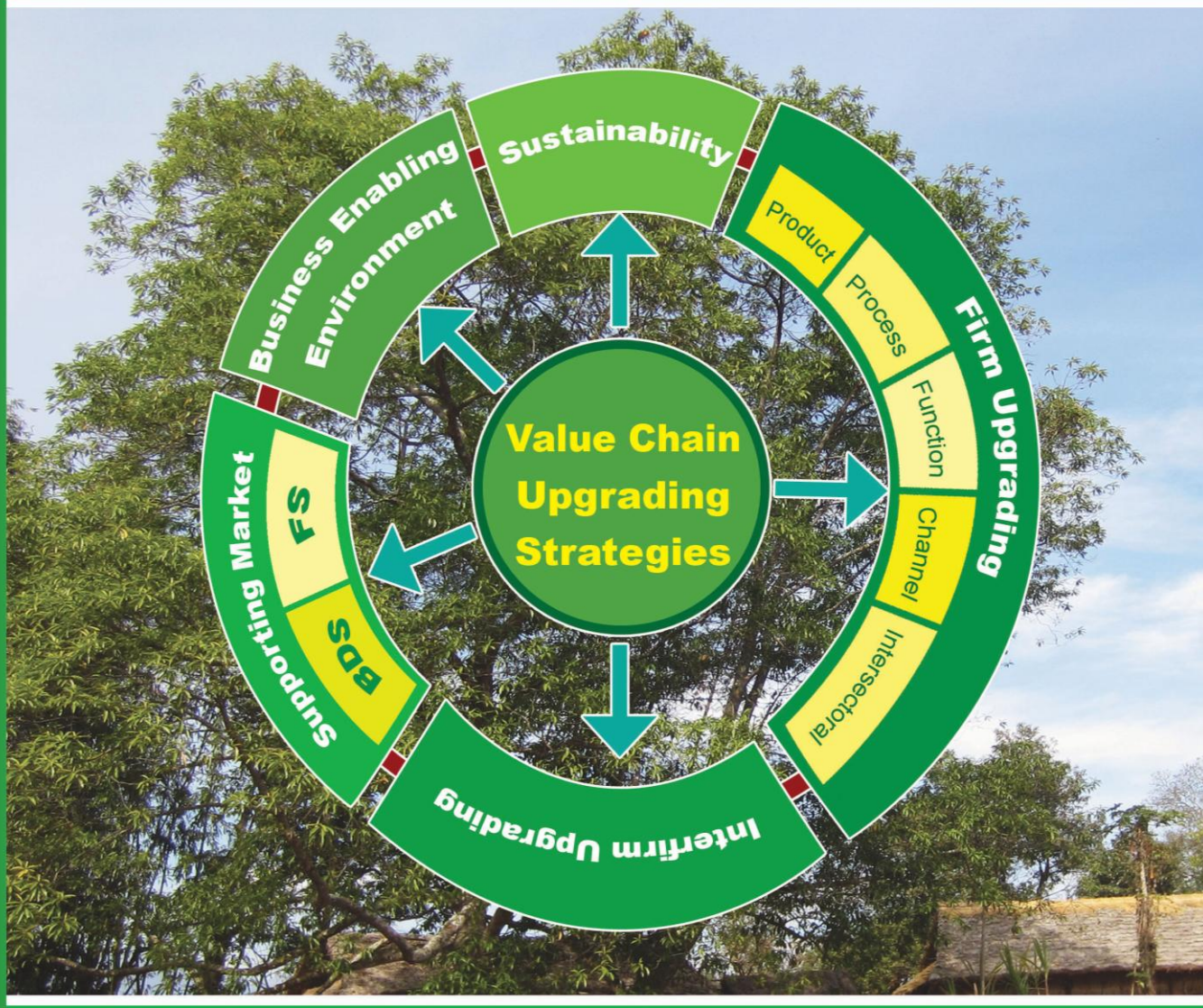
Value Chain Analysis of Forest Products in Koshi Hill Districts of Nepal:

Challenges and Opportunities for Economic Growth



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Multi Stakeholder Forestry Programme
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List of Acronyms and Abbreviations

AEC	Agro Enterprise Center
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
APPON	Association of Pharmaceuticals Producer of Nepal
ASL	Above Sea Level
B.C	Before Christ
BARDAN	Biodiversity Associates for Research Development and Action- Nepal
BCR	Benefit Cost Ration
BDS	Business Development Services
BDSPO	Business Development Service Provider Organization
BEE	Business Enabling Environment
BJC	Builders' Joinery and Carpentry Products
BMO	Business Membership Organizations
BP	Business Plan
BWP	Boiling Water Proof
BWR	Boiling Water Resistant
BZMC	Buffer zone management committee
BZUG	Buffer zone user group
Ca	Calcium
Cal	Calorie
CBOs	Community based organizations
CCA	Creosote Chromium Arsenic
CF	Community Forest
CFUG	Community Forest User Group
cm.	Centimeter
Co.	Company
COFSUN	Community based Forestry Supporter's Network
CPI	Consumer Price Index
CRC	Cooperative Research Center
CSIDB	Cottage and Small Industries Development Board
CSR	Corporate Social Responsibility
DADO	District Agriculture Development Office
DAGs	Disadvantaged Groups
DAO	District Administrative Office
DAS	Dalit Awareness Society
Dbh	Diameter at breast height
DCCI	District Chamber of Commerce and Industries
DCSI	District Cottage and Small Industries
DDC	District Development Committee
deg. C	Degree Celsius
DFO	District Forest Office
DFRS	Department of Forestry Research and Survey
DFTQC	Department of Food Technology and Quality Control
DLRO	District Land Revenue Office
DoA	Department of Agriculture
DoF	Department of Forest
DoI	Department of Industry

DPR	Department of Plant Resources
DRR	Disaster Risk Reduction
DS	Deurali Society
EBF	Environmental Bamboo Foundation
EIA	Environment Impact Assessment
FA	Forest Action
FAO	Food and Agriculture Organization
FECOFUN	Federation of Community Forestry User Group Nepal
FFS	Farmers Field School
FHAN	Federation of Handicraft Association of Nepal
FNCCI	Federation of Nepal Chamber of Commerce and Industries
FR	Fire Retardant
FS	Financial Services
FSC	Forest Stewardship Council
Ft.	Feet
FTG	Fair Trade Group
FY	Fiscal Year
GDP	Gross Domestic Product
gm.	Gram
GMF	Government managed forest
GOs	Government organizations
GT	Gum Turpentine
GTZ- PSP	Gesellschaft für Technische Zusammenarbeit- Private Sector Promotion
Ha	Hectare
HANDPASS	Nepal Hand Made Paper Association
HASCI	Himalaya Allo and Suti Cloth industry
HBTL	Himalayan Bio Trade Pvt. Ltd.
HCCP	Himalayan Community Carbon Project
HDPE	High density polythene
HEEHURLD	Health, Education, Environment, Human Rights, Local Development, and Drinking Water
Hq.	Headquarters
ICBR	International Center for Bamboo and Rattan
ICIMOD	International Center for Integrated Mountain Development
ICUC	International Center for Underutilized Crops
IGA	Income generation activities
In.	Inch
INBAR	International Network for Bamboo and Rattan
IS	Bureau of Indian Standards
ISO	International Organization for Standardization
ISSN	International Standard Serial Number
IUCN	International Union for Conservation of Nature
IUFRO	International Union of Forest Research Organizations
JABAN	Jadibuti Association of Nepal
Kcal	Kilo calorie
Kg	Kilogram
KJ	Kilo Joule
KMS	Potassium Magnesium Sulfate
KVPPA	Koshi Veneer and Plywood Production Association
KWh	Kilowatt Hour

LCEAN	Large Cardamom Entrepreneurs Association Nepal
LFP	Livelihood Forestry Project
LFUG	Leasehold Forestry User Group
Ltd.	Limited
m	Meters
MAPs	Medicinal and Aromatic Plants
MC	Management Committee
Mc	Moisture content
MDBRPP	Market Development of Bamboo and Rattan Products with Potential Project
MEDEP	Micro Enterprise Development Programme
MFIs	Micro Finance Institutes
mg.	Milligram
ml	Milliliter
MoFSC	Ministry of Forest and Soil Conservation
MoICS	Ministry of Industry, Commerce and Supplies
MR	Moisture Resistant
MSEs	Micro and Small Enterprises
MSFP	Multi Stakeholder Forestry Project
MT	Metric Tons
N	Nitrogen
N.A	Not Available/ Not Applicable
NAPF	Nepal- Australia Forestry Project
NARC	National Agriculture and Research Center
NCBS	Nepal Center Bureau of Statistics
NCC	Nepal Chamber of Commerce
NEHHPA	Nepal Herbs and Herbal Products Association
NGOs	Non Government Organization
No.	Number
NP	National Park
NPQP	National Plant Quarantine Programme
NPV	Net Present Value
Nrs.	Nepali Rupees
NS	Nepal Standard (Nepal Quality Certification Mark)
NSAID	Non Steroidal Anti- Inflammatory Drugs
NSCFP	Nepal Swiss Community Forestry Project
NTFPs	Non Timber Forest Products
NTIS	Nepal Trade Integration Strategy
OP	Operation Plan
OVOP	One Village One Product
P	Phosphorous
PF	Private Forest
pH	Potential of Hydrogen
PPE	Personal Protective Equipment
ppm	Parts per million
PPP	Public Private Partnership
PS	Private Sector
Pvt.	Private
RECAST	Research Center for Applied Science and Technology
REDD	Reducing emissions from forest deforestation and forest degradation
RH	Relative Humidity

RODFTQC	Regional Office of Deparment of Food Technology and Quality Control
RRN	Rural Reconstruction Nepal
S.	Swertia
S.N	Serial Number
SA	Samuhik Abhiyan
SAARC	South Asian Association for Regional Cooperation
SABAH	SAARC Business Association for Home Based Workers
SFRI	State Forest Research Institute, India
Sm.	SMITH
SMPPL	Saugat Micro- Promotion Private Limited
SNI	Indonesian National Standard
SNV	The Netherlands Development Organization
SOLVE	Society of Local Volunteers Efforts
SOPs	Standard Operating Procedures
Spp.	Species
Sq. ft.	Square feet
SWOT	Strength, Weakness, Opportunities and Threats
T	Ton
TAR	Tibetan Autonomous Region of China
TEF	The East Foundation
TEPC	Trade and Export Promotion Center
TOR	Terms of Reference
UMN	University of Minnesota
USD	US Dollar
USDA	United States Department of Agriculture
VAT	Value Added Tax
VC/VCA	Value Chain / Value Chain Analysis
VCA	Value Chain Analysis
VDC	Village Development Committee
WBSDN	Workshop on Bamboo for Sustainable Development Nepal
WTO	World Trade Organization

Foreword

This book is an outcome of the value chain analysis (VCA) study reports of twelve selected forest products in four districts (Dhankuta, Tehrathum, Bhojpur and Sankhuwasabha) of Koshi Hill region, Nepal. The studies for these VCAs were carried out in 2013-2014 for the Multi Stakeholder Forestry Programme (MSFP) being implemented in Cluster One since March 2013 by a consortium of Rural Reconstruction Nepal (RRN) and ForestAction Nepal (Joint Venture of RRN and FA). So, this book is a part of MSFP outcomes of this JV in four Koshi Hill districts.

This book is a result of the hard work of the wide range of contributors, encompassing from national to international levels. So, our greatest thanks go to the authors of this publication for their efforts to transform the VCA reports into the chapters of this book. This publication has been benefitted from wide range of people, namely the people and community related with the study of forest products; local to national level stakeholders; government officials at local, district and national levels; forestry, business, private sector and enterprise experts; value chain actors associated with the studied forest products; MSFP related staffs from local to national levels; and the staffs and related individuals of the local implementing partner organizations (LIPOs) of MSFP cluster one districts. We would like to extend our thanks to the local people, community members, farmers, collectors, traders and consumers related to the study of forest products for giving their time so generously so that the study team members could gather necessary information and develop an understanding of the value chain of particular products.

Thanks are also due to the institutional colleagues at ForestAction and RRN who have helped in administrating the logistics for this study. We wish to thank people who have contributed and helped to this publication by providing comments and suggestions. We would also like to acknowledge the help of many people who supported and facilitated the study team in data collection, stakeholder consultation and data analysis. We wish to extend our sincere gratitude to MSFP/SSU team, namely Mr. Ramu Subedi, Ms. Kanti Risal and Mr. Harishchandra Rai for providing necessary supports, suggestions and comments in this publication.

Last but not the least; our greatest thanks go to Mr. Jailab Kumar Rai and Mr. Suhrid Prasad Chapagain whose constant hard work in drawing the road map of this publication and his editorial contribution that made this publication a success. We would also like to thank people who have contributed in editing the language and designing of the texts and publication. We are indebted to MSFP/SSU for availing financial support to this project. We wish this publication would help to create a peaceful, prosperous and democratic future of the people dependent upon the forest resources in Nepal.

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Executive Summary

The success of community managed forest resources in Nepal is not a new phenomenon for local and global community. However, its economic contribution until now and its potentials for economic contribution from local to the national level has been an issue of debate. As a result, generating forest resources based (and related) employment opportunities has gradually been a major concern and priority of the forestry stakeholders in Nepal. In other words, establishment, support and promotion of forest based enterprises has become as one of the major intervention points for forestry programs. This has become one of the four major themes for the Multi Stakeholder Forestry Program (MSFP), implemented from 2013, in Nepal. MSFP seeks to improve livelihoods and resilience of Nepal's poor and disadvantaged people through development of the forestry sector's contribution to inclusive economic growth, poverty reduction, and tackling climate change.

The Value Chain Analysis (VCA) is one of the important steps of promoting enterprises or firms. The study team of MSFP Lot one's Joint Venture (JV) of RRN and ForestAction Nepal (RRN/FA-JV), implemented in the four districts (Dhankuta, Tehrathum, Bhojpur and Sankhuwasabha) of Koshi Hill region, also conducted VCA study of 12 selected forest products available in this region. The study was focused on assessing and analyzing the current status and future potential of selected forest products and providing upgrading strategies for the development of viable trade and business.

The overall goal of this study was to assess, understand and analyze the current status and future potential of selected forest products and provide upgrading strategies for the development of viable trade and business of the selected forest products. The study also intended to provide with comprehensive VCAs in order to determine various constraints for cultivation, processing and market of the potential forest products and explore options for potential expansions within the value chain.

The selection of the study products, in general, was based on the viability of the products (sustainable collection, processing and marketing) through stakeholder consultation in different levels, such as personal and group work, formal and informal and direct and indirect consultations. Both primary and secondary information were used to develop understanding of the value chain of the selected forest products and their multiple dimensions in multiple contexts, such as cultural, social and political. The primary data were gathered from the consultation and interaction with value chain actors – supplemented with the reflection from field observations. Understanding of the aspirations of value chain actors was highly prioritized in the field observation and stakeholder consultation.

The VCA study, at first, tried to concentrate on knowing about three aspects of selected forest products: cultivation, product processing, and market. Different types of experiences and status of cultivation, processing and market access were observed for the selected forest products.

Summary on the cultivation, processing and market status of selected forest products

SN	Products	Cultivation	Processing (in community level)	Market Access
	Medicinal and Aromatic Plants(MAP)			
1.	Alaichi (Cardamom)	Cultivation in medium scale but suffering from the increasing problem of disease	Limited processing but only through the conventional drier and that are not commercially viable	Majority to India and some in the domestic market
2.	Bael (*Aegle Marmelos)*	Limited cultivation with less benefit to the community	Processing (manually) but lack of technology	Mostly local, some regional and national
3.	Chiraito (*Swertia chirayita)*	Gradually increasing but limited to small areas and patches	No processing (Lack of knowledge but use of compressor machine is introduced)	Mainly India and China, and 5% National Consumption
4.	Rudraksha (*Elaeocarpus sphaericus)*	Gradually spreading towards the potential areas	Lack of processing in local level (because it is not a local demands) but supplied only raw products	National, India and recently increased sale to China
5.	Satuwa (Paris Polyphylla Smith)	Possible but no cultivation yet (recently being piloted by a community in Bhojpur district)	No processing yet but traded in the form of raw material	Mainly to China
	Non Timber Forest Products (NTFPs)			
6.	Allo (*Girardinia diversifolia)*	No cultivation (natural growth is sufficient)	Conventional method of processing (but lack of appropriate technology)	Good market niche (local, national and international markets)
7.	Amriso (Broom-Grass)	Cultivation in small and medium scale (both in CF and private)	Lack of vertical integration	Local, national and India
8.	Lokta (*Daphne Bholua)*	Piloted in limited places resulted into low success rate. However, Argheli cultivation is successfully practiced in some areas	Lack of technology transfer	Good market in national and international level
9.	Khair (*Acacia catechu)*	Cultivation done in medium scale	No processing in local level (needs huge investment)	National and India
10	Khote Salla (*Chir Pine)*	some cultivation with limited success rate	No processing in local level (needs huge investment)	Some in domestic and mostly in India
	Timber and Other Forest Products			
11	Uttis (*Alnus Nepalesis)*	Successful cultivation in medium scale (mainly in private land)	Semi processing but lack of enabling policy environment	Good market (in national level only, mainly to industrial buyers like veneer and plywood enterprises)
12	Bans (Bamboo)	Cultivation for only family consumption	Traditional methods of processing but lack of appropriate technology	Good market in both local and national levels

The study finally explored the possible opportunities for value chain upgrading of the study products in the forms of upgrading strategies. They were presented into nine different aspects of the products; however these have been categorized and summarized into three major dimensions in this chapter: a) Value Chain Players, namely product, process, function, channel and interfirm; b) Value Chain Supporters and Value Chain Influencers: namely BDS, FS and BEE; c) Additional livelihood opportunities and sustainability aspects namely intersectoral, and sustainability strategy.

Summary of the upgrading strategies related to the Value Chain players

SN	Products	Upgrading related to the value chain players				
		product	**process**	**function**	**channel**	**Interfirm**
	Medicinal and Aromatic Plants(MAP)					
1.	Alaichi (Cardamom)	Skills and technology for quality product	Promote seedling based cultivation	Technology for product grading at local level	Explore direct market access to the third countries	Formation of district network and linkage with national network
2.	Bael (*Aegle Marmelos)*	Storage technology	Technology for harvesting	Juice production from other fruits	Market positioning	Linkage development with entrepreneurs in other parts
3.	Chiraito (*Swertia chirayita)*	Enhancing skill for quality products	Technology transfer to ease transportation	Cultivation by DAGs in CF land	Market information for comparative advantage	Product based network formation
4.	Rudraksha (*Elaeocarpus sphaericus)*	Trade of certified product	NA	Systematic cultivation and trade	NA	Strengthening of product based network
5.	Satuwa (Paris Polyphylla Smith)	Quality product (cleansed, dried, graded and packaged)	Chemical extraction	Cultivation and trade of quality products	Trade through national pharmaceutical industries	Network formation and linkage development
	Non Timber Forest Products (NTFPs)					
6.	Allo (*Girardinia diversifolia)*	Product diversification	Technology for coarse fiber	Skill and function transfer to downward actors	Facilitate for cheapest means of transportation	Alliance for trade and access to technology
7.	Amriso (Broom-Grass)	Broom making at local level	Drying, grading and packaging at local level	Function upgrading of actors	Same channel with upgraded functions	Alliance building among all level of actors

8.	Lokta (*Daphne Bholua)*	Wastage control and quality product	Lokta cultivation as IGA	Cultivation by collectors	Market linkage expansion	Linkage with product based national network (e.g. HANDPASS)
9.	Khair (*Acacia catechu)*	Khair sale from PF and CF land	Khair harvesting from CF land	Vertical integration of actors	Explore potential channel for new products	Vertical integration of actors
10.	Khote Salla (*Chir Pine)*	Resin collection in partnership of CF and private	Resin tapping through bore hole method	Expand the value chain of product	New channel for new products	Facilitate community led enterprises
	Timber and Other Forest Products					
11.	Uttis (*Alnus Nepalesis)*	Briquette from waste	Uttis harvesting from CF land	Veneer from other species	Expanding market channel	Linkage between actors at different levels
12.	Bans (Bamboo)	Product diversification	Technology transfer	Facilitate cooperative based production	Explore local market channel	Formation of cooperative

Three aspects: Business Development Services, Financial Services; and Business Enabling Environment have been categorized under supporting services strategies for value chain actors.

Summary of the upgrading strategies related to the BDS, FS and BEE

SN	**Products**	**Upgrading strategies related to the supporting services (BDS, FS and BEE) for value chain actors**		
		BDS	**FS**	**BEE**
	Medicinal and Aromatic Plants (MAP)			
1.	Alaichi (Cardamom)	Skill and knowledge for quality seedling	Access to finance for holding the product	Facilitation for direct exporting to third countries
2.	Bael (*Aegle Marmelos)*	Enterprise governance coaching	Access to finance for advancement of technology	Contractual obligation for raw material collection
3.	Chiraito (*Swertia chirayita)*	Compressing technology	Access to finance for quality seedling and compressing technology	Facilitation for legal trade
4.	Rudraksha (*Elaeocarpus sphaericus)*	Knowledge base for expanding cultivation	NA	Facilitation of systematic royalty collection
5.	Satuwa (Paris Polyphylla Smith)	Skills for cultivation	Linkage with FS for cultivation	Awareness raising about existing legal processes
	Non Timber Forest Products (NTFPs)			
6.	Allo (*Girardinia diversifolia)*	Legal facilitation collection and trade	Access to finance for new technology	Policy provision for trade

7.	Amriso (Broom-Grass)	Market information at local level	Access to finance for holding products	Facilitation for final product making
8.	Lokta (*Daphne Bholua)*	Improve enterprise governance	Access to finance for quality products	Ease the administrative requirements and processes
9.	Khair (*Acacia catechu)*	Awareness on legal processes of trade	Access to finance for enterprise	Khair sale from CF
10.	Khote Salla (*Chir Pine)*	Awareness for legal procedures	Access to finance for community led resin tapping	Facilitation for the use of local labor
	Timber and Other Forest Products			
11.	Uttis (*Alnus Nepalesis)*	Facilitate for new technology	Access to finance for technology	Policy for bamboo as NTFPs
12.	Bans (Bamboo)	Awareness for legal process of trade	Access to finance for technology	Facilitation for Uttis from CF land

The study also tried to assess and recommend livelihoods and sustainability aspects of the value chain of selected forest products. For these, the study attempted to explore and recommend potential opportunities to expand job opportunities, increase personal income and ways to sustain the firm.

Summary of the upgrading strategies related to the intersectoral and sustainability

SN	Products	Upgrading strategies for Livelihood Improvement and social capacity enhancement	
		Intersectoral	**Sustainability**
	Medicinal and Aromatic Plants(MAP)		
1.	Alaichi (Cardamom)	Increase income from the use of other parts	Develop national branding
2.	Bael (*Aegle Marmelos)*	Product making from other parts of Bael	Facilitation for optimum operation of enterprise
3.	Chiraito (*Swertia chirayita)*	Additional income from other NTFPs	Backward and forward linkages of network
4.	Rudraksha (*Elaeocarpus sphaericus)*	Cooperative formation	Commercial cultivation
5.	Satuwa (Paris Polyphylla Smith)	Cultivation and trade of Chiraito	Promote piloting sites as resources centers
	Non Timber Forest Products (NTFPs)		
6.	Allo (*Girardinia diversifolia)*	Cultivation and income from other NTFPs (like Chiraito, Lokta)	Prioritize as major product of the place
7.	Amriso (Broom-Grass)	Increasing income from other fiber making activities	Leadership upgrading
8.	Lokta (*Daphne Bholua)*	Income from Allo and bamboo	Knowledge for harvesting

9.	Khair (*Acacia catechu)*	Innovation and investment in other uses of Bael tree	Vertical integration of actors
10.	Khote Salla (*Chir Pine)*	Explore medicinal and other uses of Khote Salla	Increase income and employment
	Timber and Other Forest Products		
11.	Uttis (*Alnus Nepalesis)*	Briquette production from wastage	Ensure sustainable harvesting
12.	Bans (Bamboo)	Use of wastage parts of bamboo	Branding ownership

It is expected that the value chain upgrading strategies recommended in this study will be useful for stakeholders concerned including related value chain actors. It is also expected that this publication will add some value to create a peaceful, prosperous and democratic future of the people dependent upon the forest resources in Nepal.

PART ONE

INTRODUCTION

Chapter 1[1]

The Context and Significance of Value Chain Analysis of Forest Products in Nepal[2]

Introduction

Since last two decades, the economic value/potential and contribution of forestry sector has remained one of the central issues of debate for all including policy makers, planners, politician, researches and academics in Nepal. There is no question on the value and contribution rendered by forest resources from local to national economy. However, the exact economic potential and contribution of forest resources is still lacking. The official statistics from the National Bureau of Statistics (CBS) has estimated 5 percent of Gross Domestic Product (GDP) contribution. But, in contrast the approach paper to 3-year interim plan (2011-2013) by Ministry of Forest and Soil Conservation (MoFSC) has estimated over 10 percent (MoFSC 2013). This figure is not much compared to the total national land area covered by the forest (approximately 40 %). However, it does not mean that the forest resource in Nepal has less contribution in national economy. Rather it demands in-depth and multidimensional analysis on the values and uses of forest resources such as ecological, cultural, social, aesthetic, and political aspects.

Regarding values and uses of forest resources in Nepal, answers of the two questions would be relevant and important for all. The first one is whether, despite different forms of values, the economic contribution of forest resources could be increased in Nepal; and if yes then how could this be made possible. The ecological diversity followed with the richness of biodiversity (both plant and other living organism), significant forest coverage (approximately 40 %), relation between rural livelihoods and forest resources (majority rural people dependent on forest resources), and access to larger transnational markets (such as China and India) have provided the basic foundation to argue that Nepal's forestry has high potential to contribute economic growth in both local and national level. There are different factors that may affect or determine the economic contributions of forest resources in Nepal. One of the most important factors would be of course the policy and legal provisions related to forest resources which affects the activities like cultivation, harvesting, processing, trade, and revenue generations. Second is capacity and skills of market actors like farmers, producers/processors, and traders that moves the whole value chain into actions. Third would be the provisions and availability of necessary services and facilities for the value chain actors such as business development services (BDS) and financial services. The next important factors are socio-cultural elements such as social classes, cultural beliefs and practices along with their consumption preferences.

Identification of value chain actors and enhancing the roles/responsibilities they are playing in the whole value chain of forest resources/products (like conservation, management, utilization, harvesting, processing, marketing) is the most important steps in increasing the economic contribution of forest resources in Nepal. But identification of the value chain

[1] Contributors of this chapter (in order): Jailab Kumar Rai, Suhrid Prasad Chapagain and Abhinaya Pathak.

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actors and their functions would be very challenging and complex for many reasons. Such as the different functions of different actors and different functions of same actors, determined by different contexts such as in the cases of different forest products (like timber, non-timber forest products-NTFPs, different NTFPs) and different situations (geographical, social, political, cultural, and ecological).

The meaning and values of forest products is one of the important elements that need to be considered while identifying and analyzing the functions of value chain actors. This is because of the diverse meanings, values and practices/actions of the different actors associated with the forest resources. For example, the meaning and values of forest resources dependent communities, political leaders, social activists, academics, researchers, policy makers, bureaucrats, and indigenous communities have different issues and concerns. This is not due to a single reason but constitutes diverse factors such as extend of forest resource dependency, cultural values associated with forest resources, socio-economic status, personal status and position amongst many others. For example, the meaning, values and uses of forest resources for different ethnic communities (such as Rautes and Chepangs), social groups (such as classes, occupation, gender) and people in different geographical regions (mountain, hill, south plain/tarai) differ from one to the another group. However, this paper is not able to discuss these all elements; instead the paper tries to introduce conceptual underpinnings of value chain actors in the context of the status of forest resources in Nepal.

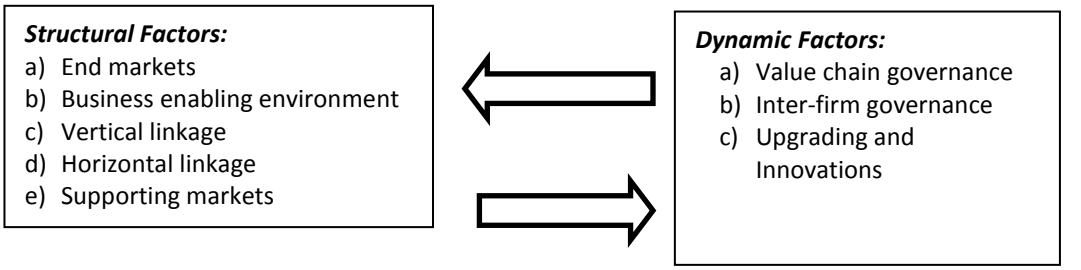
Value Chain Analysis: An Introduction to the Conceptual Linkages

There is no question that the Value Chain Analysis (VCA) has established as one of the most common steps in promoting any form of business or the enterprises. Its significance has increased because of its strengths in identifying gaps and developing intervention points for the value addition of particular business or enterprise. In general, 'VCA encompasses the full range of activities and services required to bring a product or service from its conception to sale in its final markets – whether local, national, regional or global' (Kaplinsky and Morried 2002). This means the VCA includes roles or functions of different actors such as input suppliers, producers, processors and buyers associated with the whole ranges of activities of a particular product. The actors are supported by a range of technical, business and financial services and service providers.

The concept of VCA was used in the 1960s and the 1970s by analysts charting a path of development for mineral –exporting economies (Girvan, 1987). But during the 1990s, value chain analysis has been widely used. One primary sources of the recent prominence of the VCA as an analytical structure tools arises from the work of Michael Porter who identifies two key constructs that are necessary for the upgrading national capabilities (Porter 1985 and 1985). The first is referred to the value chain distinguishing different stages of the process of supply (inbound logistics, operation, outbound logistics and marketing and sales), and after sales service and the support service the second becomes firm marshals to accomplish this task (strategic planning, human resource management, technology development and procurement). This idea was built upon the insight that an organization is more than a random compilation of machinery, equipment, people and money. It is said that these two systematic constructs become able to produce something for which customers are willing to pay a price. Porter argues that the ability to perform particular activities and to manage the linkages between these activities is a complete VCA and a source of competitive advantage (Kaplinsky 2000: 8).

A complete VCA comprises of understanding both the structural and dynamic components related to the particular products. The structure of the VCA refers to all the individuals and firms that conduct business by adding values and helping move to the product toward the end markets; while the **dynamic** components of the value chain refers to the determinants of individual and firm behavior and their effect on the functioning of the chain. The structure of the value chain influences the dynamics of firm behavior and these dynamics influence how well the value chain performs. Therefore, the process of VCA requires the use of the value chain framework to identify and understand both of this components.[1]

Figure 1.1: Structural and dynamic components of VCA



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The VCA approach is useful for its distinctive features used in analyzing an industry and the tangible and non-tangible considerations used in designing and implementing interventions. In general, the VCA tries to identify and emphasize on eight features: 1) market system; 2) end markets; 3) role of value chain governance; 4) relationship of the actors; 5) changes in firm behavior through facilitation; 6) transforming relationships among actors; 7) leverage points; and 8) empowering the private sectors.[3]

The application of VCA and its underlying intervention approaches differs from one product to another and the prevailing contexts (social, cultural, political, economic, market) of the product (Neven 2014). However, it could be claimed that the significance of VCA has been increasing globally for many reasons. According to Kaplinsky (2000), there are three main sets of reasons why VCA is important: 1) growing division of labor and the global dispersion of the production of components and systemic competitiveness; 2) necessity of efficient production for successful penetration into the global markets; and 3) requirement of the understanding of dynamic factors within the whole value chain to enter into global markets for sustained income growth.

One of the primary goals of any business is to gain an edge on their competition. One way to do so is the application of VCA approach through which an enterprise or a business organization can create a competitive advantage and can provide the greatest value to their consumers. This is, in general, through identifying each part of the value chain and seeing where improvements can be made either from a production standpoint or a cost perspective to ensure consumers satisfactions of their demands. This makes the process of getting quality products in the cheapest cost that leads a business towards benefit in the long run. In other words, value chain analysis looks at each of the activities in the value chain to determine what steps are necessary and which are not in an attempt to boost the company's bottom line.

[3] www.mircolinks.org

The process of actually organizing all of these activities and their proper analysis can therefore be called a value chain management. The goal of value chain management is to ensure that those in charge of each stage of the value chain are communicating with each other to help make sure the product is getting in the hands of customers as seamlessly and quickly as possible, which is also called 'competitive advantage' for Porter (1985). Porter further argues that this is made possible through two categories of activities: 1) primary activities; and 2) support activities. Primary activities include raw material collection to the services related to the product's performance; while the supporting activities include process of obtaining raw material, innovation of new technology, management of human resources and the organization.

The VCA describes the activities within and around an organization and relates them to an analysis of the competitive strength of the organization. To be precise, it shows the whole cycle or figure to the stakeholders about the production, trade and marketing and shows the loophole to be aware and entry point to intervene by acknowledging both good and bad aspect in the chain by using suitable upgrading or innovation techniques. It shows the possible steps which can be promoted to add the value of the product and make an enterprise profitable.

Forest resource in Nepal is considered as one of the important pillars for economic growth. However, till the date, there has no substantial contribution of this sector to both national and local economy except recognizing its role in meeting daily domestic needs for the local people. Amid this situation, there is a need to identify way forward to maximize the benefit of forest resources by optimal utilization of them. . In this context, VCA of forest resources and products that have been contributing to generate local employment opportunities and national revenue is most essential. Primarily, this includes the in-depth understanding of the following aspects of value chain in forest resources (discussion is not in priority ranking).

a. ***End Markets:*** End markets are the starting point of value chain analysis. It determines basic characteristics of a successful product or service including price, quality, quantity and timing. The understanding of end market of forest resources/products in Nepal is very complex because of many reasons such as presence of diverse forms and categories of market and consumers. In this context, a VCA helps in exploring and identifying profitable markets and ways to reach it. Here, the end market is not the location but it is people residing in a certain location with consumption habits of that product.

b. ***Business enabling environment:*** The success and failure of the operation of value chains, in general, depend upon the existing business enabling environment (BEE) in all levels such as global, national and local. This includes norms and customs, laws, regulations, policies, international trade agreements and public infrastructure (roads, electricity, and building). Forest resources in most of the cases have been discussed for its inefficient rules, regulations and policies and Nepal is not an exception. In other words, it is mostly argued that there is lack of BEE in terms of the value chain of forest products in Nepal.

c. ***Vertical and horizontal linkages:*** Vertical linkages represent conduits for the transfer of learning, information and technical, financial and business services from one firm to another along the chain; while the horizontal linkages represent between firms at any level in a value chain and that can reduce transaction costs, create economies of scale, and contribute to the increased efficiency and competitiveness of an industry in both the formal and informal levels. In forestry sector, there is need of linkage as various stakeholders are associated with the trade. For instance, linkage between Community

Forest Users Group (CFUG), Federation of Community Forest Users Nepal (FECOFUN) and District Forest Office (DFO) is a horizontal linkage that is vital for the timber or forest resource trade. On the same fleet, linkage between CFUG, district traders and industries is a vertical linkage that is essential for the value addition or processing of the forest resources/products. In this context VCA helps to build up linkages in both levels.

d. ***Supporting Markets:*** Supporting markets play an important role in firm upgrading. They include financial services; cross-cutting services such as business consulting, legal advice and telecommunications; and sector-specific services, for example, new resin extraction techniques, modernized tree harvesting equipment etc..

e. ***Value Chain Governance:*** Value chain governance refers to the relationships among the buyers, sellers, service providers and regulatory institutions that operate within or influence the range of activities required to bring a product or service from inception to its end use. There is no doubt that forestry sector is influenced by weak transparency and rampant trade of valuable forest resources/products in Nepal. In this context, VCA helps to identify existing loophole and hurdles, area of improvement and possible ways for good governance.

f. ***Inter-firm Relationships:*** Inter-firm relationships refer to the nature and quality of the interactions between stakeholders in a value chain. Forest resources based and related firms or enterprises are operated in the diverse forms. They are producing different products and services in different scales. In this context, the VCA helps to identify possible avenues for_collaboration, enable the transmission of information, skills and services; and provide incentives for upgrading.

g. ***Upgrading and Innovations:*** In order to respond effectively to market opportunities, firms need to innovate to add value to products or services and to make production and marketing processes more efficient. This activity includes upgrading of the product, process, function and channel of the product. Upgrading at the forestry sector focuses on increasing the competitiveness of all activities involved in the production, processing and/or marketing of a product or service and mitigating the constraints that limit value chain performance. In prevailing forest product value chain, there is immediate need of upgrading at different segment and above mentioned upgrading can be the possible ways to amend and commercialize forest sector.

The analysis of the forest resources in Nepal definitely require identification and in-depth understanding and analysis of functions and aspirations of the value chain actors associated with the different forest products. Such analysis helps to identify prevailing gaps and develop practical intervention points for improving its economic contribution. For this, it is worthwhile to present and discuss briefly on the national trend of forest resources production, trade and revenue generation in Nepal.

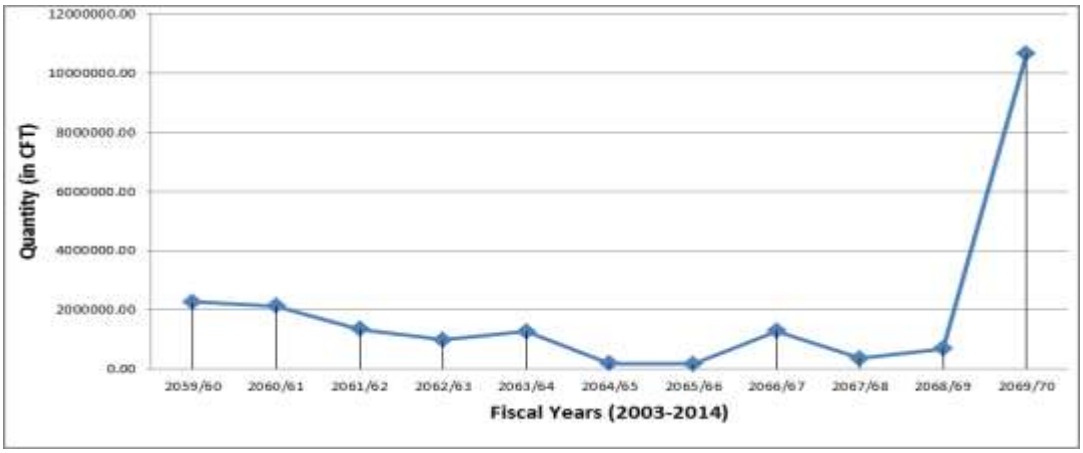
Quantitative Aspects of Forest Resources in Nepal: An Analysis of the Trend

The broader categorization of forest resources comes into three typologies: timber and firewood; non-timber forest products (NTFPs); and medicinal and aromatic plants. In general, the economic contribution of the forest resources is evaluated on the basis of the quantity produced, traded and the revenue generated out of these three types of forest products. The products, trade and revenue of the forest resources in Nepal have also been getting measured, compared and analyzed through the same variables for long.

The forest in Nepal accounts approximately 40 percent of the total national land area, which becomes nearly 5.5 million hectares (MoFSC 2013). It is one of the major productive resources in Nepal, however the economic contribution showed by the available data is not enough compared to its potentials. There may be many reasons behind this, such as lack of enabling policy environments (policies and laws), lack of basic infrastructure, lack of market, lack of technology, lack of investment, weak governance, and may others. In this context, it will be important to discuss about general processes or steps of how forest products are harvested, traded and the revenue are generated in Nepal.

The harvesting/collection and trading of timber and firewood from CFUGs in Nepal require fulfillment of long administrative processes. These processes make collection and trading of the timber and firewood from CFUGs in Nepal very complex and difficult. This complexity is also clearly reflected in the quantity of timber and firewood collected and traded during the past one decade.

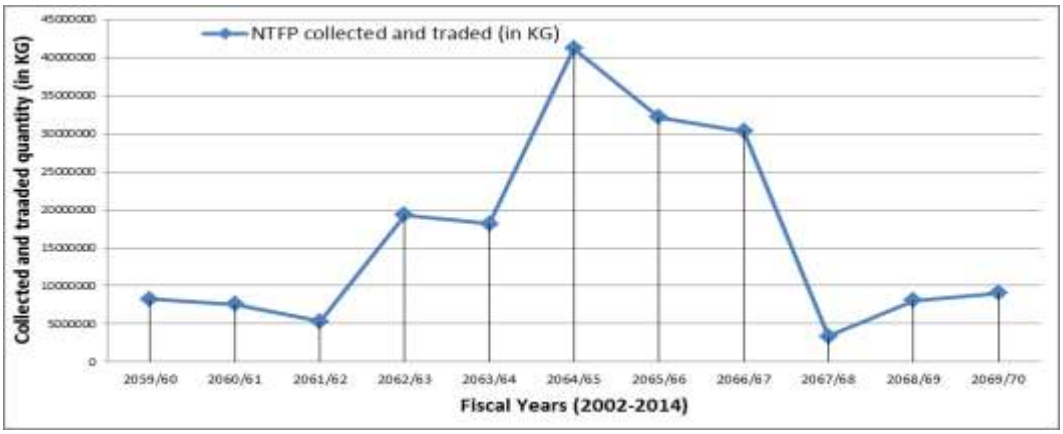
Figure 1.2: Quantity of timber and firewood collected and traded in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

The figure 1.2 clearly shows that the timber and firewood quantity collected and traded were steadily declined in most of the fiscal years except a dramatic increase in the recent one (2069/70 BS). This data demand an in-depth analysis on the decline of timber and firewood quantities to know the reasons of its decline and identify the way forward for its improvements. Furthermore, it also creates the questions of whether the timber and firewood production, collection and trade were really declined or there were some other reasons such as illegal collection and illegal trading. This chapter of this report does not penetrate the depth of these issues; however the data indicate that there are some gaps and problems in resources production, collection, trade, and revenue generation or in the data base management regarding this issue in Nepal.

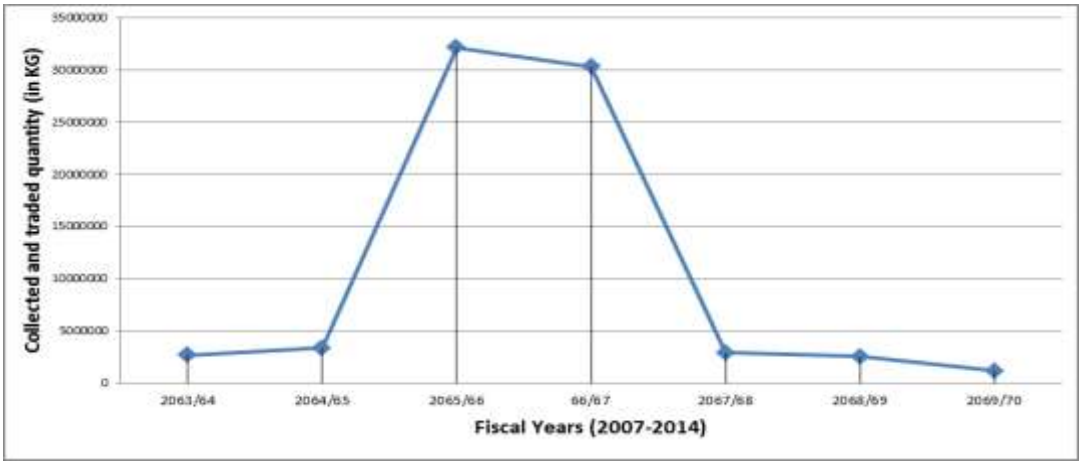
Figure 1.3: Quantity of NTFPs collected and traded in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

According to the official report published by DoF of the Ministry of Forest and Soil Conservation (MoFSC), 12 types of plants[4] have been listed into the NTFPs category. It is a general assumption that the sustainable cultivation and harvesting of the NTFPs products should maintain consistency in the quantity (increase) of its production, collection and trade. In reference to this assumption, the figure 1.3 clearly shows that the quantity of collected and traded NTFPs was dramatically increased in some fiscal years and declined in others within the last eleven fiscal years. This indicates that the NTFPs collection and trade in Nepal is not sustainable and that require improvements in its value chain. The sudden fall and rise of the collected and traded NTFPs quantity gives rise to a series of questions.

Figure 1.4: Quantity of medicinal and aromatic plants (Jadibuti) collected and traded in the last 7 fiscal years[5] in Nepal



Source: MoFSC/DoF 2064-2070 (BS)

[4] Name of the NTFPs in Nepal: LauthSalla, Resin, Argeli, Allo, Lokta, Khair, Main, Babiyo/Khar, Honey, Bhorla leaf, Nigalo, and Amriso including gravel.

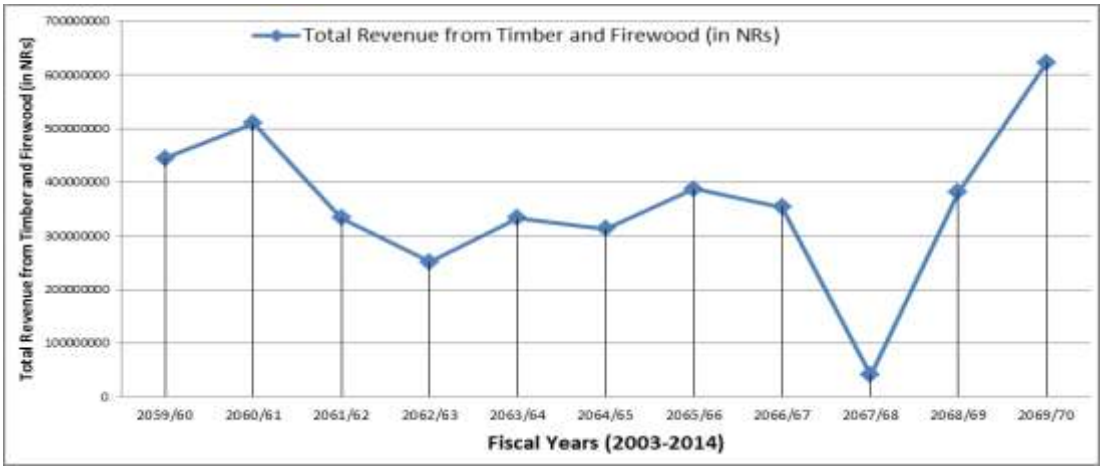
[5] Publication of the report by Department of Forest did not distinguish Jadibuti before 2063/4 (BS).

The total of 164 types of plant species have been identified and categorized as medicinal and aromatic plants (MAP) in Nepal (MoFSC/DoF 2064-2070 BS). The data (Figure 1.4) on the collection and trade of the medicinal and aromatic plant clearly show a high fluctuation during the last seven fiscal years in Nepal. Figure 1.4 shows a dramatic increase in the fiscal year 2065/66 BS, dramatic fall in the fiscal year 2067/68 BS and gradual decline in the last two fiscal years. The dramatic fall and gradual decrease in the collected and traded quantity of medicinal and aromatic plants in succeeding fiscal years indicates some problems in either the data base management or in the production, harvesting and trade of the MAPs in Nepal. In other words, the production, collection and trade practice of the MAPs in Nepal does not seem sustainable which demands in-depth and comprehensive studies and analysis.

Revenue of the Forest Resources in Nepal

One of the important dimensions of measuring economic contribution of forest resources is obviously the amount of revenue generated from the collection and trade of the forest resources and its products. The available data on the revenue generated from the collection and trade of the forest products in Nepal, over the last eleven fiscal years, have been presented and simply compared in this paper. In general, the data on revenues from forest products (timber and firewood, NTFPs, and herbal and aromatic plants) seem more or less similar to the quantitative data presented and discussed in the earlier section of this chapter.

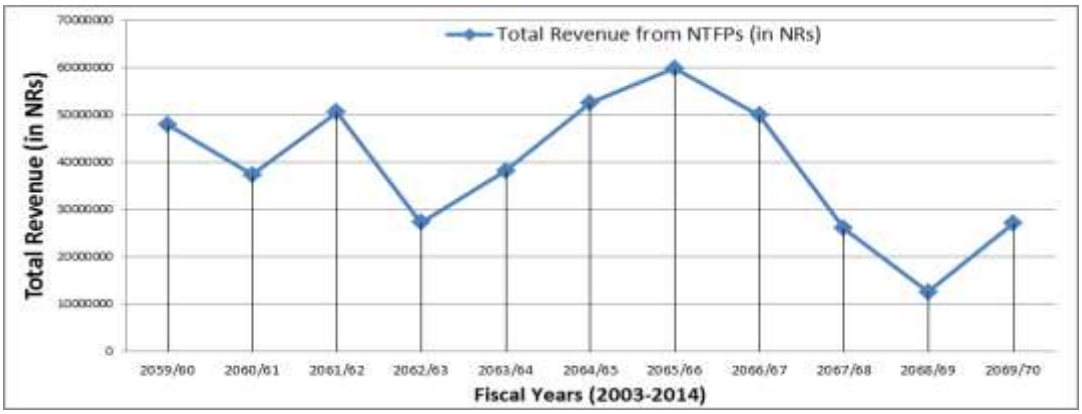
Figure 1.5: The total revenue generated from timber and firewood in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

Figure 1.5 clearly shows that the revenue generated from the timber and firewood trade was increased in five fiscal years and also decreased in five fiscal years compared to the preceding fiscal years. This means the revenue generation from timber and firewood remained unstable or inconsistent during the last eleven fiscal years in Nepal. The fall and rise in most of the years and dramatic fall and rise in the three fiscal years (2068 to 2070 BS) is much questionable that demands in-depth study/analysis. The fluctuation of revenue is not only from the timber and firewood, but also from the NTFPs.

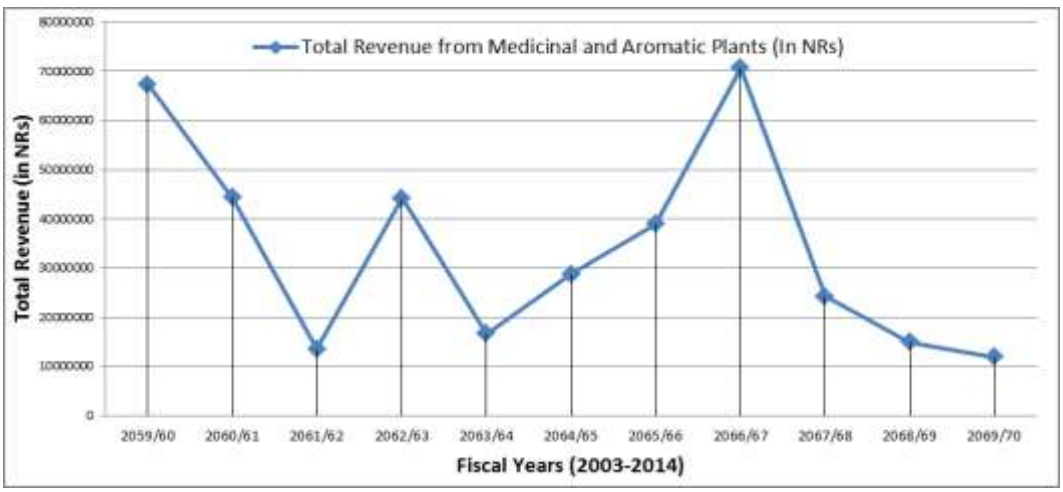
Figure 1.6: The total revenue generated from NTFPs trade in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

The figure 1.6 shows that the revenue from NTFPs was slightly increased in the fiscal year 2065/66 but it declined in most of the other years. This data demand in-depth and comprehensive studies and analysis on how revenue from NTFPs is collected and data base are managed in Nepal.

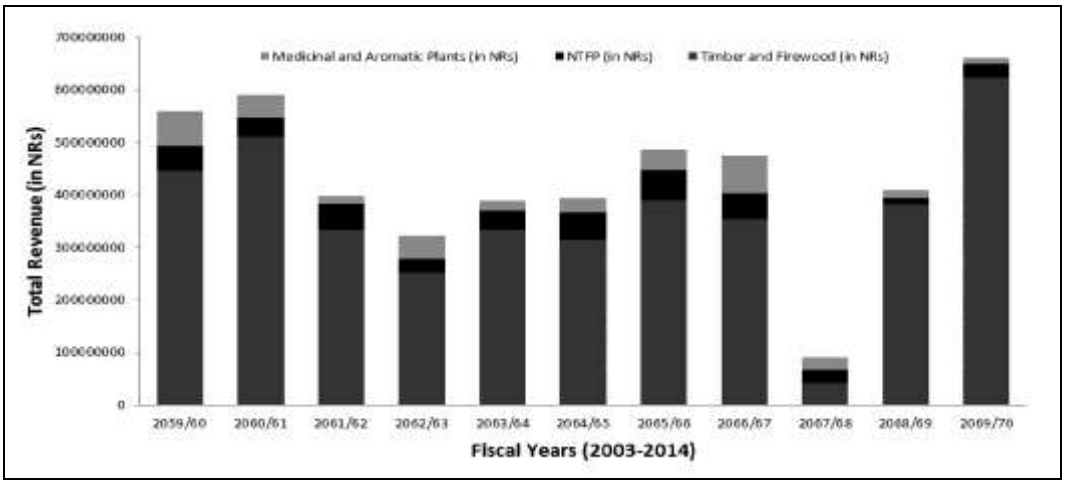
Figure 1.7: The total revenue generated from medicinal and aromatic plants in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

The trend of the revenue generated from the total collected and traded quantity of medicinal and aromatic plants in Nepal also remained as same as the revenue generated from timber and firewood and NTFPs. The figure 1.7 clearly shows that the revenue generated from medicinal and aromatic plant was not increased over the last eleven fiscal years. Rather it was declined in most of the fiscal years. A slight increase is noticeable in the fiscal year 2066/67 (BS), however the amount remained less in most of the fiscal years, except in 2059/60 (BS).

Figure 1.8: The revenue generated from three types of forest products in the last 11 fiscal years in Nepal



Source: MoFSC/DoF 2059-2070 (BS)

The figure 1.8 clearly shows the fluctuation of forest revenue within the last decade. The revenue generated in the different fiscal years, except in two fiscal years (2061 and 2070 BS), was less compared to the first fiscal year (2060 BS). Moreover, the total forest revenue generated in the succeeding fiscal years was remained less compared to the total revenue generated in the fiscal year 2059/60. This data are not satisfactory when it is compared with the coverage of forest areas (40 %), claim of improved forest governance and increased economic contribution (increased from 8 % to 10 %) (MoFSC, 2013). Similarly, gradually increasing size and number of community forest and its users throughout the country (nearly 23 percent of national total forest with over 1.6 million households through 17,685 CFUGs) also becomes questionable. This means whether the declining forest revenue is due to the increasing number and size of community forestry and its users or there are other reasons in Nepal. So, the declining forest revenue in Nepal is very crucial but critical in terms of increasing number and size of the community forestry in Nepal.

One of the indicators of the sustainable management of forest resources would be a gradual increase of the revenue from preceding fiscal years to the next. The total revenue generated from forest resources in Nepal (timber and firewood, NTFPs, and MAP) during the last eleven fiscal years seems discouraging from this point of view. In other words, the economic contribution of forest resources (in terms of revenue generation) is not encouraging in Nepal. Ideally, the revenue should have to be increased from preceding fiscal years to the succeeding one; otherwise the amount, at least, would not have to be much lower than the preceding fiscal years.

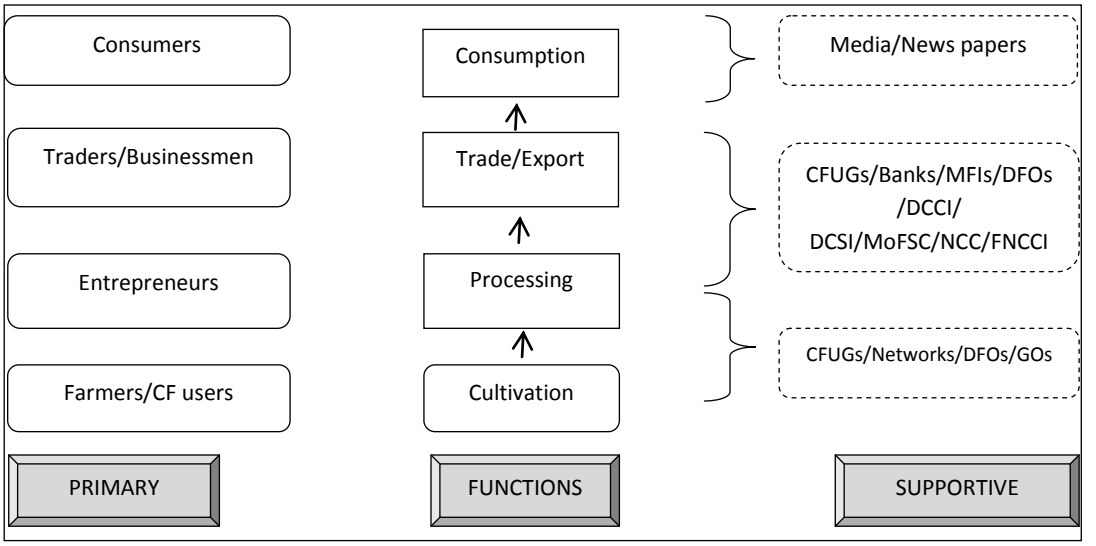
The quantity and the amount of revenue generated by forest resources in Nepal give rise to some questions. For example, were the production and trade of forest resources in Nepal really fluctuated or decreased? Do the fluctuated quantities really mean the unsustainable harvesting and trade of the NTFPs in Nepal? Or there are other reasons/problems/gaps? This paper does not depict answer of these questions; however sudden rise and fall in the total quantity of forest products indicate some gaps and problems to be identified, analyzed and provide way forward for the improvement of sustainable production, harvesting and trade of forest products in Nepal.

In this context, one of the important steps to way forward for the improvement of revenue generation from forest resources in Nepal is obviously through identification of value chain actors associated with the forest resources/products traded in the market, their existing roles and gaps in the whole value chain and then enhance their roles/capacities in the value chain of the products and its market. This means identification and enhancement of the roles/capacity of value chain actors in different steps such as cultivation, harvesting, processing and marketing of forest resources and forest products are most essential and required in the given contexts of Nepal.

Functions of Value Chain Actors: The Context of Forest Products in Nepal

It is already discussed that the economic potentials of forest resources in Nepal are yet to achieve. For this, identification of the actors, their existing functions and scope of upgrading their functions are most essential. The preliminary steps in this regard would be a proper understanding of the value chain map through which location, functions and upgrading strategy of value chain actors could be clearly identified. In general, the value chain actors can be categorized in two typologies: a) primary actors (producers/collectors, traders and consumers); and b) supportive actors (local community groups, civil society organization, government organization, technicians/experts, and financial institutions). These two forms of actors are clearly identical in the context of forest products in Nepal. The whole processes and actors engaged in the hand-made paper in Nepal could be taken as an example. There community forest users, enterprise owners, traders and buyers are clearly identical as primary actors; while CFUGs, DFOs, NGOs, trainers, and banks and cooperatives are playing supportive roles for the smooth functioning of particular enterprise.

Figure 1.9: Value chain actors and their functions of forest products identified in this study



In general, the success or failure of an enterprise or firm depends upon the level and extent of functional integration of its value chain actors. Regarding forest products in Nepal, functional relation, cooperation and coordination between primary actors and supportive actors determine the extent of success or failure of a firm (means CFUG and DFO). Talking about the firms or enterprises based or related to the forest resources in Nepal, one of the thoughts

argues that community based/managed enterprises are not possible and feasible in Nepal and hence they argue that private enterprises should be promoted. In its contrast, some other argue that the existing forest policies are not favorable to flourish community based enterprises in Nepal and hence existing policy should be changed to promote community based/managed forest enterprises in Nepal. This debate clearly indicates the necessity of the VCAs of forest products to identify existing gaps and provide comprehensive upgrading strategies to add the values in the functions and integration of associated value chain actors.

It is already discussed that the revenue generated from forest resources and forest products in Nepal is not satisfactory in terms of the size and potentials of forest resources. In the context of the importance of the functional integration of value chain actors and their functions, it can be argued that there are some functional gaps or disintegration among the value chain actors. In order to cope with this issue, the adoption of VCA is indispensable as it is capable to diagnose the gaps and provide upgrading strategies. Regarding forest products in Nepal, VCA may be important in the following aspects:

a) ***Market trend and competitiveness analysis:*** The market trend and competitiveness analysis helps the actors to know the ongoing rift in market. It shows them who are the competitors and how to compete with them. Ultimately, it helps the actors to be prepared for being presented in the market. It also helps to visualize the demand, price and market channel of product flow.

b) ***Supply chain:*** The supply chain shows the actors through which route do the products flow during the trade. It can help the body concerned to regulate the system in effective manner.

c) ***Economic analysis of resources:*** The economic analysis of resources shows the cost benefit of cultivation/production of resources, unit production cost, fixed capital, pre-operating cost, initial working capital, which help the promoter or supporter to be economic and estimate the interventions in the value chain.

d) ***Opportunities and constraints:*** It is important to identify and analyze the problems and opportunities associated with the particular products when it is aimed to promote an enterprise or firm.

e) ***Value chain upgrading strategy:*** This is important part of value chain and has high influence on the overall VCA. It includes the end market visioning; firm level upgrading such as product, process, channel, functional, intersectoral and inter-firm upgrading; business development and financial service strengthening; strategy for business enabling environment; and sustainable strategy. This helps to improve the value chain and its knowledge to stakeholders as key to improve their role in the whole value chain.

The trend of the quantity of forest resources traded and the revenue generated out of that, presented and discussed in the beginning of this chapter, clearly indicates the inconsistency of either production or harvesting and trade of forest products in Nepal. This means sustainable management of forest resources in Nepal is either lacking or very poor. Further, it will give rise to the multiple forms of questions upon the forest resources in Nepal unless it is understood and addressed immediately. There may be many ways to address this issue and VCA would be one of them. The VCA, in this context, helps in understanding the whole value chain of different forest products, gaps in their functions/roles and provides with upgrading strategies to add values through its actors. The other chapters of this book, therefore, deals with VCA of selected 12 forest products in four Koshi Hill districts in Nepal.

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PART TWO

VCA OF MEDICINAL AND AROMATIC PLANTS

Chapter 2[6]

Alaichi (Cardamom): Widely Cultivated and Exported but Limited Innovations in Processing and Market Expansion[7]

Introduction

Cardamom is one of the most traded Non Timber Forest Products (NTFPs) in Nepal. According to the official information of the Department of Forest (DoF), the total of 990620 kg cardamom was collected and traded in Nepal in the fiscal year 2068/069 (BS) alone which generated 208204.3 NRs revenue (MoFSC 2069). The data show that Nepal is one of the largest producers of cardamom, especially the black cardamom. This is the reason of cardamom cultivation as one of the most common and widespread agriculture practices for people in rural areas of Nepal.

- **Local Name**: *Alaichi;*
- **Common Names:** *Alaichi, Elaichi;*
- **English Name:** *Large Cardamom, Hill cardamom, Bengal cardamom, fragrant cardamom, Black cardamom, Black cardamom, Greater cardamom;*
- **Synonyms:** *Cardamom subulatum (Roxb) Kuntze;*
- **Botanical Name:** *Amomum Subulatum, Amomum costatum;*
- **Family:** *Zingiberaceae;*

Black cardamom is the dried fruit of a perennial herbaceous plant of the zingiberaceae family. *Amomum subulatum* is the cultivated species of Large Cardamom. Cardamom is one of the oldest spices used by man. In India, it was used as early as the 6th century BC in Ayurvedic preparations, as mentioned by Susrata (Sharma *et al.* 2000). It is an important economic crop in the Eastern Himalayas of South Asia including in Nepal. Typically, the woodland area with overhead shade and access to regular irrigation from mountain streams is favourable for Alaichi cultivation. Due to its peculiar climatic demands for cultivation, it is established as one of the widely cultivated NTFPs in Nepal, especially to the people in mountain and hills. Recently, a number of cultivated variants of Large Cardamom are adapted to different elevations and various other environmental factors such as water deficit and frost. Different species are identified and about seven wild species can still be found in the South Asia region (Sharma *et al.* 2000).

[6] The contributors of this chapter (in order) are: Suhrid Prasad Chapagain, Abhinaya Pathak, and Jailab Kumar Rai.

[7] Suggested citation of this chapter: Chapagain, S.P., Pathak, A., and Rai, J.K., 2014. Alaichi (Cardamom): Widely Cultivated and Exported but Limited Innovations in Processing and Market Expansion. In: Rai and Chapagain (Eds.), "Value Chain Analysis of Forest Products in Koshi Hill Districts of Nepal: *Challenges and Opportunities for Economic Growth",* ForestAction Nepal and RRN, Kathmandu, Chapter II, pp. 19-40

The main objective of the Value Chain Analysis (VCA) of Alaichi is to provide comprehensive information for market and social benefits by determining various constraints for its cultivation, market access, and potential expansion opportunities in its value chain. The VCA of Alaichi is based on the data/information available in the reports (published and unpublished) and literatures – supplemented by the field visits and observation in Terhathum, Sankhuwasabha and Bhojpur districts and interaction and consultation with different actors such as producers, traders, businessmen, policy makers, and government authorities in visited districts.

Habit (Characteristics), Habitat and Distribution of Alaichi

Large Cardamom stems grow up to 5 feet tall. Leaves are found on the upper portion of the stem. This is an evergreen plant with the old stems dying down after a few years. The rhizomes are a dull red colour. Flower buds appear in spring from the base of the rhizome. The peduncle is short and the buds encased in tight red bracts. Flowers appear from spring through mid-summer. Individual flowers stay open for three days and more and new ones open successively. An inflorescence stays in flower for over a month.

Large Cardamom is farmed in the Eastern Himalayas in Nepal, Sikkim and Bhutan at an altitude of 500-2000m, from subtropical to the cool temperate zones (Sharma *et al.* 2000). This species inhabits cool forest areas near mountain streams and damp forest floors. Large Cardamom is a perennial plant distributed in the mid-hills of the Himalayas. It is found on slopes of hills where there is plenty of well-drained water available, preferably in the north slopes under the shade of trees. The shade tree used in plantations and large patches of existing Cardamom agro forestry systems is the N2-fixing Himalayan alder (*Alnus nepalenis* D. Don). The use of *Alnus*-Large Cardamom system has recently proved more profitable (Sharma *et al.* 2000). It is grown on such a slope, which is not suitable for any crops, and this protects the soil from erosion and landslide. Large Cardamom grows rapidly and vigorously during the summer monsoon months. Other common shade trees are *Schiima wallichii, Engelhardtia acerifolia, Eurya acuminata, Leucosceptrum canum, Maesa chisia, Symplocos theifolia, Ficus nemoralis, Ficus hookeri, Nyssa sessiliflora, Osbeckia paniculata, Viburnum corifolium, Litsaea polyantha*, and *Macaranga pustualata*.

Large Cardamom (*Amomum sabulatum Roxb)* is an herbaceous perennial cash crop, and also referred to as "Queen of Spices". It is cultivated in an altitude range of 600 m and 2,000 m above sea level where annual rainfall is between 1,500 to 2,500 mm and the temperature varies from 8° C to 20° C. Economic yield starts from 3rd year onward after its plantation and its optimal yield period is 8-10 years. The total life span of Cardamom plants is about 20-25 years. There are sixteen varieties of Cardamom in the world. Among them five types of Large Cardamom *(Ramsey, Golsey, Sawney, Chibesey, and Dammersey)* are in farming practices across the study districts (Terhathum, Bhojpur, Dhankuta and Sankhuwasabha).

Some Village Development Committees (VDCs) are known as Alaichi pocket area in the study districts. For example, Champe, Charambi, Bhainsipankha, Bokhim, Siddheshwor, Gupteshwor, Chinnamakhu, Dobhane, Khatarmcha, Sangpang, Deurali, Helaucha, Boya, Timma, Aamtek and Chaukidanda VDCs are main VDCs of Bhojpur district where Alaichi is widely cultivated by the farmers.

Table 2.1: Alaichi production in Bhojpur district in the fiscal year 2069/70 (BS)

Fiscal Year	Potential Production Area (Ha)	Production Area (Ha)	Production Quantity (Mt)	Productivity (MT/Ha)
2069/70	360	330	188	0.52

Source: DADO, Bhojpur 2069/70 (BS)

In Dhankuta district, Mahadev Katare, Chungmang, Pakhribas, Parewadin, Dhankuta (municipality), Bhirgaun, Dandabazzar, Raja Rani, Vedetar VDCs are known as Alaichi pocket areas. The data provided by District Agriculture Development officer (DADO) show that the total of 158 MT cardamoms was produced in the fiscal year 2069/70 B.S.

Table 2.2: Alaichi production in Dhankuta district in 2069/70 (BS)

Production Area (Ha)	250
Production Quantity (MT)	158
Productivity (MT/Ha)	0.632
Worth value (Nrs.)	1.58 billion

Source: DADO, Dhankuta 2069/70 (BS)

Similarly, Madimulkharka*, Tamaphok, Mawadin, Nundhaki, Siddhapokhari, Jaljale, Syabun, Sabhapokhari, Barhabise*, Matsyapokhari, Diding*, Num, Pawakhola, Madi* VDCs are Alaichi pocket areas in Sankhuwasabha district. However, recently the Alaichi producers are suffering from the cronic diseases on their production. Madimulkharka, Barhabise, Diding, Madi VDC are severely affected by the diseases (* indicates severe production affected VDCs).

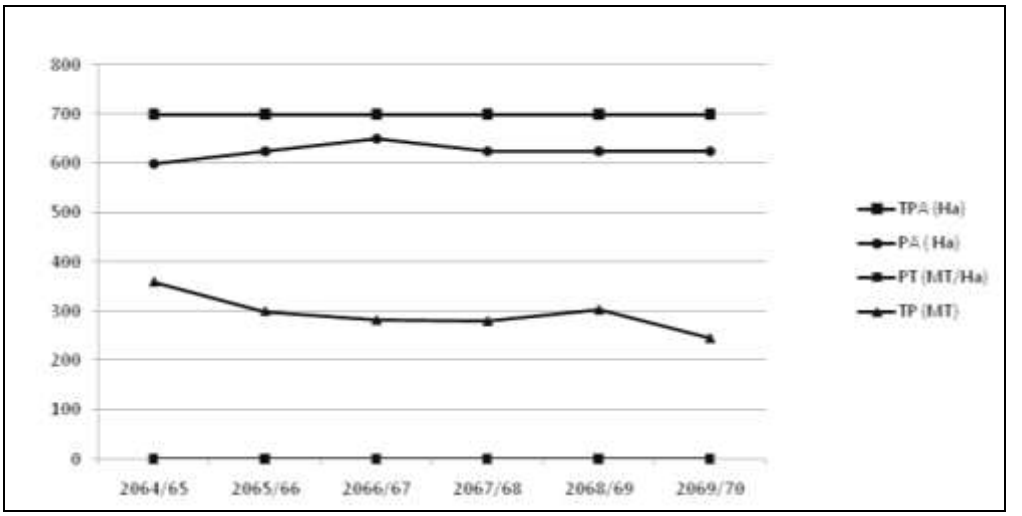
Table 2.3: Alaichi production in Sankhuwasabha district in 2069/70 (BS)

Fiscal Year	Potential Production Area (Ha)	Production Area (Ha)	Production Quantity (Mt)	Productivity (MT/Ha)
2068/69	7000	2725	1036	0.38

Source: DADO, Sankhuwasabha 2069/70 (BS)

The eight VDCs namely, Oyakjung, Esubu, Jaljale, Simle, Solma, Sungnam, Phulek, Basantapur, are known as Alaichi pocket areas in Terhathum district. The available data show that the Alaichi production in Terhathum district is slightly decreasing in every years (TPA= Total production Area; PA= Production Area; PT= Productivity; and TP= Total Production).

Figure 2.10: Alaichi production in Terhathum district



Source: DADO, Terhathum 2069/70 (BS)

The data presented above in the series of tables and figures indicate that Alaichi production is one of the main sources of income in the study districts. It is widely produced in a number of VDCs in these areas.

Uses, Chemical Compositions and Conservation Status of Alaichi

Cardamom is used mainly in the Middle East where *gahwa* is a popular Cardamom-coffee combination. It features heavily in curries, pickles, custards and spice blends such as *garam masala* in South Asian countries, and is also chewed as a nut and used as an aromatic and essential oil in perfumes. Cardamom can be purchased in organic or conventional forms and has a mild, ginger-like, sweet flavor.

Nepalese chew Large Cardamom seeds to freshen the breath and palate. It is also used as a breath freshener after a spicy heavy meal. Many Nepalese use this spice as a home remedy for digestive disorders and it is considered beneficial to teeth and gums. It is also used in meat curries, rice dishes and pickles. But the seeds quickly lose their flavor once the pods are opened. Moreover,, the cardamom oil is a precious ingredient in food preparations, perfumery, health foods medicines and beverages.

Cardamom seeds are astringent, tonic, appetizer, and diuretic. The content of essential oil in the seeds is strongly dependent on storage conditions, but may be as high as 8%. In the oil were found α-terpineol 45%, myrcene 27%, limonene 8%, menthone 6%, β-phellandrene 3%, 1,8-cineol 2%, sabinene 2% and heptanes 2%. (Phytochemistry, 26, 207, 1987) Other sources report 1,8-cineol (20 to 50%), α-terpenylacetate (30%), sabinene, limonene (2 to 14%) and borneal. In the seeds of round Cardamom from Jawa (A. kepulaga), the content of essential oil is lower (2 to 4%), and the oil contains mainly 1.8 cineol (up to 70%) plus β-pinene (16%); furthermore, α-pinene , α-terpineol and humulene were found (Satyal et al., 2012)

The trend in most of the study area shows that the Community Forest User Groups (CFUGs) have been carrying out Large Cardamom plantation as income generating activities (IGAs) for their users. *Alnus nepalensis* (Uttis) is regarded as the best shade provider to the Large Cardamom, which thrives under good shade and moist area. Recently, many of the stakeholders, mostly the District forest office (DFO), started to argue that the massive plantation of Large Cardamom within the Community Forest or any other National forests – more specifically under good Uttis forest, has resulted degradation of the natural forest, such as the *Alnus nepalensis* (Uttis). Analysing this situation, DFO has started interfering Large Cardamom cultivation in any type of National forests.

Disease has been the most appalling problem in Large Cardamom production. DADO reveals that the production has reduced to 25% due to poor Large Cardamom production area management which includes disease, pest and insects as major influencing factors. The market actors whose livelihoods are directly linked with Large Cardamom cultivation are fretful due to this contemporary disease and concerned organizations are seen baffled to address the problem. The major disease and insects with their destruction percentage in production are given in the table below (table 5):

Table 2.4: Prevailing diseases and destruction percentage of Alaichi in Bhojpur district

Disease	Destruction Percent
Furkey	5% of Production
Chirkey	5% of Production
Rhizome Decay (Gano kuhene)	5% of Production
Bagan Daduwa	30% of Production
Insect	
Caterpillar	10% of Production
Total	55 % of Total production

Source: DADO, Bhojpur, 2069/70 (BS)

Harvesting, Trade and Product Flow of Alaichi

Harvesting and drying

Alaichi starts yielding from 3rd year of its plantation. Fruit is ripped during August to November and harvesting is commonly done with the help of traditional instruments such as knife. After harvesting, the Cardamom capsules are separated manually by hands. The harvested fruits are processed mainly using traditional or improved drying technology (*bhatty)*. The existing traditional practice of curing and drying the Cardamom is age-old types, where the capsules are dried by direct heating in the traditional *bhatty*. Under this system the Cardamom comes in direct contact with smoke and turns the capsule to dark browner black colour with a smoky smell. To reduce smoke and produce light purple capsules, improved *bhatties* are being introduced.

After 18 to 24 hours of drying, the capsules are removed. But the total time of drying varies depending on factors such as fire management, initial moisture content of the capsules, weather condition and *bhatty* structures. There is no clear indicator to decide if the drying process is complete or not. In some cases, the capsules are either over-dried or under-dried at the same condition of fire and weather. Sometimes the farmers feel that the product is over-dried and they sprinkle water to increase weight. This practice leads to difficulty in maintaining consistent quality. There is a provision of premium price for improved *bhatty* products but prices also vary depending on tail-cut, moisture content, colour and the level of dryness.

Trade

Large Cardamom is one of the highest export revenue earning high value products of Nepal. Nepal is amongst largest producer of Large Cardamom in the world (along with India and Bhutan). The domestic market for Large Cardamom is less than 10% and more than 90% is exported. Previously all the export was carried out to India but recent trade of Large Cardamom to Tibetan Autonomous Region (TAR) of China has been highly encouraging for better price; however its end use in China is still unknown. Large Cardamom is sold in any form and at any time after harvesting. The price depends upon the quality (size, tail cut and colour). The end market for Large Cardamom is those countries that have high number of Muslim people who use Large Cardamom for cooking (Mainly Middle East countries like Pakistan, and Afghanistan). It is also traded in large quantities to make spices. The annual production of Large Cardamom varies in different countries (table 6).

Table 2.5: Global production of Alaichi

Country	Production in MT	Share (%)
India	5300	31
Nepal	4300	25
Bhutan	1000	6
Indonesia	3000	18
Vietnam	1500	9
Laos, Cambodia, and Thailand	500	3
China	1500	9
Total	17100	100

Source: Vassilieva, 2005

It is well established fact that Large Cardamom is a lucrative cash commodity of Nepal. The production is grown in the marginal and semi marginal types of land in the mid hill regions of Nepal. It is cultivated in nearly 37 districts of mid hill regions, however, the leading producers are the mid hills of Eastern Region. As per the production statistics, more than 97% of the total production is concentrated in seven districts of the Eastern Development Region viz. Taplejung, Panchthar, Ilam, Dhankuta, Bhojpur, Terhathum and Sankhuwasabha (Source: Durbeck et al., 2010).

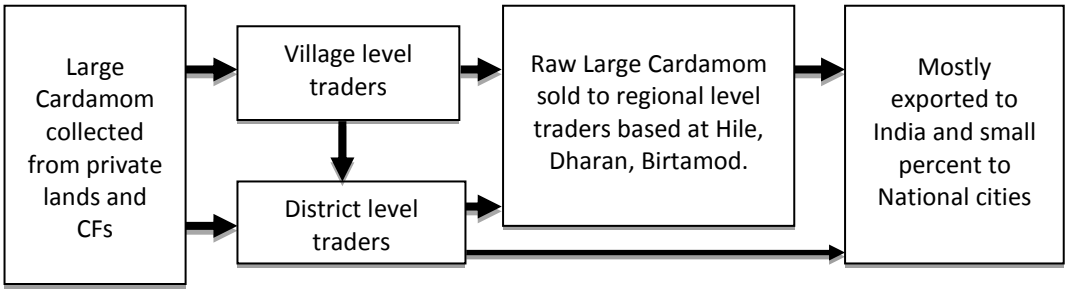
Nepal is the leading producer of large Cardamom. In the year 2007-08, the total production of large Cardamom was recorded as 7087 metric tons (MT). The numbers of farmer families involved in large Cardamom cultivation in Nepal are around 33 thousand (Soruce: Durbeck *et al.*, 2010).

More than 90% of all Nepalese Cardamom is exported. Nepal's export of large Cardamom is very much dependent on India and Siliguri in India through Birtamod . It is estimated that normally more than 80% of the production goes to Siliguri market. Large Cardamom is used in food preparations mainly in North India, Pakistan and Bangladesh and in a small way by the ethnic population in countries like, UAE, UK, United States of America (USA), Canada, Singapore, Hong Kong, etc. Large Cardamom has at present little demand from Western countries yet has some demands from Japan, Australia and New Zealand (Durbeck *et al.* 2010).

Product Flow

Huge quantity of Large Cardamom is produced from study districts in Koshi hills area. Large Cardamom produced by the farmers is sold to village level traders or district level traders. It depends on the particular producer access to trader and trader contact to producer. Traders are seen to collect the supply in District headquarters viz Bhojpur bazar of Bhojpur district, Myanglung bazar of Terhathum district, Khandbari bazar of Sankhuwasabha district and Dhankuta and Hile bazar of Dhankuta district. Village level and District level trader supplies un-graded Large Cardamom to regional trader based at Dharan, Itahari, Damak and Birtamod. The traders in these market places have their processing centres (drying, tail cutting, grading etc.) and then they export the collected products (both in graded and un-graded forms) to India through Indian traders.

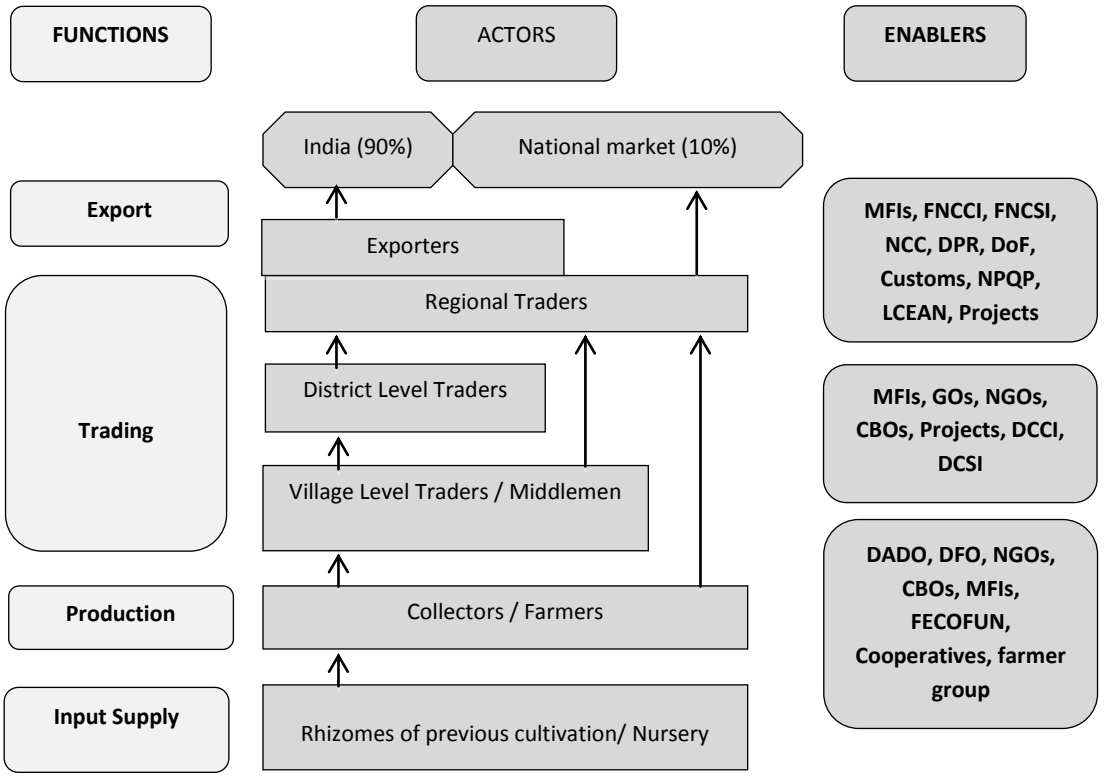
Figure 2.11: Product flow of Alaichi (Size of box does not represent the volume) in Nepal



Functions of the Alaichi Value Chain Actors

There are numerous actors involved in the Alaichi value chain. In this chapter, the major actors and their functions and enables have been tried to identify and discuss in brief. The function of actors is given in the left corner and area of intervention for enablers is given in the right corner. The major actors and their interrelationships in the Alaichi value chain is presented in the middle part of the figure.

Figure 2.12: Value chain map of Alaichi in Nepal



Source: Field consultation, 2013/014

The Alaichi value chain actors have different roles and functions in the whole value chains. The major roles and functions of actors are discussed below.

Farmers/Collectors: The farmers and collectors are the primary actors of Alaichi value chain. Farmers produce substantial quantity of Large Cardamom which is totally dependent on the land available and influence of disease in their field. Similarly, collectors collect from the public land such as Community forests and sell to village level traders or district level traders as their access to traders. In this year, producers/collectors are found to sell Large Cardamom in the price of NRs 1500 per kg (i.e. 1mann= NRs 60,000 in study districts). Farmers trade individually with the traders. It indicates that collection and group marketing are not practiced.

Village level traders: Village level traders in the study area are seen to have established direct contact with the farmers and collectors. They do so before the production of Large Cardamom in their field. Farmers or collectors are paid prior the receipt of the Large Cardamom. Village level traders are the middlemen who supply to regional traders and demand with the producer having updated knowledge of market environment. The analysis shows that the village level trader is one of the most benefitted actors among the market actors of Alaichi value chain.

District level traders: Similar to Village level traders, the district level actors also establish their contact with producer and supply Large Cardamom in large volume compared to village level traders. District level traders in the study area are the people who have adequate capital and operate other business side by side with Large Cardamom trade. They have direct link with regional level traders and processing centres presented in the Eastern Terai of Nepal.

Regional level traders: Regional traders are based at the famous trade centres of the country such as Hile, Dharan, Itahari, Damak, Birtamod etc. They are supplied by the village level and district level traders. They are supposed to trade huge production quantity of Large Cardamom of Koshi hills. In few cases, they are known to operate processing centers which supply large volume of graded Large Cardamom to India through Indian traders.

Enablers: Enablers of Large Cardamom value chain in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. The anticipated role of facilitating and regulating organisations for the proper functioning of value chain is given below (Table 2.6).

Table 2.6: List of enablers and facilitating organizations in Alaichi value chain

Major Activities	Facilitating Organizations	Regulating Organizations
Seedlings, nursery management, Trainings	DFO, FNCCI, FECOFUN	DADO
Harvesting and post harvesting organizations		DFO, CFUGs
Transport/ Export permit		DFO, DDC
Local Taxes		DDC, VDC
Processing Technology (Dryer)	DADO, FNCCI	
Market Information	AEC, ANSAB	
Resource Management		DADO, DFO

Source: Field Consultation, 2013/2014

District Forest Office and District Agriculture Development office are the responsible agencies for providing technical support on cultivation, harvesting, local processing and trading in this value chain. Those agencies also regulate the functions from production to sale through monitoring, product verifying, and levying royalty, fees, and taxes.

Ministry of Forest and Soil Conservation (MoFSC), Department of Forest (DoF), Department of Plant Resources (DPR), Ministry of Commerce and Supplies (MoCS) and Federation of Nepalese Chambers of Commerce and Industry (FNCCI) are business enablers at higher levels and they facilitate business through policy lobbying, policy formulation and bilateral trade agreements. However, in lower level there is no any facilitation and support for trading.

Economic Aspects of Alaichi Value Chain

The Alaichi cultivation is one of the most important component of evaluating its cost and benefits. The estimated cost and benefit status of Large Cardamom shows that the more benefits could be generated from Rhizome based production than Seedling. Rhizome based production system yields after 4-5 years of plantation whereas Seedling based production system yields after 7-9 years of plantation.

Table 2.7: Cost benefit of Alaichi cultivation from Rhizome

S.N	Particulars	Quantity (in kg)	Rate (in NRs)	Total (in Million)	Remarks
1.	Total cost for Production			0.2	From Rhizome
2.	Total Production	1400	1500	2.1	
3.	Total Profit			1.9	

Source: Field Consultation, 2013/2014

The market channel plays important roles in determining Alaichi cultivation in famer's levels. For example, the Middle East, South Asia, South East Asia and Europe are the main markets for Cardamom consumption but almost all of the Alaichi exported from Nepal reaches in these markets through India or Indian traders. The demand is too high due to its large consumption in these markets. Similarly, India also holds the world's largest consumer market for Cardamom. However, the Alaichi supply from Nepal is minimal due to various

reasons but specifically due to disease, pest and insects problem which has resulted peak demand and sharp increase in price of the Large Cardamom. The peak demand has also influence the trader – producer dealing process i.e. it has resulted bidding system in purchasing of raw Large Cardamom from producers.

The current price per kilogram of Large Cardamom is NRs 1500 (i.e. 1mann= NRs 60000). However, the producers and traders are suffering from the fluctuating prices and uncertainty of markets frequently. Similarly, the large gapes or differences in the market price of same products in different places have also been one of the discouraging factors for Alaichi producers.

Table 2.8: Price differences of Alaichi in different market centers

Market prices in different trade points				
Kathmandu	**Delhi**	**Tanakpur**	**Lucknow**	**Kolkata**
1,000	1,600	1,520	1,600	1,520

Source: ANSAB, 2013

Further, the price of the Large Cardamom is directly influenced by grading system. In grading system; Large Cardamom is graded as A, B and C category, where A is expensive and superior in quality and C is cheap and inferior quality. Grading is done on the basis of color, size, and percent of moisture content, presence of smoke and tail-cut.

Table 2.9: Price of Alaichi according to the different grades

Grades	NRs/Kg (Approximately)	Remarks
A	10,000	Big in size
B	5,000	Medium in Size
C	Cost price= Selling price	Small in Size

Source: Field Consultation, 2013/2014

Large Cardamom from the study districts are traded to famous Terai cities of Eastern Nepal such as Dharan, Itahari, Damak and more significantly to Birtamod, from where huge quantity of Large Cardamom is exported to India. The market channels of Large Cardamom in the study districts are already discussed and shown in the earlier figure of this chapter. To sum up, there are two-two routes in each of the study districts.

a) Product from Bhojpur Follows:

Bhojpur ----Leguwa---Hile-----Dhankuta Route
Bhojpur (Northern Part) --- Dingla---Tumlingtar----Chainpur----Dhankuta Route….

b) Product from Dhankuta Follows:

Dhankuta (Northern and western part) ---Dharan---East-west Highway route….
Dhankuta (Southern East) ---Belbari----Birtamod route…..

c) Product from Sankhuwasabha Follows:

Khandbari---Tumlingtar---Chainpur---Basantapur Route---Dhankuta route…..
Khandbari---Tumlingtar---Leguwa---Dhankuta Route…….

d) Product from Terathum Follows:

Terathum (West and North-West part) ---Basantapur---Dhankuta Route…….
Terhathum (Eastern South part) ----Ilam----Birtamod route…..

Though there are a number of trade routes, the hilly terrain and poor infrastructure facilities are the main hindrance in Large Cardamom trade when it comes to market channel. The Large Cardamom value chain could be assessed in the SWOT analysis, which is presented in the table below (table 2.10).

Table 2.10: SWOT analysis of Alaichi

Strength	Weakness
• Traditional knowledge on cultivation; • High value crop; • Successful cultivation practices already carried out in different parts of Nepal;	• Availability of quality seedlings of Large Cardamom in only few places of Nepal; • Increasing mortality rate due to disease; • Fluctuating price;
Opportunities	**Threats**
• Appropriate Climate and Geography for Large Cardamom Cultivation; • Good demand in national and international market and product can be sold throughout the year; • Value addition opportunities through grading, tail cut, and smoke-free drying;	• Diseases in Large Cardamom decreasing the production; • District Forest Office has stopped Large Cardamom production in CF due to its threat in bio diversity;

Source: Field Consultation, 2013/2014

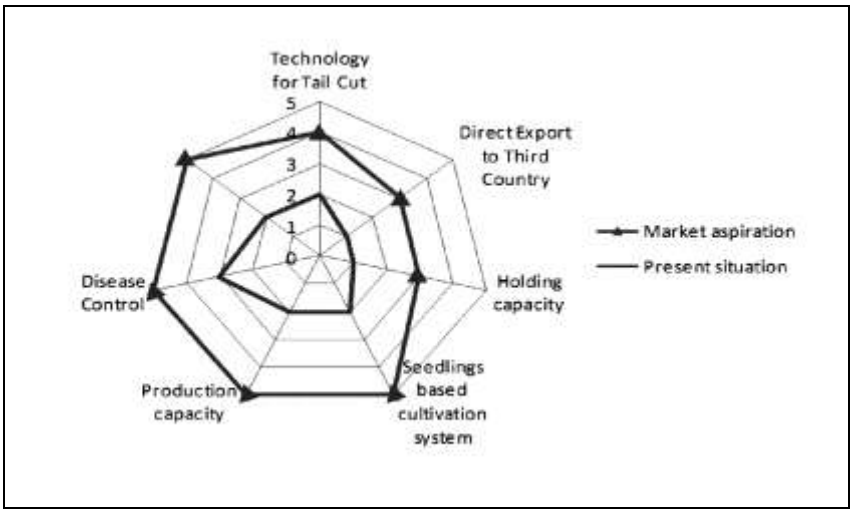
The SWOT analysis indicates that there are lots of challenges of Large Cardamom production and marketing in Nepal but with lots of avenues for possible opportunities. The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Value Chain Upgrading Strategy of Alaichi

End Market Analysis

Large Cardamom has been considered as high value products and its production is increasing throughout Nepal. Large Cardamom Entrepreneur Association of Nepal (LCEAN) is an umbrella organization of exporters, regional traders, district traders and lead farmers. The discussion with LCEAN along with farmers, district traders has revealed various gaps still existing in the value chain. These gaps are depicted by spiderogram below (Figure 28).

Figure 2.13: Market demands and gaps of Alaichi in Nepal



Source: Field Consultation, 2013/2014

The comparison between market aspiration and present situation clearly shows the wide gape which indicates that there are lots of areas and scopes for improving Large Cardamom production and its marketing in Nepal. The parameter used for comparing market aspirations and present situation of Large Cardamom is primarily based on the available data, review of the literatures and value chain actors aspiration observed and obtained from the field work, stakeholder consultation and interview with actors.

Table 2.11: Parameters used for assessing the gaps between market aspirations and present situation of Alaichi in Nepal

Parameters	1	2	3	4	5
Technology for tail cut	Tail Uncut	Tail cutting through fire blow	Tail cutting through scissors	Tail cutting simulataneously done while drying in *Bhatty*	Innovative and improved tail cutting technology (if any)
Direct export to third country	National consumption	Export to India	Export to SAARC countries	Export to Middle East	Export to Global markets
Holding capacity of farmers	Hold for a week	Hold for fifteen days	Hold for one month	Hold of three months	Hold for whole year
Seedling based cultivation	Rhizome based cultivation	Healthy and tested rhizome based cultivation	Rhizome and seedlings based cultivation	Seedlings based cultivation	Tested seedlings based cultivation
Production capacity (in terms of Area)	Non availability of Land	Culivation in a marginal land	Culivation in moderate area of own land	Culivation in possible areas	Pocket area development

Disease control	Minimum knowledge about disease control	Knowledge about disease control but no action taken	Knowledge about disease control and action initiated	Action successfully carried out disease control	Ownership from Government on approach for disease control
Commercially viable improved drying technology	Drying technology given to farmers as free	Drying technology given to farmers with their own contribution (some)	Drying technology provided with 50 percent contribution from farmers	Improved drying technology purchased by farmers	Commercial supply chain, purchase by farmers and premium price for products for Improved technology

Source: Field Consultation, 2013/2014

Talking about end market strategy of Large Cardamom, there are lots of gaps to be addressed for the improvements of these aspects of this product. Main gaps to be fulfilled are briefly discussed in the following sub-chapters.

Technology for tail cutting: Majority of Large Cardamom sold to district traders is not graded, tail cut and sometimes not properly dried also. District level traders either hold the product or sell immediately to regional traders. District level traders store Large Cardamom and do not carry out tail cutting. Tail cutting is done in regional center like in Birtamod where Large Cardamom is sold to different markets. The selling is done after grading and packaging of the collected products on the basis of their colour, size, and tail cut. The tail cutting in Birtamod is carried out through scissors. This has given employment to women in the vicinity who are paid based on per kg of cutting tail. The exporters/regional traders pay NRs 8-10 per kg for tail cutting. Some of the regional traders also practice fire blow to cut the tail but this is not efficient system. District traders also initiated some efforts to cut the tail at district headquarter which came to be much costlier due to high demand of wages from workers and lack of tail cutting practices. In a place called Rabi, Large Cardamom tail cut is carried out while drying in traditional *bhatty*. There, the producers give additional effort by continuous rubbing of Large Cardamom during drying which removes tail automatically. Most of the farmers do not give ample time as Cardamom harvesting and drying, carried out during festive period (Dashain and Tihar). Farmers wish to sell as soon as possible (sometimes wet/not properly dried with assumption that it increases the weight). Tail cutting through scissors, practiced in Birtamod, has not been replicated in hilly regions and farmers are looking for any new innovation for the tail cut. The suggestion for tail cutting will be further discussed in section process upgrading.

Direct export to third country: Majority of regional traders export Large Cardamom to Delhi through Silguri. Kharibauli, a market centre in Delhi, is a major trade point for NTFPs and Large Cardamom produced and collected in Nepal. Exporters in India put their brands in Large Cardamom in different package and sell it to the Middle East, Europe and USA. The major demand for Large Cardamom is in the Middle East. Nepalese traders are not able to penetrate the Middle East market yet. Things are encouraging as LCEAN people visited

Middle East and are discussing amongst regional traders/exporters for creating Nepalese brand and explore direct penetration to Middle East markets. The direct export can increase more quality production throughout the value chain with own national brands.

Holding capacity: The trade of Large Cardamom is carried out in two different ways. There is immediate buying and selling between farmers – district traders – regional traders and there is holding carried out by different actors. The holding is done mainly by district traders and regional traders so that they can sell in when the price is high. The price of Large Cardamom fluctuates and even regional traders are not fully confident and aware about market dynamics. In case of farmers, most of small producers purchase various products (food items, clothes) from district traders throughout the year. Moreover, it is in practice that most of the village producers take advance amount from the traders for managing their family needs. This is called *Dadani* system and district level traders will provide remaining amount after buying Large Cardamom from them. The emergence of cooperative, MFIs and additional income (remittances) has now slowly decreased *Dadani* system but it is still in practice in many places. This makes farmer to sell the product immediately to the traders with whom he/she has been purchasing other necessary items. Small farmers are not also able to hold the product due to festive season.

Seedlings based cultivation: Farmer's practices have revealed that the rhizome based production system is more susceptible to disease than the seedlings based. It was found that few of the farmers in the study areas have already started nursery. However, there is still lack of seedlings available to producer. Farmers are learning lessons from their neighbouring districts. Forexample, some farmers in study districts have borrowed the lessons and ideas from farmers in Ilam and Paanchthar districts on how to control diseases and initiate seedlings based cultivation system.

Production capacity: The discussion with concern stakeholders in four districts has revealed that there are ample potential Large Cardamom production areas which can be developed as pocket areas. Information from DADO revealed that production is carried out in less suitable land and there is scope of increasing productivity either by cultivating in more suitable land or making present land more suitable (irrigation etc.)

Disease control: There is increasing depletion of Large Cardamom due to disease, insects and pest problems. Farmers are now practicing seedlings based cultivation instead of rhizome based to make Large Cardamom more resistant to diseases. The stakeholders are also naïve to diseases and government has not brought incentive based mechanism for replantation or leaving disease affected planation field for certain years to control diseases.

Commercially viable improved drying technology: Various technologies have been introduced by development and support agencies for drying Cardamom. These improved technologies include double drum system or gassifier usage heating mechanism to dry Cardamom instead of smoke (traditional *bhatties*). These improved technologies are provided by government and non-government organizations to farmers. However, still there is lack of practices of purchasing these improved technologies. Also, regional traders/exporters are not able to provide premium prices to lesser quantity. LCEAN is negotiating between farmers and traders about the best pricing for Alaianchi dried from improved technologies.

1 Firm level upgrading strategy:

The firm level upgrading strategy is developed on the basis gaps identified from the above sub-chapters. This aspect of upgrading strategies is expected to contribute as measures to minimize existing gaps.

a) Product upgrading: The product upgrading is based on three years plan and within this period the product gets processes (drying and grading) and sold to the market. Grading and proper market management will be prominent issues in plan for product upgrading.

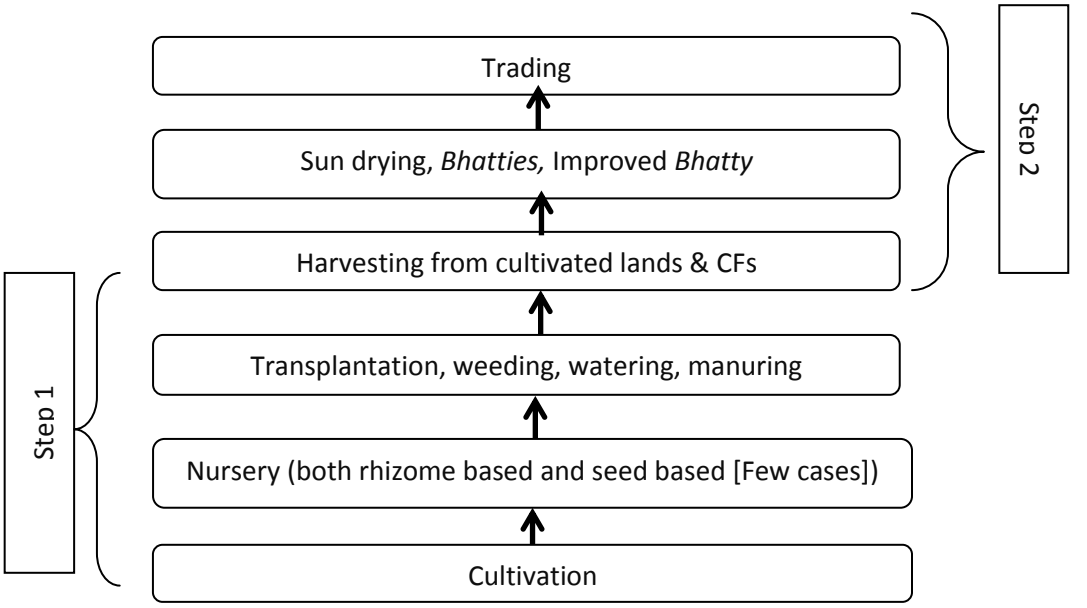
Table 2.12: Product upgrading strategies of Alaichi

Parameters	Present	Year 1	Year 2	Year 3
Product	Grading, tail cut not carried out; Limited amount of Cardamom from improved dryer	Large Cardamom cultivation through seedling; Tail cut of Cardamom from one VDC in Rabi model	Maximize production and research on suggesting commercially viable production; improved dryer and tail cut; Graded Cardamom trade from one VDC	Increase Tail cut; Graded Cardamom trade from other VDCs; Cardamom produced from improved *bhatty*
Price	NRs 1500	10-15% more value added by tail cut and graded Cardamom	10-15% more to tail cut and graded Cardamom	Premium price for tail cut, graded and purple color Cardamom
Place	End market are Hile, Dharan, Itahari, Damak, Birtamod	Same channel but exporters and traders have explored potential international markets (Cardamom from improved drier)	Same channel but exporters started to export products to third world countries (Cardamom from improved drier)	Same channel and exporter have well established markets to third world countries (Cardamom from improved drier)
Promotion	None	Cardamom from improved drier and disease resistance seedlings	Drying, Grading and product diversification, national standard process initiated	Drying, Grading, product diversification and initiate international standards process

Source: Field Consultation, 2014

b) Process upgrading: The process upgrading refers to the whole process from input supply to production, harvesting, post harvesting, and processing to marketing. Process upgrading regarding Large Cardamom in four studies districts shows two major steps for upgrading this product.

Figure 2.14: Two major processes of Large Cardamom value chain



Source: Field Work 2014

The details of process upgrading are further presented in the tabular form below (in table 62).

Table 2.13: Process upgrading strategies of Alaichi

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology intervention	Anticipated benefits
Upgrading 1: Cultivation Process	Cultivation in private lands and CFs based on Rhizome of existed Large Cardamom	Cultivation based on seedling produced from well-managed nursery	Scientific information and knowledge made available	Improved production and sustainable supply
Upgrading 2: Post harvesting	Old drying process, No grading and storage facilities	Improved drying *bhatti*es, commence grading and storage process	Advanced technology and technical information available and applied	Value addition, more benefit to local people

Source: Field Consultation, 2013/2014

c) Functional upgrading: The functional upgrading of large cardamom value chain actors is one of the most important aspects of firm level upgrading strategies. In this study, four major actors have been identified and their present functions have been discussed and based on that the upgrading functions have been presented.

Table 2.14: Functional Upgrading of Alaichi Value Chain Actors

Actors	Present Function	Upgraded Function
Farmer	Cultivation by sowing Rhizome; Selling Large Cardamom dried from traditional *bhatties*	Cultivation by planting seedling; Sale graded, dried, tail cut Large Cardamom from improved *bhatties*
Village level trader	Buy from farmers and sale to district level trader or to regional trader (grading, tail cut not carried out)	Encourage farmers to learn more about drying and grading; Trade graded and tail cut Cardamom to district and regional markets
District level trader	Buy from farmers and village level traders; storage and sale to regional market (Dharan, Itahari, Damak, Birtamod)	Encourage village trader, middlemen and farmers on graded and tail cut Cardamom; Trade graded and tail cut Cardamom to district and regional markets
Regional trader/ Exporter	Export Large Cardamom to India	Export to third world countries

Source: Field Consultation, 2013/2014

d) Channel upgrading: Large Cardamom produced throughout the country is collected in Birtamod and traded to Indian traders/markets. As per the present status, the products are dried in commercially viable improved drier, tail cut through rubbing while drying, graded and coloured based on the demands of the markets (mostly purple in colour with smoke free). Two channels could be used for upgrading this aspect of Large Cardamom in Nepal.

- Existing channel and consensus development for payment of premium price of tail cut, graded and smokeless Cardamom;
- Existing channel of exporters who are exporting other high value products like coffee, tea, ginger to the Middle East and ask them to include tail cut, graded and smokeless Cardamom;

e) *Intersectoral* upgrading: The reports, some field level observation, and consultation with some entrepreneurs show that the stem of Large Cardamom can be used for paper making. However, this practice is absent among the producers and traders of Large Cardamom. The small farmers can generate additional income by selling Large Cardamom stem to Nepali paper producing industries in Bhojpur, Terhathum, Sankhuwasabha or other regional centres. Also, Large Cardamom stem can be sold to fibre based handicraft producers. Women can be involved in making Large Cardamom fibre based products. In market, fibre from Large Cardamom stem in Kathmandu market is known as *Chandan* Fibre.

2. Interfirm upgrading strategy:

The growing commercial cultivation of Large Cardamom in Eastern Nepal has resulted that many people are engaged in production and trade of Large Cardamom. LCEAN is acting as umbrella organization for all value chain actors. Discussion with farmers and traders in four districts revealed lack of communication and program involvement with LCEAN. It is important to link farmers and traders to LCEAN and even facilitate to form LCEAN district chapter and strengthen these district level units so that they start taking care of all issues and concerns related to Large Cardamom in their respective districts. Consequntly, this district chapter may become proactive for carrying out regional to national level policy issues.

3. Business Development Services and Financial Services upgrading strategy:

Identification of potential Business Development Services (BDS) and Financial Service (FS) is one of the most important aspects in promoting and developing the product based entrepreneurships. This study also prioritized the identification of pertinent BDS and FS services. This assessment has been done on the basis of considering following vategories.

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of Very strong, strong, weak and very weak categories;

Table 2.15: Analyzing demand and supply side of BDS for Alaichi

SUPPLY SIDE	***Very strong***				
	Strong				
	Weak				Access to finance; Access to quality seedlings
	Very weak			Technology transfer for tail cutting, Incentive for replantation for disease prone cultivation	Research on scientific management of Cardamom plantation in CF
		Very weak	***Weak***	***Strong***	***Very Strong***
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries in categorization (very strong, strong and weak) and supply side of service providers (very weak, weak and strong) are selected to develop commercially viable option for these business services. The details of BDS and FS requirement could be catered by some processes and means. The potential strategies have been identified and discussed below (in table 2.16).

Table 2.16: Potential startegies for commercially viable business options of Alaichi

Services	Strategy
Access to finance	Increase holding capacity of farmers for at least one month through Cardamom based loan provision (practiced in Taplejung)
Quality seedlings	Nursery management training and awareness on cultivation based on seedlings instead of rhizomes; Ownership and strengthening of this mechanism through DADO
Technology for tail cutting	Linkages with researcher in Institute of Engineering (IOE); Research Centre for Applied Science and Technology (RECAST) etc. for finding appropriate technology for tail cutting
Research on scientific management of Cardamom plantation in CF	DFO concern on Cardamom plantation in CF has to be scientifically looked upon and provision land allocation for DAG regarding Cardamom production has to be enhanced
Incentive for replantation	DADO and government agencies should provide incentive for replantation for the farmers whose Cardamom is disease prone

4. Business Enabling Environment Upgrading Strategy:

Large Cardamom has been identified as major export product in study district, which is also a major export in many districts in Nepal. However, there is neither enabling policy environments for encouraging investments from private sectors nor state's significant supports to the producers. Therefore, there has to be significant budget allocation from government for the replantation and management of Large Cardamom nursery for farmers. The easy access for loan from financial institutions definitely would encourage local actors (farmers, traders, exporters) for value addition work in the local level. Similarly, the exporters have to be linked to International market for direct export.

5. Sustainability Strategy:

Large Cardamom has been major source of income for the farmers and also the goods for many of the local to national level traders and exporters. There has been drastic rise in the price of Large Cardamom at present compared to year 2000 to 2005. However, recently the control of diseases has become a great challenge for producers. It has directly affected to the traders and exporters alike. Similarly, the value addition works in the local levels and enhancing capacity of national exporters and traders to make them able to expand their direct market access to the international markets are possible avenues for the sustainability of Large Cardamom production and marketing in Nepal. In this regard, it is important to support LCEAN, DADO, DCCI, DFO and other agencies in their work for the promotion of Large Cardamom.

Summary of Alaichi Value Chain Upgrading Strategy

The value chain analysis of Large Cardamom, concentrated and synthesized into six upgrading strategies, has focused on identifying the roles and functions of value chain actors and then discussed about the possible upgrading strategies. The value chain upgrading strategies of Large Cardamom discussed in this chapter indicates that there are lots of areas and scopes of improving and expanding its production and markets. The analysis shows that Large Cardamom is widely cultivated in Nepal, mostly in mountain and hilly districts, and exported to India through traders and exporters based in national market centers such as Birtamod in Jhapa district.

However, according to the national data and responses of the producers and traders, the Large Cardamom production has not been increased satisfactorily for a few years. The situation is still the same. This is due to the severe damage by a disease in the cultivated areas. Despite some efforts by government and the farmers, the appropriate measures against this problem are yet to be developed. For this, the government agencies, especially the DADO, should play proactive roles. Secondly, the Large Cardamom produced by the farmers has never been processed in the local and district levels rather the collected products are directly exported to the national traders. It has made losing the possible opportunities of creating additional local jobs and local incomes. This demands the transform of the processing (such as drying, tail cut, grading etc.) technologies in the local levels. Thirdly, the Large Cardamom produced and collected in Nepal is exported to India through Indian traders. But Nepali traders and exporters are not able to expand their market relation directly to the third countries. It has confined national exporters and traders with Indian monopoly markets limiting their profits. So, the government level supports and prompt initiation is highly recommendable for the expansion of Nepali Large Cardamom markets to the third countries.

The identified and discussed Large Cardamom upgrading strategies are summarized and presented in the table below (in Table 2.17).

Table 2.17: Summary of the recommendation of Alaichi upgrading strategy

Upgrading Strategy	Recommendation
Product Upgrading	Facilitate one VDC to produce quality Large Cardamom through improved drier; Smokeless tail cut while drying by rubbing vigorously; Promotion of seedlings based Large Cardamom cultivation instead of rhizomes
Process Upgrading	Upgrade cultivation practices from rhizome based to seedlings based; Commercially viable utilization of improved driers; Research on innovative methods of tail cutting
Function Upgrading	Farmers from selected VDC encouraged to tail cut and grade cardamom
Channel Upgrading	Strengthen existing channels; Promote trading of other NTFPs or high value products (such as coffee, tea etc.); Expanding market niche of the existing channels or exporter to the third counties such as Middle East
Intersectoral Upgrading	Additional income from selling Large Cardamom stem to Nepali paper industries and fiber based handicraft producers; Handicraft production based on Large Cardamom Fiber
Interfirm Upgrading	Linkages of farmers, traders with LCEAN; Facilitate to support establishment of district LCEAN chapter/ or strengthen existing ones
BDS+ FS Strengthening	Access to finance, Access to quality seedlings, Technology transfer for tail cut, research on scientific management of Large Cardamom plantation in CF and incentive for replantation from GoN
Business Enabling Environment strengthening	Direct export market to Middle East, promotion and institutionalization of Seedlings based cultivation from DADO
Sustainability Strategy	Support existing indicatives of LCEAN, DADO, DFO, DCCI and other agencies for promotion of Large Cardamom value chain; Explore direct export to Middle East market with Nepalese branding; Seedlings based cultivation of Large Cardamom

Source: Field Consultation, 2013/2014

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Chapter 3[8]

Bael (*Aegle Marmelos*): A Plant of Multiple Economic, Cultural and Medicinal Values[9]

Introduction

Bael (*Aegle marmelos*) is one of the most valuable and well-known but less commercialized wild fruits in Nepal. Culturally, this fruit is considered as a symbol of Shiva, the widely worshiped God – particularly in Hindu religious groups – in Nepal. In addition, Bael is one of the best Ayurvedic medicinal plants, believed to be a brain tonic that can increase longevity, and is a source of eternal power.

The Bael tree is available in most parts of Nepal. It is mostly grown in dry and rocky areas. In addition to the cultural values and uses, Bael fruit is also cultivated for commercial purposes, such as the production of Bael juice in some parts of the country. This production of Bael juice is one of the increasing economic opportunities for people in areas of Nepal where Bael is available and cultivated. The villages of Dhankuta district, one of the Koshi hill districts, are areas in Nepal with the most potential for Bael fruit and Bael juice production. In Dhankuta district, Bael fruit is collected by local CFUG members or private collectors, processed at the district level, and made into a bottled juice concentrate called "squash" or "sarbat", which is mixed with one-to-three parts water to make a refreshing fruit drink. Current production is limited (depending on the producer) to three months per year, when the fruit is collected. Market connections are mainly in local and regional areas. This study is therefore based on Bael fruit and Bael juice production in Dhankuta district, particularly the Bishranti Bael juice production near Mulghat area.

In this context, Bael has been selected for the comprehensive value chain analysis (VCA) to identify its value chain actors, understand roles and functions of value chain actors, and identify and analyze various constraints or barriers in its value chain. Finally, this study also tried to explore options for up-scaling of this production into the market business and provide stakeholders with recommendations for potential expansion opportunities within its value chain. The analysis of this study is primarily based on the information and knowledge obtained from field visits and observation of the Bael fruit producer community, Bael fruit collectors and Bael juice production enterprises, and consultation meetings with community leaders, juice producers and retailers in Dhankuta district. The consultation with district level

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stakeholders, mainly related government line agencies, has also become a part of the process in this study. Overall, the analysis of this study is based on knowledge and information available on published and unpublished reports; including the report generated by the 2013 CINRAM-UMN field consultation, as well as related literatures.

Habit (Characteristics), Habitat and Distribution of Bael

Bael trees are resilient against low power-hydrogen (pH) soils, drought, and insect and fungal damage. Bael fruit is roughly 5-10 cm in diameter, whose hard, golden fruits contain a fragrant, sweet pulp. It is slow-growing of medium size, up to 40 or 50 feet (12-15 m) tall with short trunk, thick, soft, flaking bark, and spreading, sometimes spiny branches, the lower ones drooping. Young suckers bear many stiff, straight spines. A clear, gummy sap, resembling gum arabic, exudes from wounded branches and hangs down in long strands, becoming gradually solid. It is sweet at first taste and then irritating to the throat. The deciduous, alternate leaves, borne singly or in 2's or 3's, are composed of 3 to 5 oval, pointed, shallowly toothed leaflets, 1 1/2 to 4 in (4-10 cm) long, 3/4 to 2 in (2-5 cm) wide, the terminal one with a long petiole.

New foliage of Bael is glossy and pinkish-maroon. Mature leaves emit a disagreeable odor when bruised. Fragrant flowers, in clusters of 4 to 7 along the young branch lets, have 4 re-curved, fleshy petals, green outside, yellowish inside, and 50 or more greenish-yellow stamens. The fruit, round, pyriform, oval, or oblong, 2 to 8 in (5-20 cm) in diameter, may have a thin, hard, woody shell or a more or less soft rind, gray-green until the fruit is fully ripe, when it turns yellowish. It is dotted with aromatic, minute oil glands. Inside, there is a hard central core and 8 to 20 faintly defined triangular segments, with thin, dark-orange walls, filled with aromatic, pale-orange, pasty, sweet, resinous, more or less astringent, pulp. Embedded in the pulp are 10 to 15 seeds, flattened-oblong, about 3/8 in (1 cm) long, bearing woolly hairs and each enclosed in a sac of adhesive, transparent mucilage that solidifies on drying.

- **Common Names:** *Bael, bel, bela, bili, sirphal, tripatra, maredu……;*
- **Local Name:** *Bael, bel;*
- **Synonyms**: Crataeva marmelos, aegle marmelos var. mahurensis
- **English name:** *Bengal quince, Indian quince, golden apple, holy fruit, stone apple, wood apple*
- **Botanical Name:** *Aegle marmelos;*
- **Family:** *Rutaceae;*
- **Subfamily:** *Aurantioideae;*

The Bael fruit, *Aegle Marmelos (Linn.) Correa ex Roxb.,*.), is also called Bengal quince, Indian quince, golden apple, holy fruit, stone apple, *bel, bela, sirphal, maredoo* and other dialectal names, in India it is called *matum* and *mapin.* In Thailand it is called *phneou* or *pnoi* while *bau nau* in Cambodia. This is called *bilak* or *maja pahit* in Malaya; *modjo* in Java; *oranger du Malabar* in French; *marmelos* in Portuguese and *bael* in Nepal.

The tree grows wild in dry forests on hills and plains of central and southern India and Burma, Pakistan and Bangladesh, also in mixed deciduous and dry dipterocarp forests of former French Indo-China. Mention has been found in writings dated back to 800 B.C. It is cultivated throughout India, mainly in temple gardens, because of its status as a sacred tree; also in Ceylon and northern Malaya, the drier areas of Java, and to a limited extent on

northern Luzon in the Philippine Islands where it first fruited in 1914. It is grown in some Egyptian gardens, and in Surinam and Trinidad (Sharma et al. 2011).

The Bael trees are indigenous to Nepal and found in 67 Districts and Dhankuta is one of them. It has a wide range of geographical distribution ranging from 60 m in Terai to 1500 m in Middle Mountains. The trees are well protected and abundant in most parts of Dhankuta district. Many seedlings have been planted in many VDCs of Dhankuta district and hence, Bael tree population has increased over the last few years. Two major types of Baels "common" and "Rani" ("Queen") Bael fruit are found in this district but queen Bael is most preferred for Bael juice making because it is sweeter and is more fragrant of the two.

Food Properties and Uses of Bael

Food Properties of Bael

Bael tree is compounded with various chemical components; such as various phytoconstituents could be isolated from the various parts of *Aegle marmelos* (Sharma *et al.*, 2011).

Table 3.1: Phytoconstituents that could be isolated from various parts of Bael tree

Part	Phytoconstituents
Leaf	Skimmianine, Aegeline, Lupeol, Cineol, Citral, Citronella, Cuminaldehyde, Eugenol, Marmesinine
Bark	Skimmianine, Fagarine , Marmin
Fruit	Marmelosin, Luvangetin, Aurapten, Psoralen, Marmelide, Tannin

Source: Sharma et al., 2011

Further, a Bael fruit contains with various types of food values. Some of the identified food values of the fresh Bael in India and the Philippines are presented in the table below (Table 3.2) (Morton, 1987).

Table 3.2: Food value per 100 g of Edible portion of Bael fruit

SN	Properties	Quantity		SN	Properties	Quantity
1.	**Water**	54.96-61.5 g		2.	**Carotene**	55 mg
3.	**Protein**	1.8-2.62 g		4.	**Thiamine**	0.13 mg
5.	**Fat**	0.2-0.39 g		6.	**Riboflavin**	1.19 mg
7.	**Carbohydrates**	28.11-31.8 g		8.	**Niacin**	1.1 mg
9.	**Ash**	1.04-1.7 g		10.	**Ascorbic Acid**	8-60 mg
				11.	**Tartaric Acid**	2.11 mg

Source: Morton, 1987

The pulp also contains a balsam like substance and two furocoumarins (psoralen and marmelosin (C13H12O3). These substances are highest in the pulp of the large cultivated forms. There is as much as 9% tannin in the pulp of wild fruits and less in the cultivated types. The rind contains up to 20%. Tannin is also present in the leaves as is in skimmianine. The essential oil of the leaves contains d-limonene, 56% a-d-phellandrene, cineol, citronellal, citral; 17% p-cyrnene, 5% cumin aldehyde. The leaves contain the alkaloids O-(3,3-dimethylallyl)-halfordinol, N-2-ethoxy -2-(4-methoxyphenyl) ethylcinnamide, N-2-methoxy-2-[4-(3',3'-dimethyalloxy) phenyll] ethylcinnamide, and N-2-methoxy-2-(4-methoxyphenyl)-ethylcinnamamide.

Uses of Bael

Every part of the Bael tree is utilized for various purposes. The wood is yellowish or grayish white, hard lustrous, aromatic when freshly cut. It takes a fine polish and is suitable for house building, cart construction, agriculture implements, carving, pestles, tool handles, combs, etc., but the tree is too valuable fell for its timber. Wood is employed for making producer gas plant and also used for making small household articles and cattle sheds. The twigs and leaves are used as fodder. The twigs are also used as tooth brushes or chew- sticks. Sweet-scented water is distilled from the flowers. Leaf juice is applied to the body before taking a bath to remove the bad smell. The most valuable part of the tree is the fruit. A yellow dye is obtained from the unripe rind, which is used with myrobalans in calico printing (Sharma *et al.*, 2007).

In Siam, the shell is used for scenting hair oil. On distillation, the rind yields the essential oil known as 'Marmelle oil'. The sweet aromatic fruit pulp is very nutritious, which is used for making Sharbat. Mixed with lime the pulp makes tenacious cement, which is used for the construction of wells. It is also employed as a varnish (where a polished surface is required) for pictures and adds brilliancy to water colour paints. The pulp is often used as a substitute for soap for washing clothes as it has detergent properties. The dried fruits, after separating pulp from the rind, are used as pill boxes for keeping valuable medicine, sacred ashes and snuff balls. Gum from stem is non-edible but acts as a good adhesive and often for book binding. The tree has been identified as suitable windbreak or wind barrier.

In Indonesia, it is a common practice to take Bael fruit in breakfast either by cutting or breaking open the soft fruits and eating the pulp of fruit dressed in palm sugar. Beating the seeded pulp together with the milk and sugar makes a popular drink called Sharbat in Nepal and India. The fruit carries large quantity of tenacious transparent gluten, which becomes hard on drying but continues to be transparent and when ripe and mixed with juice of tamarind, forms an agreeable drink. These drinks are consumed less as food or refreshment than for their medicinal effects. Mature (full grown) but still unripe fruits are made into jam with addition of citric acid. The pulp is also converted into marmalade or syrup, which is used a food material as well as a therapeutic agent in relieving diarrheas and dysentery. A firm jelly is made from the pulp or combined with guava to modify the astringent flavor. The pulp is also pickled (Sharma *et al.*, 2007).

The Bael has religious uses and values. The name of the Bael fruit in the Sanskrit language is "Shree Falam", literally the most regarded fruit. In the holy books, the Shree title was given to only one person, and he was Shree Ram. Similarly, among the fruits, the "Shree" title was given only to Bael. The word "Sir" is derived from "Shree". The fruit is offered to Lord Shiva and in every Hindu temple in the subtropical to tropical region a Bael tree is found. The leaves also have religious significance to Hindus. In the Newar society of Nepal, girls are married, before their first menstruation, with the Bael fruit by observing that Bael is equivalent to Lord Shiva.

Bael is considered a medicine able to cure different diseases, including cholera and diarrhea. For example, the unripe fruit, 3 to 4 months old, contains anti-diarrhea properties; while the ripe fruit is used as medicine for curing constipation. The most significant claim is pharmacological properties such as anti-helminthic, hypoglycemic, cardiac stimulant, anti-diarrheal and antiviral. Some of the important medicinal properties are briefly discussed below.

a) **Gastro-protection properties:** Gastroduodenal ulcers are the most common form of gastric ulcers. Such ulcers develop when there is an imbalance in the acid mucosa levels, or due to oxidative stress along the gastric tract. Experiments gave positive results in gastric ulcer inhibition. The phenolic compounds found in Bael extracts possessed potent antioxidants which helped in reducing gastric ulcers.
b) **Control of diabetes:** Oxidative stress induced hyperglycemia or diabetes can be reduced to a great extent by extracts of Bael leaf. Studies have shown that administering leaf extracts of Bael reduced blood glucose levels up to 54%.
c) **Cholesterol control:** Bael leaf extracts were studied for their cholesterol control. They were effective in decreasing blood cholesterol levels comparable to modern drugs. Bael leaf extracts controlled not just blood cholesterol levels but also triglycerides and serum and tissue lipid profiles.
d) **Antimicrobial properties:** Bael leaves, roots and fruit extracts have been studied for their antimicrobial properties. The extracts showed inhibition of many bacterial strains. Apart from bacteria, Bael extracts were also effective in controlling fungal and viral infections. The antimicrobial properties are due to the presence of biochemicals such as cuminaldehyde and eugenol.
e) **Anti-inflammatory properties:** Bael extracts possess anti-inflammatory properties which help in reducing histamine induced contractions and induces positive relaxant effect in the inflamed regions or organs.
f) **Constipation:** Bael fruit can be taken for reducing constipation. The flesh of the fruit is believed to possess laxative properties, and it also cleans and tones up the intestines. Taking ripe fruit every day for about 2-3 months can eliminate acute and sub-chronic constipation.
g) **Dysentery and diarrhea:** According to Ayurveda, diarrhea and dysentery without fever can be treated with Bael fruit. The fruit can be dried and mixed with jaggery or brown sugar.

However, there are some general precaution in the use of Bael fruits and its food properties. The ripe fruit shouldn't be used on a regular basis at a time. Whenever utilized with no break, it creates atony of the intestines or even lacks of normal flexibility as well as major flatulence within the abdomen. Also, the Bael fruit must not be consumed in excess at any given time, as extreme consumption may create a sensation of heaviness within the stomach. Sharbat produced from Bael ought not to be very thin. It must be sticky so it can be completely chewed. It might create heaviness within the stomach if eaten hurriedly. It is also commonly recommended that one should stay away from Bael during pregnancy and while breast-feeding as too much use of Bael leaves can raise the likelihood of abortion in females.

Production Processes, Product Flow and Conservation Status of Bael

Apart from its religious values and uses, recently various parts of the Bael tree have increasingly become good for trade and business. For example, Bael leaves and fruits are traded for religious purpose especially in shops around Shiva temple like the trade in Pashupati Nath area of the Kathmandu valley. Bael fruit is now concentrated for juice/Sharbat-making enterprises. There are a number of juice-making enterprises in Nepal such as in Dhankuta, Ramechhap, Siraha, Bardiya etc. FNCCI has identified Bael as an OVOP program for Siraha and Bardiya District of Nepal. Some studies also show that some Bael fruit are traded to India from the Terai region.

Bael Production Processes in Dhankuta

Bael fruit producers in Dhankuta district are comprised of two business models: Joint-Venture (such as Bishranti Bael Juice Enterprise near Mulghat) and Private Entrepreneur (Kabita Juice Enterprise at Dhankuta district headquarters). Both models work with local CFUG collectors and private collectors for their input supply. However, these two models are different in terms of their enterprise management and the benefits they provide to the CFUGs and DAGs.

Bael fruits are collected by climbing the tree and then shaking the branch so that fruits fall to those waiting under the tree. This collection process is complicated by two factors: the difficult locations of Bael trees (on steep hills full of underbrush) and the fact that Bael trees naturally have spines along their branches. Additionally, collectors must avoid letting the fruit fall to the ground, such that the quality of the fruit is lowered due to bruising or cracking the shell. Of note is that these limiting factors greatly restrict women's involvement at the input supply level. To facilitate the collection process, a harvesting pole can be used, which eliminates the need to climb the tree and lowers the risk of cracking or bruising the fruit during collection. CFUG collectors mentioned that they would like access to such tools and / or be paid more for their services, since it has high-risk and labor-intensive.

On average, one collector gathers 35 kg of fruit in one day. Determining the exact amount one collector is able to collect in one day is difficult due to the fact that collectors generally start in areas close to their home and then proceed farther into the forest to collect more fruit. This means initially the collector may gather up to 50 kg of fruit in a day, but then at farther locations may gather as low as 20 kg. The farther off locations require the collectors to remain in the forest for up to three days gathering the fruit and then transporting the Bael to the producer / collection site. Hence, fruit gathered nearby is of greater value than fruit gathered farther away because the amount earned in one day for 50 kg of Bael is reduced if the same amount of Bael collected takes up to three days of the collector's time and potential higher transport costs.

Once the fruit is collected, it is brought 6 to 20 km[10] either to collection centers near the village roadside[11] or directly to the producer. Means of transport primarily involves sacks or *bharis*, a basket that people carry on their backs that is usually supported by a brace on the head (Edmonds, 2002). Other transport options of Bael fruit include using the local buses (once Bael is brought to the roadside), but this costs the collector approximately 1 NRs/kg in addition to the bus fare to the passenger approximately 20-50 NRs.

The quality of fruit is another aspect of Bael juice production. The Bael with no cracking or bruising, large in size (preference), yellow in color (indicating the fruit is ready to eat) are considered as good quality for juice producers. Depending on the producer, the higher quality fruits are given a higher price NRs/kg than lower quality fruit[12].

Agreements or contracts between the CFUGs and producers determine most decisions regarding CF Bael collection. The process for determining the agreement with the producer is less formalized than other NTFPs industries. Generally, two modes of Bael fruit trade were observed in the field.

- Sometimes the agreement is initiated when the producer comes to a community to request fruit for processing;
- At other times collectors sell fruit without a formal contract between the CFUG and producer;

If an agreement is made, a CFUG management committee negotiates the terms on behalf of the DAG members in their community that comprises the majority of the CFUG collectors. This provides a labor fee of 5-10 NRs/kg to the collectors. High quality Bael is sometimes bought at 15 NRs/kg, but none of the collectors or CFUG members interviewed mentioned receiving this higher price[13]. Most of the time producers give an additional royalty of 2-4 NRs/kg[14] to CFUGs for use in their communal fund. Additionally, the Vishranti producer has created a policy where 10% of the profits are put into a DAG-specific fund. However, this policy was only enacted recently and has yet to trickle down to the community level.

One elderly woman interviewed stopped collecting Bael four years ago due to an injury incurred while collecting Bael. Her job was to collect the fruit that fell out of the tree that her family member would climb and shake. One of the Bael fruits fell and hit on her back, which caused her enough injury to stop Bael collection. She stated that the money earned from collecting Bael that season was about 400 NRs, while the cost of medication for her injury was over 1,000 NRs. For her, Bael collection income was not worth the loss of time and high-risk labor.

Product Flow of Bael

The product flow of Bael follows simple mechanism. The Bael found in CF, PF and religious forest are purchased by the enterprises. They are further processed to make a juice and sold through wholesale/ retail market channel to reach customer.

[10] Distance is so variable due to the spread of communities from the various collection sites and producers

[11] For the Raghutar and Jalkanya CFUGs, the Kabita producer has two collection centers where collectors can deposit their fruit, which is then picked up by Kabita employees for transport to the processing factory in Dhankuta

[12] As was expressed by both Kabita and Vishranti, the private collectors tend to bring better quality fruit to the producer and receive a higher payment12 – up to 15 NR/kg from Kabita.

[13] Only the Kabita producer mentioned giving this higher price for high quality Bael fruit.

[14] Varies by producer

Figure 3.1: Product flow of Bael

Source: Field Consultation, 2013/2014

CFUG governance can greatly affect the efficacy of DAGs in the value chain processes and Bael juice prodcution. Because of this, it is useful to improve governance of the Bael production CFUGs. Currently, there is effective inclusion for DAGs at the collection level in the sense that they comprise the majority of Bael fruit collectors. However, if in future the Bael value chain is to be expanded upon and the need for input supply to increase, it needs to have a clear focus on ensuring that CFUG DAGs are included. If CFUG governance is to be enhanced in future, clear and enforced operational plans (OP) and targeted capacity building at the CFUG DAG need to be in place.

Conservation Status of Bael

There is lack of exact data based on Bael tree plantation area in Nepal. However, this plant is considered as one of the priority species for nursery management in most of the district forest offices. As a result a lot of nurseries are producing Bael seedlings and hundreds of CFUGs, and some private land owners, across the country have already planted the Bael tree. Similarly, there are many forest areas where the Bael tree is naturally grown and fruiting. The DFO in Dhankuta said that dozens of CFUGs in the district have already planted Bael trees and many of them have started harvesting and trading them. The nursery managed by the Vishranti area management committee (with technical and some financial support from the DFO) is also producing Bael seedlings as one of the prioritized species. Vishranti is distributing Bael seedlings to interested cultivators. Moreover, Vishranti has its own Bael cultivated forest area (just above the Vishranti area) handed over to by the government as Guthi[15] land.

However, it was stated by stakeholders that sometimes the Bael fruit buyer (the juice production enterprise) cannot buy all Bael fruit produced in the adjacent villages and hence, the producers and collectors become discouraged from doing further plantation,

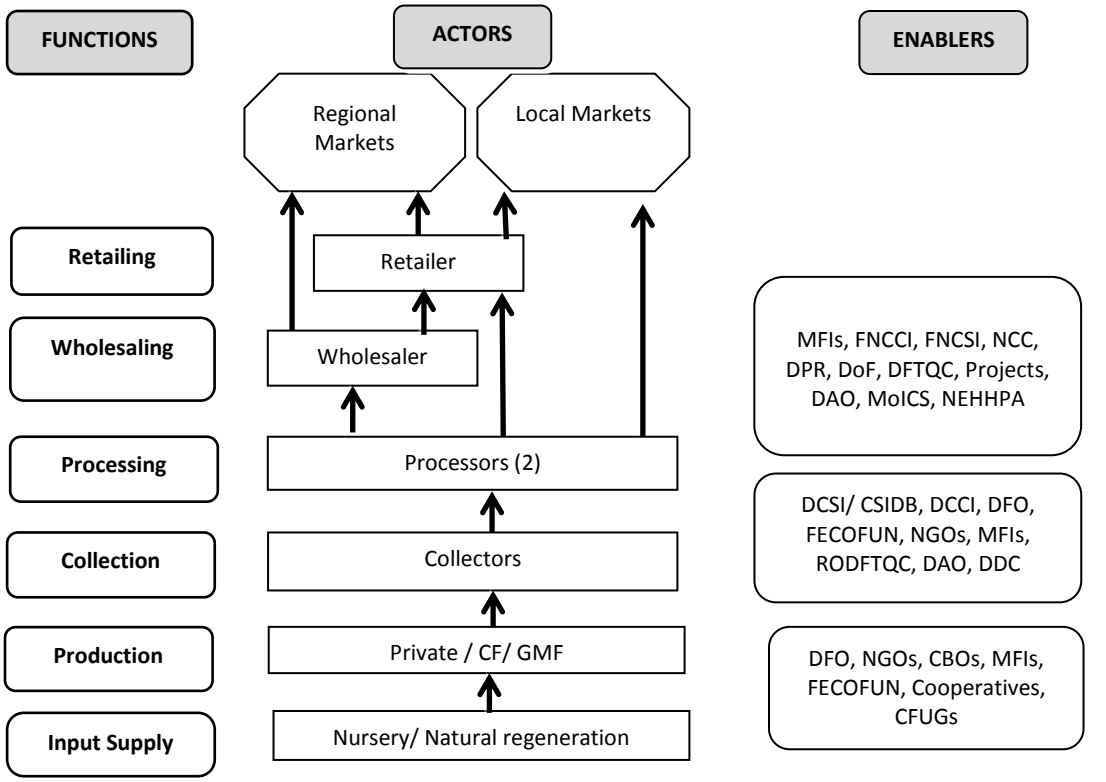
[15] The land which is handed over to the community for religious purposes.

management and production of Bael fruit. The Bael juice producers cannot buy all Bael fruit for two reasons; one is because of the lack of their capacity to produce Bael juice from all available Bael fruit, and second is that the Bael juice producers do not have the technology to store Bael fruit for long days and months.

Function of Bael Value Chain Actors

Various actors are involved in the Bael value chain. The Bael value chain actors, their functions and roles, and functions of enablers have been identified and discussed on the basis of the Bael value chain in Dhankuta district. The value chain map is given in the figure below (Figure 3.2).

Figure 3.2: Value chain map of Bael (Dhankuta Specific)



Source: Field Consultation, 2013/2014

The functions of the Bael value chain actors are further discussed below.

Market Functions:

The value chain of Bael in Dhankuta District is comprised of four main functions: Input Supply, Production, Retail and Consumption. Each function is briefly described below.

Input Supply: This functional level includes the processes and actors involved in bringing the raw material to the producer.

Production: Once the fruit reaches to the producer, the fruit is processed to produce bottled Bael juice concentrate. The juice concentrate is then sold to retailers or directly to consumers.

Retail: At the retail level, the Bael juice concentrate is purchased from the producer and sold in the market. This functional level is sometimes by-passed, as in the case of Vishranti Bael juice concentrate, which is sometimes sold directly to the end consumer. This is due to a sympathy market that exists in Dhankuta District, being that Vishranti's profits benefit the elderly home, and are sometimes purchased as "souvenir gifts" by visitors.

Consumption: At this level the end consumer buys bottled Bael juice concentrate, either directly from the producer or through a retailer.

Market Actors:

The major actor categories in the Bael value chain include collectors, producers, retailers and consumers. Most of these categories have multiple actors that play a significant role in the Bael value chain. Each market actor is classified and described below.

Collectors: Within Dhankuta District, two types of collectors contribute raw material to the Bael juice concentrate producers: CFUG members and private collectors. Although CFUG collectors serve as the primary input supplier, private collectors also contribute a minimal portion of raw material to the producers (approximately 1%, as stated by producers). Since the Bael collection season is during the off-season for agricultural activities (the primary income-generator for DAGs in the area), Bael juice concentrate is well suited to be a stable and complementary livelihood option for CFUG members and DAGs, should the Bael juice concentrate value chain include sufficient value-addition at the community level.

Producer 1 (Joint-Venture Model): The Joint-Venture Model, exemplified in Vishranti as a not-for-profit sub-sect of this model, is unique to the area. The Vishranti Bael enterprise was originally started 10 years ago as a means to generate income for the Vishranti elderly home, while simultaneously providing income and labor opportunities to 10 local CFUGs[16]. The Vishranti Temple organization has an over-arching Steering Committee (composed of volunteers from the Temple and the surrounding CFUGs), which is then divided into various sub-category departments. One of these management departments is specific to the management of the Vishranti Bael juice concentrate factory. Significantly, all of the managerial positions and a majority of the skilled labor positions associated with the factory are held by volunteers from neighboring communities and the elderly home itself. Moreover, the DFO covered the initial investment of the processing machinery and start-up costs. Hence, the Vishranti producer has incurred very minimal overhead costs by incorporating its stakeholders into the management of its Bael juice concentrate enterprise. Currently Vishranti is collaborating with the DFO in operating a nursery, with different species including Bael seedlings, in the attempt to expand the current supply of total Bael trees and Bael fruits. Vishranti management is currently in the planning stages of forming a joint-venture partnership with a private investor to upscale its production.

Producer 2 (Private Entrepreneur Model): A female entrepreneur started the Kabita enterprise 13 years ago. Bael juice concentrate is one of its products (i.e. tomato sauce, orange and mango juice concentrate, pickled mango and other local items). This enterprise production is open year-round. Its management is more typical of a privately owned business model, since no other stakeholders are directly involved in decision-making and governance

[16] CFUG's involved include: Rudrabari, Birleni, Bhangatar, Raghutar, Jalkanya, Bhuwaneswori, Garjuwa, Wathoke, Tintale, Gurlum, and Pathivara.

of the Kabita enterprise, though it does work through FECOFUN to establish agreements with local CFUGs for Bael fruit collection. Currently, Kabita employs 15 people year-round and buys its fruit from approximately 11 CFUGs, not all of whom have formalized contracts. Kabita has also received significant assistance from the Government of Nepal (GoN) (as part of its goal to encourage agricultural production enterprises[17]) and Livelihood and Forestry Program (LFP).

Retailers: Retailers of Bael juice concentrate are most prevalent at the Dhankuta District level, but extend to the regional market (i.e. Itahari and surrounding Eastern Region of Nepal) and occasionally reach to Kathmandu market when there is a surplus of Bael juice concentrate in a given year. Distinctions between the two Bael juice concentrate producers also provide an interesting example of two different marketing techniques for the product in Dhankuta District. When asked as to why individuals purchase the Bael juice concentrate, six of the nine retailers stated that consumers bought the juice concentrate for health and medicinal purposes.

Market 1 (Vishranti): The Vishranti producer relies heavily upon what they call the "sympathy" market. Within Dhankuta District, Vishranti is known for its not-for-profit enterprise whose profit goes specifically to the elderly home. The Vishranti Temple organization has campaigned throughout the District to raise funds for the elderly home and donation collection boxes have recently been erected by businesses (i.e. shops, restaurants etc.). These visual reminders of Vishranti's purpose facilitate the promotion and sales of the Vishranti Bael juice concentrate. But because of its low production each season, only a small portion of Vishranti's Bael juice concentrate reaches the regional level; the majority of their products remain in Dhankuta District, which are sold by small shop owners. There are some experiences that the Vishranti products get extended to the other markets like Kathmandu when they got financial supports from external agencies. However, Vishranti's current production capacity is back down to 25,000 bottles from 50,000 as highest in a year. This was mainly due to:

- Limited market opportunities (due to quality and quantity production);
- Lack of Bael fruit storing technology;
- Lack of funds deposit funds for further investment (all profits go to the elderly people);
- No provision for private investment;
- No profit or benefit motives of the enterprise (but a sympathy enterprise);

Market 2 (Kabita): Kabita Bael juice concentrate reaches both the District and regional and national (Kathmandu) markets, primarily due to higher production rates (an average of 135,000 bottles per year). Of the 15 retail shops interviewed or observed, 12 carried Kabita Bael juice concentrate. These retailers cited good marketing, quality products (not limited to Bael juice concentrate), and the low seasonal production rates from Vishranti as major preferences to purchasing Kabita Bael juice concentrate. Kabita products also go through retail dealers based in other Districts.

Retail Process: Once Bael juice concentrate is bottled and ready for consumption, a retailer purchases and transports the product to prepare it for the consumer market[18]. More often than not, Bael juice concentrate is purchased by the retailer by the carton, with 12*700 mL

[17] Vishranti is considered a forestry enterprise, and as such have not benefitted as highly from GoN support

[18] In the case of Vishranti Bael juice concentrate, sometimes the retailer stage is skipped and the end consumer buys the product directly from Vishranti. This is primarily due to the "sympathy" market discussed above.

bottles per carton. The range of carton sales varies significantly depending on the size of the retailer. Some shops in Dhankuta purchase as little as one to two cartons per season while others, especially larger retailers such as Gorkha Department Store in Itahari, purchase up to 300 cartons per season / year. Hence, market demand is higher than current supply of Bael juice concentrate.

Consumers: The end consumers of Bael juice concentrate reside primarily within the Eastern Region of Nepal. Many of the retail shops stated that consumers come from other Districts specifically to purchase the Bael juice concentrate, sometimes as gifts. Bael juice concentrate is known for its medicinal value (Kala, 2006), especially in "curing diseases such as cholera and diarrhea when used at the half-ripe state" (Shakya, 2002). Bael also has important cultural and religious value in Nepal as it is a symbol of the greatest Hindu god, Shiva (Paudel, 2007). During the Tihar festival, Bael leaves and fruits are in high demand and in Newari culture, "young girls are married to undamaged Bael fruits before their menstruation starts as a symbol of their future husbands."

Enablers and Facilitators:

Enablers and facilitators support the activities of actors within the value chain. Currently, enablers affect the functions of value chain actors at the collection, production and retail levels. These support services function primarily at the local and regional levels, with some facilitation available at the Kathmandu level. Table 4 describes in detail the various enablers and their roles within this VC, as well as outlines enabler gaps for each functional level.

Table 3.3: Enablers of Bael Juice concentrate in the Dhankuta District Value Chain

Major Activities	Regulatory functioning organizations
Sustainable Collection	DFO, CFUG
Royalty Payment	DFO, CFUG
Checking and Weighing	Range Post or CFUG
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Certificate of origin	FNCCI/ DCCI, NCC
Import permission and duty	Customs Office of importing country
Market information	Saugat Micro Promotion Pvt. Ltd., AEC, Koseli Ghar, DCCI
Financial Support	NGOs, Cooperatives, Commercial Banks
Processing technology	DCSI/ CSIDB, Private companies, NEHHPA
Resource management and Research	DPR, DFO, CFUG, NGOs, Consultant
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Throughout the value chain, the DFO plays a major enabler role, especially in terms of legal facilitation and joint-collaborations at the start-up level. This is not surprising as the DFO is the most influential local government agency for forest-based industries. The DFO also plays a significant role in promoting the increased propagation of Bael trees within CFUGs.

Moreover, DFO range post officers hold the authority to impose fines and sanctions to CFUGs who are harvesting unsustainably (i.e. cutting branches to collect fruit).

At the collection level other enablers include: CFUG, FECOFUN, and not-for-profit steering committees. At the production level other enablers include: DSCI, Department of Industry (DoI), Ministry of Industry, Commerce and Supplies (MoICS), the Department of Food, Technology and Quality Control (DFTQC), Village Development Council (VDC), District Development Council (DDC), Municipalities and various NGOs. At the retail level enablers include: DDC, DFO, and NGOs.

In previous years, NGO service support specific to the production and retail levels involved SOLVE and the LFP. These organizations and programmes provided managerial support, processing and sanitation training, and retail and marketing support for the producers. Currently, MSFP joint venture program (implemented by Rural Reconstruction Nepal and ForestAction Nepal) has also supported in buying bottles for Vishranti.

Economic Analysis of Bael

Bael juice concentrate production has opened a new market scheme in Dhankuta District. Because profits at every level of the value chain are relatively new and the economic impact has potential to be high. It is estimated that with current Bael tree fruit capacities, up to 534 collectors can be supported. Depending on which managerial model is being used, seasonal income earned by potential collectors varies between 4,200 NRs and 5,700 NRs and seasonal income earned by potential factory workers varies between 20,000 NRS and 32,000 NRs (at 86 days of processing).

Currently, Bael fruit collectors make, on average, 4,856 NRs per season. Several current and former Bael fruit collectors mentioned that the existing wage rates paid them for collection are lower than the time and labor risks they incur. However, in comparison, the average amount earned doing agricultural / other labor for the same duration of time earns 5,250 NRs, which is about 400 NRs more than Bael collection seasonal earnings. This amounts to about 43% of the average nominal per capita income (12,133 NRs/year) for rural citizens living in the Eastern mountains/hills (NCBS, 2004). At the current average collector wages rate, Bael collectors earn about 40% of the average nominal per capita income per year.

As the marketability and demand of Bael juice concentrate have increased over the last 10 years, the additional income generated has led to greater inclusion of DAGs in CF initiatives, supplemented their financial requirements, and augmented opportunities for further community development (i.e. educational infrastructure in the Rudrabari CFUG). However, while these mechanisms have begun to take root in Dhankuta District CFUGs, there is much room for improvement in all of these endeavours to make a more significant impact on poverty alleviation through inclusion in the Bael juice concentrate value chain.

Demand and Supply of Bael

Market survey reports of NTFPs and MAPs 2004 carried out by BDS-MAPs project has projected demand of 25,000 kg of Bael annually in Kathmandu market. At present there are two main brands that are competing in National market: Marmelous brand from Alternative Herbal Industries, Nepal and Bael from Patanjali Ayurved Ltd India. The discussion with traders at Kathmandu has revealed high demand for orange-based juice amongst fruit juice. The discussion also revealed increasing demand of Bael juices in Kathmandu along with regional market like Biratnagar, Pokhara and Nepalgunj. The increases in demand in regional areas are due to the increases in supply of Bael juice by establishment of various community and private-based enterprises throughout Nepal.

End Market

Bael juice concentrate end markets originate at the Dhankuta District level and terminate at the local and regional levels, which extend from the local Dhankuta community to surrounding Districts in Eastern Nepal. If there is a surplus of Bael juice concentrate produced in a given year, the consumer end market may reach as far as Kathmandu.

Table 3.4: End Markets of Bael Juice Concentrate Products Segmented by the Stages

Actor	Product	End Market	End market location
Collector	Bael fruit	Producer	Within Dhankuta district
Producer	Bael Juice (bottled)	Wholesaler/retailer/ consumer	Local or regional

Source: Field Consultation, 2013/2014

The Dhankuta District value chain for Bael fruit is limited to the Domestic market. As such, this section focuses primarily upon the local, regional and Kathmandu markets. This market delineation is relatively small for a NTFPs, especially in comparison to the markets of other NTFPs such as Lokta (Habeel *et al.*, 2012) or Allo (MEDEP, 2010). Because of this, the potential for market expansion is significant for Bael juice concentrate. For example, some advertising in the Nepali Times has been done in recent years discussing Bael's medicinal values, which should be expanded upon to take advantage of this strength and reach an extended market (Nepali Times, 2006). However, reliable statistical data regarding the Bael juice concentrate market are largely non-existent and currently private interest in promoting Bael is low. This is in part due to the high risk associated with the developmental aspects[19], but also due to the fact that the GoN is primarily focused on apple and citrus fruit industries (Shakya, 2002).

a) **Local End Market:** The local market[20] for Dhankuta Bael juice concentrate primarily encompasses those within the District of Dhankuta. These local shop retailers tend to purchase their Bael juice concentrate by the carton, the amount of which is variable from shop to shop. The majority of retailers interviewed stated that they saw Bael juice concentrate as fitting into a "specialty" market that caters to the specialty gift and medicinal markets. Interestingly, one barrier mentioned at this functional level was that local knowledge of Bael's medicinal value was lacking. Significantly, most of them also stated that if more Bael juice concentrate was produced, they would buy larger quantities of the product since they identified a consumer demand for it. This indicates a strong potential for future Bael juice concentrate in Dhankuta District.

b) **Regional and Kathmandu End Market:** Bael juice concentrate has reached the regional market primarily by word of mouth for the Vishranti producer, who relies heavily upon the "sympathy" market. The Kabita producer has a more established route for getting their product to the regional level with established retail dealers in towns such as Itahari. Both producers benefited greatly from marketing assistance during the LFP operation three years ago. This LFP assistance included promotional exhibitions in Kathmandu of Bael juice concentrate and networking with retailers in Kathmandu that was reliant on LFP connections. However, with the phasing out of the LFP project, today these markets remain a small portion of their total market. There is a possible lack of follow-up with these retail connections or a high cost to transport products, but the producers merely stated that the loss in funding limited the extent of their marketability.

[19] Achieving economy of scale is difficult since areas suitable for collection and production are located in small pocket areas – all of which requirement high investment costs.

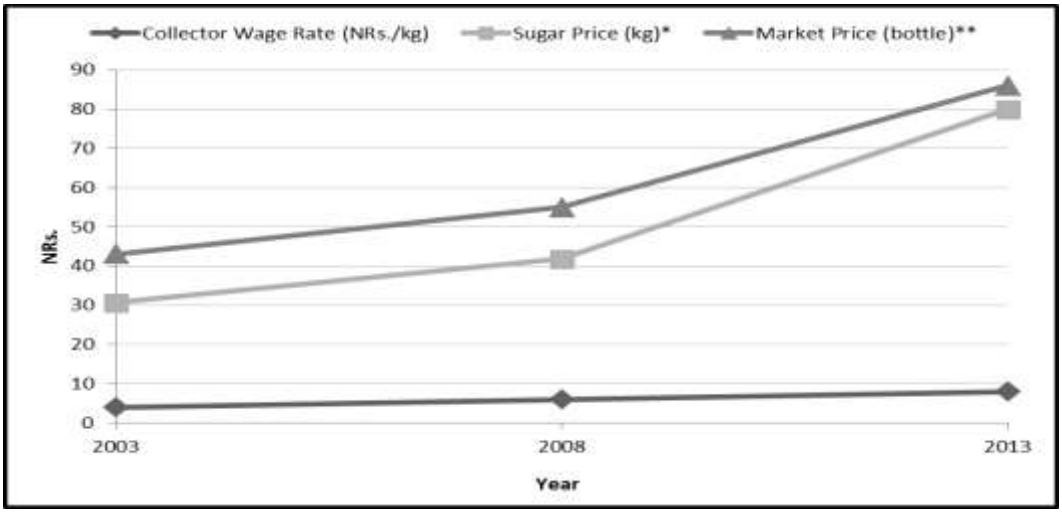
[20] Achieving economy of scale is difficult since areas suitable for collection and production are located in small pocket areas – all of which requirement high investment costs.

Price Trends

Determining price trends in the Bael juice concentrate value chain is difficult due to inconsistent patterns of pricing, weight and measurement, which generally makes the availability of price history almost non-existent. The study team gathered data for collector wage rates (NRs/kg), sugar prices (NRs/kg), and market prices (NRs/kg) per bottle of Bael juice concentrate for the years of 2003, 2008 and 2013. The price trends for collector wages rate was determined through various interviews with collectors themselves, both producers, and a SOLVE staff member who co-managed the factory while SOLVE was involved in management.

In order to understand the price trends of product inputs and their effects on market prices of the Bael juice concentrate, the team has used the price trend of sugar found in Nepal's Central Bureau of Statistics website (NCBS, 2013). Then the data were adjusted to match Dhankuta District price trends[21]. The price trend for Bael juice concentrate market prices per bottle was estimated based upon the wholesale purchase price trend.

Figure 3.3: Comparison of Price Trends of Bael in Dhankuta District (2003, 2008, 2013)



Source: Field Consultation, 2013/2014

[* Estimated based on % Change in Government Sugar price trends & current Dhankuta price/kg]

[** Estimated based on wholesale price]

The above figure (Figure 3.3) portrays an interesting comparison of all three price trends. As expected, the market price of a bottle of Bael juice concentrate corresponds with the variations of sugar price trends. More significantly, the price trend for collector wage rate does not keep pace with the increases in prices that both sugar and market price experienced between 2008 and 2013. From 2003 to 2008, collector wage rate increases the most by 50%, whereas sugar increases by 36% and market price increases by only 28% (Table 3.5). Conversely, from 2008 to 2013, collector wage rate increases the least by 50% compared to a 91% increase in price of sugar and 56% increase in market price of Bael juice concentrate (Table 3.5).

[21] First the percent in prices was calculated using the government data. Then these percent changes were translated into Dhankuta District prices, starting with 2013's price of 80 Nrs./kg.

Table 3.5: Average Price Trends and % Change for Bael Juice in NRs

Price types	2003	2008	2013	% change 2003-2008	% change 2008-2013
Collector Wage rate per kg	4	6	9	50%	50%
Sugar price per kg*	31	42	80	36%	91%
Market price per bottle**	43	55	86	28%	56%

Source: Field Consultation, 2013/2014

[*Estimated based on % change in Government sugar price trends and current Dhankuta price/ kg]

[** Estimated based on wholesale price]

SWOT Analysis of Bael

An important component of the Bael juice concentrate VCA is the consideration of its strengths, weaknesses, opportunities, and threats (SWOT) and an analysis of how these pertain to its constraints and opportunities at each functional level of the value chain.

Table 3.6: SWOT Analysis of Bael Juice Concentrate VC in Dhankuta District

Strength	Weakness
➢ Bael is a hardy plant, found abundantly in 67 Districts of Nepal; ➢ Bael is well suited for marketing as a juice; ➢ Bael is harvested adjacent to other agriculture products; ➢ In Dhankuta, producers are well prepared for Bael juice value chain expansion; ➢ Bael has high medicinal value.	➢ Collection is time consuming and labor intensive; ➢ The opportunity cost for collector is low; ➢ Storage capacity for fresh and bottled Bael is limited; ➢ Waste from Bael juice processing is not utilized; ➢ Unclear guidelines and/ or lack of standardized sanitation and safety procedures.
Opportunities	**Threats**
➢ Bael is becoming more widely known for its medicinal attributes; ➢ Planting additional "Rani" Bael seedlings; ➢ Semi- processing Bael pulp; ➢ Market expansion; ➢ Product expansion.	➢ Lack of collector interest due to underpayment; ➢ Limited opportunities for capital investment in enterprise development. ➢ GoN focuses on policies and programs to promote the commercialization of agriculture vs. forestry industries

Source: Field Consultation, 2013/2014

Strengths (to capitalize on): The characteristics specific to the Bael plant, such as its hardiness (Chatterjee, 2002) and abundance in the middle hills (Shakya, 2002), ensure a stable future for its juice concentrate production in Dhankuta District. Since Bael is not well suited for marketing as a table fruit because of its hard shell, mucilaginous texture and numerous seeds – which detract from its desirability, it is best utilized in juice concentrate form or made into other products. This serves the Bael juice concentrate VC well in terms of marketing, since the fruit is becoming more widely known for its health properties and there is demand for it among consumers. These attributes, in addition to its harvest season being during the off-season for agricultural activities, make the Bael juice concentrate value chain well suited to be a stable livelihood option for CFUG members and DAGs, should the Bael juice concentrate value chain include sufficient value-addition at the community level.

Weaknesses (to eliminate): Collection is time consuming and labour intensive, which makes it a high-risk income generating activity. This is exacerbated by the low wage rate for collecting and transporting Bael fruits to producers. Another complication is Bael's storage capacity, both before (as raw fruit) and after (processed and bottled) juice concentrates production. The storage life of Bael fruit depends upon its stage of maturity when harvested. If Bael fruit is harvested at full maturity (i.e. when fruit is developed, but not ripe for eating) it can be stored for about 15 days. If it is harvested once already ripe (i.e. when ready for eating) it can only be stored for a week. In cool storage, fruit may be stored for up to three months: 9C and 85-90% RH (Sheel, 2002). Once bottled, the quality of Bael juice concentrate has been previously hindered, in the case of Vishranti, by undesirable storage conditions. This was mentioned by two of 12 retailers in Dhankuta as a reason for preferring to sell Kabita's Bael juice concentrate. Moreover, since current production processes only utilize Bael pulp, there may be a weakness in under-utilizing waste products, if creating other marketable products is feasible and economically viable.

Opportunities (to take advantage of): As the population increases and demand in urban and rural areas for health-conscious products escalates (Shakya, 2002), Bael juice concentrate will be competitive because of its medicinal properties and its relatively new presence in the fruit juice concentrate market. Planting "Rani" Bael seedlings will increase input supply, and thus production rate, once trees become fruit bearing after seven to eight years. To meet this need, the DFO has supported the planting of approximately 50,000 "Rani" Bael seedlings in the Vishranti nursery. With an estimated 50% survival rate, this will amount to an additional 25,000 Bael trees for Vishranti. Kabita has also planted an additional 1,200 seedlings of common Bael. The CFUG cultivators can hope to have a competitive advantage to private landowners, who also plant the preferred "Rani" Bael fruits.

The annual production of Bael juice concentrate may be extended by semi-processing Bael pulp when fruit can be harvested and storing it in larger containers (with preservatives) until market demand increases. This would feasibly create a higher profit margin for producers and collectors, in addition to providing more stable employment throughout the year for processors (Rice, 2002). The idea of semi-processing is currently exemplified by the Kabita factory and is cited by research done by the International Centre for Underutilised Crops (ICUC): "If perishable, underutilized fruits are processed into shelf-stable products at a commercial level, the financial return is expected to be more for the growers [and] the postharvest loss will be reduced to a great extent" (Sheel, 2002).

Pending higher production rates for Bael juice concentrate, there may be room for market expansion by tapping more permanently into Kathmandu, national, or Indian markets. Another avenue for expansion is to better utilize and further process the currently wasted portions of Bael fruit into other products. Such products include: making rinds into essential oil (Kala, 2006) or selling dried shells for use as tinder when building fires / cooking. Moreover, by diversifying products (i.e. juicing for mango and tomato, which are also found in Dhankuta), producers may be able to extend the range of their production months; thereby increasing production capacity. A market exploration of the feasibility of these ideas is necessary to understand how they might fit into DAG availability, should production seasons be extended (i.e. if waste utilization or product diversification interferes with agricultural cultivation or harvesting) or the economic impacts of expanding production in these ways.

Threats (to overcome): One of the burgeoning problems in Bael value chain is lack of interest to participate in Bael juice concentrate collection because of low wage rates and labor-intensive collection procedures. Unless harvesting tools are made available, transport

distance is mitigated (i.e. establishing more collection centres), and producers pay more per kilogram for collected fruit, input supply barriers will limit up-scaling and expansion opportunities. These limiting factors affect all actors in the VC.

Another major threat to developing any Bael juice concentrate enterprise, but especially for Model 3 (as described in the Enterprise Management Models section), is acquiring capital for the initial start-up costs. Often private investors are uninterested in supporting community inclusion and equity in their decision-making[3]. This is exacerbated by a low interest in promoting Bael, because the GoN is primarily focused on apple and citrus fruit industries, so policies and programs to commercialize and propagate these fruits are few[2]. To offset these potential investment limitations, Bael juice concentrate producers may need to invest (at least in the initial phases of development) in simple equipment. This will not only lower start-up costs, but also make the machines easier to fix when they break down because skilled mechanics are not needed.

Another threat to Model 3 (as described in the Enterprise Management Models section) is that there are currently unclear regulations for supporting a sustainable forestry business model[3], so facilitation barriers may exist for CFUGs who wish to develop their own Bael juice concentrate enterprises.

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in the next section as a part of Value Chain Upgrading Strategy.

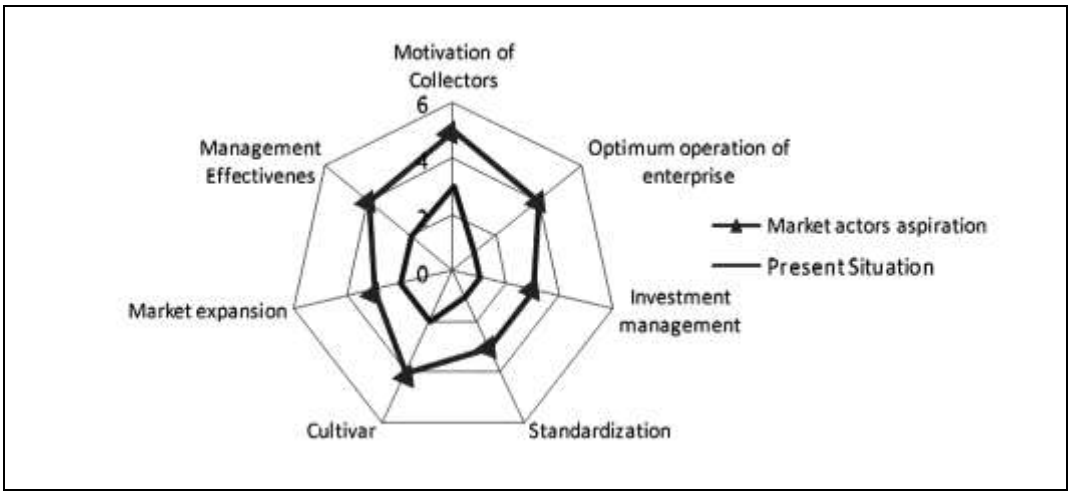
Value Chain Upgrading Strategy of Bael

End Market Analysis:

Bael has been used in religious functions in Nepal but its potential commercialization has not been fully utilized yet. The recent decade has seen various initiatives in Bael concentrate juice manufacturing, mainly initiated by community-based organizations in support of development agencies. However, the production is still too limited in the national market. Bael products have become common products in most of the market centers in the Kathmandu valley but the commercial distribution is yet to be developed.

The discussion with traders revealed that supply side strengthening of Bael has increased the market of Bael concentrate juice at the National and regional levels. Dhankuta's products, with its presence of two Bael-based enterprises and continuous strengthening of these enterprises by various development agencies, have a strong presence in the regional market; which includes Dhankuta, Dharan, Biratnagar, Itahari and Birtamod. People from Dhankuta are promoting Bael products and are taking the Dhankuta Bael products to relatives residing in other Districts of Nepal. However, there are existing gaps between the aspirations of market actors, mainly collectors, enterprises, retailing and customers. These gaps are presented in the spiderogram below (Figure 4).

Figure 3.4: Gaps between market demands and present status of Bael



Source: Field Consultation, 2013/2014

Parameters used for comparing market demands and present status have been developed on the basis of the aspirations of Bael value chain actors.

Table 3:7: Parameters used for comparing market demands and present status of Bael

Parameters	1	2	3	4	5
Motivation of Collectors	Least price paid to collection and minimal motivation	Less price paid to collectors and less motivation	Moderate motivation and modetate price paid to collectors	Good motivation and good price paid to collectors	Highly motivation and and best price paid to collectors
Optimum Operation of enterprise	Enterprise operated for more than three months	Enterprise operated for at least six months	Enterprise operated for more than six months with at least two product mix	Enterprise operated for more than nine months with at least three product mix	Enterprise operated for more than nine months with more than three product mix
Investment management	Lack of Fund for raw materials purchase and labor cost	Enough fund for raw materials and labor but lack of fund for marketing	Moderate cash flow management for raw materials, labor and marketing	Access to FIs to loan and following standard cash flow management	Well managed cash flow and access to FIs for loan
Standardization	Following minimum requirement of DFTQC	Following minimum requirement of DFTQC and continous upgrading on process	National Standard (NS)	International Standard (ISO)	ISO standard with other related certification like FSC, Global compact etc.

Cultivar	Least production of "Rani" Bael	Limited production of "Rani" Bael with demonstration plots of nursery	Moderate production of "Rani" Bael with nursery management	Large production of "Rani" Bael and commercial nursery management, enough for market expansion for Dhankuta based enterprises	Large production of "Rani" Bael with commercial nursery management and sale of seedlings to outside district enterprises
Market expansion	Catering local market	Catering local and regional market	Catering local, regional and national market	Catering local, regional, national and international market	Catering to all market and ownership of brand by district
Management Effectiveness	Dysfunctional enterprise with absence of regular meeting and work from management committee (MC)	Enterprise operated by only one or two members of MC with absence of TOR and ambigious roles and responsibilities	Enterprise operated by only one or two members of MC with a placement of manager	TOR and clear role and responsibiltieis of MC and staffs	TOR and clear role and responsibilities of MC and staffs Follow of national standards

Source: Field Consultation, 2013/2014

Looking at the differences between market demands and present status of Bael, some gapes have been identified. These gaps and possible solutions are discussed below.

Motivation of collectors: For CFUG and private Bael collectors, low wages has led to limited enthusiasm for participation in Bael value chain. This is also due to the labor intensity and high risk of Bael fruit collection (i.e. difficult terrain, poor mechanisms for collection, and transport distance is far for some CFUGs). Furthermore, due to inconsistent knowledge and lack of tools required for sustainable harvesting, some collectors cut branches when collecting Bael fruit, which damages Bael trees and inhibits fruit proliferation.

Optimum operation of enterprise: At the enterprise level, various gaps exist: production capacity, dependence upon Bael fruit's seasonality in determining production timeframes, severely limit the producer's yearly production levels. If Bael juice concentrate is the only product being produced, the production is limited to the three months in the year when Bael fruit is collected- unless storage capacity is considered. Another aspect is product diversification and maximum utilization of Bael tree. There are various possibilities in diversifying the uses of Bael tree properties. For example, possibility of producing Jam, pickles, distillation, other fruits juice production, and use of waste in products etc. need to be looked upon.

Investment management: Another gap affecting production levels includes investment management (importantly access to investment capital). Different means for increasing production include: expanding products outside of Bael juice concentrate, purchasing more equipment or equipment associated with other products processing (i.e. tomato processing) or purchasing equipment and space required for appropriate storage of the Bael product. Lastly, in terms of benefits for the CFUG members and DAGs, location of the process factory potentially limits opportunity for employment for women or DAGs. Also, the type of producer management model can severely restrict benefits to the input supply level, unless specific measures and policies are put in place to increase CFUG member benefits (i.e. CFUG member presence in management committee or implementation of a DAG-specific fund).

Standardization: The unclear guidelines and / or lack of standardized sanitation and safety procedures available for producers can lead to less than ideal sanitation and safety practices at the production site. Limited resource personnel's availability to ensure compliance with any sanitation or safety practices is therefore also a constraining factor for enablers such at the DFTQC. Furthermore, both Bael juice concentrate collectors and producers expressed interest in or mentioned the lack of continual (not just one-time) training around both collection practices and processing procedures.

Cultivar: "Rani" Bael has been identified as competitive advantage than other cultivar. It is important to promote this cultivar for commercial nursery establishment. Atpresent, there is nursery management with support of development agency but there exists gap in commercialization of input supply by strengthening private enterprises for nursery establishment.

Market expansion: The effort of development organization in recent time has increased brand image of Bael products in regional market and enterprises are not able to supply as per the demand. Still, more market penetration to other regional centers like Chitwan, Butwal, Rajbiraj, Pokhara and Kathmandu has to be done along with increasing production capacity and access to investment capital.

Management Effectiveness: This is most important in Vishranti where business is being carried out not for profit. Even, the income from Bael business is invested in social cause (for elderly people) leaving the enterprise to search for money from development organization / or loan from management committee members (personal loans) for next year production. The business is neither separately registered in DCSI/CSIDB nor managed by a separate committee. Rather it is operated as a part of Vishranti. Moreover, all benefits or incomes of Bael juice go to the elderly people but not reinvested in business.

1. Firm level upgrading strategy:

The firm-level upgrading strategy is developed based on the gaps identified above. The strategies are derived to minimize the existing gaps.

a) Product upgrading: The product upgrading is based on a three-year plan. The first year's focus will be on the optimum operation of enterprises, standardization and increasing product mix. The details of each year's strategy are presented in a tabular form below (Table 3.8).

Table 3.8: Product upgrading strategies of Bael

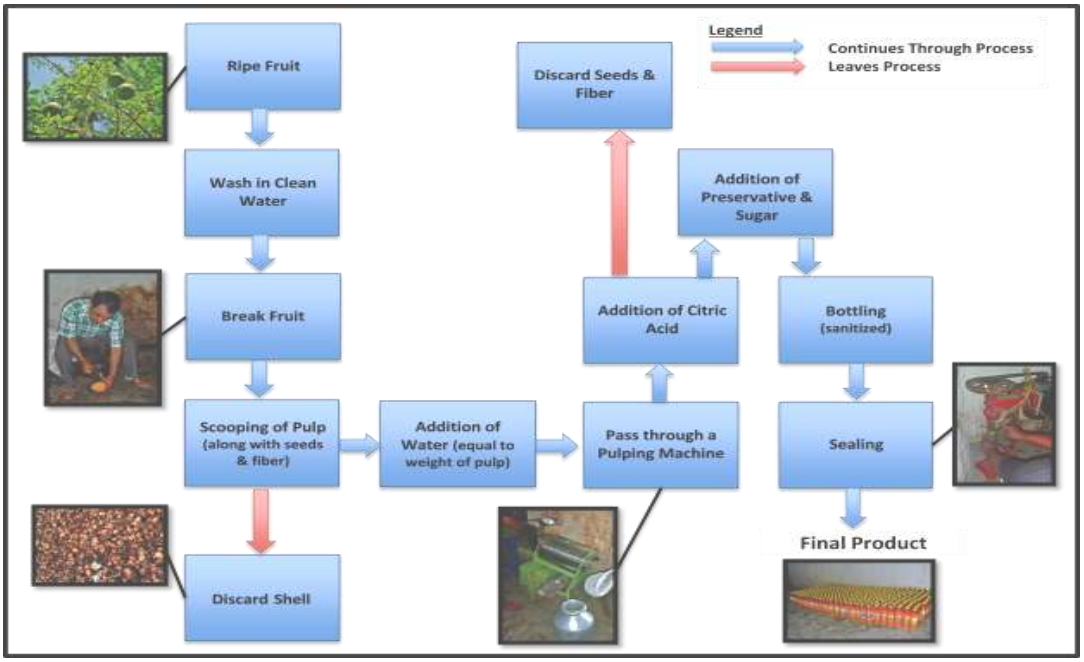
Parameters	Present	Year 1	Year 2	Year 3
Product	Three months of operation, Branded Bael Concentrated Juice	Six months operation through storage technology, market test in at least two other product mix, commercial nursery management	Six months operation through storage technology, market penetration in at least two other product mix, standardization practices to NS	Nine months operation through storage, product mix, obtain NS Standard
Price	Income only from Bael Juice	Additional income from more production	Additional income generation through market penetration	Additional income through more market penetration and product mix

Place	District, Region	District, more market centers at regional level	District, other regional market up to Chitwan	National market
Promotion	Branded, labeled, health value	Branding, labeling for health and medicinal value	Branding, labeling, health and medicinal value, negating myth related Bael consumption for some communities	NS certified Bael production

Source: Field Consultation, 2013/2014

b) Process upgrading: Once the fruit arrives at the production site, acceptable-quality fruit is separated from unacceptable-quality fruit. It is then rinsed, broken open, and the pulp extracted (this is done by hand). Next, the pulp is mixed with water and sent through the pulping machine, which separates waste from the desirable pulp. Citric acid, a chemical preservative referred to as KMS, and sugar are manually added to the mixture, which is then bottled (into 700 ml. bottles) and sealed either manually (at Kabita) or by a sealing machine (at Vishranti) and then labelled. Of the two producers, only Kabita has the capacity to store semi-processed Bael fruit, which is done after the pulping and includes the addition of just the KMS preservative. This pulp can last up to one year. Kabita is able to store this pulp in order to produce Bael juice concentrate beyond the seasonal productivity of Bael fruit[22].

Figure 3.5: Production Process Map of Bael Juice



Source: Field Consultation, 2013/2014

There are various processes involved for Bael production starting from collection to final product marketing. Some strategies have been recommended below.

[22] During Vishranti's phase of high production three years ago, the producer ran into issues with storage of excess Bael juice concentrate, the lack of which led to product contamination. This was due mainly to the absence of refrigeration and a controlled environment (i.e. exposure to alternating temperature / moisture conditions).

Table 3.9: Process upgrading strategies of Bael

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology intervention	Anticipated benefits
Upgrading 1: Production	Naturally available Bael, nursery initiated	Commercialization of nursery with "Rani" Bael seedlings	Training on nursery management	Mass production and competitive cultivar, Input based enterprise development
Upgrading 2: Collection	High risk of Bael fruit collection	Availability of harvesting pole and safety measure, establishment of collection center	Access to technology, provision of minimum tools required for collection center (weighing machine etc.), provision of operation guideline for collection center	Easiness and safety in collection, reduce in collection cost, possible increment in collector's income
Upgrading 3: Storage	Limited time period for storage and quick final product development	Improving storage life as recommended by ICUC (Rathore, D.S. 2002)	Research on best practices for increasing storage life and training	Increase in sales, optimum operation of enterprise
Upgrading 4: Waste Utilization	The waste is not utilized in commercial manner	Commercial use of wastage for dye, distillation, detergent, handicrafts	Research on best practices for product mix and access to technology and technical information	Increase in income, optimum operation of enterprises, employment creation
Upgrading 5: Standardization of whole process	Enterprises following only minimum standards of DFTQC	Enterprises to start for process of obtaining NS	Linkages with BDS for accreditation	Brand image building, quality management

Source: Field Consultation, 2013/2014

c) Functional upgrading: The Bael value chain actors have different functions and roles. Upgrading their existing functions is one of the important aspects of value chain improvement. The upgrading strategies at each level of the value chain are presented below (in Table 3.10).

Table 3.10: Functional Upgrading of Bael value chain actors

Actors	Present Function	Upgraded Function
Collectors	Collection of Bael	Cultivation of Bael in CF and private land as IGA activities focusing on DAGs
Collection Center	Not Available	Establishment of Collection Centers
Enterprises	Purchase of Bael , Processing and marketing	Production of other products linked with wastages, juice making from other fruits

Source: Field Consultation, 2013/2014

d) ***Channel upgrading:*** Bael concentrate juice produced in Dhankuta district is sold through three market channels.

a. Selling directly to consumer in the production/manufacturing place;

b. Selling through retail stores;

c. Selling through wholesales and then to the retail stores;

As the brand image of Dhankuta-based Bael enterprises exist in the Eastern Region of Nepal, it is important to carry out partnership with regional wholesalers for the sale of Bael products. The possibility of selling the products in a niche market has to be assessed. At present a niche market can be: Cosmetic and Beauty related wholesalers, retailers, Ayurveda product wholesaler, retailers, health and hygiene related products wholesaler, retailers, suppliers of beverage items for hotels and restaurants.

Table 3.11: Market niche and positioning of Bael Juice

Market Niche	Wholesale/ Retail	Positioning	Reference
Beauty and cosmetic	Beauty parlour	Beauty related benefits	16 amazing benefits of Bael juice for skin and health (Bhagat, 2013)
Ayurveda	Ayurveda shop, Hospital	Health related benefits	Health benefit sub-section in this chapter
Health and Hygiene	Fitness clubs, Swimming pools, Futsal	Fitness related benefits	16 amazing benefit of Bael juice
Beverage	Suppliers to hotels, restaurants	Alternative and innovative juice products	Hotel Soaltee Crowne Plaza serve Bael Juice as complementary for guests

Source: Field Consultation, 2013/2014

e) ***Intersectoral upgrading:*** Bael based collectors and workers at the enterprise level are not able to generate income from Bael throughout the year. It is important to empower them to manufacture products from various parts of Bael tree.

2. Inter-firm upgrading strategy:

Business membership organizations are less active in case of Bael related products. Nepal Herbs and Herbal Products Association (NEHHPA) is acting as umbrella organization for private sectors which are working in the field of NTFPs and MAPs processing. A linkage of enterprises with NEHHPA has to be carried out. FNCCI has been implementing OVOP program in Bael in Siraha and Bardiya Districts. Institutional linkages of DCCI Dhankuta with CCIs of above mentioned Districts can provide opportunity for best practices sharing and backward/forward linkages for the enterprises.

3. Business Development services and financial Services upgrading strategy:

Most of the documents on value chain analysis are based on identifying only pertinent BDS and FS services. The assessment of Business Development Services (BDS) and Financial Services (FS) in this report has been considered taking in view of following categories of supply side and demand side.

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 3.12: Demand and supply side of BDS for Bael

SUPPLY SIDE	Very strong				
	Strong				
	Weak			Nursery management and cultivation training, Technology transfer for collection, storage, processing etc.	Access to finance, Training on Product mix, Exposure visit
	Very weak		Accreditation service for NS standard	Financial planning including product costing, cash flow management and business planning	Enterprise management and governance coaching, Research on new product mix and knowledge transfer
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries in categorization (very strong, strong and weak) and supply side of service providers (very weak, weak and strong) are selected to develop commercial viable option for these business services. The business and financial service requirement can be catered by some commercially viable business service providers.

Table 3.13: Listing out commercially viable business options for Bael

Services	Strategy	Major BDS
Access to finance	Cash flow management, Advance payment from buyers, increasing share of CFUGs and private	Cooperative, MFIs, Private investors, NEHHPA
Enterprise management and Governance coaching	Management restructuring/strengthening , TOR with well-articulated roles and responsibilities	BDSPO, DCSI/ CSIDB
Research on product mix	Market research on product mix that can be sold in niche market	BDSPO, DCSI/ CSIDB, DCCI
Business partnership NEHHPA members and institutional linkages between DCCIs	Develop business partnership for cultivation, trade and best practices sharing; Institutional linkages between DCCIs (Dhankuta, Siraha, and Bardiya Districts); Exposure visit	DCCI, DCSI/ CSIDB
Nursery management and access to quality seedlings	Strengthen existing nurseries and linkages to best quality Bael seedlings	DFO, NGOs
Technology transfer for increasing storage capacity and other process as mentioned in process upgrading	Research on existing technology for storage capacity	Consultant, RECAST, Private technology transfer enterprises
NS Accreditation	Linkages with BDS providers who facilitates standardization; Partial support for standardization	BDS listed/ recognized by DFTQC, NGOs, Projects

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

Business enabling environment (BEE) is very restrictive to forest based enterprise. Various research has outlined a number of legal hurdles that are restricting value chain promotion. Enablers in the Bael juice concentrate value chain currently have unclear means of communication with CFUGs and collectors, as well as with producers. During the VCA, differing perspectives and responses were heared from the various functional levels of the value chain. This reflects an inconsistency in communication between the various market actors and enablers. In this way, lack of consistent communication pathways at the enabler functional level could limit Bael juice concentrate up-scaling and expansion or new enterprise development for Bael juice concentrate. The unclear guidelines and / or lack of standardized sanitation and safety procedures available for producers can lead to less than ideal sanitation and safety practices at the production site. Limited resource personnel's availability to ensure compliance with any sanitation or safety practices is therefore also a constraining factor for enablers such at the DFTQC. Furthermore, both Bael juice concentrate collectors and producers expressed interest in or mentioned the lack of continual (not just one-time) training around both collection practices and processing procedures. However, enablers such as the DFO, the FTD, and the DoI are limited at the district level in personnel resources required to maintain both the capacity for training combined with monitoring at both functional levels.

Major legal recommendations made in BEE are:

a. Contractual obligations from enterprises to collectors are met (i.e. appropriate wages rates for Bael collection);

b. Sanitation for juice concentrate production and facility/processor Standard Operating Procedures (SOPs);

c. Promotion of "Rani" Bael planting District wise (to encompass all CFUGs in Dhankuta) and allocation of budget of DDC, VDC, DFO for commercial establishment of nursery;

d. Enterprises lack knowledge about accounting practices and documentation policy is not adhered to normal practices which are encouraged by DCSI/ CSIDB;

e. District Forest Office are taking more time for revision of operation plan of CFUGs resulting in hindrance of making collection permit for Bael collection;

5. Sustainability Strategy:

Bael value chain development up to now has been carried out through massive support of development agencies. The discussion with enterprises revealed that they are still waiting for support of development agencies for market expansion, and in some case raw material collection and labor wages. The study team believes that these enterprises have to be now treated as growth oriented enterprises and commercial focus has to be carried out more than the development approaches. Development agencies support organizations can strengthen Bael enterprises in terms of optimum operation and link to FIs/investors cash flow management. Thus, most important part for sustainability is optimum operation of enterprises along with following up strategies as depicted in value chain upgrading section.

Summary of Bael Value Chain Upgrading Strategy

This study tried to explore the present status of Bael fruit and juice production in Dhankuta district and its market in Nepal. The plantation/cultivation, harvesting, processing and its marketing or trade of Bael fruit and juice have been tried to describe and understand. Similarly, the study also tried to discuss medicinal and food properties of Bael tree and its fruit. The important thing the study tried to depict is the identification and analysis of constraints for the expansions of possible market opportunities within its current value chain. Based on these all, the study made some value chain upgrading strategies as practical recommendations useful for further development and improvements.

Despite historically constructed cultural values and uses, the Bael tree, leaves and fruits have gradually been started to cultivate for the commercial purposes in Nepal. This study clearly depicts that Bael fruit and its juice are already established as one of the traded forest products in the country. Moreover, the study clearly shows that Bael is one of the most potential forest products for the improvements of income and livelihoods of people in rural Nepal. Moreover, Bael tree is one of the most appropriate plant species for increasing economic value of dry and unproductive land and forest areas. The study clearly shows that Bael tree has multiple uses and almost all parts of this tree have economic values. However, the economic potentials of this plant are yet to transform into use. The commercial use of Bael is limited only in the production and trading of Bael juice. The economic values of medicinal properties, cultural and religious properties and waste parts of Bael are yet to be transformed into practice. So, the economic potentials of Bale are yet to explore and convert into commercial use. Similarly, there are also some scopes and demands for the technological innovation and transfer in existing and established harvesting, collection and processing of Bael fruits for making Bael juice.

Table 3.14: Summary of the value chain upgrading strategy of Bael

Upgrading Strategy	Recommendation
Product Upgrading	➢ Six months operation through storage technology; ➢ Market test and market penetration in at least two other product mix; ➢ Obtain NS Standard;
Process Upgrading	➢ Cultivation practices, promote Bael cultivation as IGA; ➢ Access to Technology for easiness and safety for collectors; ➢ Establishment of collection center; ➢ Improving storage life; ➢ Commercial utilization of waste; ➢ NS standard in operation of business;
Function Upgrading	➢ Collectors: Collectors encouraged for cultivation; ➢ Collection Center: Establishment of collection center; ➢ Enterprises: Production of other product from parts of Bael Tree, wastages, and juice making from other fruits;
Channel Upgrading	➢ Niche market and positioning;
Intersectoral Upgrading	➢ Product making from various parts of Bael tree;
Interfirm Upgrading	➢ Linkages of enterprises with NEHHPA, DCCI Dhankuta; ➢ Linkages with DCCIs Siraha and Bardiya for best practices sharing of OVOP program;
BDS+ FS	➢ Access to finance, Enterprise management and governance coaching;

Strengthening	➢ Research on product mix, business linkages with NEHHPA members and institutional linkages with DCCIs; ➢ Nursery management and access to quality seedlings; ➢ Technology transfer for increasing storage capacity etc.; ➢ Linkages with BDS providers for NS accreditation ;
Business Enabling Environment strengthening	➢ Contractual obligations between enterprises and collectors; ➢ Standard Operating Procedures; ➢ Accounting and documentation practices ➢ Promotion of "Rani" Bael cultivation; ➢ Timely revision of operation plan;
Sustainability Strategy	➢ Support in growth oriented approach; ➢ Optimum operation of enterprises; ➢ Access to finance; ➢ Development support with clear exit strategy;

Source: Field Consultation, 2013/2014

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Chapter 4[23]
Chiraito (*Swertia chirayita)*: Widely Cultivated and Exported Medicinal Plant in Nepal[24]

Introduction

Of the many forest products, Chiraito is one the most traded forest products in Nepal. The botanical name of the Chiraito is "*Swertia chirayita* (Roxb. ex Fleming) Karsten". Locally, it is known as "Tite or Pothi Chiraito or Tikta". Chiraito is a perennial herb found in the temperate regions of Nepal. This is also one of the prioritized medicinal plants of Nepal (GoN/MoFSC/ DPR 2006). Apart from the collection of wild, it is now cultivated in most of the eastern districts of Nepal (Pyakurel *et al.* 2011). Chiraito or *Swertia* comprises 100 species (Airy Shaw, 1993) of which 32 species are recorded from 40 districts of Nepal. Around nine species of Swertia are reported to be traded in different trade centres of Nepal. Among them *Swertia chirayita* is considered as superior in quality. Others are *Swertia alata*, *Swertia ungustifolia*, *Swertia ciliate, Swertia purpurascens*, *Swertia dilatata*, *Swertia multicaulis*, *Swertia nervosa*, *Swertia racemosa*, and *Swertia tetragona* and all these have business value as well.

- **Common Name**: Chiraito, *Tite/Pothi Chiraito/Tikta;*
- **Synonyms**: *Gentiana chirayita* Roxb. Ex Fleming, *Swertia chirata* (Wall.) C.B. Clarke, *Swertia purpurascens* (D.Don) C.B. Clarke, *Agathotes chirayta* D. Don ex G. Don, *Ophelia chirayta* D. Don ex G. Don
- **English Name:** *Chireeta;*
- **Botanical Name:** *Swertia chirayita*;
- **Family:** *Gentianaceae;*

The main objective of the study was to provide a comprehensive VCA of Chiraito for both market and social benefit. For this, the study has focused on identifying and analyzing various constraints in cultivation of Chiraito, barriers to market access, explore up-scaling options and provide recommendation to the stakeholders for potential expansion opportunities within its value chain.

[23] The contributors of this chapter (in order) are: Suhrid Prasad Chapagain, Abhinaya Pathak, Jailab Kumar Rai, and Kapil Dahal.

[24] Suggested citation of this chapter: Chapagain, S.P., Pathak, A., Rai, J.K., Dahal, K., 2014. Chiraito (*Swertia chirayita)*: Widely Cultivated and Exported Medicinal Plant in Nepal. In: Rai and Chapagain (Eds.), "Value Chain Analysis of Forest Products in Koshi Hill Districts of Nepal: *Challenges and Opportunities for Economic Growth",* ForestAction Nepal and RRN, Kathmandu, Chapter IV, pp. 70-91.

The study and analysis is based on both the primary and the secondary information. The secondary information has been obtained from available published and unpublished reports and related literatures. While, the primary information has been collected from field visits and observation in Bhojpur and Sankhuwasabha districts, interaction and consultation with value chain actors (producers, traders, buyers, DFO, other officers in DFO offices, social workers etc.), and staffs of organizations working in Non Timber Forest Product (NTFPs) and Medicinal and Aromatic Plants (MAP).

Habit (Characteristics), Habitat and Distribution of Chiraito

Chiraito is a biennial or perennial herb with seasonal growth. It mostly has a single stout elongated stem, size of which ranged from 60cm to 150cm with branching at tip. Colour of stem is greenish-brown at young and turns light-brown to light-violet as the plant attains maturity. Stem is cylindrical at base and quadrangular upwards. Roots are generally small stretching by about 5-10cm long in light brown colour, somewhat twisted and gradually tapering, and bearing a few rootlets or their remnants. Leaves are ovate, elliptic or broadly lanceolate, sessile, opposite, acute, 3-5 nerved, 1.6-10cm by 0.3-3cm. Leaves grown near base are often larger than that grown near tips. Flowers are greenish yellow borne in small clusters. Flowers contain numerous minute seeds. Chiraito has a tendency to cover a wide space in a given area. It is unable to exhibit thick stocking. Whole plant is intensely bitter in taste. Flowering takes place from July to October and fruiting from September to November (Pyakurel *et al.* 2011)

Chiraito grows in temperate Himalayas from Kashmir to Bhutan and in Khasia hills of Meghlaya (Chanda, 1976). In Nepal, it is distributed within the altitude of 1500m to 3000m which is the Northern belts of the country. This plant prefers North and North-West facing moist habitat on forests, rangelands and around cultivated lands. But it is found mostly on South-West facing slopes of mixed broad leaved forest. Chiraito population mainly comprised of juveniles, followed by rosette stage and adults in wild (Pyakurel 2008). Major associates of Chiraito are *Anaphalis*sp, *Desmodium*sp, *Anemone obtusiloba*, *Elsholtzia*spp, *Fragaria*spp, *Oxalis corniculata*etc (Ghimire *et al*. 2008, Pyakurel 2008).

Uses, Chemical Composition and Conservation Status of Chiraito

Chiraito is one of the most important medicinal plants for the people in rural Nepal. It is one of the most common traditional medicines for people in mountain and mid-hills in Nepal. It has historical, ethno-botanical, medical as well as economic values for the local communities. Chiraito is an integral part of Ayurved, Yunani, Chinese and Tibetan medication system (Tabassum *et al.* 2012). It is also used in herbal medication system in USA and UK (Joshi and Dhawan, 2005).

The whole parts of the Chiraito plant are intensely bitter in taste. It is useful to treat more than 15 diseases, disorders and ailments locally and through Ayurvedic and Allopathic medicines. Dried plant is soaked in a glass of water (150-200ml) overnight and the extract is taken orally to treat fever, asthma, cold and cough. Crushed seeds are considered most effective to cure those ailments. Plant juice is taken with water to treat jaundice, headache, malarial fever, stomach disorder, gastric, ulcer and anthelmintic medicine. The plant is also used for the treatment of cuts and wounds (Ghimire *et al.* 2008). Chiraito immersed in half glass of water overnight is taken twice a day to treat diabetes and 1 teaspoon decoction thrice a day is taken to treat fever in Nubri Valley, Gorkha district (Pyakurel and Gurung 2006). Paste of plant is used to treat various skin diseases (Manandhar 2002).

It is used as tonic, febrifuge, antidiarrhoetic and to cure various liver problems. The plant is used to control the sugar level in blood. This plant shows antipyretic, sudorific, antiperiodic, anthelmintic, anti-inflammatory and hepatoprotective actions and used in urinary and liver disorders. It also contains xanthine, which are reputedly effective against malaria and tuberculosis. The herb has a beneficial effect on the liver, promoting the flow of bile; it also cures constipation and is useful for treating dyspepsia (CSIR 1986). Chiraito is also being used by the brewing industry because of its intense bitter taste (IUCN, 2004).

The Chiraito plant contains bitter secoiridoid, in particular amarogentin and amaroswertin. Amarogentin is a monoterpene glycoside and is the bitterest substance isolated till date, with a bitterness index of 5,80,00,000 and is used to some extent as an alternative bitter agent to quinine in liquor industries (Keil *et al.* 2000). Several xanthones have been isolated from *Swertia chirayita*, such as swerchirin, chiratol and 7-O-methyl swertianin (Ghimire *et al.* 2008).

Swertia chirayita falls under the IUCN and CAMP threat category "vulnerable". It has been categorised as being critically-rare and endangered in the Indian Himalayas (Joshi and Dhawan 2005). The government of Nepal has proclaimed a regulation act for the proper harvesting of *Swertia chirayita*, which is suffering from premature collection. The regulation came under act in 1995 and it forbids both collection and trade from May to September. If the rule is found to be breached, both the buyer and the seller can be jailed or fined or both (HMGN/MOFSC/FDP 1995). This indicates government's priorities and initiatives in conservation of Chiraito plans.

The government of Nepal prioritises Chiraito as having potential for economic development and has set a high priority on its research and cultivation. The plant is collected from natural forest with the permission of the respective District Forest Offices (DFO), with collectors paying a tariff of NRs 15 per kg. The government of Nepal earned NRs 1, 33, 640 as revenues by issuing collection permits from different DFOs in the fiscal year 2066/67. Tariff or duty is not required to be paid for cultivated species, the cultivated areas and estimated productivity need to be verified by rangers of DFOs, National Parks or Conservation Area Offices.

Trade, Demand-Supply and Product Flow of Chiraito

Trade:

According to an estimate, about 45 per cent of Chiraito in the Himalayan region is collected from Nepal (Joshi and Dhawan 2005). Olsen (2005) estimated a minimum volume of 373 tonnes (valued at USD 876,000) and maximum of 1,878 tonnes (valued at USD 4,411,000) of crude *Swertia chirayita* is being traded from Nepal annually. It is harvested from October to November but is traded throughout the year, as it can be stored up to three years. The national consumption of Chiraito is only 5 per cent of the total production, with 95 per cent going to international markets (India, Tibet, Germany, Sweden, Italy, Holland, and the US).

Table 4.1: Chiraito trade in five development regions in two fiscal years

Chiraito traded in Kg	Eastern Development Region	Central Development Region	Western Development Region	Mid-Western Development Region	Far-Western Development Region	Total
2068/069	79039	……	3641	803	1375	84858
2069/70	66824	17068	12684	688	15851	119315

Source: MoFSC 2069; MoFSC 2070

The given data above (in the Table 4.1) suggest high trade of Chiraito from eastern development region of Nepal. For example, Chiraito is predominantly found in most of the Northern VDCs of Sankuwasabha district, namely; Madimulkharkha, Taphu, Mawodin, Nundhaki, Sidhakali, Sidhdapokhari, Jaljala, Pathibhara, Barhabesi, Num, Tamkhu, Hatiya, Makalu, Chepuwa (Chenten) etc. According to information by DFO in Sankhuwasabha district, about 92,100 kg is the growing stock and 30,700 kg is annual allowable harvesting quantity of Chiraito in Sankhuwasabha district. Total 12,620 kg quantity Chiraito was transported in fiscal year 069/070 from Sankhuwasabha district. In fiscal year 069/070 there was 7,000 kg of dried Chiraito from private and 5,620 of dried Chiraito from government forest was estimated to be traded from Sankhuwasabha district. A recent report on Market Study of tradable and economically important medicinal and aromatic plants of Eastern Nepal showed that 2,32,226 kg of Chiraito is exported from Eastern Nepal (Pyakural *et al.* 2013)

Demand and Supply:

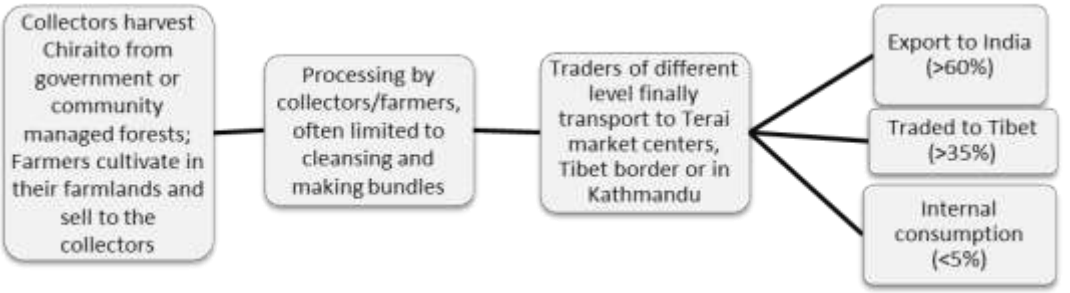
Chiraito is one of the highest export revenue earning medicinal plants of Nepal. That means it could be said that Chiraito is one of the important source of cash income for the farmers and collectors. Bulk of Chiraito originated from Nepal is traded to Indian markets. In the recent years, Chiraito is also traded in Tibet in bulk as the price in Tibet is higher than that of Indian market. According to an estimate, about 45% of Chiraito in the Himalayan region is collected from Nepal (Joshi and Dhawan 2005).

The national consumption for Chiraito has only remained to 5% of the production whereas about 60% goes to India and about 35% to Tibet; an Autonomous Region of China (TAR). Each year, more than 300 tons of cultivated and wild collected Chiraito is exported from Nepal to India and Tibet. A study by Pyakurel *et al.* 2013 revealed that 232 tons of Chiraito was exported from eastern region of Nepal to India (152 tons) and Tibet (80 tons). Other countries such as Germany, Sweden, Italy, the Netherlands, and the US are also recorded as Chiraito imported countries but in the minimal quantity (Pyakurel *et al.* 2011).

Product Flow:

The trading of Chiraito begins with collection from forests and ends with export to India and Tibet. There are three tiers of actors viz. micro, meso and macro level players in the value chain. At the micro level, there are the collectors, farmers, village and district level traders and exporters. At the meso level there are CFUGs and LFUGs. At the macro and policy level, there are institutions such as the District Chamber of Commerce and Industries (DCCI), DFO, Department of Forest (DoF) and Department of Plant Resources (DPR), which formulate and implement policies.

Figure 4.1: Supply Chain of Chiraito in Nepal



All the elements of supply chain are based on local resources. Chiraito is collected from government forests or community managed forests or cultivated and harvested during October-November. Collectors or farmers sell Chiraito to village level traders. Village level traders sell Chiraito to the district level traders (bearing the transportation cost). Further the district level traders sell this product in the regional markets, which is often situated in Terai regions (such as Nepalgunj, Krishnanagar, Bhairawaha, Biratnagar and Kakadbhitta) and in Kathmandu. Regional traders export crude Chiraito to Indian and Tibetan market while very few are consumed within the country (Pyakurel et al. 2013).

Functions of Chiraito Value Chain Actors

The different institutions, groups and individuals are engaged in the Chiraito cultivation to export. There are various actors involved in conventional value chain of Chiraito such as collectors/ farmers, village level traders, district level traders, regional traders and exporters.

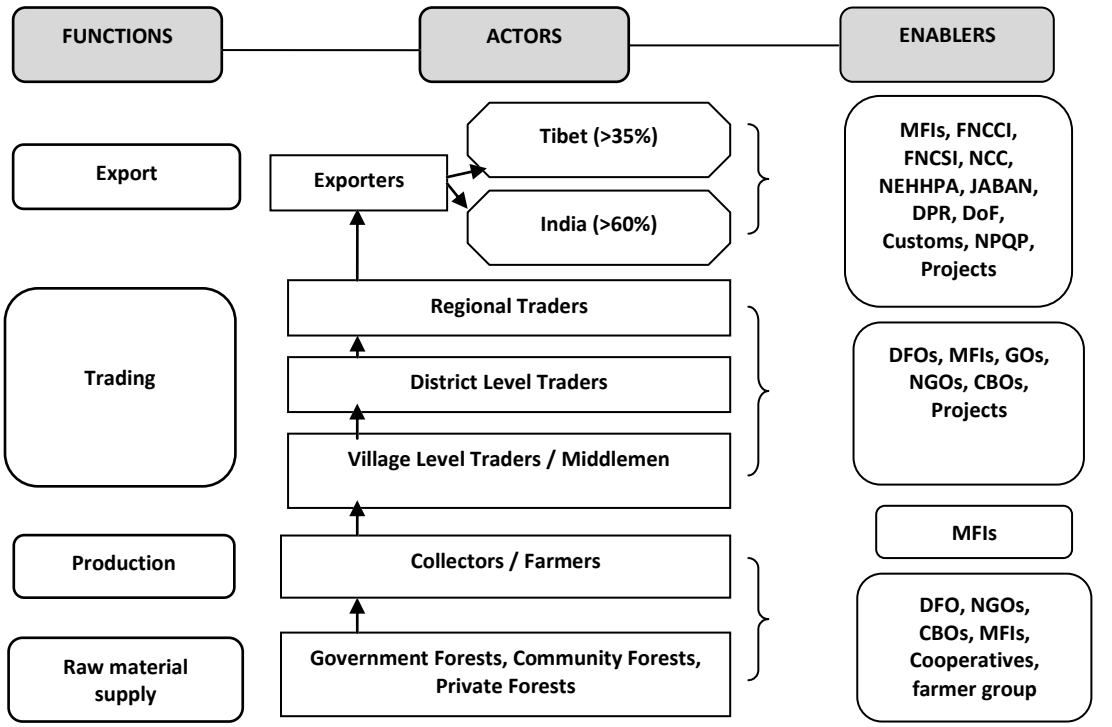
Cultivation: Cultivation of Chiraito is becoming one of the important and common productions of people in mountain and hill regions of Nepal. For example, recently the large number of people in higher altitude of Bhojpur and Sankhuwasabha districts has been cultivating Chiraito in their private lands. There are about 100-150 cultivators (CFUG households, farmers) in Sankhuwasabha district alone and it is said that 7000 kg of dried Chiraito has been traded from private land of this district (FY 069/070). In addition, many of the CFUGs have also cultivating Chiraito in the community forest areas.

Collectors: Farmers and local cultivators collect Chiraito from their cultivation field and forest areas. A large number of people are engaged in the role of Chiraito cultivators but it is difficult to know the exact number of collectors in the villages. For example, it is said that there are more than 200 collectors only in Sankhuwasabha district. These collectors collect Chiraito from CFUG and national forest. It is estimated that about 5,620 kg of dried Chiraito was collected from the government forest in Sankhuwasabha disitrct alone in fiscal year 069/ 070.

Village Level Traders: Some of the individuals in the villages are becoming village level Chiraito traders. The village level traders purchase Chiraito from collectors and sell to the district level traders. For example, 2 to 3 individuals are village level traders in Chiraito production VDC of Sankhuwasabha district and they buy collected Chiraito from the collectors and then sell to the traders based in the district headquarters, Khadbari. The selling rate of Chiraito was recorded as NRs 900-1000 per kg in fiscal year 2070 at Khadbari.

District Level Traders: The district level traders most often are based in the district headquarters. For example, it is said that about 4 to 5 individuals are stationed at Khandbari municipality of Sankhuwasabha district and these traders directly export collected Chiraito to Kathmandu, Birtamod or Tibet/China through Kimathangka border. The product flow to each trade point depends on price differences. The transportation cost also determines the flow of Chiraito to India or China. At present, 60% goes to India, 35% goes to Tibet; an Autonomous Region of China (TAR) and 5% for domestic use within Nepal. Importantly, district level traders obtain necessary documents from DFO for the trade. They usually sell the rhizome in the range of NRs 1000 to NRs 1200 per kg, depending on the size and quality.

Figure 4.2: Value chain map of Chiraito



Exporters: The collected Chiraito is mostly sold to Tibet and India in the raw form. Kimathangka in Sankhuwasabha and Kathamndu are the main routes to export Chiraito in China and Birtamod of Jhapa district is the main route for India. The exporters are mostly based in these trade centres. For example, more than 10 persons are stationed at Birtamod and they export Chiraito to India. The most common route is from Birtamod to Silguri (West Bengal State) to various cities in India (importantly Delhi and Kolkata). In case of export to China through Kimathangka border, it is interesting that the collected Chiraito is transported by exporters by chartered helicopters from collection centres in different places of the district.

Domestic Manufacturers of Herbal Medicines: Domestic manufacturers of herbal industries consumed 5% of Chiraito in Nepal. Each industry has very less demand for Chiraito.

Enablers: Enablers of "Chiraito value chain" in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases.

Table 4.2: Anticipated role of facilitating and regulating organizations to move Chiraito in the market chain

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CFUG
Royalty payment	DFO, CFUG
Checking and weighing	Range Post or CFUG
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Export recommendation, product certification and export permission for selected natural products	DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/ DCCI, NCC
Export permission and duty	Customs Office of exporting country
Import permission and duty	Customs Office of importing country
Market information	TEPC, AEC, ANSAB
Financial support	NGOs, Cooperatives
Processing technology	DCSI/ CSIDB, Private companies
Resource management and Research	DPR, DFO, CFUG, NGO, Consultant
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation 2013/2014

Economic Aspects of Chiraito

Cultivation:

The cost per hectare cultivation of Chiraito becomes approximately NRs 89,000 for first year, NRs 31,000 for second year and NRs 59,000 for third year. The expert consultation cost is kept NRs 30,000 collectively. Thus, the total cost of production is NRs 2,09,000 for three years. About 850 kg can be produced in a hectare and if sold at NRs 600 per hectare (calculated in the market rate in September 2013), the total sale becomes NRs 5,10,000. According to this calculation, the profit per year per hectare is estimated to be NRs 1,00,300 (Annex: 3). For wild collection, the harvest quantity is based on the availability in the wild and generally a collector can collect 2-3 kg of dried Chiraito in a day.

Whole plant is sun dried and care is given so that all the parts of Chiraito, including the leaves are intact. The plant needs to be well dried as it may develop fungal growth if it is stored wet. The perfectly dried Chiraito is made to one kg bundle of about 1m length. Forty small bundles are made to one bundle of 'one *maan*' (*maan*: a measurement scale widely used in the hilly regions of Nepal; equal to 40 kilograms), which is the conventional traded quantity for Chiraito. Sorting and grading are practiced by a few traders. A few traders are willing to pay extra price to the processed Chiraito. The increment in price for processed Chiraito ranges from NRs 20-30 per kg. Some attempts have been made by traders to press dried Chiraito to reduce volume for export. Chiraito extract has been isolated in the laboratory but its commercialization is yet to commence.

Price Trend:

Price trend of Chiraito in recent year is slightly increasing; whereas there has been abrupt drop during the years 2002-2006. After 2006 the price has been slightly increased.

Table 4.3: Price different of Chiraito based on Kathmandu selling price

Year	1999	2001	2002	2005	2009	2010	2011	2012	2013
Price of Chiraito in NRs (per kg)	350	400	200	100	380-420	380	400	546	550

Source: ANSAB/ MIS (1999-2013)

The decrease in price of Chiraito during 2002 to 2006 is due to lack of easy trade to Tibet/ China during political insurgency in Nepal, but its price dramatically increased between 2009 - 2013 which is because of the easy trade developed after the political settlements in the country.

The market price of Chiraito fluctuated not only over the years but it also fluctuates within the different months of the same year. For example, the data show that the price of Chiraito fluctuates within months in Kathmandu market.

Table 4.4: Annual price fluctuation of Chiraito in Kathmandu market

Years	Chiraito price (per kg) in different months											
	Jan	***Feb***	***Mar***	***Apr***	***May***	***June***	***July***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***
2013	620	725	700	700	675	600	600	600	600	600	550	550
2012	...	...	...	500	500	525	525	550	550	..	..	546

Source: ANSAB/ MIS (2012-2013)

The price of Chiraito in Kathmandu market remained linear throughout year 2012 but it was fluctuated throughout the year 2013. This has been due to fluctuating market demand for Chiraito. This might be a speculation as: The increasing number of cultivation in Eastern Nepal and reported existing practices in cultivation in other development region of Nepal potentially suggest increasing supply in coming times (if the demand from China and India remains status quo). The market for Chiraito is getting competitive rather than monopolistic as traders carry out business to either Tibet or India depending on the price variation. The demand might alter if the use of Chiraito is increased in India or Tibet/China. The recent report (January 2014) has shown the increasing demand of Chiraito in Tibet/China. Chiraito is traded and helicopters are being used for transportation by paying NRs 1000 per kg for exporters near Tibet/China border (Kimathangka).

It is important to understand the price comparison between different trade points so that product flow trend can be determined. The comparison of Chiraito price fluctuated within five years at three main trade points (Kathmandu, Nepalgunj and New Delhi) would be useful in understanding market dynamics in Nepal.

Table 4.5: Price comparison between Kathmandu, Nepalgunj and New Delhi in NRs

Year	Kathmandu	Nepalgunj	New Delhi
December 2013	550	600	760
December 2012	546	750	****
November 2011	400	450	640
December 2010	380	400	520
January 2010	380-420	380	416

Source: ANSAB/MIS (2010-2013)

The table 5 shows that the price of Chiraito is gradually increasing over the years. Similarly, the price becomes higher when it moves towards Nepalgung and India and it is generally understood that overprice between one trade point to another is a margin earned by the traders or middlemen. The price variation in different trade points is further higher in the local trade markets. For example, the price variation (recorded in January 2014) amongst actors in different trade layers have a wide gap.

Table 4.6: Recent price variation in different level of traders in Sankhuwasabha district

Actors	Price (Per KG)	Price (Per Mon)
Price of Cultivators/ Collectors (in NRs)	375	1500
Price of District level traders (in NRs)	650	26000
Price of Exporters in Ladang and Kimathangka border (in NRs)	1000	40000

Source: Field Consultation 2013/2014

The table 6 shows that prices of Chiraito become higher from local trade centers to the upper one. This is simply because of the transportation cost from local collection centers to the trade points and some portions of higher prices are also the margin earned by the traders. It indicates that there is increasing demand of Chiraito in Tibet/China at present time and which has been one of the income sources of people in the area and forest products to export. However, the price fluctuation of Chiraito and quantity of export totally depend on the market in India and China. At present, it seems that the demand from Tibet is increasing.

SWOT Analysis of Chiraito:

The field visit, observation, consultation with cultivators and traders, enablers and also the available facts and figures of Chiraito production and trade indicate that it has been one of the most important means of earning for rural people and also for the traders.

Table 4.7: SWOT analysis of Chiraito

Strength	Weakness
• Traditional knowledge on collection; • Priority NTFPs for household usage in medicinal purpose; • Easy for plantation in marginal and underutilized land; • Successful cultivation practices already carried out in different parts of Nepal;	• Almost three years cultivation time resulting less interest of farmers for commercialization; • Chiraito cultivation requires higher effort on land preparation, production process, any negligence can decrease productivity; • Availability of quality seedlings of Chiraito is only in few places of Nepal; • High mortality rate; • Fluctuating prices;
Opportunities	**Threats**
• Climate and geography of the mountain and hilly areas of the country are appropriate for Chiraito cultivation; • Good demand in international markets; • The products can be sold throughout the year; • Compressing opportunities to reduce transportation cost; • Possibility of making powders for industrial usage;	• Farmers and collectors collect immature Chiraito resulting into the unsustainable harvesting; • Lack of interest on commercialization of Chiraito in private land in comparison with off season vegetables; • Increasing supply after number of farmers carrying out cultivation whereas market demand is stagnant; • More than 95% of export and market is completely relied on China and India;

Source: Field Consultation, 2013/2014

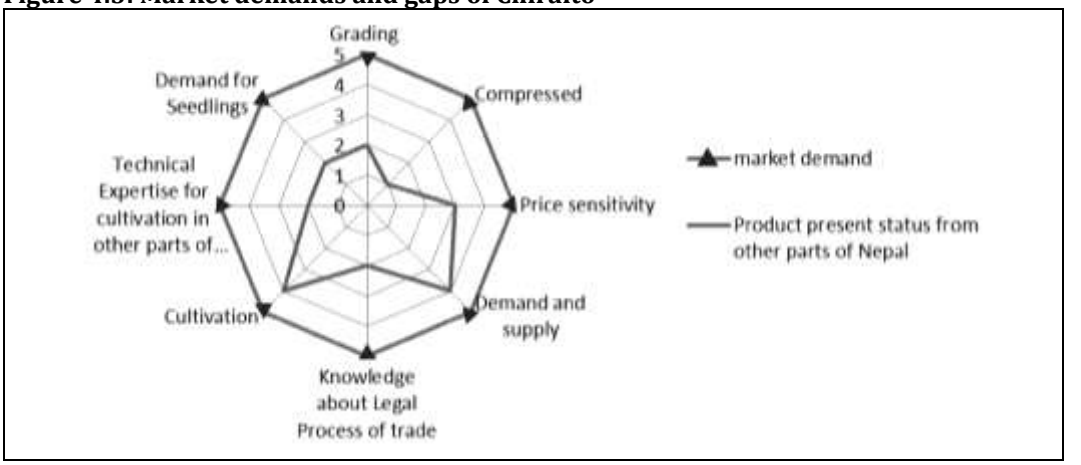
The SWOT analysis indicates that despite some threats and weaknesses, the Chiraito cultivation is most potential for improving livelihoods and income of people in rural areas in Nepal. The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Value Chain Upgrading Strategy of Chiraito

End Market Analysis:

Chiraito has been considered as high value product that could also be cultivated in agriculture and underutilized lands. The higher demands of Chiraito from China and Indian markets have gradually wide spread its commercial cultivation in Nepal. The earnings of the cultivators and traders are recorded as quite good and satisfactory. Hence, Chiraito cultivation in Eastern Nepal has become one of the potential and prioritized cultivation practices. End market strategy is prepared to fulfil the gap between market requirements and present status. This is shown in spiderogram looking at six parameters.

Figure 4.3: Market demands and gaps of Chiraito



Source: Field Consultation, 2013/2014

Based on the market demands and present status of Chiraito presented in the figure 4, there are some gapes to be fulfilled if development of Chiraito cultivation and trade is carried out by considering the value chain upgrading strategy in Nepal. Following gaps need to be fulfilled:

Grading: Among the 30 recorded *Swertia* species from Nepal, 12 species are traded under the name of "Chiraito". Knowingly or unknowingly, collectors often collect more than one species of Chiraito and mix them along with *Swertia chirayita*. Other *Swertia* species are generally regarded as *Bhale Chiraito* and it accounts for the 20% of the total trade volume. Adulteration of 5% has been reported to be common and is accepted by traders, but excess adulteration reduces the price of Chiraito. In some cases, collectors mix *Exacum* species, *Androphis*

*paniculata, Ainsliaea latifolia, Slevolgia orientalis*etc with *Swertia chirayita* which had affected the export of Chiraito in the past.

Compressed Chiraito: The compression machine is used to reduce the transportation cost of collected Chiraito. However, this has not been used in most parts of Nepal including Sankhuwasabha and Bhojpur district resulting in the rise oftransportation cost due to high volume.

Demand and Supply: The price fluctuation during 2013 has shown a trend in fluctuation demand and supply of Chiraito (assuming competitive market and price as major criteria for demand fluctuation). The Chiraito cultivation started in different parts of Nepal has shown a trend of stagnant demand compared to increasing demand during previous year. It is important to focus on quality upgrading of existing products and decrease the production cost in order to mitigate fluctuating price of Chiraito. Ironically, the discussion with traders in Khandbari revealed increasing demand of Chiraito from Sankhuwasabha and Bhojpur and this is area of new cultivation.

Price Sensitivity: Chiraito price has been fluctuating as per demand in China and India. Traders are using both the channels depending on increased market price.

Legal Knowledge about Trade: *Thekedar* and district traders collect Chiraito from farmers through village traders. The legal process is carried out by *Thekadar*/ district traders and cultivators and collectors are unaware about the legal processes. This has hindered in getting maximum price of Chiraito for cultivators and collectors both.

Cultivation Practices: Along with cardamom and other high value products, the Chiraito cultivation practices are getting commercialized in eastern Nepal. For example, the farmers in Sankhuwasabha and Bhojpur districts are encouraged for cultivation of Chiraito till the date. The pro-poor household have also started cultivation of Chiraito on their limited and underutilized lands having seen the benefit from others. The cultivation of Chiraito in CFUG land (land allocation for pro- poor as in case of *Amriso*/ broom grass, Bamboo etc.) by pro-poor have also been identified in Sankhuwasabha and Bhojpur districts but too limited. Pro-poor household cultivation of Chiraito in lease hold forest has been carried out in Tehrathum and other districts of Nepal.

Technical Expertise for Cultivation and Demand for Seedlings: The cultivators of Eastern Nepal including Sankhuwasabha and Bhojpur districts are in high demand from different parts of Nepal. The major constraints in commercialization of Chiraito cultivation in other parts of Nepal are also due to the lack of technical expertise and quality seedlings. It is of utmost time to develop roster of qualified cultivators in Sankhuwasabha and Bhojpur districts and promote them in the network of Jadibuti Association of Nepal (JABAN), Nepal Herbs and Herbal Association Nepal (NEHHPA) and Agro Enterprise Centre (AEC) for market linkages for quality seedlings and training delivery.

1. Firm level upgrading strategy:

a) Product upgrading: The product upgrading is the most important part of a successful business and enterprise promotion. Regarding Chiraito cultivation and export, following two are identified as most essential strategies for product upgrading.

I. Quality Chiraito production/cultivation and marketing;

II. Compressing of Chiraito to reduce the production cost;

b) Process upgrading: Regarding the process upgrading of Chiraito cultivation and export, this study has identified following strategies as process upgrading.

I. Adopting scientific cultivation practices (taking the service of expert farmer who can provide round the clock service during nursery raising, plantation in field, weeding, watering and harvesting);

II. Promoting organic cultivation;

III. Usage of compression machine to compress Chiraito;

c) Functional upgrading: Based on this study following strategies have been identified as essential point of interventions as functional upgrading at each level of Chiraito value chain.

Table 4.8: Functional Upgrading of Chiraito

Actors	Present Function	Upgraded Function
Herders, Collectors, DAGs	Collection of Chiraito	• Cultivation of Chiraito in private lands and CFs;
Farmers and young entrepreneurs	Collection and cultivation of Chiraito	• Cultivation of Chiraito in private lands and abandoned farmlands; • Training of Trainers to other parts of Nepal; • Seedlings sale to farmers in other region of Nepal;
Traders	Trade of Chiraito to Birtamod and Tibet border	• Involved in Chiraito Network (Interfirm upgrading); • Support cultivators for linking for training; and • Seedlings supply to farmers in other region of Nepal;
CFs	Conservation of NTFPs	• CF should allocate lands for herders; • DAGs to cultivate Chiraito;
Cooperatives	Most of the cooperatives are engaged in savings and credit	• Invest in the Chiraito value chain by providing loan by keeping Chiraito as collateral so that cultivators can stock Chiraito and sell it at right time

Source: Field Consultation, 2013/2014

d) Channel upgrading: The collected Chiraito in Eastern part of Nepal was traded mostly in Birtamod market in the previous years. But recently, transportation by helicopter charter has been adopted as easier and comfortable means in Sankhuwasabha and Bhojpur districts. The helicopter charter is used for exporting the collected Chiraito to Tibet and China through Kimathangka border. The market price in Tibet has increased in this year, thus, traders are focusing on the export of the collected products towards this market. The present trade routes of Sankhuwasabha and Bhojpur districts are:

I. Collectors in the villages - Sankhuwasabha/Khadbari – Kimathangka – Tibet;

II. Collectors in the villages - Sankhuwasabha/Khadbari – Birtamod – India;

The study recommends working on product and processing upgrading and following the existing channel. The study suggests that market price is fluctuating and for Nepalese value chain actors it is always best to sell the product in the channel which is providing higher prices.

e) Intersectoral upgrading: The field observation, interaction with farmers, cultivators, traders, and other actors suggest that the engagement of Chiraito related actors in other products is one of the most possible strategies for intersectoral upgrading. For example, the actors involved in Chiraito value chain can also work in *Allo*/ Himalayan Nettle, *Timur*/ Prickly Ash and other NTFPs value chain to cater the demand of the market and also to improve their personal income.

2. Inter-firm upgrading strategy:

The growing commercial cultivation of Chiraito in Eastern Nepal has resulted to the involvement of many people in collection, cultivation and trade of Chiraito. Now, it is important to develop a network of these value chain actors so that this network functions as common institution for knowledge sharing along with backward and forward linkages.

3. Business Development Services and Financial Services upgrading strategy:

Most of the documents on value chain analysis are based on identifying only pertinent Business Development Services (BDS) and Financial Services (FS). The assessment of BDS and FS in this study has considered following things as its basis.

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 4.9: Analyzing demand and supply side of BDS

SUPPLY SIDE	Very strong			*Input Supply*	
	Strong			*Technical training on cultivation*	
	Weak			*Market information; Access to finance*	*Legal process for private cultivation*
	Very weak			*Technology transfer*	*Allocation of CFUG land for DAGs*
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries in categorization (Very strong, strong and weak) and supply side of service providers (Very weak, weak and strong) are selected to develop commercial viable option for these business services. Based on the analysis of demand and supply side of BDS, some strategies are most essential to cater commercially viable business services.

Table 4.10: Listing out commercially viable business options for Chiraito

Services	Strategies
Market Information	• Provision of Market Information System (MIS) in collaboration with DCCI, JABAN, NEHHPA and ANSAB (via website); • Coordination and linkage between village, district and regional level traders; • Enhanced use of Chiraito network (Interfirm upgrading) to maintain the price list;
Technology and Product Development	• Technology transfer through NEHHPA for Chiraito compressing;
Access to finance	• Chiraito based loan provision from cooperative (for example, Cardamom based loan from cooperative in existence in Taplejung district);
Legal process for trade	• Formation of Chiraito network (Interfirm upgrading) and orientation to relevant stakeholders on legal process;
Excellent knowledge on Chiraito Cultivation	• Develop roster of Chiraito cultivator and share with wider audience (there is national demand for technical person on Chiraito cultivation from other parts of Nepal);
Quality seedlings available	• Linkage of cultivators, traders to NEHHPA and JABAN for trade of quality seedlings of Chiraito all over Nepal;

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

It has already been discussed that Chiraito cultivation and trade have become one of the parts of economy in mountain and some hilly areas of Nepal, especially in the Eastern Nepal. For example, people in Mountain and Hillly area of Sankhuwasabha and Bhojpur districts have been commercially cultivating Chiraito from the last decade. It is also noteworthy to mention that most of value chain actors are knowledgeable about the regulatory process for cultivation and trade of Chiraito. In recent time, more farmers are carrying out Chiraito cultivation and it is important to educate them regarding the regulatory process for cultivation of Chiraito in private land. Similarly, it is important for farmers, cultivators, CFUGs and collectors to know about various regulatory processes for collection and trade of Chiraito from National Forest and Community Forest along with the private lands. Further, it is important to formulate policy at CFUG level for enabling Disadvantaged Group (DAG) and socially marginalized communities for cultivation of Chiraito in CFUG land and linking them with necessary business service providers and actors in different aspects such as cultivation training, access to finance, legal processes, and marketing.

5. Sustainability Strategy:

The most important sustainability strategy for Chiraito is to create a brand image of Chiraito production from Nepal and in particular places such as Sankhuwasabha or Bhojpur or any other parts of the country. This can be done through upgrading at all level of value chain mentioned in above sections in different headings such as strong presence of proposed Chiraito Network (Interfirm Upgrading) for determining the quality Chiraito production and marketing. Cultivation of Chiraito in private land has gradually become a common strategy for people in the study areas (Sankhuwasabha and Bhojpur) which could be expanded in the underutilized lands.

Summary of Chiraito Value Chain Upgrading Strategy

Since last decade, the Chiraito cultivation and trade have become a part of local and national economy and large section of people have been adopting it as a part of their livelihoods and income in Nepal. However, value chain actors are yet to rely in the market demands in China and India which has great risk of larger investment in the cultivation for mass production. For example, some of the respondents consulted in Sankhuwasabha and Bhojpur showed their fear on the decline of its price as large number of farmers have already cultivated Chiraito in most of their agriculture lands and many of them are planning to cultivate Chiraito in their farmlands. It demands some policy initiatives for the sustainable marketing of Chiraito including pharmaceutical innovation of Chiraito for the industrial use and production in Nepal itself.

The value chain analysis is summarized and presented in six upgrading strategies. The upgrading strategies have focused on six important strategies: (a) End market strategy; (b) Firm level upgrading strategy; (c) Inter firm level upgrading strategy; (d) Business development services and financial services strengthening strategy; (e) Business enabling environment strategy; and (f) Sustainability strategy. The recommendations on each of these strategies are summarized below in the table 11.

Table 4:11: Specific recommendations on different upgrading strategy

Upgrading Strategy	Recommendation
Product Upgrading	• Quality Chiraito cultivation, collection and marketing;
Process Upgrading	• Scientific collection practices, Organic cultivation, Use of compressing machine;
Function Upgrading	• Cultivation of Chiraito by DAGs in CF land, cultivators as national level TOT trainers in Chiraito cultivation and selling of seedlings;
Channel Upgrading	• Best price: India or Tibet (depending on demand and supply);
Intersectoral Upgrading	• Additional income from *Allo*/ Himalayan Nettle, *Timur*/ Prickly Ash and other NTFPs;
Interfirm Upgrading	• Facilitate in the formation of Chiraito based network (including collector, cultivators, traders and supporting organizations);
BDS+ FS Strengthening	• Market information, Technology transfer, Access to finance, Legal process for trade, TOT trainer development, Seedlings supply;
Business Enabling Environment Strengthening	• Orientation and education on process of legal trade of Chiraito from private land, CF land and national forest;
Sustainability Strategy	• Strengthening of Chiraito network for backward and forward linkages ;

Source: Field Consultation, 2013/2014

Annexes

Annex 1: Domestication and Cultivation of Chiraito

Agricultural Research Station (ARS) Pakhribas in Dhankuta district has initiated Chiraito activities since 1993 and initiated propagation, cultivation and management techniques in eastern region. ARS has also published a cultivation manual for Chiratio. Department of Plant Resources (DPR) is involved in policy development and advocacy for Chiraito. Dabur Nepal, a multinational company, has started to produce and sell Chiraito seedlings in mass scale. The studies show that seeds are the effective and efficient means of propagation for commercial cultivation of Chiraito. Propagation can be done by leaf, stem or roots but are not as effective as that of the propagation by seeds. The propagation by seeds is discussed below.

Collection of Seeds: Seeds are collected from mature plants at the end of growing season i.e. during November (*Kartik-Mangsir*). Germination rate was found very low for seeds collected before September. Seeds are removed from attached particles (which are often parts of plant or dust) and after few days of air/sun drying, it is kept in cotton sack and stored in cool dry place. Seed remains viable for less than a year therefore seeds collected in previous year are sown next year. The viability of seed varies with the maturity stage of the plant and reported to be high (up to 90% germination) in seeds collected during November (Bhattarai and Basnet 2000).

Pre-treatment: Prior to sowing, seeds are pre-treated with water for 24 to 48 hours to increase the germination percentage (Barakoti, 2000). Seeds pre-treated with 50-100 parts per million (PPM.) Gibberellic acid show 72-90% germination, compared to 12-40% of germination on treatment with water (Prasad, 1999). Similarly, seeds pre-treated with cold water (3^{o}C) for 15 days show good germination rate of 91% (Raina *et al*. 1994).

Seed Sowing: The suitable soil for Nursery is 1/3 sand mixed with 1/3 forest soil and 1/3 compost mixed thoroughly and covered in nursery bed (about 8 cm thick layer). Pre-treated seeds are sown in the prepared nursery beds during April-May (*Baisakh*) or June-July (*Ashadh*) but April-May is best for germination (Barakoti 2000). Chiraito seeds are very small therefore one gram seed is mixed with a handful of sand or nursery soil and sown in the beds. Nursery beds are covered with mulch (straw or hay) to retain moisture and to protect seeds from birds and intense sunlight. Nursery beds are regularly watered. Seeds start germinating within 2 to 6 weeks of sowing. After germination, the mulch is removed and beds are covered with roofing, above 1.5-2 feet from the bed. The roofing is often made by interwoven mat of *Drepanostachyum falcatum* (Nigalo) or with modern mats like plastics and other materials. Seedlings are transferred to plastic polybags after two months (4-6 leaf stage) of germination, or transplanted directly to field after 3 months (6-8 leaf stage) of germination.

Transplantation: It is suggested to transplant the plants in the field only on the spring season of the following year. A distance of 25-45cm between two plants and 30-60cm between two rows is maintained during the transplantation. The plant thrives in fertile sandy-loam soils of acidic nature with temperate climate on North, North-East, and South-East facing slopes (Bhatt *et al*. 2006).

Alternatively, most of the farmers directly sow seeds in the field without any kind of pre-treatment. However, an innovative and simple yet efficient and economic technique was developed for sowing Chiraito seeds in the recent years. Seeds are mixed with a mixture of cow dung and water and sprayed directly to the cultivation site using a homemade sprayer. Cow dung helps the seeds to stick in slopes and also provide the nutrition.

Farmers in Eastern Nepal believe that Chiraito grows well in recently burnt forest area. Therefore, slash and burn practices are common in the eastern hills, but scientific verification for such practice is lacking and further the practice provides little benefit to the farmers and more harm to the environment. Intervention from local and government level is very essential to control slash and burn practices.

Annex 2: Sustainable Management of Chiraito

The bulk of the demand is still supplied from the Chiraito of wild origin. Cultivation of Chiraito is still confined to eastern Nepal and shares negligible percentage of total trade. Negligible efforts have been made for the development of proper agro-techniques, which hinders the success of cultivation and development of Chiraito (Barakoti 2004). Thus, there is still great concern on the sustainability of wild harvesting. The long term availability of its natural population in the wild is greatly challenged by over and premature harvesting, habitat destruction and slash and burn practices. As whole plant is in trade, individuals are uprooted indiscriminately resulting with the low plant density in many natural populations (Ghimire *et al*. 2008). Unsustainable harvesting of the entire plant has reduced the possibility of seed development for future generation and reduced the overall genetic diversity (Pant 2004). Today, natural distribution of Chiraito has been much localized in the Himalaya, limiting the occurrence of its natural populations in specific habitats. Management of Chiraito should emphasize protection and encouragement of larger growth of the existing populations and maintaining them as a gene bank and pollen source (Ghimire *et al*. 2008).

Collection Time: Chiraito should be harvested after the maturation stage (flowering/fruiting) of plant. Ideally, only mature plants should be selectively harvested by uprooting the whole plants from October to November (*Kartik-Mangsir*). Harvesting of Chiraito after maturity will ensure the seed dispersal and maintain the population in the wild. The plant shows maximum growth at flowering and senescence stage, indicating that these two stages are optimal for harvest. But for the long term survival of populations, it has been recommended that plants must be harvested in the senescence stage when most of the reproductive stages are over (Ghimire *et al*. 2008).

***Harvest Technique*:** Harvesting of Chiraito generally involves collection of whole plant by digging the soil. Uprooting practices might have negative impact on other associated species, sensitive taxa and other components of biodiversity. Appropriate trainings on harvesting technique will be effective to minimize the negative impacts. The collected plants should be thoroughly shaken to allow seed dispersal. Harvesting should be selective and only be permitted from populations: (i) with a high population density, (ii) that are evenly distributed in space, and (iii) for which the reproductive potential will not be affected by plant removal.

In some places, harvesting is done by cutting the above ground parts, leaving behind the roots. In this method, curved axe or *Aansi* (*Hansiya*)/sickle is used to cut the plant just above ground, leaving root in the field to promote vegetative propagation. This method is generally applied for cultivated ones. This method is useful for those places where early snowfall occurs. Early snowfall compels collectors to collect the plant early, before seed dispersal. However, this type of product is least preferred by traders (Pyakurel 2008).

Harvest Quantity: Resource inventory in collection area enables resource managers (generally CFUG executive committee members when collected from community managed forests) to allocate the maximum harvest limit. Rotational harvest system should be applied for the wild harvest. The forest or resource available area should be divided into at least four blocks and harvest from one block in a year will ensure the optimum productivity for years. 70% harvest of mature plants from each block is considered sustainable for Chiraito.

Annex 3: Cultivation cost of Chiraito

Table 4:12: Cost per hectare for Chiraito Cultivation in the First Year

SN	Particulars	Quantity	Rate	Total
1.	Nursery preparation (man days)	10	400	4000
2.	Pipe & other items purchase (set)	1		20000
3.	Land preparation	40	400	16000
4.	Seed (in kg)	0.2	10000	2000
5.	Compost fertilizer (in tons)	10	700	7000
6.	Plantation in the field (man-days)	40	400	16000
7.	Weeding and composting (man-days)	30	400	12000
8.	Regular watering (man-days)	30	400	12000
Subtotal for first year				**89000**

Source: Field Consultation, 2013/2013

Table 4:13: Cost per hectare for Chiraito Cultivation in the Second Year

SN	Particulars	Quantity	Rate	Total
1.	Compost fertilizer (in tons)	10	700	7000
2.	Weeding and composting (man-days)	30	400	12000
3.	Regular watering (man-days)	30	400	12000
Subtotal for second year				***31000***

Source: Field Consultation, 2013/2013

Table 4:14: Cost per hectare for Chiraito Cultivation in the third Year

SN	Particulars	Quantity	Rate	Total
1.	Compost fertilizer (in tons)	10	700	7000
2.	Weeding and composting (man-days)	30	400	12000
3.	Regular watering (man-days)	30	400	12000
4.	Harvesting (man-days)	40	400	16000
5.	Drying and storage (man-days)	30	400	12000
Subtotal for third year				***59000***

Source: Field Consultation, 2013/2013

Table 4:15: Total cost, productivity and profit from Chiraito cultivation in per hectare

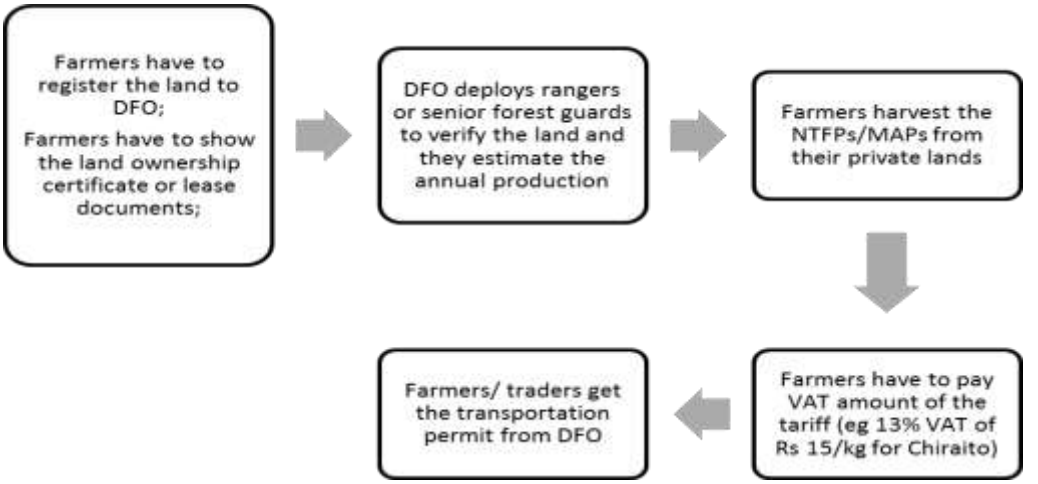
SN	Particulars	Quantity	Rate	Total
1.	Cultivation cost for first three years			179000
2.	Expert cost (borne collectively)			30000
3.	Total cost			209000
4.	Chiraito production (in kg)	850	600	510000
5.	Total profit			301000
6.	Profit per year per hectare			**100300**

Source: Field Consultation, 2013/2013

Annex 4: Legal process map for the trade of Chiraito produced in private land

Chiraito from private land can be traded by following all the legal process and paying NRs 15 as duty or tariff (In an ideal situation, if a farmer demonstrates all the documents to DFO, then they can pay only 13% of NRs 15 as VAT, otherwise they have to pay NRs 15 per kg). The process of trading NTFPs/ MAPs from private land is depicted in the figure 11.

Figure 4:4: A legal process map for commercial trade of Chiraito from private land

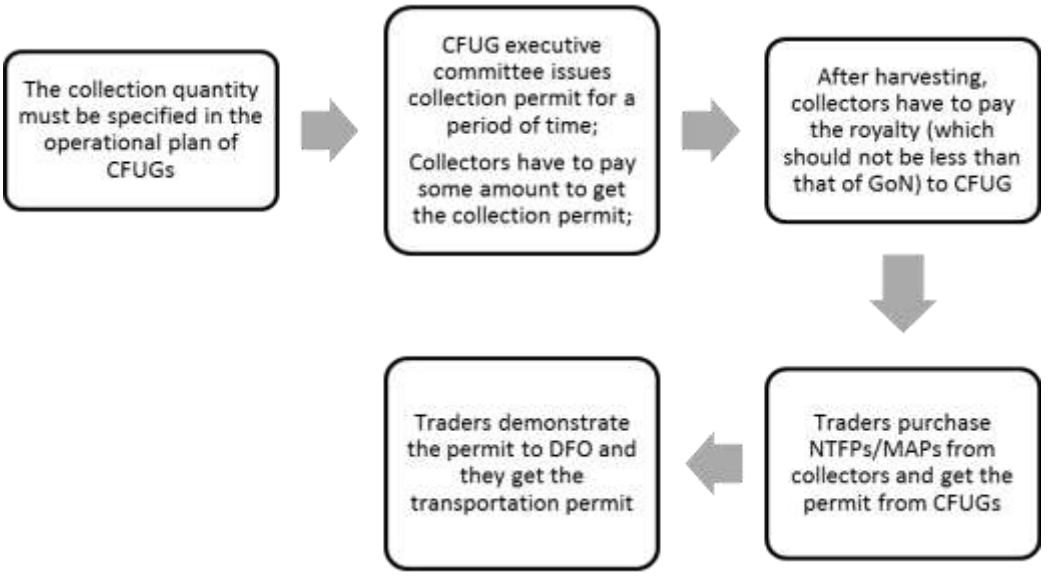


There are no specific rules for the Chiraito collected from non-registered as a private forest or land. In such cases, it is in the practice that the collected Chiraito is treated as a National Forest Product rules.

Annex 5: Legal process map for the trade of Chiraito produced in Community Forest (CF)

The trade and export of Chiraito produced in the community forest is a bit complex in terms of legal processes. Despite the potentiality, such complex legal processes sometime discourage the users to cultivate Chiraito in the community forest area. The summary of the legal processes of exporting Chiraito cultivated in the CF are showed in the figure 12.

Figure 4:5: A legal process map for commercial trade of Chiraito from CF land

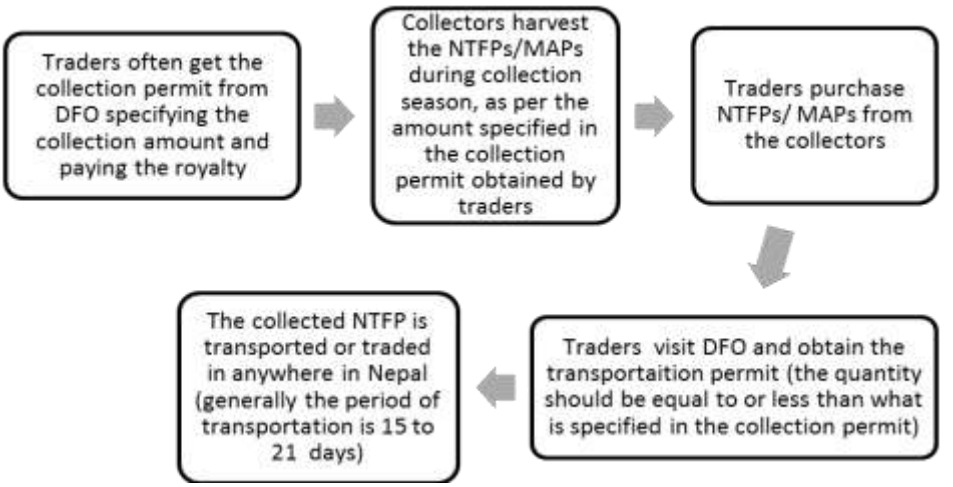


Regarding payment, it is not needed to pay again but somewhere DDC charges some amount to the collectors or traders while the products are exported out of the particular districts. In practice, DFO issues authentic recommendation for transit permit of the products to CFs and while CFs also issues final letter of transportation permit.

Annex 6: Trade procedures of Chiraito produced in National Forest (NF)

The Chiraito produced in the national forest has different procedures of trade. The DFO seems most powerful actor in taking decision on whether to allow collection; collection quantity and transportation permit of collected Chiraito. The legal procedure for the trade of Chiraito is shown in the figure 13.

Figure 4:6: A legal process map for commercial trade of Chiraito from National Forest



The collected and permissible Chiraito could be exported to the other country too. For this, DFO should give trade permit to outside country but the traded species should not be of banned species. Regarding banned species (such as CITES listed species like *Jatamasi*/ Spikenard, Kutki/ Hellebore, Orchids, *Suganghakokila*/ Cinnamon berry etc), the traders should take export permit from the Department of Forests (DoF) and in such cases the DoF issues CITES certificate to the applicant or traders. For the trade or export permit of such banned species, the exporter's trade permit certificate should compulsorily state the origin of the traded species.

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Chapter 5[25]

Rudraksha (*Elaeocarpus sphaericus*): A Plant with High Economic Potential Associated with Precious and Mystical Values[26]

Introduction

Rudraksha has been one of the most valuable NTFPs in Nepal. It is known and has been in use since time immemorial. Its origins are traced to Lord Shiva, one of the Trinities of the Hindu religion. In this religion, the Lord Shiva's images and idols are always shown wearing these Rudraksha beads. There are mystical beliefs about Rudraksha. It is believed that Rudraksha has mystical properties of self-empowerment and power to bring about positive changes from within. Therefore, its production and trade have fascinated people across the world. It is mostly used by the Hindu religious saints. Apart from this, recently its users and worshippers vary from artisans, housewives, academicians to businessmen. Its trade has been gradually increasing in Chinese markets.

- **Common Name**: *Rudraksha; rudraki;*
- **English:** *Woodenbegar;Ultrasum-bead tree;*
- **Botanical Name:** Elaeocarpus Sphaericus;
- **Genus:** *Elaeocarpus;*
- **Species:** *E. ganitrus;*
- **Family:** *Eleocarpaceae;*

Rudraksha is a large evergreen broad-leaved tree whose seed is traditionally used for prayer beads in Hinduism. The seed is borne by several species of *Elaeocarpus*, with *Elaeocarpus ganitrus*. This is principally used in the making of a bead chain or *mala*. Rudraksha is a Sanskrit compound "rudrāka" consisting of the name Rudra ("Shiva") and akha ("eyes"). Therefore, its meaning becomes "Rudra's eyes". The specific epithet *ganitrus* is possibly taken from ganitri, the name for this species in *Sundanese* and *Malay*. According to the old mythological epic "Shiva Purana", Rudraksha was the favourite tree of Lord Shiva and it grew in Gauda land (present day Gangetic plains to foothills of Himalayas).

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Recently, its cultivation, production, collection and trading have been gradually taking attentions of all development practitioners and academics in Nepal. For example, in the recent past the higher income from Rudraksha production and selling in Dingla village of Bhojpur district has become one of the means of migration to city areas like Kathamndu and Dharan. Therefore, the main objective of the Value Chain Analysis (VCA) of Rudraksha is to provide comprehensive information for market and social benefits of this product. The study also expects to understand present status and determine various constraints in its cultivation, market access, and potential expansion opportunities within the value chain. The VCA of Rudraksha is based on the field visit and observation of Rudraksha cultivation, collection, processing and trading from Dingla village of Bhojpur district. Further, the analysis is supplemented by the information collected from the interaction and consultation with different actors such as producers, traders, businessmen, policy makers, and government authorities. Similarly, the data and information available in the reports (published and unpublished) and literatures have also been used to generate knowledge synergies.

Habit (Characteristics), Habitat and Distribution of Rudraksha

Rudraksha is a large, evergreen broad-leaved tree found in tropical and sub-tropical areas at the altitudes ranging from sea coast to 2,000 m. above the sea level. The tree is a perennial that grows throughout the year. The main trunk of the Rudraksha tree is cylindrical with a greyish white and rough textured bark. In nature, leafy crown of a Rudraksha tree takes a pyramidal shape. The leaves of Rudraksha tree are shinning green on the upper side with a dull leathery dorsal side. Rudraksha flowers are white with fringed petals and they appear in April-May. Rudraksha fruits appear in June and ripen by August-October. They are globular in shape with a fleshy exterior. The bead present inside is hard and tubercle. The Rudraksha fruit is blue in colour but turns black when dried. The central hard Rudraksha uni-seed may have 1 to 21 faces.

Rudraksha seeds are covered by an outer shell of blue colour when fully ripe, and for this reason they are also known as blueberry beads. The blue colour is derived not from pigment but is structural. It is an evergreen tree that grows quickly. Rudraksha tree starts bearing fruit in three to four years. As the tree matures, the roots buttress rises up narrowly near the trunk and radiating out along the surface of the ground.

Rudraksha plant is mostly found in South Eastern Asian Islands of Java, Sumatra, Bali, Iran, Java, Timor and parts of South Asia. So, this plant mainly grows in the area from the Gangetic plain in the foothills of the Himalayas to South-East Asia such as Nepal, Indonesia, New Guinea to Australia, Guam, and Hawaii. Around 70% of the Rudraksha trees are found in Indonesia, 25% in Nepal and 5% in India.

Uses, Cultivation, and Product Flow of Rudraksha Tree

Rudraksha beads are the material from which *malas* (108 beads in number) are made. The term is used both for the berries themselves and as a term for the type of mala made from them. In this sense, a Rudraksha is a rosary, used for repetitive prayer (japa), a common aid to worship in Hinduism (Lee, 1998). Rudraksha is also used for the treatment of various diseases in traditional Indian medicine. The seeds show variation in the number of grooves on their surface, and are classified on the basis of the number of divisions they have. Different qualities are attributed to the Rudraksha based on the number of grooves, or 'faces' that it has. A common type has five divisions, and these are considered to be symbolic of the five faces of Shiva. It can only be worn with a red string or a gold chain.

Rudraksha malas have been used by Hindus (as well as Sikhs and Buddhists) as rosaries at least from the 10th century for meditation purposes and to sanctify the mind, body and soul. The word Rudraksha is derived from Rudra (Shiva—the Hindu god of all living creatures) and aksha (eyes). One Hindu legend says that once Lord Shiva opened His eyes after a long period yogic meditation and because of extreme fulfillment he shed a drop of tear. This drop of tear from Shiva's eye grew into the Rudraksha tree.

The wood of Rudraksh tree is light coloured almost whitish in appearance. It has a unique strength-to-weight ratio, making it valued for its timber. The wood of Rudraksha tree was used to make aeroplane propellers during World War I. Rudraksha has been traditionally used for meditation purpose by using beads. It has been used amongst people following Hindu religions. Rudraksha has been recommended by Saints and religious leaders for their disciple for path of spiritualism (Tewari et al., 2013).

According to the Ayurveda's medical system, wearing Rudraksha can have a positive effect on the heart and nerves, and it relieves you from stress, anxiety, depression, palpitations and lack of concentration. It is also known for its anti-ageing effect, and electromagnetic and inductive properties. People with high blood pressure have been found benefited from the use of Rudraksha seeds. It is also believed that the depression, stress, diabetes, cancer, heart diseases, blood related diseases could be cured by the use of Rudraksha mala. According to Ayurveda, Rudraksha Bead relieves headache; appetizing and beneficial in mental diseases (Kedia et al., 2014).

The fruits of Rudraksha are sour, thermogenic, appetizer, which are used for relieving cough, bronchitis, neuralgia, cephalgia, anorexia, epileptic fits, manic conditions, brain disorders. Rudraksha is also used for the treatment of headache and epileptic fits.

Rudraksha farming is a difficult process due to the slow sprouting from the beads. Depending on the humidity of the soil, it usually takes 1-2 years for a tree to sprout. Rudraksha is grown in subtropical climatic regions with temperature ranges of 25-30 degree centigrade. The tree starts giving fruit after 4-5 years. A single Rudraksha tree bears beads in all different faces or *Mukhi*s at the same time. The higher *Mukhi*s or faces are very rare. Most common Rudraksha bead is the five faceted or *panchmukhi*. The environment and location of Rudraksha trees play a major role in the bead formation and the type of bead formed. For example, the Himalayan beads seem larger, heavier and more powerful due to the environment they grow in.

One of the clusters of villages in Bhojpur (the hilly district situated at the Koshi zone of eastern development region) is famous for Rudraksha cultivation and production in Nepal. Bhojpur district is rich in biodiversity comprising sub-tropical and lower temperate forest as the main forest. This district is also rich in NTFPs though there is no any research carried out

about types and extent of NTFPs available at the district. However, the district supplied significant amount of NTFPs last year through both private and community forest. The main NTFPs of the district include Rudraksha, Alainchi, Loath salla, Chiraito and Timur.

Among the main NTFPs of the district, Rudraksha is the prominent NTFPs that are traded excessively from the district. Mainly, the two VDCs of the district; Mulpani and Keurenipani, are the VDCs where the Rudraksha are planted and traded at local to international level. Rudraksha has been a medium of development for the people of these VDCs. Most of the people in these VDCs have become financially well off by the cultivation and trade of Rudraksha. Nowadays, the trade has reached to the peak, as people have started contracting the Rudraksha fields to the traders for less than 5 years. The contract amount ranges from NRs 200 to NRs 4,00,000. Further, traders have also started contracting Rudraksha trees during flowering and fruiting time.

In context of these VDCs, the lowlands (Besi) are supposed to produce large and valuable beads in respect to highlands. People of these VDCs understand it as an impact of Climatic and edaphic factors. Trees grown at lowlands produce earlier than the tree at highlands of the same VDCs.

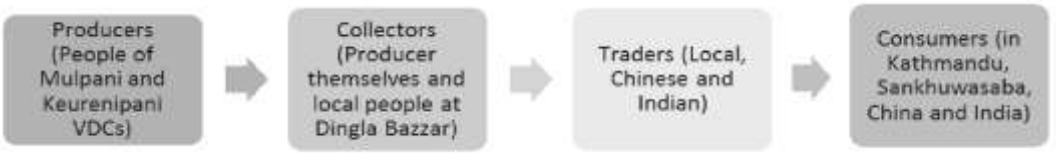
Rudraksha beads normally possess 21 faces starting from 2 faces; 1 face beads are not seen till now. However, some people said that they have seen up to 29 faces. They believe it as a rare and highly exceptional one. The extraction practice prevalent in these VDCs is Hand Picking by climbing up the tree. People mostly climb themselves to the tree and pick the beads from the branch. But some people give wages to other people to pick the beads as it is too much difficult to climb and pick the beads from the branches of the tree.

Rudraksha seedlings are available easily throughout the VDCs. Local people get the seedling free of cost but the outsiders have to pay for the same. The price differs as per the seller. The seedling grows to tree within 4-5 years of plantation and starts giving fruits i.e. Rudraksha beads.

With the advent of communication and technology reaching the whole world, the market for Rudraksha has been increasing and it has become one of precious products to wear as garland and pendant. Recently, use of Rudraksha (5 and 6 faced) in TAR in Chinese medicine has increased the prices of Rudraksha. There is lucrative price of rare type of Rudraksha (like 21 faced) and the price of one piece can sometime exceed NRs 5 million. Based on the discussions with producers and traders, about 5/6 to twenty one faced Rudraksha are grown annually in these VDCs of Bhojpur district. At present, farmers primarily the youths are using Facebook social network for selling Rudraksha. Traders in India correspond through email and Facebook and visit themselves Dingla to buy those scarce and precious Rudraksha. Indian traders and Indian pilgrimage coming to Kathmandu are the biggest buyers of precious Rudraksha.

The 5-6 faced Rudraksha is traded through road transport to Kathmandu where as precious ones are traded through individual negotiation by individual pieces. Farmers at present have necessary information about price (up to level of Indian traders) and negotiate between different village traders and district traders while selling Rudraksha. A recent report (Pyakurel and Oli, 2013) shows that 3004000 kg Rudraksha has been traded to India and 50000 kg of Rudraksha to TAR of China (this excludes trade volume of precious Rudraksha).

Figure 5:1: Product flow of Rudraksha in Bhojpur district

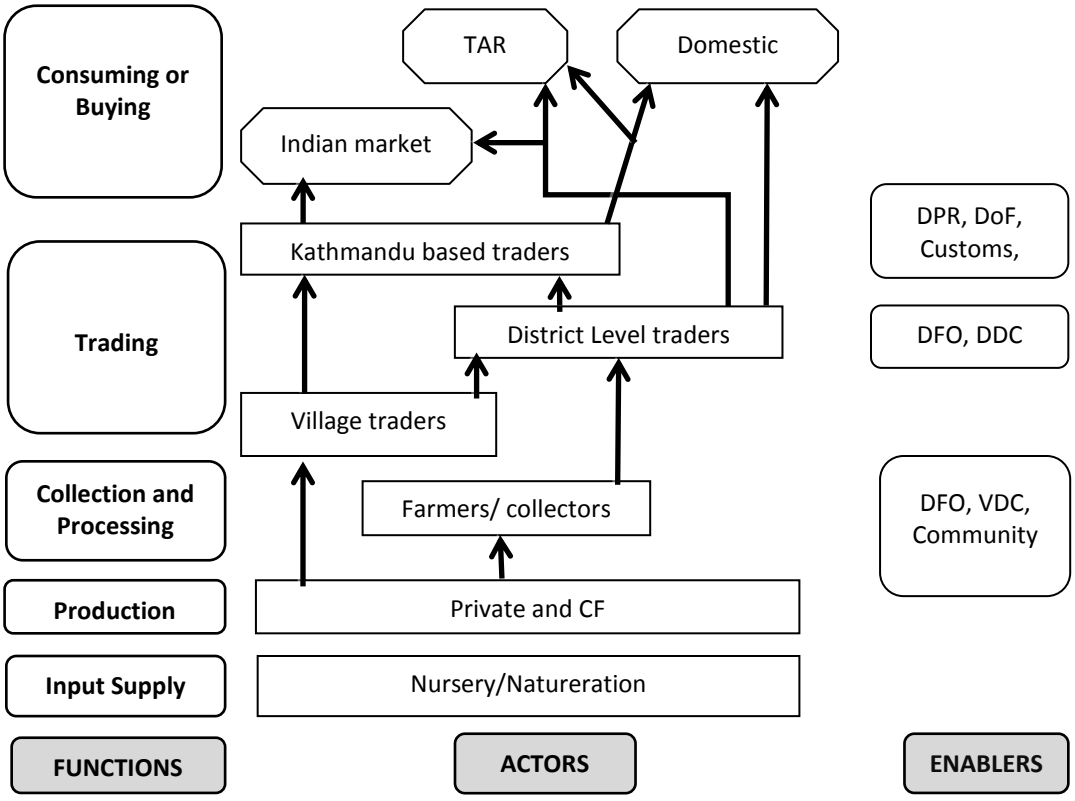


Source: Field Consultation, 2013/2014

Functions of Rudraksha Value Chain Actors

This is found that numerous actors, with specific roles and functions, are involved in the on-going Rudraksha business value chain in Nepal. This study tried to identify the roles and function of value chain actors and enablers and their relationship which has been presented in a simple diagram below (Figure 2). The function of actors is given in the left corner and the area of intervention for enablers is given in the right corner.

Figure 5:2: Value chain map of Rudraksha



Source: Field Consultation, 2013/2014

Market is one of the most important components of a value chain analysis. The market functions, generally, includes four different components viz. Production, Collection, Trade and Consumption. Talking about the production of Rudraksha, the farmers or cultivators grow Rudraksha in their private land or CF lands at varied scale and finally harvest out to

collector. Then, the producers sell the harvested Rudraksha to the village level collectors. In general, the collection is done by the producer themselves and in some cases they lease to the contractors. The collected Rudraksha is then traded to the different layers of traders (local, district, national). The traders then either sell out the products to the national retailers or export to the international traders/markets (India and China). The major national level consumption of Rudraksha is in Kathmandu while India and China are the international consumers.

Producers: Generally, the producers are the people of Mulpani and Keurenipani VDCs of Bhojpur District. Among the 63 VDCs these two are the known VDCs of Bhojpur for Rudraksha cultivation. Rudraksha grown on these VDCs are regarded better than those grown outside these VDCs and other adjacent district such as Sankhuwasabha. According to the producers, a single Rudraksha tree can produce more than five hundred beads. It is learned that the producers produce Rudraksha beads worth of Nepalese rupees half million to six million from a single Rudraksha tree; which is well grown with enormous and good quality beads. But the scenario might be different if the tree in some cases produce abnormally less amount of beads or might be no beads at all. The producer's production quantity is not fixed or recorded systematically. The quantity estimation is shadowed by the money worth of the beads as single bead values millions of rupees. Therefore, in most of the cases, the producers convert their production in terms of money rather than in quantity units.

Collectors: The collector collects the beads from the producers at different prices and creates the market at Dingla bazar. More than 300 individuals in this bazar are involved as Rudraksha beads collectors. In some cases, the producers themselves also act as collector. The collector collects those beads which are excellent to trade or which are highly demanded for sale. The collector has designated the following criteria for a good Rudraksha beads.

- Shape:– Perfect circular, Marble like shape;
- Size:– Big; more than 21/22 mm diameter;
- Weight:– weighty;
- Face:– more face more valuable;
- Clean:– non decayed & hard beads;

Traders: These are specifically middlemen, who operate as significant actor in the Rudraksha trade and have dominant role in value addition process of the Rudraksha beads. The same particular bead is traded many times among the collectors, traders and between collectors and traders. The history of the trade of Rudraksha beads shows the influence of Chinese and Tibetan traders. In ancient time, people didn't give any attention to the Rudraksha beads, they neglect it as a waste; they tried it to burn down and buried it to decay and regarded it as a "Gravel" from the tree. As the time elapsed the Chinese and Tibetan traders started trade in Rudraksha beads and thus spark the market of Rudraksha beads in the Dingla area of the Bhojpur district.

Traders trade the beads in local, national and international level. The trade extends from open to close type. The open trade means beads are bought and sold openly in the market. Whereas the close one means secrete, inside the home or hotel where people didn't get any information about trade. As the single beads (e.g. 21 faces sole Rudraksha beads) can be worth of million rupees so people trade them secretly to the consumer or the next trader. That's the reason, the exact worth trade of Rudraksha beads in a year is difficult to determine and document.

Consumers: A lot of Rudraksha beads are traded or consumed in Kathmandu, especially around Pasupatinath temple area. Traders are supposed to sell at different parts of the capital city. For example, some of the collectors and traders in Dingla bazar export collected Rudraksha to the traders (mostly their relatives or kin groups working in Rudraksha business in Kathmandu) in Kathmandu bazar. Chinese and Indian traders who are engaged directly in the trade i.e. Dingla Bazzar, supply the Rudraksha beads to their respective country, China and India. This supply relates the fact that a lot of Rudraksha beads are consumed in these neighboring countries.

Enablers: Enablers of "Rudraksha value chain" in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. At present there is lack of Government involvement in Rudraksha value chain. DDC has started levying 2% tax on the Rudraksha trade. DFO is promoting plantation of Rudraksha in community forest. Rudraksha in CFUG is annually contracted to one of the CF members by taking enough marginal royalty. Importantly community itself has strong regulation regarding collection and trade of Rudraksha. The theft of Rudraksha from other farmers (even looking at trees during flowering and bead formation time) is considered a serious crime.

Market Trend and Competitive Analysis of Rudraksha Beads

Market of the Rudraksha beads is unchecked, flourishing and excessively getting larger. Demand is too high but the supply is not as per the demand. Traders from China and India directly link to the local market i.e. Dingla Bazar. Kathmandu is the most Rudraksha beads traded part of the country from where large quantity of Rudraksha beads are traded and supplied to different parts of the country and abroad too. Similarly, being neighboring district, lots of beads are also traded to Sankhuwasabha district and from there the collected Rudraksha beads are exported to too many places of the country and abroad through different value chain actors.

Further, Chinese and Indian traders travel to the Dingla Bazar and trade at different hotel of the bazar. Due to high price of the single beads, the trade is unsafe and very complex. Trade is carried out by direct cash or cheque whereas some trader contracts the beads at certain price which is kept as confidential. Overall, the market is getting larger and busy year by year. The market has the involvement of all types of traders i.e. from local to international. The market is less informative, neither the price of the beads nor the quantitative production of the

Rudraksha beads is fixed. The trade may start between anybody and repeat at one location or place for many times. Moreover, it's not fixed who will be engaged in the trade.

Price of the Rudraksha beads is another complex aspect of value chain analysis. The season to season and its size, shape and condition play important role in its valuation. Further, price differs from producer to producer and trader to trader which makes the price estimation tough and complex.

Table 5:1: Estimated price of Rudraksha beads

S.N	Faces	Lowest Price (NRs)	Highest Price (NRs)	Remarks
1.	2	8000	10000	Per bead
2.	3	70	80	Per bead
3.	4	60		Per bead
4.	5	50		Big size, more than 21 mm
5.	5	10	12	Small size, less than 21mm (per KG)
6.	6	30		Small size (per KG)
7.	7	100		Per bead
8.	8	600	800	Per bead
9.	9	700		Small size
10.	10	500	600	Per bead
11.	11	8,000	10000	Per bead
12.	12	2000	2000	Big size
13.	13	35,000		Per bead
14.	14	10,000	20000	Per bead
15.	15	4000	5000	Per bead
16.	16	32,000	45000	Per bead
17.	17	85,000		Per bead
18.	18	100000	1500000	Per bead
19.	19	200000	300000	Per bead
20.	20	400000	500000	Per bead
21.	21	1700000	3000000	Per bead
22.	22	75,000	500000	Per bead

Source: Field Consultation, 2013/2014

(Note: The above price is not fixed one, but it was the price transacted last year i.e. 2012/2013).

According to the traders, the price of the beads may fluctuate dramatically. It mostly depends on the market condition, more specifically because traders influence directly to the price of the beads. The market starts from the Dingla Bazar of Bhojpur district and gets spread out to China, India and different countries through capital city, Kathmandu. In this process, involvement and price negotiation skills of different levels of actors, especially the traders, becomes important.

Table 5:2: End market of Rudraksha value chain actors

Actors	Product	Actors	Location
Producer	Rudraksha Beads	Collector	Dingla Bazar
Collector	Rudraksha Beads	Trader	Dingla Bazar
Trader	Rudraksha Beads	Consumer	Kathmandu, Sankhuwasabha, China, India

Source: Field Consultation, 2013/2014

The collected Rudraksha beads in Dingla villages are traded through mainly two trade routes. One is trade through Sankhuwasabha and another is through Bhojpur. These trade routes may look like:

a) Dingla bazar…..Tumlingtar (Sankhuwasabha)…….Dhankuta…….Kathmandu……exported/sold
b) Dingla bazar…..Tumlingtar (Sankhuwasabha)…….Kathmandu……exported/sold
c) Dingla bazar…..Tumlingtar (Sankhuwasabha)…….China through Kimathanka border
d) Dingla bazar…..Tumlingtar (Sankhuwasabha)…….Dharan……India
e) Dingla bazar…..Bhojpur……Dhankuta…..Dharan….Kathmandu/India/China……

Looking at the value chain actors and their roles, some strength, weaknesses, opportunities, and threats could be identified in the promotion of Rudraksha trade in Nepal.

Table 5:3: SWOT analysis of Rudraksha

Strength	**Weakness**
➢ Nepal is largest producer of Rudraksha (around 25%); ➢ Bhojpur and Sankhuwasabha districts are uniquely suitable for Rudraksha cultivation; ➢ Presence of local system to minimize theft of precious Rudraksha; ➢ High level of income generation for HHs who have more than 5 matured Rudraksha tree; ➢ Self-motivated plantation by farmers; ➢ High level of trade at Haat Bazar and district headquarters; ➢ Farmers are using internet technology for market price;	➢ Price not uniform and fluctuating demand; ➢ Lack of scientific mechanism to test fakeness; ➢ Lack of Government program and support in the sector; ➢ Very few research document in its value chain; ➢ Inactive cooperative and farmers group to boost the enterprises; ➢ Lack of certification system for assurance of quality products; ➢ Failure in cultivation in other district due to lack of scientific research on procedure for cultivation and techniques;
Opportunities	**Threats**
➢ Increasing usage of Rudraksha in Chinese medicine; ➢ Possibility of promoting in other VDC of Bhojpur along with Eastern Region; ➢ Opportunity to generate more income and employment in rural areas;	➢ Fluctuating price and depends on sentimental values; ➢ Increase fake production within district might result in negative brand image;

Source: Field Consultation, 2013/2014

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in the next section as a part of Value Chain Upgrading Strategy.

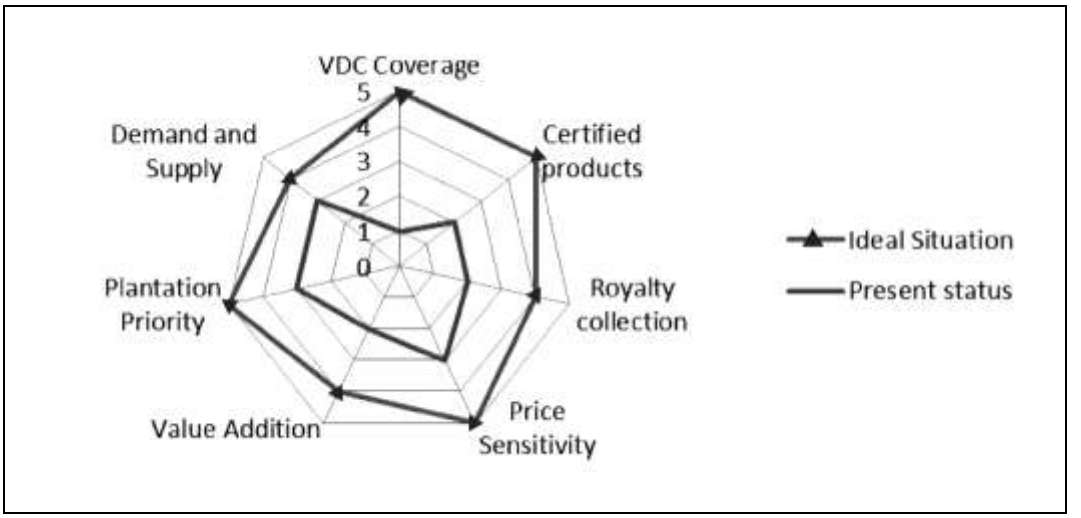
Value Chain Upgrading Strategy of Rudraksha Beads

End Market Analysis:

The communities are self-motivated for the cultivation and trade of Rudraksha beads. There is increased number of producers who are having contact directly with Indian and Chinese traders. Recently, the famers and collectors are perfect enough to negotiate for fetching maximum prices for precious Rudraksha beads. With increasing Tibetan market, the farmers can grow and make sales any time, all sized and any faced Rudraksha, such as non-precious

like 5-6 faced, in the market. Discussing with farmers it is known that one matured tree of Rudraksha can fetch minimum income of NRs 1,50,000 annually and majority of farmers now have 5-6 Rudraksha trees. The market assessment has shown positive response from all actors yet few gaps have been identified.

Figure 5:3: Gaps between market demand and present status of Rudraksha



Source: Field Consultation, 2013/2014

The parameter used for comparing present status and market demands is based on the situational parameters of value chain actors.

Table 5:4: Parameters used for comparing ideal situation and present situation of Radraksha

Parameters	1	2	3	4	5
Royalty collection	Minimal royalty collection	Collection of royalty of all faced Rudraksha beads	Scientific and practical royalty collection mechanism	Royalty collection and reinvestment of royalty in development of VDCs	
Certified product	Uncertified products	Product guranteed throught traders	Product guaranteed through BMOs	National standards	International standards
VDC Coverage	1-2 VDC production sites	At least production in 10 VDCs	Production in 50% of suitable VDCs	Production in majority of suitableVDCs	Production in all suitable VDCs
Price Sensitivity	No price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers for precious products	Best price negotiation between buyers and seller for all forms of prodcuts

Value Addition	Selling un-graded Rudraksha beads	Selling size based graded Rudraksha beads	Making some forms of Rudraksha Mala	Making variety of colourful Malas and other products like jewelleries	
Cultivation Priority	No priority of plantation	Less priority but some people have plantation in some private lands	One of the priority production from private and CF lands	Priority production but plantation in less thatn 50% cultivable private and some CF lands	Priority prodcution and plantation in more than 50% of cultivable lands (both private and CF)
Demand and supply	No demands no supply	Some demands but less supply	Some demads and good supply	High demands and fulfilled supply	

Source: Field Consultation, 2013/2014

The situational parameters used in the above figure (Figure 3) clearly shows some gaps between market demands and present status. The main gaps are discussed below.

Royalty collection: DDC has started levying 2% tax on Rudraksha trade. This taxation is carried out for trade in volume. Mainly for the trade of 5 and 6 faced Rudraksha. Rudrakshas which are traded in individual pieces are mostly traded without the knowledge of the Government. There is no mechanism of the Governement to keep records and royalty for precious Rudraksha as market price is not uniform. This is very important issue where concerned government agencies need to have wide interaction with farmers and traders. Sankhuwasbha and Bhojpur districts being adjacent, DDC levy has made serious concern over transportation between the districts as some people have been dwelling in both district they have to pay royalty even for storing in the houses (if storage is done in other district).

Certified products: Farmers and traders are aware about the quality of Rudraksha beads. For measuring size, grading entities are used first and for perfect calculation of size even caliper measurement is carried out. In case of customer it is very difficult to know about real quality. This is most pertinent in case of precious Rudraksha. There is absence of authorized certification system about faces of Rudraksha.

VDC coverage: Among the 63 VDCs of Bhojpur district, only two VDCs are main production areas. Rudraksha is a major source of income for these two VDCs. There has been seedlings plantation in other VDCs as well, but fruits' flowering is found best in these two VDCs.Scientific management for nursery bed and cultivation has to be further researched so that Rudraksha can be commercially cultivated in majority of suitable areas of all VDCs. There are very less document regarding scientific study of Rudraksha within Nepal which is very ironical as it has huge potential for increasing income for farmers. From the field experience, it can be said that 2-3 matured Rudraksha tree can easily take out DAGs from poverty trap.

Price Sensitivity: The producers and traders of Rudraksha beads in study VDCs are well aware and informed about the price and possible markets of their products. It was said that the producers and traders use modern means of communication like telephone, Facebook and internets for finding their costumers and negotiate better price of their products. However, the negotiation takes place only for the valuable and precious products but not for all forms of products. If the producers and traders can negotiate for all forms of their products, it will definitely develop business confidence among the value chain actors.

Value Addition: Most of the Rudraksha produced and collected in the study area are exported in the form of some simple grading i.e. grading based on the size and faces. However, the possible value addition work is still lacking in the producers and collectors and traders at both village and district levels. Different forms and types of products (such as Mala, decorative things, jewelleries etc) can be produced from the use of different sizes and faces of Rudraksha beads. This is not happening because almost all of the people in the study area are in one or the other way busy and earning sufficient from only the production, collection and trading to the markets.

Plantation Priority: Most of the households in study area have already prioritized on Rudraksha tree plantation. It is observed and also said that almost all of the households in the study VDCS have already planted Rudraksha trees in their private lands. Similarly, it was said that some CFUGs have also already planted Rudraksha trees in the CF areas. However, lots of Rudraksha plantation potential private lands and CF areas are still without Rudraksha trees.

Demands and Supply: The Rudraksha production is not new in the study area.However, its massive production; high market demand and good supply are all new phenomena in the study area. The quantity of Rudraksha production in the study VDCs is quite surprising when one sees and hears the total quantities. The Rudraksha produced in the study villages is highly demanded in the market; however, its demands are only from China and few from India.

1. Firm level upgrading strategy:

The firm level upgrading strategy is developed based on the gap identified in the above sections. The identified firm level upgrading strategies are expected for minimizing the existing gaps.

a) Product upgrading: The product upgrading has to focus on certification of Rudraksha. This can be done by Government organizations in partnership with business membership organizations like District Chamber of Commerce and Industries (DCCI). This will enable to create brand image on the one hand and on the other the Government can take royalty for precious Rudraksha.

b) Process upgrading: The present process employed in the Rudraksha value chain is optimal in its extent. The market system is developed through which the farmers and traders are upgrading their processes regarding quality control. Beads garlands were prepared earlier but this practice has not been carried out now. The innovation in further processes will definitely add further values in their products.

c) Functional upgrading: The functional upgrading at each level of Rudraksha value chain can be carried out in three levels.

Table 5:5: Recommendation for functional upgrading of Rudraksha value chain actors

Actors	Present Function	Upgraded Function
Farmers	Farmers in other VDCs are not able to cultivate in commercial way	Systematic and expanded cultivation
Traders	Product Traded in various market (within, with outside traders, exporters)	Promote certified products
Exporters	Exporting through Kathmandu to Tibet, and India; Exporting or through websites and electronic communications	Promote Nepal brand and trade certified products

Source: Field Consultation, 2013/2014

d) Channel upgrading: Market buyers are reaching up to farmer's level for buying precious Rudraksha. There are various channel used at present including internet based system. The study recommends use of existing channels but with further advancements in roles and functions of value chain actors.

e) Intersectoral upgrading: Rudraksha based farmers are able to generate income that supports them throughout the year. They are very concerned about Rudraksha tree and they give more time for maintenance and security. It will be best to strengthen/form new cooperative so that savings can be increased and their financial transaction could become systematic and transparant.

2. Inter-firm upgrading Strategy:

There are very limited actors involved in this value chain. They are mostly people residing in Dingla and their relatives in Kathmandu. Farmers and collectors have already raised their function in trading. Apart from that, there are exporters who are based in Kathmandu, mostly based in Pashupati Nath temple areas. There needs some improvements for increasing actors and their roles so that this value chain becomes more vigorous and increases royalty collection for the Government. Business membership organizations like FNCCI, FNCSI, NCC have to take this value chain as major exportable product and support in certified product export. There is formation of Rudraksha based trader network in Dingla but it is not functioning well. It is important to form and strengthen association including lead farmers and traders (like in large cardamom led by LCEAN) so that issues and concerns related with this particular products are dealt and resolved within themselves.

3. Business Development Services and Financial Services Upgrading Strategy:

The most pertinent business service required at present is the study in identifying the possible places (villages, VDCs, districts, regions) for commercial cultivation of Rudraksha. This can result in increasing income of household in other VDCs. Organizations like NARC, Department of Forest, and other research organizations can develop action research for promoting and drawing lessons for the sustainable cultivation practices of Rudraksha beads in similar climatic zones. Another important aspect of Rudraksha business is higher/unexpected values and prices of some products. However, there is less or no investment from such incomes. Developing mechanism for encouraging some investments out of these profits or earnings will be most crucial.

4. Business Enabling Environment Upgrading Strategy:

There is not clear policy regarding the royalty payment. Traders are paying royalty to 5-6 faced Rudraksha but precious Rudraksha are traded without knowledge and information (as they are traded in pieces). Government of Nepal (DDC, DFO etc.) has to interact with farmers, traders, CCIs and other enablers to develop pragmatic policy of Rudraksha trade.

5. Sustainability Strategy:

Rudraksha is a traditional product of the study VDCs. Its production has been traded from long time. Recent years have seen more increase in price of the product and export of all forms, sizes and faces of Rudraksha beads which is due to market information system through internet and increasing demand in TAR of China. As Rudraksha is sold in religious and spiritual value, its market is always expanding but still complex in terms of prices. It is important to create a national brand and sale certified product to national and international market. Also, commercial cultivation in other VDCs can provide more incomes to DAGs and other people.

Summary of Rudraksha Value Chain Upgrading Strategy

The study tried to explore the present status, barriers or constraints and opportunities in current Rudraksha value chain system. Based on these, the study has tried to recommend possible strategies for its improvements and expansions. The value chain upgrading strategies of Rudraksha indicates that the production, collection, trading and exporting activates of Rudraksha beads is well established and functioning very well. This is increasingly developing as one of the successful enterprises in Nepal. However, there are some scopes where a simple support and intervention will improve in its existing situation.

Table 5:6: Summary of Rudraksha value chain upgrading Strategies

Upgrading Strategy	Recommendation
Product Upgrading	Trade of Certified products
Process Upgrading	N.A
Function Upgrading	***Farmers from other VDCs:*** start systematic cultivation ***Traders:*** Promote certified products ***Exporters:*** Promote Nepal brand and trade certified products
Channel Upgrading	N.A
Intersectoral Upgrading	Cooperative formation and strengthening
Interfirm Upgrading	Formation and strengthening of Rudraksha based association and linkages with FNCCI, FNCSI, NCC for Rudraksha value chain promotion
BDS+ FS Strengthening	Research on commercial cultivation on other VDCs, training to farmers of other VDCs in nursery management and commercial cultivation
Business Enabling Environment strengthening	Specific policy developed for royalty collection from all faced Rudraksha; Incentive and encouragement from GoN for certification
Sustainability Strategy	Commercial cultivation in other VDCs; Branding and certification

Source: Field Consultation, 2013/2014

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Chapter 6[27]

Satuwa (Paris Polyphylla Smith): Potential for Commercial Cultivation in Nepal[28]

Introduction

"*Satuwa*" is one of the important and valuable medicinal herbs in Nepal. Its scientific name is "*Paris Polyphylla* Smith". It is also called "Love Apple" in English. The studies and official records show that 47,753 kg of Satuwa was collected and exported to other countries from Nepal in the fiscal year 2068/069 B.S. (MoFSC 2068/69). It is mostly collected from the national forest and a little from community forest as well. The collected Satuwa is exported to either China or India through different trade routes from Nepal.

Satuwa is a straight perennial herb distributed in temperate regions throughout Nepal. Rhizomes and roots of *Paris Polyphylla* have medicinal and commercial value. The market of Satuwa rhizomes has boomed up for the last couple of years.

- **Common Name**: *Satuwa Thoksampa;*
- **Botanical Name:** *Paris Polyphylla;*
- **English Name:** *Love Apple;*
- **Synonyms:** *Daisua Polyphylla Smith*, *Paris Daisua Buch;*
- **Family:** *Melanthiaceae;*

The main objective of the Value Chain Analysis (VCA) of Satuwa is to provide comprehensive information for market and social benefits of this product. This objective is depicted in order to determine various constraints for Satuwa cultivation, investigate barriers to market access, explore up- scaling options and provide stakeholders recommendation for potential expansion opportunities within the value chain. The VCA of Satuwa is based on the data/information available in the reports (published and unpublished) and literatures supplemented by the field visit and observation in Sampang Village Development Committee (VDC) of Bhojpur district, where Satuwa cultivation is being carried out by members of a community forest (Shree Bhadrachhe Tarebhir Community Forestry User Group [CFUG], in Sangpang-6). The analysis is further supplemented with the information collected from the interaction and consultation with different actors such as producers, traders, businessmen, policy makers, and government authorities.

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Habit (Characteristics), Habitat and Distribution of Satuwa

Paris Polyphylla is about 40-70 cm high with herbaceous stem. Its leaves are about 5-16 cm long by 1.5-4 cm wide, dark green in color, stalked 4-9 in number and arranged in a whorl at the top of the stem. The shape of its leaf is elliptic, oblong or lancelet; surface glabrous; and acuminate tip. Rhizomes are somewhat bitter, stout and creeping. Flowers are yellowish green in color with short stalk and borne solitary on terminal head. The individual flowers are very long-lived, lasting for up to three months. Its fruits are globular. Flowering occurs in April to May and fruiting in July to September (Polunin and Stainton 1984, Manandhar 2002, Ghimire *et al*. 2008).

The genus *Paris* is a complex genus with approximately 24 species. *Paris* grows primarily in the temperate and tropical regions of Europe and Asian continents. Some important species of the genus are *Paris polyphylla*, *Paris quadrifola*, *Paris cronquistii*, *Paris delavayi*, *Paris japonica*, *Paris regosa*, *Paris verticillata* etc. Out of the approximate 24 species of the genus *Paris* most of them are restricted in East Asia. *Paris polyphylla* is found growing only in some limited countries, vizChina, Bhutan and Nepal.

Table 6:1: Availability of Paris Polyphylla in China, India, Bhutan and Nepal

Nations	Availability of *Paris polyphylla*
China	Yunnn- Guizhou Plateau
India	Manipur (Hengung, Maram, Purul and Makui regions of Senapati district and Puilong in Tamenglong district), Uttarakhand, Himachal Pradesh, Lushai and Aka Hills
Bhutan	Merik (Trashigang District)
Nepal	Bhojpur, Dhankuta, Taplejung, Ilam, Tehrathum, Sankhuwasabah, Dolakha, Gorkha, Humla, Kalikot, Kaski, Kathmandu, Makwanpur, Okhaldunga, Rasuwa, Sindhupalchowk

Source: Shah et al. 2012; MoAF 2012

Though *Paris polyphylla* is found throughout Nepal, it is fairly common in altitudinal range of 1800-3300m. It prefers moist and swampy habitat and grows under dense forests, bamboo forests, thickets, grassy or rocky slopes, and on humus rich moist soil. The best place to found *Paris polyphylla* within the altitudinal range prescribed is the north facing hills and near the streamside and swampy areas.

Satuwa is considered as one of the 164 identified, collected and traded medicinal herbs in Nepal. The official data shows that total of 47,753 kg of Satuwa was collected and traded in Nepal in the fiscal year 2068/69 that has contributed to generate NRs 7,16,017 of national revenue which is 4.79% of the total generated revenue (NRs 1,49,56,066 from the total 165 types of traded products in Nepal) from more than 164 types of medicinal herbs (MoFSC 2068/69).

Table 6:2: Satuwa trade in five development regions of Nepal (FY 2011/012)

Traded yeast (in kg)	Eastern Development Region	Central Development Region	Western Development Region	Mid-Western Development Region	Far-Western Development Region	Total
2068/069	2315	111	9146	10051	26130	47,753
2065/066	0	10	81	3404	3201	6696

Source: MoFSC 2069; MoFSC 2066

The official data show that Western Development Region has higher cultivation, collection and trade of Satuwa. However, some of the districts in the Eastern Development Regions are also equally potential for Satuwa cultivation. The important question beyond this data (collection and revenue) would be whether all Satuwa collected are traded legally. The information collected from Bhojpur district forest office suggests that very limited amount of collected Satuwa has been legally traded in this district. The consultation and discussion with producers, traders, government officials, and other concerned in the field opine that huge amount of Satuwa (from both community forest and national forest) were and are illegally collected and traded in Bhojpur district. It happened before and still is in practice due to the lack of local awareness and difficult legal processes for legal trading.

Uses of Satuwa: Opportunities and Challenges

The literatures and the field visit/observation indicate that Satuwa could be one of the important forest products for creating employment opportunities and income of the resources dependent communities. Moreover, local community are ready for commercial cultivation of Satuwa. For example, at present the 6 households of Shree Bhadrachhe Tarebhir Community Forestry User Group in Sangpang VDC (ward number 6) have cultivated Satuwa in about 8 Ropani (some in community forest and some in private lands) of lands. They had sold about 50 kg of Satuwa in the previous years. A nursery is also maintained by one of the members of this group (Mr. Prem Dorje Sherpa). In his nursery, he has maintained 10 plots (2x8 sq. ft. each) which provide 7000 seedlings from each plot every year. The seedlings are sold at the price of NRs 50 per piece (half cut) and NRs 150 per seedling for whole rhizomes. Other 5 farmers have purchased seedlings from nursery and are cultivating Satuwa in natural plots. At present there is no practice of cultivation of Satuwa in agriculture lands. There is possibility of engaging 20 farmers in Satuwa cultivation by developing commercial cultivation plan with the approach of cultivating in CFUG, Farmer Field School (FFS) and private lands.

The above is a simple illustration of how Satuwa could be the means and sources for rural income and employment opportunities but the studies show that there are lots of opportunities beyond this. For example, the economic value added from the extraction of the medicinal properties of Satuwa. A study suggests that there are 10 types of pharmaceutical use of this herb: (1) Anti- TUBER activity, (2) Anti- Leishmania, (3) Anti-tyrosinase activity, (4) Haemostatic activity, (5) Uterine muscle contraction, (6) Immuno- stimulating properties, (7) Anti- bacterial action, (8) Spermicidal action, (9) Anti- Fungal, and (10) Others (Shah *et al.*, 2012).

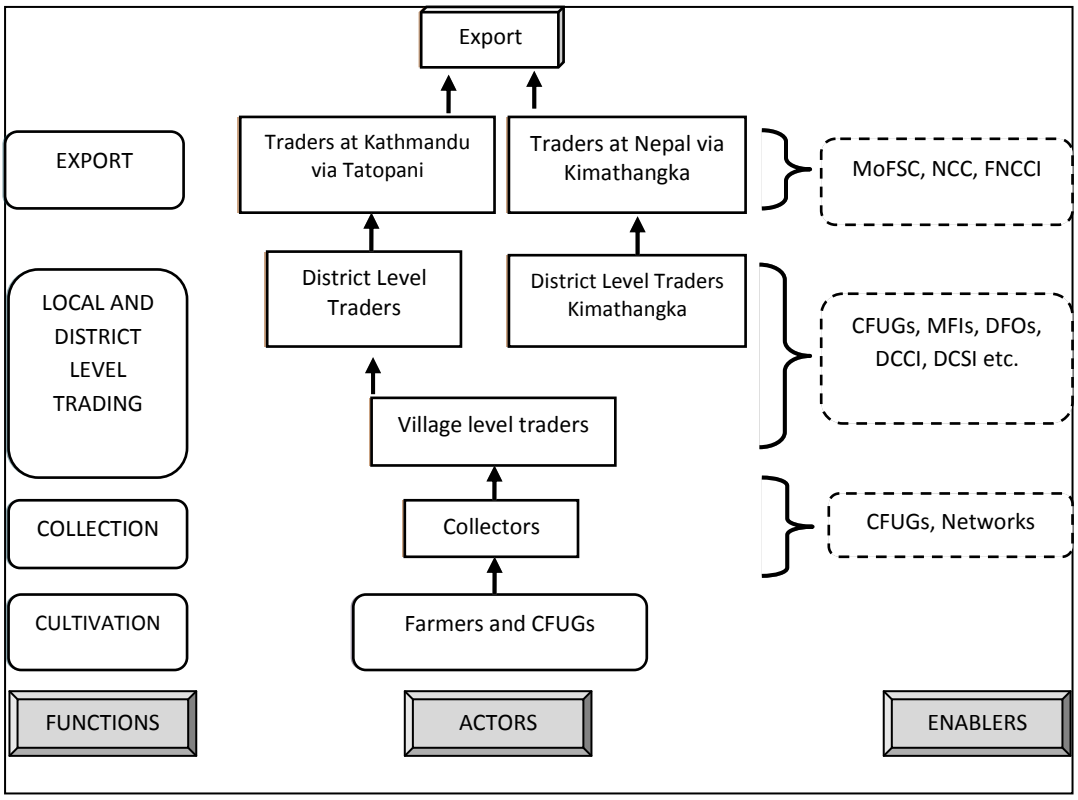
It is worth mentioning that Chinese people have been extensively using Satuwa as traditional practice and has now used it for producing medicinal tablets and other products. The recent year has shown increase in research and development of medicines based on Satuwa in Chinese market. The roots and rhizomes of Satuwa are widely used in Chinese medicines for anti-febrile, alexipharmic, DE tumescent, demulcent, and homeostatic and treatment of homeopathy. It has been used to treat traumatic bleeding, inflammation, and microbial infection and over the past decade, the cancer too. It is the main component of Yun-nan-bai-yao powder, Ji-desengshe-yao- pain tablets and Gongxuening capsules which are well known prepared Chinese medicines. It has frequently played important roles in clinics for immunity adjustment and treating fractures, aprotitis, tumors, analgesia and bleeding. Also, it has exhibited a variety of biological activities in heart and vascular malady, anti-fertility and spermicidal enhancement and sedative. Gongxiening capsules have been widely used for more than 10 years and are commercially available in most cities in China. Classically, this patent medicine has been used to cure female patients suffering from metrorrhagia, menorrhagia, metros taxis, functional uterine bleeding and chronic pelvic inflammatory.

Until now, the studies show that some studies and works on different aspects and potentials of medicinal properties of *Paris polyphylla* have been done in China whereas very little studies and works are reported in India and Nepal. Moreover, the studies available indicate that the works in Nepal and India are limited only on the studies of its ethno-botanical value. This has, perhaps, resulted into the less priority of the government and other actors for the development and cultivation of this plant. However, the studies show that large amount of Satuwa is illegally traded from India (Himachal Pradesh, Uttarakhand, Manipur etc.) through Myanmar (en route Manipur) and Nepal. This traded Satuwa may probably be used as raw materials for the Chinese herbal medicines like Yu-nan-bai-yo powder, Ji- deseng-she-yao-pian tablets and Gongxuening capsules.

Functions of Satuwa Value Chain Actors

Figure 6.1 presents the anticipated value chain map of Satuwa in Nepal. The map shows that institutions and actors have different role and function in Satuwa production to export it. Identification of the roles and responsibilities of these actors and facilitating for their effective roles would make the Satuwa production and trade as one of the successful herbal products in Nepal.

Figure 6:1: Value Chain Map of Satuwa



Source: Field Consultation, 2013/2014

Cultivators: Despite the high demands and economic value of Satuwa, the cultivation of it is yet to get recorded in Nepal. It means most of the Satuwa traded is likely be grown naturally in the national and some community forest. However, the cases show that some farmers and forest user groups have started to manage nursery and cultivate it in both private lands and community forest. For example, some households in Sampang VDC of Bhojpur district have started to cultivate Satuwa in some plot of lands. So, the farmers and forest users are the potential cultivators of Satuwa in Nepal.

Collectors: Based on the field visits and observations, consultation with actors and review of literatures, it can be said that some villagers who can identify it and have been trading it, they have been collecting Satuwa from nearby forest. In the field visit and consultation, it was reported that people from other nearby villages also illegally collect and sell this product. The most important thing noted was that the collection and trade of Satuwa are in pactice without knowing its value and usage. This means some village people and some traders are collecting Satuwa from the forest.

Traders: In most cases, the *village level traders* purchase the Satuwa rhizome from collectors and sell to the district level traders. For example, the village level traders (2-3 in number) in Sampang VDC of Bhojpur district purchase rhizome from village collectors and sell to the district level traders at Khadbari of Sankhuwasabha district. They usually sell at the rate of Rs 3500-4000 per kg. While the *district level traders* (4-5 in number) are stationed at Khadbari and directly export it to Kathmandu or Tibet (China through Kimathanka border) or India

through different routes. To trade it later, district level traders obtain necessary documents from District Forest Office (DFO) from respective districts. They usually sell the rhizome in the range of NRs 4300 to NRs 5000 per kg, depending on the size and quality of rhizome (rate practiced in 2013 in Bhojpur and Sankhuwasabha districts).

Exporters: Satuwa is sold (mostly raw) to Tibet. The exporters (more than 20 in number) are stationed at Kathmandu and they export the rhizome to Tibet. The most common route is from Tatopani (Sindhupalchok) but sometimes the rhizomes are also airlifted. Regarding study area (Bhojpur and Sankhuwasabha districts), the rhizomes are traded via Khadbari to Kimathangka route and also Taplejung to Olangchung Gola route. The trade from Kimathangka is in most cases are undocumented but sometimes there has been reports of getting transportation permit from Makalu-Barun National Park (sourced from buffer areas).

Domestic Manufacturers of Herbal Medicines: Domestic manufacturers of herbal medicines (6 in number are showing interest in phytochemical extraction and 2 has already started) have recently began making phytochemicals, the raw materials used to produce allopathic drugs. Association of Pharmaceutical Producer of Nepal (APPON) suggested that about half a dozen companies are planning to use domestic raw materials and produce phytochemicals. The chemical extraction has already been successfully carried out from the Himalayan Yew (Lauth Salla) and various domestic manufacturers are searching various herbs for extracting phytochemicals.

Enablers: Enablers of "Satuwa value chain" in the present context are those who are likely to work for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to export, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. The anticipated role of facilitating and regulating organisations for the proper functioning of value chain is given in Table 6.3.

Table 6:3: Anticipated role of facilitating and regulating organizations to move Satuwa in the market chain

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CFUG
Royalty payment	DFO, CFUG
Checking and weighing	Range post or CFUG
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Export recommendation, product certification and export permission for selected natural products	DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/ DCCI, NCC
Export permission and duty	Customs office of exporting country
Import permission and duty	Customs office of importing country
Market information	TEPC, AEC, ANSAB
Financial support	NGOs, Cooperatives
Processing technology	DCSI/ CSIDB, Private companies
Resource management and research	DPR, DFO, CFUG, NGOs, Consultant
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

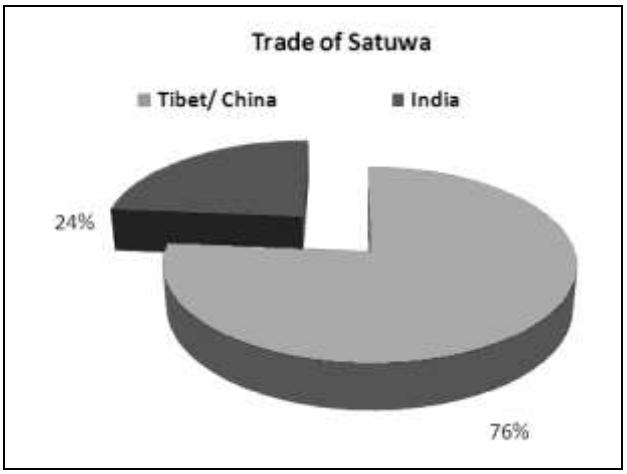
Source: Field Consultation, 2013/2014

Economic Aspects of Satuwa Rhizome

Sustainable economic contribution of Satuwa is one of the challenging aspects of its collection and trade. Until now there are no any clear guidelines and practical experiences of how and where Satuwa could be cultivated. However, some initiations by people in Sampang VDC of Bhojpur district indicate that it will be possible to cultivate Satuwa but which needs some technical and professional supports to the cultivators. It is already discussed that the selling rate and amount of Satuwa rhizome production in Sampang VDC of Bhojpur district has become one of the most potential enterprises for income of forest dependent people.

The demand and supply of a product are always important for analysing the economic aspect of the product. Talking about demand and supply of Satuwa rhizome in Nepal, it could be said that the national demand for Satuwa is still unknown. But it is evident that the demand is very high compared to the production. Its production, however, is diminishing due to the uncontrolled collection and lack of cultivation. The data of the Department of Forest showed that in FY 2011/012, a total of 47,753 kg of Satuwa was collected from Nepal but it is evident that the real quantity of collection is far higher than that of the available data. For example, Satuwa has been identified as top 3 most traded Madicinal and Aromatic Plants (MAP) in terms of Value (tradable and economically important) in Eastern Nepal (Pyakurel et. al, 2013). The trade volume shows the following percentage of trade to Tibet/ China and India.

Figure 6:2: Percentage of traded Satuwa to India and China from Eastern Region

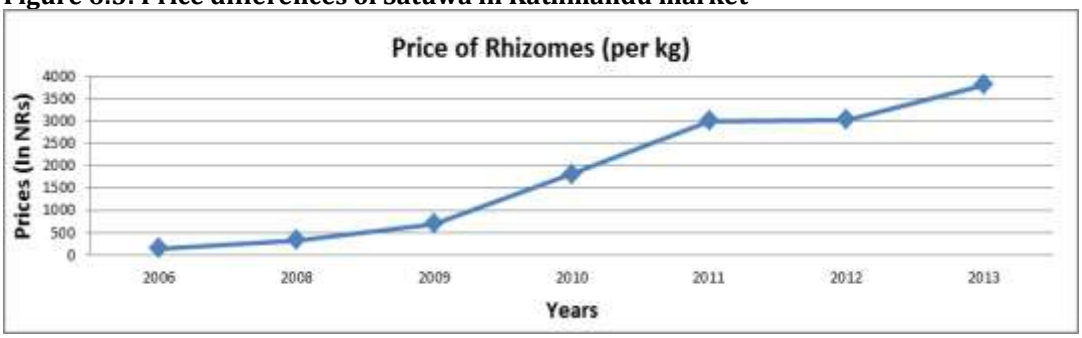


Source: Pyakurel et al. 2013

Majority of respondents have reported that most of the Satuwa is traded to Tibet/China and only 24% of Satuwa is traded in India. However, the final market of Satuwa is of course Tibet/China. It is reported that the exporters in India then supplies collected Satuwa to Tibet/China through various route from Nepal.

The price of Satuwa has soared in recent years. This has happened due to the massive use and demand of phytochemicals extraction of Satuwa in Tibet/China. The studies indicate that in the recent year large quantities of Satuwa has seen smuggling to Tibet/China from India and Nepal. However, there is still lack of comprehensive and accurate data and information about it. However at present, the government, collectors and other related stakeholders are gradually becoming aware about the importance of Satuwa and are planning for cultivation initiation that can address the growing demand of Satuwa.

Figure 6:3: Price differences of Satuwa in Kathmandu market



Source: ANSAB/MIS (2006-2013)

The price of Satuwa has increased exponentially during 2010 and 2011 and at present the traded price is between NRs 3500 to 4500. The respondents replied that the price fluctuates time and again and the information on the fluctuated prices is taken from informal communication with traders in trade centres like Birtamod, Kimathanka, and Kathmandu etc. The price comparison for 5 years at major trade points like Kathmandu, Nepalgunj and Delhi differs from one place to another.

Table 6:4: Price comparison between Kathmandu, Nepalgunj and Delhi

Year	Kathmandu	Nepalgunj	Delhi
December 2013	3800	3500	3920
December 2012	3017	2800	****
November 2011	3000	3000	3200
December 2010	1800	2200	****
January 2010	700	800	1280

Source: ANSAB/MIS (2010-2013)

Most of NTFPs has higher price in Nepalgunj as these products are exported to India. Unlike aforementioned trend, Satuwa price in Nepalgunj is relatively lower than the price in Kathmandu citing more Satuwa is traded in Tibet/ China. Previously (before 2010) Satuwa was traded in India with minimal prices (relative to present price) but market demands from Tibet/China dramatically increased.

Table 6:5: Strengths, weaknesses, opportunities and threats (SWOT) of Satuwa in Nepal

Strength	**Weakness**
• High valued low volume product; • Good demand in national and international market; • Found naturally in forests; • Favorable geo-climatic condition; • Cultivation practice in natural plots started and commercially harvested (e.g. in Bhojpur district);	• Difficult to cultivate due to specific requirements (climate, soil etc.); • Lack of technical and practical knowledge;
Opportunities	**Threats**
• Interest of various organizations in Satuwa promotion; • Income generation opportunities for poor and DAGs; • Domestic manufacturers of herbal medicines have started making phytochemicals;	• Unsustainable harvesting leads to depletion from the wild; • Its high value leads to illegal harvesting;

Source: Field Consultation, 2013/2014

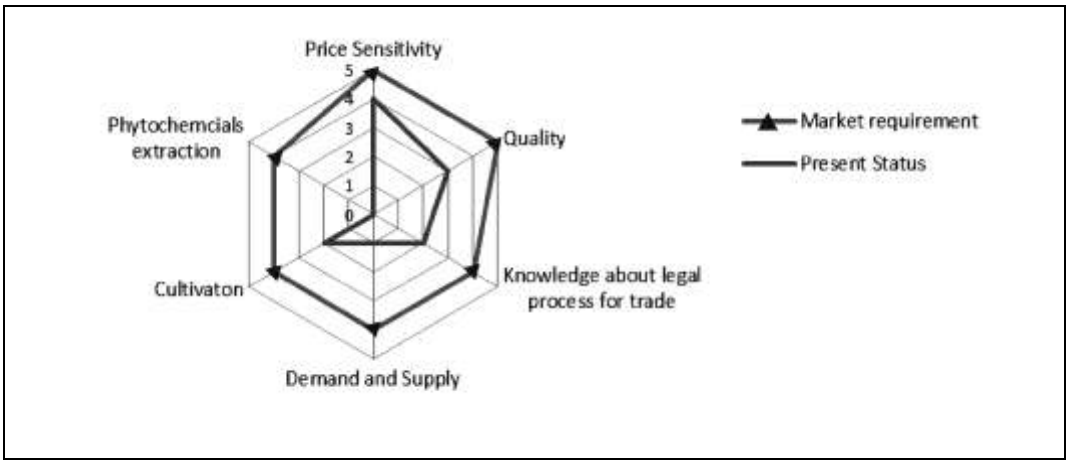
Despite some weakness and threats the SWOT analysis indicates that it is highly potential and possible to start commercial cultivation of Satuwa in Nepal. This possibility is further reinforced by the country's ecological condition and easier trade routes to economically emerging two countries (China and India). The weakness and threats could be addressed through the Business Development Strategy (BDS), which is discussed in the form of Value Chain Upgrading Strategy in this report.

Value Chain Upgrading Strategy of Satuwa

End Market Analysis:

Natural characteristics and dramatically fluctuated market prices have made us to consider Satuwa as a surprising medicinal herb. The studies show that wider use values have been identified and introduced in Tibet/China but its uses and values are limited only as allopathic medicines in Nepal and India. Based on the field level interaction and consultation, supplemented with information and information available from reports and literatures, the end market is being analysed which is expected as beneficial to bring more value addition at national level.

Figure 6:4: Spiderogram that analyzes market demand and gaps



Source: Field Consultation, 2013/2014

The analysis of the market demand and present status of Satuwa rhizome indicate that almost all of the sectors of Satuwa rhizome have gapes to be improved. For example, despite the high potentials, the extraction of medicinal substances is almost zero.

Table 6:6: Parameters used to compare end market of Satuwa

Parameters	1	2	3	4	5
Price Sensitivity	Worst price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers	Best price negotiation between buyers and seller
Quality of rhizome	Inferior	Low	Moderate	Good	Excellent
Cultivation	Cultivation tested as home gardening	Cultivation practiced in natural plots	Cultivation practiced as nursery and plantation in natural plots	Cultivation practiced as nursery and plantation in natural plots at various locations	Cultivation practiced as nursery and plantation in agriculture plots
Knowledge about legal process for trade	Very less knowledge and know nothing about Government process for NTFPs trade	Less knowledge and know only few information about how *thekedar* and district trader get permission	Moderate knowledge and even cannot do oneself know about process being carried out by *thekedar*/ district traders	Good knowledge and can do process by own	Excellent knowledge and can do whole process by own
Demand (Blue Line)	Low demand	Limited demand	Moderate demand	Good demand	Mass demand
Supply (Red Line)	Low supply	Limited supply	Moderate supply	Good supply	Mass supply
Phytochemical Extraction	Phytochemical extraction carried out in similar NTFPs	Phytochemcal extraction carried out in similar genus	Phytochemical extraction carried out in same genus	Phytochemical extraction carried out and commercialized	Medicinal tablets manufactured and Intellectual Property Right conceived

Source: Field Consultation, 2013/2014

The major gaps identified were:

Quality: Moderate quality of rhizome because both mature and immature rhizomes are collected. The immature rhizomes are smaller in size and risk of fungal attack is high.

Cultivation practices: Cultivation has been initiated in commercial way in natural plots in Bhojpur. This is innovative initiation which needs more supports from various actors. There are very few documents in detail available in Nepal regarding its cultivation. One of such

documents, which explicitly provide information about cultivation practices in Bhutan[29], is available. The approaches and possible further research on cultivation possibilities are explained in detail in Process Upgrading chapter.

Knowledge about legal process of trade: The discussion with collectors has revealed that they lack information about the legal process and are confined to the information obtained from *thekedars* or district traders for collection of Satuwa. This has been resulted into inadequate payment to the collectors, on the one hand and depletion of Satuwa in National Forest and Community Forest on the other.

Demand and Supply: A recent time has seen increase in price of Satuwa and also its trade in Tibet/ China. There is a considerable demand of Satuwa in China and en-masse collection of Satuwa from every possible forest regime has been found abundant in Nepal and India. The discussion with traders revealed that large volume of Satuwa comes from India and uses logistics mechanism from Nepal to reach Tibet/ China. At present, the discussion with traders, collectors and key personnel revealed the deleting stock of Satuwa in natural habitat and this has enforced new way for catering the demand. Farmers are highly interested in cultivation of Satuwa and further technical research on cultivation to make it more commercially viable.

Phytochemical Extraction: The chemical composition extraction has been carried out by personnel from various countries. Devkota in 2005 isolated 6(six) compounds from *Paris polyphylla* collected from Parbat district of Nepal. Similarly, eminent research from China has isolated various compounds from Paris Polyphylla . This isolation of compounds in China and extraction of phytochemicals has been used in commercial way by developing herbal medicines like Yu-nan-bai-yo powder, Ji-deseng-she-yao-pian tablets and Gongxyening capsules. Recent interest from the members of Association of Pharmaceuticals Producers of Nepal (APPON) for extracting phytochemicals (including already practiced phytochemical extraction from Lauth Salla) has shown a positive trend for usage of Nepal based raw materials and developing value added products. The organizations working in NTFPs/ MAPs promotion have to develop strong partnership with pharmaceuticals industries and ensuring regular supply through cultivation practices along with advocating potential importance of Satuwa can result in commercial development of phytochemical extract from Satuwa within Nepal in coming days head.

1. Firm Level Upgrading Strategy:

(a) Product upgrading: Due to inadequate and insufficient processing technology, the Satuwa rhizomes are still traded in the form of raw to Tibet. The product strategy has to focus in three different aspects:

- Cleansed, graded and packaged Satuwa in present market channel (from present year);
- Nursery management and commercial cultivation of Satuwa (1 to 5 years of work);
- Partnership building with private industries for phytochemicals extraction of Satuwa (1 to 5 years of work);

[29] A field manual of nursery management and cultivation of Satuwa, Ministry of Agriculture and Forest, Royal Government of Bhutan

Table 6:7: Product upgrading based on four parameters

Parameters	Present	Year 1	Year 2
Product	Raw Rhizome	• Cleansed, dried, graded and packaged rhizome; • Cultivation enhancement; • Discussion start with private industries for phytochemical extraction;	• Cleansed, dried, graded and packaged rhizome; • Cultivation enhancement; • Strategic alliance for extraction of phytochemicals and start initiation in research through private sector;
Price (based on present price)	Rhizome: NRs 3000-NRs 3500 (collectors price)	• Rhizome: NRs. 3000-NRs. 3500 (collectors price) • Price for seedlings: Nrs. 50- 150 per piece	• Rhizome: NRs. 3000- NRs. 3500 (collectors price); • Price per seedlings: NRs. 50-150;
Place	Khadbari, Kimathangka, Kathmandu	• Khadbari, Kimathangka	• Kathmandu based industries for phytochemical extraction; • Nationwide for Satuwa seedlings;
Promotion	N.A.	• Promotion of nursery and cultivation initiative amongst development vectors; • Promotion for strategic alliance build up for phytochemical extraction	• Promotion for international exposure for existing practices in Satuwa Cultivation (Bhutan) and existing practices in China and India; • Promotion for investment from development vectors for piloting initiative for phytochemical extraction;

Source: Field Consultation, 2013/2014

(b) <u>Process Upgrading:</u> The discussion with Department of Forest Research and Survey has revealed an interest for Satuwa cultivation if the demand has to come from the community through district forest office. However, the discussion with other development sectors has to be initiated with a brief concept note presenting milestones and expected outcomes. The process of trading starts with collection and ends with export. But the process mentioned here focuses on process of value addition or processing. The major steps are given in the figure 6.5.

Figure 6:5: Major steps of Satuwa processing

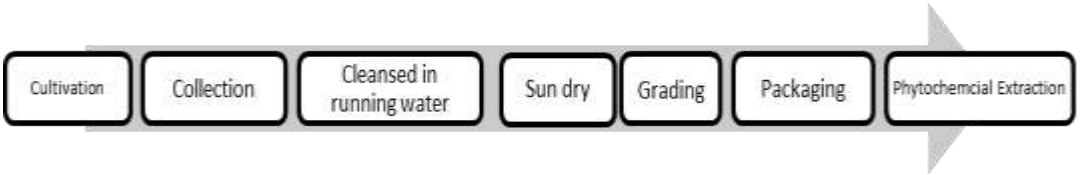


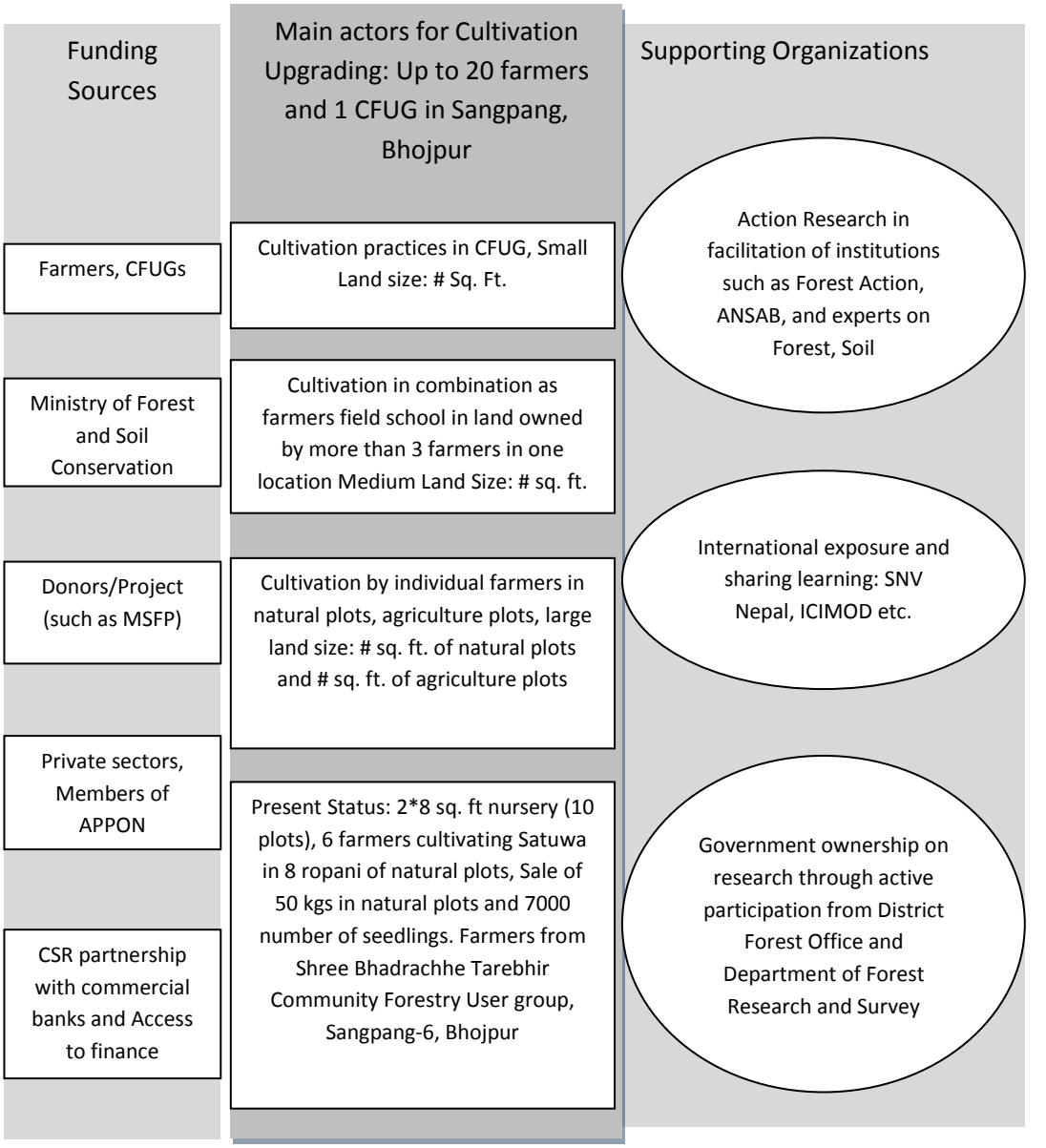
Table 6:8: Process upgrading matrix

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology used and cost	Anticipated benefits
Upgrading 1: Cultivation	Nursery management and cultivation in natural plots	Upgrading nursery management and cultivation in CFUG, FFS, and private land	Cultivation process, governance coaching	Extending existing cultivation practice to national knowledge and replication
Upgrading 2: Collection	Unsustainable wild collection	Rotational harvesting system, collection of mature rhizomes,	Knowledge on sustainable harvesting	Maintaining healthy population in the wild
Upgrading 3: Drying	Sun dry	Alternate sun and shade dry to maintain the quality	Knowledge on post harvesting technique	Good price of rhizome
Upgrading 4: Grading	Not carried out	Grading according to size and quality		
Upgrading 5: Packaging	Not carried out	Packed in clean jute sacs according to the graded rhizome		
Upgrading 6 Phytochemical Extraction	Not carried out	Initiate commercial research from private sector for phytochemical extraction	Chemical composition, Extraction process, Intellectual property rights etc.	Usage of raw materials at national level for manufacturing allopathic drugs

Source: Field Consultation, 2013/2014

A lesson from commercial cultivation of Satuwa is one of the important and effective ways of promoting its commercial production in Nepal. As mentioned the cultivation of Satuwa has already started in Sampang VDC of Bhojpur district, this practice can be termed as innovation by referring to other places where similar initiatives have failed. This practice is self-initiative by an entrepreneur/farmer who is now becoming as a local institution (Shree Satuwa Conservation and Nursery Management, Sangpang VDC 6 in Bhojpur district). This is legally registered in District Forest Office. At present, there is one farmer who is having nursery and along with him other 7 farmers are commercially cultivating Satuwa in natural plots. This initiative has to be upgraded by testing the possibilities of Satuwa cultivation in different scenario. The possible steps of Satuwa cultivation would be as in the illustration of figure 6.

Figure 6:6: Commercial cultivation of Satuwa – An Illustration



Source: Field Consultation, 2013/2014

(c) ***<u>Channel Upgrading:</u>*** The current trade of Satuwa showed that centres like Khadbari, Kimathangka, and Kathmandu are established as export centres. The existing route for Satuwa trade from Bhojpur area is as follows:

- Product from Bhojpur district – Khadbari – Kathmandu or Khadbari-Kimathangka;

- Products from Eastern Nepal:

    a. Khadbari- Kimathankga;
    b. Taplejung- Olangchunggola;
    c. Birtamod- Delhi; or
    d. Directly to Kathmandu;

Based on this study it could be said that the use of existing trade channel/route will be best option for Satuwa trade but there needs a focus on product upgrading and process upgrading.

(d) ***<u>Function Upgrading:</u>*** The major actors in the Satuwa Value Chain are as follows and their function upgrading need to be carried out in the following ways.

Table 6:9: Function upgrading matrix of Satuwa

Actors	Present Function	Upgraded Function
Cultivators	Cultivating in small scale	Cultivation in different process (Mentioned in process upgrading)
Collector	Unsustainable wild collection	Rotational harvesting system, Collection of mature rhizomes,
Trader	Purchasing all the products from collectors	Encourage collectors to grade and pack the rhizomes
Exporter	Export raw	Export cleansed, dried, graded and packaged rhizomes
Pharmaceutical Industries in Nepal	Phytochemical extraction from Lauth Salla	Phytochemical extraction from Satuwa

Source: Field Consultation, 2013/2014

(e) ***<u>Intersectoral Upgrading:</u>*** Some other products could be cultivated along with Satuwa. For example, Satuwa and Chiraito farming are interrelated and can be practiced together. The farmers in Bhojpur are cultivating both Chiraito and Satuwa. Such practice in cultivation of Chiraito and Satuwa can provide high income for the farmers.

2. Inter-firm Upgrading strategy:

The formal network is one of the important actors to carry out issues and concerns of a group or a firm or an enterprise and so on. The formal network or institution to carry on all issues and concerns of Satuwa related activities such as cultivation, marketing, export etc. would be important for promoting and advancing this product. For example, the formal network of Chiraito producers is formed by local producers in Sampang VDC of Bhojpur district (name: Tintale Chiraito Kheti Byawasayi Sangh) to carry out all issues and concerns related to Chiraito. This network is legally registered in District Forest Office. The Satuwa cultivators, collectors, traders also can form a similar types of network and build relationship with District Forest Office, traders, members of Association of Pharmaceuticals Producer of Nepal (PPON) etc.

3. Business Development and Financial Service Strengthening strategy:

The assessment of Business Development Services (BDS) and Financial Services (FS) are most important part of any institution or enterprise. In this study, the BDS and BS has been considered taking in view of following two things:

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories.

Table 6:10: BDS and FS strengthening matrix for Satuwa

SUPPLY SIDE OF BDS	Very strong				
	Strong		Market Information		Market requirement about the traded rhizome
	Weak			Entrepreneurship skills (up to grading and packaging)	
	Very weak			Value Chain Financing	Commercial Cultivation techniques
		Very weak	*Weak*	*Strong*	*Very strong*
		DEMAND OF SERVICES BY VALUE CHAIN ACTORS			

Source: Field Consultation, 2013/2014

The commercially viable business services for the above services requirement can be catered through applying some strategies. Based on this study and analysis, the following activities would be the possible strategies for business service strengthening of Satuwa cultivation, trade and export:

Table 6:11: Business service strengthening strategy

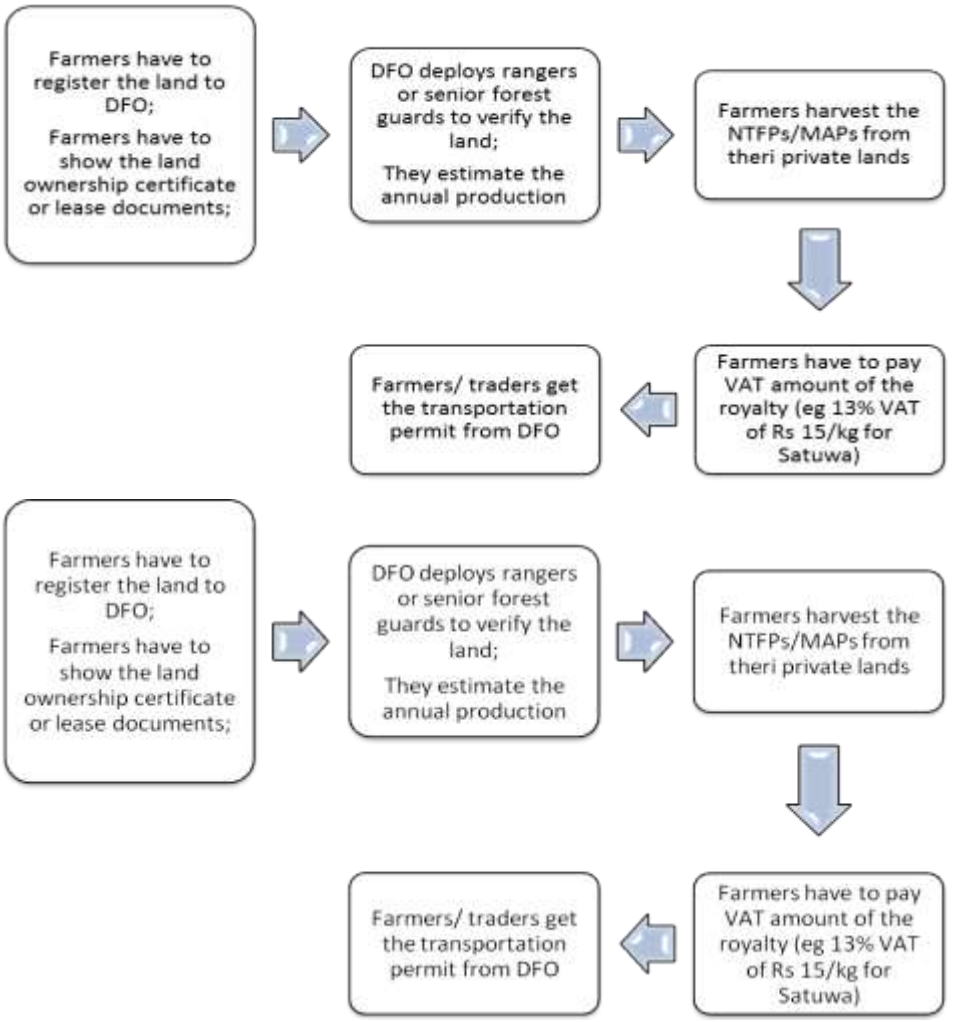
Services	Strategy
Inadequate market information	Establishment of Market Information System (referring to the website of ANSAB)
Cultivation skills	Provision of cultivation training and action research
Access to finance	Corporate Service Responsibility (CSR) support for cultivation initiative and value chain financing assessment for linkages with Financial Service providers

Source: Field Consultation 2013/2014

4. Business Enabling Environment Strategy:

Review of the available reports, field visit and observation and stakeholder consultation suggest that presently Satuwa has depleted in National Forest and Community Forest. It is important to carry out action research on CFUG, Farmers Field School (FFS) and private land so that different actors would become capacitated and informed about the challenges and opportunities of Satuwa and lessons learned could be documented and communicated for the policy debates. For example, the farmers in Sangpang VDC of Bhojpur district are well aware about the process of cultivation (both legal and practical) in private land and its trade by submitting necessary document and following the process as prescribed by DFO. They are aware that Satuwa from private land can be traded by following all the legal process and paying NRs 15 as royalty (in an ideal situation, if a farmer demonstrates all the documents to DFO, then they can pay only 13% or NRs 15 as VAT, otherwise they have to pay RNs 15 per kg). People have been practicing all these in Sampang VDC of Bhojur district. The process of trading NTFPs/ MAPs from private land is depicted in figure 7.

Figure 6:7: A legal process map for commercial trade of Satuwa from private land



There are no specific rules for the products out of the non-registered as private forest land. Therefore, it is now treated as national forest products and its constituting rules. Legal aspects for commercial cultivation of NTFPs/ MAPs are not well understood by majority of the farmers and traders in Nepal. But it was observed that producers and traders in Sampang VDC of Bhojpur district are aware about the legal process and they are working together with DFO for commercial cultivation of Satuwa and its trade.

5. Sustainability Strategy:

The most important factor for sustainability of Satuwa cultivation would probably be the condition or situation of whether it is cultivated commercially. At present, only natural plots are being exploited for the cultivation. It could be commercially cultivated in both the private agriculture land and the plots of community and government managed forest. The study recommends development sectors for the action research regarding commercial cultivation of Satuwa in different plots. This can increase local production including sales of seedlings from nursery management, commercial cultivation and trade. Moreover, such community

would become resource center for commercial cultivation of Satuwa. The commercial cultivation probably would create synergies for multiple actors' engagements in this sector including innovation of its multiple commercial uses and trades.

Summary of Satuwa Value Chain Upgrading Strategy

The literatures, opinions of the stakeholders and practices observed in the field suggest that Paris rhizome is one of the most potential medicinal herbs for commercial cultivation in Nepal. The value chain map of Satuwa also shows that there is a significant demand in Indian and Chinese market. As a result, large amount of Satuwa has been despatched to these countries in raw form, of which most of them are illegal and undocumented. Further, this study shows that there is a lack of technology and technical inputs for the producers and collectors and lack of scientific innovation and work for its processing. Similarly, the study indicates that the roles of the government and other actors are seen insufficient both for farmers and traders. Due to which competitive and commercial production is yet lacking.

Based on the above stated gapes, this study concludes and recommends five important upgrading strategies: (a) Firm Level Upgrading, (b) Interfirm level Upgrading, (c) Business Development Services and Financial Services Strengthening, (d) Business Enabling Environment, and (e) Sustainability Strategy.

Table 6:12: Upgrading Strategy as recommendation for Satuwa Cultivation

Upgrading Strategy	Recommendation
Product Upgrading	• Cleansed, dried, graded and packaged rhizome; • Phytochemicals extraction;
Process Upgrading	• Cultivation practices in different plots; • Phytochemicals extraction (private sector led);
Function Upgrading	• Collection to Cultivation (Farmers); • Export raw to export cleansed, dried, graded and packaged rhizomes (farmers, collectors, traders and exporters); • Phytochemicals extraction from Satuwa (e.g. Lauthsalla is already carried out);
Channel Upgrading	• Prioritize promote existing channel focusing on Pharmaceutical industries of Nepal; • Innovation for potential other channels;
Interfirm Upgrading	• Formation of Satuwa based formal networks (e.g. Chiraito based network in Sangpang VDC of Bhojpur district) and registration in DFO; • Linkages between APPON members and Cultivators; • Linkages between cultivators/collectors and traders for quality upgrading and trade;
Intersectoral Upgrading	• Chiraito cultivation and trade along with Satuwa;
BDS+ FS Stregthening	• Market information, cultivation skills, access to finance (using CSR initially for action research and then linking commercial banks with VC actors);
Business Enabling Environment Strengthening	• Orientation and realization of trade as per legal process map for commercial trade of Satuwa from private land;
Sustainability Strategy	• Develop some communities (such as Sampang VDC of Bhojpur district) as piloting sites for nursery, cultivation, collection and primary processing, trade for the initiation as resource centers;

Source: Field Consultation, 2013/2014

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PART THREE

VCA OF NON TIMBER FOREST PRODUCTS

Chapter 7[30]

Allo (*Girardinia diversifolia)*: Innovative Technology Transfer in Crossroad for Viable Business in Mountain Regions[31]

Introduction

The livelihood of rural people, in a way or the other, is related or associated with the forest resources in and around them. It becomes transformed into the valuable product when people give meaning and value to the products in their own local social, cultural and economic contexts. Allo is one of the forest products in mountain and hilly area of Nepal on which some people, especially indigenous one, are making their living and earning. This is also related with the cultural value of local people. For instance, Rai communities in Shankhuwasabha require Allo and Allo products in some cultural rites and rituals. Moreover, they are making it a source of earning and means of livelihoods.

Girardinia diversifolia is the botanical name of Allo. It is called "Nettle, Himalayan Nettle, Stinging Nettle" in English which is locally known as *Pua*. It is perennial shrub belonging to Urticaceae family. The stem bark of Allo contains fibres with unique strength, smoothness and silk like lustre. The fibre is used to make clothes and many of the local people in mountain and hilly area of Nepal, especially in the Eastern Nepal, have been using it since time immemorial. This is tradition and indigenous knowledge of some ethnic groups (for example Kulung Rai community in Shankhuwasabha district) in making different kinds of cloths from its fibre and threads. It is interesting to note that the clothes made by Allo fibre and thread from some districts in Nepal have been now commercially traded and exported to some other countries.

In this context, Allo has been selected for the details study so as to provide a comprehensive VCA of Allo and its products, including both market and social benefit evaluation. This objective was depicted in order to determine various constraints for Allo, investigate barriers to market access, explore up-scaling options and provide recommendation to the stakeholder for potential expansion opportunities within the value chain. The study is based on both the primary and the secondary information. The secondary information was obtained from the available VCA reports, other published and unpublished reports, and related literatures. Similarly, the primary information has been obtained from field visits and observation to some producers, retailers, and traders in Shankhuwasabha district, interaction and consultation with district stakeholders including producers, retailers, traders and government officials.

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Habit (Characteristics), Habitat and Distribution of Allo

Allo is a robust shrub reaching up to a height of 2m or more. Leaves are stalked, alternate, and dentate, palatably divided with three distinct nerves running to three lobes. Size of mature leaf measures 10-24cm by 7-18cm. Leaf blade and stalk contains long awl-shaped bristles and stinging hairs. Flowers are sessile and borne on axillary and terminal branched spikes. Female spikes may reach up to 40cm long whereas male spike short but much branched (Polunin and Stainton 1984, Manandhar 2002). Flowers are green to yellowish green in colour, flowering occurs in July-August and fruiting from September to early November. Allo propagates by seeds, root offshoots (new plant arising from root of old plant) and root suckers (Pyakurel and Baniya 2011).

Allo or *Girardinia diversifolia* shows wide distribution in the southern belt of the Himalayas. It has been recorded from Northern Pakistan, Kashmir, North-west India, Nepal, Sikkim, Bhutan, Southern and Eastern Tibet, Sri Lanka, Northern Myanmar, China and Malaysia. Allo shows wide distribution on the southern belt of the Himalayas in Nepal. It is distributed throughout Nepal at 1200-3000m in moist, forest areas with shade or semi shade, along the gorges, streams and tributaries and on the edge of the cultivated land. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils. The plant prefers acid, neutral and basic soils (Pyakurel and Baniya 2011).

Allo is found in forests with Uttis (*Alnus nepalensis*), Guras (*Rhododendron arboreum*), Okhar (*Juglans regia*), Malo (*Viburnum mullaha*), Khasru/Banjh (*Quercus* spp.), Kafal (*Myrica esculenta*), Lauth salla (*Taxus wallichiana*), Pangra (*Aesculus India*), Sugandhakokila (*Cinnamomum glaucescens*) etc. as major tree components. Its associated shrub species are Dhatelo (*Princepia utilis*), Lokta (*Daphne* spp.), Argeli (*Edgeworthia gardneri*), Nigalo (*Drepanostachyum falcatum*), Ban Silam (*Elsholtizia* spp.) etc.

There is a lack of data on the potential stock or availability of Allo that could be harvested on a sustainable basis. The production pockets in terms of commercial scale harvest are located in Sankhuwasabha and Solukhumbu districts of Eastern region; Nuwakot, Ramechhap, Sindhupalchok and Dolakha districts in Central region; Parbat, Myagdi, and Baglung in Western region; Rukum, Rolpa, Dolpa, Humla, Jumla, Dailekh, and Pyuthan in the Mid-western region; and Darchula, and Dadeldhura in the Far-western region. A rough estimation based on average per district potential (in mainly accessible areas) of extracting 36.1 Metric Ton (MT) of dried Allo bark yields production can be increased three to four times, very easily with the possibility of achieving an industry out level of around 1,000 MT of Allo fibre/yarn production in about two to three year time (MEDEP, 2010).

Uses, Chemical Composition and Conservation Status of Allo

Residents of hilly areas and ethnic groups have extracted and spun these fibres to weave durable jackets, porter's head bands or straps, fishing nets, ropes, bags, mats, coarse clothing material, blanket, etc in the remote villages of Nepal for centuries. The specialty of Allo is its strength and durability. It is often lighter and more delicate-looking than its wild contemporaries, jute and hemp. Therefore, Allo has been a major source of income and also a basis for livelihood for the local people in some parts of the country. For example, Allo processing and making cloths from its fibre and threads are one of the major sources of income and means of livelihoods of Kulung Rai community in Shankhuwasabha district (Joshi et al, 1989). Most items are made for domestic use and are sold in Melasand Bazars at Dingla and Bhojpur.

The use of Allo fibre and thread is traditional knowledge and practices of this community. They have been practising it since time immemorial. Recently, this community have started to make fancy items, such as varieties of bags, jewellery purse to travel bags, coat cloth, and ladies items-shawl, brassier, slippers when the outsiders took interest in Allo products. Dyeing was also practiced according to customers' demand using local plants such as Majitho, Banmara, Chutro, and Dar (Barakoti and Shrestha 2008).

It is learned that about 4200 people of Shankhuwasabha district are involved in the Allo profession. However, only 100 people are fully engaged in the profession i.e. giving full time to the Allo work. Most of the people take it as their part time job giving much more time to other job, mainly agriculture. As the population is increasing and many people are being engaged in Allo trade giving less attention to its sustainable production, the resources are depleting day by day in the fast pace.. In total 34 VDCs of Sankhuwasabha, only five VDCs are counted for their Allo production and from where Allo is extracted and traded in maximum volume. These VDCs are Yafu, Mangtewa, Tamku, Bala, and Sisuwakhola. Allo is harvested/extracted from private forest; community forest, buffer zone community forest and national park i.e. Makalu Barun National Park of the district.

The mature Allo plants are thoroughly shaken to allow seed dispersal and then cut with a knife inches above the ground. The outer dead barks are removed and inner bark is peeled off. The dry bark is generally soaked for few days in water before peeling the bark. The harvested bark is sun dried for few days. The dried barks are made to bundles and stored in dry place. The bark is converted into the fibres and threads. The thread is then used for weaving cloths.

The plant demonstrates the presence of 5-hydroxytryptamine and histamine biologically (Rastogi and Mehrotra 1993). The fibre of *Girardinia diversifolia* contains 86.5 per cent cellulose and tannin. Similarly, the tender vegetative shoots and inflorescence are cooked as a vegetable. Roasted seeds are pickled. Roots are diuretic, aperients and tonic. The ash of the plant is applied in cases of ringworm and eczema. The root is mixed with *Centella asiatica* (Ghodtapre) and boiled for about 10 minutes, strained, and the liquid—about four teaspoons twice a day—is used to treat gastric trouble. The juice of the root—about six teaspoons twice a day—is used to treat constipation. Fresh leaf juice is applied to treat headaches and joint aches. It is also considered to be useful in fever (HMGN/ MFSC/DMP 1982, Manandhar 2002). The leaves are also used as tonic for cattle and root paste is applied on swellings (Ghimire et al. 2008). Warm root juice is given to the drunk for cooling effect in Dang (Rajbhandari 2001).

Changing circumstances led higher demand of fashionable products of Allo. Hence the residents of Sankhuwasabha started to harvest it extensively for weaving different materials to fulfill outsiders/tourists' demand. As a result, natural stands have been declining despite the rules and regulation of the forest user groups, as they open for harvesting only from September to December (Shrestha, 2000).

The users have been applying local knowledge and implements for processing baste, for spinning and weaving. There is little information on ethno-botany, processing, weaving, marketing, and domestication practices. Therefore, identification of the existing situation needed for better planning research and development works, for management and sustainable utilization to meet the increasing demand.

The national and global status of *Girardinia diversifolia* is not known. Its status in Nepal is not threatened and is abundant throughout the sub-Himalayan tracts of Nepal. The bark is harvested from national forests with the permission of DFO paying NRs 5 per kg as revenue. Premature and over harvesting of Allo to fulfil the commercial demand are the identified threats for its sustainability. People used to harvest Allo immediately after the monsoon and sell (to fulfil their needs during Dashain; the greatest festival of Nepali people) without paying much attention towards the sustainability. Forest fire, open grazing and anthropogenic activities like clearing the forest for cultivation are other factors affecting the sustainability in the wild.

Harvest time and technique: Allo become harvestable after fruiting during August-October (*Bhadra Ashwin*). Collectors prefer to harvest Allo during winter because the cold reduces the stinging effect. The collected plants should be thoroughly shaken to allow seed dispersal. The plants are cut with a knife inches above the ground and put in a *doko*[32]. Forceps are used to hold the stem. Alternatively, collectors wear gloves during harvesting to be protected from stinging bristles. Allo harvested without uprooting the roots can regenerate well in next year and further it was observed that the proper harvesting increases the vitality of plant and improves the quality of fibre.

[32] *Doko:* local weaved basket often made from Nigalo (*Drepanostachyum falcatum)*

Harvest intensity: As Allo is a widely available herb; its harvest is often carried out without resource inventory. But resource inventory is necessary for the sustainability and maintaining healthy population in the wild. The collection areas are divided into at least two blocks and mature plants are allowed to harvest from a block in a year. 90% of mature Allo can be harvested from a block, as per the guideline published by DoF for NTFPs. Harvest quantity and collection area needs to be altered if natural hazards like erosion or forest fire destroys the natural population.

Trade, Demand-Supply and Supply Chain of Allo

The national production of Allo thread is around 1805 tons per year (MEDEP 2010). Half of the production is consumed within Nepal whereas half are exported to third countries. The demand of Allo woven clothes is high in international market and it is a prime souvenir product of Nepal. Still there is no exact data on the quantity of Allo collected, processed, and traded in Nepal. This is because the trade of Allo is not recorded in its name rather it is in most cases recorded as 'other products'. The traders and producers in Shankhuwasabha complained that they have been facing lots of export problem due to the lack of its recognition in sthe trade list.

Table 7:1: The quantity of Allo traded in five development regions in three fiscal years

Allo traded in fiscal years (in Kg)	Eastern Development Region	Central Development Region	Western Development Region	Mid-Western Development Region	Far Western Development Region	Total
2068/069	0	0	8386	26855	0	32,241
2065/066	0	4425	3900	48692	7764	65581
2063/064	0	100	5100	42516	1005	18140296

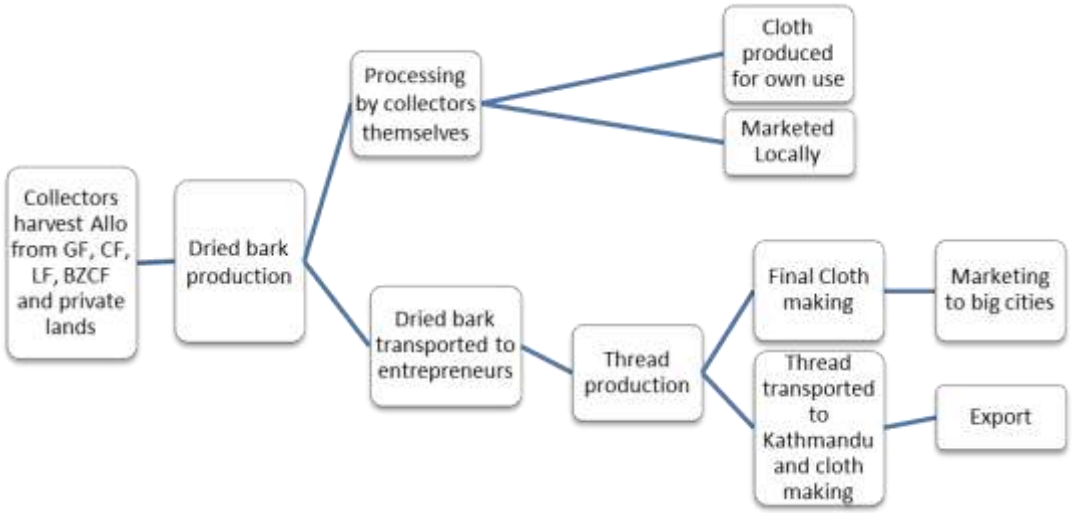
Source: GoN/MoFSC, 2069, 2065, 2064

The table 7.1 shows that the quantity of Allo trade is zero in Eastern Nepal. But in practice, thousands of people belonging to Kulung Rai community in Sankhuwasabha district alone are working in Allo which is equally applicable in Solokhumbu district. It indicates tht the official figures are unrealistic because the information vis-à-vis the Eastern Region is completely wrong.

Though the official data do not show Sankhuwasabha district as Allo traded district, this district is one of the prime destinations for all the marketing actors involved for supply chain of Allo yarn, thread and value added products. Sankhwasabha is pioneer in innovating various process upgrading mechanism for commercial trade of Allo. The Allo products in Sankhuwasabha districts are highly demanded and traded in Kathmandu and other countries of the world especially in Europe. However, the demands of the Allo products are traded or supplied from different parts of the country.

The trading of Allo starts with collection of bark from forests and ends with export. There are three tiers of actors viz. micro, meso and macro level players in the value chain. At the micro level, there are the collectors, thread and cloth makers, wholesalers and retailers. At the meso level there are CFUGs, Local Forest Users Group (LFUG), Buffer Zone Users Group (BZUG) and Allo Cloth Association. At the macro and policy level, there are institutions such as the Department of Cottage and Small Scale Industries (DCSI), Department of Forests (DoF) and the Ministry of Industry, Commerce and Supplies (MoICS), which formulate and implement policy. A simplified supply chain for Allo thread and cloth making in Nepal is presented in figure 7.1.

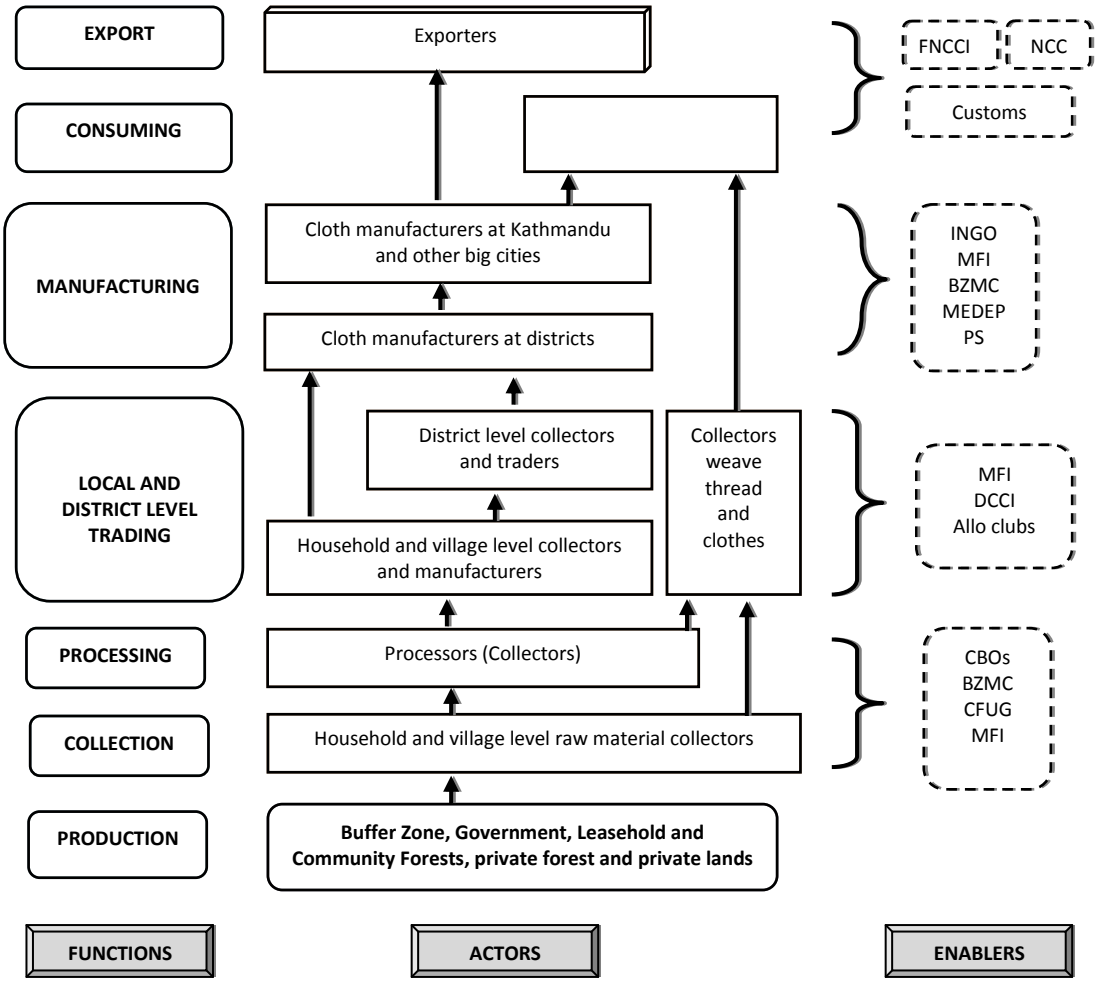
Figure 7:1: Supply Chain of Allo thread and cloth (Size of box does not represent the volume).



Functions of Allo Value Chain Actors

Understanding of the different functions of the value chain actors of Allo production and trade and their interrelations is very important for identifying crucial areas of interventions and supports to promote and add value in their production and market chains. In general, there are five levels of actors in the whole value chain of Allo product. They are raw material producers and collectors, processors, traders, manufacturers, and exporters. The figure 7.2 presents the value chain map of Allo products in Nepal. The function of actors is given in the left corner and area of intervention for enablers is given in the right corner of the figure.

Figure 7:2: Value Chain Map of Allo products



Collectors: Collectors in this chapter refer to those people who collect the Allo-bark or raw materials from the forest. Collectors can also be regarded as the Allo bark extractors. Allo bark is collected from the nearby CF, GMF, BZCF, NP and PF by collectors using traditional weapons such as sickles. They cut down the Allo plant and leave it there for some minutes so that the prickles will not hurt them during bark extraction and transportation. Collectors collect only the bark of the Allo plant leaving the solid, rigid stem making the back pack (Bhari) light for extraction from the forest to their home. In context of CF, extraction time is fixed especially from mid-October to mid-December (Mangsir to Poush), the CF allows its member to enter the CF for Allo bark collection. Collectors cut down the Allo bark to their capacity i.e. they cut down whole day and night. It is learned that a collector cut down or extract up to 25 kg of Allo bark in a day. The permission is given by CF only after payment of certain amount (NRs 5 per kg) by the collectors. The collectors collect the bark to their home and use or sell it as per the market condition. If they have to stock it then they will dry it in courtyard and store it. However, if fibre is to be produced immediately, then they will use it without sun drying. The collectors do trade not only Allo extracted from the forest, but also *Jakhilma* (coarse fibre) and thread; it depends on collectors. Most of the collectors have

learned to trade the Allo in thread form. Collectors sell out the Allo thread individually and also through groups (*Allo clubs*) to make the trade simple, easy, efficient and economical. These collectors sellout their product to different traders and enterprises in district headquarters or district trade centres. For example, the collectors and manufacturers in the villages sell out their products to the traders in Khandbari Municipality.

Processor/ Manufacturer/ Producer: The processors buy the Allo bark, *Jakhilma* or thread from the collectors or in some cases collectors themselves form a group and start processing the Allo barks. For example, in Sankhuwasabha district, processors themselves are the district traders. They process the Allo bought from collectors and then produce thread and weave out clothes and trade themselves to regional and national city-markets, especially in Kathmandu. It is usually observed and seen that the collectors collect Allo and process them and sell-out thread to the cloth manufacturer or producer. For example, Dilli Kulung, who is regarded as the pioneer of Allo profession in Khandbari municipality of Sankhuwasabha district, functions as one of the processors/manufacturers as well as traders of the Allo products in the district headquarters. She mostly purchases Allo products i.e. Allo bark, *Jakhilma* and thread from Bala, Sisuwa, Tamkhu and its adjacent VDCs through different known and unknown local collectors. It was said that one household or one family generally supplies nearly 15-16 *Dharni* Allo thread (approximately 35-40 kg). She purchases approximately 9 Dharni Allo product in which Allo thread holds almost 90 percent of the purchase every year from the collectors. According to her, the transportation fare is too high costing about 2 hundred rupees per Dharni i.e. 1kg = NRs 80. She doesn't trade thread and other raw Allo product but supplies finished products such as scarf, shawl, hanky, plasma, cloth etc. to the capital city. She said almost 30 percent value is added when the products are traded to Kathmandu. Overall, she sells 10-15 lakhs worth finished Allo product every year in Khandbari and Kathmandu market.

Traders: Traders trade out the clothes prepared by the processors outside the district. For example, it deserves mention that the traders in Sankhuwasabha district only trade finished Allo products and the processors themselves are traders. However, if they have to trade outside district, they are helped by the collaborative institution called "*Himalaya Allo and Suti Cloth Industry*" (HASCI). The motive of this industry is to provide an easy market and reasonable price to Allo products in the district by supplying the collected Allo products to Kathmandu. The industry acts as a collection centre of the Allo products in the district and Allo products from different VDCs are collected by the industry and supply as per the demand from market. At present the HASCI along with other development sectors has introduced automatic thread making machine which is in the process of installation in Sankhuwasabha district. This machine automatically produces specified Allo thread. So, it could be said that a single value chain actor of Allo products has multiple functions in the value chain.

Exporters/Producers: The exporters and manufacturers in Kathmandu city collect and manufacture different products. They sell their products in the domestic markets or to the exporters. Exporters purchase quality products and sellout to the third countries, especially in the European markets and to thebuyers there. The Allo products are therefore known as one of the best exported indigenous products of Nepal. Allo clothes that worth NRs 4.76 million is exported from Nepal in one year period between 2011-2012 and 2012/013 (FHAN: 2011/2012-2012/2013).

Enablers: Enablers of Allo value chain in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. The activities of the enablers include collection to end use of the prodcuts, advocacy for simplifying trade policy

and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. There are three specific locations where Allo is found: (a) Location governed by DFO (CF, GMF, LF etc.); (b) Buffer zone area and National Park area; and (c) private land and private forest. The roles and functions of regulatory organization depend on where do the Allo barks are collected from. It is easier for Allo bark collection from private forest and private land, and community forestry; however there are still legal barriers for collection from buffer zone and National Park area. For example, the collectors and traders in Shankhuwasabha responded that the Buffer zone area and national park area of the district is rich in the availability of Allo but after the declaration of Makalu Barun National Park, the local people have been facing lots of problems in collecting and trading of the Allo raw materials. Moreover, the traders in the district headquarters complained that they are frequently confronting problem in exporting the end products to Kathmandu in the security check-posts such as in the Tumlingtar airport. They complained that Allo is not clearly listed as tradable products and hence they often get trade permit as "others". As a result, the security personnel always harass them labelling itas illegal or untradeable goods.

Table 7:2: Anticipated role of facilitating and regulating organizations to move Allo in the market chain

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CFUG, BZMC, NP
Royalty Payment	DFO, CFUG, BZMC, NP
Checking and weighing	Range Post or CFUG, NP
Release order or transit permit	DFO, NP, DDC
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Export recommendation, product certification and export permission for selected natural products	DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/ DCCI, NCC
Export Permission and duty	Customs Office of exporting country
Import Permission and duty	Customs Office of importing country
Market information	TEPC, AEC, ANSAB
Financial Support	NGOs, Cooperatives, Commercial Banks
Processing technology	DCSI/ CSIDB, Private companies
Resource management and Research	DPR, DFO, CFUG, NGOs, Consultant, NP,
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Economic Aspects of Allo Products

Allo and its products are getting highly commercialized in Nepal. Thousands of people are making out their living and earning through Allo production, collection, processing, manufacturing and trading. But the earning of the individuals depends on where and how much time is spent in this occupation.

Labor Costing of Allo Processing:

Yields of dried fibre are around 600 kg per hectare (Pyakurel and Baniya 2011). Plant fibre is extracted in commercial scale in most of the hilly districts (Bajhang, Rolpa, Pyuthan, Rukum, Baglung, Sankhuwasabha etc) of Nepal. Allo is traded either in raw (dry bark) or semi processed (coarse fibre) or processed (cloth) form. Dried bark is traded approximately at NRs 90 per kg, coarse fibre is traded at NRs 400 per kg, thread is traded at NRs 600 per kg and handmade cloth (generally mixed with 50% cotton) is traded at NRs 600/meter.

Being a seasonal plant, collection of Allo bark is carried out for two months (60 days) only. A collector can collect about 25 kg of fresh bark per day (from 100 kg green plant) but the quantity of harvest depends upon the availability of the resource in the wild. The quantity is generally reduced to one fifth after sun drying; therefore, 5 kg of dried bark is collected per day. It exemplifies that the maximum amount that can be collected by an individual per year (within a period of 60 days) is about 300 kg. Thus in an average, if a collector collects Allo bark throughout the season (60 days) and sells at the rate of Rs 90 per kg, then s/he may earn NRs 27,000 for two months (per day=NRs 450; per month=NRs 13500).

One man/day is required to produce 1.5 kg of fibre from dry bark. This includes soaking in water, cooking, washing, drying, beating and cleaning. If a person involves him/herself for 8 months (240 days) in fibre making, s/he can produce 360 kg fibre and earn NRs 144,000/year at the present rate of NRs 400/ kg (per day= NRs 600; per month= NRs 18000).

About 2.5 persons/days are required to produce 1 kg of thread from fibre. If a person involves him/herself for 8 months in thread making, s/he can produce 96 kg thread and can earn NRs 57,600/year at the present rate of NRs 600/kg (per day = NRs 240; per month = NRs 7200). Knitting the Allo thread is therefore not an economically viable option and it is recommended for processors to sell the coarse fibre rather than selling the yarn or threads (ANSAB 2010, MEDEP 2010).

About 7 meters of cloth can be woven from 1 kg of Allo thread and 0.9 kg of cotton thread. One person can weave about 2 meters of such cloth per day. If a person works for 8 months, s/he can weave about 480 meter of cloth, requiring 69 kg of Allo thread. The cost of production (excluding the fixed costs) would be around NRs 44,000 (including cost for 69 kg Allo thread and 65 kg cotton thread) and selling price would be NRs 288000, a total profit of NRs 244,000 for period of eight months (NRs 1000 per day; NRs 30,000 per month).

Processing of Allo:

Processing of Allo bark for the manufacture of fibre includes the following processes:

a) Digesting/cooking: The dried barks are soaked in water for one to two days prior to cooking. Bigger barks are separated by hands to make them smaller. The barks are put into copper vessel containing boiled water and ash or *Kamero*[33] and keep boiling for 3-4 hours. Generally, 5 kg of dried bark is boiled with 7-8 kg of ash or *Kamero*.

[33] Kamero: White soil consisting lime

About 10-12 kg of firewood is required to cook the 5 kg bark. The fibre is relatively soft when boiled with Kamero. The bark is left overnight in the copper vessel after cooking. Cooking time is reduced to just two hours for freshly collected bark. Alternatively, improved cooking method is proposed and adapted in some districts. The barks are soaked in water with 4% Sodium Hydroxide and 0.5% Sodium Sulphide and cooked for two hours. This type of digestion consumes less firewood (almost 40% less) and further the fibres are soft and relatively clean. But community prefers to cook bark using ash because it does not make the hand rough.

b) Beating and Washing: The cooked barks are cleaned in water by continuously beating. Wooden mallet is used for beating. Cleansing requires a lot of water therefore cleansing is generally carried out in streams and tributaries. It will take four hours to clean 5 kg of bark and in turn yield 1 kg fibre. A person can wash up to 18 kg of bark in a day.

c) **Cleansing**: The washed bark are mixed with paddy husk or maize flour or in a white clay solution and dried in sun for 5-6 hours. The process will soften the fibre and bring extra whiteness. The coarse fibres are again cleansed by beating and rinsing in water. Finally, the fibres are separated manually. It takes many days for a man to clean a kg fibre.

d) Bleaching: A mixture of 200 gram Calcium hypochlorite and 200 gram Sodium bicarbonate is poured in 20 litre water and 1kg woven thread is kept in the solution for 24 hours. The threads are washed until the smell of chemical is completely washed away. This process will remove the black spots and other attached particles from the thread and the thread truns into dull white. Alternatively, bleaching can be done by soaking the thread on 2% Calcium hypochlorite solution for 2 hours. The threads are wasted thoroughly and sulphuric acid is mixed in water to make 0.005% solution and soaked the thread in this solution for another 1-2 hours. For the final bleaching process, the threads are dipped for three hours in warm (70^{o}C) about 20 litre of hydrogen peroxide solution. The thread finally attains white colour.

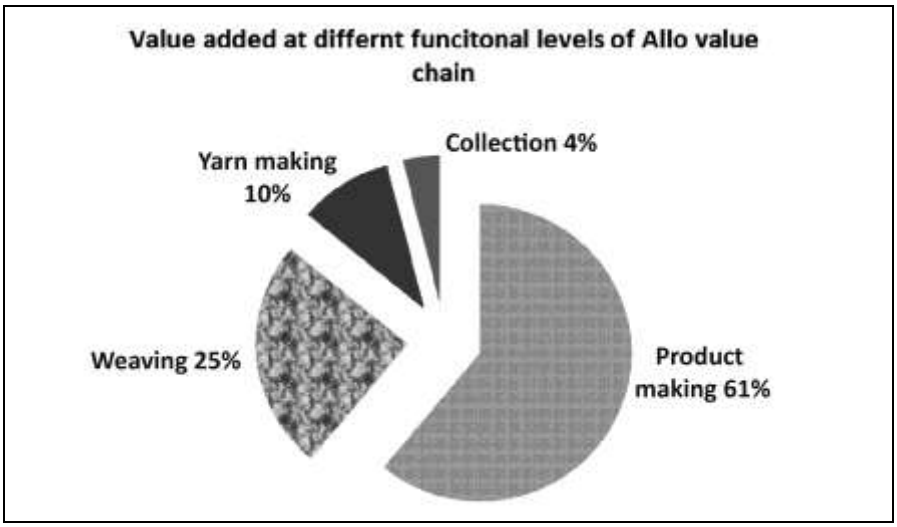
e) Spinning: The spinning is either done with self constructed hand spindle made of wood or with spinning wheel. Spinning with the hand spindle is slower than the wheel but the hand spindle is preferred because it is light enough to carry and women find it handy and suitable for spinning during their leisure time or during other activities (Thapa, 2003). It will take one man days to weave thread from *Charkha* for 1.5 kg fibre. The threads are either sold to the entrepreneurs or collectors themselves weave to make coarse clothes.

f) Weaving: The bleached white coloured threads are coloured using natural or chemical dyes. The threads are sometimes mixed with cotton thread to make the fabric smooth. Two persons are required to fix the loom (weaving machine). The fitness of the yarn depends largely on the skill of the spinner and also on the quality of the fibres. The yarn thus spun is woven on a back-strap loom.

Value addition:

The net (of intermediate inputs) value added at different levels of operation shows the product making and retailing stage capture the most value in the chain (61 percent). Based on the final retail price of product corresponding to one kg of yarn (NRs 3,600) the value addition at different stages are calculated to be NRs 150 (4 percent) at collector's level, NRs 350 (10 per cent) at the level of yarn making, NRs 900 (25 per cent) in weaving activity, and NRs 2,200 (61 per cent) at the level of product making.

Figure 7:3: Value added at different functional level of Allo value chain

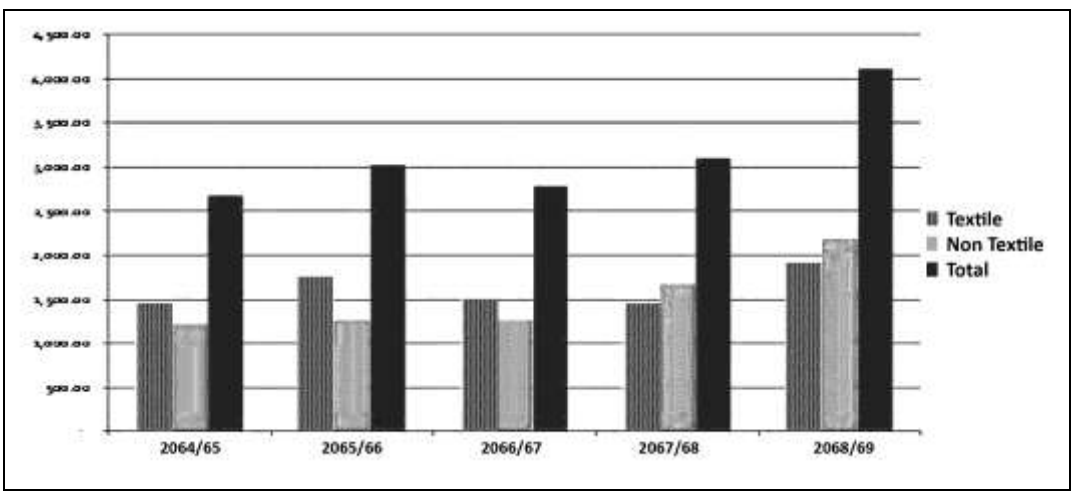


Source: MEDEP 2010

The figure 7.3 indicates that the incomes of chain operators can be significantly increased through gradual shift to higher value added activities notable to the level of weaving fabrics and product making.

The export of handicraft product in Nepal has been increasing in recent years. The major increment is found in textile subsectors. The textile subsector comprised of: Woollen goods, pashmina products, felt products, cotton goods, silk products, hemp goods, Dhaka goods, Allo goods and some others.

Figure 7:4: Export trend of handicrafts



Source: Adhikari et al. 2012

For the fiscal year ended on July 15, 2012, Nepal's handicraft exports grew by an impressive 32.31 percent from previous fiscal year. Nepal's handicraft export grew on account of enhanced participation of Nepali handicraft makers in international trade fairs, and an

escalating value of US dollar against the Nepali rupee. In textile sector, pashmina exports for the period grew by 10.89 per cent year-on year, cotton goods by 53.59 per cent, silk items by 79.11 per cent, hemp goods by 49.18 per cent and Allo goods by 90.74 per cent. However, exports of Dhaka products declined by 17.29 percent (FHAN 2011-2012 and 2012-2013). However, based on this figure it could be said that Allo products and exports must be increasing in the recent times. The finished products of Allo are exported to different international markets. The use of Allo in carpet industries in Nepal has also increased in recent times. There is still lack of data on annual consumption of Allo thread by carpet industries.

SWOT Analysis of Allo:

The identification of strengths, weaknesses, opportunities and threats (SWOT) of any products would be helpful in understanding the situation, define and decide future actions or interventions for its improvements; it would be value addition in VCA. Therefore the SWOT analysis of Allo production, processing, collection, manufacturing and trade, taking place in Nepal, is important for VCA.

Table 7:3: Strength, Weakness, Opportunities and Constraints of Allo

Strength	**Weakness**
• Dried barks, coarse fibers, threads and clothes all have good markets; • Good demand in national and international markets; • Market of local product exists in local level; • Good attraction amongst tourist as souvenir products; • Found abundantly in forests; • Rare infestation of diseases and pests; • Favorable geo-climatic condition and possibility of natural re-generation; • Immediate cash flow for pro poor from Allo based enterprises;	• Market of Allo thread is low compared to that of coarse fiber despite thread making needs more effort; • The production of all fiber at local level is not cost effective; • Existing technologies are simple but time consuming and tedious which needs improved technology to process fiber from dried bark; • Inadequate quality control that leads to the Inconsistent quality of threads that finds hard to meet the international demand and at the same time find hard to compete with products of big cities;
Opportunities	**Threats**
• Possibility of high value addition within the country; • Increasing use of Allo in carpet industries; • Interest of various organizations in Allo promotion; • Income generation opportunities for women; • New technologies are being researched by various organizations in each process of Allo processing; • Plenty of scope to manufacture high quality products (finer threads);	• Allo based enterprises are forfeiting Allo based work due to tedious work; • Dependent on import of chemical (dyes) from India; • Might lead to deforestation due to increased demand for fuel wood to process Allo;

Source: Field Consultation, 2013/2013

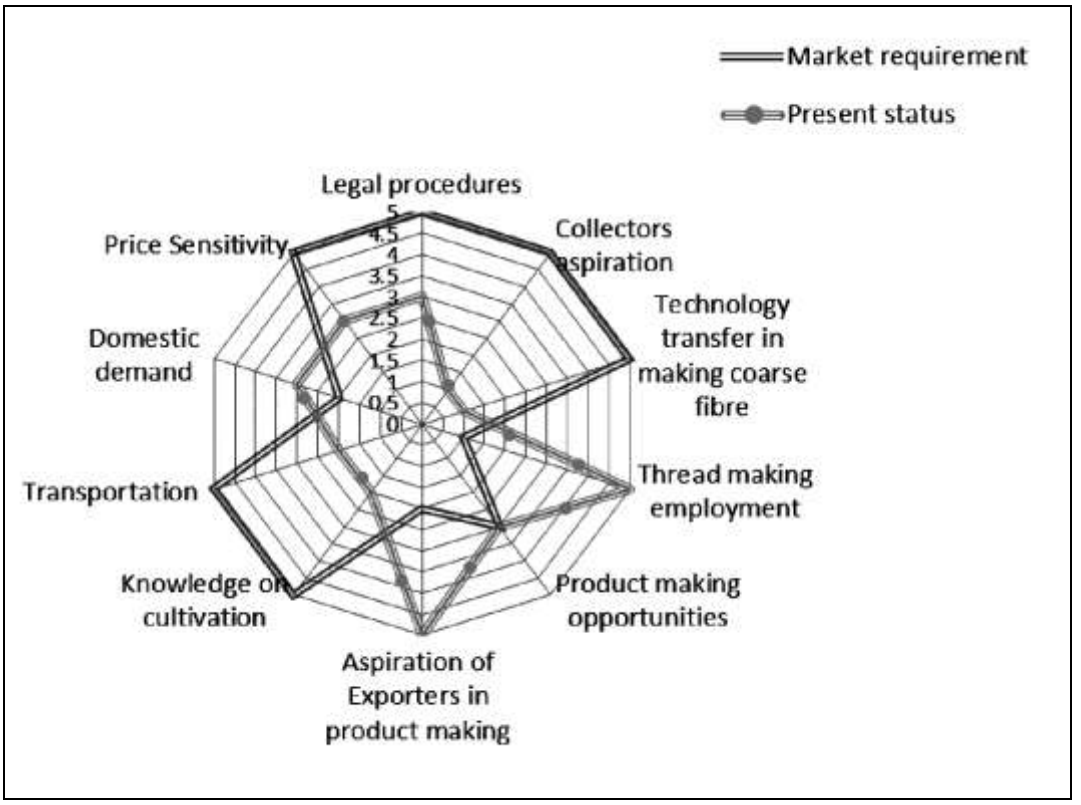
The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Value Chain Upgrading Strategy of Allo

End Market Analysis:

The end market analysis of Allo products and its business/export would be helpful in understanding the existing gapes. This analysis is based on the information obtained by the methods adopted in this study (field visit and observation, consultation and interactions with stakeholders in Sankhuwasabha district).

Figure 7:5: Gaps between market demands and present status of Allo products



Source: Field Consultation, 2013/2014

The parameters presented in the figure 7.5 are further shown in its detail form in the table 4 below. The information on different parameters obtained from the field has been categorized into 5 levels.

Table 7:4: Parameters used to analysis end market strategy of Allo VCA

Parameters	1	2	3	4	5
Collectors Aspiration	Highly negative	Negative	Average	Positive	Very positive
Thread making employment	Very less	Less	Average	More	High
Product making opportunities	Very less	Less	Moderate	More	High
Aspiration of exporters in product making	Very less	Less	Moderate	Positive	Highly positive
Price Sensitivity	Worst price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers	Best price negotiation between buyers and seller
Domestic Demand	Low demand	Limited demand	Moderate demand	Good Demand	Mass demand
Domestic Supply	Low supply	Limited supply	Moderate Supply	Good Supply	Mass supply
Knowledge on cultivation	Inferior	Less	Moderate	Good	Excellent
Transportation to Kathmandu	Very high cost	High cost	Moderate cost	Low cost	Very low cost
Legal procedures	Illegal trade	Some Practices of legal trading	Moderate practice of legal trade	Maximum practice of legal trade	All legal trade
Technology transfer in coarse fibre making	Traditional Technology	Appropriate Technology used in one process (production, processing, product development)	Appropriate Technology used in more than one processes	Technology used in all the processes and meeting national quality demand	Technology used in all the processes and meeting international quality demand

Source: Field Consultation, 2013/2014

The major gaps between market requirements and present status of Allo production and trade in Nepal, presented in table 7.4, are further discussed below. This discussion is mainly based on the stakeholder consultation in Sankhuwasabha district for Allo value chain analysis.

Aspiration of collector's decreasing and immediate need for transfer of technology to make coarse fibre: The collectors who also extract coarse fibre from Allo are not motivated enough due to tedious processing of making coarse fibre. They are following traditional practice of processing which is time consuming and that also deteriorates the quality of Allo fibre. There should be research on best practices for cooking Allo bark (including best vessel where it can be cooked) along with appropriate beater machine for making quality Allo fibre. Most of these collectors (who also make coarse fibre) are at present showing less interest in this business.

***Thread making employment is p*otential to decrease if technology is developed for thread making:** The recent intervention of development vectors by including automated thread making machine at field level can potentially decrease present thread making households. There are large numbers of household who are involved in thread making. The opportunity for these household has to be foreseen. The best possible solution can be upgrading their function to product (making starting from Allo cloth by using improved Tan).

Product making opportunities and aspiration of exporters: The thread making machine intervention has brought product making opportunities for the people involved in Allo value chain. There can be situation where present Allo thread making household can shift towards product making. Yet the discussion at present with exporters revealed that they are more interested in Allo thread and Allo cloth from which they can design various products themselves. The product making opportunities at present seems stagnant and also willingness to provide more value addition at local level is not much appreciated by exporters. Exporters are in dilemma to outsource value added product development at local level due to lack of uniform quality on the one hand and on the other, due to less availability of extra entities for product making.

Knowledge on cultivation: Since Allo plant is naturally regenerated every year, there is lack of practice of its cultivation. At present collectors/ farmers are interested in cultivation of Allo in CF, BZCF, and LF. Best practices on Allo cultivation have to be trained to the farmers.

Transportation highly costlier: In many cases transportation of final product has become very difficult and expensive for local producers and traders. For example, the product from Sankhuwasabha district is supplied to Kathmandu by using air transport. This is highly costlier in comparison to road transport. There should be initiative to send the product through road transport by fulfilling all the required legal procedures. Moreover, the Allo product is not listed as separate tradeable forest product and hence traders and exporters face frequent problems and obstruction in the security and trade check-posts.

Low domestic demand so depends on more supply: There is very less demand in domestic market for Allo products. This is due to high cost and lack of product diversification to suit domestic customer. There should be assessment of domestic demand and strategy to develop product that suit domestic consumers.

Price Sensitivity: Exporters and other marketing actors have strong supply chain of their own. For example, traders based in Sankhuwasabha district headquarters have their own supply chain of their products. From their point of view, Sankhuwasabha has best quality product along with best price to offer. Still, it has not been assessed whether the profit margins are high in product making. If this is the case, there need to be functional upgrading of existing households who are selling Allo bark, Allo coarse fibre or Allo thread to Allo product making.

Legal procedures: Allo is found abundant in National park and buffer zone areas. But the National park authority does not allow collection of Allo rather there is a Buffer zone authority and its own laws to be followed for the collection and transportation of Allo from and through buffer zone area, which is complex and difficult for the traders and collectors. Similarly, there is some existing practices of legal trade through community forest (by paying royalty for collection) but inventory of resources along with documentation on CF operation plan is absent in most of the CFUG and BZCF. Also, manufacturers are getting legal hassle regarding exporting of Allo product to Kathmandu market.

1. Firm Level upgrading strategy:

The gap analysis through spiderogram has been a path way for developing value chain strategies to move forward. The strategies are made in different parameters like: Product upgrading, process upgrading, function upgrading, channel upgrading, and intersectoral upgrading. These are discussed in the following sections.

a) Product upgrading: After assessing the experiences of various organizations and in depth discussion with exporters, the most important product in Allo value chain has been identified as ALLO THREAD. There has been already an intervention from a development sector in introducing automatic thread making machine. Now, focus has to shift from what impact (positive and negative) this automatic thread making machine will bring to existing people working in Allo value chain. Thus the focus now shift on developing more producers in Allo product making and bringing appropriate technology for making coarse fibre. Similarly, the diversification of products so as to increase local consumers would be another part of product upgrading.

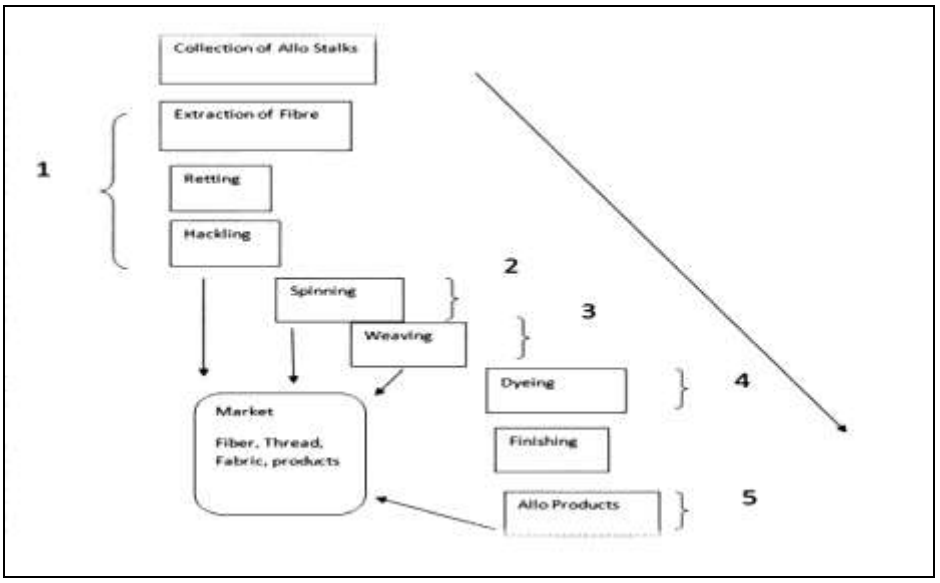
Table 7:5: Product upgrading based on four parameters of Allo products

Parameters	Present	Year 1	Year 2
Product	• Allo bark; • Allo fibre; • Allo thread ; • Allo product making;	• Allo thread making through automated machine; • Allo product making (cloth) from those who earlier were making Allo thread;	• Allo thread making through automated machine; • Allo product making and product diversification (through subcontracting);
Price (based on present price)	• Allo bark: NRs 50-60; • Allo Fibre: NRs 600; • Allo Thread: NRs 600;	• Allo thread will be little less price due to machine use; • Competitive product development (due to decrease in Allo thread price);	• Competitive product development (due to decrease in Allo thread price);
Place	• Kathmandu through air transport;	• Kathmandu through road transport;	• Domestic market penetration through road trasportt;
Promotion	• Strong perception regarding quality thread	• Strong perception regarding quality Allo cloth;	• Strong sub contracting linkages for product diversification;

Source: Field Consultation, 2013/2014

***b) Process* Upgrading:** The process upgrading refers to the whole process from collection to fibre making, thread making, cloth making and product development. The whole processes could be levelled into five stages: raw material extraction; spinning of raw materials into threads, weaving cloths; dyeing and finishing the cloths; and make quality and quantity final products so that the products are marketable.

Figure 7:6: Major steps from collection to marketing of Allo products



The whole steps of processes upgrading could be presented into the different levels of actions (existing practices, recommended practices, technological transform, and anticipated benefits) in a tabular form. These are presented in the table 7.6.

Table 7:6: Process upgrading matrix of Allo products

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/Technology used and cost	Anticipated benefits
Upgrading 1: Allo fibre making	Traditional practice	Appropriate technology has been found to be used by Buddhanilkantha based enterprise for Allo fibre extraction by using sugarcane machine	NRs 25,000 - NRs 30,000 (information being sought from Budhanilkantha)	Reduction in production cost
Upgrading 2: Thread making	Traditional practice; automated thread making machine has been presently transferred	Automated thread making machine best utilization	Automated thread making machine: > NRs 50,00,000	Increased quality and customized thread making
Upgrading 3: Weaving	Usage of Taan, focusing on those who are now making Allo thread	Improved Taan, Usage of power loom with linkages to FS	Taan: NRs 10000 - NRs 15000 Power loom: NRs 300000 –NRs 500000	Increased quality, increased efficiency
Upgrading 4:	Not available	Usage of natural	Composition of Majitho,	Natural

Dyeing		dye like Majitho, Turmeric etc.	Turmeric etc. with other composition	colour, premium prices
Upgrading 5: Product making	Not available	Focus on product making from those who are now making Allo thread (there is a danger for their business due to introduction of automated thread making machine)		

Source: Field Consultation, 2013/2014

The process upgrading of Allo products presented in the table 7.6 shows that there are lots of possible scopes and opportunities in improving its products and businesses in Nepal. However, introduction or transfer of the appropriate technology seems difficult due to the geographical condition and lack of development infrastructure, especially the road transportation and electrification, of the country which ultimately obstruct the easy reach to the outsiders.

c) ***Channel Upgrading:*** It was observed that the main producers and traders in the districts (Shankhuwasabha) have their out retail shops (or collection and demonstration centers) in the district headquarters. It was observed that some of the quantity of Allo production gets sell-out in the local market by traders themselves. While large sum of their products is mostly exported via air flights from Tumlingtar airport to Kathmandu. But traders do not rely and entertain the roadways for the export of their productions. So, the study recommends promoting the existing channel but encouraging and facilitating for the use of road transport.

d) ***Functional Upgrading:*** In this study, mainly the five layers of Allo value chain actors and their functions have been identified. Upgrading in their existing functions and roles would definitely upgrade and promote the existing volume and quality of products. The possible functions upgrading are presented in the table 7.7 below.

Table 7:7: Function upgrading matrix of Allo products

Actors	Present Function	Upgraded Function
Collector/ Coarse fibre producer	Collection from the wild and coarse fibre making	Coarse fibre making from appropriate technology usage (this technology has to be further research based on example of usage of sugarcane extraction machine)
Thread producer individual	Thread making	Product making from thread
Thread producer institutional	Machine installation going on	Thread making and marketing, subsidize thread to present Allo thread producer to make Allo cloth
Manufacturer	Simple and common products	Skills enhanced for diversification of products targeting equally to the local, regional, national and international markets and consumers
Exporter	Exporting fine Allo products	Exporter are interested in thread and are sceptical about Allo products (excluding cloth), they have to link for subcontracting for Allo based products

Source: Field Consultation, 2013/2014

e) ***Intersectoral Upgrading***: Allo collection is carried out in forest (private, Community, national, leasehold, protected area etc.) and mostly women groups are mobilized for Allo collection, processing and product making. These collectors can be trained in cultivation of other forest products such as Chiraito, Argeli, Satuwa and other products for additional income. The intercropping practices would also integrate women groups involved in the Allo related profession with male members in their family and society.

2. Interfirm Upgrading Strategy:

The Allo collection, processing, manufacturing, and trading have been taking place in its own pace, nature and extent. There would be some ways of interfirm upgrading for Allo products in remote areas of the country like Sisuwa and Bala VDCs of Shankhuwasabha district. Based on the observation and interaction in study area, following are recommended as possible ways for the interfirm upgrading.

a. Alliance between existing Allo thread producers and institution which are operating Allo thread making machine for subsidize Allo thread for product making;
b. Alliance between exporters and Allo product producers group for subcontracting;

3. Business Development and Financial Service Strengthening Strategy:

The discussion about Allo production and trade in this report clearly indicates the importance of BDS and FS for quality and quantity production. The assessment of Business Development Services (BDS) and Financial Services (FS) in this report has considered following two things.

a. Categorization of business service demand from beneficiaries (value chain actors) in four levels: very strong, strong, weak and very weak;
b. Categorization of supply side of BDS provider's in four levels: very strong, strong, weak and very weak categories;

Table 7:8: BDS and FS strengthening matrix for Allo production

SUPPLY SIDE OF BDS	Very strong				
	Strong				
	Weak		Value Chain financing	Training on product making	Market requirement about quality and price
	Very weak			Legal process of Allo trade and cultivation of Allo	Appropriate Technology Transfer for coarse fibre
		Very weak	*Weak*	*Strong*	*Very Strong*
		DEMAND OF SERVICES BY VALUE CHAIN ACTORS			

Source: Field Consultation, 2013/2014

For commercially viable business services of Allo production, some strategies would be required. The possible and potential strategies for catering required business services are presented in the table 7.9.

Table 7:9: Business service strengthening strategy

Services	Strategy
Inadequate market Information	• Provision of market information including design, through linkages with Saugat Micro -promotion Private Limited (SMPPL), SABAH Nepal and Fair Trader Group organizations;
Cultivation training	• Research on Allo cultivation practice and training;
Technology and Product Development	• Research on existing practices for Allo fibre extraction; • Technology transfer for Allo fibre processing from best practices in Nepal;
Legal process orientation	• Orientation on legal processes; • Advocacy for specific policies for trade of Allo products, and collection from Protected areas and Buffer zone;
Training on product development	• Embedded training delivery through subcontracting with exports for making Allo products;

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

The value chain actors are currently facing policy hurdle in Allo. There is lack of legal process in collection of Allo from buffer zone area and moreover, it is not allowed from protected areas. The problem facing by the collectors should be shared and discussed with other stakeholders, especially the government authority. Similarly, the orientation on the various policy processes for collection of Allo from GMF, CF and private land to the value chain actors (collectors, manufacturers and traders) would also be fruitful. The following issues would be the major concerns for business enabling environment upgrading strategies of Allo products.

a. Trade of Allo and Allo based products to Kathmandu and other market due to absence of specific policy and recognition regarding Allo product trade (it is mentioned under "other" criteria which is not specific).
b. Collection and transportation of Allo raw materials and from Buffer zones and Protected Areas (national park warden and authorities obstruct);
c. Legal processes and provision on registration of new enterprises (at least 3 km far from the forest area) and developing relation with financial institutions (no investments from banks and cooperatives);

It is recommended to have policy level dialogue at district level and discussed possible way for specifying policies for Allo based products. It is also recommended to work together with macro level organizations and advocate for favourable and specific policy for one of most promising exportable product of Nepal.

5. Sustainability Strategy:

Many of the places in Nepal could be promoted with brand image of specific and quality Allo products like souvenir and other gift items. For example, Sankhuwasabha brand image has increased due to Allo production and its trade to Kathmandu and international markets. The market, mainly the exporters are very positive towards the local producers, collectors and manufacturers because of the quality productions. It is important to maintain this brand image in long term. Now it is important for government line agencies and Nepal Chamber of Commerce and Industries (NCCI) to focus their support on this product. Present Sankhuwasabha district has identified herbs as ONE DISTRICT ONE PRODUCT[34] but has not included Allo as herbs. For sustainable business and positive growth of Allo products, now it is important to include this product in the list of herbs as ONE DISTRICT ONE PRODUCT. To sum up, many of the actors are still not considering Allo as most potential products in Shankhuwasabha district and due to that roles, functions and responsibilities of value chain actors have not been integrated to upgrade Allo as one of the sustainable forest product in Nepal in general and Shankhuwasabha in specific.

Summary of Allo Value Chain Upgrading Strategy

Based on the analysis of data and functions of the value chain actors, it could be said that Allo related products and marketing is one of the most viable forest products in Nepal through which the local economy (income and employment generation for people those who are dependent on forest resources and living in the rural areas) would be improved. Further, the study found that large number of rural people are earning their living and getting employments from this product and its products have been well sold-out and exported in national to international markets.

[34] http://www.aec-fncci.org/_pdf/ODOP%20final%20booklet.pdf

The value chain report is synthesized into some specific upgrading strategies. The identified and discussed upgrading strategies indicate that there are lots of scopes and spaces for promotion Allo products and its trades in Nepal. The upgrading strategies have focused on mainly five important strategies: a. Firm level Upgrading, b. Interfirm level upgrading, c. Business Development Services and Financial Services strengthening, d. Business Enabling Environment and e. Sustainability Strategy. The upgrading strategies have been further summarized into some specific actionable recommendations. The recommendations have mainly focused on the easing Allo collection from the forest areas, technology transfer for making coarse fiber, diversification of products and easing for its trade and export of final products.

Table 7:10: Recommendation for the upgrading strategies of Allo products

Upgrading Strategy	Recommendation
Product Upgrading	• Diversification of Allo product making (through subcontracting and skill transfer);
Process Upgrading	• Appropriate technology transfer for making coarse fiber; • Access to Taan for product making (with linkages to financial service providers);
Function Upgrading	• Skill and function transfer to downward actors such as Allo product making from existing thread producers;
Channel Upgrading	• Strengthen existing channel and facilitate road transport for Allo products trade to Kathmandu and other market centers;
Intersectoral Upgrading	• Cultivation and collection of other forest products such as Chiraito, Argeli and other NTFPs along with Allo;
Interfirm Upgrading	• Alliance between existing thread producers and Allo thread machine enterprise for subsidizing Allo thread for product making; • Alliance between exporters and Allo product producers group for subcontracting;
BDS+ FS Strengthening	• Provision of market information system; • Research on Allo cultivation and skill enhancements through trainings; • Orientation on legal processes for collection of Allo from CF, GMF, LF and BZCF; • Training on product development;
Business Enabling Environment strengthening	• Advocacy for specific policy on Allo based product trade to Kathmandu and other market centers; • Facilitate collection of Allo from Buffer zone and Protected Areas (with reference to the paradigm shifts in protected areas policies and priorities);
Sustainability Strategy	• Identify and place Allo with HERBs as ONE DISTRICT ONE PRODUCT;

Source: Field Consultation, 2013/2014

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Chapter 8[35]

Amriso (Broom-Grass): Widespread Cultivation Demanding for Value Addition in Processing[36]

Introduction

Amriso is one of the common NTFPs for domestic uses in Nepal. It is mostly used for two purposes: making broom and fodder for livestock (Howell, j. *et al*., 1991). Its cultivation is most common for people in Nepal, especially among the farming communities. This has become one of the important traded and exported products of the country. The commercial cultivation of Amriso has been increasing gradually in different parts of the country, especially in the hills and mountains. For example, most of the farmers in Terhathum, Sankhuwasabha, Dhankuta and Bhojpur districts are cultivating broom grass in their farmlands but in the different scales, such as many of them have been cultivating in larger areas for commercial purposes while some are just for the household consumptions.

Amriso is a perennial, high value, non-perishable cash crop for wide range of agro-climatic conditions. It is a multipurpose species which provides brooms, fuel, and fodder and has high soil conservation value. Amriso is commonly known as Broom grass, which is one of the most long lasting NTFPs. Once it is planted, it lasts for years. It belongs to the plant family of "*Gramineae"* or "*Poaceae".* Its scientific name is "*Thysanolaena maxima"* or "*Thysanolaena agrostis"*. It is an evergreen species which remains in culms having a maximum height of 3 m with leaves having 90 cm length and 8 cm width. Leaves are mostly sharp on both sides.

The details Value Chain Analysis (VCA) of the broom grass has been carried out for two purposes. The first purpose is to provide comprehensive value chain information for market and social benefits of broom grass whereas the second is for determining various constraints for its cultivation, market access, and potential expansion opportunities. The preparation of the VCA of broom grass is based on the data/information available in the reports (published and unpublished) and literatures – supplemented by the field visits and observation of broom grass producing farmers in Terhathum, Sankhuwasabha, Dhankuta and Bhojpur districts, collectors and exporters in Jhapa district, and interaction and consultation with different actors such as producers, traders, businessmen, policy makers, and government authorities in visited districts.

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Habit (Characteristics), Habitat and Distribution of Amriso

Broom grass is a large-leafed grass closely resembling a bamboo. It has broad culms, perhaps 1 cm in diameter, and leaves about 8 cm wide at their broadest, tapering to a point and about 50 cm long .The leaves are dark green and have a distinctive pattern of indentations running across them about two third of the way up. There are no branches from the stem and culms are not hollow, but apart from these features, it resembles a small stature bamboo. The culms can be a meter or more in diameter. The culms and flowers heads are up to two meters in height.

It has massive rooting systems similar to a small bamboo. This is common in the damper area of forest throughout Nepal. Despite its apparent preference for cool and damp areas, it grows well when planted on reasonably dry and stony sites. It can also be grown in some hot yet relatively humid areas, however it is not as tough as many other local grasses.

It can be propagated both by seeds and vegetative part but vegetative cutting is better. It can be transplanted by separating the shoot along with roots. Its flower is used for making broom, thin shoot can be used for fencing purpose and grass can be used for livestock feeding. Sometime Broom grass is given to cow/buffalo after the delivery to remove placenta in case placenta is not coming out naturally.

A Thysanolaena maximum is a glycophytic species distributed in temperate and sub-tropical areas. It is mostly found in Nepal, India, China, Bhutan, Burma, Malaysia, New Guinea, and in many other Eastern and South East Asian countries. It can be found at an altitude of 100m to 1900m from sea level having rainfall of more than 500 mm. This can also be planted from plain land Terai to 2000m altitude. This plant does not prefer frost and water logging and mostly prefers light and organic matter content soil. It prefers fertile, moist soil and grows better in sandy loam soil (Bhuchar, S.K., 2001).

Broom grass cultivation is available in almost all of the farming communities in Nepal. For example, of the total 32 VDCs in Terhathum district, almost all VDCs have cultivation of Amriso but VDCs such as Shrijung, Oyakjung, Pouthak, Morahang, Ambung, Jirikhimti, Sabla, Tamfula, Jaljale, Piple, Ishibu, Sandu, Khamlalung, Basantapur, Sungnam, Solma, Phulek and Okhre have notable cultivation and they sell broom grass to regional and national traders and exporters based at Dhulabari of Jhapa district. This is applicable in most of the districts in Koshi hill areas.

Cultivation, Uses, Trade and Product Flow of Amriso

Cultivation, harvesting and yielding processes of broom grass:

Cultivation of broom grass is comparatively easy and requires less financial inputs. It can be grown on marginal lands, wastelands and on edge of agricultural fields. It grows well on a wide range of soils varying from sandy loam to clay loam (soil pH: 5.3-9.3; moisture: 11.6-37.6%). The planting can be done by seeds or rhizomes. Some people also collect and transplant the wild seedling for propagation but it is recommended to get quality seeds from nurseries.

It can be propagated artificially through seeds, rhizomes and wild seedlings transplant. The seeds are generally available in March (*Chaitra*) from mature panicles (branched cluster of flowers). Small mother beds 2m x 1m are prepared and sowing is done by broadcasting 5g to 10g seeds in each bed. Seeds are covered with very thin layer of sand and the beds with thatch grass. Watering is done as and when required. The germination starts after two to three weeks of sowing. The grass cover is removed on germination of seeds and regular weeding and watering is done. After 4 to 6 weeks the seedlings are either transplanted to other beds at spacing of 10cm x 10cm or in the polythene bags filled with a mixture of soil, sand and farm yard manure in a ratio of 1:2:1. Watering and weeding is done regularly till the seedlings are ready for planting in field in the beginning of next rainy season.

The propagates/rhizomes (roots along with culms) are collected by digging of roots from wild or cultivated plants after harvesting the crop during February or March (Falgun-Chaitra). The culms are cut leaving 15- 20 cm long stem with roots and used for raising nursery as well as for planting in the field. Two to three culms along with bud sprouts and rhizomes are separated from clump and planted either in polybags or in field. The mixture of top soil, sand and farm yard/compost manure in 1:2:1 ratio is used for filling the polybags or pits. During transplanting the soil should have sufficient moisture for plant establishment. The plants are watered as and when required and kept in shade. The rhizomes are easy to transport to long distances for propagation as well as for plantation. The cut ends of culms can be dipped in melted wax to prevent drying and decaying. A small clump of rhizome having culms of 4 to 5 nodes is good for planting and almost cent per cent result is obtained by this method. The sprouted rhizomes are ready within three months for transplanting in the field.

The planting site must be clean and free from weeds. Thorough jungle cutting should be done before or during March and debris are either burnt or removed from the field. The pits of 30 cm^3 are dug out one month before the planting and left for weathering. A spacing of *2.5m x 2.5m* is the best for plain fertile land and 1600 seedlings are required for planting of one hectare area. While for hilly areas planting in contour lines or on the bunds of terraces at a

spacing of 1.5 x 2.0 m is good and about 2500 to 4000 plants are required for one hectare area. The compost manure and 10% BHC @ l0 gm per pit are mixed in each pit soil before filling and planting. The spacing may vary with the type of land being used for cultivation. However, good yield can be obtained when it is cultivated on fertile lands. It is generally planted at the onset of monsoon during May - June, when soil has sufficient moisture for plant establishment. Several culms sprout from each plant resulting into a clump of culms from every pit.

It does not require much care after planting. However, 3 to 4 weeding and soil working in the first year and three similar operations in subsequent years are necessary for obtaining good return. Compost manure can be applied in soil during second weeding to get better yield from the first year itself. Fencing is essential to protect the crop from browsing and grazing.

Brooms (inflorescences) are harvested on maturity during winter season from January to March (*Poush-Falgun*). The panicles become tough and its colour changes to light green or red. The harvesting should be done carefully when the brooms are matured properly. The culms are harvested by cutting above the ground, panicles and stem are disjoined. The panicles can also be hand pulled and dried in fields. The woody stem (culms) can be used for fuel, fencing, pulp and paper or other purposes. Young and newly sprouted shoots should not be damaged during the harvest. Brooms are made by bundling about 30-35 dried inflorescences and sold in the market. It is not a perishable product and can be stored or transported to distant places. The leaves are harvested for fodder once in the middle of monsoon (*Bhadra*) from second year onwards. To obtain high yield from broom grass, fields are burnt during April after harvesting the crop in 5th or 6th year. The propagates are again planted in June as per the method described earlier.

The yield of broom mainly depends on the quality of planting materials, fertility of land and cultivation practices adopted. The yield differs according to the age of the plant. The highest yield of up to 1.5 kg/plant is obtained from the flowers of 3-4 year old plants (Karki 2001).

Table 8:1: Estimated growth rates of broom grass cultivation

Headings	1st year	2nd year	3rd year	4th year
Number of culms per tussock	13-25	54-78	213-275	170-205
Height of tussock (Average meter)	1.56	2.38	3.26	3.1
Inflorescence length (Average meter)	0.96	1.13	1.23	1.15
Dry matter production tonnes/ha	5.41	8.9	10.4	9.2

Source: Bisht N.S. & Ahlawat S.P., 1998

The yield is low in the first and the fifth year. The highest yield is obtained in the third year. The maximum growth takes place from second year onwards when annual increment in number of culms per tussock is very high. The yield of broom mainly depends upon the quality of planting material, type of land and cultural practices adopted.

Uses of broom grass:

Amriso is a perennial, high value, non-perishable cash crop for wide range of agro-climatic conditions. It is a multipurpose species which provides brooms, fuel, and fodder and has high soil conservation value. The inflorescence is used for brooms, which many villagers sell in the urban market. It is said that some indigenous communities in Nepal, for example Chepangs in mid-hills, eat fresh leaf buds. Broom grass is usually available in large quantities from July to February and leaf is used as cattle feed in the period of fodder scarcity.

It has the comparative advantage of tolerance to harsh environmental conditions such as steep rocky mountain slopes, shallow soil, drought and high rainfall conditions. Therefore, it is suitable to grow on wastelands, as well as in homesteads. The fibrous root system of the plant is very useful in checking soil erosion on steep slopes. The broom sticks have also been tried by paper and pulp industries for manufacturing handmade papers. The cultivation of this grass can wean away the practice of shifting cultivation and reduce the dependence of people on forests.

Amriso is a perennial plant and it regenerates through seeds under natural condition. The seeds mature during *Magh* to *Falgun* and disseminate by wind to long distances due to their lightweight. Seed dispersal is also affected by water in some areas. The seed germinates in the beginning of the rainy season (*Ashar-Shrawan*). The seedling establishment and the growth is good on loose and exposed areas such as landslides and freshly disturbed soil specially near road construction sites where light availability is good. It also regenerates rigorously through rhizomes (vegetative propagation).

Trade of broom grass:

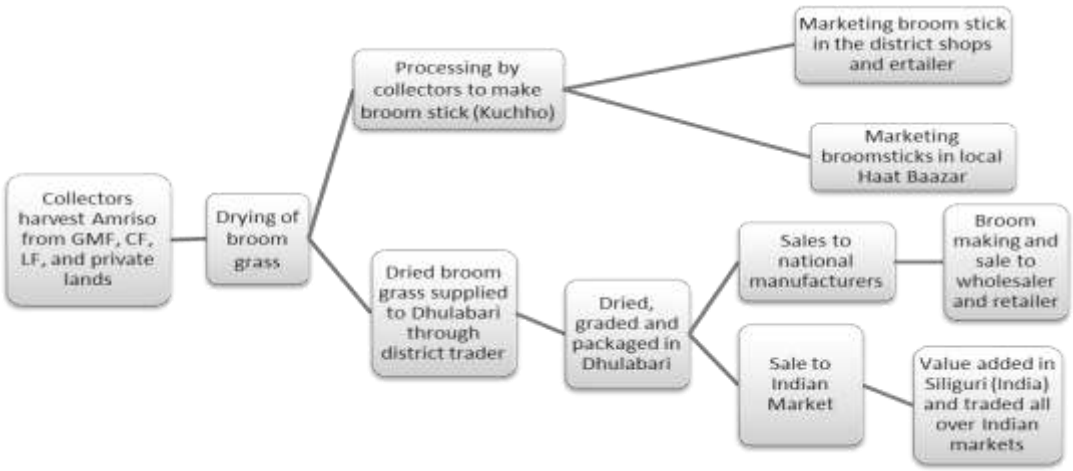
The cultivated broom grass is traded to the different market centers in Nepal. For example, the broom grass produced and collected in Koshi hill districts are traded to the exporters or traders based in the regional and national market centers, the Dhulabari bazar of Jhapa district. But broom grass sold to the regional traders is usually in raw form i.e. without making Broomstick (Kuchcho). The broom grass traded from these districts is exported to Indian markets and hence the broom grass producers and traders in Koshi hill districts are mostly influenced by Indian traders rather than Nepali traders. In short, monopoly market by Indian traders is seen in Amriso business. Nepali traders who collect, gather and store broom grass from the producers of different places of the country has to bear tough market condition due to monopolistic market situation created by Indian traders at Dhulabari.

According to the national traders and exporters of broom grass based in Dhulabari bazar of Jhapa district, the collection and exporting quantity of broom grass is rapidly increasing in Nepal. However, the official data generated and published by the Department of Forest are far less than the real quantity collected and exported by the exporters and traders. For example, it is recorded that only 6963 kg of broom grass has been collected and traded in the fiscal year 2068/069 in Nepal (MoFSC, 2069 BS) which is too less compared to the real production. The national production of Amriso is not known. However, the information collected from Kakarvitta custom office suggest more than 10,000 MT of broom grass is traded to India in the fiscal year 2069/70. This means there is huge gaps in the official data of DoF and custom office. This is because the quantity recorded must be only the broom grass collected from CF and GMF as they should get written permission to harvest it by paying NRs 2 for per kg as royalty. This means the broom grass cultivated and collected from private lands and forest are not included in this data.

Product flow of broom grass:

The trade of broom grass starts from the different VDCs in the districts. The farmers or the producers cultivate, extract and collect broom grass flower from their field and sell to the local and district level traders. The price negotiations take place between producers and traders. The local traders purchase in as minimal price as possible and transport either to the local and district traders or directly to regional and national traders at Dhulabari bazar of Jhapa district.

Figure 8:1: Supply chain of broom grass in Nepal



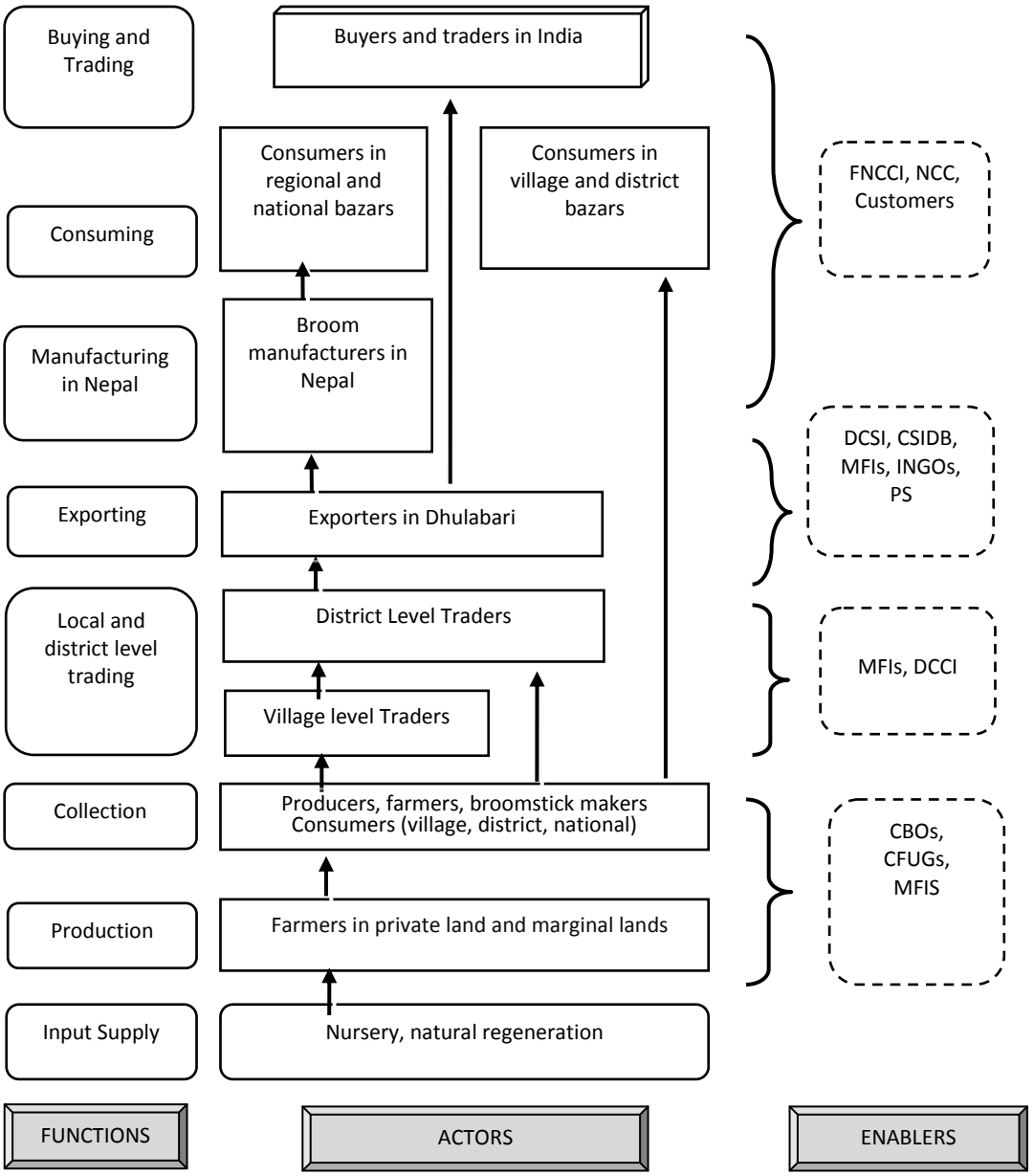
Source: Field Consultation, 2013/2014

The above figure (Figure 8.1) shows that the broom grass flowers produced by the farmers or cultivators reach to both national and international consumers and markets. However, the broom grass exported to India is traded in the raw form i.e. only in the form of dried and packaged form rather than the final product. This is because of the lack of skills and investment of national traders and exporters. In addition, the lack of proper market linkages and relations between Indian traders/buyers and national traders/exporters is also equally important.

Functions of Amriso Value Chain Actors

The numerous actors with different roles and functions are involved in the broom grass value chain. However, identification of these actors and their roles and functions is often difficult but crucial for identifying their upgrading strategies. Producers or farmers or cultivators, traders, manufacturers, and enablers are major value chain actors of any products and which is equally applicable in broom grass value chain. The function of these actors, in terms of broom grass, is discussed in the sections below of this chapter. Similarly, the value chain actors and their functions have also been presented in the simple diagram below (Figure 3) where the functions and roles of the value chain actors are presented in the left corner and area of intervention for enablers is given in the right corner.

Figure 8:2: Value Chain Map of Amriso



Source: Field Consultation, 2013/2014

The functions and roles of major broom grass value chain actors are discussed below.

Producers: Producer refers to those people who cultivate broom grass in the fields. The broom grass is generally cultivated in private lands, CF areas, LF area and GMF in some places of the country. However, broom grass cultivation in FUGs area, LF area and GMF area is very less compared to the private lands and private forest. The farmers or cultivators either borrow seeds or seedlings or purchase from nearby broom grass cultivator. They don't care

or work on cultivated areas as this species grows vigorously under limited favourable condition. Broom grass is harvested by the producer in winter months i.e. Mangsir, Poush and Magh. The farmers sell the flower of the broom grass. The remaining stem of the plant locally named *Dhakhla* is not used yet for commercial purposes (for example, it was said that the stems of broom grass could be used for producing papers). The produced broom grass flower is sold to local brokers or traders who collect from producer of nearby VDCs and trade in large quantity.

Traders: Traders of Broom grass flower have diverse roles such as the collector, gatherer, and transporter, and seller to the national traders or exporters based in Dhulabari bazar of Jhapa district. The field study at Terhathum district highlights that each VDC possesses an elite trader who collects all the broom grass flowers from the particular VDC and trades in large quantity. Traders usually are local people, who collect the Broom grass flower from the nearby producers in the villages and store at some particular places if required and transport directly to Dhulabari bazar. The price of Broom grass is influenced by the price at Dhulabari bazar determined by Indian traders. There is no any fixed price rate of Broom grass flower rather it is totally depended on the market condition in India. The price may rise and fall at any time. Kendra Sangraula, who is a trader based on Lasune village of Terhathum district, reveals that he collects the Broom grass flowers from Solma, Sungnam and Phulek VDCs either directly from producer or through village traders. He purchased 70 to 80 MT Broom grass flowers last year. He bought it from the producer of the VDCs at a rate of NRs 70 per kg and sold out at the rate of NRs 80-90 per kg (unstable price rate). His expenditure includes transportation cost i.e. for 10 MT of Broom grass flower (one truck) to be transported to Dhulabari. He paid NRs 30,000 for transportation and NRs 3000 as transport tax, commission by police, gangs etc.

Exporters: Exporters are situated in Dhulabari bazar and they export collected Broom grass flowers to Indian traders or buyers. The product is further value added in Silguri (broomstick making) and some of the products are again imported to different parts of Nepal. The Broom grass flower is also traded to Delhi. There are different model of broom-stick sold in different states of India. The Silguri/Delhi based

manufacturers supply artistic broom-sticks according to the market demands. Selling or business of Broom is generally high during a festival (Laxmi Puja, which generally falls in October or November) and at that time every household purchases at least one new broom.

Enablers: Enablers of "Broom grass value chain" in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. The anticipated role of facilitating and regulating organisations for the proper functioning of value chain is presented in the tabular form below (Table 8.2).

Table 8:2: Anticipated role of facilitating and regulating organizations to move Broom in market chain

Major Activities	Regulatory functioning organizations
Collection	DFO, CFUG,
Royalty Payment	DFO, CFUG
Checking and weighing	Range Post or CFUG
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Export recommendation, product certification and export permission for selected natural products	DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/DCCI, NCC
Export Permission and duty	Customs Office of exporting country
Import permission and duty	Customs Office of importing country
Market information	Traders
Financial Support	NGOs, Cooperatives, Commercial Banks
Processing technology	DCSI/ CSIDB, Private companies
Resource management and research	DPR, DFO, CFUG, NGOs, Consultant
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Economic Analysis of Amriso

Broom-grass cultivation is increasingly developing and promoting as one of the profitable enterprises in Nepal. A tentative cost for cultivation, yield and economic returns could be estimated for understanding its economic potentials. However, it may vary according to labor efficiency, wages, soil fertility, cultural practices, market price and demand, and access to markets.

Table 8:3: Expected yield and income from the cultivation of Amriso in one hectare area

Yield (in per hectare land area)	1st Year	2nd Year	3rd Year	4th year
Average yield of culms/tussock	18	60	225	180
Total yield of culms (from 1600 tussock)	28800	96000	360000	288000
Total number of brooms (Average 35 sticks/broom)	822	2740	10285	8228
Total income @ NRs 35 per broom (farm get price)	28770	95900	359975	287980

Source: Pyakurel, 2012

The plantation has a rotation of 6 years in which 5 crops are taken annually. Its cultivation can generate approximately NRs 29,000 (farm get price) in the first year from one hectare and maximum income generation is estimated to be NRs 360,000 in the third year per hectare. The profit can be raised further if brooms (final saleable product) are processed by the cultivator themselves. The planting and establishment costs can be saved to a great extent if the individual/farmer and his family members take up the works themselves.

Table 8:4: Cost for cultivation and land development of Amriso in per hectare land area

S. N.	Items	Cost (NRs)
1	Land preparation (10 persons @ NRs 300)	3000
2	Digging of pits 30 cm^3, 1600 no. (10 persons @ NRs 300)	3000
3	Compost manure (10 tons @ NRs 500/MT)	5000
4	BHC @ 10g/pit	1500
5	Seedling / propagates cost (NRs 4/seedling)	6400
6	Weeding for two to three times (20 persons @ NRs 300)	6000
7	Harvesting and drying (10 persons @ NRs 300)	3000
8	Making bundles, transportation and miscellaneous	5000
	Total cost of cultivation in the first year	32900
	Maintenance cost in 2nd and subsequent years (per years)	10000

Source: Pyakurel, 2012

According to the estimated calculation, the maximum profit is gained in the third year. The total estimated benefit from the initial four years is given below (in Table 8.5), however the leased land is assumed as provided in free of cost and further the cost of family labor is not included in it.

Table 8:5: Estimated profit and loss for initial four years from Amriso cultivation

Year	Profit or Loss	Estimated Net Profit loss (in NRs)
First	Loss	4000
Second	Profit	86000
Third	Profit	350000
Fourth	Profit	278000
	Total NPV up to four years	

Source: Pyakural, 2012

Net Present Value (NPV) can be described as the "Difference Amount" between the sums of discounted; cash inflows and cash outflows. It compares the present value of money today to the present value of money in future, taking inflation and returns into account. The Net Present value is NRs 4,90,558 and the Benefit cost Ratio (BCR) for Broom grass is 11%.

Table 8:6: Net Present Value calculation @ 12% interest rate

Years	1	2	3	4	Total
Cost	32900	10000	10000	10000	62900
Income	28770	95900	359975	287980	772625
Discounted cost	29375	7972	7118	6355	50820
Discounted income	25688	76451	256223	183016	541378

Source: Pyakurel, 2012

The broom grass demand is high from the traders but supply has not been able to meet the market demands due to problems such as low market price when sold by the farmers or the producer and unidentified disease which has been gradually reducing the production quantity. Similarly, the price of the Broom grass is also unstable in the market which causes both the producer and trader to bear loss. Day to day fluctuation of the price has harsh effect on trader who trades in huge quantity. For example, according to the traders in Terhathum district, the price was increased from NRs 50 to NRs 95 per kg within few month time period in the past.

Value addition of broom grass is done by making brooms which are made by bundling about 30-35 dried inflorescences and sold in the market. Brooms are required in each house, therefore, it has sufficient demand throughout the country and marketing is not a problem. There are only few farmers who do value addition activities from their levels. For example, the farmers in Oyakjung VDC of Terhathum district manufacture Brooms and sell it to retail shops in district headquarters and in Haat Bazar in Terhathum, which is increasing additional income and creating additional job opportunities.

Table 8:7: Strength, Weakness, Opportunities and Constraints of Amriso in Nepal

Strength	Weakness
Production: • Climatic suitability and traditionally Cultivated; • Rural communities attracted by prospect of its cultivation and marketing; • Grows well in marginal and sloppy lands; ***Marketing:*** • Well-established value chain and availability of traders at different levels; • High demand at the markets; ***Enabling environment:*** • Government focus as an IGA; • Availability of research and extension services;	***Production:*** • Lack of proper knowledge and techniques in cultivation and nursery management; • No solution to the problem of broom grass flower disease; ***Marketing:*** • Lack of collective marketing practices; • Lack of reliable market information; • India as a sole market; ***Enabling environment:*** • Insufficient infrastructure –inputs, credit and quality seeds; • Insufficient broom grass marketing awareness and knowledge;
Opportunities	**Threat**
Production: • Opportunity to increase area and productivity; • Availability of quality seed production; • Option for international markets; • Large scale demands and further scopes for enhance supply	***Production:*** • Famers' production pocket areas decreased or stopped due to the unexpected flower diseases; ***Marketing:*** • Very dramatic price fluctuation;

Enabling Environment: • NGOs providing supports to farmers; • Provision of incentives in national budget for processor/exporter to minimize their costs; • Government highlighted Value chain aspect of commercialization in Three-years Interim Plan (2010-13)' • High potential for reducing poverty and employment creation through value chain;	

Source: Field Consultation, 2013/2014

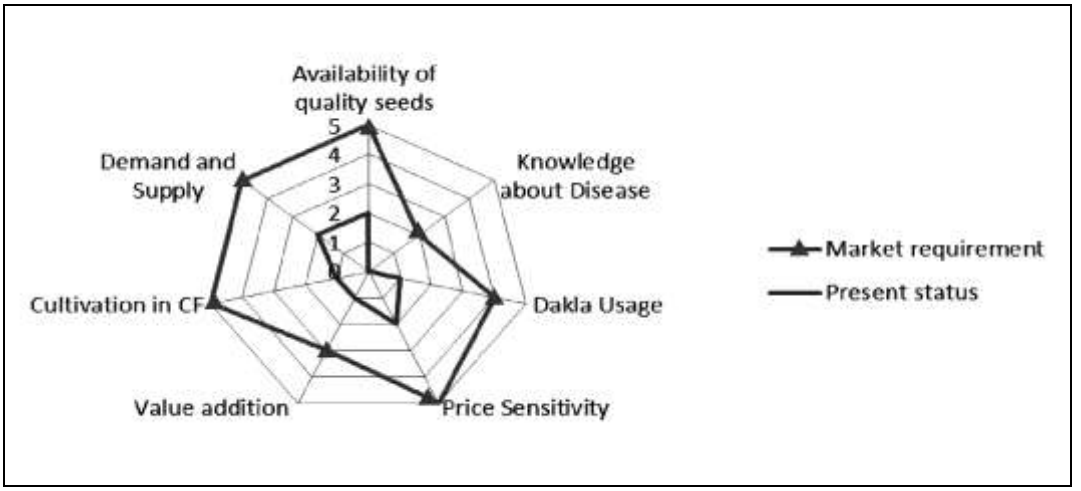
The identified strengths, weaknesses, opportunities and threats indicate that commercial cultivation of broom grass is economically viable and socially compatible. However, there are some practical hurdles for its smooth progress. The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Value Chain Upgrading Strategy of Amriso

End Market Analysis:

Status of the end market of broom grass is compared between the 'present status' and 'market requirements'. The present status and market requirement of broom grass are compared on the basis of seven aspects.

Figure 8:3: Comparison of present status and market requirements of amriso



Source: Field Consultation, 2013/2014

The comparative analysis of present status and market requirements clearly shows the wide gaps in almost all aspects of compared variables. The comparison is based on the different ranking of parameters and these parameters are presented in the table below (Table 8.8).

Table 8:8: Parameters used to compare present status and market requirements of amriso

Parameters	1	2	3	4	5
Price Sensitivity	Worst price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers	Best price negotiation between buyers and seller
Availability of quality seed	Low supply	Limited supply	Moderate supply	Good supply	Mass supply
Domestic Demand (Blue line)	Low demand	Limited demand	Moderate demand	Good demand	Mass demand
Domestic Supply (Red line)	Low supply	Limited supply	Moderate supply	Good supply	Mass supply
Knowledge about Disease	Inferior	Less	Moderate	Good	Excellent
Dakla Use	Not in use	Less	Moderate	Good	Excellent
Value Addition	Selling un-dried broom grass	Selling dried broom grass	Making broomsticks	Making broomsticks in commercial scale	Making broomsticks as per market demands in India
Cultivation in CF	Very less	Less	Moderate	High	Very high

Source: Field Consultation, 2013/2014

The major gaps identified in this study are further described below.

Availability of quality seeds: Farmers are searching for quality seedlings for broom grass cultivation. There is lack of research on quality seedlings even though there is availability of various seedlings. However, the indigenous practices of cultivation prevailing in some places, for example in Terhathum district, has become the source of knowledge for producers in other places. Farmers have to depend on external sources for seedlings for cultivation. They are purchasing in expensive prices and lack knowledge about nursery establishment and cultivation. There is immediate requirement of nursery management of broom grass and quality supply of seedlings.

Knowledge about diseases: There is recent trend in high infection of flower disease in the production area. The production of broom grass is interrupted by this unidentified disease which particularly attacks the flower, making it fragile and disintegrates due to small shake. The knowledge about diseases is still lacking amongst farmers, even agro-vets, and traders. There is still absence of appropriate plan and protection measures to mitigate the disease problems in broom grass cultivation. Diagnosis and proper solution of the unidentified disease of broom grass can boost production quality. Locally, people called *Phoolango* to the disease that is damaging their cultivated broom grass. Stakeholders also stressed about the lack of appropriate and timely supports from Government and non-government organization in value chain development of broom grass.

Usage of Dakla: Dakla, the remaining portion of broom grass after flowers (i.e. stems) are extracted, is not used due to lack of knowledge and appropriate market access. Dakla, which can be used as raw materials for handmade paper, has economic value that could generate additional incomes for the producers. Dakla can be worth NRs 7-8 per kg. Optimal management of Dakla can be done by supplying it to nearby paper and pulp industries.

Price sensitivity: The price of broom grass varies from NRs 25 to NRs 90 per kg depending on market demands. There are some cases where producers do not sell broom grass due to lower price. Instead, they use it to feed their livestock. This is due to the monopolistic market of broom grass by Indian traders. Most of the broom grass in Eastern region of Nepal is exported to India (Silguri and Delhi) through Birtamod bazar based traders. Due to the lack of access to finance, the producers are unable to hold their products to wait for the best price in one hand and in other there is only limited number of farmers who are carrying out value added activities. There is less bargaining power of producers due to lack of collective marketing and ability to hold the product. The study also revealed that there is lack of trust between farmers and traders about quality and pricing of broom grass at present time.

Value addition: The trade of broom grass in producer's levels is carried out in raw form. There is absence of drying, grading and packaging of the products in district level whereas only few farmers are making broomsticks to sell it to retail-shops in the district headquarters and local haat-bazars. Huge quantity of broom grass is traded from Nepal to India and ironically lots of broom sticks are getting imported from India to fulfil the national demands. Discussion with value chain actors revealed that there is possibility of *Kucho* (broom stick) production within country and export to India. This requires functional upgrading at all level along with technical assistance and access to financial services for *Kucho* enterprise. There are already strong linkages of district based traders with national traders and buyers/traders in Indian markets such as Silguri and Delhi.

Cultivation in CF: There is high potential for cultivation of broom grass in CF area, GMF areas, private lands and private forest in Nepal. This initiative could be carried out in different places and scales to increase its production and meet the market demand. The broom grass can be grown vigorously and can be cultivated with minimum care and effort. So, its cultivation helps for income generation of disadvantaged groups to achieve better livelihood. Farmers also use bare lands for its cultivation.

Demand and Supply: There is increasing demand of broom grass in Indian markets. The Indian government is supporting its farmers for the commercial cultivation and production of broom grass in different parts of India. Nepal might face competition with Indian production in terms of quality and supply. At present, the discussion with exporters in Dhulabhari bazar of Jhapa district revealed that there is fluctuation demand of broom grass from India (in some case there is abrupt decrease in export as in 2012). The possible way to develop *Kucho* in Nepal could be used to cater national demand and demand of various states and bazar in India.

1. Firm Level Upgrading Strategy:

The identification analysis of gaps between present status and market demands of Broom grass is very important for developing path way for moving value chain strategies forward. The firm level upgrading strategies further analyzed into five aspects: product upgrading, process upgrading, function upgrading, channel upgrading and intersectoral upgrading. They are discussed in brief in the following sub-sections.

a) Product upgrading: After assessing the value chain dynamics of broom grass, the end market actors (exporters) are willing to provide more value added activities at producer or farmers' level. The exporters invest huge amount in drying, grading and packaging of collected broom grass to make it exportable to India. They are interested in if drying, grading and packaging functions could be carried out at farmer's level. The exporters are also highly interested to export *Kucho* to India if value addition can be carried out at farmer's level.

Table 8:9: Product upgrading based on four parameters

Parameters	Present	Year 1	Year 2
Product	Raw broom garss	Dried, graded and packaged	*Kucho* manufacture
Price (based on present price)	Raw broom grass: NRs 90 (maximum) for per kg during high demand	Dried, graded and packaged broom grass: NRs 110-120 (by value addition)	NRs 25-35 per *Kucho*
Place	Export raw broom grass to Dhulabari	Export dried, graded and packaged broom grass by farmers to Dhulabari	Export to dried, graded and packaged broom grass to different markets in India and Dhulabari by district headquarters based traders and exporters
Promotion	N.A	At least one VDC in each districts supplies dried, graded and packaged broom grass	At least one VDC of each districts supply *Kucho* products

Source: Field Consultation, 2013/2014

b) Process Upgrading: The process of broom grass trading starts with collection and ends with export. But the process mentioned here focuses on process of value addition in the due course of its processing.

Figure 8:4: Major steps applied in processing amriso

Source: Field Consultation, 2013/2014

This is identified that there are six major steps of broom grass processing. The upgrading strategies of these six processes are most important and some possible strategies are identified and presented in the table below (Table 8.10).

Table 8:10: Process upgrading strategies of amriso

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology used and cost	Anticipated benefits
Upgrading 1: Sun drying	Dried in sun for very less time	Sun drying in mass scale	Holding capacity for sun drying	Increased in quality
Upgrading 2: Grading	Absent	Grading of broom grass as per market demands	Grading knowledge	Variant in price as per grade
Upgrading 3: Packaging	Absent	Packaging of graded broom grass	Packaging knowledge, packaging in appropriate bags such as Jute	Increased quality and ready to export
Upgrading 4: Kucho manufacturing	Very limited	Practices of *Kucho* making in commercial scale with existing *Kucho* producers	*Kucho* making knowledge and access to extra entities for product making	Value added at farmers level

Source: Field Consultation, 2013/2014

c) Channel Upgrading: The present trade of broom grass related products is going in its own pace and which is smooth in terms of cultivation, collection, and trading.

III. ***Present trade channel***: Product by farmers – to district traders – to Dhulabari based traders – to Indian traders….

IV. ***Recommended trade channel:*** The study recommends promoting the existing trade channel but carry out more value added activities at farmer's level.

d) Functional Upgrading: The identification of major actors in the broom grass value chain and their existing roles and functions have remained most important parts of this study. Based on the study and analysis of the roles and functions of the value chain actors, some upgrading strategies have been recommended.

Table 8:11: Recommendation for functional upgrading of amriso value chain actors

Actors	Present Function	Upgraded Function
Farmers	Cultivation in fallow and marginal land; Sale of raw broom grass without drying, grading and packaging	Cultivation in agriculture land, CF, LF, GMF and nursery management; Trade of dried, graded and packaged broom grass; Trade of *Kucho*
Village level traders	Buy broom grass from farmers and sale to district traders	Dried, graded and packaged broom grass and produce quality *Kucho* and sale to district traders and retailers
District level traders	Buy from farmers or village level traders and sale to exporters in Dhulabari	Buy dried, graded and packaged broom grass from farmers/village traders and trade to exporters in Dhulabari or direct to Indian markets (like Silguri, Delhi); Buy quality *Kucho* from farmers and sale to exporters in Dhulabari or direct to Indian markets (like Silguri, Delhi)
Exporter	Export broom grass to India after drying, grading and packaging	Export value added broom grass through same supply chain; Search/ explore *Kucho* market in India and manufacture and supply quality *Kucho* as per requirement of traders in Indian markets

Source: Field Consultation, 2013/2014

e) Intersectoral Upgrading: The broom grass cultivators and collectors can be trained in quality and demands based *Kucho* making for additional income. They also can be trained in different handicraft making skills from various fibres that are available in the districts.

2. Interfirm Upgrading Strategy:

The interfirm upgrading of broom grass could be carried out by building alliance between the actors in different scales and levels. The possible strategies for interfirm upgrading through alliance building are given bellow.

c. Alliance between existing broom grass producer with broom grass based national and regional networks (Dhulabari based traders have established their national association);

d. Alliance between producers, district level traders, and national exporters for envisioning and implementing product upgrading strategies mentioned in above sections;

3. Business Development and Financial Service Strengthening Strategy:

The assessment of Business Development Services (BDS) and Financial Services (FS) in this study has been done on the basis of the following categories.

c. Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;

d. Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 8:12: BDS and FS strengthening matrix for amriso

SUPPLY SIDE OF BDS	*Very strong*				
	Strong				
	Weak		Value Chain Financing	*Kuchho* Making; Access to other entities for *Kuchho* making	Linkages to paper producers for sale of Dakla
	Very weak			Broom grass seedlings	Nursery management Information of disease
		Very weak	*Weak*	*Strong*	*Very Strong*
		DEMAND OF SERVICES BY VALUE CHAIN ACTORS			

Source: Field Consultation, 2013/2014

The commercial viable business services for the above services requirement can be catered as:

Table 8:13: Amriso business service strengthening strategies

Services	Strategy
Linkages to paper producers for sale of Dakla	• Interaction and network development between paper producers and broom grass producers; • Coordination and linkages with HANDPASS, FHAN, MAHAGUTHI and other national traders and producers for research on Dakla usage in paper and market demand;
Kuchho making	• Market research on various demand of *Kuchho* in Indian markets through Dhulabari based exporters; • Lobby on policy advocacy for decreasing custom charge for entities to be used for *Kuchho* making; • Buy back arrangement between exporters in Dhulabari and farmers for *Kuchho* making; • Training in *Kuchho* making as per market demands;
Broom grass Seedling	• Support lead farmers on nursery management through coordination with DoA and DFO;
Disease control in broom grass	• Documentation of diseases on broom grass; • Linkages with DoA, DFO, NARC for further research on disease control;
Value chain financing	• Broom grass based loans for farmers from cooperative and MFIs to hold broom grass for value addition

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

The business enabling environment in broom grass looks relatively better compared to other NTFPs in Nepal. However, the broom grass value chain actors require some regulations for smooth trading, especially they are demanding for suitable business enabling environment.

a. Less taxation for entities for making *Kucho* at national level. The Government of Nepal has high taxation of entities for *Kucho* making; this hinders competitive advantage of *Kucho* in Indian market.

b. Value chain actors are not getting budget or support on broom grass from government line agencies and it is important that there should be allocation of budget from VDC, DDC, DFO, DoA on the promotion of broom grass in the production and traded districts.

5. Sustainability Strategy:

The discussion with value chain actors revealed possible function upgrading at all levels. This is very encouraging as exporters in Dhulabari are willing to trade dried, graded and packaged broom grass from farmers' level. Another positive point is the establishment of broom grass based national association and its expansion in districts where broom grass is cultivated, produced, collected and traded to the national traders. The strategies mentioned in this report are aspiration of value chain actors and if this is implemented through participation of exporters, district traders and farmers (of at least one VDC in each production district), this initiative can be replicated in other VDCs of the production districts.

Summary of Amriso Value Chain Upgrading Strategy

The study tried to explore the present status of broom grass cultivation, harvesting and its market and identified the constraints and opportunities within its current value chain system. And based on these, the possible strategic recommendations for intervention for further development and improvements have been presented.

The value chain analysis of broom grass, concentrated on six upgrading strategies, has focused on identifying the roles and functions of value chain actors and then discussed about the possible upgrading strategies. The value chain upgrading strategies of broom grass indicates that the production, collection, trading and exporting activities are well established business in Nepal. However, there are some scopes where a simple supports and interventions will up-scale its production, marketing and businesses. For example, the simple supports to the farmers and producers for the value addition, viz. drying, grading and packaging, of their products are most essential and demanded by its value chain actors. Similarly, the production of broomsticks or Kucho is also equally potential value addition that could be done on the farmers or producers level. These forms of value addition works definitely lessens the burdens of traders in district and national level so that they will start thinking and doing of further higher level value addition (such as exploring better markets, technology innovation and introduction for international standard quality productions) in the broom grass business.

Table 8:14: Summary of the amriso value chain upgrading Strategies

Upgrading Strategy	Recommendation
Product Upgrading	Dried, graded and packaged broom grass production in the first year and quality *Kuccho* manufacturing in second year in the farmers' levels
Process Upgrading	Drying, grading and packaging of broom grass; quality *Kuchho* manufacturing
Function Upgrading	Functional upgrading of farmers, district traders and exporters for trade of dried, graded and packaged broom grass from VDC level
Channel Upgrading	Usage of existing channel but with value additions in all levels
Intersectoral Upgrading	Income generation through production and sales of handicraft from available other fibers
Interfirm Upgrading	Alliance between farmers, district traders and exporters through broom grass based association
BDS+ FS Strengthening	Linkages to paper producers for sale of Dakla; quality *Kuchho* making training and research; Nursery management and access to quality seedlings; Research on disease control and awareness to farmers; Value chain financing through broom grass based loans for farmers
Business Enabling Environment strengthening	Advocacy for reducting taxation for entities for making quality *Kuchho;* Advocacy for allocation of budget for broom grass value chain by development agencies
Sustainability Strategy	Implementation of value chain upgrading in leadership of broom grass based association

Source: Field Consultation, 2013/2014

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Chapter 9[37]

Lokta (Daphne Bholua): Widely Commercialized but Limited Investments for Sustainable Conservation and Management[38]

Introduction

Lokta is one of the evergreen or deciduous shrubs found in temperate regions. This is hence one of the common shrubs found in the northern belts, the middle hills and mountain regions stretching from west to the east, in Nepal. Lokta is one of the non-wood forest products. It is called "*Nepali Paper Plant*" in English and known with multiple names such as "*Seto Lokta, Seto Baruwa, Baruwa, Kagaj pate"*. Its botanical name is "*Daphne Bholua and Daphne Papyracea*". It falls in the "*Thymelaeaceae*" plant family.

The production of paper, commonly known as 'local paper' or 'Nepali paper' or 'Nepali Kagaj', is most common use of Lokta plant. This plant has been a source or raw materials for hundreds of paper producers in local to national levels. Moreover, the dozens of paper craft industries/companies, operating in Kathmandu valley, have been producing high quality paper crafts and exporting them to the different countries in the world, especially in the Europe. Hence, this plant is one of the important means and sources of local and national economy in Nepal.

This product is selected for the details study so as to provide a comprehensive VCA of Lokta and its products, including both market and social benefit evaluation. This study expects to discuss and understand various constraints for market access of Lokta products explore its up-scaling options and provide stakeholders recommendation for potential expansion opportunities within the value chain. The study is based on both the primary and secondary information. The secondary information was obtained from the available VCA reports, other published and unpublished reports, and related literatures. Likewise, the primary information has been obtained from field visits and observation in some produces, retailers, and traders in Sankhuwasabha, Bhojpur and Terhathum districts. The further primary information has also been obtained from the interaction and consultation with the stakeholders in the districts including the government officials.

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Habit (Characteristics), Habitat and Distribution of Lokta

Daphne bholua is an erect or spreading evergreen shrub, reaching heights up to 6m but mostly smaller than 3m. Leaves are alternate, very short stalked, elliptic to oblanceolate, entire, dull green, leathery, and hairless. Flowers are white, flushed pink or purplish externally, borne in terminal rounded stalkless clusters, and give out a sweet-scent. Fruits are ellipsoid in shape and fleshy, orange in colour at first and then deep red when fully ripe. Flowering occurs from October/November to April/May, and fruiting from March/April to June (Polunin and Stainton 1984, Ghimire *et al*. 2008 a).

Daphne bholua is a shrub that tolerates shade and grows as an under storey shrub in moist places. The plant generally grows on moist north-east facing slopes and prefers humus rich loamy clay and well-drained soil. It can grow in acidic and neutral to slightly basic soils. Its growth is denser and gregarious in moist conifer and broad-leaved forests of the temperate Himalayas at middle elevations. *Daphne bholua* does not tolerate very dense canopy. Conversely, it grows easily in open forests or pastures (Ghimire *et al*. 2008 b).

The plant requires partial shade with about 30 per cent canopy cover (Branney 1994). It is distributed all over Nepal within an altitudinal range of 2000m to 4000m. It is distributed from Sikkim to north-east India to west China. Distribution range of *Daphne bholua* varies in Mountain and Hilly areas of Nepal from east to west. For example, Sankhuwasabha district in East Nepal where many VDCs are well known for Lokta production and cultivation such as Chepuwa, Powakhola, Num, Matsyapokhari, Barhabise, Sabhapokhari, Jaljala, Sidhdapokhari, Nundhaki, Mawadin, Madimulkharka and Tamaphok. As mean annual precipitation is low and upper timberline is at a comparatively lower altitude in west Nepal, *Daphne bholua* rarely grows on altitudes more than 3000m there. In eastern Nepal, *Daphne bholua* extends up to 4000m (Jeanrenaud 1984). It has been recorded from Dhunche-Chandanbari (1970m), Dimsa-Cholangpati (2800m 3400m), and Helambu (2650m) within the Langtang National Park.

Daphne papyracea is a plant that likes shade and grows as an understorey shrub in moist places, but it also grows well in open areas. Its growth is denser and gregarious in moist conifer and broad-leaved forests of the temperate Himalayas at middle elevation. *D. papyracea* is endemic to the Himalayas and is distributed from Kashmir to northwest India. It is distributed all over Nepal within an altitudinal range of 1500-2400m and is common in moist conifer forests and temperate Himalayas. Major associates of *Daphne bholua* are *Arundinaria maling, Betula utilis, Abies spectabilis, Quercus semecarpifolia, Taxus wallichiana,* and *Tsuga dumosa*. Similarly, *Arundinaria maling, Drepanostachyum falcatum,* and *Laurels* are major associates of *Daphne papyracea.*

Uses, Chemical Composition and Conservation Status of Lokta

Barks (inner bark) of the Lokta consist of strong fiber and hence it is used to make paper, commonly called "Nepali Hand Made Papers", through traditional knowledge and technology. Nepal has a very long history of papermaking that goes back to at least the 12th century (Ghimire et al. 2008 a). The paper has been praised for its attractive texture, durable character, anti-pest properties and eco-friendly nature. Handmade paper is insect-resistant and lasts for more than 500 years. For this reason, handmade paper had been used in ancient times to document religious myths and epics. It is widely used in government offices and courts. Although handmade paper has been widely used by the government of Nepal for many years, its domestic use is not growing significantly. Reliable data in relation to domestic consumption is difficult to obtain. Most low-quality paper rejected by export buyers ends up in the domestic market.

The handmade paper making processes are simple but interesting. Initially, collectors peel the raw bark from the Lokta bush in the forest and dry it in the sun. The dried bark is immersed in water to soften and clean removing the black spots and impurities (soaking). The cleaned Lokta is cooked in a mixture of water and caustic soda (earlier it is said that it was cooked with ashes). Then, the cooked Lokta is washed with clean water to rinse the caustic soda. The clean Lokta is then beaten with a wooden mallet to make it into pulp. The soften pulp is then mounded in wooden frames by spreading the thin pulp (with a proper mix of water and pulp) to make paper sheet. The frame is dried in the sun, after which the paper is taken out of the frame.

In some parts of the country, there are household level paper producing units, where entire families are often involved in Lokta bark collection and paper making. These small units also buy Lokta bark from their neighbours, and occasionally employ some of them in paper making. Larger paper production units buy the paper from the other units and sell it to the Kathmandu market. The large paper making units are usually run by local entrepreneurs as well as, more recently, by cooperatives or FUGs. Urban manufacturers buy paper sheets from the paper producers, and manufacture various paper products (paper crafts) and export them.

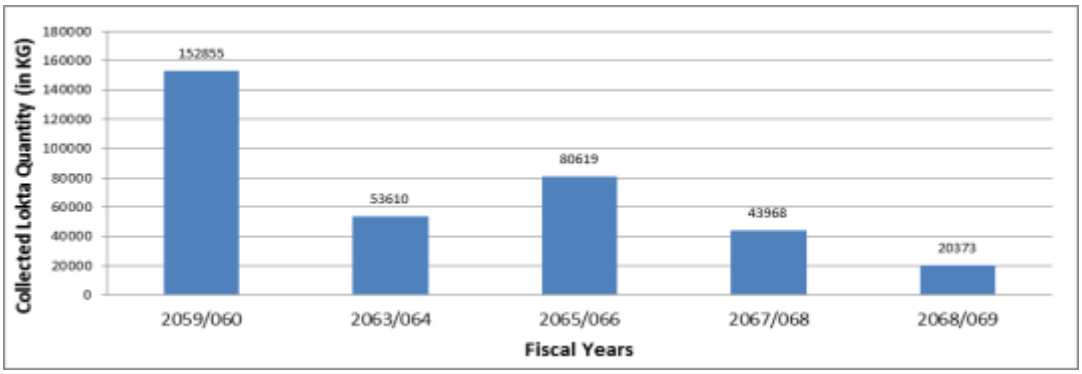
Daphne bholua contains toxic resins (CSIR 1986). Taraxerone has been isolated from the leaves such as the *daphnoretin* and *β- sitosterol* could be isolated from the bark, stem and roots. Daphnin, Sterol and three glycosides (G-1, G-2 and amorphous G-3) have been isolated from the roots of *Daphne papyracea*. G-1 and G-3 are identified as flavonoid glucosides but not characterised. Daphnetin, daphnetin-8-β-glucoside, taraxerol and its acetate taraxerone, daphnetin and β- sitosterol-D-glucoside have been isolated from aerial parts (Rastogi and Mehrotra 1993). The identification of economic value of its chemical components and their uses are yet to know in Nepal.

Locally, the stem's bark is used as a source of coarse fiber for ropes and cordage. The bark's paste is applied to treat sprain and fracture after mixing with other herbs in Langtang (Dongol 2002). Bark decoction is used in cases of fever, while the root and bark juice is considered an anthelmintic and is used to treat intestinal worms. The juice is also used for intestinal disorders and as an anti-leech agent (Ghimire *et al.* 2008 a).

These species are very important for preserving biodiversity and for the conservation of watershed and environment. . However, the natural status (national and global) of Lokta is not known yet. The studies, field level observation and consultation with stakeholders indicate that the status of Lokta is threatened, by dint of unsustainable harvesting in most of the parts in Nepal. Recently, some steps are taken for the sustainable management of the species through nursery establishment and cultivation.

The national data published by the Ministry of Forest and Soil Conservation (MoFSC) shows that the Lokta collection is gradually decreasing in Nepal. It indicates four things. First is that the Lokta production must be decreasing in Nepal. The second is that Lokta has been overharvested or over-collected or haphazardly collected in past years. Similarly, the third is that the Lokta collection is in practice but illegally so that it does not come under the national data. And the last must be that Lokta conservation and management have not been taking place along with its collection and use for paper production.

Figure 9:1: National data showing Lokta collection in different fiscal years



Source: MoFSC 2060 (BS), 2064 (BS), 2066 (BS), 2068 (BS), and 2069 (BS)

The figure 9.1 clearly indicates the urgencies of sustainable management and conservation of Lokta in Nepal. Talking about Lokta collection in eastern Nepal, the reason of zero collection is due to two reasons. One is that most of the Lokta now has started to get collected from CFUGs and second is that Lokta in national forest has become subject of illegal collection and trading.

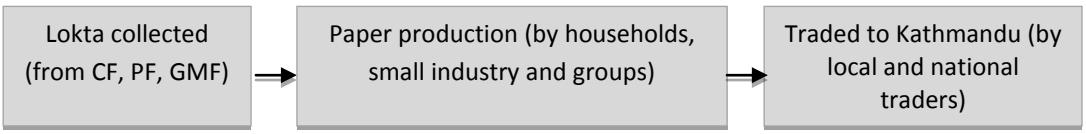
Trade, Demand-Supply and Product Flow of Lokta

Handmade paper is the fifth largest export product in the handicraft category in Nepal. It covers about 11 per cent of the total export in the category. Handmade paper products are exported to 60 countries, major importers being the US, the UK, France, Japan and Switzerland. Handmade paper is used to manufacture varieties of paper crafts mainly postcards, gift items, lamp shades, notepads, files, visiting cards, photo albums, calendars, and diaries. These products are sold through retail outlets in urban areas of Nepal or exported (Pyakurel 2010). It is estimated that about 1,10,481 metric tonnes of raw Lokta bark are available in different parts of the country. Of this, only 800 to 1,000 metric tonnes is collected each year (HANDPASS 2003). This figure indicates that Lokta bark collection and its paper production definitely contribute in the national economy but ensuring sustainable harvesting would be important issue in this regard.

The collection of Lokta raw materials is increasing every year in Nepal. For example, the DFO data in Sankhuwasabha district shows that about 20,224 kg of Lokta bark was collected in Sankhuwasabha district alone in the fiscal year 2069/70 (BS). In its contrast, the national data shows no any record of Lokta collection and trade that year (MoFSC 2069). This indicates that there are some errors in the national data. However, the fact is that the Lokta based paper product is one of the highest export revenue earning handicrafts of Nepal. Large quantity of Lokta is collected from mountain and hilly districts in Nepal. There are high demands of Lokta papers in national and international markets, but quality product is prerequisite for the latter.

At the dawn of the year 2000, development agencies supported establishment of Lokta based enterprises making people aware about the value of Lokta bark and Lokta paper. However, overharvesting has been one of the prominent issues in Nepal in recent days. For example, presently most of Lokta in Eastern Nepal is over consumed by enterprises established in the region. Local traders trade bark through regional traders for enterprises in region and other parts of Nepal. This trend has been decreasing due to increasing number of Lokta enterprises in eastern Nepal.

Figure 9:2: Product flow of Lokta

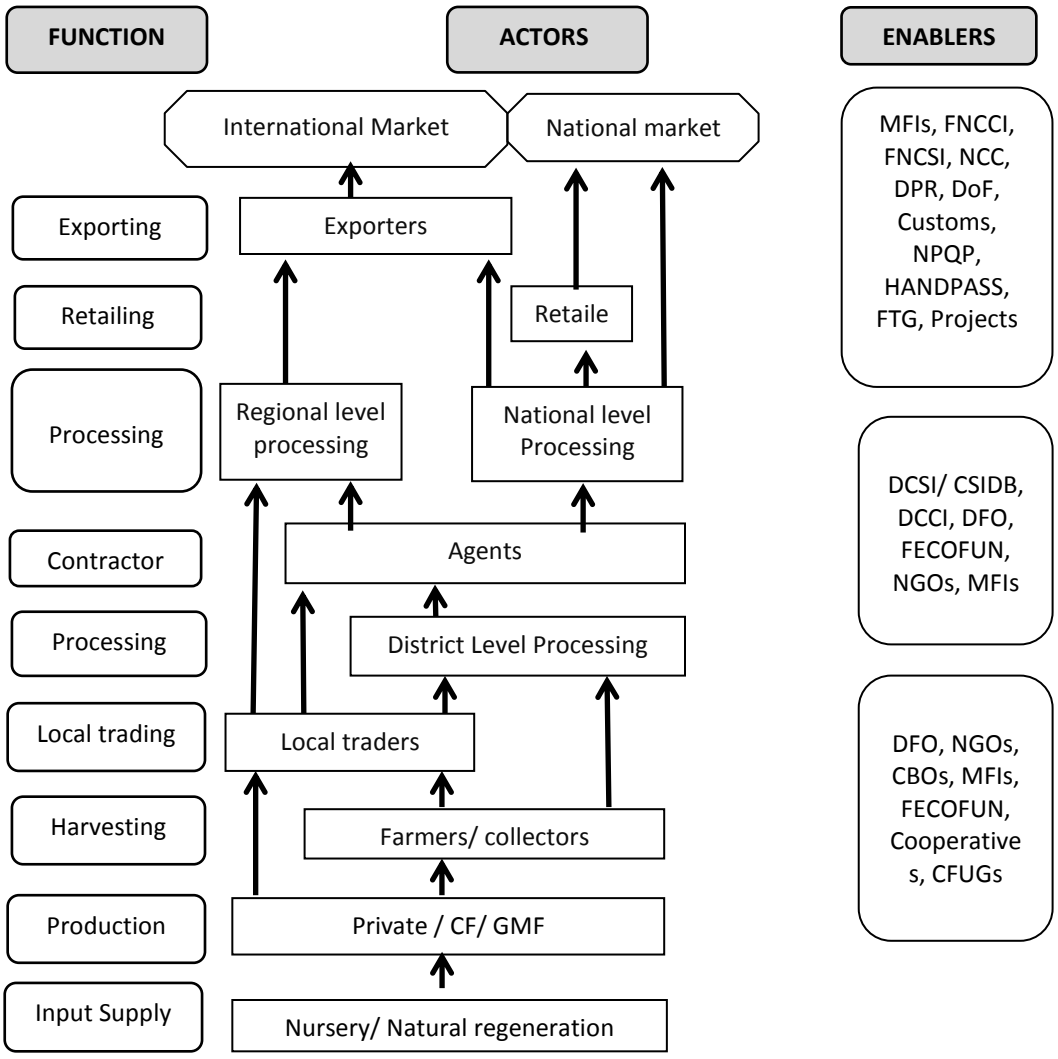


The product flow of Lokta is very simple in the sense that Lokta barks are collected by people from community forest, private forest and government forest. The paper is produced and traded to the market especially to the buyers and traders in Kathmandu.

Functions of Lokta Value Chain Actors

The Lokta value chain comprises numerous actors with different functions. The main actors in the value chain are the Lokta bark harvesters/collectors, processors/producers and traders. The different actors and their roles are interrelated to each other in the whole value chain. In terms of value chain actors and their functions, the individual households or micro entrepreneurs collect the Lokta bark and dry them up. The dried Lokta inner bark are collected or bought by the producers (individual, enterprises, and industries) and produce papers out of these raw materials. The produced papers are sold out to the exporters and paper craft producers in Kathmandu through traders or agents. And finally the finished products (paper and paper crafts) are either reached to the final buyers through retailers or exported to other countries by national exporters.

Figure 9:3: Value chain Map of Lokta



Source: Field Consultation, 2013/2014

The following sections are discussed in brief about the functions of value chain actors.

Harvesters/Collectors: Lokta bark is harvested by the local individuals from the nearby CF, GMF and PF. The collectors pay taxes (for example, in Sankhuwasabha district a collector pays NRs 5 per kilogram) for Lokta bark extracted from the GMF as royalty. Similarly, Lokta harvested from CF should pay similar amount or above or as per the rules mentioned in the operational plan of the concerned CF. Collectors use traditional weapons to extract out the bark from the Lokta stem. And ultimately the barks are sun dried and sold to local processors (the selling rate is different in different places which may range from about 100 to 150 NRs in local market). It is estimated that a collector collects approximately 200 kg Lokta barks in a year from the PF and CF.

Processors/Producer: Lokta barks collected by the collectors are bought by the processors and the processors use the Lokta bark to make different paper products. Processors here are the individuals or groups who own the industry and produce paper from the Lokta bark. In short, it is operating in different modes such as individual, community, CFUGs, and partnership between public and private. After the processing of the Lokta into different products, these products are directly traded with Kathmandu based traders. It is noteworthy that the Lokta paper producers not only buy the raw materials collected by the farmers/collectors but they are also providing job opportunities to some individuals, especially to the local people.

Table 9:1: List of Lokta based enterprises in Sankhuwasabha district

SN	Name of the enterprise	Location	Owner
1.	Barun Paper Industries	Khadbari NP-3	Rudra Bd.Gurung
2.	Ganesh Pathivera Nepali Paper Industries,	Tamafok-9	Gorakh Sunder Sakya
3.	Chandra Nepali Paper Industries	Siddhakali-8	Yangdu Sherpa
4.	Sabhapokhari Nepali Paper Industries	Syabun-8	Hindu Kumar Rai
5.	Jimi Nepali Paper Industries	Madimulkharka-6	Chitrarekha Jimi
6.	Sulav Paper Industries	Num-6	Pranod Gauli
7.	Ramkaji Argali prasodhan tatha Paper Industries	Tamafok-9	Ramkaji Gurung
8.	Khadbari Hand Paper Industries	Khadbari-1	Devanand Shrestha
9.	Matsyapokhari Hand Paper Industries	Matsyapokhari-5	Padam Bdr Gurung
10.	Tinjur Hand Paper Industries	Tamafok-9	Kabal Man Gurung
11.	Jadibute Nepali Paper industries	Siddhapokhari-4	Amrit Bdr Rai
12.	Sinha devi Nepali Paper Industries	Bala-8	Bam Bdr Rai
13.	Khyampalung Nepali Paper Industries	Syabun-8	Taraman Gurung

Source: DVN and NORMS 2013

Traders: In practice, there are two types of traders: national traders and local traders. The national traders are usually Kathmandu based. They keep close contacts with local producers and national buyers/ processors/ traders/ exporters. The national traders buy locally produced papers directly from the producers and transport to the demand places (Kathmandu, Dharan and Biratnagar). Local traders are involved in the Lokta bark trade in collection centres. Sometime they also sell produced papers to the market centres like Kathmandu.

Enablers: Enablers of "Lokta value chain" in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. The funtions of enablers include collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases.

Table 9:2: List of enablers and facilitating organizations in Lokta value chain

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CFUG
Royalty Payment	DFO, CFUG
Checking and weighing	Range Post or CFUG
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Export recommendation, product certification and export permission for selected natural products	DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/ DCCI, NCC
Export Permission and duty	Customs Office of exporting country
Import permission and duty	Customs Office of importing country
Market information	TEPC, AEC, ANSAB
Financial Support	NGOs, Cooperatives, Commercial Banks
Processing technology	DCSI/ CSIDB, Private companies
Resource management and Research	DPR, DFO, CFUG, NGOs, Consultant
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Enablers in Production & Processing Function: District Forest Office (DFO) and District Agriculture Development Office (DADO) are the responsible agencies for providing technical support on cultivation, harvesting, local processing and trading in this value chain. Those agencies also regulate the functions from production to sale through monitoring, product verifying, and levying royalty, fees, and tax.

Enablers in Trading & Export Functions: Ministry of Forest and Soil Conservation (MoFSC), Department of Forest (DoF), Department of Plant Resources (DPR), Ministry of Commerce and Supplies (MoCS) and Federation of Nepalese Chambers of Commerce and Industry (FNCCI) are business enablers at higher levels and they facilitate business through policy lobbying, policy formulation and bilateral trade agreements. However, in lower level there is no any facilitation and support for trading.

Economic Analysis of Lokta Processing

It is quite difficult to develop exact analysis of the cost and benefits of Lokta processing. However, a tentative calculation would be helpful in understanding its cultivation, collection, processing and marketing of Lokta products. An analysis for 10 kg Lokta raw material processing and production of Nepali Handmade Paper is depicted in table Table 9.3 below.

Table 9:3: Tentative cost and benefit analysis of Lokta processing

Items	Cost (in NRs)	Remarks
10 kg Lokta bark (10*110)	1100	Bought from collectors
Fuel wood	50	For cooking
Caustic Soda	80	For softening bark
Labor cost	300	Employee or worker
Others	100	Mousselines
Total costs/investment	16,30	1 kg= NRs 163
One kori Lokta paper (income)	24,00	4 kg (1 Paper = 20gm) Size=20"*30"
Total profit/Benefit = NRs 770;		
Therefore, total profit per kg is NRs 77;		

Source: Field Consultation, 2013/2014

Fixed Capital: The calculation given in the table 9.3 clearly shows possible benefits by producing papers from Lokta barks, however, it does not include the investment or expenses for setting out the enterprise. Fixed capital requirement for the establishment of a Lokta factory at cottage level is estimated to be around NRs 50,000 - NRs 70,000. However, it may differ as per the factory location area and infrastructure attached to the factory premises.

Pre-operating Cost: Industry registration, market linkages and other hidden costs are kept in pre-operating costs. All these cost heads are highly variable. Therefore, it is very difficult to estimate the actual pre operating cost, which approximately may come around NRs 8,000.

Initial Working Capital: Though labour cost is comparatively less in rural areas, the producers mostly suffer from the availability of labours (both: skilled and non-killed; and permanent and temporary). So, it is estimated that (for labour wages and money invested for production of handmade paper for 2 months) approximately NRs 150000 - 200000 as initial working capital.

Historically, Lokta paper has been used for most of the government documents and religious texts in Nepal. Nowadays, it is used mainly for paper crafts such as wrapping papers, boxes and bags, greeting cards, Thankas (Tibetan paintings) and wallpapers including stationery use. Its demands have been increasing in both national and international markets. Large quantity of Lokta products are supplied to Kathmandu and other regional markets such as Dharan, Biratnagar, Nepalgunj. The existing production is not able to meet the current demand from the market.

The present prices of the Lokta paper seem quite good in terms of investments discussed in the above heading of this chapter.

Table 9:4: Local (Sanknuwasabha in 2014) price rate of Lokta products

Items	Quantity	Price(in NRs)	Remarks
Lokta Bark (KG)	1	100-110	
Nepali Paper (Kori)	1	1600	2 kg (1paper=10gm)
Nepali Paper (Kori)	1	2400	4 kg (1 paper=20gm)
Nepali Paper (Kori)	1	3500	6 kg (1paper=30gm)
Nepali Paper (Kori)	1	4200	8 kg (1paper=40gm)

Source: Field Consultation, 2013/2014
[Note: 1 Kori= 200 pieces of Nepali Paper]

The price rate clearly shows that thinner paper production (e.g. 2 KG) is more beneficial to them as it requires fewer raw materials but in practice the labor/producers feel easy to produce thick papers. So, the market prices of different weighted papers, the amount of raw materials used, and cost for labor is very important in Lokta paper production. In addition, the market channel is another important aspect of Lokta paper produces. This means who are their traders and whom that traders sell their products play important roles for the profit from their enterprise.

Since few decades, the Lokta paper production has been one of the most important forest products in Nepal. However, its production and marketing have been obstructed by different factors. But at the same time lots of possibilities have also been on the scene.

Table 9:5: SWOT analysis of Lokta

Strength	Weakness
• Unique feature of Lokta fiber available in Nepal; • Unique local knowledge on Lokta harvesting; • Export oriented diversified products with diverse markets; • Development vectors working in Lokta based enterprise from last ten years; • Lokta value chain actors have pragmatic knowledge on Lokta enterprise set up and its smooth operation;	• Scattered and small scale paper industries; • Most of the enterprises are running below annual target; • Lack of knowledge for designing and product diversification; • Lack of proper marketing and promotion efforts; • Lack of awareness towards conservation of the resources for sustainable harvesting; • Poor monitoring and law enforcement for the sustainable resource management; • Inactive cooperative and farmers group to boost the enterprises; • Lack of certification system for assurance of quality products;
Opportunities	**Threats**
• Growing niche market opportunities; • Prospect for domestic as well as international market; • Opportunity to generate more income and employment in rural areas;	• Declining of Lokta resource may threat to the supply of raw materials; • Fast changing consumer taste and few feedback mechanism; • Domestic threat in terms of labor issues;

Source: Field Consultation, 2013/2014

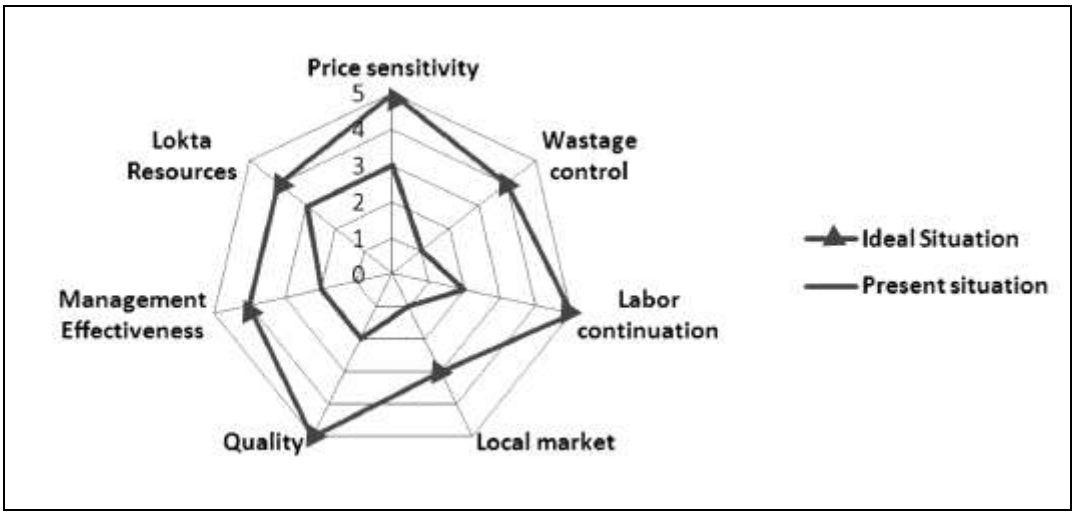
The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Lokta Value Chain Upgrading Strategy

End Market Analysis:

Lokta has been used for manufacturing Nepalese paper which is used for making various paper based products especially handicrafts and souvenir items. The end market analysis is carried out by interacting with some traders, buyers, producers (Ang Dawa Sherpa as trader, HBTL, FTG, and HANDPASS as buyers and exporters). Discussions in depth with these actors were carried out to identify the gaps that exist presently. The gaps have been compared between the present situation (observed and became known from the field work and interaction in Sankhuwasabha and Bhojpur districts in 2013/14) and ideal situation. The projection of ideal situation has been prepared on the basis of actor's expectations and aspirations developed out of their knowledge, skills and experiences.

Figure 9:4: Gaps between market demand and present situation of Lokta



Source: Field Consultation, 2013/2014

The parameter used for preparing spideregram is shown in details in the table below.

Table 9:6: Parameters used to analyze end markets of Lokta

Parameters	1	2	3	4	5
Price sensitivity	Worst price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers	Best price negotiation between buyers and sellers
Wastage control	More than 25% wastage	More than 15% wastage	Around 10% wastage	Industry standard wastage 2-5%	Zero waste
Labor continuation	Each season new worker	Only 10-30% worker contiuing	30-50 worker continuing	Required worker conitnuing for receiving target	Annual source of income for worker to continue throughout
Local market demand (red line)	Low demand	Limited demand	Moderate demand	Good demand	Mass demand
Local Market Supply	Low supply	Limited supply	Moderate supply	Good supply	Mass supply
Quality	Inferior quality	Moderate quality	Good quality	High percentage of A grade quality	High percentage of A grade quality with certification
Management Effectiveness	Disfunctional enterprise with absence of regular meeting and work from management committee	Enterprise operated by only one or two members of management committee with absence of TOR and ambigious roles/ responsibilities	Enterprise operated by only one or two members of management committee with a placement of manager	TOR and clear role and responsibiltiei s of management committee and staffs	TOR and clear role and responsibili ties of managemen t committee and staffs Follow of national standards
Lokta Resources	Unavailability of Lokta in CF	Patch availability of Lokta in cetain part of CF	Depletion of Nearby Lokta and availability at distant	Scintific management of Lokta and availability of Lokta for enterprise purpose continuosly Plantation of Lokta	Scintific managemen t of Lokta and folowing of standard practices (FSC certified etc.)

Source: Field Consultation, 2013/2014

The comparison shows wide gaps between present situation and idea situation of Lokta production and its marketing in Nepal. Some of the major gapes and ways these are getting fulfilled in the studies areas are discussed below.

Price sensitivity: Almost all Lokta enterprises in Bhojpur and Sankhuwasabha districts are trading their paper through a trader/middle-man (Mr. Aang Dawa Sherpa who is originally from Bhojour district and now lives in Kathamndu). He is one of the most trusted (by the national buyers) national agents for different national level paper product making enterprises. He procures paper from nearest road head of enterprises making them easier for marketing. Majority of enterprises are very happy with this marketing but not informed about price variation and are selling Lokta at the same price throughout the year. Aang Dawa Sherpa has some personal investment in some producers in the villages and provides them technical information for quality productions. However, dependence on a single buyer is becoming one of the obstacles for the local producers to up-scale their market niche. This is also known that the manager and president of some local producers were exposed to market by development vectors earlier but still lack changing market perspective in one hand and in other committee members are not internalizing the view point of manager and president due to lack of exposure.

Wastage control: In most of the local producers, more than 20% of Lokta is wasted during processing. There is absence of incentive of minimizing wastage amongst workers on the one hand and on the other management committee has utterly failed to innovate the measures of minimizing wastages. Large quantity of Lokta is found in water drainage due to lack of a simple blocking system such as keeping levels of net-filters in the washing. The paper wastage is more known at national market, the discussion with them revealed that they use 'A' level paper and rest is sent for recycling. The inferior quality means more the wastage of resources, labour and investment. Workers in the local enterprises do have little knowledge about quality production and also lacks the exposure to update information on waste control and quality improvement as carried out by national processors.

Labour continuation: There are trained people in the enterprises but majority of them are not continuing. There are only 1-2 workers who are working throughout the season. The movement of people in search of work in district headquarters, regional centres and abroad has restricted continuation of labour. Workers are able to earn monthly NRs 4000 to 15000 monthly during the season depending on the quantity of paper (in Kori) they become able to make. As they are not involved through out the year, there is a trend of discontinuation of labour.

Local demand: Government organizations are increasing the use of Nepali handmade paper and the changing lifestyles of pople in district headquarters have increased demand for souvenir and gift items. There has been no market penetration from the enterprises to test paper related products in local levels like district headquarters. The national processors and exporters do not aspire to subcontract paper making to enterprises and are showing interest only on procurement of A grade quality Lokta paper.

Quality: The quality of Lokta paper made by the local producers is mostly a moderate in quality. Out of 10 sheet of paper shown to exporters, 5 are of 'A' grade. The exporters are interested in 'A' grade paper and they do more value addition at national level before exporting or selling through retail market. There are separate entities for colouring of paper in Kathmandu valley (such as in Kapan), cutting, and also making paper related products. Exporters are able to outsource various value added works to separate enterprises at national level but are not willing to do same at rural level due to lack of quality maintenance on the one hand and on the other due to lack of unavailability of entities for making paper related products.

Management Effectiveness: Most of the enterprises are not running successfully. There have been various efforts from development agencies and institutions but handmade paper enterprises are not functioning well. The major reason being the enterprise governance a poor is due to the limited persons in the leadership and other as silent and inactive (for example, in one of the visited enterprises in Bhojpur, only two persons – president and manager, are working and are responsible since its establishment). There is lack of documentation and transparency regarding the enterprise operation. There is absence of workable business plan including TOR depicting roles and responsibilities of management committee along with manager and staffs. Also, establishment of forest based enterprises is very lengthy and cumbersome due to various rules and regulations required to be followed. Development agencies are providing more support for enterprises for registration rather than other BDS services for product upgrading, process upgrading and channel upgrading. Financial management along with cash flow is very important for this business as finance is required for collection of raw materials. There is presence of advance payment by national exporters/processors (e.g. Aang Dawa Sherpa provides some advance for business operation in East Nepal) but this chain is not established with the enterprises.

Lokta resources: The community forest inventory has been carried out in CFUG where the enterprises are established (mandatory). The discussion with CF members at factory location revealed that there is depletion of Lokta at vicinity and now Lokta is available only in small patches for distant forest areas. This has led to lack of interest for collectors to go for Lokta collection due to more time taken for reaching Lokta plots on the one hand and on the other difficult terrain due to availability now at those patches. There has been effort in commercial cultivation of Argeli but commercial cultivation of Lokta is minimal due to maturity time (8 to 10 years). Lokta nurseries have also been established recently but are not able to meet the seedlings demand of the district. HANDPASS has shown important concern over depletion of Lokta and threat for losing international market due to lack of availability of raw materials. National exporters and processors are interested in investment in Lokta plantation in partnership with CF and local producers. There is requirement for carrying out updated resource inventory to look at present stock of Lokta that can be sustainably harvested. Some management plan of CF has to be revised and this has also hindered procurement of raw materials from CF by enterprises.

1. Firm level upgrading strategy:

The firm level upgrading strategy is developed based on the identified gaps that are discussed in the above headings of this chapter. The strategies are derived to minimize gaps between existing situation and the ideal situations.

a) Product upgrading: The product upgrading is based on three years plan and in the first year focus will be carried out for quality production and waste control. The detail of each year strategies is presented in table below (table 44).

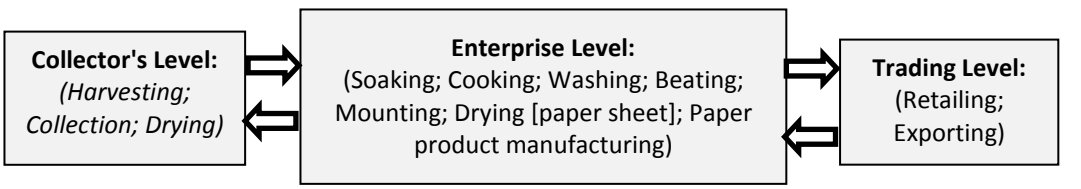
Table 9:7: Product upgrading strategies of Lokta

Parameters	Present	Year 1	Year 2	Year 3
Product	High waste; Moderate quality;	Minimal waste; Superior quality;	Minimal waste; Superior quality; Paper products for district market;	Obtain national quality standards, minimal waste, superior quality (maximum A grade) Paper products for district, Subcontracting for paper product from national market, Certified paper production
Price	NRs 3500 for 1 kori (30gm)	Up to 10% increase due to waste control, another minimum 10% increase due to superior quality	Additional income generated through paper based products sale to district headquarters	Additional income through certified paper product sale Additional income generated through paper product as subcontracting work from national exporters/ processors
Place	Immediate road head, sale to Agent	Members of FTG, sale through same agent	Members of FTG, sale through same agent, Agreement with retailers in district headquarters	Member of FTG, sale through same agent or directly, Agreement with retailers in district headquarters, agreement with FTG members of HANDPASS members for getting subcontracting assignments
Promotion	None	Superior quality	Superior quality and sustainable harvesting	Certified paper production

Source: Field Consultation, 2013/2014

b) Process upgrading: The process upgrading refers to the whole process from input supply to production, harvesting, post harvesting, and processing to marketing. Process upgradingregarding Lokta in local level (in this case Sankhuwasabha district in particular) shows three vital steps to be upgraded.

Figure 9:5: Major processes involved in Lokta value chain



Source: Field Consultation, 2013/2014

Table 9:8: Process upgrading strategies of Lokta

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology intervention	Anticipated benefits
Upgrading 1: Harvesting and collection, peeling, drying	Collectors collect from CF and sale to enterprises after peeling and drying	Promote Lokta cultivation as IGA; Rate of raw materials as per distance of collection	Nursery management; cultivation training; Cash flow management and product costing	Sustainable resource management; Increase in willingness for collectors to sale raw materials to enterprise;
Upgrading 2: Soaking, Cooking, Washing	Maximum wastage of Lokta raw materials during these steps	Minimize wastages by using filters	Simple net filter mechanism in layers	Minimum wastage and maximum benefit
Beating, Mounding, Drying	Water powered bitter machine; Sun drying	Appropriate land location in vicinity for more direct sun drying; assessment of other available land nearby;	N.A	Less time to dry, more production
Paper product manufacturing	5 to 10gm paper production for incense making	Assess district headquarters market for souvenir and gift items	Market exposure	Additional income from product making, Annual involvement of workers
Upgrading 3 Trading	Agent buy from nearest road heads	Partner with FTG, HANDPASS members and trade through same agent	Knowledge on trade procedures, partnership development with FTG and HANDPASS members	Confidence built in market linkages, creating competitive trade

c) Functional upgrading: Explanations of the functions of all value chain actors of Lokta are felt not necessary in this study. So, the present functions and upgraded functions of four major actors (collectors, enterprises, agents, FTG and HANDPASS members) have been discussed in this chapter.

Table 9:9: Functional upgrading of Lokta value chain actors

Actors	Present Function	Upgraded Function
Collectors	Collection of Lokta, peeling and drying	Cultivation of Lokta in CF and private land as IGA activities focusing on DAGs
Enterprises	Production of moderate quality paper	Production of paper based products for district consumers
Agent	Buying Lokta paper from nearest road heads and selling to various exporters or processors at national level; Embedded service delivery like advance, technical information, field visit etc.	Expand linkages with other exporter, traders, producers like FTG members
FTG members and HANDPASS members	Buying products through their already developed trade channels or agents	Partnership with enterprises for cultivation, paper trading, and subcontracting for paper based product development

Source: Field Consultation, 2013/2014

d) Channel upgrading: In most cases, the Lokta paper is sold through their already developed agents or channels. The agent buys it from nearest road heads in the district and further trade in national markets. In this case, the channel upgrading could improve the trade benefits to the producers. This can be done in two ways:

i) Existing channel of agent and build partnership with FTG members;
ii) Develop retail channel for marketing paper based products in district headquarters;

e) Intersectoral upgrading: Lokta based collectors and workers at enterprise are not able to generate income from Lokta throughout the year. It is important to empower and enhance skills for producing other products such as products from locally available fibres, bamboos or any other forest products. For example, there is abundance of Allo and bamboo in the Lokta available areas. Intersectoral upgrading of collectors and enterprise workers can be done in such forms of value chains.

2. Inter firm upgrading strategy:

Handmade Papers Associations (HANDPASS) is an umbrella organization for the promotion of handmade papers in Nepal. Similarly, the Fair Trade Groups (FTG) is another umbrella organization of fair trade organizations in Nepal. Recently, the HANDPASS has opened regional branches in some parts of the country. In this context, it is important to link local paper producers with these organizations and facilitate for business membership so that they could get appropriate information, business linkages and capacity building. At present, it is important to build linkages especially with above three organizations with the leadership of DCCI or DCSI.

3. Business Development Services and Financial Services upgrading strategy:

It is most important to identify BDS and FS for the promotion of a particular product or an enterprise. In this chapter, the identification of BDS and FS for Lokta enterprise has considered following two things:

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories; and
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories.

Table 9:10: Analyzing demand and supply side of BDS for Lokta enterprise

SUPPLY SIDE	Very strong				
	Strong				
	Weak			Research on district headquarters market demands; Nursery management and cultivation training; Access to quality seedlings	Access to finance; Training on paper making products; Exposure visit;
	Very weak	Business partnership with HANDPASS and FTG members		Financial planning inclusing product costing, cash flow management and business planning	Enterprise management and governance coaching; Knowledge on trade procedures
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries and supply side of service providers in four categories (very weak, weak and strong) are figured out to understand existing situation and develop clear understanding for commercially viable option for the promotion of Lokta business services. The required BDS and FS could be catered by different forms and types of commercially viable business service providers.

Table 9:11: Lists of possible options for commercially viable business of Lokta production

Services	Strategy	Major BDS
Access to finance	Cash flow management, advance payment from buyers, increasing share of CFUGs and private	Cooperative, MFIs, Private investors, FTG and HANDPASS
Enterprise management and Governance coaching	Management restructuring/strengthening , TOR with well-articulated roles and responsibilities	BDSPO, DCSI/ CSIDB
Research on district headquarters market demand and training on paper product making	Market research on paper products that can be sold to government organizations, operation of souvenir and gift shops, on the job training on paper making from FTG or HANDPASS members	BDSPO, DCSI/ CSIDB, DCCI
Business partnership with HANDPASS and FTG members	Develop business partnership for cultivation, paper trade and subcontracting partnership for paper based product	DCCI, DCSI/ CSIDB
Nursery management and access to quality seedlings	Strengthen existing nurseries and linkages to best quality Lokta seedlings	DFO, NGOs
Knowledge on trade procedure	Awareness about trade procedures along with other legal processes for collection, production and processing	Lawyers, FECOFUN, DFO

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

The forestry sector policies and laws are not favourable to promote forest enterprises value chain actors. So, the business enabling environment is very restrictive to forest based enterprise including Lokta value chain actors. Various research has outlined a number of legal hurdles that are restricting value chain promotion of handmade paper related enterprises. Based on the review of literatures, field visits in Sankhuwasabha and Bhojpur districts, and consultation with stakeholders, following barriers have been identified in Lokta value chain.

a. Enterprises have to pay fees to both CFUGs and DFO for the extraction and trade of Lokta bark. Based on the field work, it is found that the collectors pay NRS 5-10 per kg to CFUGs and NRs 5 per kg to DFO. In addition, the District Development Committee (DDC) also charges the exporting taxes, which in practice have been paid by the agents or buyers of the product.
b. Legal process of trade is only known to limited individuals (in most cases the president or manager of enterprises) which have been getting into the result of dis-functioning of the enterprises in case they are unavailable or inactive. There is less possibility of succession planning for new manager or president due to the lack of knowledge about the complex and more bureaucratic legal processes to get permission to export. This means there are number of documents that need to be submitted during collection, processing and trading of NTFPs including Lokta.
c. It was observed and known that most of the local producers/enterprises lack knowledge about systematic accounting practices and documentations. These have been creating gapes between the ground level practices and the policies encouraged by District Cottage and Small Industries (DCSI) and Cottage and Small Industries Development Board (CSIDB).
d. From the practical point of view of CFUGs in the rural areas, it is very difficult task for CFUG leaders and managers of the enterprises to keep up to date of the Operation Plan (OP) of their CFUGs. In most cases, it was observed that the District Forest Officers (DFOs) are reluctant to go for easy-approve to the revised OP submitted by the communities, rather they have been creating lots of technical qualities and administrative procedures. These have been major hindrances for the Lokta collection permit and export of Lokta products/paper.

Based on the above policy issues, the study recommends for local to national level policy dialogues so that the existing policy hurdles for Lokta collection and export are eased.

5. Sustainability Strategy:

Lokta is unique product of Nepal and has strong brand image. The market of Lokta paper and paper crafts is increasing. The most important issue raised by all stakeholders, especially the national exporters, is depletion of Lokta all over Nepal. Thus, the prime importance for sustainability is to carry out sustainable harvesting including Lokta plantation and conservation.

Another important factor is lack of enterprise management system. Most of enterprises are stagnant and they are not operated quite well even with technical and financial supports from

external agencies such as development agencies and governments. This is primarily due to the lack of enterprise management knowledge amongst managers and committees. Thus, it is very important to provide enterprise governance counselling and build capacity of management committee. Similarly, other important aspect is lack of continuation of labour. The appropriate strategies have to be developed and well implemented in the practice to improve continuation of workers.

Summary of Lokta Value Chain Upgrading Strategy

There is no question that the Lokta paper and paper crafts is one of the most exported Nepali handicrafts. Thousands of people are getting employment and earning their living in and from the Lokta based and related occupation in Nepal. Based on the functions of Lokta value chain actors and expanding markets of Lokta paper products, it could be said that there is no market problems of Lokta papers and paper crafts. The ensured and expanded market of Nepali handmade papers and paper crafts are due to the quality of the papers. It is noteworthy that the quality paper could be ensured by two main ways: ensuring the use of pure raw material (Lokta rather than mixing other materials) and production technology (traditional and indigenous systems). Therefore, maintaining the quality of the production is most essential for Nepal's Lokta paper and paper crafts.

The analysis of the functions of Lokta value chain actors and possible interventions have been presented in mainly six upgrading strategies. Based on the discussed six upgrading strategies, the issue of sustainability seems most urgent for Lokta enterprise in Nepal. This is because the quantity of Lokta collection is decreasing every year which indicates that Lokta is declining due to either there is illegal collection and trading or overharvesting and haphazard harvesting in the past. Similarly, it is equally important that the local producers are still limited to the production of only paper but they have not been upgraded towards the value addition of the paper until now. Therefore, the local producers are only the suppliers of the papers to the national buyers and exporters. This indicates that there are some urgencies of knowledge and technology transfer to the local produces so that they could add some values in their products and increase job opportunities in the local level. To sum up, the upgrading strategies of Lokta enterprises discussed in this chapter identified the sustainability and technology transfer as most essential steps as Lokta value chain upgrading strategies. The summary of the Lokta upgrading strategies are presented in the tabular form below (table 12).

Table 9:12: Recommendation for the upgrading strategies of Lokta prodcuts

Upgrading Strategy	Recommendation
Product Upgrading	Minimal wastage, Superior quality i.e. production of 'A' grade, Paper based product development for consumers in the district markets
Process Upgrading	Promote Lokta cultivation practices, promote Lokta cultivation as IGA, Minimize waste by using filters, Appropriate land allocation in vicinity for drying
Function Upgrading	Collectors encouraged for cultivation, Enterprise to further focus on paper based products to cater district markets, Agent to extend linkages with FTG members, FTG and HANDPASS members to initiate partnership
Channel Upgrading	Existing channels through agent to link with FTG members, Partnership with retailers to sale in district markets
Intersectoral Upgrading	Additional income from other forest products such as Allo and bamboo based product development
Interfirm Upgrading	Linkages of enterprises with HANDPASS, FTG, FHAN through initiative of DCCI, DCSI

BDS+ FS Strengthening	Access to finance, Enterprise management and governance coaching, research on district market demands and training on paper craft/product making, business linkages with FTG and HANDPASS, nursery management and access to quality seedlings, knowledge on trade procedures
Business Enabling Environment strengthening	Ease the double taxation systems, develop awareness about legal process, timely revision of operation plan
Sustainability Strategy	Ensure sustainable harvesting and cultivation systems, Enterprise management strengthening, develop mechanism and systems for labour retention

Source: Field Consultation, 2013/2014

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Chapter 10[39]

Khayar *(Acacia catechu):* A Plant with Potential for Multiple Economic Uses[40]

Introduction

Khayar *(Acacia catechu)* tree is one of the most important forest resources that has been identified and emphasized for its income generating potential (Bhandari and Katwal 2011). It is considered as one of the five[41] Non Timber Forest Products (NTFPs) in Nepal. According to the annual report published by the Department of Forest (DoF), 18412.82 cf of Khayar, generating NRs 19,34,749 revenue, was traded in the fiscal year 2068/069 (BS) (MoFSC/DoF, 2069 BS) in Nepal. However, the traded national quantity and amount of revenue has fluctuated over the past years. For example, the traded quantity in fiscal years 2065/066, 2066/67, and 2068/069 were 32057; 258445 and 18412 cf3 and the revenue collected were 7617862; 17855872 and 1934740 respectively (MoFSC/DoF, 2065; MoFSC/DoF, 2066; MoFSC/DoF, 2069). The decline in the traded quantity and revenue may give rise to the question of why it happened. Does it mean that the production, trade and income of Khayar have been decreasing in Nepal?

Table 10:1: Wide variety of local names of Khayar

Languages	Regions and local names
Burmese	Sha
English	Betel- nut palm, black cutch, catechu tree, cutch tree, heartwood
French	Acacia au cachou
Malay	Pinang
Nepali	Khair, Khaira
Sanskrit	Khadir
Tamil	Karungali, kamugu, paku, baga
Thai	Sa-che, seesiat, seesiat nua, sisiat- nua
Trade name	Khersal, Katha, kath, cutch tree, pegu tree

Source: Orwa *et al.*, 2009

[39] Contributors of this chapter are (in order): Suhrid Prasad Chapagain, Alexandria Cruz, Kayla Mueller, and Kapil Dahal.

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[41] The five major NTFPs in Nepal are: Lauth Salla, Khoto, Lokta, Argheli, and Khayar.

It is difficult to find the exact data on total Khayar cultivation area, actual quantity of its trade (traded and potential or could be traded), and the actual contribution or potential contribution in the local and national economy in Nepal. However, it is claimed that its cultivation will generate large income and employment opportunities if its trade is eased in Nepal. It is said that a number of districts in Nepal have high potential for Khayar cultivation, and many of them have successfully planted and started cultivating and trading in the market. The Koshi hill districts also have high potential for Khayar plantation, cultivation and trade; for example many of the CFUGs and private land owners in Dhankuta and Terhathum districts have lots of Khayar already planted and have income from its trade. This study therefore is primarily prepared on the basis of information collected in these districts and their trade channels.

The study aims to provide a comprehensive value chain analysis (VCA) of Khayar production and trade from these two districts. The study tried to identify Khayar value chain actors and understand their existing roles and functions. Secondly, the study attempts to identify and analyze various constraints or barriers in the Khayar value chain in the study districts. Finally, the study tries to explore options for up-scaling of this product into the market businesses and provide stakeholders recommendations for potential expansion opportunities within its value chain. The analysis of this study is primarily based on the information and knowledge obtained from field visits and observation of the value chain of Khayar production and harvesting in Dhankuta and Terhathum and then trade to their market niche. The field visit and observation were supplemented with consultation meetings with its value chain actors, such as Khayar producers/farmers/CFUGs, collectors or harvesters (Thekedar or middlemen), buyers and processors and traders in the eastern region. The consultation with district level stakeholders, mainly related government line agencies, has also become a part of this study process. On top of these, the analysis of this study is based on knowledge and information available on the published and unpublished reports and related literatures.

Habit (Characteristics), Habitat and Distribution of Khayar

Khayar is a strong light-demander. It grows naturally on a wide range of soils, preferring well-drained, coarse, gravelly alluvial soils, but it also tolerates heavy clay and calcareous soils. It grows well on soils with pH values between 7.4 and 8.9. It will withstand flooding. The seedlings are somewhat susceptible to severe frosts, but from the sapling stage frost damage is slight. However, over most of its range, and the areas where it is likely to be planted, frost is not a major problem. It is very drought-resistant. It needs to be protected against grazing and browsing. *Khayar* is deciduous, shedding its leaves about February, and putting out new leaves at the time of flowering, in June. It coppices well, unless it is in mixture with other species, when these tend to shade out the coppice shoots. The seedling, like that of most *Acacia*s, develops a strong taproot.

Table 10:2: Taxonomic hierarchy of Khayar

Kingdom	Plantae – plantes, Planta, Vegetal, plants
Subkingdom	Viridaeplantae – green plants
Infrakingdom	Streptophyta – land plants
Division	Tracheophyta – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants, phanérogames
Infradivision	Angiospermae – flowering plants, angiosperms, plantas com flor, angiosperma, plantes à fleurs, angiospermes, plantes à fruits
Class	Magnoliopsida
Superorder	Rosanae
Order	Fabales
Family	Fabaceae – peas, legumes
Genus	*Acacia* Mill.
Species	*Acacia catechu* (L. f.) Willd. – black cutch

Source: ITIS, 2014.

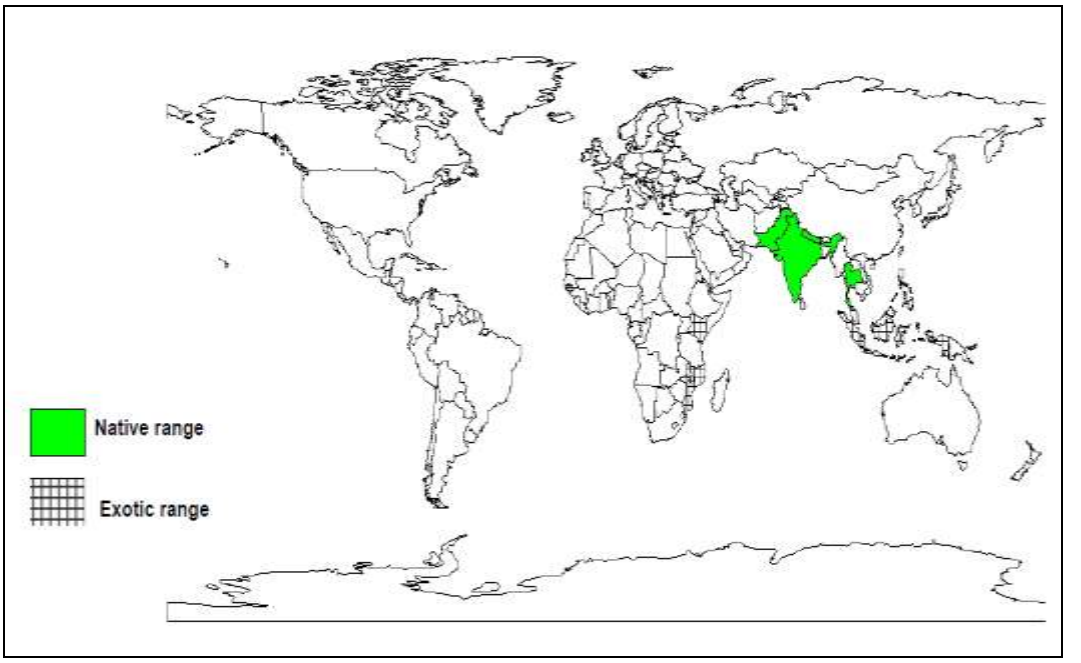
Khayar (Acacia catechu) is a small or medium-sized, thorny tree up to 15 m tall; bark dark grey or grayish-brown, peeling off in long strips, or sometimes in narrow rectangular plates, brown or red inside; branches slender, puberlous when young but glabrascent, with 2 curved, 8-mm prickles at the base of each petiole. Leaves bipinnately compound, with 9-30 pairs of pinnae and a glandular rachis; leaflets 16-50 pairs, oblong-linear, 2-6 mm long, glabrous or pubescent.

Its flowers are characterized with 5-10cm long axillary spikes, pentamerous, white to pale yellow, with a campanulate calyx, 1-1.5 mm long, and a corolla 2.5-3 mm long; stamens numerous, far exserted from the corolla, and white or yellowish white filaments. Fruit grows in strap-shaped pod, 5-8.5 cm x 1-1.5 cm, and flat, tapering at ends, shiny, brown, dehiscent, 3-10 seeded; and seeds broadly ovoid.

Khayar becomes leafless for a time during the hot season. In northern India, leaves are shed about February, new leaves appearing towards the end of April or during May. The flowers appear at the same time as new leaves. Trees continue in flower until July or August. Pods develop rapidly, becoming full size by September or October and turning from green to reddish-green, and then brown. They begin to ripen by the end of November through to early January. Pods dehisce not long after ripening and commence falling in January, continuing to fall in the succeeding months. Some pods remain on the tree until the following October, by that time, however, the seed has become extremely damaged by insects. The wind- dispersed seeds germinate with the onset of rains.

Khayar is a native tree species to India, Myanmar, Nepal, Pakistan, and Thailand; whereas it is exotic to Indonesia, Kenya, Mozambique, and Australia. Outside Nepal it occurs throughout most of India and extends to Thailand and southern China.

Figure 10:1: Documented species and their distribution



Source: Orwa *et al.*, 2009

The above figure (Figure 10.1) shows areas where native and exotic species have been planted. However, it neither suggests the species can be planted in every ecological zone within that country nor that the species cannot be planted in other countries than those depicted. But some tree species are invasive and one needs to follow bio-safety procedures that apply to the planting site. In general, the *Khayar* occurs naturally in mixed deciduous forests and savannas of lower mountains and hills. It is especially common in the drier regions on sandy soils of riverbanks and watersheds.

Table 10:3: General features that require to grow Khayar

Annual rainfall	500–2000mm
Normal temperature range	1–39°C
Mean Annual temperature	32-39 °C
Altitude range	Up to 1500m.
Seasonal adaptability	Dry season up to 3–4 months
Soils	Sandy, gravelly alluvium, loamy and sandy clay soils. Can grow on poor shallow calcareous soils. Does poorly on clay or poorly drained soils.
Light requirement	Strong light demander
Other site limitations	Seedlings are intolerant of frost

Source: Orwa *et al.,* 2009

In Nepal it is widespread in the Tarai, and extends to about 900 m (exceptionally to 1400 m). It is very characteristic of the edges of broad river channels in the Tarai and dun areas, and often extends some way into the beds of river. It also grows freely on the high gravelly terraces at a considerable elevation above the water level. It is not, however, confined to such sites, and is fairly tolerant of soil conditions.

Wood Properties, Uses and Conservation Status of Khayar

Wood Properties:

The *Khayar* constitutes some valuable chemical compounds that could be used for different purposes, such as medicinal and chemical. Major constituents of *Khayar* are catechin, epicatechin, epicatechin gallate, procatechinic acid, tannins, alkaloids quercetin and kaempferol, porifera sterol glucosides, and (+)-afzelechin gum.

Table 10:4: Active constituents and therapeutic application of Khayar

Active constituent	Therapeutic application
Tannins	Acts topically as astringent to mucosal surfaces and following oral ingestion it consequently get hydrolysed and alter the fluidity of the bowel contents (so used as anti- diarrheal remedies). They are also attributed with anti- hemorrhagic, anti-inflammatory and antacid properties.
Catechin	Have significant antioxidant and antimicrobial effects. It is considered to be the best antioxidant.
Flavonoids	Increase secretion of insulin and inhibit cyclooxygenase and lipoxygenase. Thus it possesses anti diabetic and anti- inflammatory effect.
Taxifolin	Potent antibacterial agent

Source: Lakshmi et al. 2011

Different parts of the Khayar tree constitute chemical properties that produce some important pharmacological activities. The major pharmacological activities are presented in the table below (Table 10.5).

Table 10:5: Pharmacological activity of various parts of Khayar

Parts Used	Pharmacological activity
Bark	Dysentery, diarrhoea and in healing of wounds, Antioxidant, healing of sore throat, gingivitis, Antidiabetic activity
Leaf	Hepatoprotective, Antio secretory and Anti- ulcer, Antioxidant and Antibacterial, Anti-mycotic activity
Heartwood	To treat mouth sore, gingivitis, dental caries, it possess anti- oxidant and anti-diarrhoeal activity, Ethyl acetate extract of *Acacia catechu* possess analgesic, antipyretic Hepatoprotective and Anti diabetic activity

Source: Lakshmi *et al.*, 2011

The Khayar tree is equally rich in Ayurvedic properties. It is useful for the treatment of skin diseases and also used as astringent herbs that are used in tooth paste. Some of the notable Ayurveda properties are presented in the table below (Table 10.6).

Table 10:6: Some important Ayurveda properties of Khayar tree

Variables	Ayurveda Properties
Taste (Rasa)	Tikta(bitter), Kashaya(astringent)
Property (Guna)	Ruksa(dry)
Potency (Veerya)	Sheeta (cold)
Post digestive effect (Vipaka)	katu (pungent)
Dosha-Karma (Action on Doshas)	Pitta kapha Hara (pacifies pitta & kapha dosha)
Actions (Karma)	Pacana (digestive), Medo-hara(anti-dyslipidemic), Kushtaghna(curing skin disorders), Stambhana (cooling), Rucya (taste promoting), Krimighna (anthelminthic), Sotha hara (anti-inflammatory), Mutra-samgrahaniya(anti-diuretic), Kandughna(anti-pruritic)
Significant rejuvenative actions (Rasayana Karmas)	Sonitasthapana (haemostatic), Rakta-prasadana (Blood purifier), Dantya (promoting dental health)
Indications (Rogaharatva)	Kustha(skin disease), Kasa(cough), Kandu(itching), Krmi (worm infestation) , Meha(diabetes), Jwara(fever), Vrana(wound), Svitra(leucoderma), Sotha(odema), Pandu(anaemia)

Source: Chauhan et al., 2011

Uses of Khayar:

In addition to the Ayurveda properties, the Khayar tree has some common and well established uses of wood products. The main products are *cutch* (used for tanning and dyeing) and *Katha* (used to mix with betel nuts for chewing taste). These are extracted from the heartwood by boiling. The strong durable timber is used for house posts, tools, and wheels; fuel-wood and charcoal, hardwood etc. The uses of Khayar can be divided into two main *categories:*

a) Traditional Usages: Traditional uses of Khayar tree can be further divided into some headings. These are discussed below.

Table 10:7: Some traditional uses of Khayar tree

1) Uses As Medicine:
• The decoction of bark mixed with milk is taken to cure cold and cough.
• The bark decoction is either alone or used in combination with opium to cure severe diarrhoea.
• Katha after drying is applied on lemon slice and taken regularly with empty stomach to cure piles.
• Heartwood of Khayar is boiled with other ingredients to prepare the decoction. It is taken as tea by the pregnant ladies to keep warm their body. It is also given to cure fever due to cold during the pregnancy.
• A decoction is served to women after 2-3 days of child delivery, prepared by boiling Katha along with Ellachi (cardamom). It is believed that it provides strength to the body and also helps in secretion of milk.
• The water boiled with the heartwood chips of Khayar , is used to take bath by women after delivery. It is considered beneficial to cure the body pains.
• Katha or decoction of heartwood is applied in mouth and on tongue to cure mouth ulcer. It is also applied externally on ulcers, boils, skin eruptions and on gums as disinfectant.
• Khersal, a crystalline form of cutch sometimes found deposited in cavities of the wood is used medicinally for the treatment of coughs and sore throat.
• The bark is said to be effective against dysentery, diarrhoea and in healing of wounds.

- The seeds have been reported to have an antibacterial action.
- In East Africa, the powdered bark, mixed with sulphate of copper and egg yolk, is applied to cancerous growths.

2) Uses as Food:

Seeds contain water-soluble mucilage (6.8%); a good protein source but nutritionally incomplete with respect to essential amino acids.

- Seeds of Khayar are very good source of protein.
- Khayar extract is used in paan (chewing betel leaf) which is used after meal as sweet dish or along with tobacco for stimulant effect. Paan is a part of tradition of indo Asian culture.
- Leaves and branches are also food of goats and other animals.

3) Uses as Fencing:

- Cut branches are extensively used for fencing purpose by the farmers to protect agricultural fields and local grasslands from domestic livestock and wild animals.

4) Use for Socio-Religious Beliefs:

- Khayar is considered as one of the sacred trees by the natives and wood is used in the religious ceremonies at the time of havans (yajna).
- Wood is considered sacred and used as one of the religious plants along with bhojpatra (Betula utilis) at the funeral ceremony. It is believed to provide mukti or moksha (peace to the heavenly soul, salvation).

5) Use as Fuel:

The Khayar wood is excellent firewood. The calorific value of sapwood is estimated at 5 142 kcal/kg, heartwood 5244 kcal/kg. Dry wood on destruction gives 38.1% charcoal of very good quality.

- The dried logs, twigs and branches are largely used as fuel.

6) Use as Fodder:

- The trees are lopped heavily for their leaves used as fodder particularly for sheep and goats.

7) Use as Household Articles:

- Wood of Khayar is preferred to prepare various parts of local plough, handles of axe, saw, sickle, hammer, spade and combs.

8) Use As Timber:

Comparatively Khayar is heavy with a density of 880-1000 kg/ m^3 at 15% mc. It is recommended to saw the comparatively heavy wood of Khayar when green; the wood is also very strong, durable and resistant to white ants.

- The wood is considered durable and widely used by the inhabitants for house building material as poles and to prepare furniture like bed poles, tables etc.
- Spent chips left over after extraction of *Katha* and cutch can be used for the manufacture of hardboards.

9) Use as Tannin or dyestuff:

A substance called cutch, which is marketed as a solid extract, can be isolated from the heartwood. Depending on the way of processing, several products can be obtained from crude cutch.

- The dark catechu or Pegu cutch is used to tan heavy hides into sole leather, often in a mixture of tan stuffs.
- Catechu extract is also used for dyeing silk, cotton, canvas, paper and leather to a dark-brownish colour.
- Khayar contains tannic acid which causes the tanning of protein in leather industries. Although now a days leather industry use many other new chemicals for tanning process but *Khayar* is still used in backward areas.

10) Other Uses:

- Gum or resin: The bark exudes a light gum of very good quality and is one of the best substitutes for gum arabic.
- Poison:The bark is said to be toxic and contains an alkaloid and both fruit and stem are used in Myanmar to poison fish.

- The tree is a host for the lac insects; catechu extract is also used for preserving fishing nets and ropes and a viscosity modifier in on-shore oil wells.
- The tree is thought to have a powerfully protective mucilaginous juice, one of the most remarkable properties of which is its power of retaining water.
- It is well known that fire and even hot metal can come in contact with bare skin without injury, provided the skin is covered with the mucilage.
- The Masai of Kenya use the spines to sew the edge of their shields and the warriors use it as a meat skewer.

Sources: Singh and Lal, 2006, Orwa *et al.* 2011, Chauhan *et al.* 2011 and Lakshmi *et al.* 2011

b) Medical Usage: It is already discussed that the Khayar tree is rich in its chemical compounds and these compounds are valuable for medical uses.

Table 10:8: Some important medical uses of Khayar tree

The leaves, shoots, and wood of the Khayar tree are used to make different types of medicines. The two types of Khayar, black catechu (cutch) and pale catechu (*Katha*) contain slightly different chemicals, but they are used for the same purposes and at the same dose.

- Catechu is used for diarrhoea, swelling of the nose and throat, dysentery, swelling of the colon (colitis), bleeding, indigestion, osteoarthritis, and cancer.
- People apply catechu directly to the skin for skin diseases, haemorrhoids, and traumatic injuries; to stop bleeding; and for dressing wounds.
- Catechu is included in mouthwashes and gargles used for gum disease (gingivitis), pain and swelling inside the mouth (stomatitis), sore throat, and mouth ulcers.
- In foods and beverages, catechu is used as a flavouring agent.

Source: TRF, 2009

It is thought that catechu may contain chemicals that can decrease inflammation and kill bacteria. Research suggests that taking 500 mg of a specific catechu extract in combination with a specific Baikal skullcap flavonoid extract known as flavocoxid (Limbrel, Primus Pharmaceuticals) twice daily significantly reduces symptoms of osteoarthritis of the knee. Similarly, this is also used for injuries; Diarrhoea; Swelling of the nose and throat; Swelling in the colon; Bleeding; Cancer; Skin diseases; Hemorrhoids and other more acute health conditions. However, more evidence is needed to rate the effectiveness of catechu for these uses.

However, there are some side effects of using Catechu. Catechu is safe in amounts found in food. But there is not enough information to know if it is safe in the larger amounts that are used as medicine. A specific combination product called flavocoxid (Limbrel, Primus Pharmaceuticals) that contains catechu was safely used in research studies lasting up to 12 weeks. However, there are concerns that this combination product might cause liver problems in some people. This side effect does not appear to be common and might only occur in people who have a type of allergic reaction to it.

It's also not known whether it's safe to apply catechu directly to the skin. Some of the precautions and warnings in using Catechu are outlined below (Source: TRF, 2009).

- ***Pregnancy and breast-feeding:*** Catechu is safe for pregnant and breast-feeding women in food amounts. But larger medicinal amounts should be avoided until more is known.
- ***Low blood pressure (hypotension):*** Catechu might lower blood pressure. There is a concern that it might lower blood pressure too much, causing fainting and other symptoms, in people who already have low blood pressure.
- ***Surgery:*** Because catechu might lower blood pressure, there is a concern that it might interfere with blood pressure control during and after surgery. Stop using catechu at least 2 weeks before a scheduled surgery.

Conservation Status of Khayar

The early growth of Khayar tree is comparatively slow. In Thailand, the mean annual diameter increment is recorded as 0.8 to1.3 m. Weeding of the Khayar tree is essential, especially when the plants are still young. Protection against fire is necessary, especially in the drier parts of its range, and so is protection from grazing animals. Rotation regimes depend upon the intended use: for fuel-wood production, felling is usually at 10-15 years of age; trunks with a diameter of 30-35cm are considered the most economic. For extracting the tanning agent cutch, this size may not be achieved for 30 years.

Seed storage behaviour is orthodox. According to different authors, viability is lost within 1 year in hermetic storage at room temperature at 11-15% mc; viability is maintained for at least 2 years at ambient temperature; viability is maintained for 9 months in open storage at room temperature; viability can be maintained for several years in hermetic storage at 10 degree Celsius. There are 15 000 to 40 000 seeds/kg.

Parasitic plants of the genus Cuscuta may kill the plant, and hemiparasitic plants of the genus Loranthus may damage trees. Insects reported to attack the cutch tree include Bothogonia species, seed boring beetles such as Bruchidus terranus and Bruchus billineatopygus, and the leaf eating insect Dasychira mendosa. Rodents are also reported to damage the trees. The beetle Sinoxyon anale (a branch and twig borer) is found in Thailand. It primarily bores into sapwood of cut logs or into diseased and weak poles, but occasionally it tunnels into shoots and young stems to feed. Fungi, such as Ganoderma lucidum, also cause root rot.

Table 10:9: Causes, symptoms and control measures for diseases on Khayar tree

Root rot disease	Heart rot disease
Causes: • Caused by Gandodermalucidum • It causes heavy mortality in Khayar plantation raised after clear- felling (estimated up to 45% in first nine years.) • Spread out by old infected roots to new roots **Symptoms:** • Tree becomes yellow. • Appears white layers in between wood & bark region **Control measures:** • Old root should be dogged out in plantation. • Isolation trenches 1.5m along across the line including all diseased plant can be dogged out to control infections. • Resistant species like Simal and Ailanthus can be planted with Khayar as mixed plantation.	**Causes:** • Caused by Fomesbadius • Stem are injured by them. **Symptoms:** • Hollowing of bole • Becomes yellow spongy after decaying • Appears ear shaped basidocarp on branches & stem **Control measures:** • Affected trees should be regularly removed in markings. • Sporophores should be collected & burnt.

Source: Forestrynepal, 2014a.

Silviculture of the Khayar tree is presented below.

Table 10:10: Silviculture of Khayar tree

Silvicultural characters	Seed collection	Propagation	Uses
Deciduous tree and strong light demander, frost hardy, moderately drought hardy, coppice strongly, destroyed by grazing	December – March, 40,000 s/kg. germination=60-80% viability=1 year	Direct sowing, entire planting, stump planting	Manufacture of *Katha* and cutch and also used as timber

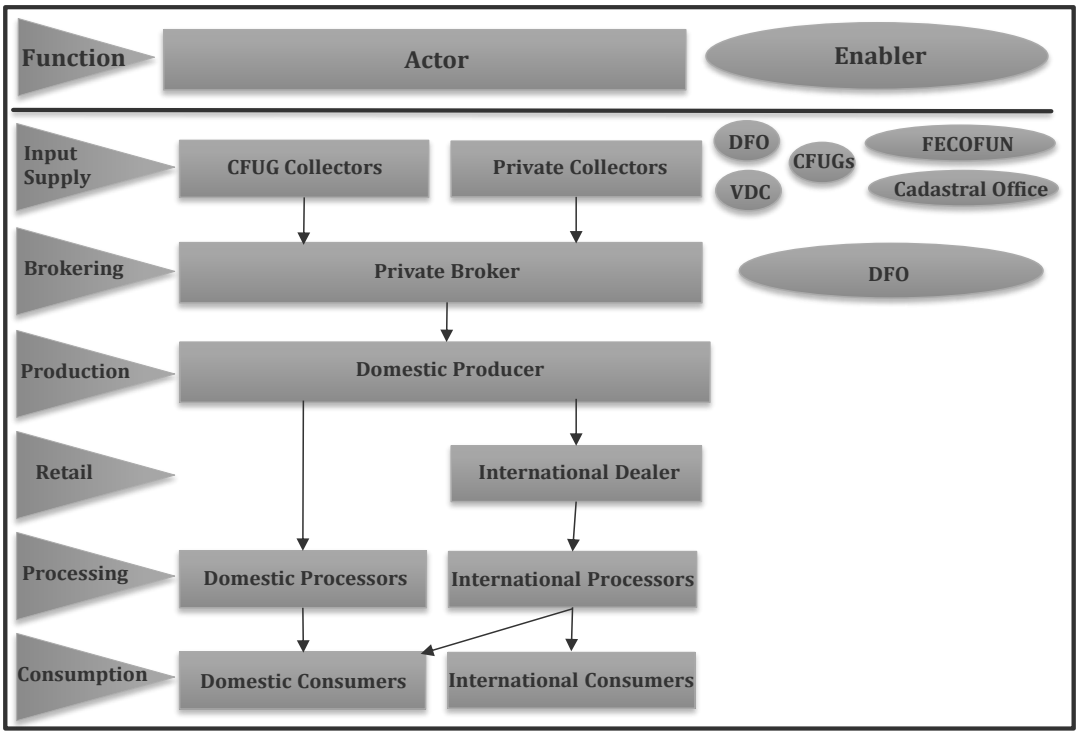
Source: Forestrynepal, 2014b.

The Cutch Tree is on the Alert List for Environmental Weeds, a list of 28 non-native plants that threaten biodiversity and cause other environmental damage. In Australia, it was found that the Khayar weeds have the potential to seriously degrade only in the early stages of establishment. Cutch Tree causes economic damage by forming dense impenetrable stands. It can potentially reduce primary production by displacing and/or shading pastures. The sharp thorns on Cutch Tree branches can impede the movement and mustering of stock (CRC 2003).

Functions of Khayar Value Chain Actors

The value chain map of Khayar has been outlined to describe the various functions, actors, and enablers involved at each level of its value chain. Also included is a detailed illustration and description of the input supply level of the value chain, where greatest economic and social impact for CFUGs can be made.

Figure 10:2: Value chain map of Khayar in eastern Nepal



Source: Field Consultation, 2013/2014

The Khayar value chain begins at the input supply level, in which Khayar timber is sourced and harvested. In Terhathum and Dhankuta districts, Khayar is sourced from one of two types of land: either privately owned forests or community forests. In efforts to curb what was perceived as rampant over-exploitation of forest resources, a government ban was implemented nearly five years ago that restricts all CFUGs from harvesting for commercial sale the green trees of many important commercial species, including Khayar. Khayar harvest for commercial use is restricted to dead, dying and diseased trees. Because of this moratorium on the harvest of green trees for commercial use, CFUGs in both Terhathum and Dhankuta districts have not harvested Khayar in a number of years. The most recent sale of Khayar was undertaken by a CFUG in 2009, who sold 348 ft^3, or approximately 10,440 kg. Private landowners wishing to sell Khayar from private land must first verify that the land indeed belongs to them and that harvesting is occurring within their land boundaries, as incidents of illegal harvesting in the past have taken place where private sellers sell Khayar from CFUG land. The DFO, VDC and District Land Revenue Office (DLRO, the office in charge of registering and verifying landholdings. Also known as the Cadastral Office) all have their part in this verification process.

Whether the Khayar is sold from CFUG or privately-held land, a private, independently affiliated broker arranges all of the processes that take place from the Khayar harvest to its transportation to the processing factory. This broker manages the labor used in harvesting, supplies the axes and chainsaws used in the process, submits an application to the DFO for felling and transportation approval, oversees the debarking and trimming of felled trees, arranges the truck used to transport the Khayar to the factory and so on.

Khayar timber from Terhathum and Dhankuta ends up in regional processing centers near Dharan, Itahari and Biratnagar. In these processing centers, Khayar is chipped and boiled to extract the gum from the tree's tissues—this gum is processed and sold in solid form as *Katha*, a primary ingredient in the chewing paan popular throughout South Asia, and in liquid form as cutch, which is used in oil drilling operations and as a preservative for sail cloth and fishing nets. *Katha* and cutch destined for international markets is sold from the production factory to international—largely India-based—dealers, who sell it on to processers who turn it into finished products and sell it either back to Nepalese or to international consumers. *Katha* and cutch that stays in the domestic markets is sold from production factories to secondary processors, who again make finished products and sell them on the Nepali markets both within the region and around Kathmandu.

Market Actors and Functions:

Within a value chain, value-additive activities and functions occur distinctly but not independently of one another. Just as these relationships between functions are interconnected, so too are the relationships between actors responsible for carrying out these functions. This section will discuss the roles of the different market actors involved in this Khayar VCA for Dhankuta and Terhathum districts: namely, the CFUGs, private land-owners, independent brokers and production and processing companies that helped to inform this report. Although it should be noted that the viewpoints expressed here do not represent the entirety of perspectives present in the value chain, they provide an important representative sample of some of the most prominent actors and functions.

a) CFUGs: Before five years, Khayar was often sourced from community forest user groups. Since Nepal's government placed a ban on the harvest of all green timber for commercial use, CFUG sale of Khayar has dropped dramatically although some CFUGs are still able to harvest and sell dead, dying and diseased stock. For this VCA, the research team spoke with various members of one CFUG in Terhathum district and two executive committee members of CFUGs in Dhankuta district.

In Terhathum, members of the Tumlingtar Bhadure CFUG shared their perspectives on the legal issues surrounding Khayar harvest for CFUGs that restricted many from capitalizing on this potentially lucrative resource. The CFUG had been involved with a criminal case just three or four years prior to this research that today still makes them reluctant to engage in the Khayar harvest. Certain executive committee members of the CFUG had engaged in an under-the-table agreement with a private land-owner to harvest green Khayar and sell it through the private land owner's name. It was agreed that the executive committee members and the private land-owner would split the profits from this illegal harvest, instead of feeding them into the CFUG fund as should have occurred. The committee members and the private land-owner were caught and arrested by the DFO for their illegal actions, but not before 1,000 trees of Khayar — nearly all the Khayar growing in the community's forest—had been cut. This timber was confiscated in the DFO, resulting in a huge loss for the CFUG. Today, because of the heightened verification processes they must go through as a result of this case, as well as the fact that they no longer have Khayar of a mature age to harvest; the Bhadaure community is reluctant to explore Khayar as a potential income generator. Other CFUGs in Terhathum have taken heed from this example, and according to the current Bhadure CFUG chief, no CFUGs in Terhathum are harvesting Khayar .

In Dhankuta, the chief of the Beeleni Pakha CFUG and the secretary of the Rudrabari CFUG shared their communities' experiences with harvesting Khayar . Both community leaders recognize the income potential associated with Khayar , as the Beeleni Pakha chief acknowledged that in a year when Khayar is sold, the income from its sale can constitute 80-90% of the CFUG fund's income for that year. Khayar harvest is also an important source of income for the community's poorest members, who are given priority to work as labor in the process. However, the last time both CFUGs sold Khayar was four years ago, for a number of different reasons. One is that Khayar has a "medium" regeneration rate and Khayar forests need time between harvests to increase their growing stock. Another is the ban placed on cutting green Khayar for commercial sale, limiting the communities to cutting only dead, dying and diseased trees, of which there are only so many. CFUG leaders also acknowledge that the entire process of cutting and auctioning Khayar is lengthy and complicated, with many non-transparent stages of the process where value is lost to corruption and elite capture. CFUGs in Dhankuta voiced a desire and hope to be able to continue with Khayar harvest into the future, but also recognize a need for greater support from NGOs and other resources if they are to capitalize upon the profit potential that Khayar offers.

b) Private Land-owners: Because of the government ban on CFUGs cutting green timber for commercial sale, nearly all of the Khayar harvested in Terhathum and a significant amount of the Khayar from Dhankuta is harvested off of private land. Many of these private land-owners are middle or low income agriculturalists who have inherited the land through their families. For private land-owners, Khayar harvest is a source of inconsistent but important income. While many legal and administrative barriers also exist for private land-owners in its harvesting process, they do not face the same problems that CFUGs must overcome.

c) Independent Brokers: Independent brokers are crucial actors in the Khayar harvesting process, as they are involved and often in charge of the steps from when a private or CFUG seller first decides to harvest it , all the way to when the Khayar is delivered to the factory. For this VCA, brokers from both Terhathum and Dhankuta districts shared their perspectives. Almost all of the costs associated with the harvest, including application fees, wages and equipment, are all born by the broker. One Dhankuta broker explained that, for all of this investment of time and effort, his profit per kilogram is only 4 to 5 NRs. Brokers face pressure from many different sides to conduct business in illegal or unapproved ways. The companies they work with often impose high supply quotas that they are pressured to meet, causing a need for brokers to overstep the auction process with CFUGs and prearrange agreements. When Khayar is inaccessible, brokers are forced to bear this extra cost and therefore have to go below the government minimum rate they can offer to sellers. Brokers can often also be pressured, whether willingly or reluctantly, to reinforce corrupt practices by paying bribes to officials or to the "timber mafia."

d) Production Company: Of the four main actors considered in this process, the *Katha* and cutch production companies undoubtedly have the most economic and political leverage in this value chain. Production companies capture the majority of the value added in the Khayar value chain. *Katha* and cutch are high-value commodities that are extremely tradable and demanded throughout South and Southeast Asia. The use of *Katha* in Gutka (a mixture of crushed areca nut, tobacco, *Katha*/ catechu, paraffin, slaked lime and sweet or savory flavorings) in recent times in India has seen high increase in its demand.

Enablers and Facilitators:

Because it is a high-value forest resource, the Khayar value chain is more complex and lengthy than that of many other forest resources. The various actors within the chain are supported by a number of government and civil-society organizations. Government laws and policies also affect the actions that take place within the value chain. Although these enablers and facilitators can be found at every level, the focus for this analysis lies at the input supply level and therefore enablers and facilitators of Khayar harvesting processes will be emphasized here.

The DFO commonly provides support for general administrative and governance needs and coordination amongst the private land-owners and CFUGs within both Dhankuta and Terhathum districts. This coordination can assist the sellers during company negotiations, offering them leverage, as they will be informed about appropriate market prices and other terms they must negotiate in writing out the contract. Current market prices for Khayar and other timber products are broadcast in by the Terhathum District DFO over FM radio once a week; to inform sellers of the market prices they are capable of receiving.

Within the Khayar value chain, VDCs are responsible for verifying the boundaries of CFUG versus privately-held forest, as well as monitoring harvest processes to prevent illegal practices. A District Land Revenue Office (DLRO) plays a similar role to VDCs in this regard; the DLRO acts as the land records office for a District, verifying land boundaries and survey land to create maps and records. Private land-owners hoping to harvest Khayar often have their land boundaries verified by the DLRO before they can receive DFO approval to harvest. The District Development Committee is a third powerful enabler in its value chain. The DDC not only plays a role in verifying land boundaries and monitoring harvest practices, but also collects a tax on all Khayar transported out of the district, in order to support district-wide development projects such as infrastructural development and public health initiatives.

Communities get assistance from FECOFUN in drafting their organizational plans as well as their constitutions, which often dictate harvest amount and labor hiring practices. FECOFUN also often provides workshops for community members on such topics as management or accounting, which are held in either the primary bazaar or the community depending on demand. When CFUGs run into legal issues having to do with Khayar , such as the criminal case the Bhadure CFUG mentioned previously encountered, FECOFUN provides legal counsel for them. FECOFUN is also currently challenging the government ban on the harvest of green trees for commercial sale, arguing that if CFUGs are autonomous bodies with independent management rights, they should be allowed to sell their resources without restriction.

Table 10:11: Enablers of Khayar in Terhathum and Dhankuta Districts

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, PF, CF
Royalty Payment	DFO, CF
Checking and weighing	Range Post
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Certificate of origin	FNCCI/ DCCI
Market information	Agents, *Katha* enterprises
Financial Support	N.A
Processing technology	*Katha* enterprises
Resource management and Research	DFO
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Economic Analysis of Khayar

The growth of the pharmaceutical industry and the unceasing development of new and more effective synthetic and biological medicinal products have not diminished the importance of medicinal plants in many societies. Various research has shown high medicinal remedies possible but still needs future classification of herbal medicines, as well as for evaluative studies of their efficacy and safety, and their potential use in national health care systems in different parts of the world. Hence, this study tries to discuss the various pharmacological activities and Ayurveda literature about *Khayar* with the aim to contribute in further research in the issue and actions through recommendation in its value chain actors.

Manufacturing Products from Khayar

The process of manufacturing is simple and standardized. Heartwood of Khayar is cut into fine chips and around 8 to 9 kg are kept in a wire net cage to avoid direct contact with heated surface of the extractor. Extraction is done by boiling chips with water for about three hours. These cages, with about 25 to 27 liters of water, nearly three times the weight of chips, are placed in extractors. Extract from each extractor is mixed after filtering with the help of muslin cloth and concentrated in an open pan on fire and then kept in shade to facilitate crystallization of *Katha* for about two days. After completed crystallization, the curd like mass is passed through frame and plate- type filter press operated manually and then it is washed with cold water to improve the quality of *Katha*. It is then placed on wooden frames with canvas cloth to separate traces of cutch. Finally *Katha* is cut into uniform tablets with the help of wire cutter or knife and dried in sheds. The moth liquor after removal of *Katha* is further concentrated in an open pan till it becomes viscous and then poured in wooden frames for drying. The dried material is cutch.

It is estimated that a Khayar tree normally can yield 1 to5m^3/ha/year. The yield of hardwood is estimated as 50–75 m^3 at 60 years that approximately carry the capacity of yielding 4–6 tonnes of cutch. The wood density is normally estimated as 0.8–1.2 m.

About 100 kg of *Acacia* chips give 5 kg of *Katha* and 14 kg of cutch; the yield depends on the quality of chips. There is a lack of research on identifying yield of Nepalese based enterprises and also lack of process assessment of these enterprises for making them more efficient and get optimum yield. Processing methods have been well defined in India and Thailand along with substantial body of Indian silvicultural data on the species. There is urgent need for research on yield, processing techniques and innovation, alternative process of *Katha* making in Nepal.

There are two major commercial products from Khayar tree at present viz. *Katha* and cutch. About 63,000 tons of Khayar wood in India is annually consumed for manufacture of cutch and catechu. Chemically the products are catechin (*Katha*) and catechutannicacid (cutch). A third article of commerce is also obtained in the shape of a white powder, known as khersal, which appears as a deposit in the wood.

The studies found that Katha can be produced from other species. Sources from which *Katha* are being extracted now are (Source: Soni and Sharma, 2001):

a. *Uncaria gambier* Roxb (found in Malaysian region);
b. *Acacia chundra* Willd;
c. *Acacia catechuoides;*

There has been large import of Gambier from Malaysia to India recently as yield of *Katha* obtained and its characteristics are comparable to *Katha* obtained from *Acacia catechu*.

Table 10:12: End products from Katha and cutch enterprise

Present products	Description
Katha (Pale catechu)	It is mainly used in betel leaf (paan) as masticatory and valued for its catechin contents. (Source: EIRI, 2014)
Cutch (Black catechu)	The byproduct of *Katha* industry largely used for dyeing, coloring pulp in paper industry, water softening and in deep oil drilling operation. (Source: Orwa *et al.* 2009, EIRI, 2014)
Khersal	White powder which appears as a deposit in a wood which is used for medicinal purposes especially for cough and sore throat. (Source: Orwa *et al.* 2009)
Spent chips	Used for heating purpose in Biscuits manufacturing industries (Nepal), also used for making hardboards. (Source: Field Consultation, 2013/ 2014)

Katha is obtained mostly by crystallization in cold water from the water extractives of the heartwood of *Acacia catechu* Willd. In India extraction of *Katha* and cutch is carried out by both cottage sectors as well as large scale units. The processing companies go through many

value addition activities and also obtain the highest profit of revenue up to this point of the value chain, which is why it is integral to understand their activities as well as their revenues received. Value addition activities are conducted by multiple actors within the value chain. However, this study found that some companies within those surveyed in Itahari were doing both the final processing and exporting of Khayar all within one company, rather than splitting up the activity amongst different actors. Moreover, the important thing was that its producers or community has no input costs to its production , especially since all costs are reimbursed by the broker after the purchase.

Table 10:13: Estimated production costs according to the actor

Activities	Actors and their Activity Costs (NRs/kg)				
	CFUG	Broker	Final processor	Exporters	Total
CFUG					0.00
Payment to CFUG		10.00			10.00
Harvesting costs		15.00			15.00
Payment to broker			30.00		30.00
Processing and storage			11.15		11.15
Payment and packaging				58.63	58.63
Total	0.00	25.00	41.15	58.63	124.78

Source: Field Consultation, 2013/2014

The broker invests around NRs 25 for Khayar, which can be broken down into the NRs 10/ kg of it as well as NRs 15 for harvesting costs, such as the harvesting of the tree and the transportation of the segments out of the community forest. The cost of production for the final processor is estimated to be NRs 41.15 per kg. . This can be broken down as NRs 30 for payment to the collector and then NRs 11.15 for the processing and storage of the processed Khayar tree. Exporters then have a production cost of NRs 58.63 per kg, which covers the costs of paying the processor and packaging the two products, amongst other value addition activities. Thus at this point of the value chain, the total added cost from the chain actors in NRs 124.87. At this point the Khayar has been broken down to its two products, and can be expected to earn NRs 1,100 per kg of *Katha* and NRs 38 per kg of cutch (Bhandari and Katwal, 2011).

Trade and Markets of Khayar Products:

Black catechu is included in several European pharmacopoeias but the current scale of usages, if any, is insignificant. There appear to be no imports of cutch into developed country markets for use as a dyestuff or as tanning agent. Trade in cutch appears restricted to the traditional usage areas of the Indian subcontinent and certain countries in Southeast Asia. Imports have been reported for Pakistan, Nepal, Bangladesh and Myanmar, which are not self-sufficient in domestic production, and by China.

Table 10:14: The end markets of Khayar products from east Nepal

Actor	Product	End market	End market location
Collector	Khayar	Producer	Regional commercial hubs: Dharan, Itahari, Biratnagar
Producer	Cutch	Domestic and South Asian processors	Nepal, India, South Asia, Southeast Asia
	Katha	South Asian processors	India, South Asia, Southeast Asia

Source: Field Consultation, 2013/2014

The table above (Table 10.14) illustrates Khayar end markets segmented by their stages of production. It is clearly seen that the Khayar sourced from Terhathum and Dhankuta districts go to the producers at regional commercial hubs, largely in the low-lying cities of Dharan, Itahari and Biratnagar. In these areas, it is processed into either *Katha* or cutch. Cutch is either sold on the domestic or international markets to processors who use it for the creation of finished products like cloth preservatives or color fixatives.

The majority of *Katha* produced in Nepal is sold on the international market, largely to India, where it also used in further processing, especially to make paan, a chewing tobacco substance popular in the region. Cutch primarily remains in the domestic market, while *Katha* plays an important role in the international market and is a very profitable product across various nations and uses. Khayar is sold from 34 out of the 75 districts in Nepal, demonstrating its vastness across the nation and its role in trade.

The Katha and cutch producers in Nepal say that India is a primary trading partner with Nepali-based processing companies, but there are other nations as well which product *Katha* and cutch, such as China, Indonesia, Thailand and Burma. India is also the leading country among South Asian countries in terms of its production and export capacities. Literature suggests that Nepal exported 18,040 metric tonnes of Khayar from 2001 to 2002, and the numbers seem to increase across the span of time, reaching 43,870 metric tonnes in 2004 and then growing to 121,710 metric tonnes in 2008 and 2009. This data show the growth of the share of Khayar sales in Nepal's total exports, which averaged around 0.7% in 2004 to 2005 and then grew to reach 1.8% in 2008 and 2009 (Bhandari and Katwal 2011).

A study on *Katha* found that it contributes around 1.8% of export in Nepal (Bhandari and Katwal, 2011) and it is ironic that less research has been carried out for upgrading the Khayar value chain. Extraction of *Katha* and clutch required factory set up. There are six registered *Katha* enterprises in Nepal. These enterprises have high investment in factory and are getting Khayar trees from all over Nepal. Research has shown an increasing demand of *Katha* and cutch and search for alternatives due to high exploitation of Khayar tree. Forest based industries Development Plan 1988, depicted 6 licensed *Katha* plants were provided annual quota of 31, 060 m^3 and recommended to preserve remaining Khayar forest for careful conservation on a sustained yield basis. The recent discussion with *Katha* enterprises has shown threats of closure of their enterprises due to lack of raw materials availability in the future. The secondary information revealed those six *Katha* factories with a total annual production of 650 tonnes of *Katha* and 700 tonnes of Catechu (potential to produce 1800 tons of *Katha* and 2200 tonnes of catechu). During the same time, six small scale plants were closed.

The future of the country's six *Katha* plants are now depending on *Katha* tree available in lower hilly regions. The sustainable annual yield of Khayar from Tarai forests has declined from 26,000 m^3 in 1979 to about 8, 400 m^3 in 1988, while the total annual quota of six enterprises are almost 38000 m^3 (Sheak, 1989). On the other hand, the Khayar tree loses its market value in ten years. It is very important to look at this perspective and develop a model for growth of its value chain in Nepal.

SWOT Analysis of Khayar Value Chain in East Nepal:

An important component of the Khayar VCA is the consideration of its strengths, weaknesses, opportunities, and threats (SWOT) and an analysis of how these pertain to its constraints and opportunities at each functional level of the value chain.

Table 10:15: SWOT Analysis of Khayar value chain in Terhathum and Dhankuta districts

Strengths (to capitalize on)	Weaknesses (to eliminate)
➢ Lucrative and Expensive product; ➢ Flexible harvesting period; ➢ Priority of employment given to DAG ; ➢ Require little skill training in supply chain; ➢ Strong support from FECOFUN; ➢ Radio broadcasts to support knowledge sharing;	➢ Elite capture of legal processes by brokers; ➢ Accessibility of forest to road drastically changes price; ➢ Lack of sense of ownership; ➢ Take 25-35 years to grow to adulthood; ➢ Employment is insecure and unstable; ➢ Legal controversies surrounding Khayar ; ➢ Lack of understanding of required process for harvest;
Opportunities (to take advantage of)	**Threats (to overcome)**
➢ Major contribution to the CFUG fund; ➢ Employment opportunities for DAG populations;	➢ Brokers prioritize forests over CFUGs; ➢ Broker organizations create fixed prices of Khayar ;

Source: Field Consultation, 2013/2014

Competitive analysis provides an overview of the SWOT within the Khayar value chain. This specifically examines the strengths and weaknesses that are internal within the resin collection process, as well as the opportunities and threats that lie external to the current Khayar value chain.

a) Strengths: Khayar is a forest product that has heartwood which can be used for the production of many products to be sold on the world market. For this reason, it is a very lucrative product for CFUGs within the area. One CFUG stated that they earn 80-90% of their fund solely for the sale of it . That funding can then be used to provide necessary development work within the communities such as funding for education and adult literacy as well as providing roofs for homes and stretchers for the communities. It is also a product which can be sold at any time of the year except monsoon season, so it is flexible according to the schedules and lifestyles of those within the CFUG, who commonly have complex schedules organized around agriculture.

Khayar presents valuable opportunities for DAG groups who often rely on infrequent labor opportunities for income to be used to purchase food that they are unable to grow. Harvesting it requires little to no training because many people in the area have spent generations harvesting and utilizing it for non-business purposes, and thus are very experienced in the process. Because the harvesting process is usually a short term employment opportunity (the longest period of employment found by the research team was one month), it can be completed while also maintaining the crops that DAGs grow. This gives them a unique opportunity to be able to generate income without sacrificing their lifestyles and necessary activities.

FECOFUN is also involved much in the Khayar process, specifically within Terhathum district. The organization has continuously pushed for the weakening and lessening of the legal barriers encountered by CFUGs and has also assisted in filling range post

positions so that CFUGs can endure legal processes with much more ease. The DFO within Terhathum also identified a relatively new radio broadcast which was created to advertise the monthly rates of Khayar as well as other forest products. This broadcast assists locals with identifying the market rates of Khayar and other products so that they can have stronger negotiating power against brokers who may have been buying for lower than market rates in the past.

b) Weaknesses: Many of the weaknesses within Khayar production lie within a lack of understanding, lack of ownership, and a controversial history within the Khayar industry. Because commonly the CFUGs unofficially give brokers the rights to organize all legal and harvesting processes, some communities are unaware of how to navigate these complex requirements on their own. One private seller stated that while the broker could organize the legal requirements in under two weeks, it would take them around one month due to their lack of understanding for what needs to be completed for legal approval. While this is information for a private forest, parallels can be drawn between some of the legal requirements for community forests, and it should be noted that various actors stated that community forests had even more complex legal barriers. For this reason, some of its sellers stated they sold at lower rates than necessary in order to avoid the hassles of navigating the legal process. Another major weakness is that accessibility of the Khayar forest to the road that plays a major role in determination of the selling price, at times bringing the price down to NRs 6 per kg which is NRs 4 below the minimum rate set by the government. This means that those who are already at a disadvantage of having inaccessible forests are receiving lower income than the standards that are supposed to be ensured by the government.

Another weakness identified by almost all stakeholders within the value chain (communities, governmental and nongovernmental organizations) is the lack of sense of ownership of the community to the community managed forests. However, these opinions differ on why the lack of ownership exists. While the Terhathum DFO seems to imply that the lack of ownership is due to the community rather than a single household owning the land, community members stated that the land is really under government control and not their own. This can be attributed to the many legal barriers and hurdles placed in front of the community even after they have completed their vote on how to manage the forest. One pilot program in Terhathum seeks to solve the reasoning identified by the DFO by using land allocation to separate the CFUG land amongst households, and then have each household dedicate a percentage of their earnings (ranging between 10-15%) to the CFUG fund. These households are then managed by the CFUG. However, the DFO also stated that community leaders have been resistant to this plan because of the growing responsibility to manage households on top of their standard CFUG management requirements. One should also be hesitant to gather further information on the root of the lack of sense of ownership prior to implementation of target programs, as the purposes behind implementation of community forestry initiatives could be lost in switching to a method of household management.

The legal controversies surrounding Khayar have become quite intricate and notorious, causing many to communities to withdraw from the market entirely in order to avoid any negative associations. The current case within the Supreme Court surrounding a community forest in Terhathum has brought community forestry sale of Khayar to a halt in the surrounding districts. Within this case, the Steering Committee of a Terhathum CFUG conducted secret negotiations with a broker harvesting from a neighbouring private forest. These negotiations resulted in an illegal arrangement for the broker to

harvest and privately sell up to 1,000 Khayar trees on the border of the community forest nearest the private forest selling the same. The process was brought to a halt by community members once the trees began being harvested. Prior to this case, communities and FECOFUN stated that many were unaware of the potential benefits of it for business purposes and thus were not involved in the process. Unfortunately, this case has brought to light the benefits of its sale, but has done so in such an environment that communities are still unwilling to participate in the notorious market.

c) Opportunities: Khayar presents opportunities to CFUGs in primarily two ways. First, it provides a major source of income for CFUG funds that are used for community development initiatives. Secondly, communities interviewed by the research team stated that DAG members of the CFUG are given priority for the employment opportunities generated by it .

The generation of income in the CFUG fund is incredibly valuable not only for the CFUG, but also in the development of infrastructure as well as greater medical and education systems. Also, CFUGs are commonly organized and provide support to one another by sharing information on best practices and knowledge gained; thus the strength and growth of one CFUG fund have the potential to create spillover effects for the CFUGs affiliated with that community. The CFUG fund is commonly used to support DAG groups, which should be especially highlighted in poverty alleviation programs.

Khayar plays an important role in this process due to its potential to generate massive collective income for a community with a minimal time requirement and flexible harvesting season.

Another primary benefit of it is the priority given to DAG men for the employment opportunities generated through its sales. Communities interviewed stated that employees responsible for the cutting, debarking and transportation of it can expect to earn NRs 500-800 per day, NRs 1,000 if they work from dawn to dusk, over a period of one week to 30 days. This income provides additional support to DAG populations which commonly rely on short term, hard labor opportunities as well as subsistence agriculture in order to support themselves and their families. While this employment is short term and varies from year to year based on the community's determination of whether or not they will sell Khayar as well as how much of it they are choosing and permitted to sell, the income generated is still helpful to those employed.

d) Threats: The first sets of threats come from the involvement of the broker within the Khayar value chain. Brokers often prioritize the purchase of Khayar from private forests due to the intense legal processes surrounding CFUGs. Thus, communities are seen as a last resort for many brokers who have not let their full potential of its sales for that time. Because of this, communities have less bargaining power and less of a guarantee of valuable Khayar sales. Brokers are also organized in tight broker organizations which collaborate to set prices and ensure that CFUGs are unable to turn to multiple brokers in order to find higher rates. These organizations pay brokers to not offer CFUGs any money for their Khayar , leaving them with one option for brokers to sell their products to. Brokers also often times front the costs of Khayar harvesting for CFUGs with an advance. This advance covers the cost of wages, legal documentation, and supplies needed. Because the brokers are offering so much financial assistance, the necessary investment needed from CFUGs to get involved is too high for many of them to bear the cost.

The second sets are the threats within the current value chain. First, there is a large amount of pressure between CFUGs to abstain from the sale of Khayar in the current legal environment. This makes its market tainted by corruption and can leave CFUGs with poor associations if they become involved, which serves as a major discouragement amongst communities. Second, the CFUGs still remain under vast government control through the legal requirements they must pass through in order to sell it . As stated previously, CFUGs have more legal barriers than private forests, which makes the process costly and time consuming and can often restricts CFUGs from pursuing Khayar harvest as an income generation opportunity. Lastly, the auction process is sometimes staged, as the contracts between brokers and CFUGs are prearranged. Not only does the CFUG have an arrangement with the broker prior to the auction, but the broker also has arrangements with the other brokers present, often times paying them between NRs 1,000 - 5,000 not to bid on the Khayar . This can leave communities to receive less than the market price for their Khayar sales.

Last within the threats is the threat of unrecorded service charges. These charges are identified by every stakeholder and exist throughout the entire value chain. For example, service charges were identified in the negotiations between the CFUG executive committee and the agent, in the legal process between the agent, DFO and range post, and in the transportation process between the agent, police, and local political groups and gangs. These service charges not only take potential profits away from the CFUG, but they also serve as investment costs which increase the barriers for the CFUGs to harvest and manage their own Khayar sales directly to a factory. These charges threaten the legality and thus the security of the Khayar market, making the communities less incentivized to get involved in the process which has great income potential for the CFUG fund.

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as a Business Development Services (BDS) strategy in the next section, as a part of Value Chain Upgrading Strategy (VCUS).

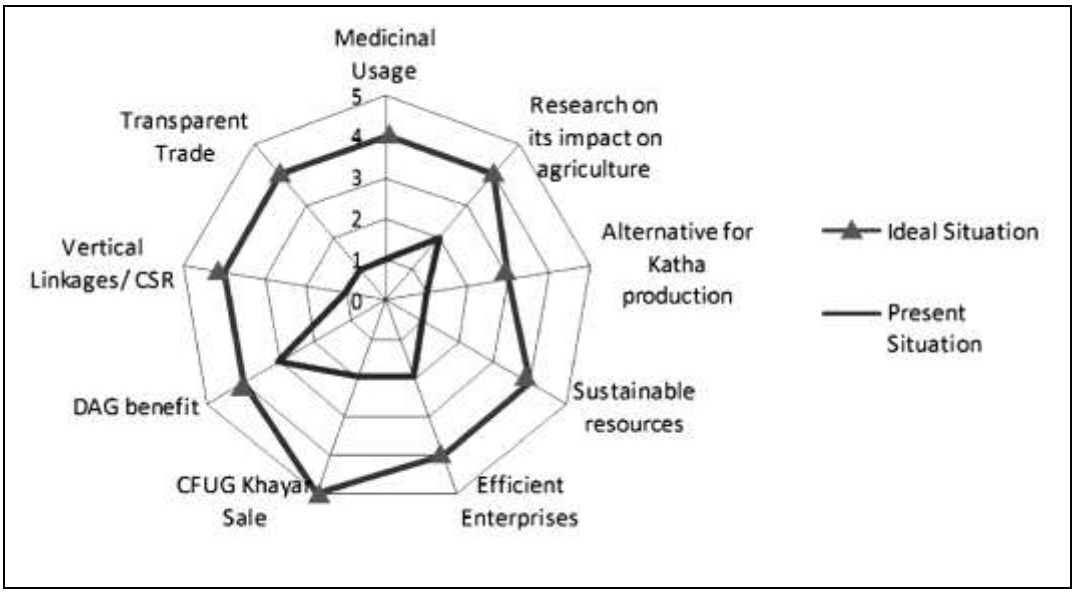
Value Chain Upgrading Strategy of Khayar Products

Khayar is considered a medicinal wonder both in Ayurveda and modern medicine. Its use has been explored in India and many other countries in various products. However, it has been largely and commonly used in paan making. Another important aspect of it is over exploitation and various corruption cases. The possible value chain upgrading activities are discussed in the coming section.

End Market Analysis:

The discussion with various stakeholders in Khayar has shown various issues associated with its trade. The issues and concerns of the value chain actors have been categorized into the commercial values and compared to see gaps between the market demands and present status.

Figure 10:3: Gaps between ideal situation and present status of Khayar production in east Nepal



Source: Field consultation, 2013/2014

The comparisons between the ideal situation and present status have been done by developing some conditional parameters. These comparative parameters are presented in the table below (Table 10.16).

Table 10:16: Parameters used to compare ideal situation and present status of Khayar value chain

Parameters	1	2	3	4	5
Medicinal Usage of Khair	Khair usage for conventional/ traditional purpose	Khair based products developed for medicinal purposes through Ayurvedic practitionares	Khair based products developed through pharma industries	Khair based product development through MSEs	Optimum utilization of Khair for possible best practices
Efficient Katha enterprises	Minimal yield of *Katha* and cutch	Avarage yield of *Katha* and cutch	Industry standard yield of *Katha* and cutch	Best yield of *Katha* and cutch	
DAG benefit	DAG benefit in terms of partial employment	DAG benefit in terms of partial and some full employment	DAG involvement in majority of process	DAG involvement if product making from Khair	
Transparent trade	Minimal understanding of trade amonst supply chain actors	Average understanding Trade amongst supply chain actors	Trade process understood by supply chain actors and can carry out in own if needed	Vertical integration between enterprises and supply chain	
Vertical Linkages/ CSR Katha enterprises	Competitive price paid to supply chain	Competitive price and transparency maintained throughout supply chain	Investment of private sectors in resource management	Investment of private sectors for skill upgrading of local people to involve in value chain	Voluntery and standard certification on CSR like global compact etc.
Alternative for Katha production apart from acacia catechu species	Usage of one species	Usage of more than one species	Usage of possible species	Import of species	
Research on its Impact on biodiversity and environment	Grass root knowledge about impact	International cases on its negative impact	Technical notes and case studies at national level	Policy on impact control from DFO/ DADO etc.	
CFUG Khair sale	Khair sale prohibited from CFUG from the District but permission provided in other District	Khair sale pemitted from CFUG	Khair sale permitted in District by following required regulation	Khair sale permitted in District and easiness for trade	Certification like FSC and other obtained for sale of Khair from CFUG and permission from DFO
Sustainable resoruces	Exploited	Depleting trend	Avarage	Sustainable	Certified

Source: Field Consultation, 2013/2014

The above figure (Figure 10.3) clearly shows the wide gaps between the ideal situation (which is also the market demand) and the present status of the Khayar value chain in east Nepal. Identification and implementation of practical strategies are most essential and hence some of the possible strategies are discussed below.

Medincal usages of Khayar: Khayar at present has been widely used for *Katha* and cutch manufacturing. Secondary information has revealed the richness in medicinal properties of Khayar tree. It is also equally useful for hair dyeing. Traditional medicinal usage has been carried out by native but there are lack of research on new product development apart from *Katha* and cutch. There needs to be further research regarding MSEs creation from various parts of Khayar.

Efficient *Katha* and cutch enterprises: The industry standard yield of Khayar for manufacturing *Katha* and cutch is: 100 kg of *Acacia* chips give 5 kg of *Katha* and 14 kg of cutch. The enterprises are on the one hand running below the capacity and on the other hand research on their efficiency has not been documented. It is important to develop case studies of existing *Katha* enterprises to examine the yield and recommend steps for higher yield and efficiency. This can also increase business volume for *Katha* enterprises which are facing high dilemmas in raw materials procurement. Also, present enterprises in Nepal are not able to commercially use some important and valuable properties like:

a. Khersal for its medicinal benefits, which is deemed as waste;
b. Spent chips left over after extraction is sold for heating purposes whereas it can be used for manufacture of hardboards;

DAG benefit: There is a high involvement of DAG communities during the harvesting of Khayar. They are used to harvest it from private forest by brokers and private forest owners. Their involvement can increase with possibilities of MSEs creation by optimum usages of Khayar tree and its part in medicinal and other usage.

Vertical Integration and Corporate Social Responsibility (CSR) of *Katha* and cutch enterprises: Brokers are major suppliers of Khayar to enterprises and this creates a lack of effort from *Katha* and cutch enterprises to work as socially responsible business. There are limited activities from enterprise for the promotion and upgrading of supply chain. It is desirable for these enterprises to work on sustainable management of resources, training to local people and increasing transparency in the trade.

Khayar sale from CFUG: At present, green timber of Khayar from CFUG has not been permitted in Terhathum and Dhankuta district. This brings in a catch- 22 situation because of:

- Rampant exploitation of Khayar in the last couple of years;
- Lack of sustainable harvesting practices due to high age of regeneration;
- Earlier experiences of wrong doing by CF and various cases filed;

Further research is required to find optimum solutions for CF Khayar sale as restricting it increases illegal trade and decline in CFUG income. One suggested modality can be: **"Limiting auctioning to registered Khayar enterprises".** Khayar based enterprises are suffering from a lack of supply chain links and are always inclined to brokers. There is missing link between CF and enterprises. As there are a small number of Khayar enterprises (six in Nepal), it is important to develop vertical linkages for regular/ sustainable supply along with CSR provision of these enterprises for resource management and capacity building of CF. This may gradually reduce the illegal and negative activities carried out by the brokers. The broker functional upgrading or alternative income mechanism can be discussed between CF and enterprises. The broker still can act as an agent for enterprises for collection and transportation of Khayar to enterprises.

Transparent trade: There are clear regulations regarding Khayar trade from GoN, but still there is lack of understanding of trade amongst supply chain actors, mainly CF and PF. There are missing links regarding how and in what way Khayar from CF and PF reach enterprises. Brokers seem the most powerful actor in this value chain where information about backward and forward linkages is not well communicated. There are incidences of corruption in its trade, which hinders the transparency in trade. It is important to devise more pragmatic process of trade by increasing transparency at all levels.

Alternative for *Katha* production: In Nepal *Katha* and cutch are produced from acacia catechu only. There has been research which has found that *Katha* can also be produced from *acacia chundra* Willd and *acacia catechuoides*. Further, in India there is import of *Unacaria gambier* Roxb from Malaysia which has comparable characteristics as *Acacia catechu*. There has been some news about health effects of Gambier in India which has to be further explored. These alternative species for *Katha* production are very important for fully functioning enterprises.

Research on its impact on biodiversity and environment: The Cutch tree is on the Alert list for Environmental weeds (CRC, 2003). It suggests cutch tree causes economic damage by forming dense impenetrable stands. It can also potentially reduce primary production by displacing and/ or sharing pastures. In Nepal, research on this has not been carried out. It is important to analyse the impact of *Acacia catechu* in biodiversity and environment.

Sustainable resources: The sustainable annual yield of Khayar from Tarai forest has declined from 26,000 m^3 in 1979 to about 8, 400 m^3 in 1988, while the total annual quota of six enterprises is almost 38,000 m^3. This has now increased the trade from lower hills after access to transportation. It is important to learn from Tarai experience and develop sustainable model for Khayar supply to enterprises. There has been lack of policy regarding sustainable harvesting from private land in Nepal. Thus, it is also important to: **"Develop sustainable harvesting modalities in Private Land".** The discussion with Brokers revealed their interest in procurement of it from private land due to relative easiness. This again has increased exploitation of Khayar in private land. This can be a remedy for short term but a conscious effort in its value chain has to be looked upon for long term trade. Khayar based products can contribute to National economy in long term if the resources are managed in CF and PF.

1. Firm level upgrading strategy:

The firm level upgrading strategy is developed based on the gaps identified above. The strategies are derived to minimize the existing gaps.

a) Product upgrading: At present *Katha* and cutch are major products from Khayar tree. It is important to maximize and optimize Khayar tree/ and multiple uses of its parts in a commercial way. The product upgrading is based on three years plan and in first year focus will be carried out optimum operation of enterprises, standardization and increasing mixed products. The detail of each year strategies is presented in table below (Table 12).

Table 10:17: Product upgrading strategies for Khayar value chain

Parameters	Present	Year 1	Year 2	Year 3
Product	Khayar from private land; *Katha*, cutch and spent chips to biscuits manufactures for heating purpose	Khair from PF and CF; *Katha*, cutch, Khersal (medicinal usages) and spent chips for manufacture of hardboards	Khayar from PF and CF; Research on MSEs possibilities for products related to Khair tree apart from *Katha* and cutch	Khayar from PF an CF; Alternative species; Import MSEs development and promotion
Price	Income to PF	Income to CF and PF		Additional income to MSEs; Optimum operation of *Katha* and cutch enterprises from other species
Place	India	India	India	National, India
Promotion	Over exploitation and non-transparency in trade; CATCH- 22 situation	Confidence building and devising pragmatic way for transparent trade	Promoting Khayar as major sources of income and exportable product; Promoting for enlisting in NTIS; Promoting its importance amongst pharmaceutical industries	Certification at *Katha* and cutch enterprise level; Certification at supply chain level

Source: Field Consultation, 2013/2014

b) Process upgrading: The whole process of Khayar value chain can be presented in simplified flow chart.

Figure 10:4: Production process map of Khayar

Timber harvesting	→	Felling of trees	Peeling of bark	Cutting into logs	Transport to roadside
↓					
Brokers	→	Truck Rental	Transportation authorization from DFO		Log pick up/ delivery
↓					
***Katha* and cutch enterprises**	→	Cutting of wood into fine chips; Extraction	Crystallization; Filtration; Washing	Tablet making; Concentrating and Drying	Packing

Source: Field Consultation, 2013/2014

There are various processes involved in Khayar production starting from collection to final product marketing. The important steps required for upgrading its value chain are presented in the table below (Table 10.18).

Table 10:18: Process upgrading strategies recommended for Khayar value chain

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/Technology intervention	Anticipated benefits
Upgrading 1: Timber harvesting	Khayar harvesting from private land; Timber sold in terms of whole tree rather than ft^3	Khayar harvesting from PF and CF; Additional species for harvesting timber; Sale of timber from PF and CF in terms of ft^3	Resource inventory; Operation plan revision; Scientific resource management; Realization of policy regarding sale of timber in ft^3	Increase in income of CF; More partial employment for harvesting laborer; Additional income to PF and CF from Timber sale
Upgrading 2: Brokers	Truck rental; transport authorization; log pick up/ delivery etc.	Transparency	Awareness about legal process for trade amongst VC actors	Increased trust between VC actors; Minimization of corruption
Upgrading 3: *Katha* and cutch production	Extraction; Crystallization; separation and sale	Increase efficiency and yield	Assessment of yield of *Katha* and cutch and recommend for best practices	Increased efficiency

Source: Field Consultation, 2013/2014

c) Functional upgrading: The functional upgrading at each level of value chain is one of the most essential parts of value chain upgrading. Some possible and important upgrading strategies are presented in the table below (Table 10.19).

Table 10:19: Functional upgrading strategies recommended for Khayar value chain

Actors	Present Function	Upgraded Function
Harvesters PF and CF	Khayar harvesting	Vertical linkages with *Katha* and cutch enterprise; MSEs development
Brokers	Transport authorization; log pick up/ delivery; truck rental	Agent of *Katha* and cutch enterprises
Katha and cutch enterprises	*Katha* and cutch production; Missing link with PF and CF	*Katha* and cutch production from other species; Vertical integration with PF and CF

Source: Field Consultation, 2013/2014

d) Channel upgrading: Khayar value chain follows simple channel. The major customer of Khair is *Katha* and cutch enterprises in Nepal. They get Khayar through brokers. The final products made are *Katha* and cutch. Majority of *Katha* is exported to India whereas cutch is also sold in domestic market. After these the end products reach customer through wholesale/ retail channel. The study recommends assessing further on the use of Khayar for MSEs development. *Katha* and cutch enterprises have to explore channel to sale khersal to medicinal and/or Ayurveda enterprises and spent chips to hardboard manufacturer. The possible usage at present is depicted in Table 10.20.

Table 10:20: Possible usage of Khayar tree for channel upgrading strategies

Product	Present use	Possible additional usages
Khayar used by PF, CF	Sale to Broker	MSEs product: medicinal, hair dye, seeds, religious, household articles
Khayar used by enterprises	*Katha* and cutch	*Katha*, cutch, khersal (medicinal use), spent chips (hardboard)

Source: Field Consultation, 2013/2014

e) Intersectoral upgrading: Khayar is highly depleting due to increasing demand of *Katha* and cutch in Indian market. This scenario has accelerated the sale of Khayar to those industries. This has led to lack of research and innovation regarding usage of Khayar tree as MSEs development. It has high medicinal and Ayurvedic usages. So it is important to explore in this regard which can create additional income to CF members.

2. Interfirm upgrading strategy:

Katha and cutch are exportable products of Nepal and have high demand in South Asia. At present, there is a dubious situation where:

- CF and PF are overexploiting resources;
- *Katha* and Cutch enterprises are operating much below their capacity;
- Rapidly declining Khayar resources in Tarai;
- Increasing sourcing of Khayar from lower hills;
- Lack of transparency at all level;
- Maximum years require for regeneration;
- Already established enterprises with high investment;

This has led to identify Khayar value chain as a CATCH-22 situation. Thus development practitioners and development actors could contribute with innovation of a unique strategy that can benefit all the stakeholders involved. It is very important to develop vertical linkages between CF/ PF and *Katha*/ cutch enterprises.

3. Business Development services and financial Services upgrading strategy:

Most of the documents on value chain analysis are based on identifying only pertinent BDS and FS services. The assessment of DBS and FS in this report also has been considered taking in view of:

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 10:21: Status of demand and supply side of BDS in Khayar value chain

SUPPLY SIDE	Very strong				
	Strong			Resource inventory of other species for *Katha* manufacturing	
	Weak		Linkages to medicine/ herbal manufacturers for increasing medicinal usages	Research and actualization regarding *Katha* production form other species	Development of standard operation manual of *Katha* enterprise for maximum; Awareness about legal process for trade
	Very weak		Research on product development from Khair tree (apart from *Katha* and cutch)		Research on policy advocacy regarding timber sale in ft^3 from PF and CF; Policy advocacy for permission of Khair sale from CFUG
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries in categorization (very strong, strong and weak) and supply side of service providers (very weak, weak and strong) are selected to develop commercially viable options for these business services. The business and financial services requirement in the Khayar value chain can be catered by following (Table 10.22) commercially viable business service providers.

Table 10:22: Listing out commercially viable business options for Khayar value chain

Services	Description	Major BDS
Research on other species for Katha and cutch manufacturing, resource inventory and import easiness for gambier species	Research carried out for *acacia chundra* Willd and *acacia catechuoides* for *Katha* and cutch manufacturing; Import subsidy on *gambier* species subjected to its effectiveness	Forest specialists, DFO, Consultants; GoN
Recommend best practices for industry standard yield	Assessment of yield of *Katha* and cutch in Nepalese enterprises	Technical specialists, *Katha* and cutch enterprises, consultants
Awareness about legal process of trade	PF and CF lack information and knowledge about legal process and are selling timber as per negotiation with contractors	FECOFUN, DFO, projects, key personnel, lawyer
MSEs development and linkages with medicinal/ herbal manufacturers	Income for DAG, CFUG members from usage of Khayar for MSEs; Additional marginal income to *Katha* and cutch enterprise by sale of Khersal	DCCI, DCSI/ CSIDB, Private sectors, Technology service providers, Pharmaceutical industries, Ayurveda industries, Herbal industries
Policy advocacy for permission of Khayar sale from CF and also for sale of timber in ft^3	PF are selling timber as whole tree even though it is documented in ft^3	FECOFUN, COFSCUN, NGO federation

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

Business enabling environment (BEE) is very restrictive to forest based enterprise. Various research has outlined a number of legal hurdles that are restricting value chain promotion. Major legal recommendations made in BEE for Khayar value chain are outlined below:

a. Standard operation manual for *Katha* and cutch enterprises has to be developed (based on industry standard yield) and owned by DFO. This will help in increasing efficiency, increasing yield of *Katha*/cutch enterprises in one hand and in other it helps maintaining transparency.
b. Khayar harvesting and sale from CF is not permitted in study districts. It has to have permitted by devising pragmatic modality (vertical integration) to negate existing catch- 22 situations in Khayar value chain.
c. Timber sale from PF is not carried out in ft^3 and whole tree is sold. It is recommended to realize sale in ft^3 for PF while DFO representative carry out verification process.
d. Include Khayar in Nepal Trade Integration Strategy (NTIS) 2010 to establish it as one of the most valuable economic products.
e. Import subsidy for alternative species for *Katha*/cutch manufacturing subjected to effectiveness of species.

5. Sustainability Strategy:

The Khayar value chain is very unique and has become a paradoxical situation which mainly *Katha*/ cutch enterprises are finding it hard to escape due to their high investment. This again calls for development actors to initiate for vertical integration and support enterprises with sustainable resources. For this the role of *Katha*/cutch enterprises, CF and PF are very important. There are proper institutions which represent CF and *Katha*/cutch enterprises, but presence of PF in mainstream has not been effective. The strategies mentioned earlier are best deciphered for sustainability of Khayar value chain and making it one of the important products for export. Further, deliberation is required, as there is lack of research on various aspects and prospects of Khayar value chain in Nepal.

Summary of Khayar Value Chain Upgrading Strategy

The study tried to depict the present status of Khair value chain, with particular focus in east Nepal. The present plantation/cultivation/conservation status; harvesting, collection and processing processes; and trading/ marketing of Khayar tree have been simply described in this study. The study has a particular focus in Terhahum and Dhankuta districts. Moreover, the study tried to identify value chain actors and analyze their roles/functions, with the aim to identify the constraints or obstacles for the involvement of traditionally disadvantaged groups in the values chain, as well as expansions of possible market opportunities within its current value chain. Then, based on these all, the study made some value chain upgrading strategies as practical recommendations for further development and improvements of Khayar products, production processes, and improvements through its value chain in Nepal.

The study clearly depicts that Khayar is one of the valuable plant species that carries multiple economic values through multiple uses and products. However, in Nepal only Katha and cutch are produced and sold to the market. But, the underlying economic potentials (mainly product diversification like khersal, hardboard, hair dye production; and value addition in all levels of existing processes) of Khayar tree are yet to be explored and utilized in Nepal. These require further studies for the identification/innovation of potential technologies and

development of enabling policy and business services providing environments to encourage or attract potential local and national investors/ entrepreneurs. Secondly, the higher demands of Khayar by Katha producers on the one hand and on the other the lack of awareness and weak governance in CFUGs has compelled DFOs to ban the trading of Khayar from CFUGs. This situation demands officially owned and prepared clear guidelines or manual for Khayar , Katha and cutch production and processes. In addition, the vertical integration of value chain actors seems equally important. The policy advocacy for easing the harvest and trade and awareness in sustainable harvesting, including support and facilitation in cultivation/plantation, also seem important. The last but most important thing is innovation for the use of alternative species in Katha production.

Table 10:23: Summary of the value chain upgrading strategy of Khayar

Upgrading Strategy	Recommendation
Product Upgrading	➢ Khayar sale from PF and CF; ➢ Alternative species including import of *gambier* species; ➢ Commercial sale of *Katha*, cutch, khersal (for medical purpose) and spent chips (for hardboards); ➢ MSEs Possibilities for product apart from *Katha* and cutch (eg. Hair dye, herbal medicine, seeds, religious usage, household article manufacturing etc.); ➢ Confidence building and devising pragmatic way for transparent trade;
Process Upgrading	➢ Timber harvesting: Khayar harvesting from CF (now not permitted); Realization of policy regarding sale of timber in ft^3; ➢ All the process: Awareness about legal process of timber trade; ➢ *Katha* and cutch production: Assessment of yield of *Katha* and cutch enterprises and recommend for best practices;
Function Upgrading	➢ Harvesters: Vertical linkages with *Katha* and cutch enterprises, MSEs development; ➢ Brokers: Act as agent of *Katha* and cutch enterprise; ➢ *Katha* and cutch enterprise: Vertical integration with PF and CF, *Katha* and cutch production from other species;
Channel Upgrading	➢ Current channel and searching channel for new product as depicted in product upgrading;
Intersectoral Upgrading	➢ MSEs development in Ayurveda and other uses;
Interfirm Upgrading	➢ Vertical integration between CF/ PF and *Katha*/ cutch enterprises;
BDS+ FS Strengthening	➢ Import subsidy on *gambier* species subjected to its effectiveness; ➢ Research on other species for *Katha* and cutch manufacturing and resource inventory; ➢ Assessment of yield of *Katha* and cutch in Nepalese enterprises; ➢ Awareness about legal process of trade; ➢ MSEs development and linkages with medicinal and herbal product manufacturer; ➢ Policy advocacy for permission of Khayar sale from CF and also for sale timber in ft^3;
Business Enabling	➢ Ownership of Standard Operation manual for *Katha* and cutch enterprises based on yield from Government (after development);

Environment strengthening	➢ Khayar sale from CF permitted and development actors and partners devising pragmatic modality (vertical integration); ➢ Policy actualization for sale of timber in ft^3; ➢ Inclusion of Khayar in NTIS; ➢ Import subsidy for alternative species for *Katha* and cutch manufacturing subjected to effectiveness of species;
Sustainability Strategy	➢ Vertical integration and support enterprises with sustainable resources; ➢ Develop sustainable harvesting modalities also in PF; ➢ Limiting auctioning to registered Khair enterprises;

Source: Field Consultation, 2013/2014

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Chapter 11[42]

Khote Salla (*Chir Pine*): A Plant Highly Potential for Multiple Commercial Uses[43]

Introduction

Khote Salla *(Pinus roxburghii)* is one of the abundant plant species in most of the hill and mountain regions in Nepal. It is increasingly becoming one of the major means of livelihood and sources of income for people in Nepal, mostly the rural people associated with the Community Forestry. The Khote Salla tree is largely used for timber and fuel wood for rural people. However, its resin is increasingly becoming one of the highly demanded products in Nepal, and as such, rural people associated with Khote Salla trees are gradually being attracted towards the commercialization of this tree species.

Not only for rural livelihoods and income, but Khote Salla is also becoming one of the important products for the national economy. The revenue generated from the collection and trading of Khote Salla has made a significant contribution to the national economy. For example, 9.72% (NRs 12901120) of the total national revenue (NRs 132734266) generated from forest products (timber, non-timber, herbs and herbal products) was alone from the collected and traded resin in the fiscal year 2068/069 (MoFSC/DoF, 2069 BS). Moreover, the employment opportunities generated during the resin tapping and in resin based industries are also important while talking about the economic and livelihood contribution of Khote Salla in Nepal.

The resin tapping and resin based industries are on-going economic activities generated out of the Khote Salla tree in Nepal. Other economic benefits and opportunities of Khote Salla tree are yet to be explored in Nepal. Moreover, social and environmental benefits and opportunities may be still far from the exploration and analysis. In this context, this study aims to provide a comprehensive value chain analysis (VCA) of Khote Salla tree and its economic production in Nepal, with particular focus in Dhankuta district. The study tries to identify Khote Salla value chain actors and understand their existing roles and functions. Secondly, the study attempts to identify and analyze various constraints or barriers in Khote Salla value chain in the study district, including barriers to value chain access by traditionally marginalized peoples. Finally, the study tries to explore options for up-scaling of this product into the market business and provide stakeholders recommendation for potential expansion

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opportunities for its value chain actors. The analysis of this study is primarily based on the information and knowledge obtained from field visits and observation of the value chain actors of Khote Salla, its production and harvesting in Dhankuta district and then trade to their market niche. The field visit and observation were supplemented with the consultation meetings with its value chain actors such as Khote Salla producers/farmers/CFUGs, collectors or harvesters (Thekedar or middlemen), buyers and processors and traders in eastern region. The consultation with district level stakeholders, mainly related government line agencies, has also become a part of this study process. This study is also supplemented with the knowledge and information from the available published and unpublished reports and related literature.

Habit (Characteristics), Habitat and Distribution of Khote Salla

The genus *Pinus*, of the Pine family, is characterized by evergreen leaves. Normally, it is a tall tree that grows up to 55m with 2m to 3m of its trunk diameter. Its branches are more or less whorled with its bark commonly in dark grey and dark-red-brown color, thick, deeply and longitudinally fissured and rough, exfoliating in longitudinally elongated plates, and scaly. Winter buds are brown, small, ovoid, and not resinous.

Table 11:1: Wide variety of local names of Khote Salla

Languages	Regions and local names
Hindi	Chir
Urdu	Pāri-bhadra, cheer, sanobar
English	Chir Pine, Imodi Pine, long leaved
Chinese	Xu mi chang ye song
Nepali	Khote Salla
Sanskrit	Sarala, Saratadrava, Shrivasa
French	Pin à longuesfeuilles
Common name	Chir Pine, three leaved Pine, Himalayan long leaved Pine

Source: Zipcodezoo, 2014

Species of *Pinus* can often be identified by the leaf arrangement, one needle or clusters of from two to five (in all cases enclosed in a sheath at the base) leaves 3 per bundle, slender, flabellate-triangular in cross section, 20-30 cm × 1.5 mm long, finely toothed, light green, persisting on an average for a year and a half. It is also called Chir Pine which is distinguished from other Pine species on the basis of its 3 needle shaped leaves per bundle.

The flowers are monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and are pollinated by wind. Male flowers are about 1.5 cm long, arranged in the form of cones, female cones, solitary or 2-5 together, ovoid to 10-20 cm × 7.5-13.0 cm. When ripe it becomes brown, woody seeds winged, without amount of pollen and carried away by wind. Seed cones are shortly pedunculate, ovoid, 10-20 × 6-9 cm. Seed scales oblong, thick, stiff, apophyses strongly swollen, broad at base when closed, green at first, ripening glossy chestnut-brown when 24 months old, conspicuously transversely ridged, umbo triangular,

and protruding. The seeds of Chir Pine are 8-12 mm long, wing 2.5 cm long. Seed maturity occurs between October and November (Kaushik *et. al*, 2010).

Table 11:2: Taxonomic hierarchy of Khote Salla tree

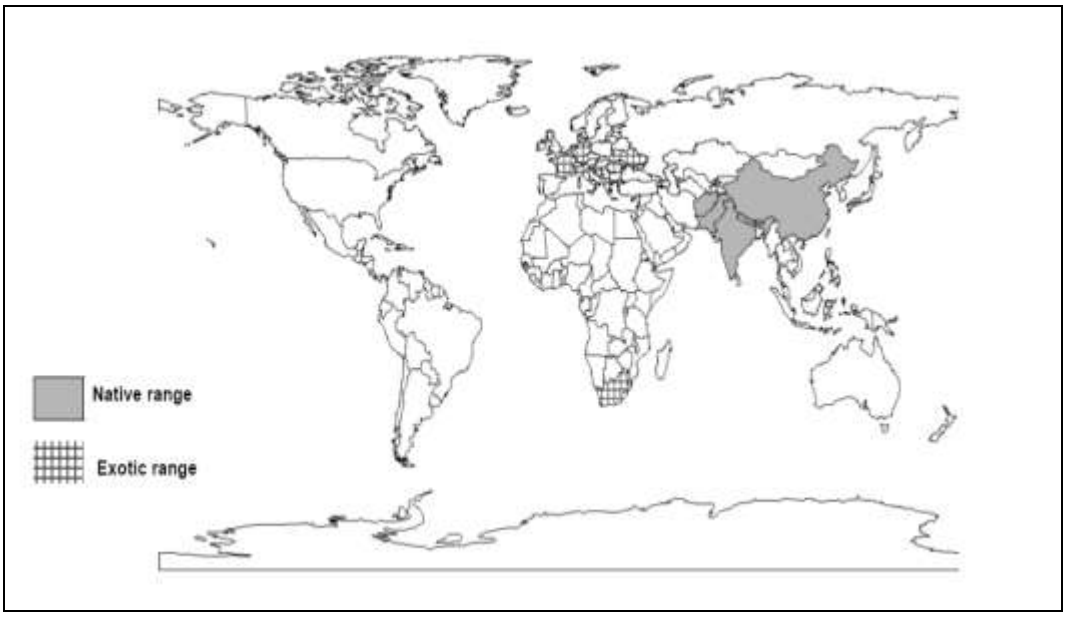
Domain	**Eukaryota**
Kingdom	Plantae
Subkingdom	Virida plantae
Phylum	Tracheophyta
Subphylum	Euphyllophytina
Infraphylum	Radiatopes
Division	Pinophyta
Class	Pinopsida
Order	Pinales
Family	Pinaceae
Subfamily	Pinoideae
Tribe	Diapensieae
Genus	*Pinus*
Subgenus	*Pinus*subg. *Pinus*
Species	*Pinus roxburghii*

Source: The Taxonomicon, 2014

Pinus roxburghii is widespread and common in the north-south oriented outer valleys of the Himalaya and its foothills and often forms pure stands, especially on dry, fire-prone slopes. Mature trees are relatively fire resistant; regeneration after destructive fires can be massive and rapid when it acts as a pioneer species. In prolonged dry seasons, it may drop most of its leaves. It occurs on a variety of substrates, from deep soil to bare rocks. Its altitudinal range is from 400 m to 2,300m above sea level with the highest growing, scattered individuals at 2,500m. *Pinus roxburghii* is restricted to the monsoon belt with summer rains. In its higher altitudinal range, this species is commonly mixed with *Cedrusdeodara* and *Pinus wallichiana*, but occurs below the forest zone characterized by species of *Abies*. Broad-leaved trees (angiosperms) are commonly *Quercusincana*, *Schimawallichii* and *Rhododendron arboreum*. Towards its lower limit angiosperms become more dominant and the Pines occur on rocky slopes with a northern or eastern aspect.

The native species of Khote Salla is found in many of the South-Asian and South-East-Asian countries viz., Afghanistan, Bhutan, China, India, Myanmar, Nepal, and Pakistan. Whereas, the exotic Khote Salla species is found in some other countries like France, Germany, Italy, Romania, South Africa, Ukraine, USA, Yugoslavia (former) too.

Figure 11:1: The distribution of native and exotic documented Khote Salla species



Source: Orwa et al., 2009

The main area of occurrence of *Pinus roxburghii* in Nepal is between 900 and 1950 m, but in sheltered valleys in the foothills it sometimes extends to as low as 450 m, and in the dry upper valleys of the Karnali and Bheri it reaches 2700 m in a few localities. In the west of Nepal it forms large areas of almost pure Pine forest on both north-facing and south-facing slopes and is also found in places associated with hill *Shorearobusta* forest. In central Nepal it is largely confined to drier areas such as south-facing slopes, and in areas of particularly heavy rainfall, such as in the hills north and east of Pokhara, it is absent altogether.

In eastern Nepal it is very localized, occurring in the lower parts of the Arun and Tamor valleys, but it is absent in wetter areas even from south-facing slopes. Thus, it is characteristic of sites which are either climatically or ecologically rather dry and apparently cannot compete with other vegetation in wetter areas. Outside Nepal, it extends fairly continuously as far west as Afghanistan. East of Nepal its occurrence is more sporadic; it is found in Sikkim and Bhutan, but only in drier areas.

Chemical Properties, Uses and Conservation Status of Khote Salla

Chemical Properties of Khote Salla:

The chief constituents of *Pinus roxburgii* are α-Pinene, β-Pinene, car-3-ene and longifolene. And the chief chemical constituents extracted from Resin of plants are α-Pinene (18.1%), longifolene (13.8%) and carene (51.8%). The chief constituents of Turpentine oil from *Pinus roxburghii* are α-Pinene, β-Pinene, car-3-ene, and longifolene, hydrocarbons (d- and l-Pinene), Resin acids, camphene, fenchene, dipentene and polymeric terpenes.

Pinene and car-3-ene compounds are known for various pharmacological activities and longifolene has interesting characteristics for *anti mosquito activity*. The pharmacological activities of *Pinus roxburghii* have been investigated scientifically to validate the potential of the plant as a treatment for a variety of ailments.

Table 11:3: Pharmacological activity of various parts of Khote salla

Acitivity	Parts used
Antibacterial inhibitory activity against microbes	Bark, leaves (needles), female cones
Heterozygosity/ fitness	Leaves (needles); Embryos, using isozyme
Antibacterial	Oil
Analgesic and Anti- inflammatory	Alcohol extracts of bark
Hepatoprotective activity	Wood oil
Antidyslipidemic and antioxidant activity	Needles
Antconvulsant activity	Alcohol extract
Antiasthmatic activity	Alcohol extract
Contact dermatitis	Saw dust can cause occupational contact dermatitis
Cytotoxic activity	Cone essential oil
Wound healing activity	Methanol and aqueous extracts of the leaves

Source: Kaushik *et al.* 2013 and Mohd *et al.* 2013

Uses of Khote Salla:

Khote Salla (Chir Pine) has multiple uses , such as medicinal and industrial. It is noteworthy that almost every part of this tree species is valuable for different purposes and uses. There are mainly two broad uses of Khote Salla tree.

Table 11:4: Broader categorization of the application of Khote Salla tree

a) Medicinal Application		
Parts of the tree	**Chemical Property**	**Uses**
Bark		• Cough cold, tuberculosis, bronchitis, influenza, Diuretic, rubefacient, diaphoretic properties, Nonsteroidal anti-inflammatory drugs (NSAIDs)
Leaves	Abietic Acid	• Inhibits lepoxygenase activity; Anti-inflammatory property; In musical instrument to make them less slippery
	Shikimic Acid	• Medicine for bird flu, swine flu and influenza; for synthesis of antibiotics
b) Industrial Application		
Resin		• Printing inks, adhesives, varnishes, oil in electric cables
Bark	Xanthone	• Act as insecticide, Used in preparation of Xanthyl, Act as larvicide, Contains antioxidant properties
	Sugar	• For sweetness, baking, beverages, Wound cleaning, Heals wounds
Needles		• Electricity, Shikimic acid, Charcoal
c) Environmental Application		
Tree/Forest		• Combat Greenhouse effect, Reduce soil erosion, Reduces disaster/ land sliding, electricity,
d) Cultural and Religious Application		
Tree/ Forest		• Used for worshiping deities and incense making

Source: Silori, 2013

a) Medicinal and Pharmaceutical Uses of Khote Salla tree:

The medicinal application of Khote Salla is very important. The ***poly herbal oil*** is extracted from Khote Salla tree. For example, there is a traditional Unani medicine that contains oleo Resin from *Pinus roxburghii* and has been shown to have significant analgesic and anti-

inflammatory activity. Similarly, ***Rumalaya gel*** is also produced from the Khote Salla tree. A potent phytopharmaceutical formulation containing Resin from *Pinus roxburghii*, Rumalaya gel has been used in traditional medicine to relieve joint and bone pains associated with various orthopaedic ailments.

Table 11:5: Some patent drug which constituent Khote salla

Drug Name	Company	Uses
Arlin Liniment	Retort Pharmaceutical	An effective relief from rheumatoid arthritis
Amopen oil	Phytopharma	
Arthronav Liniment	Abhinav	Powerful rub for oedema and pain
Mobyl ointment	Ayulabs	Relieves oedema and vascular congestion
Myostaal Liniment/ gel	Solumiks Herbaceutical Limited	Beneficial in the treatment of joint disorders
Pain off oil	Ban	Fast, effectives and gentle pain relief
Rhuma oil	Baidyanath	Agonizing joint and muscle pain
Rumalaya gel	Himalaya Healthcare	Relieves joint and bone pains associated with various orthopaedic ailments
Cold balm	Himalaya Healthcare	Soothing balm that relieves nasal and chest congestion; Its counter- irritant effects relieve headaches and body aches associated with the common cold
Rumalaya vet	Himalaya Healthcare	Anti- inflammatory that stops inflammation by regulating the release of inflammatory mediators in the animal's body; As an analgesic, it controls pain
Pain balm	Himalaya Healthcare	Quick acting headache and body ache reliever that remedies pain naturally
Rumalaya liniment	Himalaya Healthcare	Relives joint and bone pain associated with various orthopaedic ailments

Source: Saral Health, 2014 (and Companies websites)

The information about the use of *Khote Salla tree* by Nepalese enterprises with patent rights has not been found. However, it is found to be used in the Ayurveda treatment system. Some of the well-known Ayurveda properties of Khote Salla tree are: (Source: DoA, 2006)

a) Guna (Qualities): Laghu (light), tikshna (sharp), snigdha (slimy);
b) Rasa (taste): Katu (pungent), tikta (bitter), madhur (sweet);
c) Vipaka (post digestive taste): Katu (pungent);
d) Virya (potency): Ushna (hot);
e) Karma: Dipana, Kaphahara, Raksoghna, Vatahara, Visaghna, Durgandhahara, Dustavranasodhaka, Varnaprasadana

Different parts of the Khote Salla tree have diverse traditional medicinal values and uses. Some of the important uses are presented in the table below (Table 6).

Table 11:6: Traditional medicinal uses of Khote Salla tree in South Asia

Parts used	Traditional use
Leaves	Leaves (needles) are used to increase the flow of urine (diuretic), prevent soil erosion, used for sheltering and for keeping fruits in crates, decoction of leaves is applied locally to treat sprains;
Wood	Wood is used to cool the burning sensation of the body, emollient, aromatic, antiseptic, deodorant, haemostatic and diuretic, stimulant, anthelmintic, digestive, liver tonic, haemoptysis, worm infection, flatulence, liver diseases, bronchitis inflammation, use for skin disease, pruritus and giddiness, fuel wood, wood oil is used as a nerve tonic, expectorant, burns and cracks, Resinous wood is applied inside the lower eyelids to keep the eye clean and attractive;
Bark	Fuel wood, bark paste is used in burns and cracks, used for skin disease and ulcers
Oil/ Turpentine oil	The Turpentine oil is rebefacient, in the form of Linimentum Terebinthinae and Linimentum Terebinthinae Acetium, in chronic rheumatism; Used as diuretic;
Resin	Plant Resin is applied locally on the pimples for about 2-3 hours daily, Resin is employed as a stimulating application for ulcer and abscesses and as basis for plaster, used in snake bite and scorpion sting, used for painful chest, skin disease and blood purifier, oleoresin is thermogenic, expectorant, anodyne, anti-inflammatory, purgative, rubefacient, vermifuge and demulcent, 2g of Resin with an equal amount of common salt is boiled in 250-300 ml of water and drunk warm before bedtime for 2-4 days to cure cough, cold, asthma, chronic bronchitis, liver and spleen disease, kidney and bladder, gonorrhoea, scurvy, epilepsy, haemorrhoids and tuberculosis , it is used in steam bath for the treatment of rheumatic infections, Resin is applied on boils, pimples and blisters, pus formation, heel cracks, above the eye to remove swelling used in broken ceramic pottery, used in cuts and wound;
Seed	Roasted seeds are eaten as galactagogue edible source of oil;

Source: Kaushik et al, 2010

Medicinal application or values of the Khote Salla tree is one of the most important aspects of this plant species. There have been continuing studies and efforts to explore medicinal properties and uses of this plant in China and India. However, there is little to no effort and knowledge in Nepal. For example, the retailers of herbal, ayurvedic and medicine products in Dhankuta do not know about medicinal applications of *Pinus roxburghii*. Similarly, there is also lack of secondary information about innovation from national level medicinal industries to extract various possible compounds for medicines.

b) Industrial Uses of Khote Salla tree:

Crude ***Resin*** obtained by tapping from living pine trees is the most valuable raw material for Rosin industries. It is a thick, sticky, but usually still fluid material. It is opaque (due to the presence of occluded moisture), milky- gray in color, and inevitably contains a certain amount of forest debris (Pine needles, insects, etc.) when it is collected from the trees. Most *Pinus* species 'bleed' when the step wood (xylem) is cut or otherwise injured, but probably only a few dozen of approximately 105-120 species which exist has been tapped commercially as a source of Resin for Rosin and Turpentine (Coppen and Hone, 1995).

Table 11:7: Resin quality and yield characteristics of some Pinus species

Species	Producing country	Yield per tree[44]	Quality	Quantity
Pinus elliottii Engelm.	Brazil, Argentina, South Africa, USA, Kenya		++	++
P. massoniana D. Don	China	3-4 kg	+	+
P. kesiya Royle ex Gordon	China	1.8- 2.4 kg	+	+/-
P. pinaster Aiton	Portugal, Spain, South Africa	3.7- 7.2 kg (36 kg maximum Catalan, 1963)	++	+
P. merkusii Jungh. & Vriese	Indonesia, Vietnam	20-40 kg	+	+
P. roxburghii Sarg.	India, Pakistan, Nepal, Bhutan	3-6 kg (9.5 kg maximum Sehgal et. al, 1994)	+	+
P. occarpa Scheide	Mexico, Honduras		+/-	+/-
P. caribaea Morelet	Venezuela, South Africa, Kenya	25 g per day	+	+++
P. sylvestris L.	Russia		+/-	+/-
P. halepensis Miller	Greece	24 kg average per year	++	+
P. radiata D.Don	Kenya		+++	+

Source: Coppen and Hone, 1995
[Note: Resin characteristics are rated on a scale from very good (+++) to poor (-)]

The pine resin is then transformed into ***Rosin*** as a major processed resin product. It remains behind as the involatile residue after distillation of the Turpentine and is a brittle, transparent, glassy solid. It is insoluble in water but soluble in many organic solvents. It is graded and sold on the basis of color, the palest shades of yellow-brown being the better quality (Coppen and Hone, 1995). Several physic-chemical characteristics influence the quality of Rosin which is largely dependent on the species of Pine from which the Rosin is obtained, i.e. they are determined more by genetic than environmental and processing factors. Rosin is used in a chemically modified form. It consists primarily of a mixture of abietic- and pimaric- type acids with small amounts of neutral compounds. This intrinsic acidity, coupled with other chemical properties, enables it to be converted to large number of downstream derivatives which are used in a wide range of applications. The derivatives include salts, esters, and maleic anhydride adducts, and hydrogenated, disproportioned and polymerized Rosins. Their most important uses are in the manufacture of adhesives, paper sizing agents, printing inks, solders and fluxes, various surface coatings, insulating materials for the electronics industry, synthesis rubber, chewing gums and soaps and detergents.

Turpentine is a mixture of organic compounds, mainly terpenes, and its composition can vary considerably (more so than Rosin) according to the species of Pine from which it was derived. It is a clear, flammable liquid, with a pungent odour and bitter taste. It is immiscible with water and has a boiling point above 150°C. It is a very versatile material chemically, and nowadays, it is used mostly after further processing. It usually undergoes fractional distillation to isolate the desirable chemicals which are transformed into value-added derivatives. The further processing is only economical if it is carried out on a very large scale and it is not something to be considered by a new producer of gum naval stores. Occasionally,

[44] Scientific literature review

the Turpentine is rich enough in alpha-Pinene, for example, to be used in whole form. The derivatives are widely used in fragrance, flavour, vitamin and polyterpene Resin manufacture. It is used to form the basis of a substantial and growing chemical industry. The biggest single Turpentine derivative, synthetic Pine oil, is used in disinfectants, cleaning agents and other products with a 'Pine' odour. Many derivatives, including isobornyl acetate, camphor, linalool, citral, citronellol, citronellal and menthol are used either on their own or in the elabouration of other fragrance and flavour compounds. A few of the minor constituents of Turpentine, such as anethole, are employed for fragrance or flavour use without the need for chemical modification

Table 11:8: Principle uses of Turpentine and Rosin

Turpentine	Rosin
Chemicals and pharmaceuticals; Gums and synthetic Resins; Paint, varnish and lacquer; Products for railroads and shipyards; Shoe polish and related materials; Rubber; Printing inks; Adhesives and plastics Furniture; Insecticides and disinfectants	Paper and paper sizing; Chemicals and pharmaceuticals; Ester gums and synthetic Resins; Paint, varnish and laquer; Soap; Linoleum and floor coverings; Adhesives and plastics; Oils and greases; Rubber; Printing inks; Shoe polish and related materials

Source: Coppen and Hone, 1995

Table 11:9: Present usage of Rosin

Process	Usage
Esterification	Adhesives, printing inks, paints and varnishes, chewing gum, depilatings wakes, road marking
Hydrogenation	Paints and varnishes, adhesives, chewing gum
Direct use	Phosphorous, emulsifier, sealing wax, insulating, tackifier, water proofing, depilatings waxes
Dismuation	Adhesives (labels, tapes), fungicides, anti- corrosion agents
Rosin Adduct	Paper sizing, printing inks, alkyd Resins
Maleic modified Resins	Lacquers, enamels, varnishes, printing inks, alkyd Resins
Polymeration	Varnishes, Adhesives, inks, thermoplastics
Saponification	Soaps, resonates, polymerization emulsifier(synthetic rubbers), paper sizing

Source: Rescoll, 2013

The most recent research on Rosin is to create biodegradable, renewable plastics from Pine sap (Chuangbing Tang, University of South Carolina). There has been an excellent research which has shown the possibilities of MAPs cultivation in *Pinus roxburghii* (Sanwal et. al. 2011).

Quality standard of Rosin and Turpentine:

The International Organization for Standardization (ISO) for Rosin and Turpentine exists for only for *Pinus pinaster,* which is technically not equivalent for Turpentine from *Pinus roxburghii*. Secondary information revealed an absence of national standards or Rosin and Turpentine. Bureau of Indian Standards (BIS) exists for Gum spirit of Turpentine and technical specification of various grades of Rosin in Indonesian National Standard for gum Rosin. However, a general standard of Rosin is categorized by its colour. The Rosin categories purchased on the basis of colours vary from pale amber to black. The lighter the colour, the more valuable the Rosin.

(Note: X=Extra white; WW=Water white; WG=Window Glass; N=Nancy; M=Mary; K=Kitty; H=Harry; D=Dark; B=Black)

Figure 11:2: Rosin Grades defined by their colours

Source: Sharma and Lekha, 2012

Turpentine is a form of clear limpid and transparent liquid with a characteristic odour and pungent and somewhat bitter taste. It is free from sediment, suspended matter, separated water and added adulterants.

Table 11:10: Requirements for Oil of Turpentine as per BIS 533:2007 (Clauses 4.7 and 7.1)

S.No	Characteristic	Requirement
1	Relative Density	
	At 20^0 C	0.860 0 to 0.870 0
	At 27^0 C	0.852 0 to 0.862 0
2	Relative index	
	At 20^0 C	1.467 0 to 1.477 0
	At 27^0 C	1.468 0 to 1.475 0
3	Acid Value, *Max*	1.0
4	Distillation range	
	Initial boiler point (IBP) ^{0} C, *Min*	155
	95ml. *Max* up to. ^{0} C	260
5	Residue on evaporation (wholly organic) percent (m/m), *Max*	2.0
6	Alpha-pinene, percent, *Min*	2.0
7	car-3-ene, percent range	40-65

Source: BIS, 2007

The data and information on the production, trade and export of rosin and turpentine in Nepal are still not available. But it is known that rosin and turpentine produced in Nepal mostly are exported to India. There are more than 15 Rosin and Turpentine based industries in Nepal. Resin tapping is carried out in 35 Districts out of 75 Districts. The DFO office provides collection permits to these enterprise and makes necessary agreements.

Table 11:11: List of Rosin and Turpentine industries in Nepal

	Name of Industry	Collection permission (in MT/year)	District	Date of Agreement	Factory site
1.	Herbs Production and Processing Company Limited	550	Makwanpur- 130, Dhankuta- 250 and Sindhuli- 170	2050/10/03	…..
2.	Laxmi Rosin and Turpentine Pvt. Ltd.	4000	Rolpa- 725, Salyan- 2325, Surkhet- 950	2055/06/04	Nepalgunj
3.	Ganga Rosin and Turpentine Pvt. Ltd.	4000	Achham, Bhajhang	2056/05/03	Nepalgunj
4.	Durga Rosin and Turpentine Pvt. Ltd	1400	Gulmi, Palpa, Bhojpur and Okhaldhunga	2057/08/13	…..
5.	Sunrise Rosin and Turpentine Pvt. Ltd.	3580	Parbat, Dhading, Nuwakot, Kavre, Dolkha, Khotang, Ramechhap, and Dhankuta	2058/06/30	Charpane, Jhapa
6.	Bangala Mukhi Rosin and Turpentine Pvt. Ltd.	3000	Jajarkot- 2200, and Rukum- 800	2058/11/01	Nepalgunj
7.	Bhadrakali Rosin and Turpentine Pvt. Ltd.	4000	Doti	2059/04/28	Geta, Kailali
8.	Bharbani Chemical Pvt. Ltd	3500	Kailali and Dadeldhura	2059/04/28	Geta, Kailali
9.	Khanal Rosin and Turpentine Pvt. Ltd.	1500	Dailekh- 650, Puythan- 400 and Arghakhanchi- 450	2059/05/07	Nepalgunj
10.	Swastik Rosin and Turpentine Pvt. Ltd.	3000	Jajarkot- 2000, Dailekh- 500 and Kalikot- 500	2059/06/22	Kapilvastu
11.	Himal Rosin and Turpentine Pvt. Ltd.	1700	Baitadi	2060/09/21	Shreepur, Kailali
12.	Surya Chemicals	1000	Panchthar, Terhathum, and Sindhuli	2061/09/19	Charpane, Jhapa
13.	Ganpati Rosin and Turpentine Pvt. Ltd.	4000	Dang- 400, Salyan- 1950, Pyuthan-400, and Rolpa- 1250	2061/12/09	Kapilvastu
14.	Dabya Rosin and Turpentine Pvt. Ltd.	1208	Dhankuta-200, Udayapur-259, Tehrathum- 200, Panchthar-510, and Taplejung- 39	2063/11/14	Tarahara
15.	Dibya Rosin and Turpentine Pvt. Ltd.	4000	Kailali- 600, Doti- 1000, Dadeldhura- 1500, and Baitadi- 900	2063/11/14	Attaria, Kailali
	Total	40438	35		

Source: DFO, 2007, cited in Subedi 2014

c) Usage of Pine needles of Khote Salla tree:

The studies and practices have proved that pine needles could be used s for different purposes such as check dams, coal briquettes, use in gasifiers, ornamental artifacts, medicinal oil, torchwood and perfumed chips from dead stumps and more (Chandran *et al.* 2011). Some of the innovations in using Pine needles are:

- ***Check dams:*** Pine needle is used for chek dams in Uttarakhand India. The needles are collected, rolled over and tied tightly to form cylindrical logs. These Pine needle logs are then transported and plugged across eroding gullies and streams and secured with vegetative pegs. These check dams not only conserved soil and moisture by decreasing the speed of runoff but also contributed to reduction of calcium content in water. The increased moisture regime around the check dam area also helped in preventing the occurrence and spread of forest fires. About 70 kg Pine needles were utilized for an average check dam of 2-3, length and 50 cm diameter in Uttarakhanda India. The mud and calcium deposited in the spaces within the Pine needle check dam helped to further strengthen the check dam by cementing and the vegetative pegs sprouted to form vegetative barriers across the stream. The reservoir formation on the upstream side of the check dams also served as waterholes to wild animals.
- ***Bailing and briquetting:*** Pine needle charcoal briquettes are made by partial combustion of Pine needles in cylindrical barrels and immediately mixing it with mud, and drying them. The briquettes made by this process were inefficient and released a lot of smoke. Hence, a newer technique was innovated where Pine needles were collected and passed through a simple briquetting machine to compress the needles to briquettes of different sizes and designs. The Pine needles were fed from one end of the machine and a hydraulic press was used to compress these needles. The heat generated by the machine helped in extraction of Resin which helped to glue the needles together to form a solid brick. The briquette coming out from the machine was then tied securely to prevent falling of the briquetted mass. These briquettes are supplied to industrial areas for use in furnaces and boilers, where they showed very good efficiency and were cheaper than other fuel. Small scale coal briquettes are also made with specialized machines, with additional mixtures like sawdust and some adhesives. These small briquettes could be used in smokeless stoves for cooking purposes and also in fire places for heating rooms in winter. The briquettes had high calorific value up to 4800 Kcal/ kg when used as such and 4000 Kcal/ kg when mixed with saw dust. The briquettes had a bulk density of 800 kg/m3. The combustion was uniform due to uniform size and the wastage was also less due to easier handling. The other advantages over other forms of fossil fuels were the low or absence of toxic gases of sulphur and phosphorous, low ash content (2-10%) as compared to coal (20-40%) and also less emission of black smoke (carbon). However, one of the disadvantages in use of Pine needles in low temperature furnaces requiring temperatures less than 1500 degree Celsius was the evaporation of Resin and their condensation in the canopy of the furnaces thus blocking the exhaust. This situation was not present in high temperature furnaces, which could completely burn the Resin content. Better designs of low temperature furnaces have to be researched to solve this issue.

- ***Electricity:*** Use of Pine needles in bio- gassifiers is one of the exiting innovations useful for rural people. This innovation is experienced in Uttarakhand India. The Pine needles were experimented to use in bailed form for bio- gassifiers. The bails were more efficient with respect to reduced transportation costs as well as more quantity of fuel per batch due to reduced bulk. It was observed that 13kg dry Pine needles could produce 9 KWh of electricity using standard gassifiers. Approximately 400 kg of dry Pine needles can produce approximately 10 KW of electricity for the whole day, which is substantial amount of power required for rural electrification for at least 40 households. Hence the per household consumption of Pine needles can be at 10 kg per day or 3650 kg per year, which can be collected easily from just 1 ha of Pine forest in a year.
- ***Making composite wood:*** Pine needles proved to be very good material to convert into composite wood by cutting them to standard sizes, mixing with adhesives and pressing them into panels in a hot press. These panels could be used for several structural purposes like partitions, false ceilings, etc. and other temporary constructions and also could be used to make low cost furniture. Pine needles can also be used in cooling pads after removing their outer lignin content by chemical processes to form a soft flexible spongy mass.
- ***Manufacture of chemical products***: Pine needles are also source of valuable chemical products like needle oil, alpha- Pinene, Turpentine, lingo- cellulose products and also food grade flavors like vanillin, bio effective having neutraceutical antioxindant properties are also being extracted in countries like China and Russia. Alcoholic and non-alcoholic beverages are also prepared from Pine needles in several countries.
- ***Pine cones for ornamental products:*** Pine cones are the main culprits of rapid spread of fires from one part of the forest to another. The Pine needle on catching fire acquires kinetic energy and rolls and bounces down to ablaze a different area. The energy also causes the Pine cones to explode causing missiles of burning pieces to far away areas across natural fire breaks like streams and fire lines. The collection of these cones is traditionally done to a limited extent by some villagers near tourist places to make ornamental artifacts to be sold to tourists. Miracle Bamboo Pvt. Ltd. Kathmandu is innovating new souvenir products from Pine cones. The damaged cones not fit for ornamental purposes could be used as an efficient fuel in furnaces due to their Resin content. The seed production and regeneration of Pine forests is not affected as the cones mature on the trees itself and fall after the seeds have dispersed.
- ***Further Scope:*** Mulching use in garden, fertilizer, Pine needle tea, handicrafts (basketry), essential oils, Shikimic acid extraction are other potential uses of Khote Salla tree.

Conservation of Khote Salla Tree:

Khote Salla tree could be cultivated in two ways: natural regeneration and artificial regeneration.

a) Natural regeneration: It takes places through seeds. Under ordinary forest conditions, trees less than 30-years old seldom bear cones. The cones begin to open during April-May of the third year, i.e., about-24 months after their appearance, and the seeds get dispersed during April-July. Under natural conditions, the seeds germinate as soon as sufficient

moisture is available. The germination commences at the beginning of the monsoon. A number of factors such as light, drought, topography and soil have considerable influence upon the extent and quality of natural regeneration.

b) Artificial regeneration: It is required transplanting nursery-raised seedlings or by direct sowing. The mature cones are collected from the trees during March-April and are placed in the hot sun to loosen the scales, and thereafter the seeds are threshed out. The seeds are sown in the nursery during March-April in shallow drills 15 cm apart. The seedlings are picked out in July. One-or two-year old seedlings are usually transplanted at the beginning of the rains.

Brown-needle disease (*Mycosphaerella gibsonii*) is reported from Nepal on indigenous *Pinus roxburghii* and *P. wallichiana,* and on several exotic Pines. It apparently causes most damage to nursery plants at 400-2000 m altitude, but can remain serious on saplings of *P. roxburghii*, *P. caribaea* and *P. oocarpa* in plantations. Dothistroma needle blight (*Mycosphaerella pini*) is also reported, on *P. wallichiana* near Daman, at 2000 m altitude. Needle-rust diseases also occur quite frequently on both *P. roxburghii* and *P. wallichiana*, but are considered unlikely to cause serious damage. (Ivory, 1990)

According to the silvicultural system, a Pine tree has 90 to 160 years of rotational period. The regeneration period is generally about 25 to 30 years. The regeneration felling period can be classified into tree types: Uniform felling, Group felling, and Strip felling. In many places selection felling is being practiced, which is not appropriate by seeing its light demanding characters.

Fire plays an important role in soil nutrient status and understory vegetation for pine trees. The soil nutrients (soil organic carbon, nitrogen, phosphorus and potassium) get decreased compared to pre-fire assessment. The understory vegetation also get diminished after fire in all forest sites. The study concludes that in Chir Pine forest, fire plays a role in reducing soil nutrients along the altitudinal gradient, soil depths and understory vegetation. Thus, these nutrients can be saved through some management practices, e.g. by early controlled burning and by educating local villagers about the negative impacts of severe wild fires on soil and vegetation (Kumar et. al, 2012).

Product Yield and Resin Tapping Methods

Resin is one of the most important valuable traded products of the Khote Salla tree. It is estimated that the wood weighs about 650 kg/ m3 (air dry) and has a calorific value about 21, 200 KJ/ kg. Around 3-5 kg Resin per year is recommended for *Pinus roxburghii* in the conditions of Nepal. Yield and quality of Resin affect the economic aspect of the Resin tapping work. The yield of Resin depends on following things:

a) Types of Species: This is because of the inherited capacity of individuals, seed origin. For example *Pinus roxburghii*, *P. elliottii*, *P.merkusii*, *P. carabaea* gives good yield of Resin than *Pinus petula*, *P. kesiya*.

b) Types of Location: This means environmental factors such as soil, rainfall, humidity, air and soil temperature. In general, more yields in a warm than on a cool climate.

c) Technique of tapping: Cup and lip method yield less than rill method whereas bore-hole method is considered for more yields.

d) ***Tree morphology:*** Big Tree crown size/crown height and Twist trees yield more Resin.

e) ***Part of the trees***: The yield of Resin is largest in the Resin of the root column, less in the clean part of the bole and least in the vicinity of the branches.

f) ***Side of stem:*** More Resin is secreted on the south than on the north side of the stem.

g) ***Soil:*** Resin produces more in dry, warm, loose and sandy soils than in moist places, stiff and cold soil.

h) ***Nature of forest:*** More Resin producer trees in open forest than in crowded forest.

i) ***Nature of ground:*** More Resin on hilly or sloping than on level ground.

The proportion of Rosin and Turpentine oil in Chir Pine is 75% and 22% respectively with 3% losses. Imported Resin contains 75-95% Pinenes, whereas Chir Pine Resin contains only about 25% Pinenes.

Various methods of tapping have been adopted by different countries in accordance with the development of new technology, availability of labour and tapping trees. Tapping involves causing of physical injury to the cambium layer and sapwood of the tree by making a blaze with an adze and collection the exuded Resin in a metal or plastic pot (Chaudhari, 1995). There are two kinds of resin tapping processes:

a) ***Light and continuous tapping:*** This is done in all trees above 0.9 m in girth. Trees between 0.9-1.8 m in girth are tapped in one channel and above 1.8 m girth in two channels for five years. At the end of five years, a new channel is tapped leaving 10 cm space from old channels.

b) ***Heavy tapping:*** This is tapping to death, and common in developed countries. In this method maximum possible quantity of Resin is exuded by making many possible channels at 10 cm space. It is generally initiated five years in advance of main felling.

The above resin tapping process is applied in the stem of living tree. These processes are conducted by different tapping methods. They are:

a) Cup and lip method;
b) Silva hill basula method;
c) Bark chipped method;
d) Rill method (presently in use in Nepal);
e) Bore-hole method;

Of these methods, Rill method is most common and universally applied in the field. However, recently a Bore-hole method is becoming more appropriate and desired by the collectors.

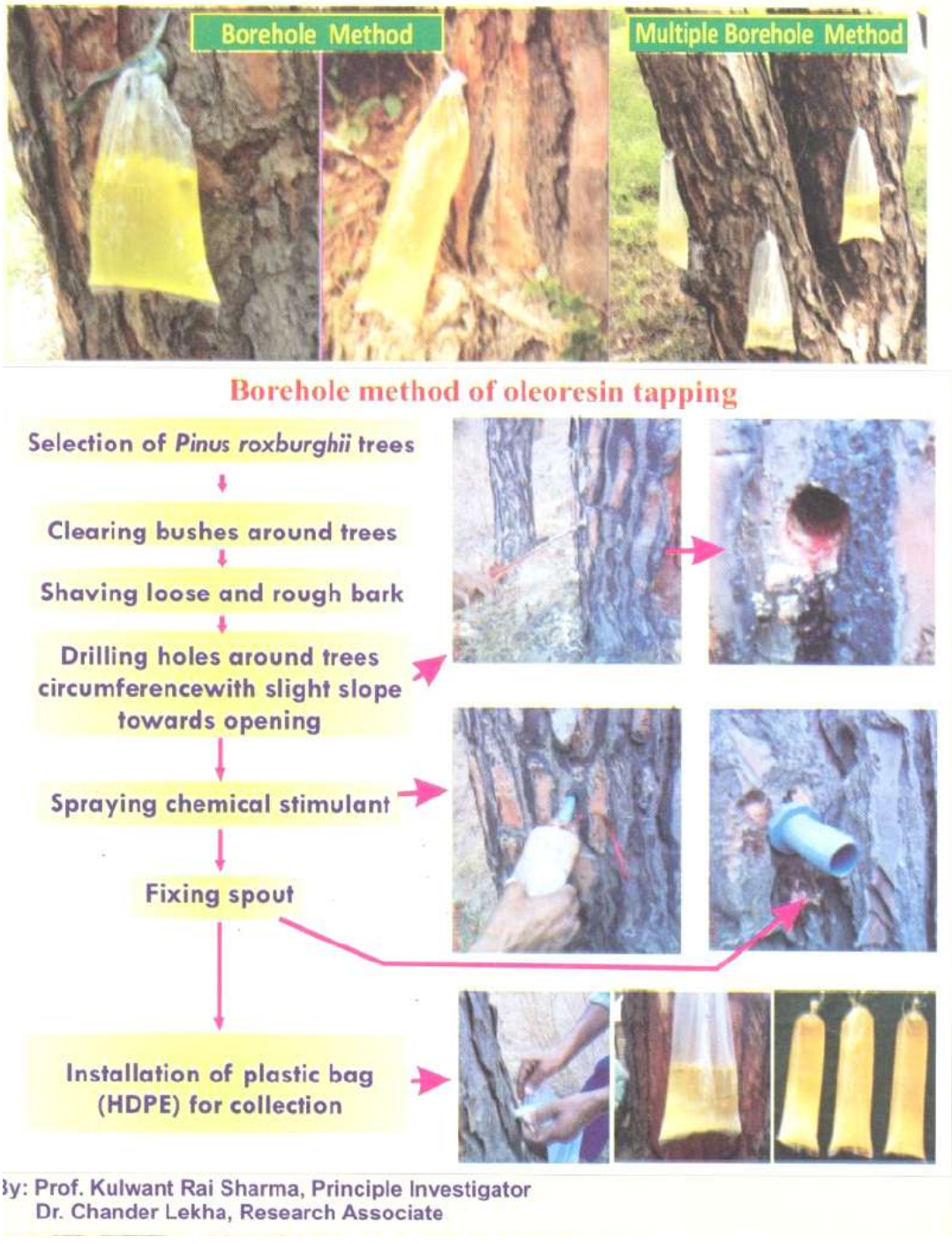
Rill method: This is an improved method to overcome the disadvantages of the cup and lip method. In rill method, the bark of the tree over a surface area of about 45 cm in height and 30 cm in width is removed with the help of a bark shaver. The surface is made very smooth and the thickness of the bark left should not be more than 2 mm to facilitate freshening of the blaze. The blaze frame is kept on the stem in the vertical portion, 15cm above the ground level and the position of the blaze is marked with a marking gauge. The control groove is cut with a grove cutter by drawing it from top to bottom. The lip is then fixed in the tree with nails. For freshening of the blaze, the tapper stands near the tree on one side of the blaze and holds the freshening knife at the lowest point of the control groove. The knife is then pulled

up by the tapper along with blaze line marked on the tree. The depth of the rill is about 2mm into the wood. After making a freshening on both arms of the blaze a 1:1 mixture of dilute sulphuric acid (20%) and dilute nitric acid (20%) is sprayed on the freshly cut rill with the help of spray bottle. Exudation of oleoresin starts soon after the rills are made. The pot containing the oleoresin is emptied into a collection can. The resin adhering to the pot is removed with the help of a scraper. The control groove is also increased to avoid accumulation of resin in it.

Bore-hole method: The bore-hole method involves drilling holes into the wood to open the maximum number of Resin ducts. Holes of 2.5 cm in diameter are drilled to a depth of 10.0 cm measured from the bark- xylem interface. These holes are drilled with slight slope towards opening, so that oleoresin drains freely. Multiple bore-holes are arrayed evenly around the tree's circumference, at an interval of one month during tapping season. Chemical spray of 1:1 mixture of 10 percent 2- chloroethyl- phosphotic acid (Ethephon) and 20 per cent Sulphuric Acid is applied inside holes with fine spray bottle. A spout is tightly fixed in the hole. The polythene bag is attached to the spout with the help of tie for collection of oleoresin and replaced when filled with oleorosin during the period of tapping.

The biggest advantage of this method is that Resin is tapped after the fire season around June 15, thus the tapped trees are not exposed to the fire hazard. It would also save labour and thus bring down the cost of Resin tapping by about 25 per cent. Besides, the quality of Resin will be much superior and without dust and other impurities as it would be collected in a polythene bags attached to the bore. The quality of Rosin, Turpentine oil and other products manufactured from it will also be much better and fetch higher prices. The Turpentine contents were found to be significantly higher in bore-hole method of tapping than rill method; the relative flow rate was higher in bore-hole Turpentine as compared to rill method.

Figure 11:3: Bore-hole Method of resin tapping



Source: Sharma and Lekha, 2012

There are some issues and challenges in Resin tapping, mainly the environmental and technical issues. Regarding environmental issues, two are very common and important to know and discuss.

a) ***High concentration of acid mixture applied as stimulant:*** It is prominent one. A stimulant for Resin extraction, mixture of Dilute Sulphuric Acid and Dilute Nitric Acid (20%) should be applied to tree where rill is formed for Resin tapping (MoFSC, 2064). If mixture is concentrated, it may negatively affect the growth and development of Pine tree tapped. Some people say that mixture applied is more concentrated than that permitted by Resin Collection Procedures. The Resin collectors are paid based on amount of Resin collected so they spray heavily with the hope of more extraction. The acid mixture flows from trees during rainfall and causes severe effects to soil as well as growing vegetation.

b) ***Mother trees:*** In the past, there was no any provision to keep mother trees as a source of fertile seed. Therefore, all tapable sized Pine trees were tapped. It is mentioned in Resin Collection Procedure (Source: MoFSC, 2064) that the mother trees up to 5 trees per hectare are to be selected and numbered with enamel paint. People say that seed produced from tapped trees are of poor qualities and also the timber quality is decreased.

On the other hand, there are some technical Issues in the resin tapping. Three issues are very important to know for the Khote Salla value chain actors.

a) ***Selection of trees to be tapped:*** During monitoring of Resin tapping by DFO, it has been observed that some under sized Pine trees are also tapped. The trees above 30cm diameter (or 95 cm girth) at breast height can be tapped (Source: MoFSC, 2064).

b) **Control of heavy tapping and leakage:** The DFO has a suggestion to the Private companies to control on heavy tapping by making rill size, angle and groove (Source: MoFSC, 2064). DFO has also a suggestion to arrange necessary training to labourers and manpower involved in it and to do regular supervision from company's side. Training has been conducted but still there needs improvement on technical aspects of rill making and collection in time without spoiling on the ground. It has been observed in some places that Resin collected in funnel from the rill split at ground due to lack of timely supervision.

c) ***Low quality timber production from tapped trees*****:** People have general notion that Resin tapped trees yield low quality timber. Whereas secondary information reveals that, the absence of any adverse effects caused by tapping is demonstrated by the fact those plantations of Pines are tapped in many parts of the world. That means studies suggest no loss in quality of the log is observed after felling, whether it is destined for timber or pulp production, and although there is some loss of volume increment during the period of tapping, this is more than compensated for by the revenue earned from Resin production. The damage is undoubted heightened if wood is removed deeply from the tree or over too wide an area while tapping (Coppen and Hone, 1995).

The multiple uses of Khote Salla tree indicate lots of economic potentials in Nepal. However, except some domestic uses in the forms of timber and timber wood, its potentials have not been explored and utilized for the local and national economy.

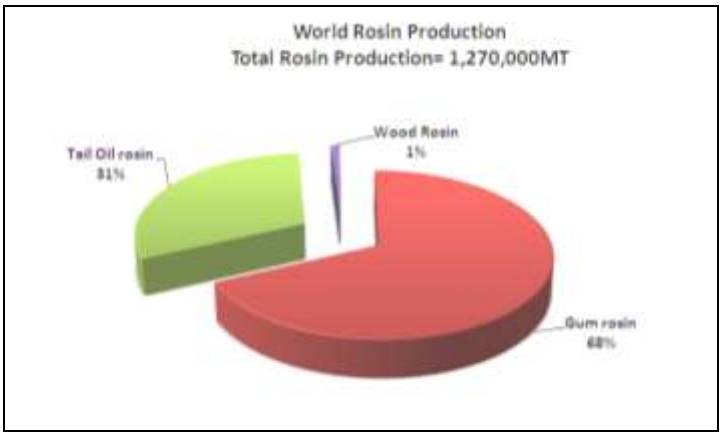
Production, Market and Trade of Resin and Turpentine

Resin Production, Market and Trade:

The data on the quantity of global Resin production seem very exciting. Data show that approximately 2,340,000 MT of resin was produced and traded globally in 2011; which comprises of 54.3% (1,270,000 MT) Rosin Resins; 42.7% (1,000,000 MT) Hydrocarbon Resins; and 3.0% (70,000 MT) Terpene Resin (Source: Rescoll, 2013)

There are three major sources of Rosin: (a) Gum: Tapping the oleoresin of living Pine trees; (b) Tail Oil Rosin (TOR): By-product of Kraft pulping process; and (c) Stump wood: Extraction/ special processing of Oleoresin from stumps.

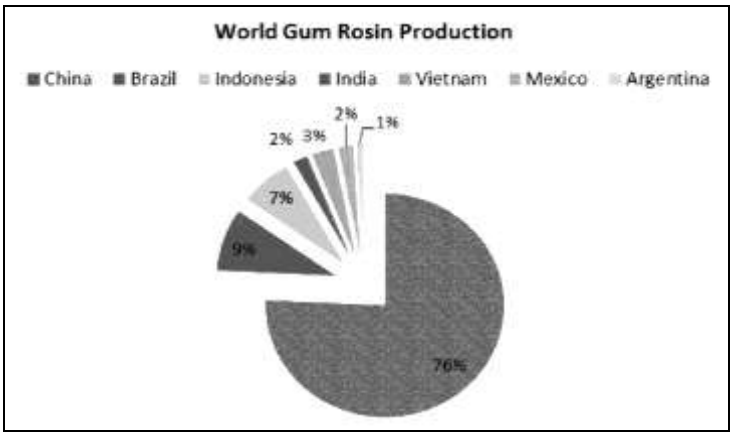
Figure 11:4: World Rosin production, 2011



Source: Rescoll, 2013

Gum Rosin is the world's largest production apart from other two sources. However, its production and moderate distribution is widely dispersed. The data show that production quantity is incomparable for other countries, like that of China. Almost 76% of the global resin Gum production comes from China.

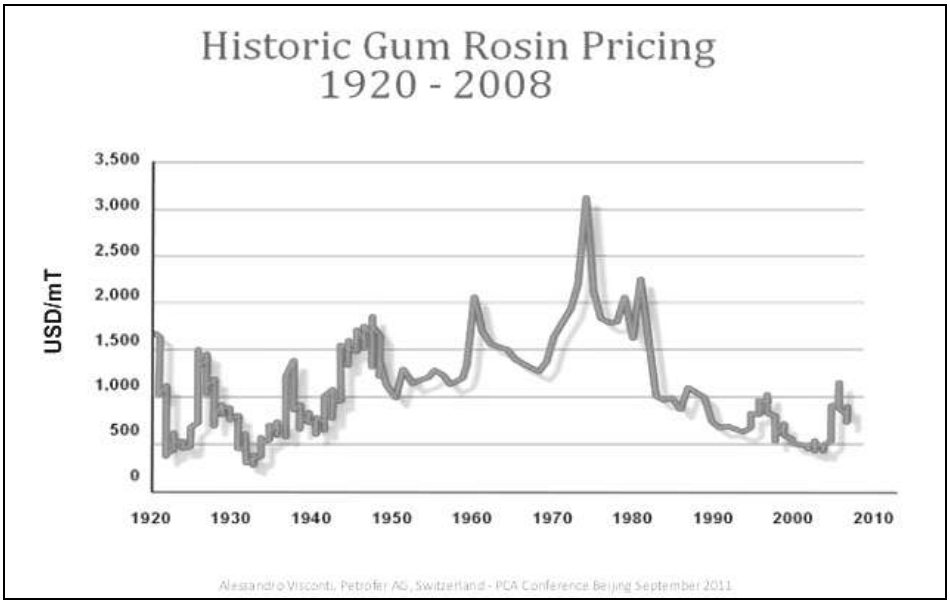
Figure 11:5: Distribution of World's Rosin Gum production



Source: Rescoll, 2013

It is interesting to see that the major producer of Rosin has been changing in intervals of decades. In the year 1964-1966 the USA was major producer of Rosin and Turpentine (47 and 42.5 % respectively). From 1990-1993 China and Indonesia have become major producers of Rosin and Turpentine. And at present, China is in the forefront in the production of Rosin. Not only the production quantities, but the prices of Resin is also fluctuating over the years and decades. The price of Rosin has increased sharply during 1970s which was due to the global oil crisis.

Figure 11:6: Change in Gum Rosin price in between 1920 to 2008



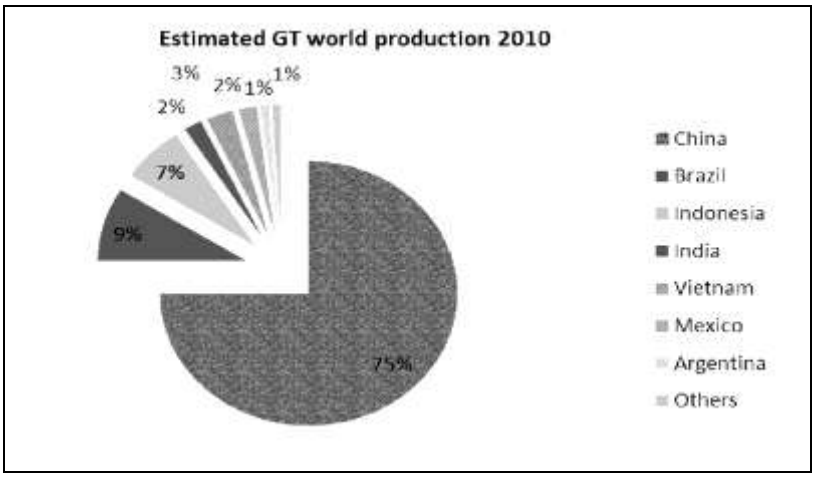
Source: Visconti, 2011

The Rosin price seems comparatively low but stable during the last four decades. The Rosin price fluctuation has many reasons, such as fluctuation in oil price, imbalance in the demand and supply, export tax rebates and foreign exchange rates (Source: Jian, 2011). It is assumed that production growth in China is limited in the next few years and by that reason its demands will be high and likely to increase. In this light, China will be shifting from a producer and exporter of Rosin to a country of both producer and consumer. The increase in Rosin prices stimulated a growth in Rosin production and output, not only in China but also in Brazil, Indonesia, Vietnam, amongst many countries.

Turpentine Production, Market and Trade:

Global Turpentine supply comes from two major sources. One is obtained by the recovery effort of the Kraft process during pulping Pine trees- the first phase of the paper making process. The end product is named crude sulfate Turpentine (CST), the by- product from pulping mills, mainly produced in North America. The other is obtained by tapping living trees to accumulate Pine gum Resin, which then is processed into Gum Rosin (GR) and Gum Turpentine (GT) with an approximate ratio of five to one. GT is the so-called by-product of Gum Rosin production. One thing in common for the two sources is the nature of being a "by-product".

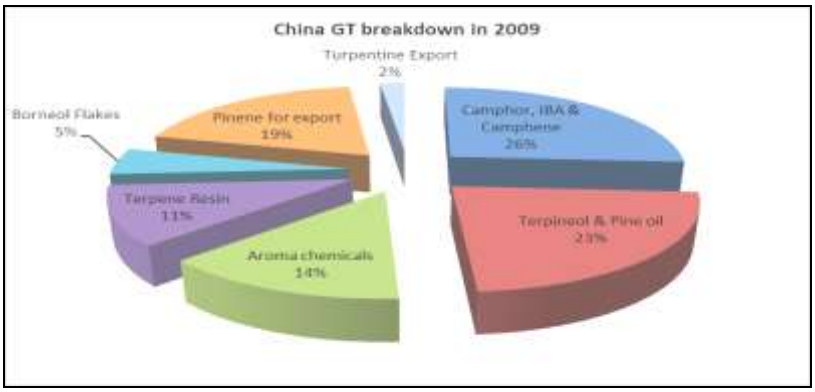
Figure 11:7: Estimated Gum Turpentine Production in 2010



Source: Zheng, 2012

The global production of gum Turpentine is estimated as 1,73,000 MT in the year 2010 and China again is recorded as the largest producer.

Figure 11:8: Gum Turpentine Breakdown in 2009 produced in China



Source: Zheng, 2012

There is a high possibility that the supply of Gum Turpentine from China will offset the global demand in the coming decade, while the competition between the Terpene based chemicals and the petro based chemicals will be continued (Zheng, 2012). China seems the leader in this business and hence its market implications affect the whole value chain. That demands proper understanding of the increasing demand of Gum Turpentine along with increasing industries in China and Chinese markets.

Resin Production, Market and Trade in Nepal:

There is a lack of proper database and references about Nepal's contribution in the global resin production and trade. However, a study showed that Nepal's contribution is significantly noteworthy (i.e. 3.18% or the total) in global Rosin Resins (i.e. 1,270,000 MT) production and trade (Source: Rescoll, 2013). It is estimated that Nepal has the potential to tap about 60,000 MT of Resin (DFRS 2061, cited in Subedi 2010). The data show that 2420MT (2420612 kg) was recorded as a traded quantity by generating NRs 12, 901, 120 as national revenue (MoFSC/DoF, 2069 BS).

The employment opportunity from Resin Tapping in Nepal seems another aspect of importance. The data show that around 40438 MT Resins could be collected from around 13 500 000 trees every year in Nepal (DFO 2007, cited in Subedi 2010) if a single tree gives 3 kg during one season. For attaining this amount, 11, 233 labourers are required. It is prescribed that resin tapping of 1000 to 1500 tress needs a full time engagement for a collector (Source: MoFSC, 2064). If 1200 trees are assumed then 675 supervisors are needed to supervise Resin tapping work. This amount is calculated taking 20000 trees which are supervised by one supervisor. In this way, Rosin and turpentine industries are playing crucial role creating job opportunity for rural people. It also contributes to income of community forest user groups (Source: Subedi, 2010).

Case I: Resin Collection in Bhaisekham CFUG in Dhankuta

Bhaisekham CFUG is a well-established and well-organized CFUG in Dhankuta district. It was established 20 years ago, which is the second oldest CFUG in this district. This CFUG covers 79 hectares of forest with 155 households as its user households. The community area is relatively easily accessible, at less than a two hour walk up a dirt two-track. The primary livelihoods of the household are agriculture, specifically the cultivation of corn, barley and tomatoes on a rotational basis. The CFUG has been harvesting Resin over the past 20 years, and identified Resin tapping and timber as their primary income generators for the CFUG fund. The income is invested in the construction of schools, rural electrification projects and the introduction of piped water.

Table 11:12: General information of Bhaiskham CFUG in Dhankuta district

Bhaisekham CFUG information	
Description	**Unit**
Forest Area	79 hectares
User Households	155 households
Years in Resin collection	20 years
Hired labourers (local) in Resin tapping	3 employees
Estimated Resin collection	NRs 32,000
Collected tin	18

Source: Field Consultation, 2013/2014

This CFUG harvest about 4,000 kg of Resin during the collection season. The collection is done through a contract with the government Resin Company (Herbs Production and Processing, Ltd). The contract agreement was that the company would pay into the CFUG fund eight rupees per kilogram of Resin collected from their forest. These agreements usually are valid over a four to five year span, as it is in the company's interest to secure rights to a CFUG for a length of time so that no other companies can gain those rights. The Resin collection company also assists with plantation of new Pine trees within the community forest.

Unlike many other communities in Dhankuta district participating in Resin collection, the government company hires labourers from within the Bhaisekham community and trains them on how to collect Resin from the trees. The training is provided freely and trainees are selected based on previous experience with forest work or previous knowledge of some technical aspects of Resin collection. Currently there are three skilled labourers paid 15 rupees per kilogram of Resin collected from the forest. The training for the occupation is described as "learning by doing", where the labourers are shown and explained the technical aspects of the collection practice, such as how much bark to remove from the tree and how deeply to score it. They are then sent out, under supervision, to apply these techniques in

person. Based on their performance in this supervisory period, the decision to offer labourers a permanent collector position for the season is then made.

For the Resin collection season, hired collectors go out to the selected forest areas, tap the trees specified by the CFUG and the DFO for Resin, and then return to their other occupations, largely agricultural. Ten to fifteen days later they return to the forest and take the collected Resin from those tapped trees to a collection area within the forest, which consists of a small fenced in area where Resin is collected in tins of 18 kg capacity. They also then continue to tap more of those trees that have been selected for the season.

Community members stated that Resin is unable to bring in a substantial source of income, and is thus considered to be a side job along with agricultural occupations rather than a full time job. Members from within the CFUG are also hired as unskilled labourers to carry the tins of Resin from the forest collection area to the roadside, where the company will pick it up in a truck to take it to the collection center where it is weighed and waits to be transported to the factory. These carriers are paid three rupees per kilogram of Resin carried—thus, the employees are paid 54 rupees per container.

Table 11:13: General information of Resin collection in Bhaisekham CFUG in Dhankuta district

Contract through Government company					
Activities	**Low**	**Medium**	**High**	**Unit**	**Payment Recipient**
Contract	8		9	NRs/kg	Paid to CFUG fund
Collection		15		NRs/ kg	3 CFUG labourers
Transportation		54		NRs/ 18kg Tin	CFUG labourers
Total revenue in CFUG fund	32,000			NRs/ season	

Source: Field Consultation, 2013/2014

The processes and cost of Resin tapping for private company is slightly different than that of in CFUGs.

Table 11:14: Costs incurred for Herbs production and processing Ltd. Company

Herbs production and processing company: Government managed production				
Rate	**Low**	**High**	**Unit**	**Remarks**
Contract	8	12	NRs/ kg	Work with 11 CFUGs
Collection	15	22	NRs/ kg	Employs 40 employees
Transportation	3		NRs/ kg in 18kg tin	Employs 70 employees
Overall investment by company	70		NRs/ kg	
Potential pay-out to CFUG if Resin was collected independently	80	90	NRs/ kg	Not the current operational model

Source: Field Consultation, 2013/2014

Case II: Resin Collection in Madhuganga CFUG in Dhankuta district

Madhuganga CFUG is also situated in Dhankuta district, but has faced a very different situation of Resin collection in compare to that of in Bhaisekham CFUG. The primary difference between the Madhuganga and the Bhaisekham community is that the Madhuganga community works through a private Resin company that does not utilize local labourers in Resin collection, while the Bhaisekham community works with a government Resin collection Company that does hire local labourers for Resin collection. The earlier is also much less easily accessed than the latter . The access road to the community has been washed out by monsoon rains and is in drastic disrepair, inaccessible to vehicular traffic. The community can be reached on foot up this access road, or by taking a public bus to Hile, a hilltop community above Dhankuta municipality, then making a treacherous three hour descent down the hill into the community.

Table 11:15: Details of Madhuganga CFUG in Dhankuta district

Madhuganga CFUG information	
Description	**Unit**
Forest Area	72 hectares
Households	245 households
Years in Resin collection	12 years
Hired labourers (local) in Resin tapping	0 employees
Estimated Resin collection	125,000 NRs
Collected tin	18

Source: Field Consultation, 2013/2014

Madhuganga has been collecting Resin for twelve years from their 72 hectares of forest, 90% of which is Chir Pine. They identified Resin as the primary income source for the CFUG fund, stating that it brings in about 125,000 rupees annually for the 245 members. Community members generate household income through growing rice, maize, millet and wheat as major crops. However, in the year 2013 this CFUG could not collect Resin due to the issues primarily stemmed from a change in the CFUG steering committee leadership. The CFUG general assembly vote concluded that they would spend the year harvesting timber but due to the legal hurdles (forest law states that Pine forests can only be harvested for timber or Resin in a season) the steering committee was unable to do or resolve it. They attempted to switch and focus on Resin collection instead, asking that the company pay nine rupees per kilogram of Resin collected and also assist with maintenance of the washed-out access road. The company disagreed with this provision for road maintenance and before an agreement was made the deadline for the Resin collection application passed, leaving the community without opportunities for Resin or timber harvesting to support its fund.

After the agreements and trainings to the collectors, labourers collect the Resin. The community members are paid between 15 and 50 rupees per 18 kg tin—based on the distance of the forest collection area to the roadside—to carry the tins from the trees to the road, where they are then sometimes transported to be weighed at a collection and measurement station. The community members stated that commonly they make about 350 rupees from carrying the containers, but that they would not carry the containers if they believed they would make fewer than 200 rupees. Some days they could make up to 500 rupees carrying containers but would then be unable to work the next day. After the Resin is measured and final payments are settled, it is transported to a factory near Dharan.

Table 11:16: Revenues received for Resin collection in Madhuganga CFUG in Dhankuta

Madhuganga: Contract through private company					
Activities/ Rate	**Low**	**Medium**	**High**	**Unit**	**Payment recipient**
Contract	8		9	NRs/ kg	Paid to CFUG fund
Collection		15		NRs/ kg	Non- local labourers
Transportation	15		50	NRs/ 18kg tin	CFUG labourers
Total revenue into CFUG fund	125,000			NRs/ season	

Source: Field Consultation, 2013/2014

The calculation of cost incurred by the private company in collection to the transportation would become a part of analysis in understanding the investment of the industry and possible scopes for expanding job opportunities for local people.

Table 11:17: Cost incurred by Sunrise Rosin Collection Company

Sunrise Rosin company: Private production				
Activities/ Rate	**Low**	**High**	**Unit**	**Remarks**
Contract	6.3	10.0	NRs/ kg	Dependent on various factors
Collection	15.0		NRs/ kg	Hired from outside CFUG
Transportation	15.0	50.0	NRs/ kg	Hired from outside CFUG
Overall investment by company	47.5		NRs/ kg	Includes royalties and taxes
Potential pay- out to CFUG if Resin was collected independently	30.0		NRs/ kg	Not the current operational model

Source: Field Consultation, 2013/2014

Potential revenue from managing Khote Salla for Carbon Offset Payment in Nepal:

Except medicinal and Rosin trade, Khote Salla tree in Nepal has the possibility of revenue generation from carbon offset payment (Source: KC and Stainback, 2013). A project "Piloting Payment for Ecosystem Services: The Himalayan Community Carbon Project (HCCP)" has been piloted in 2010 and completed in 2012. One of the objectives of this project was to generate experience and learning that would contribute to Nepal's national Reducing Emission from Deforestation and Forest Degradation (REDD) strategy.

Table 11:18: Average carbon stock and annual sequestration rates from various studies

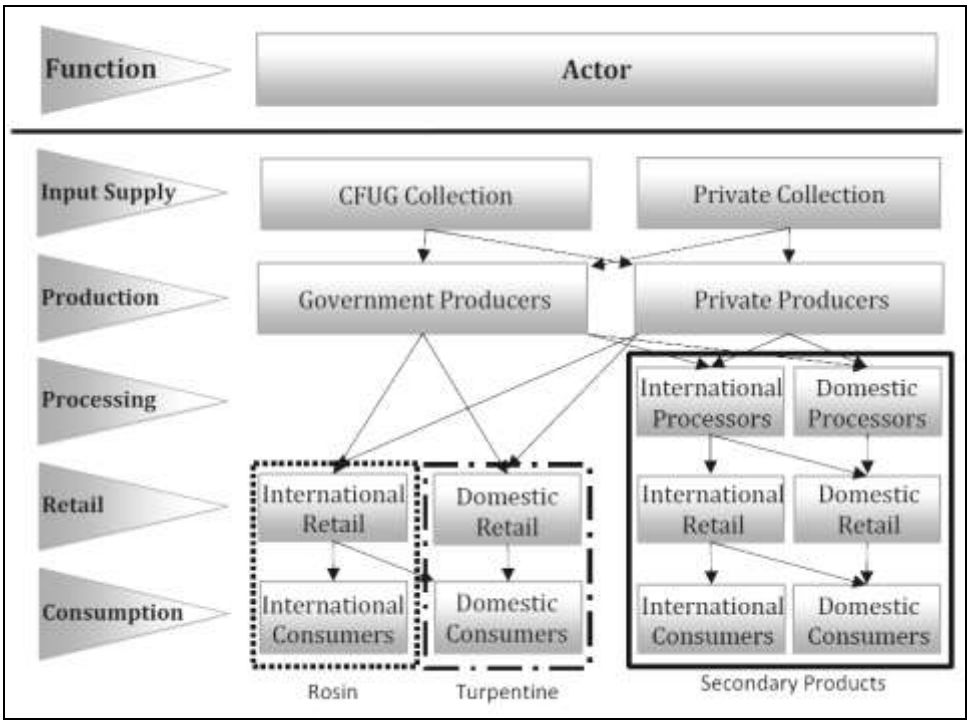
Forest Types	Carbon stock (tons/ha)	Carbon Sequestration Rate (C tons/ ha/ yr)	Sources/ References
Chir Pine, Salyan, Nepal	76.82	2.21	Adhikari, 2011
Chir Pine, Lalitpur, Nepal	38.70	1.35	Baral et. al, 2009
Chir Pine, Palpa, Nepal	116.8±28.08	-	Shrestha, 2008
Chir Pine, degraded forest,Kumaon, India	17.49-33.42	1.07-1.27	Jina et. al., 2008
Chir Pine, Toli Village Panchayat, India	161.03	-	Tiwari & Karki , 2007

The preliminary research findings from carbon monitoring surveys of selected community forests in Nepal suggest that carbon stocks are increasing at the rate of 2 to 5 Tons per hectare per year (Dahal and Baskota, 2009). Thus, carbon offset payments could be another potential source of income to community forest users along with Resin tapping.

Functions of Khote Salla Value Chain Actors

There are more than 15 private enterprises and one Government enterprise that are processing Rosin and Turpentine in Nepal. Rosin is exported to India, whereas the majority of Turpentine is sold in the national market for Turpentine based enterprises (paints, adhesives etc.). Dhankuta is unique in itself as there are two supply chains existing for Resin collection. One supply chain is through government enterprises (Herbs production and processing company limited) and another is through private enterprises (Sunrise Rosin and Turpentine Pvt. Ltd., Dabya Rosin and Turpentine Pvt. Ltd.).

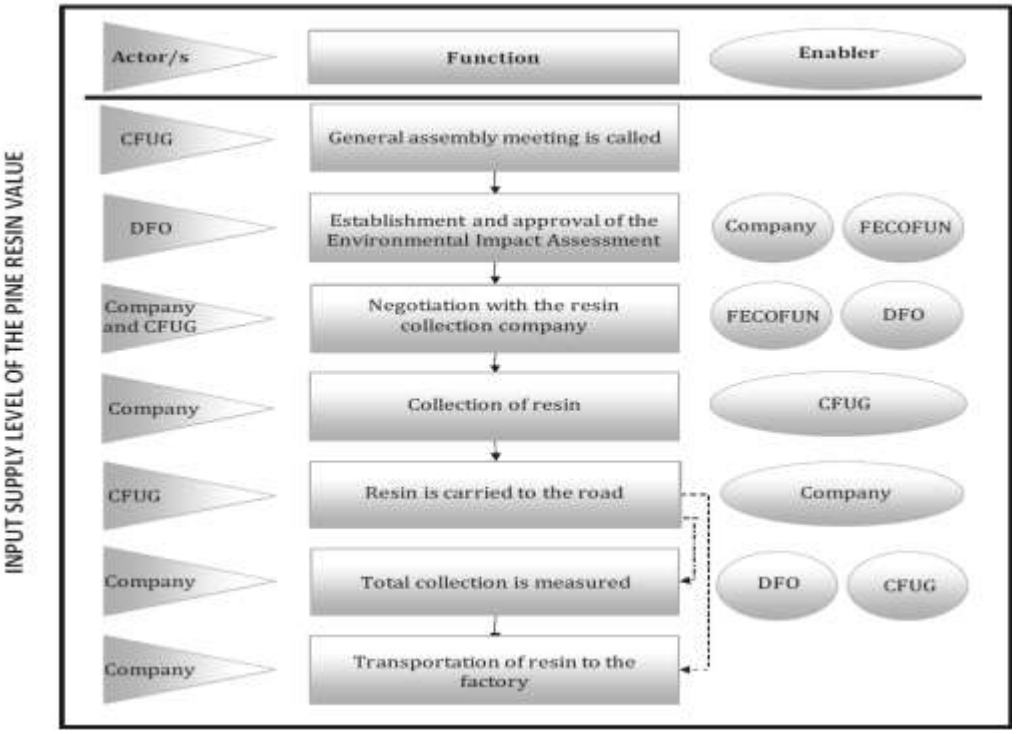
Figure 11:9: Value chain map of Resin produced and traded in Dhankuta district



Source: Field Consultation, 2013/2014

The final products derived from Pine Resin can be split into three categories: Rosin, Turpentine and Secondary Products produced from those goods. The input supply and production levels for all three categories of products are similar, being sourced from either CFUG-managed or privately owned Pine trees and taken by either a government-managed or a privately owned production facility. In both of these production facilities, the production processes are fairly similar. Raw Resin is placed into a copper still and brought to a boil (somewhere between 90 and 115 degrees Celsius), where Turpentine evaporates out and is condensed, while Rosin remains in a molten form within the still. Turpentine is then bottled, while Rosin is cooled and sold in a solid form. These two products can be sold as finished goods. Most Turpentine produced in Nepal stays in the country, while the majority of Rosin produced is sold internationally, largely to India. If Turpentine and Rosin are meant for further processing into secondary products, they are sold to either international or domestic processors.

Figure 11:10: Input supply level of the pine Resin value chain



Source: Field Consultation, 2013/2014

a) General Assembly Meeting: In an effort to combat overexploitation of forest resources, Nepal's law states that CFUGs cannot extract Pine Resin and harvest Pine timber in the same year. Because of this, CFUGs take a vote at their annual general assembly meeting on whether they wish to extract Resin or harvest timber in that year. A two-thirds quorum must be present to hold the vote, and the decision is made by majority rule. Factors influencing the decision include market prices of timber vs. Resin in that year, the number of years in a row one activity vs. another has been taking place (if timber cutting has taken place too many years in a row, the CFUG will choose Resin to allow some time for the growth of tree, and vice versa), and the current condition of local equipment and roads.

b) Environmental Impact Assessment: Before Pine Resin can be extracted from a CFUG, an Environmental Impact Assessment (EIA) must be conducted. This assessment details not only the potential environmental ramifications of Resin extraction but also sets up an operational and management plan for the community forest, outlining which trees can be harvested, when, and at what rate. This assessment must receive approval from the District Forestry Office (DFO), the local branch of the Ministry of Forests and Soil Conservation, the governmental department in charge of environmental protection. An EIA can be carried out either by a third party group hired by the Resin extraction company, or by technical experts from the DFO who advise CFUGs on such matters as conducting a resource inventory to allocate an annual allowance of trees that can be cut for either timber or Resin.

c) Negotiation: Once the EIA has received approval from the DFO, the CFUG can enter into negotiations with an interested Resin extraction company for the rights to tap Resin in their forest. Very few CFUGs in Dhankuta collect their own Resin, preferring to contract out this right to a government or privately owned company. The negotiations concern the rate to be paid to the CFUG per kilogram of Resin extracted, as well as the rate per kilogram paid to the skilled Resin collectors and the rate per kilogram paid to the porters who carry Resin to the roadside. Additional items discussed in this stage include the size of the advance paid to the community, if desired, and additional terms of support such as road maintenance.

d) Collection: Once an agreement is settled between the collection company and the CFUG, Resin extraction begins. To tap the tree, a section of bark at breast height is removed, exposing the inner wood. One large vertical central channel is carved into this exposed section of wood, running to the trunk of the tree. Small grooves or rills are then cut at an angle off of this central channel so that the Resin from these small rills funnels into the central channel. A small tin cup is placed at the bottom of this central channel to collect the Resin; it is emptied every 10 to 15 days over the six month collection period. The bared sections of wood are sometimes treated with diluted acid to reopen the grooves and stimulate up to 40% more Resin secretion.

e) Transport to Road: Resin from the small tin cups is collected in a forest collection area not far from the trees being tapped. In this collection area, Resin is stored in tins capable of holding 18 kg of Resin. The length of time Resin sits in this collection center is dependent upon the company practices. This Resin is then carried from the collection area to the roadside by local labourers, who carry the tins with traditional Nepali head and body straps.

f) Measurement of Total Collection: Resin carried to the roadside is then picked up in trucks leased by the company for the purpose of transporting the Resin to factories to the south of Dhankuta. In some instances, before the Resin is taken to the factory it is taken to a weighing center, where officials from the DFO, the CFUG and the company supervise the weighing process. Royalties paid to the DFO and total payments to the CFUG are calculated off of this total measure.

g) Transport to Factory: Whether the Resin has been weighed at a station or collected from the roadside; it is then transported by truck to factories in the commercial centers to the south of Dhankuta, including cities like Dharan, Itahari and Biratnagar.

Market Actors and functions of Khote Salla Value Chain in Dhankuta District:

Within a value chain, value-additive activities and functions occur distinctly but not independently of one another. Just as these relationships between functions are interconnected, so too are the relationships between actors responsible for carrying out these functions. This section will discuss the role of the CFUGs and processing companies responsible for Resin collection in this VCA.

1) ***CFUG:*** The majority of Resin collected in Dhankuta district comes from CFUG managed forests, who sign a contract with Resin processing companies giving them the right to tap their Pine trees. Before this agreement can be established, it is the responsibility of the two parties to complete an Environmental Impact Assessment (EIA). The CFUG described this process as quite lengthy and involved. After the EIA has been approved, the CFUG and Resin extraction company can draft an agreement for the rights to collect Resin. The contract agreement was that the company would pay into the CFUG fund eight rupees per kilogram of Resin collected from their forest. These agreements usually are valid over a four to five year span, as it is in the company's interest to secure rights to a CFUG for a length of time so that no other companies can gain those rights.

2) ***Resin and Turpentine Enterprises (Private Company):*** The private company buys the resin collected by the CFUGs, processes and produce Rosin and Turpentine from the collected Resin. Resin Collection Company also assists with plantation of new Pine trees within the community forest.

3) ***Resin collector or labor:*** Two types of collectors are mobilized in tapping Resin from the tree. It is mostly provisioned itself in the agreements between private company and CFUG. The agreements may be based on two conditions: either the private Resin Company utilize labourers in the community (especially the particular CFUG) or bring its labourers or workers of its own. The labourers have mainly two functions: tapping or collecting Resin from living tree and carry the collected resin to the road head.

Enablers and Facilitators of Khote Salla Value Chain in Dhankuta District:

The DFO and FECOFUN commonly provide support for general administrative and governance needs and coordination amongst the CFUGs within Dhankuta district. This coordination can assist the CFUGs during company negotiations, offering them leverage, as they will be informed about appropriate market prices and other negotiations and options the company has in writing out the contract. Local NGOs such as Society of Local Volunteers' Efforts (SOLVE), Rara Nepal and RRN are involved in providing administrative and technical support for enterprise development needs. The primary difference identified between the actions of the DFO and FECOFUN and the nonprofit organizations is that the DFO and FECOFUN tend to specifically tackle issues concerning forestry, while the NGO organizations in the area specifically focus on enterprise development support services such as business advising and marketing assistance.

Table 11:19: Enablers of Khote Salla Value Chain in the Dhankuta District

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CF
Royalty payment	DFO, CF
Checking and weighing	Range Post
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Certificate of origin	FNCCI/ DCCI
Market information	Rosin enterprises
Financial support	Private sectors/ Rosin enterprises
Processing technology	Private sectors/ Rosin enterprises
Resource management and research	DFO
IEE, EIA	DFO
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

SWOT Analysis of Khote Salla

Competitive analysis provides an overview of the Strengths, Weakness, Opportunities and Threats (SWOT) within the Resin value chain. This specifically examines the strengths and weaknesses that are internal within the Resin collection process, as well as the opportunities and threats that lie external to the current process.

Table 11:20: SWOT Analysis of Khote Salla value chain in Dhankuta district

Strengths (to capitalize on)	**Weaknesses (to eliminate)**
➢ Widely available resources; ➢ Maximum possible business from Chir Pine (including all parts); ➢ Nepal's production of Resin account 3% in global trade; ➢ Various researches published and carried out in Chir Pine in Nepal and India; ➢ Availability of global market analysis and positioning of different *Pinus* species for product development; ➢ Increasing global market for Rosin and Turpentine; ➢ Providing direct benefit to more than 12000 people and CFUGs (Subedi, 2010);	➢ Lack of product optimization and usage (only Rosin and Turpentine is manufactured); ➢ Lack of standardization of product; ➢ Private sector led business with very less income to CFUG; ➢ Lack of motivation for local people to indulge in Resin collection; ➢ Lack of improved tapping method, persisting still with Rill method;
Opportunities (to take advantage of)	**Threats (to overcome)**
➢ Maximum utilization/ application of product for medicinal, industrial and environmental usage; ➢ Prominent product for Carbon offset payment; ➢ Business solution for disaster risk reduction (fire reduction) through utilization of needles; ➢ Potential to increase Resin collection to 60000 MT (DFRS 2061, cited in Subedi 2010);	➢ Increasing competition from China; ➢ Over exploitation practice in Resin tapping;

Source: Field Consultation, 2013/2014

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

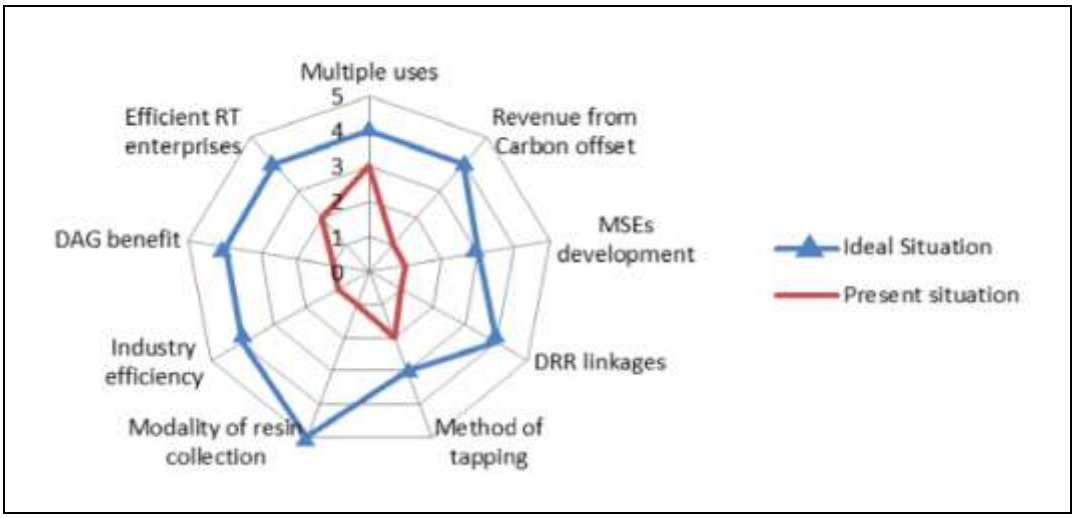
Value Chain Upgrading Strategy of Khote Salla

Chir Pine is a wonderful species with a potential for wider and multiple applications. The standing volume of this species in Nepal (6.3% of total forest in Nepal) also indicates (DFRS, 1999) its great potential for the country's economic growth through increasing employment opportunities and income of the people. For this, possible strategies have been identified and discussed below.

End Market Analysis:

The discussion with various stakeholders in Pine Resin and secondary information collected have shown various issues associated with its production and trade. The issues associated with Khote Salla Resin production and trade have been analysed on the basis of nine variables. The analysis is done from the perspectives of its ideal situation and the present status.

Figure 11:11: Comparision between ideal situation and present status of Khote Salla in Dhankuta district



Source: Field Consultation, 2013/2014

The parameters used to compare ideal situation and present status of the production and trade of Resin have been prepared on the basis of aspirations of the value chain actors and the present situation. The parameters are presented in the table below (Table 11.21).

Table 11:21: Parameters used to compare ideal situation and present status of Khote Salla

Parameters	1	2	3	4	5
Multiple usages	Pine Resin usage for traditional purposes	Pine Resin usages for tradtional, timber usages	Pine Resin usages for production of Rosin and Turpentine	Pine Rosin usages for medicinal, industrial and envrironmental usages	Maximum utlization of Resin in all possible applications
Efficient Rosin and Turpentine enterprises	Minimal yield of Resin, Rosin and Tupentine	Avarage yield of Resin, Rosin and Turpentine	Industry standard yield of Resin, Rosin and Turpentine	Best yield of Resin, Rosin and Turpentine	
DAG benefit	DAG benefit in terms of partial employment, usage of external labour	DAG benefit interms of partial and some full employment	DAG involvement in majority of process	DAG involvement if product making from Pine Resin	
Revenue from carbon offset	Initial research carried out in potentiality	Presence of institutional mechanism at local level for furthur research	Ownership of Government, projects regarding potentiality of species for carbon offset	Pilot program of potentiality	Actualization of revenue from managing Chir Pine for carbon offset payment
MSEs development	Minimal number of MSEs in value chain	Average number of MSEs in value chain	Large number of MSEs in supply chain	Large number of MSEs in extended value chain within country	Large number of MSEs throughout value chain
DRR linkags	High disaster prone (fire)	Medium disaster prone (fire)	Limited and controllable	Business mechanism for	

			disaster (fire)	reducing disaser (fire)	
Methods of tapping	Traditional method	Method that has been seen more efficient in past decade (Rill method)	Method that has been more efficeint recently (bore-hole method)		
Modality of Resin collection	Private led with external labour	Private led with community based labour	Private-Community partnership led by private	Private community partnership , with private investors within community	Private-community- BMOs partnership with establishment of small processing enterprises
Industry Efficiency	Lack of competitiveness	Average competitiveness	Highly competitive in region (Asia)	Globally competitive	

Source: Field Consultation, 2013/2014

It is clearly seen that there are wide gaps between the ideal situation and the present status of Resin. Reduction in these gaps is essential for the improvement of resin production and trade in Nepal. Some potential strategies for reducing these gaps are discussed below.

Multiple usage of Pine Resin: Pine Resin at present has been widely used for traditional purposes, timber and mainly for Resin collection. Secondary information has revealed possibility of its usage for medicinal, industrial and environmental benefits. The discussion with herbal retailers in Dhankuta revealed lack of product development from Chir Pine. Its industrial usage is limited to Rosin and Turpentine from which again extended value chain can be reached. There are no existences of enterprises that add more value to Rosin for product development. Different products like camphor are imported from China and India which has potential for import substitution. There is lack of enterprises which use needles and cones for making handicrafts, briquette, essential oils etc. Needles and cones which are major sources for forest fire are underutilized. The earlier sections described about possible applications of various parts of Chir Pine for MSEs development. Nepal government and private sector has to look closely on these huge possibilities.

Efficient Rosin and Turpentine enterprises: The proportion of Rosin and Turpentine oil in Chir Pine is 75% and 22% respectively with 3% losses etc. Imported Resin contains 75-95% Pinenes (e.g. *Pinus massoniana*, *Pinus yunnanensis*, *Pinus kesiya*, *Pinus elliottii* etc.), whereas Chir Pine Resin contains only about 25% Pinenes. There is lack of documentation about efficiency of existing enterprises in Nepal along with standard quality of product manufactured.

DAG benefit: The majority of enterprise manufacturing Rosin and Turpentine in Nepal is private (One is Government owned and another is CFUG-Private-FECOFUN partnership). All these private enterprises are using labourers from other districts. The local labour forces are sometimes interested in working in resin collection, but perceive a distinct obstacle in their ability to do so. This is due to lack of practices, inability to wait for longer time for full payment, and other agriculture and cultural work in vicinity. Resin collection can provide annual income to local people if they can manage between their agriculture work and Resin collection. This issue has to be addressed in an innovative way, otherwise its external labour will continue to be utilized, to the detriment of local labourer who could benefit from collecting Resin.

Revenue from Managing Chir Pine for carbon offset payment: Some research shows the potentiality of carbon offset payment. This will be a promising initiation, and Nepal government has to take ownership with development of pilot program with the partnership of development agencies and partners.

MSEs Development: The only MSEs thriving in the Resin value chain are Rosin and Turpentine based enterprises. The experiences in India and China have shown possibilities of large number of MSEs throughout the value chain (at input supply level and at extended value chain level). It is important to foster input supply level enterprises which can maximize utilization of various parts of Chir Pine. This will enable local people also to collect Resin in one hand and operate MSEs.

Disaster Risk Reduction linkages: It has been documented that Chir Pine is accounted for forest fire due to underutilized presence of cone and needles. There is an effort needed for business-based ways of reducing disaster (fire). This can be three pronged via, (a) Utilization of needles, (b) Utilization of cones, and (c) Plantation of MAPs. These methods are well documented and practiced in India.

Methods of tapping: In Nepal Resin collection is carried out by rill method. In India, present practice is the bore-hole method, which has various advantages including reduction in cost. Nepal government has a manual to be followed for Resin collection through rill method, when perhaps the bore-hole method should be practiced. There has been an absence of secondary information which attributes to advantages and disadvantages of this method in Nepal.

Modality of Resin collection: This is an interesting system where a number of private enterprises used to be allocated to districts for Resin collection. At present, this license system does not exist and there is the possibility of any other enterprises to collect Resin from any districts of Nepal. This has surely made created price gouging in one hand and in the other opened the possibilities of community led enterprises. One such enterprise in Ramechhap district (Tamakoshi Community Rosin and Turpentine Pvt. Ltd.) is based on community- private- FECOFUN partnership and is successfully collecting more than 1500 MT of Resin annually. In Dhankuta District also, the possibility of such a model has to be seen due to an increased investment environment from district people along with strengthened financial institutions. There are appropriate technologies available for Resin processing (around NRs 15,00,000 with capacity of 1500 kg per day (Source: Swaraj, 2014). This initiative can be piloted by using bore-hole tapping method along with MSEs development by utilization of Resin collectors. This will help local collectors for additional income and can thus see Resin tapping business as a priority over agriculture and social priorities.

Industry efficiency: The imported Resin contains 75-95% Pinenes whereas Chir Pine Resin contains only 25% Pinenes. There has been specific commercial usage of different species for example *Pinus Kesiya* and *Pinus elliottii* are preferred by beta pinene route aroma chemical producers because of their high content of beta pinene. There is lack of information regarding the best suited industries for *Pinus roxburghii* (ink industries).

There is also lack of information and research regarding the market niche and best usage of *Pinus roxburghii*. It is of utmost importance to see industry competitiveness of Nepal in Rosin and Turpentine. There is no document or research that has been carried out to see competitiveness of Nepalese Rosin and Turpentine in Asian market in comparison to China, India and Indonesia.

1. Firm level upgrading strategy:

The firm level upgrading strategy is developed based on the gaps identified as above. The strategies are discussed on some issues based specific strategies. They are discussed below.

a) Product upgrading: At present, timber and Resin (extended to Rosin and Turpentine) are major products from Pine Resin tree. It is important to maximize and optimize Pine Resin tree/ and its parts can be used for commercial purposes. The product upgrading is based on three years plan and in first year focus will be carried out optimum operation of enterprises, standardization and increasing mixed products. The detail of each year strategies is presented below (Table 11.22).

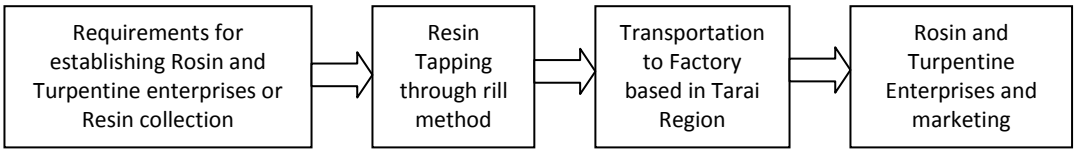
Table 11:22: Khote salla product upgrading strategies

Parameters	Present	Year 1	Year 2	Year 3
Product	Pine Resin collection from CF by private enterprises and government enterprises;	Resin collection piloting in CF through Community- private-FECOFUN partnership with bore-hole method; usage of local labour;	Resin collection and establishment of MSEs for Rosin and Turpentine manufacturing within District; Research on establishment of medicinal MSEs; Research on establishment of MSEs for products from needles and cones; National level ownership for *Pinus roxborghii* as source of revenue from carbon offset;	Rosin and Turpentine sale through community based enterprise; MSEs developed for medicinal and underutilized products; Piloting for getting potential revenue from managing Chir Pine for carbon offset payment;
Price	Income to CF and external labour NRs 6 as royalty;	Income to CF and local labour NRs 9 for CF as royalty;	Income to community enterprises, CF, local labour;	Additional income to MSEs;
Place	Nepal	Nepal	Nepal	Nepal
Promotion	Few actors involved and led by 15+ private enterprises;	Community- private business model; Multiple MSEs development	Chir Pine application in Medicinal, Industrial and Environment;	Realization and piloting of innovative enterprises in Medicinal, Industrial and Environmental applications;

Source: Field Consultation, 2013/2014

b) ***Process upgrading:*** In general there are four steps of Resin related processes in Nepal. This is presented in the figure below (Figure 11.12).

Figure 11:12: Processes of Khote Salla value chain



Source: Field consultation, 2013/2014

There are various processes involved for Pine Resin production. This process starts from collection and ends to the final product marketing. The steps involved in the production to marketing are presented in the table below (Table 11.23).

Table 11:23: Process upgrading strategies of khote salla

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology intervention	Anticipated benefits
Upgrading 1: Resin Collection requirement; Rosin and Turpentine manufacturing requirements	➢ Resin collection by carrying out resource inventory, IEE/ EIA, BP by private enterprises; ➢ Resin collection by community led enterprises by doing IEE, resource inventory, BP	➢ Strengthen community led enterprises for Resin collection; ➢ Support piloting for community led enterprises for manufacturing Rosin and Turpentine in vicinity;	➢ Legal knowledge on Resin collection enterprise; ➢ Legal knowledge on establishment of Rosin and Turpentine manufacturing enterprises;	➢ Increased negotiating power; ➢ Alternatively establish enterprises for competing and collaborating with existing private enterprises;
Upgrading 2: Resin collection	➢ Resin is collected through Rill method; ➢ Resin collection is carried out mainly by outside labourer; ➢ Lack of MSEs in supply chain;	➢ Resin Collection through Bore-hole method; ➢ Maximum utilization of local labour through potential for MSEs creation;	➢ Training in bore-hole method; ➢ Exposure visit to see real practices; ➢ Assessment on MSEs opportunities for local labour;	➢ Increase efficiency and reduction in production cost; ➢ Increase income of labourer and MSEs development; ➢ Increase employment at supply chain;
Upgrading 3: Transportation	➢ N.A.			

Upgrading 4: Rosin and Turpentine Production	➢ Rosin and Turpentine production in Tarai region; ➢ Lack of information on quality of products; ➢ Lack of information about industry competitiveness ; ➢ Lack of extended value chain for product development for Rosin and Turpentine;	➢ Rosin and Turpentine production (MSEs) in vicinity of resources; ➢ Standard practice on quality of Rosin and Turpentine; ➢ Assessment of Nepal's competitiveness in global market; ➢ Competitive product development at national level (e.g. Camphor etc);	➢ Access to finance; ➢ Access to Technology; ➢ Enterprise Management; ➢ Standard practice manual development; ➢ Industry analysis of Rosin and Turpentine; ➢ Assessment of competitive product from Rosin and Turpentine;	➢ Increase in CFUG income, value addition at District level; ➢ Increased efficiency and branding of Rosin and Turpentine industries; ➢ Identifying niche and developing marketing strategy for Rosin and Turpentine in Nepal; ➢ Increase employment and income in extended value chain;

Source: Field Consultation, 2013/2014

c) ***Functional upgrading:*** The functional upgrading of Resin value chain should be carried out at each level of its actors. The possible function upgrading of Resin value chain upgrading strategies are presented in the table below (Table 11.24).

Table 11:24: Functional upgrading strategies of khote salla

Actors	Present Function	Upgraded Function
Resin Collectors	Resin collection	Resin collection; MSEs development;
CFUG	Regulatory and royalty	Investment in enterprises; regulatory and royalty collection;
Rosin and Turpentine Enterprises	Rosin and Turpentine manufacturing and sale	Product development and sale in extended value chain;

Source: Field Consultation, 2013/2014

d) ***Channel upgrading:*** Pine Resin value chain follows a simple channel. Rosin and Turpentine enterprises situated in Tarai region collect Resin from hilly regions by employing external labours. Collected Resin is transported to factory and Rosin and Turpentine is manufactured. Rosin is sold in mainly Indian market and Turpentine is sold to domestic industries. Recent industry report suggests growing internal consumption of rosin and turpentine in China, which might have possibilities of exporting Nepal's product to Chinese market. This study recommends optimal use of Pine tree as potential channel upgrading strategies.

Table 11:25: Possible usage and possible channels for upgrading

Application	Existing	Elsewhere Existing	Lead actor in Channel
Medicinal	Traditional practices;	Used as herbal medicine and compounds in modern medicine in India and China;	Herbal and Ayurvedic wholesalers and retailers;
Rosin and Turpentine	Rosin exported and Turpentine domestically consumed by industries;	Various products developed from Rosin and Turpentine;	Importer of products from extended value chain;
Needles and cones	Limited ornamental and handicraft;	Multiple usage;	Actors depending on MSEs;
MAPS cultivation in Chir Pine forest	Information N.A.;	Research has shown possibilities of few species;	NTFPs, MAPs traders;
Pinus roxburghii as potential revenue for carbon offset	Limited but presence of research for its potentiality;	Research document found in case of India but information about real practices yet not garnered;	Private sectors, intermediaries;
Business way for reducing fire in forest through utilization of needles and MAPs cultivation	Research not found;	Research available in India but information about real practices yet not garnered;	Actors depending on MSEs;
Timber sale	Practice exist; Further research required on people's perception on diminishing quality of log after tapping;	Practice exist; No effect on quality of log even after Resin tapping; Leaving some incidence like: wood is removed deeply from the tree or over too wide an area while tapping;	Saw mill, furniture manufacturers;

Source: Field Consultation, 2013/2014

e) ***Intersectoral upgrading:*** Pine Resin of Nepal accounts for 3% of global trade. Internationally, institution and enterprises are harnessing all the possible usage of Chir Pine and in Nepal it is harnessed only for Rosin and Turpentine. There are ample of successfully demonstrated and operated practices in herbal medicine, usage of needles and cones as enterprises and products made at extended value chain. It is important to create MSEs apart from Resin collection so those local labourers are motivated to carry out Resin tapping activities.

2. Interfirm upgrading Strategy:

Chir Pine value chain has remained stagnant from its inception and there seems very little aspiration for product development and growth within the value chain. Private enterprises are continuously tapping Resin by paying royalty to CFUGs and using external labour. There have been no concrete steps for using local labour. The government has already cancelled the licensing system which used to prevail previously where Resin collection in particular district was "assigned" to particular enterprises. At present, anyone can tap Resin after completing

the necessary process, along with agreement with CFUGs. It is important now to upgrade the function of each value chain actors and provide opportunities to community led enterprise at local level to collect Resin. The private enterprises should focus on moving to extended value chains after partnering with community based enterprise for the supply chain. An initiative to bring all actors together and increasing aspiration of each actor for functional upgrading is a must to add more value at all levels.

3. Business Development Services and Financial Services Upgrading Strategy:

Most of the documents on value chain analysis are based on identifying only pertinent BDS and FS services. The assessment of Business Development Services (BDS) and Financial Services (FS) in this study has been done on the basis of the categorization of demands from beneficiaries and supply by the service providers. The categorization of demands and supply has been done on four categories.

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 11:26: Categorizing demands from beneficiaries and supply side of BDS providers of khote salla

SUPPLY SIDE	Very strong				
	Strong				
	Weak		Linkages to medicine/ herbal manufacturers for increasing medicinal usages	Development of standard operation manual of Rosin and Turpentine enterprise; Awareness about legal process for Resin collection and enterprise establishment	Value Chain financing for community led Resin collection; Training in bore-hole method; exposure visit to see real practices
	Very weak	Resin from other species mainly Eucalyptus	Piloting for getting potential revenue from managing Chir Pine forest for carbon offset payment	Research on industry competitiveness; Assessment of competitive product from Rosin and Turpentine	Research on product development from Chir Pine apart from Rosin and Turpentine
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand of beneficiaries and supply side of service providers in four categories (very weak, weak and strong) have been levelled to understand the existing situation. The assessment of this situation is helpful in developing possible recommendations for commercially viable options for these business services. The business and financial services required can be catered by commercially viable business service providers.

Table 11:27: Recommendation for commercially viable business options of khote salla

Services	Description	Major BDS
Manual on best practices for industry standard yield	Assessment of yield of Resin, Rosin and Turpentine in Nepalese enterprises	Quality specialists, Forest specialists, Rosin and Turpentine enterprises, consultants
Awareness about legal process of enterprises establishment	CFUG and members lack information about community based enterprises for Resin tapping as well as community based Rosin and Turpentine manufacturing	FECOFUN, DFO, projects, key personnel, lawyer
MSEs development and linkages with medicinal/ herbal manufacturers	Income for DAG, CFUG members from usage of Pine Resin parts for MSEs	DCCI, DCSI/ CSIDB, Private sectors, Technology service providers, Pharmaceutical industries, Ayurveda industries, Herbal industries
Research on industry competitiveness and assessment of competitive product at extended value chain	Lack of knowledge about Nepal's product in relation to global market, Numerous opportunities for product development at extended value chain	Industry expert, TEPC, FNCCI, Consultants
Piloting for getting potential revenue from managing Chir Pine forest for carbon offset payment	Initial research on potentiality already carried out, need to own this aspect from GoN and support from development actors and agencies	CFUG, FECOFUN, Intermediaries, Private sectors, Projects
Training on bore-hole method and practices actualization in Government regulation	Bore-hole method is cost effective than the rill method, Nepal Government has to assess this method and actualize through necessary policy formation but at least carry out action research for testing its viability in Nepal	DFO, FECOFUN, CFUG, Action research based organizations, Projects
Value chain financing for community led Resin tapping	Requirement of working capital for Resin tapping, raw materials purchase, equipment etc.	Community investment, cooperatives, private investments
Eucalyptus Resin tapping possibilities	Industry experts suggest upcoming competition from Eucalyptus Resin to Pine Resin	Forest specialists, industry experts, consultants

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

The business enabling environment (BEE) is very restrictive to forest based enterprises. Various research has outlined a number of legal hurdles that are restricting value chain promotion. Major legal recommendations made in BEE for Pine Resin value chain are listed below.

a. Standard operation manual for Resin collection (through bore-hole methods) and Rosin and Turpentine has to be developed (based on industry standard yield) and owned by DFO. This will help in increasing efficiency, increasing yield of Resin collection along with Rosin and Turpentine enterprises in one hand and in other help in transparency.

b. Include Chir Pine in NTIS as it/ Resin already account 3% of Global trade (Nepal Trade Integration Strategy 2010).
c. Guideline to be developed for interested community/ community based enterprises for collection of Resin.
d. Favourable and incentive based policies for Rosin and Turpentine based enterprises for product development after carrying out research on industry competitiveness along with assessment of competitive products that can be developed at extended value chain.
e. Strict mechanism for Resin collection and regulation follow up to decrease over exploitation of Chir Pine.
f. Specific policy regarding utilization of certain percentage of local labour for Resin collection and development of incentive/ motivation for local labour. This has to be initiative from DFO, Private enterprise and CFUGs.
g. Mechanism for leasing National Pine forest to Private companies or community led enterprise after assessing the possible consequences.
h. Incentive including seed capital for establishment of MSEs focused on disaster risk reduction (fire).

5. Sustainability Strategy:

Resin from Chir Pine and other *Pinus* species is getting competition from hydrocarbon Resins that are produced from Petrochemicals. Industry experts suggest that the demand for Resin from Pine trees is increasing at 3% in the short term and medium term. It has the potential to increase more globally, as now the focus is on renewable sources of raw materials. For Nepal, it is important to realize its share in the global market and to aspire to move to an extended value chain. For sustainability and increasing market it is important to carry out functional upgrading at all levels. This will also increase local labour employment through establishment of community based enterprises for Resin tapping and MSEs based on Chir Pine various applications apart from Resin, Rosin and Turpentine. Importantly, strict mechanisms for Resin tapping with possible new methods has to be introduced and regulated for sustainable supply of Resin raw materials. In Nepal, the studies indicate that very little is done in Chir Pine relative to its potentialities for MSEs development both at the supply chain level and at the extended value chain. For sustainability and its contribution to the national economy, more private and community led enterprises have to be established for all possible applications of Chir Pine.

Summary of Khote Salla Value Chain Upgrading Strategy

The study tried to describe the present status of the Khote Salla value chain in Nepal, particularly focusing in resin tapping in Dhankuta district and its market chain in the east Nepal. By doing this, the study tried to identify value chain actors and analyze their roles/ functions, with the aim to understand the constraints or obstacles for the expansions of possible market opportunities within its current value chain. Based on these all, the study tried to recommend the possible value chain upgrading strategies as practical recommendations in Nepal.

The study clearly depicts that Khote Salla is one of the valuable plant species that carries great potential through multiple uses and products. However, in Nepal it is used for only limited purposes; namely timber, Resin, Rosin, and turpentine. The potential commercial utilization of this tree is yet to be explored and transformed into the possible actions. The most important thing that has not been explored and practiced would be the

commercialization of its medicinal properties and multiple uses. These require further studies for the identification/ innovation in knowledge and potential technologies. In addition, enabling policy and business services providing environments is most essential to encourage or attract potential local and national investors/ entrepreneurs in this sector.

The existing value chain is also not able to benefit local communities and poor to the extent that it could or should. This requires innovation, capacity development and up-scaling of the roles and functions of the whole value chain actors. Similarly, the innovation of new technologies and knowledge and its transfer is equally important for upgrading the value chain actors.

Table 11:28: Summary of the value chain upgrading strategy of Khote Salla

Upgrading Strategy	Recommendation
Product Upgrading	➢ Resin collection piloting in CF through Community- Private- FECOFUN partnership; ➢ Tapping through bore-hole method; ➢ Usage of local labour; ➢ Research and development of MSEs for medicinal and underutilized products; ➢ Piloting for getting revenue from managing Chir Pine for carbon offset payment; ➢ Promotion of Chir Pine as major forest products for increasing income and employment through MSEs creation and development in Medicinal, Industrial and Environmental applications;
Process Upgrading	➢ At community level: Strengthen community led enterprises for resin collection; ➢ Resin tapping through bore-hole method; ➢ Maximum utilization of local labor through MSEs creation; ➢ Rosin and Turpentine industries (Small scale) establishment in vicinity of resources; ➢ At all level of value chain: Standard practices on quality tapping of resin from new method and quality production of rosin and turpentine; ➢ For Rosin and Turpentine Industries: Industry strengthening based on recommendation from assessment of competitive product development at extended value chain and Rosin and Turpentine Industry Competitive analysis (both research to be carried out);
Function Upgrading	➢ Resin Collectors: Resin collection, MSEs operation; ➢ CFUGs: Investment in enterprises, regulatory function, royalty collection; ➢ Rosin and Turpentine enterprises: Product development and sale in extended value chain;
Channel Upgrading	➢ Current channel and searching channel for new product as depicted in product upgrading; ➢ Assess and expand Chinese market where China has now decreased exports of Rosin and Turpentine as its internal consumption has increased;
Intersectoral Upgrading	➢ MSEs development in medicinal application; ➢ Needles and cones based enterprises; ➢ Product developed at extended value chain;
Interfirm Upgrading	➢ Strength community led enterprises for resin collection and strengthen rosin and turpentine industries for product development at extended value chain; ➢ Linkages between Rosin and Turpentine industries and Community led Resin Collection;

BDS+ FS Strengthening	➢ Manual on best practices for industry standard yield; ➢ Awareness about legal procedure for establishing community led resin collection enterprises; ➢ MSEs development and linkages with specific market actors; ➢ Research on industry competitiveness and assessment of competitive product at extended value chain; ➢ Piloting for getting potential revenue from managing Chir Pine forest for carbon offset payment; ➢ Training on bore-hole method and practices actualizations in Government regulations; ➢ Access to value chain financing for establishment of community led resin tapping; ➢ Further research on Eucalyptus resin tapping possibilities; ➢ Market research on export possibilities of rosin and turpentine to Chinese market;
Business Enabling Environment strengthening	➢ Ownership of Standard Operation manual for bore- hold method and for rosin and turpentine enterprises based on yield from Government (after development); ➢ Inclusion of Pine Resin in NTIS; ➢ Favorable and incentive based policies for rosin and turpentine enterprises for product development at extended value chain (based on recommendation of reports on Industry competitiveness); ➢ Strict mechanism for resin collection and regulation follow up to decrease over exploitation of Chir Pine; ➢ Specific policy regarding utilization of certain percentage of local labour for resin collection; ➢ Incentive including seed capital for establishment of MSEs focused on reducing fire disaster by utilization of needles and cones;
Sustainability Strategy	➢ Aspire value chain actors for functional upgrading to compete in Global market and increase income and employment; ➢ Incentive to labour from additional income generated through MSEs development; ➢ Strict mechanism for resin tapping and actualization of latest method of tapping; ➢ Sustainable supply of resources to rosin and turpentine industries; ➢ Expose private sectors at all level for possible MSEs possibility through Chir Pine value Chain;

Source: Field Consultation, 2013/2014

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PART FOUR

VCA OF TIMBER AND OTHER FOREST PRODUCTS

Chapter 12[45]

Uttis (*Alnus Nepalesis*): Fast Growing Timber Species with High Commercial Values in Nepal[46]

Introduction

Uttis (*Alnus nepalesis D. Don*) is one of the common trees found in Nepal. It is naturally abundant in all parts of the country and used mostly for household consumption, such as fuel wood, fodder and timber, in rural Nepal. However, it has increasingly been commercialized in some parts of the country – mostly in the Tarai and places accessed by road transport. The commercialization of Uttis is mainly in making veneer and plywood. For example, there are a number of veneer industries operating in the Eastern Region of the country, such as in Morang, Sunsari and Jhapa district.

According to the Department of Cottage and Small Industry (DCSI), a total of 18 Veneer Industries have been registered and are operating in different parts of the country (MoCI 2013). Interestingly, two veneer industries, one in Terhathum[47] and and one in Shankhuwasabha[48], were established and are operating in road-head or road-accessed places. The Uttis abundantly available in the adjacent villages of these industries are being used as raw materials and the veneer produced in these industries are being supplied to plywood industries in the Tarai regions.

Uttis is available in almost all parts of rural Nepal. As such, the expansion of road infrastructure and transport to rural areas is creating a higher possibility of its commercialization, thereby contributing to the local economy. In this context, Uttis has been selected for the comprehensive value chain analysis (VCA) to identify its value chain actors, understand roles and functions of value chain actors, and identify and analyze various constraints or barriers. Finally, this study also tries to explore options for up-scaling of this product into the market business and provide stakeholders recommendation for potential expansion opportunities within its value chain.

The analysis of this study is primarily based on the information and knowledge obtained from field visits and observation of the value chain of veneer production industry in Terhathum

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[47] Operating in district headquarters, the Myanglung bazar.

[48] Operating in Mamling VDC which is also in the road head.

district. The field visit and observation was supplemented with consultation meetings with its value chain actors such as Uttis producers/farmers, Uttis collectors or harvesters (Thekedar or middlemen), veneer producers, and veneer buyers (in Morang and Sunsari districts). The consultation with district level stakeholders, mainly related to government line agencies, has also become a part of this study process. Overall, this study's analysis is based on knowledge and information available on published and unpublished reports; including the report generated by the 2013 CINRAM-UMN field consultation, as well as related literatures.

Habit (Characteristics), Habitat and Distribution of Uttis

Uttis is a deciduous or semi-deciduous tree with a straight trunk that reaches up to 30 m in height and 60 cm (rarely to 2 m) in diameter. It occurs, generally, at the altitude of 500m to 3,000 m elevation. Particularly in the lower altitudes, Uttis grows in moist sites, such as near rivers and in ravines, but it will also colonize rocky sites exposed by landslides, or lands abandoned following cultivation. Uttis occurs naturally in both pure and mixed stands and is well known as a species that gives some stability to slopes. Seed of Uttis has been planted in degraded areas to stabilize landslides.

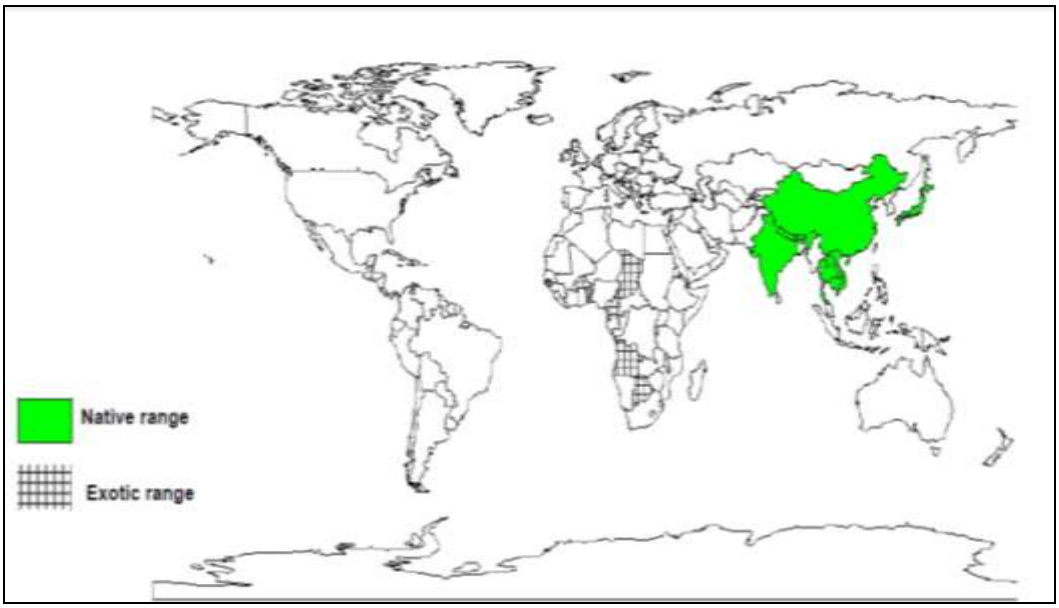
The Characteristics of *Alnus nepalensis,* which is the botanical name, include: twigs ribbed and glabrescent and dark grey bark, often with yellowish patches and slightly raised lenticels. Its leaves alternate are elliptical, ovate to oblong, 6-21 cm long, 4-10 cm wide, entire, denticulate or sinuate, shallowly crenate to sub-entire, rounded or cuneate at the base, with 12-16 pairs of lateral veins, top surface dull or shiny dark green, and under surface pale with dot like, yellow- brown scales. The petiole is strong and 1.5-2 cm long.

Fruits, which resemble the cones of the pine family, are dark brown, upright on short stalks, elliptical, composed of many spreading, hardwood scales. The seeds are light brown, circular and flat with 2 broad, membranous wings, more than 2 mm across. The catkins are produced in September and October in India and China and from September to November in Nepal. The new cones appear between December and March in Nepal and the seeds ripen in December in Yunnan (China).

Uttis is a pioneer species of degraded lands. It grows well in full light and is moderately shade-tolerant (Storrs and Storrs, 1984). It does not require fertile soil. It prefers permeable soils but will thrive on land with a high water table but not completely waterlogged. These characteristics make it a rapid colonizer of gravelly land exposed by landslips and old cultivated land and secondary soils, which are frequently unstable. It is often found growing along water courses, gullies and shady ravines, usually in gregarious strips. Relatively short-lived, Uttis forms a transitory crop which often dies for no apparent reason before the tree obtains useful heights. It can apparently tolerate sites which are snow-covered for long periods. It tolerates mild frosts although defoliation often results.

Uttis is a native species for Bhutan, Cambodia, China, India, Japan, Laos, Myanmar, Nepal, Thailand, and Vietnam and exotic species for many countries like Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Cost Roca, Cote d'lvoire, Democratic Republic of Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Indonesia, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Philippines, Rwanda, Sao Tome et Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, US, Zambia, Zimbabwe.

Figure 12:1: Distribution of Uttis species[49]



Source: Orwa *et al.* 2009

Uttis is widely and generally distributed throughout the cooler parts of the northern temperate region of Asia, extending southward at high altitudes in Columbia, Peru, Bolivia, Japan, Southern China, North- Eastern India, Myanmar, Malaysia and Algeria. However, Uttis is predominately a tree of the Himalayas, spreading from Pakistan in the west, through north-west India, Nepal, Bhutan, north-east India and eastwards through northern Myanmar to China. All species thrive in cold swamps, on spongy bottom lands and on high mountain slopes, where they often form the most conspicuous feature of the vegetation. The records show that it is abundantly found in the Western and Eastern Himalayas, Darjeeling region (West Bengal and India), the Koshin Hills and Shan State (Myanmar), and Yuhan and Kurzy (China).

Table 12:1: Wide variety of local names of Uttis

Countries	Regions and local names
Nepal	*Central and Eastern:* Uttis, kodom; *Western*: bishuwa, Uttis, udis
Pakistan	*Northwest Province:* Uttis, udishi, wasta; *Bushahr*: kunchm kentz, ni, newn; *Western Himalayas:* kurnis, kohi, kunsh
Bangladesh	Uttis, kokam, kowal
Bhutan	*Lepcha*: kowal
Myanmar	*Kachim Hills*: maibau, maiboa
India	*Kumaun*: Uttis, kodom; *Punjab*: kihi, kol; *Jaunser*: pusala, puzala; *Sutlej:* kuntz, ni, newn; *Chamba*: piak; *West Bengal:* kowal

Source: Orwa *et al.,* 2009

[49] The above figure (Figure 1) shows country where the species has been planted. It does neither suggest the species can be planted in every ecological zone within that country nor that the species cannot be planted in other countries than those depicted. Since some tree species are invasive, one needs to follow biosafety procedures that apply to planting site.

Within Nepal, Uttis grows mainly between 900 m and 2,700 m. This is the Sub-Himalayan region which supports a subtropical, semi-evergreen, hill forest vegetation. It has been found in all five development regions of Nepal. Out of 35 species, two Nepalese trees are of primary importance for Nepal. In Eastern Nepal, many Community Forests User Groups (CFUGs) have planted cardamom under Uttis. Uttis tree prefers a moisture-rich environment and north-facing slopes of Nepal's Middle Hills. However, it is also found on south-facing slopes in higher rainfall areas where the soil remains damp.

Properties, Uses and Conservation Status of Uttis

Chemical Composition of Uttis:

A study identified a total of twenty-one chemical compounds found in Uttis (Truong 2011). The leaves have eighteen compounds, including seven triterpenoids, three flavonoids, and three diarylheptanoids. The twigs have five compounds of which one compound, betulin, has not been found in the leaves. The stem bark has five compounds including betulin, taraxerone and β-sitosterol.

Compounds which were isolated from the *Alnus nepalensis* include: taraxeryl acetate, physcion, 1-nonacosanol, heptacosanoic acid, quercetin, β-sitosterol-3-O-β-D-glucopyranoside, quercitrine, taraxerol, 22-hydroxyhopan-3-one, 2-hydroxydiploterol, betulinic acid, mangiferonic acid, 24(E)-3-oxodammaran-20(21)-24(25)-dien-27-oicacid, 1,5-epoxy-1 (3', 4' - dihydroxypheny l-7- (4" - hydroxyphenyl) heptane, bis-(4-hydroxyphenyl) heptan-3-ol, hirsutenone, gallic acid, quercetin-3-O-β-D-galactopyranoside, betulin, taraxerone, and β-sitosterol. Among these, 1,5-epoxy-1-(3',4'-dihydroxyphenyl-7-(4'-hydroxyphenyl) heptaneis is a new substance. 2-hydroxydiploterol was isolated for the first time from the plant, and mangiferonic acid, 24(E)-3-oxodammaran-20(21)-24-dien-27-oic acid and physcion were isolated for the first time from the Betulaceae family. The chemical compound of Uttis is briefly described below.

a) ***Triterpenoids:*** Triterpenoids are ubiquitous in the plant kingdom. Recent evidence supports the beneficial effects of naturally occurring triterpenoids against several types of human diseases, including various cancers (Phan *et al*., 2011).

b) ***Flavonoids:*** Many flavonoids are shown to have antioxidative activity, free-radical scavenging capacity, coronary heart diseases prevention, and anti-cancer activity, while some flavonoids exhibit the potential for anti-human immunodeficiency virus functions (Yao, 2004). Fruits and vegetables are the main dietary sources of flavonoids for humans, along with tea and wine.

c) ***Diarylheptanoids:*** Treatment of inflammatory diseases.

Wood Properties of Uttis and its Uses:

The wood of Uttis is soft, light and even grained. With a 12 percent moisture content, Uttis weighs between 478 and 589 kg m^3. The wood seasons well and is not liable to warp or split. Samples, which were kiln dried in DeharaDun India, showed no appreciable degrading. Fungal staining develops easily and the timber must be open stacked immediately after conversion. The wood is not durable in the open – it must be kept under cover to remain durable. It is, however, liable to discoloration by oxidization and fungal sap stain. Its durability under water is considered to be good. The timber is easily sawn by hand or machine and presents a smooth, shiny surface and its nail holding properties is moderate (Troup, 1909).

Although it is not considered to be among the best construction timbers, Uttis wood has been widely used for house building in the hill areas because of the scarcity of other species. Below 1,500 m, it can only be used when it is regularly smoked by cooking fires as this prevents attack by boring insects. Above 1,500 m, it can be more widely used, although not in damp situations (Lutz, 1977). With careful conversion and seasoning the wood is used in veneer production. Some of the wide uses of Uttish wood are:

a. ***Box making:*** It is used to a limited extent for tea chests and heavier packing cases. However, its nail holding properties are only moderate.

b. ***Plywood:*** The wood can be peeled when it is fresh but it is better if boiled for four to six hours. It is then used for producing grade-two plywood.

c. ***Matches:*** The wood splints well but it is weak.

d. ***Beer cask:*** This is excellent timber for beer casks.

e. ***Tanning:*** The bark yields a dark brown dye and is used in tanning.

f. ***Rope Bridges:*** It is a good source of hooked sticks.

g. ***Fibre:*** In the Philippines, kraft pulping of Uttis gives a pulp yield of 47.6%, and bleaching improved the brightness to 76%. It is suitable for the manufacture of high quality paper.

h. ***Medicinal Usages (warning[50]):*** A useful diuretic for reducing swelling legs (Duke 1983). The juice of the bark is boiled and the gelatinous liquid applied to burns (Manandhar, 2002). The leaf, roots, and bark of *Uttis* are used in dysentery, stomach aches and diarrhoea in Ayurveda (Pande, 2006). A decoction of the root of Uttis is prescribed to treat diarrhea and paste from the leaves is applied on cuts and wounds as a hemostatic (Changkija, 1999).

i. ***Chinese Medicine:*** *Uttis* is a common Chinese medicine, its bark to treat rheumatism, bone-setting fractures, edema, and diarrhea (Chen 2007).

j. ***Other uses:*** Carving, pattern making, turnery, toys, artificial limbs and posts for landslide control.

Uttis is widely used as a fuel primarily because it is readily available. However, it also has the advantages of drying quickly, splitting easily and burning without sparks or odor. The wood has high calorific value: 18, 225 kJ/ Kg (Sapkota, 1981); 20, 480 kJ/ kg (IUFRO, 1985) on an oven-dry basis. *Shorea robusta* (Sal tree), a preferred fuel wood, has a similar calorific value of 20,500 kJ/ Kg but burns slowly (Harker *et al.*, 1982). These advantages are off-set by the lack of hot ember production needed for good cooking. Present demand for Uttis for making Veneer has realized its commercial value and is used for trade.

Other Uses of Uttis:

a) ***Erosion control:*** A well- known species that gives some stability to slopes that tend to slip and erode. Its seeds have been scattered to stabilize landslide areas.

b) ***Shade or shelter:*** An interplant with annual crops and is used as a shade tree for greater *Cinchona officinalis* (Quinine Bark tree) and *Amomum subulatum* (Black cardamom)

[50] Medicinal uses listed is obtained from secondary information please discuss to doctor before use

c) ***Reclamation:*** Effectively used to reforest abandoned *taungya* areas because it grows as a pioneer in degraded habitats with low fertility soils. It is also planted to improve the stability of slopes liable to erosion and landslides, and for mine reclamation.

d) ***Nitrogen fixing:*** Uttis forms a symbiosis with nitrogen-fixing actinomycetes of the genus *Frankia* and is therefore able to improve degraded lands.

e) ***Soil improver:*** Considerable quantities of nutrients are recycled through the litter of Uttis leaf and twig litter of Uttis may produce 3-6 T/ ha litter annually, containing N 3.4-3.7 g, P 0.08- 0.7g, Ca 0.2 g per 100 g dry matter.

f) ***Intercropping:*** On terraced slopes, the species is commonly pillared for poles and interplanted with crops like maize, barley, chili and pumpkin. The cultivation of large cardamom or Quinine bark trees in combination with *nepalensis* is a common practice in central Himalayas.

Conservation Status of Uttis:

Uttis grows naturally in the sloped areas in most of its favorable (discussed above) climatic and geographical regions. However, because of the higher demands from veneer industries, the commercial plantation is becoming a priority of farmers in rural Nepal. Generally, a spacing of 2.5 x 2.5 m is commonly used for plantation, although closer spacing is desirable for a fuel-wood crop. It is pollarded for posts. On good sites, poles and fuel wood can be harvested after 5 years. Small-diameter timber can be harvested in less than 10 years. Longer rotations are needed for ordinary saw timber. Uttis coppices after cutting, but successful regrowth seems to depend on seasonal and locality variations, with wet season felling and moist localities being best. Trees develop an extensive lateral root system and are fast growing, with a common mean annual diameter increment of 2 cm and annual increments of 2.7 m in height and 2.9 cm in diameter having been recorded in Nepal. However, *Alnus* species are very susceptible to wind damage.

The seed of Uttis is collected between November and March, depending on locality, when the cone-like fruits turn yellowish-brown and begin to open, but before the seeds have been dispersed by the wind. The seeds display orthodox storage behavior. Viability is maintained for 15 months in hermetic storage at 4-5 deg. C with 5-10 % mc. There are (min. 1.6) 2.3-3.5 million seeds/Kg.

The leaves are sometimes damaged and stripped from the tree by beetle larvae. The trunk is sometimes attacked by borers and ants usually attack young plants.

Functions of Uttis Value Chain Actors

Introducing Veneer and Plywood

Uttis is not considered good for furniture manufacturing but is gaining popularity, which has led to higher demands of the raw materials for veneer enterprises in Nepal. The Uttis wood or log is obtained from farmers or producers and processed to produce veneers. The collected Uttis log is mounted on a machine and rotated in a longitudinal axis while the cutter peels off layers from the logs which are called veneer. The other method for obtaining veneers is slice-cutting instead of rotary-cutting, and it produces veneers of even better quality.

Decorative veneers of high quality are usually obtained from trees such as oak, mahogany, maple, walnut, cherry and teak wood. Research documents regarding use of other species in Nepal in veneer has not yet been documented. There are various tree species from which

veneer can be produced. Uttis falls in the Group 3 classification of species for construction and industrial plywood. It also falls in Category C in the categories of the most commonly used species based on specific gravity ranges for hardwood and decorative plywood. The category C implies a low-density species (0.42 or less specific gravity).

Table 12:2: Relative Suitability of Uttis

Common Name	Specific gravity[51]	Relative Suitability			
		Construction plywood	Decorative face	Inner plies of decorative panels	Container veneer and plywood
Alnus nepalensis	0.34	C	B	A-B	A

Source: Lutz, 1977

A rating of A indicates the species is well suited for end product; B intermediate; and C generally not well suited for the product. This suggests Uttis is suitable for inner plies of decorative panels and container veneer/plywood.

Table 12:3: Specific uses and desirable veneer qualities

End Use	Typical Specific Use	Desirable veneer qualities
Inner plies for decorative panels	Inner plies for prefinished wall panels, furniture, flush doors, cabinets, and case goods	Low weight, low shrinkage, straight grain, fine uniform grain, and easily glued
Container veneer and plywood	Wire-bound boxes, bushel baskets, paper-overlaid veneer, cleated panel boxes and plywood-sheathed crates	High in stiffness, shock resistance, and resistance to splitting, light color, free from odor and taste, moderate in weight

Source: Phadke, 2012

Plywood construction also involves the same technology as described in veneer. Veneers are obtained from good quality timber logs, and these veneers (a minimum of three) are then stacked upon one another and firmly glued together using adhesives such as urea melamine formaldehyde resins or synthetic phenolic resins, and by hot pressing them together under high pressure. Also while stacking the layers (veneers) upon one another, care is taken that the grain pattern alternates in each adjacent layers. This is what makes plywood such a strong material.

Table 12:4: Silvicultural character and uses of important tree species

S.N.	Name of Trees	Silvicultural Characters	General Usage
1.	Dalbergia sissoo Nepali: Sisau English: Sissoo	Large, deciduous tree, strong light demander, frost hardy, moderately drought hardy, coppice strongly	Building furniture, cart wheels, tool handles etc.
2.	Acacia catechu Nepali: Khayar	Deciduous tree and strong light demander, frost hardy, moderately drought hardy, coppice strongly, destroyed by grazing	Manufacture of katha and cutch, and also used as timber
3.	Pinus roxburghii Nepali: Khote Salla English: Chir pine	Evergreen, light demander, frost and fire hardy, do not coppice	Used in construction work, very valuable resin is tapped from it

[51] Based on weight when oven dry and volume when green (Lutz, 1977)

4.	Alnus nepalensis Nepali: Uttis English: Alder	Pioneer species liable to be damaged by browsing, light demander , moderately frost hardy	As a fuel wood and timber though it is not considered good; Veneer and plywood manufacturing
5.	Cedrus deodara Nepali: Devdaru English: Deodar	Light demander, frost hardy, liable to damage by browsing, fire sensitive, evergreen, does not have coppice	Valuable timber, strong and durable, used for construction, general carpentry, railway sleepers etc.
6.	Schmia wallichii Nepali: Chilaune	Large evergreen dominant spp. with Castanopsis indica, shade tolerant, frost hardy, dieback	Fuel wood, house building, sleepers, planks and scantlings, plough etc.
7.	Shorea robusta Nepali: Sal	Deciduous, light demander, frost hardy, drought sensitive, dieback, coppice strongly	Main constructional timber in Nepal, used for construction of the doors, windows, frames, planks, carts, carving, sleepers etc.
8.	Castanopsis indica Nepali: Dhale katus	Evergreen, associated with Schima wallichii, coppice well, small plant , frost tender	Building and shingles, lopped for fodder etc.
9.	Terminalia alata Nepali: Asna, saj English: Indian laurel	Deciduous tree, light demander, pH up to 8.4, fairly tolerant to fire, drought sensitive, coppice fairly, pollards well	Used for joists, doors, window frames, carts, ploughs, rice pounders, leaves as fodder etc.
10.	Bombax ceiba Nepali: Simal English: Red silk cotton	Deciduous, buttress at base, strong light demander, drought resistant, moderately frost hardy, coppice badly	Match manufacture, packing cases, toys, plywood, fuel wood, fodder etc.
11.	Michelia champaca Nepali: Champ	Evergreen, moderate light demander, seedling grow under high shade, moderately frost hardy, fire sensitive, coppice well	Fodder, timber, used for carpentry, construction, doors, windows etc.
12.	Tectona grandis Nepali: Sagawan English: Teak	Deciduous, light demander, not tolerant suppression, front tender, draught sensate, fire resistant, strong coppice	Used for house building, ship and boats, furniture, sleepers, veneers, fuel wood etc.
13.	Eucalyptus species Nepali: Masala English: Eucalyptus	Evergreen, aromatic leaf, planted in water logged area, light demander, frost hardy, fast growing species., strong coppice	Timber, fuel wood, electric poles, oil etc.
14.	Populas species Nepali: Lahare pipal	Require high water table but cannot stand water logged, light demander, frost hardy, fast growing species	Boxes, matches, veneer, paper pulp, poles, fuel wood

Source: Forestry Nepal, 2014

Plywood is manufactured in a variety of grades in India and across the world, and just by knowing these plywood grades one can determine the quality of the plywood and know its potential usage. Four of the most common types of graded plywood are available in India.

1. ***MR grade plywood:*** MR stands for 'Moisture Resistant' plywood. It is also known as commercial plywood and is the most commonly used material for making home and office furniture. It is of an interior grade and meant for making furniture that will be used indoors.

2. ***BWR grade plywood:*** The acronym BWR stands for 'Boiling Water Resistant'. It is exterior grade waterproof plywood that is better than MR grade plywood. It is the preferred choice of material for making pieces of furniture that are likely to get wet e.g. kitchen cabinets and other kitchen furniture. It is also costlier than MR grade ply. There is also another grade known as BWP, which is commonly used with block boards. Similar to BWR grade plywood, BWP block boards are also of an exterior grade having waterproofing qualities.

3. ***Marine grade plywood (Marine ply):*** Marine grade plywood is superior in strength and quality to both MR and BWR grades of plywood. It is primarily used for exterior marine applications such as for building boats and woodwork required to be done in ships.

Apart from these 3 basic plywood grades, there are several types of plywood such as flexible plywood that can be rolled up into sheets and useful for making curved furniture, and FR grade fire retardant plywood which is good at resisting fires and used in public places such as theatres. There is also a variety of industrial grade plywood such as Structural plywood, which is phenolic film-faced concrete shuttering plywood used in building construction work.

Nepalese plywood enterprises manufacture MR and BWR grade plywood.

Table 12:5: Basic types of plywood

Basic types of plywood
1. Commercial MR grade for interior use
2. Water proof BWR grade for exterior use
3. Marine Ply
Types of wood used (Refer to annex for differences)
1. Hardwood- Heavier and stronger
2. Softwood- Lighter and weaker
Other types
1. Flexible plywood that can be bent
2. Film- faced shuttering plywood for industrial use
3. Structural plywood for industrial use
4. Fire retardant plywood

Source: Phadke, 2012

Plywood is further classified in terms of:

a. Number of piles, e.g., 3 ply, 5 ply, 13 ply etc. (Number of plies are always an odd number)

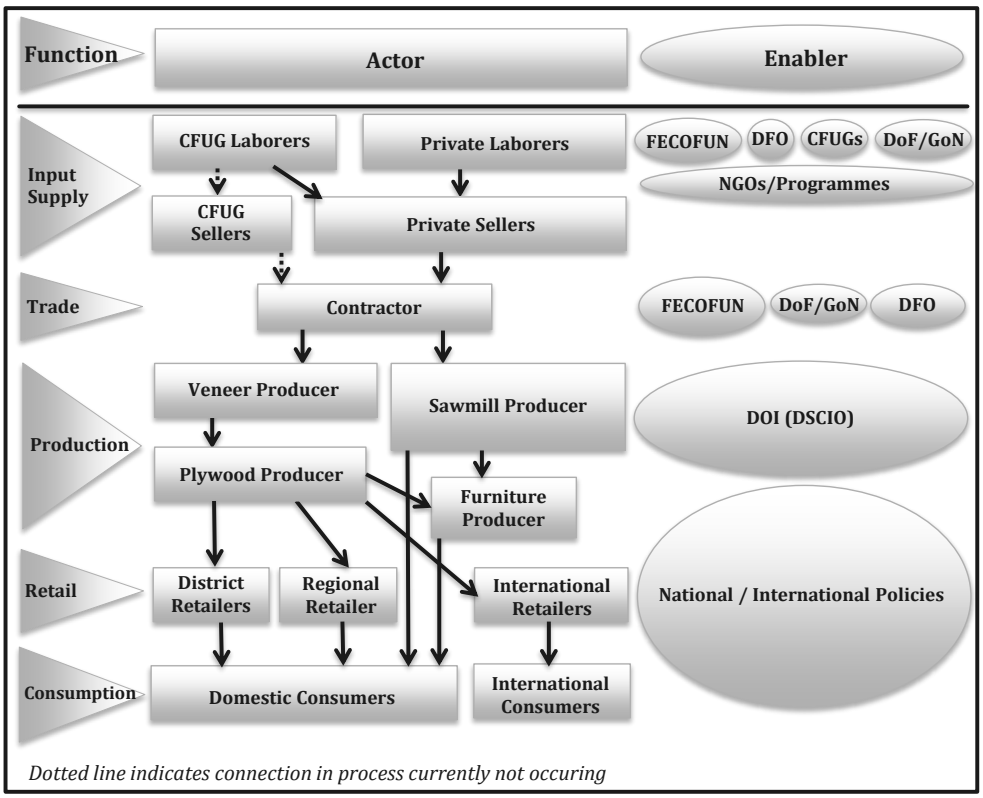
b. Thickness; 18 mm ply, 19 mm ply etc.

c. Sizes of sheet; 6 x 4 sheet (6 feet by 4 feet), 8 x 4 sheet (8 feet by 4 feet)

Value Chain Map of Uttis: A Perspective from Terhathum and Eastern Nepal

A value chain (VC) map has been outlined to describe the various functions, actors, and enablers involved in the present levels of the value chain. A brief description of each of these components, including the end product markets and governance issues are outlined below.

Figure 12:2: Value Chain Map of Uttis Harvested in Terhathum District



Source: Field Consultation, 2013/2014

Market Functions:

The VC of Uttis in Terhathum district is comprised of five main functions: Input Supply, Trade, Production, Retail and Consumption. Each function is briefly described below.

a) Input Supply: This functional level includes the processes and actors involved in harvesting Uttis logs and bringing it to the roadside for collection.

b) Trade: Once the Uttis logs have been harvested, contractors collect it from the roadside and sell it to producers (i.e. sawmills, or veneer and plywood factories). Legal issues are also typically dealt with at this level.

c) Production: There are two major avenues that Uttis logs follow once they reach the production stage of the Terhathum district value chain. These processes are outlined below.

- ***Veneer to Plywood to Furniture:*** If contractors sell Uttis logs to veneer factories, the Uttis is processed into veneer and then sold to plywood factories and made into plywood. If this plywood is sold to furniture factories, it is then processed into furniture.
- ***Sawmill to Furniture:*** Contractors will also sell Uttis logs to sawmills, where it is processed into milled timber. If sold to a furniture factory, this milled timber is then processed into furniture.

d) Retail: At the retail level, hardware retailers sell plywood to consumers as construction material. In the cases of sawmills and furniture factories, the retail level is bypassed. Milled timber from sawmills is sold directly to the consumer as construction material; furniture factories also sell their furniture (made from both plywood and milled timber) directly to consumers.

e) Consumption: Consumers purchase Uttis harvested in Terhathum district in the forms of:

- Construction materials (i.e. plywood or milled) from hardware retailers or sawmills;
- Furniture (i.e. made from plywood or milled timber) from furniture factories.

Market Actors:

The major actor categories in the Uttis value chain include: harvest laborers, sellers, contractors, producers, retailers and consumers. Most of these categories have multiple actors that play a significant role in each functional level of the value chain. Each market actor is classified and described below.

a) Harvest Laborers: Harvest laborers include CFUG Disadvantaged Group (DAG) members or local individuals who work independently. A harvest laborer (or an average team of seven harvest laborers) enters the Uttis value chain when hired by a contractor. Their role as harvesters in the VC is to fell, de-bark, cut Uttis timber into logs, and transport the logs to the roadside for collection making. Harvest laborers make an average wage rate of 525 NRs per day, including one to two meals (depending on agreement from contractors).

b) Uttis Sellers: These market actors are comprised of CFUGs who sell Uttis from their allotted forestry land or from individuals who own private forestry land. For the past two years, the GoN and DFO have imposed a provision for CFUGs in Terhathum district; this restriction states that Uttis cannot be harvested or sold by CFUGs unless categorized by one or more of the four Ds (dead, dying, damaged, or diseased). This provision has prevented CFUGs from participating in the Uttis market, since more abundant, higher quality "green" Uttis trees are only available to CFUGs for personal use, pending permission from DFO (i.e. construction and community purposes internally / within their respective CFUGs). The reality of this restriction is disputed outside of Terhathum district, but for all practical purposes the actors here believe it to be true, and operate as such. On the other hand, pending DFO permission, private landowners are not limited in their capabilities to fell and sell "green" Uttis trees, and currently are the only input suppliers to the Uttis market for Terhathum district. These private owners currently receive an average of 200 NRs/ft^3 to sell their Uttis logs to contractors.

c) Contractors: Contractors are the trade-level actors, who enter the Uttis value chain by hiring harvest laborers to collect Uttis logs. The contractor will then sell the Uttis logs to various producers for processing. In order to harvest Uttis, contractors must apply (at any time throughout the year) for a permit from the DFO, which are granted during the legal harvesting season of October through May. There is a bidding process for contractors to purchase Uttis from CFUG (previously). This agreement generally occurs before harvesting and can be described as follows:

- There is a 1000 NRs fee for a contractor to participate in the CFUG Uttis sale bidding process.
- Traditionally, the winning bidder then acquires all legal documents necessary to fell Uttis trees. These are: a certificate that the forest where trees will be felled is registered for Uttis sale, an application from the DFO, a receipt that a 13% VAT tax has been paid, a VDC / Municipality recommendation letter, a map of the land where trees will be felled, and a range post inquiry report.
- Once these documents have been provided, the contractor is allowed to harvest CFUG Uttis trees, as per the application.
- Once trees have been felled, de-barked, and cut into logs, they must be transported to the roadside.
- Next, a DFO range post officer does a log inquiry report and if this proves satisfactory, a "stamping" of logs is done, which acts as permission for the contractor to transport logs to the various producers for processing.

Purchasing Uttis logs from CFUGs is very difficult and complex. On the one hand, the DFO sometimes restricts CFUGs from selling their Uttis; and on the other hand, going through the legal bidding processes and accruing documentation is very complex and lengthy. As a result, the private producers or sellers are the main raw material producers for veneer producers in Terhathum district. Because the basic agreement between a contractor and private seller is up to whichever terms are agreeable to them, the auction process is avoided. That means the legal process is less involved (e.g. the DFO does not require an inquiry report from a DFO range post officer, nor are VDC / Municipality recommendations needed), but DFO permission to fell and transport Uttis is still necessary. However, the price varies depending on demand and seasonality, distance from the road head and road head to purchasing producer's factory, and bargaining capacity of sellers. The average selling price for the harvested Uttis logs was approximately 325 NRs/ft^3 in 2013. Estimates from contractors are as follows:

- 5,000 NRs/trip to rent a tractor (including fuel and labor costs). Based on an approximation of traveling seven km from harvesting site to collection center, a tractor will be able to make three trips (each carrying 338 ft^3) in one day. Tractors are used to transport Uttis logs from the roadside to local producers.
- Six-wheeler trucks with 20 foot beds can carry 400 ft^3 of Uttis logs and are used to transport Uttis from the roadside to regional producers in Biratnagar or Itahari. The average cost of renting one truck is 30,500 NRs (per load of 400 ft^3 logs).
- Thus, total transport costs for the contractor varies depending on where the Uttis is being transported, with costs obviously less at the local level.

d) Producers: At the production level, there are four main actors who produce Uttis products to be sold either to retailers or directly to consumers. The DCSI regulates how closely these producers are able to operate in relation to CFUG forests, which in Terhathum district is a minimum distance of three km. If a proprietor wishes to establish an Uttis factory within this limit, this person must join in a Public Private Partnership (PPP) agreement with the proximal CFUG (which generally entails paying an agreed upon royalty to the CFUG per month or per year).The main producer actors and their processes are outlined below:

- ***Veneer Factory Process:*** If Uttis logs are sold to veneer factories, they are processed into sheets of veneer. Approximately 1 ft^3 of Uttis logs is processed into 100 ft^2 of veneer sheets. In Terhathum district, veneer producer located in Myanglung (operating for the past three years), purchases his supply of Uttis logs from any of ten contractors who are located locally and will contact him when they have harvested Uttis. This producer sells veneer (which is sold in ft^2) to whichever plywood factory gives the best price, on average 3.90 NRs/ft^2, and are located regionally (i.e. primarily Biratnagar and Itahari). Because this veneer factory is located within three km of the Gadi CFUG forest area, a royalty of 20,000 NRs is paid each year. This payment is made as part of the stipulations of the PPP with the Gadi CFUG, which allows the factory to operate so close to their forest.

- ***Plywood Factory Process:*** Uttis can be purchased from contractors for plywood production in two ways, depending on producer capabilities: as processed veneer from a veneer factory or as Uttis logs directly from the contractor. Plywood can then be sold to hardware retailers (and sold to consumers as construction material) or to furniture makers (and used to produce furniture). Uttis inputs are supplied both as veneer and as Uttis logs, which are then processed into varying sizes of plywood outputs – both water resistant and non-water resistant – and doors. Once produced, Uttis plywood is sold at an average rate of 32 NRs/ft^2. The general process in plywood production is as follows:

    - Logs are peeled into veneer (see process above for veneer factories);
    - Veneer sheets are sorted;
    - Sheets of veneer are sent through a drying machine, removing unwanted moisture from the wood, and then seasoned to prepare for layering;
    - Pieces of timber that are large enough (by length and width) are cut into strips and laid together to form a thicker, more 'sturdy' layer that can be sandwiched between two pieces of smooth plywood;
    - Plywood layers are assembled into varying styles;
    - The thicker/piecemeal layer is sandwiched between two pieces of veneer;
    - Layers of veneer (the smoothest sheets on the outside) are alternated to form a board;
    - Assembled plywood is pre-pressed before being sent through a hot press;
    - If plywood is processed with water resistant coating, this is done after the hot press;
    - Plywood is cut and sanded to final product specifications;

- ***Sawmill* Process:** Uttis input at sawmills is purchased from contractors as Uttis logs and is processed into milled timber of varying sizes. This is a fairly straightforward process. First, the log is rolled into place on the saw table and is guided through the vertical saw by two (unskilled) laborers on either side (depending on the size of the log, there may only need to be one laborer on either side). Next, a skilled laborer cuts the timber into various sizes; these may be 4"x3"x12', 4"x6"x12', 2"x8"x12', and so forth, based on final specifications. Once milled, timber is sold at an average rate of 538 NRs/ft^3, either directly to consumers for use in construction or to furniture makers.
- **Furniture Factory Process:** Uttis is purchased for furniture making from plywood factories or sawmills and processed into furniture. The furniture is made for local consumers based on demand (i.e. only produced furniture per specific orders, not in large quantities).

e) Retailers: The only retailers of Uttis products are for plywood and these are primarily hardware stores. These retailers are stationed locally (within Terhathum district), regionally (within Eastern Nepal, especially near Itahari), and internationally (i.e. India).

- **District and Regional:** The plywood sold in the district and region are made and bought from regional producers (such as Biratnagar and Itahari in the case of East Nepal). They sell at varying rates depending upon the thickness of the plywood, district from the production centres (as it includes transportation cost) but on average the market price of plywood is 36 NRs/ft^2.
- **International:** Some Uttis products are being sold (i.e. veneer, plywood, and logs) in international markets – namely India.

f) Consumers: Consumers of Uttis harvested in Terhathum district are found locally, and purchase the end products of Uttis in the forms of plywood, milled timber, and furniture.

Enablers and Facilitators:

Enablers that were present throughout the Uttis value chain are CFUGs, FECOFUN, DFO, DoF / GoN, NGOs / Programmes (i.e. a former LFP project and recently is MSFP in Koshi hill districts), and the DCSI office. They play different roles in input supply, trader, and producer levels (where enabler support was observed). Throughout the value chain, the DFO plays a major enabler role, especially in terms of legal facilitation and processing. This is not surprising as the DFO is the most influential local government agency for forest-based industries and is the entity who decides to enforce particular forestry restrictions (such as the current restriction on CFUGs harvesting green wood). Moreover, DFO range post officers hold the authority to impose fines and sanctions to market actors who are harvesting Uttis illegally. Another major player throughout the value chain is the GoN / DoF – particularly in their role as promulgators of harvesting restrictions and establishment of selling guidelines and practices for forest products coming from the CF.

Other enablers include: FECOFUN and NGOs / Programmes. FECOFUN plays a primarily advocacy role on behalf of the CFUGs and acts as a conduit of market price information. NGO's and Programmes provide training and monitoring services, with past Programmes such as LFP playing a significant role in facilitating enterprise development within the CFUGs. At the production level the DSCIO is the primary enabler for veneer, milled timber, and furniture producers.

Table 12:6: Enablers of Uttis Value Chain in the Terhathum District

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, PF
Royalty payment	DFO
Checking and weighing	Range Post
Release order or transit permit	DFO
Local taxes	VDC, DDC, Municipality
Checking and endorsement	Forest check post
Certificate of origin	FNCCI/ DCCI, NCC
Market information	Contractors, veneer enterprises
Financial support	NGOs, Cooperatives, Commercial Banks
Processing technology	Veneer enterprise, Plywood enterprises
Resource management and research	DFO
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

Economic Analysis of Uttis

End Market of Uttis:

The Uttis value chain has five end products and markets, segmented by the stages of: harvesting, trade, production, and retail sale (Table 12.7). The end products include Uttis logs, veneer, milled timber, plywood, and furniture. Uttis end markets are stationed locally (Terhathum district), regionally (Dhankuta District and the Tarai Region – i.e. Biratnagar and Itahari), nationally, and internationally.

Table 12:7: End Markets of Uttis Products Segmented by the Stages

Actor	Product		End market	End market location
Laborer	Uttis logs		Contractor	Terhathum district, Dhankuta district or Tarai region
Contractor	Uttis logs		Saw mill, veneer, furniture producers	Local or regional
Enterprises	Veneer		Plywood producer	Regional or national
Enterprises	Plywood		Plywood retailers	Local and national
Enteprises	Milled timber, furniture		Consumers	Local and regional
Retailer	Plywood		consumers	Local, national and internatioanl

Source: Field Consultation, 2013/2014

Uttis harvested in Terhathum district can be found in local (within Terhathum district) and regional (throughout Eastern Nepal) markets, while veneer products also reach the international market (primarily India due to proximity).

a) Local market: Furniture produced by the Uttis in Terhathum is sold in the local market, whereas the plywood as end products comes from Tarai.

***b) District market*:** Furniture produced in the district are supplied or consumed in the district markets; whereas the plywood is supplied from regional producers.

c) **Regional market:** Because the South Eastern Nepali cities of Itahari and Biratnagar are located in close proximity to India, this is an area of dense and varied industrial processing. For Uttis (logs and veneer) harvested in all Koshi hill districts (including Terhathum) are sold to the veneer and plywood industries located at this regional level and plywood as end products go to the regional markets.

d) **International market:** The district veneer producers have no or less access to the international market. However, their products are traded to the international market (India) through the regional producers and traders.

However, unclear taxation practices and government royalties for financing in the forestry sector have limited the accessibility of achieving these benefits. For example, value addition along the value chain is limited by a product's endorsement by the Federation of Nepalese Chambers of Commerce and Industry (FNCCI), which requires a letter or certificate of origin for the product. It is difficult to obtain document for small cooperatives unless they are registered with the Department of Industry (DoI) or the DCSI. This may insert a difficult barrier for veneer, plywood, or furniture factories hoping to export Uttis to India or other countries.

Price Trends of Uttis:

Price trends for Uttis logs do not appear to fluctuate much within the Terhathum district. The GoN established a minimum price per ft^3 within the regulations promulgated under the Forest Act back in 1993. This minimum rate was 100 NRs/ft^3 and the maximum rate discovered in interviews with various actors within the Uttis VC is 300 NRs/ft^3. Hence, on average, Uttis logs are purchased from the Uttis seller for 200 NRs/ft^3. Most of the actors in Terhathum district have only been selling or purchasing Uttis logs and/or products for at most three years and during this timeframe their purchasing or selling rates have not fluctuated much from the current average prices of Uttis at its various stages of production within the VC (for Terhathum district only).

At a regional level, other districts such as Dhankuta and Sankhuwasabha have either similar prices or slightly higher prices than Terhathum district products. For example, Uttis logs are sold at around 300 NRs/ft^3 – which is the high end for Terhathum district – and milled timber is sold at 600 NRs/ft^3 in Sankhuwasabha, but sold at 550 NRs/ft^3 in Terhathum. Two years ago in Biratnagar (i.e. the regional level), Uttis veneer was sold for approximately 3.20 NRs/ft^2, but currently is sold for approximately 4 NRs/ft^2.

SWOT Analysis of Uttis:

An important component of the Uttis VCA is the consideration of its strengths, weaknesses, opportunities, and threats (SWOT) and an analysis of how these pertain to its constraints and opportunities at each functional level of the value chain.

Table 12:8: SWOT Analysis of Uttis Value Chain in Terhathum District

Strength (to capitalize on)	Weakness (to eliminate)
➢ Uttis is a naturally abundant pioneer species that can be symbiotically grown with regional cash crops, stabilizes degraded slopes and enhances nutrient cycling; ➢ Uttis is fast growing species; ➢ Veneer and sawmill producers in Terhathum are already in stages of expansion;	➢ Skill labor supply at the CFUG level limited by migration; ➢ Use of outsiders for labor collection triggers unsustainable harvesting practices; ➢ Contractor networks limit the negotiation power of supply sellers; ➢ Current collection practices expose Uttis to weathering, which can diminish its quality; ➢ Limited availability of skill labor at CFUG level; ➢ Perceived as less quality than other timber for furniture production;

Opportunities (to take advantage of)	Threats (to overcome)
➢ Uttis is processed at a lower cost than other timber products throughout value chain; ➢ Production of value added production in Hills area, such as veneer and saw mill industry expansion, for transport to Tarai and other urban areas; ➢ Market expansion; ➢ Private sector investment increasing;	➢ DFO restriction on sale of Uttis from CFUG; ➢ Lengthy and complicated process, with unclear guidelines, for permission for CF to sell their Uttis; ➢ Lack of ownership of CF and members in Veneer enterprises; ➢ PPP model of veneer enterprise strongly private sector led; ➢ Veneer enterprises facing existence problem due to emerging veneer cum plywood enterprise with huge investment;

Source: Field Consultation, 2013/2014

Strengths (to capitalize on): Uttis provides numerous ecological benefits. In Terhathum district, this tree grows rapidly as a naturally abundant pioneer species. It is valued for its ability to stabilize degraded slopes resulting from landslides, which are frequent in this region, and it enhances nutrient cycling through its leaf litter. According to recent estimates, general timber supply in the hills area is expected to increase 3.20 million m^3, which is an increase of 1.39 million m^3 from 2011's supply estimates. As a fast growing pioneer species, Uttis can play a significant role in this increase in timber supply for the area. Additionally, Terhathum district already has local veneer and sawmills producers, both of whom are in the planning stages for expansion into additional factories in other districts. One veneer factory owner is also hoping to expand into the Indian market, pending GoN approval. Having these actors with their associated infrastructure are strengths at the district and regional level.

Weaknesses (to eliminate): Particular weaknesses within the Uttis value chain are apparent at the input supply, trade and production functional levels. At the input supply level, due to migration for education or work, CFUG labor supply for agriculture and forestry is limited (and declining), even though the population of Nepal continues to increase. As such, collectors from outside the area or region are often hired for harvesting Uttis, which can trigger unsustainable harvesting practices. At the trade level, contractor networks are able to limit the negotiation power of the supply sellers, which would be especially felt by CFUGs if they were allowed to sell their green wood. For example, contractors can unite to refuse to buy Uttis until the selling price is lowered. Sellers are forced to lower the price because continued exposure to weather causes warping and diminishes the quality and hence the price of the timber.

At the producer level, waste from both veneer and milled timber processing is sometimes discarded. Both forms of waste can be sold as fuel or possibly made into briquettes, both of which would be additional sources of income for the producer. Also of importance, Uttis wood is perceived locally to be easily susceptible to wood-burrowing pests, meaning that furniture made with Uttis is seen to have lower durability. In terms of skilled labor, CFUGs have none (if very few) skilled labor resources, and are often not hired for better-paying (skilled labor) positions in factories, such as sawing / milling timber, furniture-making, or managerial positions. Lastly, at the production level a clear understanding of all costs (including hidden) and all sources of income was difficult to obtain, leading to low transparency of costs/incomes and therefore inconsistent net revenue calculations. This inconsistency is a barrier to an accurate market analysis of the value chain of Uttis, which is crucial for developing an Uttis enterprise.

Of the two furniture factories interviewed in Myanglung, both owners stated that they did not purchase or use Uttis for constructing their furniture because it is highly susceptible to pests and therefore of poor durability. However, it is possible that because Uttis is cheaper to purchase than other timber, that these furniture makers do use Uttis, but do not disclose this to consumers, because of its inferior quality perception.

Opportunities (to take advantage of): Compared to other timber products – especially Sal, Katus and Chilaune – Uttis is processed at lower costs throughout the value chain. Hence, Uttis products can be marketed at more affordable prices from producers to the consumers. In a study quantifying benefits received by CFUGs within forestry enterprises, timber provides the second highest benefit, at 77.5 million NRs. Of the total volume of timber sold by CFUGs (i.e. for enterprise purposes), 30% came from Uttis and its market price is double the amount paid by local CFUG members for the same wood. Hence, the potential income for CFUGs is significant if current restrictions are lifted. While timber supply is estimated to increase and will be at a surplus for the Hills area, the Tarai area's timber supply will be at a deficit. Hence, Hill area timber surplus could reduce the pressure of forest product demand in the Tarai if the production of value-added products such as veneer and milled timber are expanded upon in the Hills area. With production expansion and demand for timber products in the Tarai, Terhathum district producers have the opportunity to expand their markets into a regional and possibly international context.

Threats (to overcome): The value chain of Uttis is susceptible to many threats, which would need to be addressed or further analyzed. The primary threat at the input supply level revolves around the GoN restriction on CFUGs selling their green wood. This restriction severely limits CFUGs in their ability to take advantage of the income generating opportunities that selling Uttis can provide. Veneer enterprises are facing existence problem due to emergence of veneer cum plywood enterprises at regional market hubs.

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

Value Chain Upgrading Strategy for Uttis

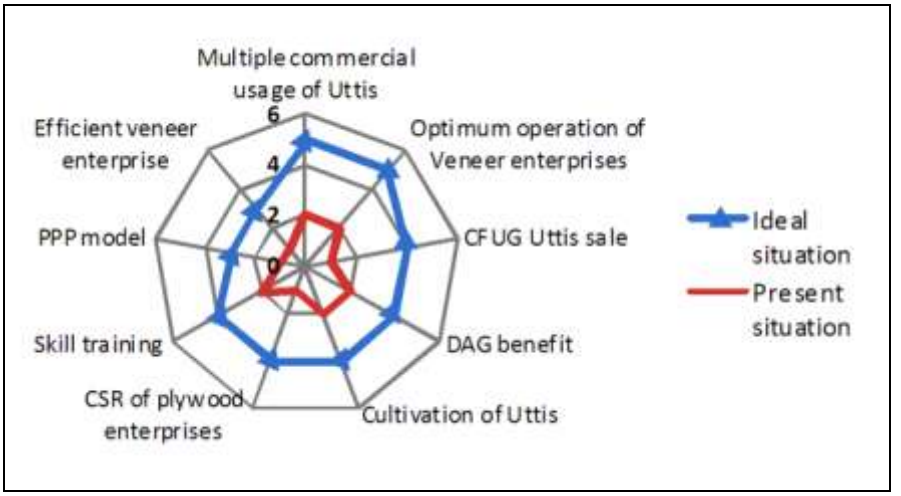
Uttis has been used as main species for fodder and fuel wood for rural people. There has been increasing plantation and natural regeneration of Uttis for last five decades. The use of Uttis as raw materials in veneer and plywood commercially started since last decade and now there has been increasing interest and investment of private sectors in this value chain. There are a number of veneer and plywood enterprises in Eastern Nepal and this is in increasing trend. Private sector actors are interested in investing in operation enterprises in hilly districts which are now restricted due to the km rule. Still

private sector actors can form the PPP model for establishment of veneer enterprises at the district level. The possible value chain upgrading strategies are discussed in the six headings below.

End market analysis

The discussion with various stakeholders in Uttis has shown some positive results regarding high investment of the private sector in this business, employment creation, and import substitution of plywood. However, there are some gaps existing in the Uttis value chain, which is presented in the spiderogram below (Figure 3).

Figure 12:3: Gaps between market demands and present status of Uttis



Source: Field Consultation, 2013/2014

The parameters used to compare market demands and present status of Uttis is presented in the table below (Table 12.9). The identification of market demands is based on the aspiration of value chain actors.

Table 12:9: Parameters used to compare market demands and present status of Uttis

Parameters	1	2	3	4	5
Multiple uses of Uttis	Uttis use for conventional/ traditional purpose	Uttis use for furniture, veneer and plywood purpose	Uttis use for niche market purpose incase of furniture and plywood	Uttis use expanding to the medicinal purposes	Optimum utilization of Uttis for possible best practices
Optimum operation veneer enterprise	Optimum operation of enterprise through single product	Optimum operation of enterprise through single product and waste management	Optimum operation of enterprise through single product and briquette manufacturing	Optimum operation of enterprise through multiple products	Certified veneer enterprise with multiple products
Efficient veneer enterprises	Usage of traditional process of veneer manufacturing	Usage of efficient process for veneer enterprises	Standard operation guideline for veneer enterprises		

DAG benefit	DAG benefit in terms of partial employment	DAG benefit interms of partial and some full employment	DAG benefit through supply chain purchasing, partial and full emplyment	Outsourcing for making value added products through DAG	
Cultivation of Uttis	Natural regeneration of Uttis	Uttis cultivation as commercial business	Uttis cultivation in CF and marginal land	Land allocation in CF, marginal land for DAG for Uttis cultivation and sale	
CSR of plywood and veneer enterprises	Competitive price paid to supply chain	Competitive price and transparency maintained throughout supply chain	Investment of private sectors in resource management	Investment of private sectors for skill upgrading of local people to involve in value chain	Voluntery and standard certification on CSR like global compact etc.
Skill training	Subsidized training for basic skills	Subsidized training for semi/ skill	Commercial viable training in Uttis, veneer, plyhood	Embedded training from veneer, plyhood enterprises	Standrad training modules for each steps throughout Uttis value chain
PPP model	Private sector led with minimum annual payment to CFUG	Private sector led with optimum payment of royalty to CFUG	CFUG- Private partnership	CFUG led with private sector involvement as shareholders	CFUG led with private sectors as technical and marketing advisor
CFUG Uttis sale	Uttis sale prohibited from CFUG	Uttis sale prohibited from CFUG from the district but permission provided in other district	Uttis sale permitted in district by following required regulation	Uttis sale permitted in district and easiness for trade	Certification like FSC and other obtained for sale of Uttis from CFUG and permission from DFO

Source: Field Consultation, 2013/2014

Some strategies could be used to reduce gaps between market demands and present status of Uttis value chain. Some possible strategies are discussed below.

Multiple Uses of Uttis: Uttis at present has been widely used for veneer and plywood manufacturing. Its previous use was basically for fodder and fuel wood. The use of Uttis in furniture is not considered good due to diseases and being inferior wood species for furniture making. Its use could be explored and increased for medicinal values. The use of Uttis has to be seen in two basic ways.

a. Making of products best suited from Uttis (at present plywood is made but there is opportunities to make products after veneer production/ like boxes etc.);

b. Making products for medicinal use especially leaves and other parts of Uttis tree;

Both above uses have to be further researched and best practices from different countries have to be looked upon. The secondary information collected revealed that there is less use of Uttis in plywood in India and USA. It is important to do further research on what market niche Uttis-based plywood can contribute to the national market and international market. There are limited studies carried out regarding analyzing competitive advantages or market niche advantages of Uttis-based plywood products.

Optimum operation of veneer enterprises: Present knowledge and practices on Uttis in Nepal, including Terhathum, is limited to the manufacturing of veneer and then plywood. The field observation and interaction show that the waste materials of Uttis (after veneer) have not been used for economic values. In this regards, the briquette manufacturing could be planned. For example it is already being practiced in Dolakha based veneer enterprises. Secondary information has shown that there are various species from where veneer can be made and the end use varies as per the species. It is important to see what other available timber species could be used for veneer production. This will create possibility of developing multiple production and mixed production. For sure, Uttis-based veneer can be a major product for the enterprises whereas other species can be minor products.

Efficient veneer enterprises: The step-by-step guidelines for veneer enterprise operation is already developed and in use by some entrepreneurs in the world (Lutz, 1977). These guidelines have to be closely studied and used to increase conceptual and practical knowledge horizons in operating veneer enterprises. Identification of market niche and process upgrading is required and the technology usages have to be in place according to end market products. For example in general, the greatest yield is obtained by rotary cutting. Half-round, flat-slicing, or back cutting provides intermediate yields; and the least yield is obtained by quarter or rift slicing. The smoothest and tightest veneer can be produced by quarter or rift slicing, followed by rotary cutting. The roughest and loosest veneer is produced by flat-slicing, half-round, or back-cutting. Therefore, it is important to look after "the position of Uttis-based plywood" and its competitive market with other species-based plywood and design processing methodology in similar way. With the increasing number of veneer enterprises it is important to develop standard operation guideline so that highly efficient veneer enterprises can be operated as district level. With the advent of the PPP model along with investment of the CFUG as members in veneer enterprises, it is utmost important to assess the whole process and increase efficiency. Veneer enterprises should aim to attain NS certification whereas plywood enterprises should aim to attain FSC certification.

DAG benefit: The Uttis value chain in Terhathum shows partial employment to harvest laborers and full-time employment in the veneer industry. Employment of DAGs along with members of the CFUG is negligible due to the lack of skilled labor. The assessment in the field has shown there is limited interaction between veneer enterprises and DAG communities. Additionally, there is a limited relation between the enterprise and the CFUG (even though it

follows a PPP model). It is important to provide incentive to DAGs and community members for purchasing wastages, provide skill training and strengthen their supply chain, including Uttis cultivation.

Cultivation of Uttis: At present Uttis is naturally regenerated and cultivated in private lands. There has been increasing demand of Uttis for veneer enterprises and it is important to allocate CFUG land for Uttis cultivation but restriction from DFO to allow CFUGs to sell Uttis is one of the biggest challenge and policy hurdle for Uttis cultivation.

Corporate Social Responsibility (CSR) of plywood and veneer enterprises: Contractors are the major suppliers of veneers to enterprises but there is absence of institutional mechanism for their social responsibilities. It leads a lack of effort from plywood and veneer enterprises to work as socially responsible businesses. There are limited activities from the enterprise for the promotion and upgrading of the supply chain. It is desirable for these enterprises to work on sustainable management of resources, provide training to local people and provide incentives to the community for purchase of wastages.

Skill training: With increasing numbers of veneer and plywood-based enterprises in the region, there is increasing demand for skilled human resources. At present there are very little commercial training providers operating in the region, with most basic trainings being provided by development agencies. It is thus important to develop training contents and facilitate private sector actors to produce commercially viable training.

PPP model: The Terhathum-based enterprise is based on the PPP model. The enterprise is legally owned by CFUGs but is managed and operated by the private sector. This has decreased the role of CFUGs (as only getting royalty annually). An increasing lack of ownership of this enterprise from community members is resulted due to their lack of involvement. The present PPP system needs to be accessed and adjusted so that increased participation of CFUG members can be increased in the enterprise.

Uttis sale from CFUG: At present, Uttis sales from CFUGs have not been permitted in Terhathum district. This restriction must be removed, following the regulatory process. Cultivation of Uttis along with scientific management has to be promoted.

1. Firm level upgrading strategy:

The firm level upgrading strategy is developed based on the gap identified above. The strategies are derived to minimize the existing gaps.

a) Product upgrading: The major product is Uttis and hence its maximization and commercialization is essential. The product upgrading could be based on a three-year plan. The first year focus could be made on carrying out optimum operation of enterprises, standardization and increasing mixed products. The detail of each year's recommended strategies are presented below (Table 12.10).

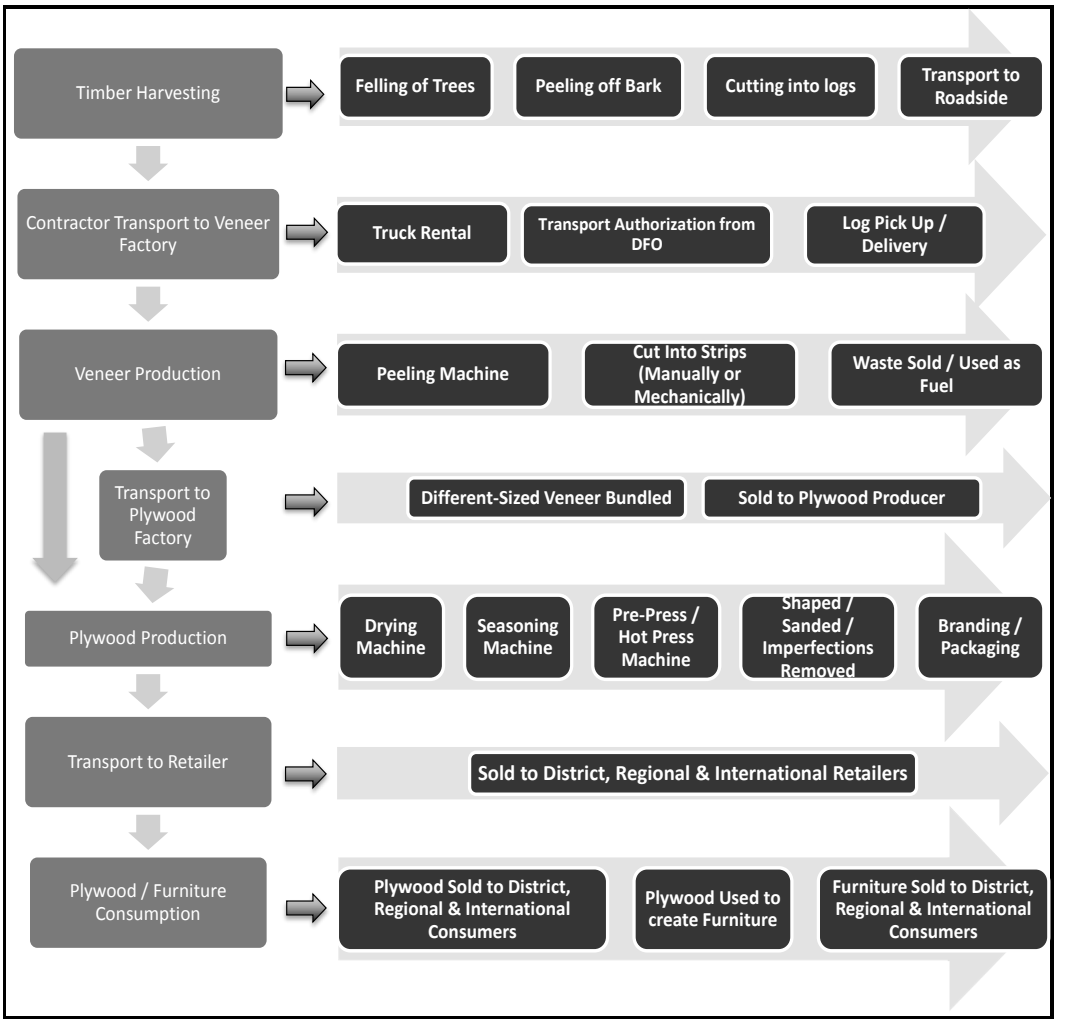
Table 12:10: Product upgrading strategies of Uttis

Parameters	Present	Year 1	Year 2	Year 3
Product	Uttis from private land, and veneer from industry	Uttis from private and CF and then production of veneer, plywood and Briquette	Veneer, plywood and briquette from other species as well	Reach to all possible market niches with diversified products
Price	Income only from Uttis	Additional income from briquette	Additional income from other species	Additional income through more market penetration and mixed and diversified products
Place	District, Region	District, Region	District, Region, National	National, India and International
Promotion	Inactive participation of CFUG and other members	Permission for sale of Uttis from CFUG; Advantage form competitive market niche of Uttis-based plywood	Higher advantage from competitive market; Niche of Uttis-based plywood; Strong business partnership between CFUG and private entrepreneur	Nepal Standard(NS) veneer enterprise level; Forest Stewardship Council(FSC) certified at plywood enterprise level

Source: Field Consultation, 2013/2014

b) Process upgrading: Uttis at present is used for veneer manufacturing and plywood making. There are various steps in each from timber harvesting to plywood making. Figure given below (Figure 12.4) has outlined the production process of turning Uttis to veneer and plywood.

Figure 12:4: Production Process Map of Uttis



Source: Field Consultation, 2013/2014

There are various processes involved for Uttis production starting from collection to final product marketing. This is further presented as recommended steps for process upgrading in the tabular form below (Table 12.11).

Table 12:11: Process upgrading strategies of Uttis

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology intervention	Anticipated benefits
Upgrading 1: Timber harvesting	Uttis harvesting from private land; Timber sold in terms of whole tree rather than ft^3	Uttis harvesting from PF and CF; Additional species harvesting for plywood purpose; Sale of timber from PF and CF in terms of ft^3	Resource inventory; Operation plan revision; Scientific resource management; Realization of policy regarding sale of timber in ft^3	Increase in income of CF; more partial employment for harvesting laborer; Additional income to PF and CF from Timber sale
Upgrading 2: Transportation to Veneer factory	Truck rental; Transport authorization; log pick up/ delivery etc.	Transparency;	Awareness about legal process for trade amongst value chain actors	Increased trust between value chain actors; Minimization of corruption
Upgrading 3: Veneer production	Veneer production through rotary cutting	Assessment of standard practices in veneer manufacturing and increasing efficiency; Briquette production	Development of standard operation guideline	Increased efficiency
Upgrading 4: Transport to plywood factory	N.A.	N.A.	N.A.	N.A.
Upgrading 5: Plywood production	Production of MR and BWR grade and sale	Niche market for Uttis plywood and possibilities of plywood from other species	Research on competiveness of Nepalese plywood	Increased contribution of plywood in Nepalese economy

Source: Field Consultation, 2013/2014

c) Functional upgrading: The functional upgrading at each level of value chain can be carried out as:

Table 12:12: Functional Upgrading of Uttis value chain

Actors	Present Function	Upgraded Function
Harvesters	Uttis harvesting	Cultivation in CF and marginal land
Contractor	Transport authorization, log pick up/ delivery, truck rental	N.A.
Veneer enterprises	Veneer production from Uttis and sale to Plywood industries; Veneer industries are facing existence challenge from Veneer cum plywood enterprises at regional level	Veneer production from other species; Briquette manufacturing Product development from veneer apart from Plywood
Plywood enterprises	MR and BWR grade plywood	Plywood from other species

Source: Field Consultation, 2013/2014

d) Channel upgrading: Uttis and its products are sold in the following channel:

- Uttis from PF…….to…….Saw Mill and Furniture (in District level)
- Uttis from PF…….to …….Veneer industry (in District level)……to……Plywood industries (in national level)
- Uttis from PF…….to……..Veneer industries (in Regional level)…….to……Plywood industries (in national level)
- Uttis from PF……..to……..Veneer cum plywood industries (in Regional level)

After these the end products reach customer through wholesale/ retail channel. The study recommends assessing further the use of Uttis, veneers and plywood and finding niche markets.

Table 12:13: Possible Use of Uttis

Product	Present use	Possible more usages
Uttis	Mainly raw materials for veneer enterprise	Medicinal usages
Veneer	Mainly supply veneer to plywood enterprise	Products apart from plywood like Laminated Veneer Lumber (LVL) etc.
Plywood	Uttis based MR and BWR grade plywood	Other species based plywood, identification of niche market

Source: Field consultation, 2013/2014

e) Intersectoral upgrading: Uttis in Terhathum, from private forest, are sold to veneer industries, where veneer industries have legal status in the form of the PPP model. But in practice, the industry is managed by the private investor. This has restricted the possibility of intersectoral upgrading as there is an absence of CFUG participation. There is the possibility of briquette manufacturing and Uttis cultivation. The research on new product development for veneer and its application (excluding plywood) can potentially provide additional employment opportunities to CFUG community members.

2. Interfirm upgrading strategy:

Timber-based enterprises have regional associations (Koshi Veneer and Plywood Production Association/ KVPPA), which are working for overall development of its members. There has been various interaction programs between development agencies and value chain actors involved in timber, including Uttis. Various policy concerns are articulated during this interaction; however, important factors like transparency in trade, negotiating power of private forest owners and its positive impact on CFUG and its members have yet to be discussed. It is important to form alliances between owners of private forests and CFUGs and the capacity development of plywood enterprises is essential to turn the plywood value chain into a major source of income for Nepal. Similarly, the CFUG federation (namely FECOFUN) has to accelerate its advocacy and lobby for permission of the sale of CFUG Uttis from the GoN.

3. Business Development services and financial Services upgrading strategy:

Most of the documents on value chain analysis are based on identifying only pertinent Business Development Services (BDS) and Financial Services (FS). The assessments of BDS and FS have been done by considering demands from beneficiaries and supply from service providers in four categories.

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;
- Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 12:14: Categorization of Demands Supply of Uttis Value Chain

SUPPLY SIDE	Very strong				
	Strong			Resource inventory of other species for veneer manufacturing	
	Weak		Linkages to medicine manufacturers for increasing medicinal usages	Research, innovation and actions accordingly for veneer production form other species	Development of standard operation manual of veneer enterprise; Awareness about legal processes for trade
	Very weak		Research on multiple products development from veneer (apart from plywood)	Technology transfer for briquette making	Research and policy advocacy for timber sale in ft^3 from PF and CF; Research on competitiveness of Nepalese plywood; Specialized skill training; Policy advocacy for permission of Uttis sale from CFUG
		Very weak	Weak	Strong	Very Strong
		DEMAND SIDE			

Source: Field Consultation, 2013/2014

Business services which are in demand by beneficiaries (very strong, strong, weak and very weak) and the supply side of service providers (very weak, weak, strong and very strong) are categorized to understand the present status and recommend commercially viable option for business services. The business and financial services required can be catered by following commercially viable business service providers.

Table 12:15: Commercially viable business options and recommendation of potential service providers

Services	Description	Major BDS Providers
Research on other spp. for veneer manufacturing and resource inventory	Research carried out for softwood and hardwood from which veneer can be manufactured (the species which are available and possible for cultivation in Eastern Nepal)	Forest specialists, DFO, Consultants
Development of standard operation manual of veneer enterprises	Assessment of present process and recommendation for standard operation	Technical specialists, Veneer entrepreneurs, consultants, KVPPA
Awareness about legal process of trade	PF and CF lack information and knowledge about legal process and are selling timber as per negotiation with contractors	FECOFUN, DFO, projects, key personnel, lawyers, KVPPA
Technology transfer for briquette making	Income from wastages	DCCI, DCSI/ CSIDB, Private sectors, Technology service providers, KVPPA

Research on product development from veneer (apart from plywood)	Veneer enterprises are facing existence problem due to emerging establishment of veneer cum plywood enterprises and it is important to assess market for product that can be made from veneer apart from plywood;	Forest specialists, consultants
Policy advocacy for permission of Uttis sale from CF and also for sale of timber in ft^3	CF from Tehrathum are not permitted to sale Uttis and PF are selling timber as whole tree	FECOFUN, COFSCUN, NGO federation
Research on competitive advantage of Nepalese plywood	Plywood can be manufactured from different species and it is very important to see competitiveness of Uttis based plywood along with niche market it can penetrate (in national and international markets)	FENFIT, consultant, KVPPA

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

The Business Enabling Environment (BEE) is very restrictive of forest-based enterprise. Various research has outlined a number of legal hurdles that are restricting Uttis value chain promotion. Major legal recommendations made in BEE for the Uttis value chain are outlined below.

a. Standard operation manual for veneer enterprises has to be developed and owned by DFO. This will help in increasing efficiency of veneer enterprises while also helping to maintain transparency.
b. Uttis sale from CFUGs is not permitted in Terhathum and it has to be permitted with DFO depicting required work to be carried out (e.g. Inventory, revision of OP etc.). Development agencies and actors could support the endeavor to overcome the prerequisites in this processes.
c. Timber sale from PF is not always carried out in ft^3, but rather the whole tree is sold. It is recommended to sell Uttis in ft^3 units while the DFO representative carries out the verification process.
d. Include plywood within the Nepal Trade Integration Strategy (NTIS) 2010.

5. Sustainability Strategy:

Uttis is found abundantly is Eastern Nepal and its sale has increased from PF, which is due to the increasing number of veneer and plywood enterprises. In addition, the Uttis is also highly abundant in many of the CFUGs in Koshi hill districts including Terhathum. The commercial plantation with focus on Corporate Social Responsibility (CSR) from enterprises and DFO programs is required for sustainable supply chain of Uttis. There are still demands of various aspects of in-depth researches (technological, medicinal etc.) which could recommend on the way that how Uttis and its products (like plywood) can contribute to local to national economy. It is thus important to carry out in-depth analysis of plywood value chain and bring development actors and agencies for its upgrading. PPP model has to be revisited and strong CFUG and Private Partnership modality has to be developed.

Summary of Uttis Value Chain Upgrading Strategy

This study tried to understand and describe the present status of plantation/ cultivation/ conservation, harvesting processes, veneer production processes, and market or trade of Uttis in Nepal. The study particularly focused on Terhathum district. Moreover, this study tried to identify value chain actors and analyze their roles/functions with the aim to locate constraints or obstacles for the expansions of possible market opportunities within its current value chain. Finally, the study provided value chain upgrading strategies as practical recommendations for further development and improvements of the Uttis value chain in Nepal.

The study clearly depicts that Uttis is one of the widely abundant indigenous trees in Nepal. It is mostly used as fuel wood, fodder and timber. Recently, this plant has been increasingly used as raw material for veneer and plywood production; however, it is limited to places where road transport is available and accessible. The chemical compounds of Uttis suggest that this tree has multiple economic values and potentials such as medicinal uses, bio-briquette etc. which are yet to be explored and transformed into commercial uses. This indicates that Uttis is one of the most important and economically potential plant species in Nepal.

Veneer production in rural areas (such as in Terhathum district) and plywood production in regional markets are two newly established but well-functioning aspects of the Uttis value chain in Nepal. However, the economic potentials beyond the existing value chain have yet to be explored and transformed into practice. Innovation and transfer of new technologies for quality products and products other than veneer and plywood are essential steps forward for current Uttis value chain actors in Nepal. Supporting the harvest and trade of Uttis logs from CFUGs is another important part of upgrading the Uttis value chain in Nepal. Similarly, expanding the market niche would become equally important, but this requires quality, quantity and diversity of products. Additionally, research and innovation for the use of other plant species in veneer and plywood production is equally important.

Table 12:16: Summary of the value chain upgrading strategy of Uttis

Upgrading Strategy	Recommendation
Product Upgrading	➢ Uttis sale from PF and CF; ➢ Veneer production from other species; ➢ Expanding market niche of produced plywood (India and international market); ➢ Briquette manufacturing from waste; ➢ Strong business partnership between CF and Private sector in PPP model (for example in Terhathum); ➢ Nepal Standard of Veneer enterprises, FSC certification for Plywood enterprise;
Process Upgrading	➢ Timber harvesting: Uttis harvesting from CF (now not permitted), develop realization on the necessity of policy regarding sale of timber in ft^3; ➢ All the process: Awareness about legal process of timber trade; ➢ Veneer production: Development of standard operation guideline for veneer enterprises; ➢ Plywood production: Niche market assessment and development for plywood value chain in Nepal;

Function Upgrading	➢ Harvesters: Cultivation in CF and marginal land ; ➢ Veneer Enterprise: Veneer production from other species; Briquette manufacturing; product development from veneer apart from plywood; ➢ Plywood enterprise: Plywood from other species;
Channel Upgrading	➢ Niche market channel expanding to international markets; ➢ Innovation for commercial use of medicinal properties;
Intersectoral Upgrading	➢ Briquette manufacturing; product development of veneer (excluding plywood);
Interfirm Upgrading	➢ Linkages between PF, CF with KVPPA; ➢ Regular interaction among actors and stakeholders;
BDS+ FS Strengthening	➢ Research on potential other species for veneer manufacturing and resource inventory; ➢ Development of standard operation manual of veneer enterprise; ➢ Awareness about legal process of trade; ➢ Technology transfer for briquette making; ➢ Research on product development from veneer (apart from plywood); ➢ Policy advocacy for permission of Uttis sale from CF and also for sale timber in ft^3; ➢ Research on competitive advantage of Nepalese plywood;
Business Enabling Environment strengthening	➢ Ownership of Standard Operation manual from Government (after development); ➢ Uttis sale from CF permitted and development vectors supporting for completing prerequisite activities needed to be carried out by CF; ➢ Policy actualization for sale of timber in ft^3; Inclusion of plywood in NTIS;
Sustainability Strategy	➢ Sustainable harvesting and cultivation; ➢ Strengthening CSR of veneer and plywood enterprises; Strengthening PPP model based on CF- Private partnership;

Source: Field Consultation, 2013/2014

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Chapter 13[52]

Bans *(Bamboo):* Economically Viable Product but Requires Innovation and Transfer of Modern Technology[53]

Introduction

Bamboo is one of the most widely used products for people all over the world and it is not an exception in Nepal. The data show that more than 2.5 billion people in the world use bamboo products in everyday life (Scurlock et al., 2000) and its number may be increasing along with the inventions of new technology and varieties of products. It has over 1500 uses and has tremendous versatility (Rai and Chauhan, 1998). Because of its global demand and diverse uses, Bamboo is now known as "green gold" of the forest. It is also known as "poor man's timber" since it is used by the rural population.

With its versatile uses such as construction materials, woven products, agricultural implements, fodder, vegetables and scaffolding and in stabilizing slip-prone slopes, Bamboos are in great demand by the rural households in Nepal. They comprehend this species as an alternate to tree for fulfilling their demand of forest products. Therefore, this is one of the most common plant species grown on both farmlands and forest areas of the country (Das and Oli, 2001).

Bamboo is known as Bans in Nepali language. It plays a vital role in the Nepalese economy. Bamboos are used in daily household activities in the rural as well as urban areas since time immemorial. Various bamboo products such as baskets, mats and sieves are widely used products in Nepal. Bamboo-based economic activities are an intrinsic part of both the rural and the urban socio-economic life of Nepal. Bamboo resources are established as a robust piller for rural economy (Karki and Karki, 1996).

Bamboo and its products marketing is important source of income for household. Especially, for those people who are socially and economically under-privileged. In Nepal, Bamboo craft - makers living in the rural areas are the major producers of Bamboo products. Preponderantly, ethnic groups such as Dom, Bin, Rajbanshi, Chepang, Tamang and Rai are the major occupational castes involved in Bamboo craftsmanship. Different woven products such as basket and sieve are major Bamboo products produced by them which are notably used in the rural and urban areas of the country (MDBRPP/DFRS, 2010b).

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This plant has multiple uses and values in Nepali society, mostly for the economic and livelihood purposes. Many of the rural communities in Nepal are using it as their source of earning and means of employment from producing traditional materials and modern crafts. Moreover, the bamboo crafts are becoming one of the most demanded products in the urban areas like the Kathmandu valley and other city areas of Nepal. Number of businesses and enterprises have been established and operated in different parts of the country. However, the economic potentials of bamboo and bamboo related products are yet to get identified, established, developed and promoted in Nepal.

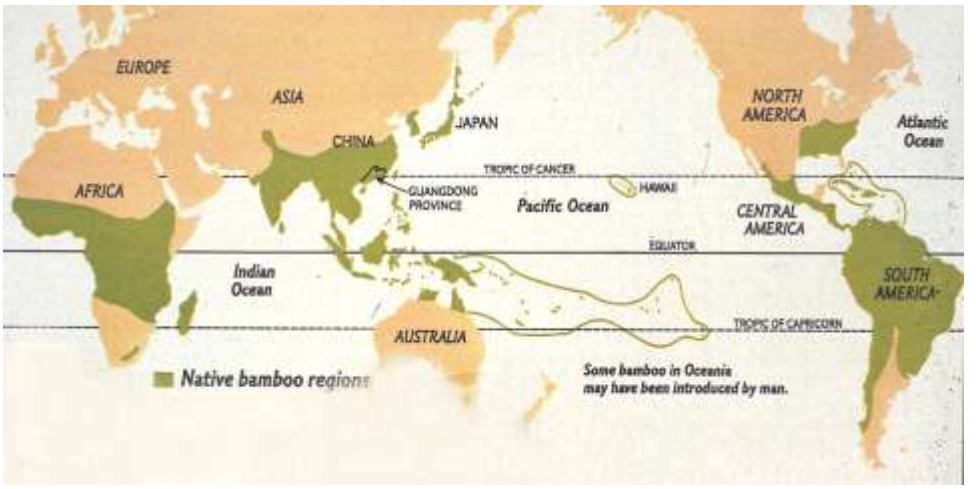
In this context, bamboo has been selected for the comprehensive value chain analysis (VCA) to identify its value chain actors, understand roles and functions of value chain actors, and identify and analyze various constraints or barriers in market access. Finally, this study also tried to explore up-scaling options and provide stakeholders recommendation for potential expansion opportunities within its value chain. This study and analysis is primarily based on the information and knowledge obtained from field visits, observation, interactions, and consultation workshops in Aakhisalla VDC of Dhankuta district. Some of the traders and retailers based at Dhankuta bazar (the district headquarters) have also been consulted for their experiences and perceptions on the bamboo handicraft productions and marketing. Further, the knowledge and insights have been developed from the observation, interaction and consultation with bamboo craft producers, collectors, retailers and exporters based in the Kathmandu valley. The consultation with district level stakeholders, mainly related government line agencies, has also become a part of this study process. On top of these all, the analysis of this study is based on knowledge and information available on the published and unpublished report and related literatures.

Habit (Characteristics), Habitats and Distribution of Bamboo

Bamboo is the fastest growing perennial evergreen arbores cent plant belonging to the true grass family *Poaceae*, subfamily *Bambusoideae*. The adaptability of bamboo is very interesting and peculiar among the plant species. It can grow in a wide range of climate and regions making it the principal and the most productive member of the grass family. Bamboo can thrive in hot, humid, rainforests and also cold hardy forest having temperature of about -20°C. It can tolerate extreme precipitation ranging from 32-50 inches annual rainfall. Bamboo's unique rhizome structure is responsible for its accelerated growth rate. Comprising of over 1,500 species included in 87 genera worldwide, Bamboos are unevenly distributed in different parts of the humid tropical, sub-tropical and temperate regions.

Bamboo is one of the most widely used, versatile products with over 1500 (Lopez, 2003) uses in everyday life among 2.5 billion people. It is distributed in many parts of the world. The native bamboo species are mostly distributed in the equatorial regions of the world such as middle parts of Africa, South Asia and South East Asian countries, and most of the parts of South America and Southern belts of North America. Of the native bamboo available many countries in the world, China is the largest producers and exporters.

Figure 13:1: Distribution of Native bamboo species in the world



Source: Bassam and Jacob (1996)

Occurrence of Bamboo is more common in the eastern half of the country from Dhaulagiri to Sikkim Border, as high as 4000m (Stapleton, 1994). There are over 75 genera and 1250 species of the Bamboos in the world (FAO, 1978) and 80% of this resource is found in South and South East Asia and China (Sharma, 1988).

Bamboos are endemic to all the three major ecological zones of Nepal: Tarai, Mid-hills and Mountains. However, they are more concentrated and they show larger diversity in the eastern half of the country, from the Annapurna to the Kanchenjunga ranges of the 'Himalayan Mountains'. Species abundance is directly related to the amount and distribution of rainfall, with areas that receive well distributed and greater rainfall, such as Pokhara and Illam regions, having the largest number of Bamboo species. Nepal has both tropical Bamboos found in South-East Asia and temperate Bamboos found in Tibet and Bhutan.

In Nepal, 12 genera and more than 50 species of Bamboo have been recorded so far. Out of the 75 districts of Nepal, 73 are known to have one or more species of Bamboo. It has been estimated that the total growing stock of Bamboo in Nepal is around 15 million cubic meters with an approximate biomass value of 1060 million tons (Karki and Karki, 1995) which would have been increased over this period.

Uses, Trade, Product Flow and Conservation Status of Bamboo

Uses of Bamboo:

Bamboo is widely cultivated in both rural and urban areas of the country because of its vigorous regeneration, fast growth, high productivity, quick maturity, short rotation and desired form. Bamboo cultivation in rural areas is generally restricted to the banks of watercourses, marginal and leftover land, low-productivity land, homesteads, and back and front yards of houses on the hills. However, the situation is quite different in the eastern districts where the farmers consider Bamboo to be as important as other agricultural crops and grow it in their rice fields. Although the use pattern is overwhelmingly based on traditional practices, more and more new uses are being popularized with the expanding and more easily accessible infrastructure, information and technology.

Table 13:1: History of the usage of bamboo in China

Usage	From years
Construction	7000
Weaving products such as baskets	5000
Furniture: bed, table, chair	3000
Bamboo shoots for food	2500
Transportation: bridge, rafter, boat	2000
Paper Making	1400

Source: Chen, 2007

The above information (in Table 13.1) clearly indicates that use of bamboo is not new in the human society. However, its extent and purpose may be diverse for people in different social, ecological, economic and political contexts.

Table 13:2: Purposes and markets of bamboo in some selected Asian countries

County	Utilisation vis-à-vis market
Bangladesh	Housing, paper
China	Panels, furniture, housing, paper, fibre textile, charcoal, Bamboo vinegar, Bamboo shoots, handicrafts
India	Handicrafts, housing, incense sticks, paper, construction, scaffolding
Indonesia	Furniture, construction, handicraft
Malaysia	Handicrafts, furniture, tooth picks, basketry (domestic market), export of raw Bamboo
Myanmar	Utensils, handicraft, construction material, pickled Bamboo shoots, pulp and paper
Nepal	Bamboo shoots, weaving materials, scaffolding, housing, storage bins, roofing, incense stick
Philippines	Furniture (international demand), handicraft (exports), construction material, pulp and paper, processed Bamboo shoots
SriLanka	Cottage industry, handicrafts (international demand), housing
Vietnam	Housing construction material, promising international market

Source: Chen, 2007

Bamboo's prominent role in the traditional life of Nepal is well acknowledged (Poudyal 2006, Bista 2004, Das & Oli, 2001, Karki *et al.* 1998, Storey 1990). Bamboo is used in all aspects of social, cultural and economic life of all caste and ethnic groups in Nepal (Bista, 2004; Das 2007). Eighty one species (5.2% of the world species) belonging to 23 genera (24% of the world genera) are found in Nepal.

Table 13:3: Most commonly used Bamboo species in Nepal

Scientific Name of species	Local Name of the species	Use
1. Bambusa balcooa	Dhanu bans	Construction
2. Bambusa nepalensis	Tama bans	Stick/pole
3. B. Nutans subsp. cupulata*	Mal bans	Scaffolding
4. Dendrocalamus hamiltoni*	Choya bans	Weaving
5. D. giganteus	Dhungre bans	Construction
6. Phyllostachys nigra	Nigalo	Stick/weaving

Source: INBAR, 1998
(Note:*means most used and traded species)

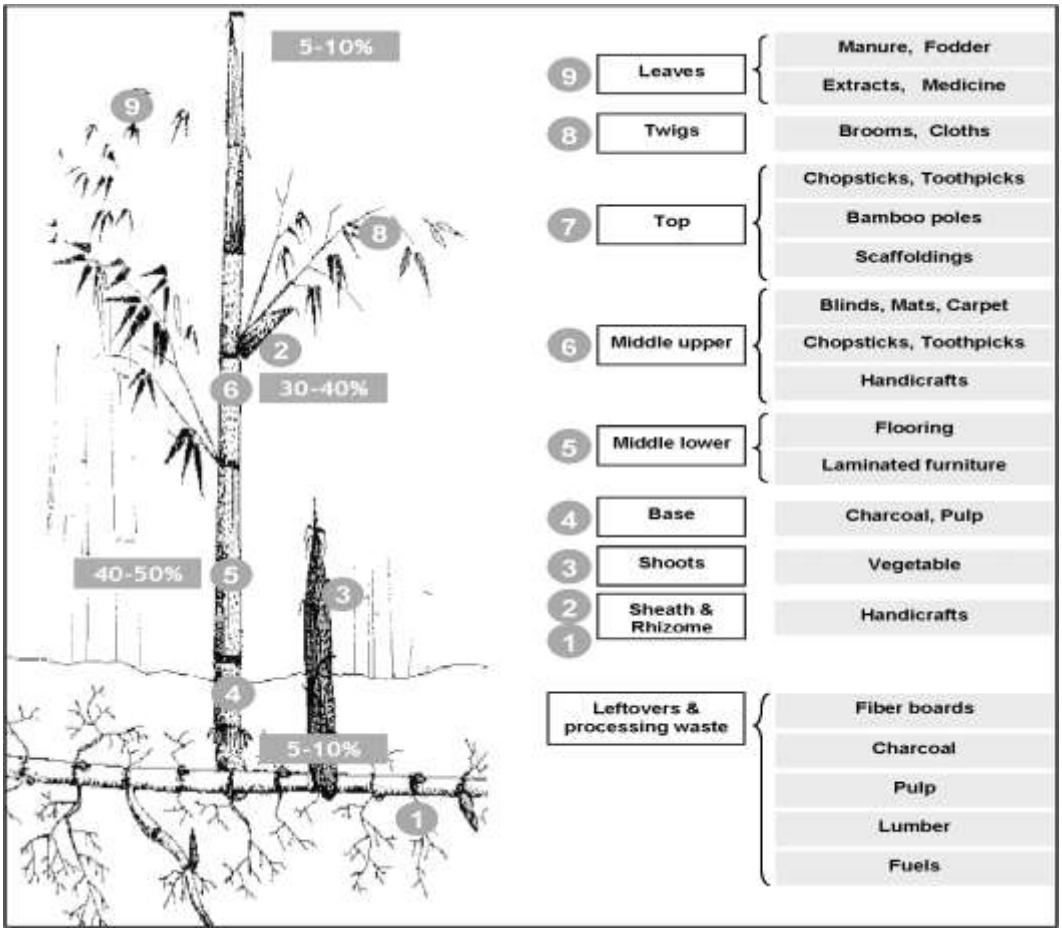
Bamboo plays a vital role in rural socio-economic life for its variety of uses: material for house construction, fencing and enclosure for cattle, agricultural implements, and for making handicrafts and furniture for income generation. In many places, Bamboo is used for the protection of farmlands from landslides, and soil and riverbank erosions. Young shoots of Bamboo are used as a seasonal vegetable by many people, in both rural and urban areas. Some of the major uses of bamboo are described below.

a) ***Construction:*** Bamboo, like true wood, is a natural composite material with high strength-to-weight ratio useful for structures. Bamboo intended for use in construction should be treated to resist insects and rot. The most common solution for this purpose is a mixture of borax and boric acid. In its natural form, Bamboo as a construction material is traditionally associated with the cultures of South Asia, East Asia and the South Pacific, to some extent in Central and South America. Bamboos are used to hold up simple suspension bridges, either by making cables of split Bamboo or twisting whole culms of sufficiently pliable Bamboo together. Bamboo has also long been used as scaffolding all over the world. In Japanese architecture, Bamboo is used primarily as a supplemental and/or decorative element in buildings such as fencing, fountains, grates and gutters, largely due to the ready abundance of quality timber. In the eastern Tarai of Nepal, Bamboos are traditionally used to construct almost all parts of a house except the fireplace. Bamboo houses are widely prevalent in the rural areas of eastern Nepal (Karki, *et al.*, 1998). Beams, trusses, frames, walls, partitions, ceilings, doors, windows and floors are made from round or split culms. Long culms are laced together for erecting construction scaffoldings in urban areas.
b) ***Agricultural implements:*** Many articles are made out of Bamboo for on-farm and off-farm agricultural uses. Some common uses are: water pipes, hoe handles, aeration mats, sieves, screens, fans, carrying rods, racks, carry baskets (thunse and doko), ropes (namlo), trays (nanglo), barns, granaries, cylindrical baskets (dalo), and grain containers (bhakaris), bins and other types of containers.
c) ***Arts and handicrafts:*** Bamboos are also commonly used for a great number of general construction purposes. Round or split culms of suitable size and quality are used to produce a range of products such as: ladders, musical instruments, sport implements, bows and arrows, fishing rods, tool handles, frames of fishing nets, fishing traps, boating poles, bullock cart railings, mats and sheets, etc. Many art objects and items for household use are also made from Bamboo culms, splits and strips. These include flower pots, model furniture, lamp stands, lamp shades, sun shades, picture frames, mats, blinds, mat ceilings, hand fans, dusters, brushes, walking sticks, cudgels, fruit containers, book and shoe shelves, baskets, ladies' bags, wastepaper baskets, combs, hats, blow pipes, TV antenna posts, flag-poles and pencil holders.
d) ***Shelters:*** Shelters made of Bamboo are common in most of the parts in Nepal, mostly for the rural communities. They are erected for cattle, agricultural and cultural fairs, market stalls and bus stops.
e) ***Food:*** Bamboo is not recommended for its nutritional value. Still, the tender shoots of Bamboo have long been used in Southeast Asian cooking. They can be sliced, canned, or pickled, among other preparation methods, and are generally used as an added ingredient in many dishes. Pulverized Bamboo skin includes antioxidants that make it useful as a natural food preservative (EBF, 2010).
f) ***Soil erosion control:*** Round or split Bamboo culms are used for protecting hill sides and riverbanks. Every year, large quantities of Bamboo culms are used for the protection of the Koshi River banks. The dam maintenance project buys Bamboo

culms from the farmers. Farmers employ Bamboo culms for making check dams and spurs to protect their farmlands from torrential rains and soil erosion (Karki, *et al*., 1998).

g) Environmental balance: The energy required to produce Bamboo is about half of that necessary for wood, one eighth the energy necessary for using concrete in the same capacity, and only one fiftieth of that needed for steel. Bamboo absorbs four times as much carbon dioxide from the environment as trees do (McCoy, 2009). Bamboo can produce more housing while using less land than timber. Only 70 hectares of Bamboo plantation can provide enough material to build 1000 houses per year.. In its contrast, it would require the destruction of 600 hectares of natural forest for the same result (INBAR, 2010).

Figure 13:2: Parts of bamboo tree and their general uses



Source: Zhu, 2008 and Chen 2007

Many of the communities in Nepal are one or the other way related with bamboo and its products and many of them are involved with bamboo related works for their livelihoods. For example, Aakhisalla VDC of Dhankuta district is one of those where majority of Rai community are earning their living from bamboo handicraft making occupation. Among the

35 VDCs and one municipality of the Dhankuta district, each and every VDC has notable and Potential Bamboo cultivation. Aakhisalla VDC is regarded as the home of Bamboo of Dhankuta district. It has high Bamboo cultivation making people engaged in the Bamboo profession. The Bamboo profession seems traditional as people are involved in the profession for years and years. People are cultivating Bamboos in their own farmland making Bamboo as their main farm crop. There are many small domestic Bamboo industries in Dhankuta district more prominently in Aakhisalla VDC and Dhankuta municipality. People use Bamboos that are produced in their own farmland neglecting Bamboos of community forest.

People in this village grow Bamboos in both cultivated and uncultivated land. Bamboos can be seen in nearby houses, roadsides, play grounds, slopes and adjacent to the stream channels. Bamboos are used by the people for their individual usage to commercial purpose at small to high level. Majority of the people in this village rely on Bamboos business as they take it as prospering business compared to any other business or job that they used to carry out in the past. They found it efficient financially and physically to operate as they are using their indigenous and well known skills to produce Bamboo based products.

People in Aakhisalla VDC used to produce more than fifty items but only twenty five items of Bamboos are produced more frequently and traded in the market. The market of Bamboo and its products are tremendously encouraging and prospering in Dhankuta district. The demand is too high and the supply is not sustaining the demand. The supply of finished product of Bamboos is high in comparison to raw Bamboo poles. Bamboos are used for different purposes. Due to its diversified use, it is one of the best products which are traded in large quantity from Dhankuta district. The most used or consumed form of Bamboo and thus are produced by people in Aakhisalla village are introduced below.

a) ***Handicrafts*****:** Majority of the Bamboo products (Approximately more than 90%) produced in Dhankuta district come under handicrafts. Handicrafts such as Tea sieve, folders, baskets, boxes, carpets, curtains, cushions, mouse pads, lamp sheds, cups, bags, key chains, vase, etc are produced. They have high values and they are traded in huge quantity to the markets. Producers work out for months (1-2 months) to produce Bamboo handicrafts, gather the finished product in a store room and sell them to the traders from outside district such as Dharan, Biratnagar, Kathmandu, Hetauda etc as per the demand.
b) ***Furniture:*** Furniture such as book rack, tea table, clothes hanger, etc is produced in notable quantity. It holds approximately 9% of the Bamboo product production. These are traded in local market to national market.
c) ***Construction:*** Bamboo poles though are preferred for construction works, from Dhankuta District they are rarely supplied or traded for construction purpose, except in few cases. This scenario shows that people are much interested to handicrafts, which corresponds to value addition mechanism among different actors of the market i.e. Bamboo pole producer, transporter, Bamboo products manufacturer and the Bamboo traders.
d) ***Raw Bamboo:*** Every year more than 100000 culms are transported through river to Tarai part of Nepal. There are around 1000 people who transport raw Bamboo by the river as an IGA as seasonal work.

However, the prices of the Bamboos that are brought from outside of Dhankuta municipality decrease drastically to one half the price of the Bamboo of municipality. Transportation cost is the main factor for value addition. The production quantity and its production costs possess high differences as the production cost is very low compared to production quantity.

Trade of Bamboo:

Global market for Bamboo products is approximately USD 10 billion. The internal consumption that is primarily in construction of houses is estimated as USD 5 billion. While the global Bamboo economy is estimated to be 14 billion dollars,the commercial consumption which includes Bamboo and Bamboo- based products are worth USD 4.85 billion and Bamboo shoots worth 0.15 billion (INBAR, 2007). Bamboo handicrafts and Bamboo shoots are major tradable Bamboo products. China is historically in front on diverse usage of Bamboo products. China at present has more than 70% of market share in Bamboo based products worldwide.

The total estimated coverage of Bamboo area in Nepal is approximately 63,000 hectares. Sixty per cent of this lies in the natural forests. The estimated total growing stock of Bamboo in Nepal is about 16 million cubic meters with an approximate bio mas value of 1061 metric tons. The estimated annual production of culms in Nepal is 3.01 million. Of these, 2.64 million culms are internally consumed and the rest are exported to India. The estimated annual production of Bamboo shoot in Nepal is around 102 MT, all of which is consumed locally (Karki and Karki, 1995).

Bamboo market in Nepal is estimated at around NRs 1 Billion where 25,000 plus families from excluded/ethnic groups are involved in Bamboo related livelihood activities in Eastern Nepal alone. Additionally, 3.3 million farming families are somehow involved with the Bamboo sub sector either as producers or users of Bamboo based products. Bamboo has various advantages such as it has potential to create rural employment; it is environment friendly, cheap and abundant. With rich variety of Bamboo species (from the tropical species of South-east Asia to the temperate species of Tibet) Bamboo sector in Nepal can play a prominent role in eradicating poverty.

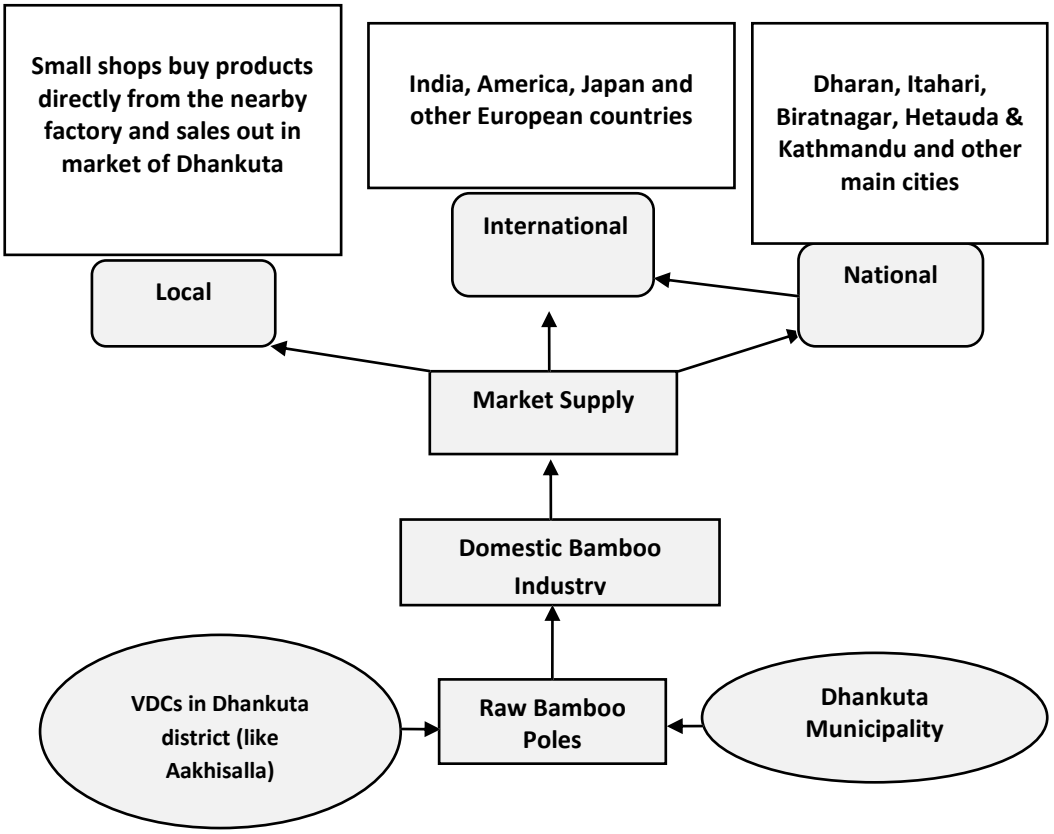
The technology used in manufacturing Bamboo products is simple and traditional like weaving, joining and pasting. Most of the Bamboo goods such as doko, dalo, mandro, bhakari, nanglo and dhaki in Nepal are made by weaving, while some other goods, such as sofa, racks and stools are made by nailing. Most of the handicrafts are made by pasting with adhesive/glue. The tools are very simple such as hammer, knife, hack-saw and others. The main auxiliary materials used for manufacturing Bamboo goods are nails, ropes, plastics and leaves. Similarly, the finishing materials used for polishing the products are kerosene, varnish and paints (MDBRPP/DFRS. 2010a).

It is estimated that about 3.3 million farming families are somehow involved with the Bamboo sub sector either as producers or users of Bamboo based products (Pant, 2006). If the Bamboo and other NTFPs are developed, it can contribute much more to the regional and national economy (Sharma, 1988, Amatya and Newman, 1993). However, the government has not considered Bamboo and other NTFPs as important as other sectors, because they were considered easily accessible, cheap and their potential to the regional and national economy is not well understood. Their importance is put in periphery in order to give priority to development of physical infrastructure supporting agriculture, tourism and industry and hydropower industry (Three years Interim Plan 2007/08-2009/10). Despite Nepal's geographical and cultural richness of Bamboo, due to governments' indifference, lack of support for subsistence farmers, disorganized market, and limited skills, Bamboo based economy only contributes 1-2% to the national GDP (Karki *et al.* 1998).

Product Flow of Bamboo:

At present Dhankuta, particularly Aakhisalla VDC is well known for brand/quality production and a prime destination for all the marketing actors involved in supply chain of Bamboo products. The trading of Bamboo starts with collection of Bamboo from CF, private lands and NF and ends with domestic consumption and export. There are three tiers of actors viz, micro, meso and macro level players in the value chain. At the micro level, there are the producers, collectors, home based workers and lead producers. At the meso level there are CFUGs, lead producers and district level wholesalers/retailers. At the macro level there are Kathmandu based enterprises/entrepreneurs and exporters. A simplified product flow of Bamboo (based on the production and supply flow from Dhankuta district) is given below (Figure 13.3).

Figure 13:3: Bamboo product flow



Source: Field Consultation, 2013/2014

The product flow chart shows local bamboo products reaching to the different markets such as local, national and international. But in practice, there are very few cases of exporting the products to third world countries due to two reasons: quantity and quality of the products. The most products are traded in the local and national markets.

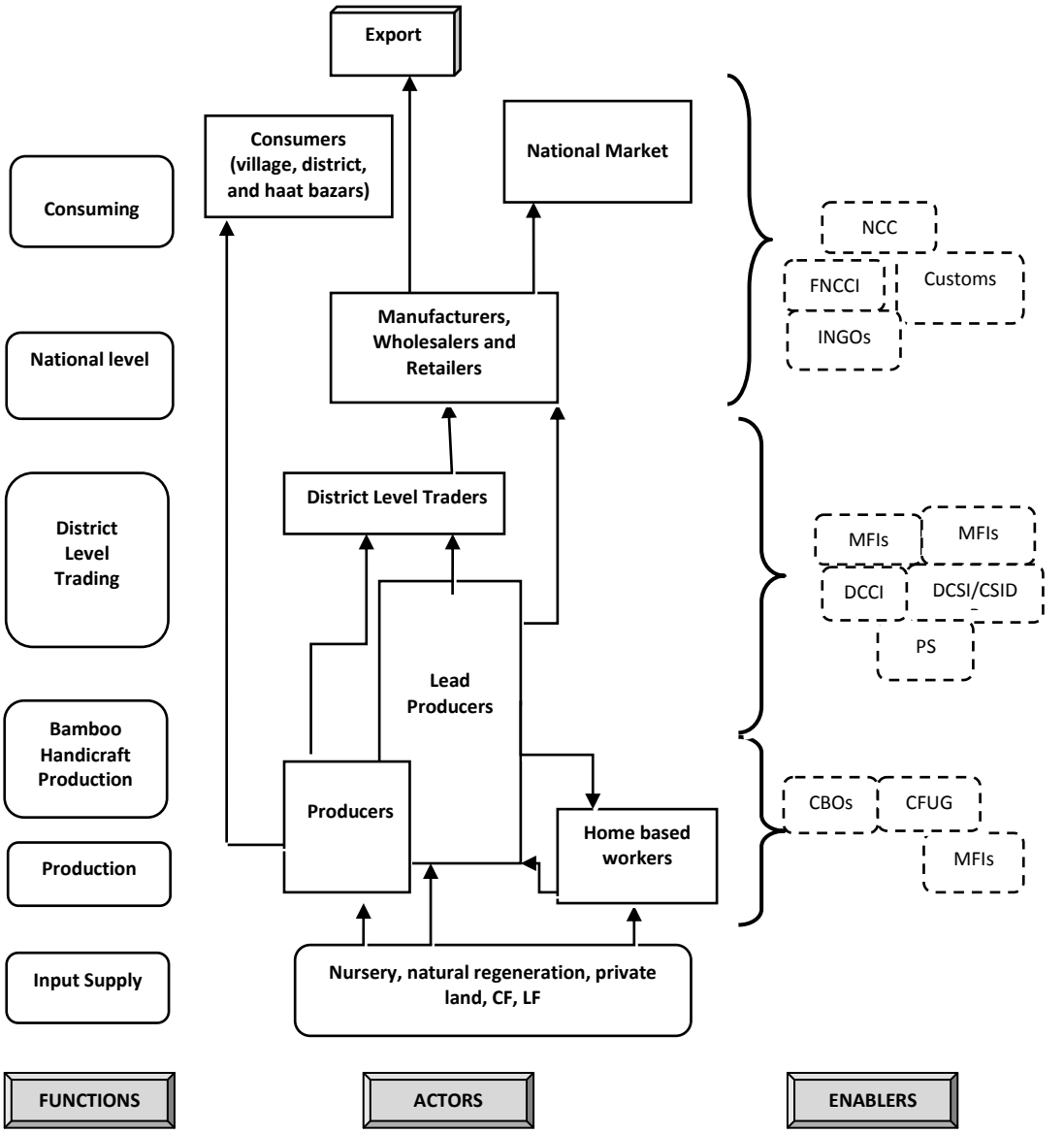
Conservation Status of Bamboo

Natural Bamboo resources in Nepal have considerably dwindled during the last three decades. This is primarily owing to the large-scale destruction of the habitat of Bamboos resulting from encroachment and release of forest land for agriculture, shifting cultivation, negligence in the management of natural Bamboo stands, and the lack of an appropriate policy governing the resources (Karki, *et al*., 1998). Despite economic potentials of bamboo cultivation, it is yet to be a priority for all including the development agencies and government line agencies. Similarly, the lack of modern technological inventions for quality and quantity bamboo handicraft products and lack of road transport, the local farmers have also not been encouraged in the commercial bamboo cultivation in Nepal.

Functions of Bamboo Value Chain Actors

Numerous actors, with different roles and functions, are involved in the bamboo value chain. Identification of these actors, understanding their present roles/functions, and gaps between present and required roles/functions of the value chain actors have become important issue for this study. The role and function of actors, their relationship and function of enablers have been presented in the figure below (Figure 13.4). The function of actors is given in the left corner and area of intervention for enablers is given in the right corner.

Figure 13:4: Value Chain Map of Bamboo



Source: Field Consultation, 2013/2014

The roles and function of bamboo value chain actors are briefly discussed below.

Producer: Bamboo is cultivated mostly in the private lands, few in the CF, LF, and GMF areas. For example, bamboo handicrafts produced and traded from Dhankuta district are mostly made by the bamboo cultivated in the private lands such as Aakhisalla VDC where almost all of the village people have bamboo cultivated in the private lands and most of them work in bamboo handicraft making occupation. In some cases the bamboo producers sell out their Bamboo poles to the bamboo handicraft manufacturer in the village or nearby villages. But in most of the cases, bamboo producer or cultivator use their bamboo themselves for making bamboo handicrafts. The main advantage of producer being involved in the Bamboo product manufacturing is the relatively high profit that they gain in comparison to benefit they achieve in selling just the Bamboo poles to the traders. Further, it has created employment opportunity to the local people.

Lead Producers: Lead producers are the craftsmen who have registered their industry as small industry working on Bamboo. They are mostly engaged in producing varieties of bamboo handicrafts and furniture. For example, altogether fifty items of handicrafts and furniture are manufactured by bamboo handicraft producers in Aakhisalla VDC of Dahnkuta district. They use traditional equipment such as Khukuri, Knife and Sickle to make their products. People work under a common hut of the village and produce huge quantity of products which they trade later in one lot. Lead producers also provide necessary raw materials to home-based workers who prepare handicraft products and sell to the lead producers getting amount in piece rate.

Traders: The final Bamboo products are bought by the traders based in Kathmandu, Dharan, Biratnagar, Hetauda and other big r cities and market places. They contact directly with the manufacturer and buy the products. Manufacturers are not able to supply the adequate products as traders demand huge quantity of products. The best solution to the situation could be to increase quantity and quality of production in a short period of time.

Enablers: Enablers of "Bamboo value chain" in the present context are those who are working for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases.

Table 13:4: Anticipated role of regulating organizations to move Bamboo in the market chain

Major Activities	Regulatory functioning organizations
Sustainable collection	DFO, CFUG
Royalty Payment	N.A (DFO), DDC
Checking and weighing	Range Post or CFUG
Release order or transit permit	N.A (DFO), DDC
Local taxes	VDC, DDC, Municipality
Checking and endorsement	N.A (Forest check post)
Export recommendation, product certification and export permission for selected natural products	N.A., DFO (recommends the concern customs offices), DPR (permission to export processed natural products that are prohibited for raw material export)
Certificate of origin	FNCCI/ DCCI, NCC
Export Permission and duty	Customs Office of exporting country
Import permission and duty	Customs Office of importing country
Market information	TEPC, AEC
Financial Support	NGOs, Cooperatives, Commercial Banks
Processing technology	DCSI/ CSIDB, Private companies
Resource management and Research	DPR, DFO, CFUG, NGOs, Consultant,
Taxes	Inland Revenue Department, Department of Customs
Enterprise registration	Office of Company Registrar, CSIDB/ DCSI, VDC

Source: Field Consultation, 2013/2014

The above table is an ideal one showing how Bamboo has to be regulated as NTFPs. At present there is no specific policy regarding Bamboo trading, marketing and business. So, enabling environment is highly demanded for moving bamboo products in the market chain.

Market Dynamics of Bamboo Products

Bamboo is used for different purposes like building materials, as a food source, and as a versatile raw product. However, the modern plastic and construction material on the one hand are gradually displacing bamboo from its historical uses (Gunatilake *et al.* 1993, Daniggelis, 1997) but on the other hand, using handmade utilitarian and decorative objects is creating new emerging markets. In housing sector, an interest is growing for low cost annexes, restaurants, weekend homes and even residential homes. In this burgeoning market, a transition of traditional Bamboo craftspeople to the modern Bamboo sector can be relatively easy (and necessary), provided adequate organization, marketing skills, additional knowledgebase and proper policies are provided.

It has been widely reported that the demand and the supply of the Bamboo products such as stool, rack, and road sweeping broom have been increased significantly over the years, especially in the urban areas. As reported by the traders of Bamboo, the increasing demand of Bamboo has motivated the suppliers to go to the interior parts of the districts, even to the remote rural areas to collect the Bamboo culms. Regarding Bamboo supply in the Kathmandu Valley, it is estimated that 50 to 60 MT of Bamboo is supplied daily there from different Bamboo supplying areas. The urban-based manufacturers, who constitute a small number, reported that the supply of Bamboo as raw-material has met their demand. (MDBRPP/DFRS, 2010). Furthermore, the interest in modern market does not require intensive technology, but it needs more design skills and new craftsmanship and institutional support. On the contrary, in Nepal, the high technology intensive Bamboo endeavours like plywood and parquetting industry suffered a setback, because it is unable to compete with cheap Chinese and Indian plywood and parquets and the price of Bamboo lamination is more than wood products. Keeping historical uses of Bamboo in mind, Nepal can make a swifter and more effective transition to crafts based Bamboo industries than a technology based (Adhikari, 2013).

It is estimated that NRs 5000-10000 per month can be earned from 10 Ropani of land by selling at least 50 poles in a month (Field Consultation, 2013/2014). Regarding handicraft production from the bamboo, the finished products' expenditure becomes nominal compared to traded product profit. However, different product forms do consume unequal time for producing final products.

Table 13:5: Estimated Earning of bamboo handicraft making from number off poles

Quantity (Poles)	Time (Days)	Product worth (in NRs)	Remarks
1	7	15,000	Handicrafts
4	8	24,000	Furniture

Source: Field Consultation, 2013/2014

There is no requirement of fixed capital as most of the Bamboo based industries operate in the manufacturer's house. Further, all the activities of productions are carried out manually by hand. The operating cost such as enterprise registration, market linkages and transportation cost are highly variable. Therefore, it is very difficult to estimate actual pre-operating cost. Being a cottage industry, the total capital is low and hence, it would be NRs 5,000- 10,000. However, substantial support from NGOs, development agencies and government agencies has reduced the pre-operating cost. The Bamboo products are purchased or collected by the regional traders in huge quantity so the Bamboo manufacturer should have at least NRs 60,000-1, 00,000 as initial working capital.

The main advantage and the most prospecting factors reside in the availability of the market for the finished product of Bamboo with peak demand. However, there are no any sorts of project intervention in upgrading or promoting the Bamboo factory or cultivation. The product has market in Dhankuta district but much product is traded outside the district. The products are traded in Dhankuta district, along with nearby districts: Sunsari, Morang, Makwanpur, Kathmandu and even to India and from Kathmandu to America, Japan and different European countries as well. As the product is traded outside the district, the price of the products gets double the price at Dhakuta as value is added by transportation costs, labour wages and traders profit in the trade process.

The Bamboo is raw material for bamboo handicrafts. The quality and market price of the final products are most often influenced by its availability: easy or scarce and price of bamboo poles. For example, the bamboo handicraft producers in Aakhisalla have their own bamboo poles and hence they harvest required bamboo as per they need and require. In case they sell or buy a pole of bamboo , the present market price a buyer has to pay was (during field consultation in 2013/2013) NRs 100 per pole for Mal Bans and NRs 500 per pole for Choya Bans. While, the price of same bamboo pole is more than NRs 300 and NRs 500 in some parts of the country such as in Badikhel VDC in Lalitpur district.

Bamboo products produced in local levels are traded to different market centres such as Dharan, Itahari, Biratnagar, Hetauda, and Kathmandu through local and district level traders based in the district headquarters. Some products are exported to foreign countries like Japan, America, South Korea, and India through the traders in Kathmandu. The general market channel for bamboo products in Aakhisalla VDC of Dhankuta district may look like this:

a) Aakhisalla---Dhankuta---Dharan---Itahari---Biratnagar/Kathmandu/Hetauda
b) Aakhisalla---Dhankuta---Kathmandu---Japan, South Korea, India, European countries

Although bamboo value chain is functioning well in its own value chain, there are some strengths, weaknesses, opportunities and threats in bamboo handicraft production and marketing.

Table 13:6: Strength, Weakness, Opportunities and Threats of Bamboo

Strength	Weakness
• Long Life and faster growth shrubs; • Abundant raw materials available in local level; • Low capital required to run MSEs; • Cheap substitute for wood for poor households who are making rafters, battens, walls and scaffoldings; • Growers have general skill in Bamboo transplant and use; • Sloppy land, climate and soil are suitable for Bamboo production; • High level of skills on weaving ; • Presence of marketing producers who trade their product to regional and national market; • Dhankuta brand is well trusted amongst traders at National level; • Cost Champion amongst product from other districts of Nepal; • Support from district level organizations like CSIDB/ DCSI, DFO and NGOs for Bamboo based enterprise development; • Self evolved supply chain/per piece based employment for housewives;	• Off cut stumps with a portion of rhizome is a traditional method of propagation; • Growers less care about harvesting methods, timing of harvest, looping, cleaning, fertilizing and trenching; • Manual production with absence of appropriate technology usage; • Unable to supply as per market demand; • Absence of cooperative mechanism for forward and backward linkages;
Opportunities	**Threats**
• Improved cultural practices can improve productivity and quality of culms and clumps; • High demand of Bamboo product in national and international market; • High concern of government and non government organizations in the Bamboo sector;	• Migration of skillful producers to cities and overseas employment; • Might lose Cost champion brand due to lack of appropriate technology; • Threat of substitute (like plastic products) due to lack of innovation and new product development;

Source: Field Consultation, 2013/2014

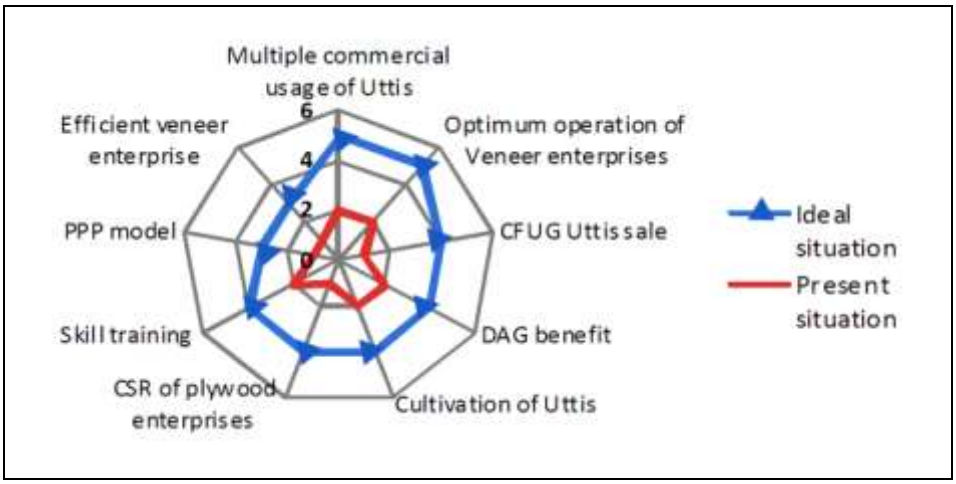
The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in the next section as a part of Value Chain Upgrading Strategy.

Bamboo Value Chain Upgrading Strategies

End Market Analysis:

The end market strategy of bamboo value chain is developed from the comparative analysis between present status and market demands of bamboo value chain. The comparative parameters are developed on the basis of consultation with value chain actors.

Figure 13:5: Difference between present status and market demands of bamboo



Source: Field Consultation, 2013/2014

The comparative differences between present status and market demands of bamboo presented above (Figure 13.5) have based on the different situational parameters.

Table 13:7: Parameters used to compare present status and market demands of bamboo

Parameters	1	2	3	4	5
Quality Seedling availability	Very less	Less	Average	More	High
Technology Usage	All manual	Usage of technology in one process	Usage of technology for one to three process	Usage of appropriate technology for most of the process	Usage of appropriate technology for mass production
Product development	Single cultural and traditional product	Multiple cultural and traditional product	New product development as per changing lifestyle	Multiple product development as per changing lifestyle	Continuous product development as per changing lifestyle
Price Sensitivity	Worst price negotiation between buyers and sellers	Weak price negotiation between buyers and sellers	Moderate price negotiation between buyers and sellers	Good price negotiation between buyers and sellers	Best price negotiation between buyers and seller
Domestic Demand (Blue line)	Low demand	Limited demand	Moderate demand	Good Demand	Mass demand
Domestic Supply (Red line)	Low supply	Limited supply	Moderate Supply	Good Supply	Mass supply
Cost Leadership	Very High pricing vs. competitor	High Pricing vs. Competitor	Similar pricing vs. competitor	Less pricing vs. competitor	Least pricing vs. competitor
Supporting organizations	Very less support	Less support	Average support	High support	Very high support

Source: Field Consultation, 2013/2014

The major gaps between present status and market demands as an idea situation are further discussed below.

Quality seedlings availability: There is lack of managed and well developed nursery for seedlings which could supply enough seedlings to producer. Due to vigorous natural regenerations capacity of Bamboo; there is a wide opportunity to cultivate and produce large quantity of Bamboo. Also, the land use system, pattern of cultivation, and land capability of district largely favour the production and development of Bamboo in Dhankuta district. At present, Aakhisalla VDC and Dhankuta municipality are major sources for Bamboo and the cultivation in other VDCs (including existing ones) is necessary to cater high demand of Bamboo/Bamboo products. CF and LF can be allocated for Bamboo plantation as IGA activities for DAGs.

Technology usage: There is lack of modern technology especially appropriate machine to make Bamboo products as they are still using traditional equipment for the production. There is high demand for Bamboo fibre (choya) in national market and there is no systematic mechanism to update on new skills and technology to cater national demand. At present the traditional (manual) system possesses high risk to be injured. Technology/equipments such as drill machine, brolamp, gloves, Bamboo choya cutting machine are highly demanded by the producers. These technologies can enhance efficiency and quantity of Bamboo products manufacturing and also resolve most of the safety issues.

Product development: Currently, use of Bamboo is restricted to traditional handicrafts, furniture and construction sectors. There needs to have innovations in new product development that address the present changing lifestyle of people. The discussion with traders revealed that even traditional product (like Dhakki) can be reinvented to suit changing lifestyle by redesigning with colour, texture, designs etc. There are also increasing use of Bamboo in fashionable items including Bamboo shawl, Bamboo clips etc. The present discussion with Bamboo enterprises at national level suggested high demand of Choya in market. Choya is used as main raw material for making Bamboo products.

Demand: The national level enterprise has strong supply chain with Dhankuta based producers. They procure various Bamboo products by placing a demand. The main product that is being traded is Dhakki. There is huge demand for other products also, but producers are not able to shift to new product development. Also, producers are not able to supply the demand of existing Dhakki to national market.

Cost leadership: An average Dhakki is sold in wholesale price of NRs 70 to enterprises in Kathmandu. This price is the least price all over Nepal. This is due to high skill of producers on the one hand and strong linkages of Kathmandu based enterprises in Dhankuta on the other. This price has remained same for the last three years. The producers are not able to bargain for more price and enterprises in Kathmandu are not also increasing the prices. There is pertinent need to reinvent some of these traditional products and also develop new products to get better price from Kathmandu based enterprises. Kathmandu based enterprises sell this Dhakki in retail price up to NRs 150. In supply chain, the lead producers provide necessary raw materials for Dhakki weaving to home based workers (mainly women) and pay them up to NRs 15 per Dhakki weaving. One household can weave up to 8-10 Dhakki per day. This amount is less than minimum daily wages but still women carry out weaving during leisure time and get payment as per completed piece.

Supporting organization: DCSI/CSIDB is carrying out various supports to Bamboo based enterprises from long time. The support has also been carried out by Non-government Organizations (NGOs) for Bamboo based enterprise development. At present, it is very important to build synergy amongst development agents and strengthen Bamboo Brand that Aakhisalla producers have achieved from majority of value chain actors. Any new initiative has to be minutely discussed with development agents and value chain actors as producers are very close to supporting organizations.

Price sensitivity: Producers are not able to bargain the increment in price from Kathmandu based enterprises from the last three years. In supply chain also, the home based workers are not able to bargain with lead producers for increasing price for weaving. This is due to lack of reinventing products to give a different look and also inability of producers to include new products in their product list. Producers are selling Dhakki every year and its demand is also high but they have not changed any design on Dhakki for the last decade. This has decreased the bargaining power of producers (more value addition more price).

1. Firm Level Upgrading Strategy:

The gap analysis presented in the spiderogram has been a path way for developing value chain strategies to move forward. The strategies are made in different parameters like: Product upgrading, process upgrading, function upgrading, channel upgrading, and intersectoral upgrading.

a) Product upgrading: After assessing the experiences of various organizations and in depth discussion with Kathmandu based entrepreneurs, the most important product in Bamboo value chain has been identified as CHOYA and new product development. There is absence of support and experience of Choya cutting machine in Nepal whereas new product development is not possible till now as producers are not changing their product design (even though Kathmandu based entrepreneurs are providing information about new products). The strategies to be followed for product development in coming three years are presented below (Table 13.8).

Table 13:8: Product upgrading based on four parameters

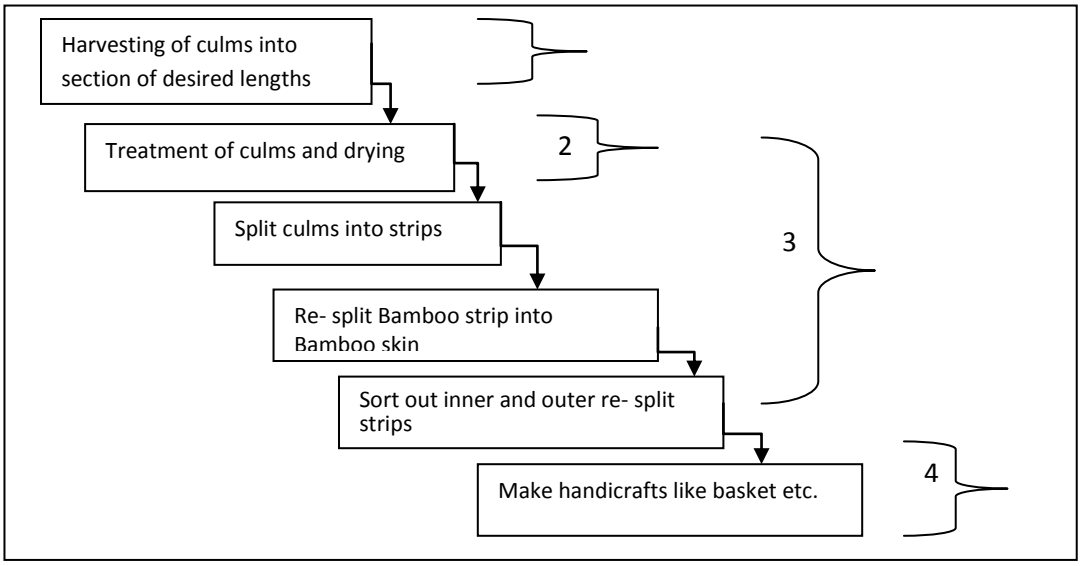
Parameters	Present	Year 1	Year 2
Product	Bamboo; Some bamboo handicraft products (mainly Dhakki, pen holders)	• New product development: Special product ("*Dhankuta ko Chino*"); • Product addressing changing lifestyles: Bamboo clips, Bamboo bangles; • Bringing efficiency and reinvention on present products: Dhakki, penholder etc.	Upgrade strategies as per Year 1; Introduction of Choya cutting machine
Price (based on present price)	Bamboo Dhakki NRs 70	Reinvented Dhakki: NRS 90	Sale of choya in commercial scale
Place	Kathmandu	Kathmandu	All over Nepal
Promotion	Cost champion	Cost champion and Innovation champion	Cost champion and innovation champion

Source: Field consultation, 2013/2014

b) Process Upgrading: The Bamboo product making process can be divided into non-chemical (traditional) and chemical methods. The selection of appropriate process depends on various factors from the beginning like: (a) State of Bamboo: green or dry, (b) Form of Bamboo: round Bamboo or splits, (c) End applications: in ground contact, exposed to atmosphere, undercover, structural/ non structural, (d) Scale: quantity to be manufactured and available time, (e) Potential causes of decay: biotic (fungus/ insects) and abiotic (cracks/ weathering).

Non-chemical, Traditional Bamboo treatment methods are ancient methods which have been still practiced in Dhankuta. These are simple and cost effective without the use of chemicals or supporting equipments. This process is inadequate (time consuming) for commercial business of Bamboo. The figure 8 shows process map of traditional method. There exist well established method of appropriate technology and chemical preservative usage for efficiency and protection of Bamboo products from degradation.

Figure 13:6: Major steps from collection to marketing of Bamboo



Source: Field Consultation, 2013/2014

The steps of bamboo process upgrading need to be further discussed and based on these discussion further strategies could be recommended.

Table 13:9: Process upgrading matrix of Bamboo

Process Upgrading	Existing practices	Recommended practices	Technical knowledge/ Technology used and cost	Anticipated benefits
Upgrading 1: Bamboo/ Culm harvesting	Traditional practice, Producers in Dhankuta are well known for exact timing of Bamboo harvesting	Extend this practice to other places where producers are not practicing	Training and exposure	Uniformity of Dhankuta brand being perfectly harvested culms
Upgrading 2: Seasoning, Leaching, Drying	Storing culms in water, storage is water causes leaching of starch Dried in a dry, well ventilated shade for 2-4 months	Possible usage of Creosote, Chromium Arsenic (CCA) treatment, Kiln drying of Bamboo takes 9 days	Training on CCA treatment,	Timely treatment and drying of culms
Upgrading 3: Splitting Culm	Usage of local knifes such as Khukuri, khurpa or hassiya for cutting and splitting	Usage of Hand Splitter, Choya cutting machine	Hand Splitter: NRs 2000 Choya cutting Machine: NRs 500000 approximately	Increased quality, increased efficiency
Upgrading 4: Weaving	Weaving carried out in simple design with traditional tools	Weave knives imported from Germany, China, and France permit finer work Knowledge about 8 types of weaving	N.A	Enriched design and innovation

Source: Field Consultation, 2013/2014

The major source for above process upgrading has been derived from a report Reviewed on Traditional designs and technologies of Bamboo and rattan products in Nepal published by the Department of Forest Research and Survey, 2011. In short, there is demand of following technology at present.

Table 13:10: Immediate technology requirement in Dhankuta

Equipment	Functions
Bans/choya cutting Machine	It cuts the Bamboo poles into preferred size needed for products
Brolamp	It produces fire which removes the hairy substance in Bamboo poles
Drill Machine	It pierces the Bamboo which is used to make furniture products
Gloves	It protects the hands during the work.

Source: Field Consultation, 2013/2014

c) ***Channel Upgrading:*** The present trade of Bamboo related product in Aakhisalla VDC of Dhankuta district channelized through traders at Dhankuta district headquarters or local traders to Kathmandu. The study recommends to use the existing channel but with following additional components.

- Selling local brand in the local market (eg. Dhankuta ko chino branding and selling within Dhankuta district);
- Reinvention of existing products and sale to Kathmandu based enterprises;
- Choya sale to all over Nepal;

d) ***Functional Upgrading:*** The major actors in the Bamboo Value Chain are as follows and their function upgrading need to be carried out in the following ways.

Table 13:11: Function upgrading matrix of bamboo

Actors	Present Function	Upgraded Function
Home based workers	Weaving products as per demand of lead producers	Vertical integration and form a cooperative, weave product as per demand of lead producers
Producers	Bamboo product making	Vertical integration and form a cooperative, innovative product development
Lead producers	Bamboo product making and marketing, Work division to home based workers	Product reinvention, new product development, technology transfer
Kathmandu based enterprises	Buying products from lead producers	Investment in technology transfer, Subcontracting for new product development and product reinvention
Cooperative	N.A	Establishment of cooperative (as vertical integration) comprising of home based workers, producers and lead producers and own appropriate technology

Source: Field Consultation, 2013/2014

e) ***Intersectoral Upgrading:*** The market demand of Bamboo products can provide income throughout the year. If the upgrading strategies mentioned above are implemented, there is no necessarily a need of households to carry out other intersectoral activities. It will be wise to carry out research on charcoal production from bamboo wastages.

2. Interfirm Upgrading Strategy:

Based on the identification of value chain actors, analysis of their roles and functions, and gapes between present status and market demands of bamboo, following two strategies are recommended as interfirm upgrading strategies.

a. Formation of cooperative at VDC level as a part of vertical integration between home based workers, producers and lead producers;

b. Partnership between cooperative (to be established) and Kathmandu based entrepreneurs for sub-contracting, technology transfer and investment;

3. Business Development and Financial Service Strengthening Strategy:

The assessment of Business Development Services (BDS) and Financial Services (FS) in this study is based on the categorization of demands from beneficiaries and supply side of BDS providers.

a. Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories;

b. Categorization of supply side of BDS providers in terms of very strong, strong, weak and very weak categories;

Table 13:12: BDS and FS strengthening matrix for bamboo value chain

SUPPLY SIDE OF BDS	Very strong				
	Strong				
	Weak		Value Chain Financing	Advocacy for favorable policy	Market requirement about quality and price
	Very weak			New product development	Access to quality seedlings, Access to appropriate technology
		Very weak	*Weak*	*Strong*	*Very strong*
		DEMAND OF SERVICES BY VALUE CHAIN ACTORS			

Source: Field Consultation, 2013/2014

The above required (Table 13.12) services are most essential for making bamboo value chain a commercially viable business. Some possible strategies have been identified for the effective services deliveries.

Table 13:13: Business services strengthening strategy for Bamboo value chain

Services	Strategy
Access to quality seedlings and nursery management	➢ Research on appropriate process for nursery management along with lead farmers (such as KB Gurung in Damauli in Tanahu district), NARC, INBAR; ➢ Training on nursery management including high value Bamboo;
Access to technology for Choya cutting	➢ Facilitation on fund raising from different development agencies for choya cutting machine; ➢ Linkages and technology transfer of choya cutting machine from China or India through technology service providers in Kathmandu;
Product Development	➢ Subcontracting and partnership mechanism between producers/lead producers with SABAH, FTG, Nepal Knot Craft Centre, Miracle Bamboo etc., for new product development; ➢ Embedded product development training through PS; ➢ Facilitation for identification of "Dhankuta ko chino" amongst development agencies present in Dhankuta;

Source: Field Consultation, 2013/2014

4. Business Enabling Environment Upgrading Strategy:

Department of Forest (DoF) has no specific plan and policies for Bamboo enterprises except its plantation for the purpose of bio-engineering. The harvesting and sale of Bamboo from privately owned land and community managed forests are in practice in some places. However, there are no laws or regulations controlling or regulating the trade in Bamboo plant and its products in Nepal. Stands of Bamboo and rattan in natural forests are degrading, mainly because of excessive and unmanaged use. There is lack of clear national policy and suitable marketing infrastructure for Bamboo and rattan industry in Nepal (Pokhrel, 2008). The Government of Nepal has specific policies regarding trees, however, there are no such restrictions imposed on the harvesting of Bamboo. The recent legislative and policy changes, which bring Bamboo under NTFPs, tend to favour establishment of processing enterprises in rural areas. However, the government has not banned the export of raw Bamboo culms to India, immature Bamboo from national and community forests are regularly being cut illegally and exported to India at a low rate, leading to the depletion of Bamboo in forests. As a result, the prospects for the establishment of a large number of manufacturing units within Nepal are not bright (Pokhrel, 2008). The value chain actors are currently facing certain policy hurdle in Bamboo. The major concerns are: Lobbying for favourable policy implementation such as incentives to exporters, no tax/fees levy on transportation, no royalty levy from private lands, and reduce multiple taxation systems.

5. Sustainability Strategy:

The brand image of Dhankuta, more specifically in Aakhisalla VDC, has increased due to better quality but lower price of Bamboo production and its established trades from local to national markets. Dhankuta is considered as cost champion in Bamboo. This has to be upgraded to cost and innovation champion in Nepal and for this a joint work with development agencies is very necessary. The market or national traders and exporters, mainly Kathmandu based, are very positive towards the producers, lead producers and home based workers. It is important to maintain this brand image in long term. Now it is important for Government line agencies and Chamber of Commerce and Industries (CCI) to focus on this product and include in various programs for the promotion including One District One Product (ODOP) and One Village One Product (OVOP).

Summary of Bamboo Value Chain Upgrading Strategy

The study tried to explore the present status of bamboo handicraft making and its trade in Nepal, with particular focus on bamboo handicraft producers in Aakhisalla VDC of Dhankuta district. The study tried to identify and analyze the present status of bamboo cultivation, harvesting, bamboo handicraft producing, its trading including identification and analysis of constraints and opportunities within its current value chain system. Based on these, the study made some strategic recommendations for its further development and improvements in Nepal, particularly in Aakhisalla VDC.

The value chain upgrading strategies of bamboo products indicate that the production, collection, trading and exporting activities are well established business in Nepal. In terms of the availability of raw materials and market demands, it could be said that its production and trading is one of the most viable enterprises in Nepal. However, innovation of modern technology for quality and quantity production, enabling policy environment, development of local to national mechanism that could integrate local to national entrepreneurs for their joint efforts in advocating enabling policies and practical innovations, and expanding market niche

would definitely up-scale production and trading of bamboo products in Nepal. For example, the supports (technical, material) in the introduction of modern technology for Choya production in Aakhisalla VDC will definitely up-scale the preset status of bamboo production and trading. These forms of value addition works definitely enhance capacity quantity production; while quality assuring knowledge and mechanism would be another component that should go simultaneously.

Table 13:14: Summary of the bamboo value chain upgrading strategies

Upgrading Strategy	Recommendation
Product Upgrading	Year 1: New product development: "Dhankuta ko Chino", Product addressing changing lifestyles: Bamboo clips, Bamboo bangles, Bring efficiency and reinvention on present products Year 2: Introduction and operation of Choya cutting machine and sale of Choya to all parts of Nepal, Branding Dhankuta as Cost and Innovation Champion
Process Upgrading	Introduce CCA treatment, Kiln drying of Bamboo, Hand splitter machine, imported weaving knives, Introduce choya cutting machine
Function Upgrading	Vertical integration to form a cooperative; Subcontracting between Kathmandu based buyers and lead farmers
Channel Upgrading	Existing channel for Bamboo handicrafts; "Dhankuta ko chino" branding and sale within Dhankuta
Intersectoral Upgrading	Charcoal production from bamboo
Interfirm Upgrading	Formation of cooperative at VDC level as a part of vertical integration between home based workers, producers and lead producers; Partnership between cooperative and Kathmandu based enterprises for sub-contracting, technology transfer and investment
BDS+ FS Strengthening	Access to quality seedlings and nursery management; Access to appropriate technology (choya cutting, manual splitter), Product development
Business Enabling Environment strengthening	Lobby for policy for bringing Bamboo under NTFPs
Sustainability Strategy	Ownership of branding Cost and Innovation champion Bamboo production in Dhankuta in support and facilitation of development agencies; Strengthen alliance between development agencies within district

Source: Field Consultation, 2013/2014

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PART FIVE

CONCLUSION

Chapter 14[54]

Lessons, Opportunities and Challenges of Value Chain Analysis of Selected Forest Products in Nepal[55]

Summarizing VCA Studies

It is already stated that the main objective of this study was to identify the constraints in cultivation, processing and market access; and explore up-scaling options and provide recommendation for potential expansion opportunities within the value chain of studied forest products in Nepal. The study therefore tried to understand cultivation, processing and market status of selected forest products and provide the value chain upgrading strategies. It does not mean that the study findings are complete form of VCA study. There may be gaps in terms of methodology and coverage of the contexts to address all aspects, issues and dimensions of products that need to be further identified and analyzed to make these VCAs further rich and comprehensive. However, the study tried to identify and analyze multiple dimensions, aspects and issues of the selected products as much as possible.

The study, in terms of approach, dealt with some major aspects of study products, namely natural characteristics, chemical properties, socio-cultural aspects, uses, production processes, access to finance and market dynamics (demand and supply) with the aim to explore potential opportunities for value chain upgrading. In other words, this VCA study tried to concentrate on knowing about three aspects of selected forest products: cultivation, product processing, and market of the product. Different types of experiences and status of cultivation, processing and market access were observed for the selected forest products, that means some are limited and some are better in cultivation, processing and market access.

Table 14:1: Summary of the cultivation, processing and market status of selected forest products in Nepal

SN	Products	Cultivation	Processing (in community level)	Market Access
		Medicinal and Aromatic Plants(MAP)		
	Alaichi (Cardamom)	Cultivation in medium scale but suffering from the increasing problem of disease	Limited processing but only through the conventional drier and that are not commercially viable	Majority to India and some in the domestic market
2.	Bael (*Aegle Marmelos)*	Limited cultivation with less benefit to the community	Processing (manually) but lack of technology	Mostly local, some regional and national
3.	Chiraito (*Swertia chirayita)*	Gradually increasing but limited to small areas and patches	No processing (Lack of knowledge but use of compressor machine is introduced)	Mainly India and China, and 5% National Consumption

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4.	Rudraksha (*Elaeocarpus sphaericus)*	Gradually spreading towards the potential areas	Lack of processing in local level (because it is not a local demands) but supplied only raw products	National, India and recently increased sale to China
5.	Satuwa (Paris Polyphylla Smith)	Possible but no cultivation yet (recently being piloted by a community in Bhojpur district)	No processing yet but traded in the form of raw material	Mainly to China
	Non Timber Forest Products (NTFPs)			
6.	Allo (*Girardinia diversifolia)*	No cultivation (natural growth is sufficient)	Conventional method of processing (but lack of appropriate technology)	Good market niche (local, national and international markets)
7.	Amriso (Broom-Grass)	Cultivation in small and medium scale (both in CF and private)	Lack of vertical integration	Local, national and India
8.	Lokta (*Daphne Bholua)*	Piloted in limited places resulted into low success rate. However, Argheli cultivation is successfully practiced in some areas	Lack of technology transfer	Good market in national and international level
9.	Khair (*Acacia catechu)*	Cultivation done in medium scale	No processing in local level (needs huge investment)	National and India
10.	Khote Salla (*Chir Pine)*	some cultivation with limited success rate	No processing in local level (needs huge investment)	Some in domestic and mostly in India
	Timber and Other Forest Products			
11.	Uttis (*Alnus Nepalesis)*	Successful cultivation in medium scale (mainly in private land)	Semi processing but lack of enabling policy environment	Good market (in national level only, mainly to industrial buyers like veneer and plywood enterprises)
12.	Bans (Bamboo)	Cultivation for only family consumption	Traditional methods of processing but lack of appropriate technology	Good market in both local and national levels

Of the total 12 studied forest products, nine products have cultivation practices by the farmers or collectors themselves. This indicates that there are some positive symptoms of enterprise promotion in the Koshi hill districts. However, the scale of cultivation, in most cases, is not much encouraging because the cultivation scale is limited to the small scale except some in medium scale. Moreover, many of the products, though they are possible, have not been promoted into the cultivation practices. This means the cultivation of selected forest products (except bamboo and Allo) need to be scaled up to make them means of sustainable enterprises in the region and also for sustainable economic growth (local to national) through adoption of the value chain approach.

Regarding the processing, VCAs clearly show that most of the forest products are exported (sold out) either in the form of raw materials or semi-processed forms. There are many reasons behind this. One of the most important reasons is the lack of technological innovations and technological transfer to the producers or cultivators. Moreover, some forest products, such as Khair and Uttis, are very difficult to get processed in the community level because of the huge amount of investment required to set their processing units; while some

products, such as Satuwa and Chiraito, are not processed due to the lack of knowledge about chemical properties of the products and their uses. However, some products (such as bamboo, Bael and Allo) are completely processed in the local level but these products are also facing different forms of problems such as legal barriers for transportation of the final products (Allo: lack of its name in the trade list), lack of technological innovation (for all products) and quality products (bamboo and Bael juice). All these indicate that technological innovation and their transfer to the local level actors is one of the most important aspects of value addition of forest products in Nepal.

Market access is equally important component of VCA study. Talking about this component of the selected forest products, it seems quite interesting and encouraging because almost all of the products have both the national and international markets, which indicates that the study forest products have no or less problem with the market access. Moreover, the market demands of some study products (and which most potential for increasing quantity of the production) are much greater than the existing scale of production and supply. For example, market demands of bamboo handicrafts produced in the Aankhisalla VDC of Dhankuta district and Lokta handmade papers produced anywhere is very high than the quantity supplied from this region. These products have different forms of constraints for increasing their quantity of the products such as lack of skilled human resources, stable job opportunities for the workers, maintaining quality of the products, lack of modern technology for processing/product making, and lack of proper market information and linkages in bamboo handicraft production. Similarly, lack of raw materials, maintaining the quality of products, and fulfillment of administrative procedures (permission for collection of raw materials, information on the collection and paper production, permission for selling/trade/export, hurdles in product transportation) are observed as practical problems for increasing the quantity of Lokta handmade paper in the study region.

It is difficult to discuss case by case and one by one in detail about the status of the above issues of 12 selected forest products in this chapter. However, the discussion about the representative cases and the summary information/status presented in the table 14.1 provides bases for drawing the conclusion. Based on these, it can be concluded that the selected forest products have lots of barriers and opportunities for value addition in the different level of value chain actors, but these require proper identification, analysis and transformation into the actions. These also need proper integration and cooperation among the value chain actors for all level of activities such as cultivation, processing, marketing and also to create enabling policy environment.

Gaps from the Market Analysis

One of the major objectives of the VCA studies of selected forest products was to provide with specific but possible and practicable value chain up-scaling options for the value addition of the particular forest products. Therefore, the study was intended to explore potential expansion opportunities, which in this study is called "value chain upgrading strategies", for upgrading the functions of value chain actors. The value chain upgrading strategies have been framed into five components: 1) firm level upgrading strategy; 2) inter-firm upgrading strategy; 3) business development and financial service strengthening strategy; 4) business enabling environment strategy; and 5) sustainability strategy. The methods and processes of identifying upgrading strategies are another innovations of VCAs in this study. It was based on the comparative analysis of the market demands and present situation of the particular forest products. The market demands were form of ideal situations measured on the basis of actor's aspirations, which were compared with the situation that are facing and struggling by

the value chain actors. The gaps between market demands and present situation of the selected forest products have become useful in understanding the level of demands or needs for functional upgrading of the value chain actors.

Table 14:2: Highest and lowest gaps between market demands and present situation of forest products

SN	Products	Market Analysis (gaps between market demands and present situation)		
		Highest (with value of gaps)	**Lowest (with value of gaps)**	**More than market demands (with additional value)**
		Medicinal and Aromatic Plants (MAP)		
1.	Alaichi (Cardamom)	• Drying technology (3) • Seedling based cultivation system (3) • Production capacity (3)	• Tail cut technology (2) • Direct export to third country (2) • Holding capacity (2)	
2.	Bael (*Aegle Marmelos)*	• Enterprise operation (3) • Management of investment (2) • Product standardization (2)	• Market expansion (1) • Motivation of collectors (2)	
3.	Chiraito (*Swertia chirayita)*	• Compressing technology (4) • Grading (3)	• Cultivation (1) • Demand and supply (1)	
4.	Rudraksha (*Elaeocarpus sphaericus)*	• Production expansion (4) • Certified products (3)	• Demand and supply (2) • Value addition (2)	
5.	Satuwa (Paris Polyphylla Smith)	• Chemical extraction (4) • Demand and supply (3)	• Price sensitivity (1) • Cultivation (2)	
		Non Timber Forest Products (NTFPs)		
6.	Allo (*Girardinia diversifolia)*	• Technology for coarse fiber (4) • Aspiration for raw material collection (4)	• Product making opportunity (0) • Legal procedures (2)	• Employment from thread (+4) • Product making aspiration (+3.5)
7.	Amriso (Broom-Grass)	• Cultivation in CF (4) • Multiple use of Dankla (3)	• Knowledge about disease (2) • Value addition (2)	
8.	Lokta (*Daphne Bholua)*	• Labor continuation (3) • Quality products (3) • Wastage control (3)	• Lokta resources (1) • Market (2)	

9.	Khair (*Acacia catechu)*	• Medicinal uses (3) • Sale from UFUGs (3) • sustainability of resources (3)	• DAG benefits (1) • Alternative of Katha production (2)	
10.	Khote Salla (*Chir Pine)*	• Modality of resin collection (4) • Benefits to DAG (3) • Efficient industry (3)	• Resin tapping methods (1) • Multiple uses (1)	
	Timber and Other Forest Products			
11.	Uttis (*Alnus Nepalesis)*	• Establishment and operation of enterprise (1.5) • Uttis sale by CFUGs (1.5) • Multiple uses of Uttis tree (1.5)	• Uttis cultivation (1) • Skill training (1)	
12.	Bans (Bamboo)	• Technology uses (3) • Demand and supply (3) • Product development (3)	• Supporting organizations (1) • Quality seedlings (2)	• Cost leadership (+1)

The value for comparison was ranged from zero to five and therefore the gaps between market demands and present situation mean level or extent of required functional upgrading of value chain actors. So, it is understood that higher the gaps higher the needs and lower the gaps lower the needs in functional upgrading of value chain actors. The table 14.2 clearly shows that the gaps between market demands and present situation of different forest products differ from one product to another in different scales in diverse aspects. This clearly indicates different forms of demands, needs, and requirements for value chain upgrading of different forest products in Nepal. Similarly, these gaps also demand further analysis for the identification of the actors and their functions for exploring the potential value chain upgrading strategies.

Summary of Value Chain Upgrading Strategies

The study finally explored the possible opportunities for value chain upgrading of study products. They were presented into nine different aspects of the products; however these have been categorized and summarized into three major dimensions in this chapter: a) Value Chain players, namely product, process, function, channel and inter firm; b) Value Chain supporters and Value Chain influencers: namely BDS, FS and BEE; c) Addtional livelihood opportunities and sustainability aspects namely intersectoral, and sustainability strategy.

Table 14:3: Summary of the upgrading strategies related to the Value Chain players

SN	Products	Upgrading related to the value chain players				
		product	process	function	channel	Interfirm
			Medicinal and Aromatic Plants(MAP)			
1.	Alaichi (Cardamom)	Skills and technology for quality product	Promote seedling based cultivation	Technology for product grading at local level	Explore direct market access to the third countries	Formation of district network and linkage with national network
2.	Bael (*Aegle Marmelos)*	Storage technology	Technology for harvesting	Juice production from other fruits	Market positioning	Linkage development with entrepreneurs in other parts
3.	Chiraito (*Swertia chirayita)*	Enhancing skill for quality products	Technology transfer to ease transportation	Cultivation by DAGs in CF land	Market information for comparative advantage	Product based network formation
4.	Rudraksha (*Elaeocarpus sphaericus)*	Trade of certified product	NA	Systematic cultivation and trade	NA	Strengthening of product based network
5.	Satuwa (Paris Polyphylla Smith)	Quality product (cleansed, dried, graded and packaged)	Chemical extraction	Cultivation and trade of quality products	Trade through national pharmaceutical industries	Network formation and linkage development
			Non Timber Forest Products (NTFPs)			
6.	Allo (*Girardinia diversifolia)*	Product diversification	Technology for coarse fiber	Skill and function transfer to downward actors	Facilitate for cheapest means of transportation	Alliance for trade and access to technology
7.	Amriso (Broom-Grass)	Broom making at local level	Drying, grading and packaging at local level	Function upgrading of actors	Same channel with upgraded functions	Alliance building among all level of actors
8.	Lokta (*Daphne Bholua)*	Wastage control and quality product	Lokta cultivation as IGA	Cultivation by collectors	Market linkage expansion	Linkage with product based national network (e.g. HANDPASS)
9.	Khair (*Acacia catechu)*	Khair sale from PF and CF land	Khair harvesting from CF land	Vertical integration of actors	Explore potential channel for new products	Vertical integration of actors
10.	Khote Salla (*Chir Pine)*	Resin collection in partnership of CF and private	Resin tapping through bore hole method	Expand the value chain of product	New channel for new products	Facilitate community led enterprises

Timber and Other Forest Products						
11.	Uttis (*Alnus Nepalesis)*	Briquette from waste	Uttis harvesting from CF land	Veneer from other species	Expanding market channel	Linkage between actors at different levels
12.	Bans (Bamboo)	Product diversification	Technology transfer	Facilitate cooperative based production	Explore local market channel	Formation of cooperative

The value chain upgrading strategies presented in the table 14.3 are some of the representative strategies outlined in the VCA studies in this study. The aim of presenting some recommendations in this chapter is to show the sample of what upgrading strategies were identified and how they look like when they are presented in a combined form. This also helps to understand their linkages in terms of transforming them into the action and create opportunities for possible practical integration. To sum up, the upgrading strategies related to the market actors for 12 forest products clearly show the different situations, needs and requirements for value chain upgrading in Nepal.

Figure 14:1: Framework for Value Chain Upgrading Strategies

Three aspects of value chain upgrading strategies could be categorized under supporting services strategies since they are related to the services in demands or required by the value chain actors. These services play vital roles in the value chain of the products and hence identification of the gaps, required services and value chain upgrading strategies is most essential for forest products in Nepal. Some representative upgrading strategies are presented below.

Table 14:4: Summary of the upgrading strategies related to the BDS, FS and BEE

SN	Products	Upgrading strategies related to the supporting services (BDS, FS and BEE) for value chain actors		
		BDS	**FS**	**BEE**
		Medicinal and Aromatic Plants (MAP)		
	Alaichi (Cardamom)	Skill and knowledge for quality seedling	Access to finance for holding the product	Facilitation for direct exporting to third countries
2.	Bael (*Aegle Marmelos)*	Enterprise governance coaching	Access to finance for advancement of technology	Contractual obligation for raw material collection
3.	Chiraito (*Swertia chirayita)*	Compressing technology	Access to finance for quality seedling and compressing technology	Facilitation for legal trade
4.	Rudraksha (*Elaeocarpus sphaericus)*	Knowledge base for expanding cultivation	NA	Facilitation of systematic royalty collection
5.	Satuwa (Paris Polyphylla Smith)	Skills for cultivation	Linkage with FS for cultivation	Awareness raising about existing legal processes
		Non Timber Forest Products (NTFPs)		
6.	Allo (*Girardinia diversifolia)*	Legal facilitation collection and trade	Access to finance for new technology	Policy provision for trade
7.	Amriso (Broom-Grass)	Market information at local level	Access to finance for holding products	Facilitation for final product making
8.	Lokta (*Daphne Bholua)*	Improve enterprise governance	Access to finance for quality products	Ease the administrative requirements and processes
9.	Khair (*Acacia catechu)*	Awareness on legal processes of trade	Access to finance for enterprise	Khair sale from CF
10.	Khote Salla (*Chir Pine)*	Awareness for legal procedures	Access to finance for community led resin tapping	Facilitation for the use of local labor
		Timber and Other Forest Products		
11.	Uttis (*Alnus Nepalesis)*	Facilitate for new technology	Access to finance for technology	Policy for bamboo as NTFPs
12.	Bans (Bamboo)	Awareness for legal process of trade	Access to finance for technology	Facilitation for Uttis from CF land

It is commonly understood that every firm or enterprise requires better BDS, FS and BEEs for their sustainable growth and operation. However, the level of demands may differ from product to product and place to place. These differences are determined by many factors such as access to services, supply and demand situations, competitiveness of the entrepreneurs or enterprises and many others. Summary of the upgrading strategies presented in the table 14.4 also clearly shows different forms, types and extent of needs, demands and requirements of different forest products in Koshi Hill districts. This indicates the importance of identifying gaps, required services and upgrading strategies for a product or a firm within the existing contexts.

Livelihood improvement is one of the inevitable and most prioritized components for both development and research projects. The difference is that the development project deals with actions for livelihood improvements; while research projects deal with methodology or approach of livelihood improvement. Therefore, it must be a part of VCA studies and hence the studies discussed in this publication also tried to deal with livelihood improvement of the people in some respect. In addition, the studies have also tried to address social and sustainability components of the study products. The study and analysis tried to provide with some value chain upgrading strategies in these three aspects.

Table 14:5: Summary of the upgrading strategies related to the intersectoral and sustainability

SN	Products	Upgrading strategies for Livelihood Improvement and social capacity enhancement	
		Inter-sector	**Sustainability**
	Medicinal and Aromatic Plants (MAP)		
	Alaichi (Cardamom)	Increase income from the use of other parts	Develop national branding
2.	Bael (*Aegle Marmelos)*	Product making from other parts of Bael	Facilitation for optimum operation of enterprise
3.	Chiraito (*Swertia chirayita)*	Additional income from other NTFPs	Backward and forward linkages of network
4.	Rudraksha (*Elaeocarpus sphaericus)*	Cooperative formation	Commercial cultivation
5.	Satuwa (Paris Polyphylla Smith)	Cultivation and trade of Chiraito	Promote piloting sites as resources centers
	Non Timber Forest Products (NTFPs)		
6.	Allo (*Girardinia diversifolia)*	Cultivation and income from other NTFPs (like Chiraito, Lokta)	Prioritize as major product of the place
7.	Amriso (Broom-Grass)	Increasing income from other fiber making activities	Leadership upgrading
8.	Lokta (*Daphne Bholua)*	Income from Allo and bamboo	Knowledge for harvesting
9.	Khair (*Acacia catechu)*	Innovation and investment in other uses of Bael tree	Vertical integration of actors
10.	Khote Salla (*Chir Pine)*	Explore medicinal and other uses of Khote Salla	Increase income and employment
	Timber and Other Forest Products		
11.	Uttis (*Alnus Nepalesis)*	Briquette production from wastage	Ensure sustainable harvesting
12.	Bans (Bamboo)	Use of wastage parts of bamboo	Branding ownership

Major objectives of the intersectoral upgrading strategies were to explore additional opportunities for improving the livelihood of primary actors (especially the collectors and farmers) through increasing their income; while the inter-firm upgrading strategies were aimed to explore opportunities for empowering and capacitating the producers/entrepreneurs through developing their relation and networks with relevant actors and service providers. Similarly, the study tried to explore the opportunities for making upgrading strategies developed sustainable. The upgrading strategies presented in the table 14.5 clearly show that needs and demands for upgrading differ from product to product. This may be due to many reasons and many of the reason have been already

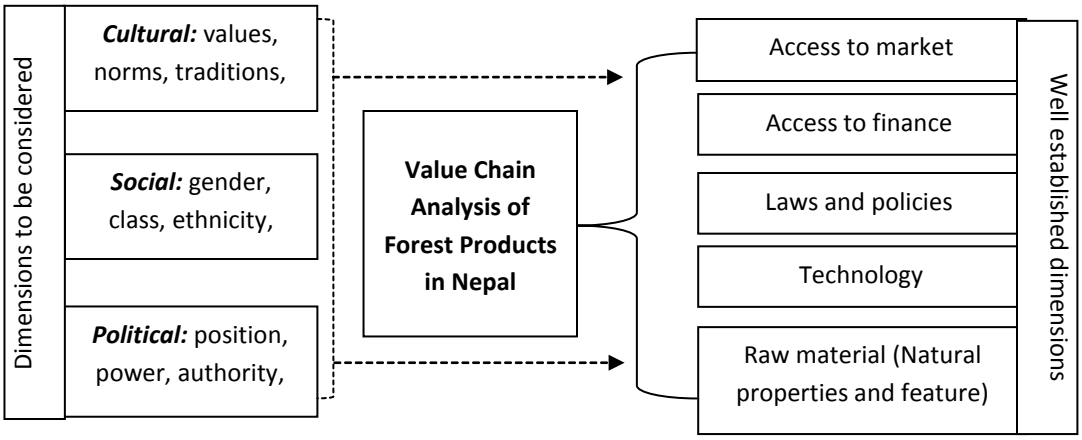
discussed in the earlier sections of this chapter and many of others are lacking in this writing. However, based on the presented summary of the upgrading strategies on livelihood, social and sustainable aspects, it can be concluded that product based strategies are required and hence exploring potential opportunities is an important step for this.

Exploration of Embedded Dimensions in Value Chain Analysis

The conceptual underpinning of VCA gives rise to the debate on what it is and what is not and how it is and how is not, when the arguments and methodologies applied by different experts and institutions are brought into comparison and discussions. Some argue it as tools for enhancing competitiveness (Kaplansky 2003) of a firm while others argue it as tools to introduce multidisciplinary approach in NTFPs; while some VCAs intend to focus on consumer segmentation rather than end market analysis and other on the inclusion of environmental aspects. However, this chapter is does not deal with the diverse opinions, arguments and experiences of experts and institutions on this issue; rather the chapter tries to deal with the lessons learned and conclusions derived from the VCA of 12 selected forest products from four districts in Koshi Hill region.

The VCAs of selected forest products have become a means and tools for understanding the dynamics of value chain of forest products that have been selected for this study. The VCA of the selected products was started with the understanding of natural habits/characteristics of particular forest species and was ended with the recommendation of upgrading strategies in its value chain. However, in between, the VCA study dealt with different aspects of the products such as cultural, economic, market, legal, technological and financial issues related with the particular products. The objective of dealing with these all was to understand the multiple dimensions that are embedded within the value chain of that particular product. It was observed that the underlying characteristic features of the multiple dimensions have been playing significant roles, functions and influence in the value chain of that particular product. Therefore, understanding these aspects of particular products became important for VCAs of the forest products included in this publication.

Figure 14:2: Major dimensions of value chain analysis of forest products in Nepal



The figure 14.2 tries to show how different dimensions of particular forest products may get affected or influenced by different dimensions associated with the particular forest product. However, some of the dimensions, though they are important in determining the value chain of the products, in most of the cases are less acknowledged and considered in the VCA

studies. Namely, cultural, social and political dimensions associated or related with the products are little considered in the value chain studies. These dimensions are not directly visible, however in fact these dimensions –in a way or the other – have been playing vital roles in determining or influencing the functions/roles of value chain actors in many cases and circumstances.

But it is equally important to know that these dimensions may have relative importance for specific forest products and different contexts. For example, Rudraksha and Bael products in this study context found higher cultural values, while Allo cloth weaving and Bamboo handicraft (at least in the case of Aakhisalla VDC of Dhankuta district) making have higher social values. Similarly, resin tapping is most influenced by the political power and authority because policies and decisions about this product (observed in this study) are influenced and controlled by the national actors and contractors. Therefore, well established dimensions of VCA study is not sufficient to understand value chain of the forest products and hence it demands exploration of other invisible and new dimensions of the products that are playing significant roles in determining value chain of the forest products.

Influence or effect of the different dimensions of the products may differ from one product to another because of the fact that value and use of a product differ from actor to actor and one place to another. For example, VCA of Allo helps to come in the conclusion that the legal provision of trade and export of Allo raw materials (through national park area) and its market products (through security and costume office) is a great hurdle that entrepreneurs are facing; however the case is different for Lokta hand-made papers (much hurdle is observed in the fulfillment of the official requirements during whole process such as harvesting, processing and export). However, both of these belong to the legal issues in the embedded value chain. The underlying situation observed and shared by the actors of different products were very important to enrich the understanding of how value chain of a forest product is influenced or determined by underlying multiple dimensions.

Table 14:6: Multiple dimensions of forest products with scale of influence to the value chain

SN	Products	Multiple dimension of forest products and extend of influence in the VCA[56]							
		Social Aspects			*Other Aspects*				
		Cultural[57]	*Social*[58]	*Political*[59]	*Natural*[60]	*Technology*[61]	*Policy*[62]	*Financial*[63]	*Market*[64]
	Medicinal and Aromatic Plants(MAP)								
1.	Alaichi (Cardamom)	No	Medium	Medium	No	Low	Low	Medium	High
2.	Bael (*Aegle Marmelos)*	High	Low	Low	Medium	Low	No	Low	No

[56] The relation between particular forest products and people has been categorized into four levels: no, low, medium and high.
[57] Cultural, in this study, refers to the traditional and customary values, beliefs and practices of local people associated with the particular product.
[58] Social, in this study, refers to the differences in terms of caste/ethnicity, gender, class, occupation of the people.
[59] Political, in this study, refers to the power, position, authority of the people that influence decisions and activities related to the particular products.
[60] Natural, in this study, refers to the natural features of the particular products that determine relation and behaviors of local people.
[61] Technological, in this study, refers to the technological advancement/innovation/use for the processing of the particular products.
[62] Legal, in this study, refers to the legal and policy provision that hinders the cultivation, processing and trade of particular forest product.
[63] Financial, in this study, refers to the investment status or policy for investment by private sectors or financial institutions for the particular products.
[64] Market, in this study, refers to the market access and influence of market of the particular products.

3.	Chiraito (*Swertia chirayita)*	No	Medium	Medium	Low	No	Low	Low	High
4.	Rudraksha (*Elaeocarpus sphaericus)*	High	Medium	Medium	Medium	Low	Medium	Medium	High
5.	Satuwa (Paris Polyphylla Smith)	No	Medium	Low	Low	No	Low	No	High
	Non Timber Forest Products (NTFPs)								
6.	Allo (*Girardinia diversifolia)*	Medium	High	Low	Medium	Medium	Medium	Low	Medium
7.	Amriso (Broom-Grass)	No	Medium	Medium	No	No	Low	Low	Medium
8.	Lokta (*Daphne Bholua)*	No	Medium	Medium	Medium	Low	Medium	Medium	High
9.	Khair (*Acacia catechu)*	No	Medium	High	Medium	Low	High	Medium	High
10.	Khote Salla (*Chir Pine)*	No	Medium	High	Medium	Low	High	Medium	High
	Uttis (*Alnus Nepalesis)*								
11.	Uttis (*Alnus Nepalesis)*	No	Medium	High	Medium	Low	High	Medium	High
12.	Bans (Bamboo)	No	High	Low	No	Low	No	Low	Low

It is already discussed that the natural characteristics, including chemical properties of the product, technological dimensions (availability, investment, advancement etc.), existing policies provisions including enabling policy environment, access to finance including investment status, and market dynamics (access, demand, supply etc.) are well established dimensions of VCA studies globally. However, the social dimensions of the products are rarely considered. So, the scale of influence summarized in the table 14.6 clearly indicates the importance of cultural, social and political dimensions of the forest products in Nepal. The table also clearly shows that the influence of the different dimensions may differ from one product to another. It demands further analysis to know the reasons of these differences which is lacking in this chapter.

Conclusion: Lessons, Opportunities and Challenges

The lessons learned in the methodological approaches remained very important in this VCA study. To be precise, the methodology adopted in this study encompasses with field level observation and consultation (with all level of value chain actors, i.e. local to the national) to the review and analysis of available data and literatures. However, the findings and conclusions were primarily based on the reflection and understanding of the experiences, knowledge and aspirations of the value chain actors associated with the particular products. The aspiration of value chain actors have been tried to analyze to identify and draw upgrading strategies of value chain actors. For example, the end market strategy of study products have been tried to compare and analyze from two different situations: a) an ideal situation – conceptualized from the market demands; and b) existing situation – observed and shared by the value chain actors. Another dimension of the methodology was the selection of forest products for this VCA. The processes adopted to select the particular product for VCA and its underlying causes or reasons were equally important methodological aspects of this study.

Selection of the products for this study was based on the consultation with stakeholders and value chain actors with the aim to know its viability of trade and enterprise promotion. The selection was based on the priority ranking of the viability of trade and enterprise promotion of particular forest products. The methods adopted in the selection of study products clearly indicate that the studied forest products are most potential and viable for the trade and potential for the contribution to local and national economic growth. In other words, methodology adopted in the selection of forest products for VCA has comparative advantage of promoting trade and economic growth; however it will depend on the applicability of the upgrading strategies mentioned/recommended in the particular VCA or their best utilization or application on the ground.

The study team believes that the upgrading strategies recommended in the VCAs are practical and practicable since these are based on the aspirations of value chain actors, especially from the experiences and perceptions of the producers, actors responsible in the processing and the traders. In this context, it is assumed that there must be less questions on the applicability of the recommended upgrading strategies of the VCA; rather the best use or transformation of the upgrading strategies will determine the extent of value addition of these VCAs on the real ground.

In order to conclude the methodological lessons of the VCA study, it is experienced that the identification and analysis of value chain actors and their functions of forest products in Nepal is very complex. There may be innumerable reasons behind this. Of them, observation and reflection of this project (based on the methodology adopted in this study project and experiences of authors in this chapter) team has identified three issues as main reasons: a) lack of establishment of the products as well functioning business firm; b) lack of enabling policy environment; and c) lack of access and awareness about the existing legal and policy provisions for most of the value chain actors. In this context, understanding of the multiple dimensions of a particular product became a part of focus in identifying value chain actors and their functions in the whole value chain of that product. This approach helped to identify value chain actors at different point of the particular forest products and access/consult to understand their experiences and aspirations in the particular product. It could be concluded that understanding of the multiple dimensions of a particular product is very important in value chain of a particular forest product and the methodology adopted in the study determines level of understanding on the conceptual and methodological embedded-ness of the value chain actors.

One of the important lessons of this VCA study is that legal and policy provisions are not only the obstacles for the establishment and promotion of forest based enterprises in Nepal but there are also lots of opportunities within the existing legal and policy provisions in Nepal. But for this, the awareness raising, capacity enhancement and facilitation are highly desirable, at least in the context of Koshi Hill region. Similarly, the lack of technological innovation, lack of technology transfer, access to finance, quality product development, supply of quality and quantity products are also equally important problems in enterprise promotion in Koshi Hill region.

Exploring potential opportunities for livelihood improvement must be, in a way or the other , an ultimate goal of enterprise promotion or business development. Regarding this, the findings of this study clearly indicate that NTFPs based enterprises are most potential in the Koshi Hill region. Not only the NTFPs based enterprises are the priority for investment, but also this is most potential for creating employment opportunities and means of income generation for people in rural communities. However, the study observed that none of the

entrepreneurs have been able to be promoted as lead entrepreneurs or firm in the region. So, few of the enterprises or entrepreneurs (at least one for each products) should be supported and promoted as lead firm or lead entrepreneurs in the region so that s/he could lead whole processes of that product as an example and model of that product in the region.

It is already discussed that the study also tried to look at the market access from local to international level. It is clearly presented that majority of the selected forest products are, in a way or the other, , exported to international market, namely India and China including some other Asian, European and American countries. This clearly indicates that forest products in Koshi Hill region are also contributing to the global economy and markets. This means forest products in this region are also contributing to the global value chain.

A clear message of this study – depicted from the identification and analysis of value chain actors, their functions, access to market, access to finance, technological advancement and many other aspects of the products – is that the socio-cultural, political and market actor's embedded-ness in the VCA is most complex but crucial for promoting any types and forms of forest based enterprises in Nepal (especially in the Koshi Hill region). This could not be understood and sensed from the monolithic and top down approach instead it requires engrained, well informed and empirical based study, analysis and also the interventions. In addition, the understanding of the aspirations of value chain actors is most essential.

The VCA study of selected 12 forest products has explored, discussed and recommended with some value chain upgrading strategies (the summary have been already presented in this chapter as well). There are some important opportunities of these strategies.

a) ***High aspirations of value chain actors:*** It is observed that the value chain actors, especially the producers, farmers, entrepreneurs, traders, cultivators, of almost all of the study forest products have higher level of aspirations for their enterprises or firms. Their confidence on their investment and continuous efforts for their enterprises are very important and good symptoms for the success of forest based enterprises in Koshi Hill districts.

b) ***Good market access:*** The forest products selected and studied do not have the market problems, rather the production and supply of the almost all of the products are less than the market demands. Moreover, the study region has very good market access to both the national and international levels. For example, Indian market and market to China are easily accessible for almost all of the products in the study region.

c) ***Priority of economic growth from forest sectors:*** The geographical coverage and the conservation status of forest resources are now quite good in Nepal. So, the recent demands and expectation of forest resources in Nepal is to increase economic growth from forest resources. So, all of the forestry stakeholders, including donors, Nepal government and related line ministries have prioritized the economic growth from the forest resources in Nepal. So, this priority obviously creates opportunity for the best use of these VCA study recommendations.

d) ***Highly potential for resources availability:*** The VCA study products are highly abandoned forest species in the Koshi hill region. Similarly, the cultivation and supply of these products are also mostly practiced, encouraged and highly potential in this region. So, there are higher chances of sustainable production, supply and marketing of these forest products from this region.

e) ***Improving basic infrastructure facilities:*** The establishment and promotion of enterprise or business firms necessarily require with the basic infrastructure like road transportation, electricity, means of communication and other social services and networks. The Koshi Hill regions are comparatively advanced in this regard. So, this situation also indicates the higher opportunities of the VCA studies in this region.

Despite the above discussed opportunities, there are also some challenges of the value chain upgrading strategies explored and recommended in the VCAs. Some of the major challenges are discussed below.

a) ***Application of the VCA approach and recommendation of these studies:*** It is a fact that many of the studies in Nepal end with production or result of things in the paper but not in the practice. Similar is the case regarding the application of VCAs of different products, firms and enterprises. In other words, the culture of research based policy formulation and study based intervention has not been yet developed in Nepal. Moreover, there are very rare cases that the firms and enterprises in Nepal are established, promoted and developed on the basis of value chain approach. Similarly, many of the entrepreneurs in Nepal are not aware about the importance and use of value chain (and VCA) approach for enterprise development and operation.

b) ***Lack of enabling policy environment:*** Though Nepal is successful in expanding forest coverage and forest resources conservation, the existing policies and laws are not favorable for forest based enterprises establishment, promotion and their operation. This is due to the policy hurdles and tedious administrative procedures and requirements in every step of enterprise operation. For example, the existing laws do not allow to establish any of the forest based enterprises in proximity to the forest area (earlier, it was 3 KM but now flexible policy is in the process of formulation). Similarly, there are lots of policy and administrative processes, requirements and hurdles in harvesting, collection, transportation and marketing of forest products. So, application of value chain upgrading strategies are challenging when these hurdles are visualized.

c) ***Political instability:*** Nepal is undergoing through political transformation. A sobering problem in which the state has been suffered for long years is instability of the government. Regarding recommended value chain upgrading strategies, its direct implication is on the formulation of appropriate policies and political influence in the day to day life of local people, including enterprises and entrepreneurs. So, national politics has less successful in prioritizing and operating the forest related and forest based enterprises for long years. In this context, stable government is highly desirable for the application of these strategies on the ground.

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Annexes

Annex 1: Local Implementing Partner Organizations (LIPO) and MSFP/JV Staffs who supported in this study

MSFP/JV Staffs		
District	**Name of the staffs who supported in this study**	
Lot Office (Dhankuta)	Dambar Tembe, Sudil Gopal Acharya, Bhakta Karki, Tanka Maya Limbu, Semina Kafle	
Dhankuta	Ananta Ghimire, Madan Bashyal, Meena Thapa, Yohesh Dhakal	
Terhathum	Ramesh Bhandari, Sumit Gautam, Nirajan Khadka, Krishna Dungana, Richa Niraula	
Bhojpur	Ramesh Maske, Binaya Shaha, Samjhana Adhikari	
Shankuwasabha	Sanjib Gupta, Tek Bahadur Baruwal, Sita Rai	
Districts/	**Name of the LIPO**	**Name of the staffs/individuals who supported in this study**
Dhankuta	FECOFUN /HIMAWANTI/COFSUN	Siva Angla and Rajendra Khadka
	SOLVE Nepal/RARA	J. P. Bhujel and Jyoti Pradhan
Terhathum	FECOFUN	Tulsi Sagraula and Laxmi Mishra
	DAS/DS/PAC	Dipak Limbu
Bhojpur	FECOFUN/COFSUN	Tek Bahadur Thapa and Sabina Rai
	SA/HEEHURLDE	Dipendra Shrestha (SA) and Utter Kumar Rai (HEEHURLDE)
Shankuwasabha	FECOFUN/COFSUN	Chindum Bhote, Wang Chedar Bhote, and Badri Sapkota
	SORDEC/TEF	Indra Kumar Rai (SORDEC); Binod Gurung and M B Limbu (TEF)

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