

MSC thesis

(Cardamom cultivation, its effect in rural livelihoods and its importance in international market)

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Table of contents

CHAPTER I

Introduction.....	5
Background.....	5
Statement of problem.....	6
Justification of the study.....	7
Objective of the study.....	8
Scope and limitation of the study.....	10

CHAPTER II

Value chain analysis.....	11
Introduction.....	11
Value chain Map.....	11
Analysis of value chain and price margin.....	13

CHAPTER III

Literature Review.....	16
Policy frameworks about NTFPs.....	16
Policy for cardamom.....	18
Uses of cardamom.....	19
Agro-Climate requirements for cardamom cultivation.....	20
Economic benefits of cardamom cultivation.....	21
Role of cardamom cultivation in biodiversity conservation.....	22
Synthesis of literature review.....	24
Conceptual framework of the study.....	25

CHAPTER VI

Material and Methods.....	26
Literature Review.....	26
Direct Observation.....	26
Questionnaire Survey.....	26
Interview with key Informants.....	27
Focus group discussion.....	27
Data processing and analyzing.....	27
Materials and Equipment.....	27
Research Process.....	28

CHAPTER V

Markets and International Markets.....	29
Traders.....	30
Pricing.....	30
Export and Import of cardamom.....	31
Cardamom and cardamom production.....	31

CHAPTER VI

Result and Discussions.....	33
Cultivation practices.....	34
Major seasons for cardamom cultivation.....	34
Major areas/VDCs for cardamom cultivation.....	35
Types of diseases that exist in cardamom farming.....	35
Species of cardamom.....	35
Average annual production of cardamom.....	36
Drying.....	37
Investments.....	38
Earnings.....	41

Availability of sufficient manpower for the processing of cardamom.....	42
Institutions providing credit.....	42
Training received for cardamom cultivation.....	43
Status of biodiversity in cardamom cultivation area.....	44
Effect of cardamom cultivation on livestock raising.....	51
CHAPTER VII	
Conclusion and Recommendations.....	63
Conclusion of the study.....	65
Role of cardamom cultivation in bio-diversity conservation.....	65
Recommendations.....	65
REFERENCES.....	68

Chapter I

INTRODUCTION

Background

Nepal is an agricultural country. With an area of 147,181 square km, Nepal, being a small land-locked country, has occupied only 0.01 percent of the world's land. It is rich in geographical, cultural, religious and linguistic significance. It has a vibrant and diverse ecosystem (Chaudhary, 1998). Producing a wide range of unique and valuable medicinal plants, it accommodates tropical forests of the Terai in the south, all the way through subtropical broad leaf and coniferous forests at the middle to temperate, and stretching to the sub alpine and alpine vegetation in the North (Tripathi, 2007).

Generally, the forest plays an important role to enhance environment quality. In addition, the forest conserves and nurtures biological resources. Hence, forest resources are an integral part of the livelihood support system in Nepal, where an overwhelming majority of the 20 million people live in the interface between forest and agriculture. The forest is a major part of the daily lives of rural people in Nepal. The forests have undoubtedly been utilized to satisfy the subsistence needs of local people for a long time. Rural communities are totally dependent on forest products i.e. fuel wood, fodder, timber and other non-timber forest products (NTFPs).

Laws such as the Forest Act 1993 and forest regulation 1995 have identified non-timber forest products (NTFPs) as important sources of income to rural people. The Nepal Biodiversity Strategy Implementation Plan (NBSIP) (2008-2012) also emphasizes the importance of exploring marketing opportunities for NTFPs. The master plan for the forestry sector, which has been in effect since 1989 (MPFS, 1989) has identified six major programs and six supportive programs. The programs include: income generation through local and economic development of the country and management of the Non-Timber Forest Products (NTFPs) with-in the framework of community forest.

Nepal hosts a wide range of NTFPs including 700 species of medicinal herbs, which forms an important part of biodiversity and the national economy (Subedi, 1997; Luitel, 2002). NTFPs consist of all the products other than timber, fuel wood, and fodder for domestic purpose. There are 76 plants of medicinal value, the main NTFPs collected is leaf litter in the form of leaves of both conifers and broad-leaved trees. NTFPs form an important part of Nepalese

economy, both locally as well as nationally. In recent years, the market of NTFPs has expanded, and this is an opportunity as well as a challenge for a sustainable, efficient, and equitable management of NTFPs resources (Ojha, 2001).

Recent studies indicate that several commercially valuable species are being over-harvested due to higher demand for raw materials for herbal industries in India and other third world countries. NTFPs, which were previously neglected and underestimated resources in Nepal, have potential to engender multi-millions dollar earnings (Subedi, 1997). The country is rich in terms of floral diversity. Every year, forty –two thousands tons of NTFPs have been harvested in Nepal with a trade value of 26.8 million dollar (ANSAB, 1997; CECI, 1999).

Statement of problem

Rising demand in the market has influenced farmers of Sankhuwasava district to switching from farming traditional crops to cardamom. About 70,000 farmers of eastern Nepal are involved in its production. The product offers a unique advantage as not many countries can produce it (Sharma, 007). The exports of cardamom are mainly done through middlemen who work on a commission basis and have disabled farmers from enjoying the upper hand in pricing. Some of the causes of such adverse conditions are poverty, illiteracy, health and problems of transport. There is no policy support to expand production, provide credit facilities to farmers and support the emergence of local stockiest.

On the other hand, from the biodiversity conservation point of view, it is not clear whether cardamom cultivation is sustainable in the long run. People's actions are reducing biodiversity by hampering forest resources that foster cardamom cultivation.

Some of the organizations like FECOFUN (28\11\009) stated that it is stepping forward for biodiversity conservation and trying to stop farmers from cultivating cardamom in the community forests. However, it is a pity that they have not developed alternate sources of income and livelihoods from new agricultural products, which will cause the farmers to give up cardamom cultivation in the forest.

Furthermore, how economic proceeds of some of these lucrative endeavors will be shared equitably are also burning questions that affect the livelihoods of farmers.

Justification of the study

Farmers in the areas examined for this study use both private and community forests for cardamom cultivation, thus suppressing forest regeneration by the weeding out of tree seedlings. Combined with this, there is high demand for fuel wood required for cardamom drying. Thus cardamom cultivation may lead to the demise of forests. Forest degradation and deforestation are usually the result of over exploitation in search of income without alternative income generating options.

The rural communities depend on forest-based products like NTFPs, timber, fuel wood and livestock raising for their livelihoods. Since cardamom is also a non timber forest-based product (NTFPs), the rural livelihoods depend on its cultivation using traditional techniques for collecting these plants. Most of the people residing nearby cardamom cultivation area are engaged in its cultivation. The influential people are privatizing big sizes of the forest areas for cardamom cultivation. The income that comes from such large endeavors, go into the hands of few selected people. Only the smaller portion of the forest is available to others. Even the remaining forest is also being used by community forestry, which is again leased out to the selected people for the cardamom cultivation. Since the less forest area is available for other purposes, there is no space to extract basic forest products like grasses/ fodder and limited grazing facilities for live stocks thus reducing the alternative enterprises that depend on forest-based products such as livestock raising. Again marketing/ trading/ processing is also controlled by few people.

Based on these realities and facts, I would like to have inquiries on

- Whether cardamom cultivation is the best alternative for income generation in the study area?
- How cardamom cultivation is affecting biodiversity?
- And how is this contributing to the benefit of rural poor?

Objectives of the Study

General objective

The general objective of this study is to identify the effects of cardamom cultivation in rural livelihood as well as its effect on the status of biodiversity in Diding (ward no:2,3,4,5) and Matshya Pokhari(ward no:2,5) VDCs of Sankhuwasava District and its market.

Specific objectives

Specific objective of the study are as follows:

- To document the status of cardamom cultivation.
- To identify the status of biodiversity in cardamom cultivation area.
- To identify the effects of cardamom cultivation in the rural livelihood.
- To compare cardamom cultivation with other income generating alternatives in terms of comparative benefits.
- To recommend appropriate measures based on result and discussion for the improvement of cardamom cultivation.

Scope and Limitation of the study

Description of the study Area

The study was carried out in Diding and Matshya pokhari VDCs of Sankhuwasava district. These VDCs are located in Sankhuwasava district, Koshi zone, in the eastern part of Nepal. Sankhuwasava district is one among the 16 remote districts of kingdom of Nepal. It is a mountainous district, situated in the northern part of Koshi zone. The spatial location of this district is between latitude $27^{\circ} 10'$ to $27^{\circ} 55'$ north and longitude of $88^{\circ} 57'$ to $89^{\circ} 41'$ east.

Sankhuwasava district, the district of Mt.Makalu has 33 VDCs and one municipality (Khandbari, the headquarter of the district). It is surrounded by Taplejung and Terhathum district in the east, Solukhumbu and Bhojpur in the west, Dhankuta in the south and by Tibet of china in the north. On the basis of land area, it is the largest district among the districts of Koshi zone. It has 3,177 sq.km. Area and the size of population are 141903. The density of population is 48.8 per sq.km. (CBS, 1991) and 94.27 percent of the total populations are dependent on agriculture.

The famous natural scenarios–Milke, Danda, Kumbhakarna, Lambhasumwa, Pachpokhari, Jaljalae, Sanglungma, Posti Bhanjyang have highlighted the position of the district.

General description of Sankhuwasava District

S.N.	Items	Description
1	Climate	Sub-tropical monsoon and warm
2	Soil	Alluvial, Red brown, Lacustrine blackish
3	Aspect	Valley and Hills
4	Major rivers	Arun, Sankhuwa ,Sava
5	Vegetation types	Papal, Kattus, Sallo, Chilaune, Uttis, Okhar, Chap, Rudrakshya, and other NTFPs
6	Races	Rai, Kami, Tamang, Damai, Sarki, Gurung, Sherpa, Newar, Magar, Limbu, Brahmins

Sample selection process and sampling

The study was conducted in two VDCs Diding(ward no:2,3,4,5) and Matshya Pokhari (ward no:2,5) of the Sankhuwasava District. Since the population was homogeneous, the random sampling method was applied for the selection of samples. Household number in Diding was less so standard sample size i.e. 20% of the household number was taken but in the case of Matshya Pokhari, the household number was more so due to the time constraint only 10% of the total households number was taken as sample size.

Matshya Pokhari(ward no:2,5)

Total households = 239

Sample size (n_1) =10% of 239

$$=23.9$$

$$\sim 24$$

Diding (ward no: 2,3,4,5)

Total households=263

Sample size (n_2) = 20% of 263

$$= 52.6 \sim 53$$

$$\begin{aligned}\text{Total sample size (n)} &= (n_1+n_2) \\ &=24+53 = 77\end{aligned}$$

Household survey to know about the status of cardamom cultivation and its effect on rural livelihoods and bio-diversity conservation was conducted with farmers both having large cardamom area and those having no area for farming at all to incorporate the difference incurred by cardamom cultivation in the rural livelihoods.

Scope and limitations of the study

This study presents the current status of cardamom cultivation and its effect on rural livelihoods and on biodiversity conservation. This study provides information to the Government, line agencies, community, policy makers and researchers to carry out further research.

The study is focused on Diding (ward no:2,3,4,5) and Matshya pokhari (ward no:2,5). Therefore the result obtained from these VDCs cannot be generalized as that of the whole cardamom producing areas of Sankhuwasava District. Research was done within short period of time and the details of the field level practices may be hard to be incorporated in the study and may not explain overall aspects of cardamom cultivation. Similarly there were difficulties in the collection of the necessary and important facts due to the unavailability of the sufficient relevant and up to date information

Although the study tried to include all the levels of the cardamom cultivators involved in the data collection, women and some cultivators were not able to provide satisfactory information.

Chapter II

VALUE CHAIN ANALYSIS

Introduction:

With an objective of studying value chain an extensive field visits were carried out in five major cardamom growing hill districts of Eastern Development Region – Ilam, Panchthar, Taplejung, Dhankuta and Terhathum. The field visits concentrated on discussions with Cardamom growers & traders, and also carried out a series of interactions with concerned stakeholders–Commercial Agricultural Alliance (CAA) district offices, District Chamber of Commerce and Industry (DCCIs), District Agriculture Office (DADOs), Cardamom Development Center, Pandam, Ilam, Cooperatives, NGOs/INGOs, individual growers, etc. The secondary data and information so collected have been duly analyzed and interpreted to derive upon following findings and its corresponding chain produced.

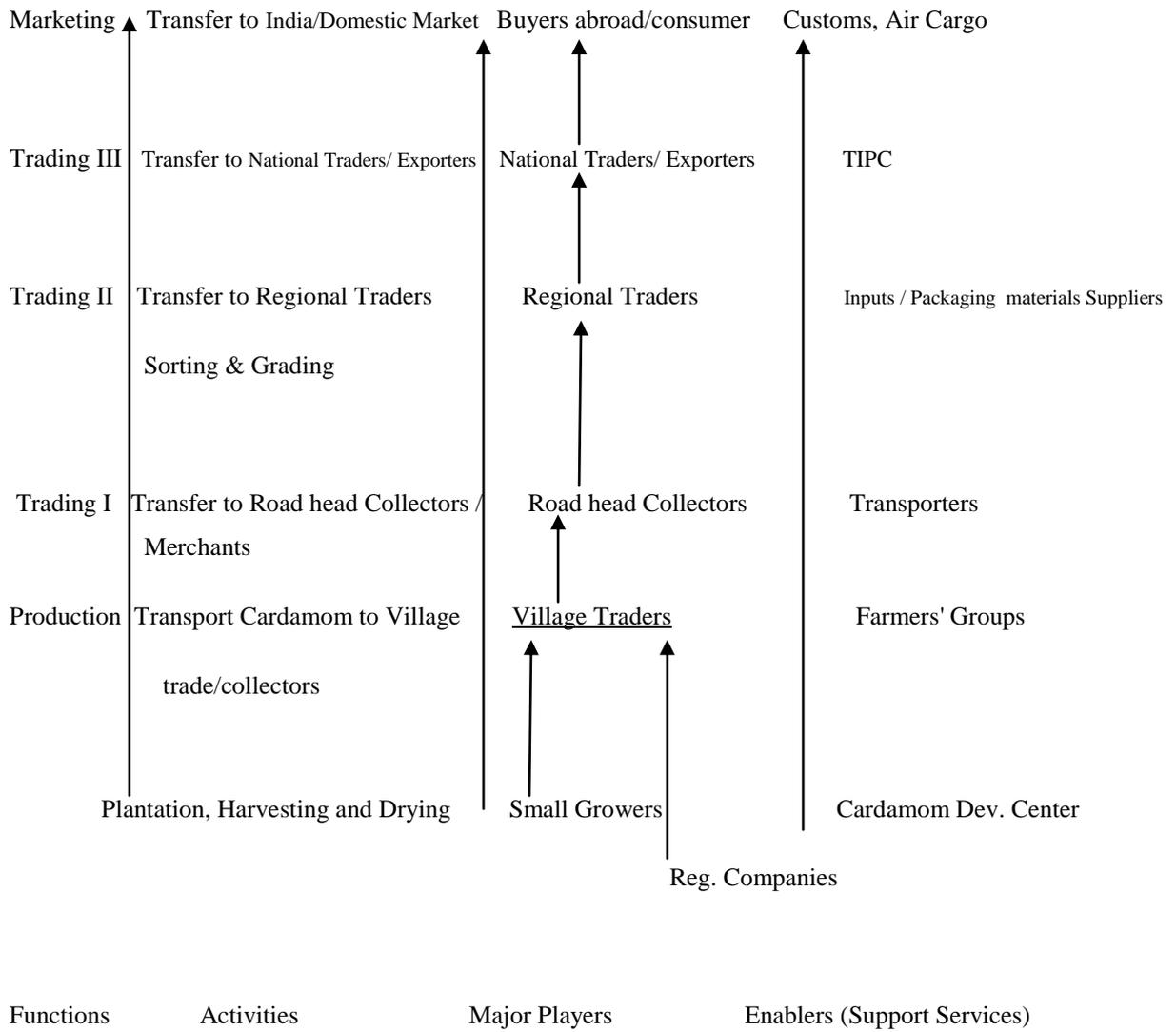
Value Chain Map

As show in figure below, the cardamom value chain map provides a graphic preview as it moves from production to the consumers, passing through different stages and processes. The linkages are shown vertically from bottom to the top. The left hand blocks represent the major functions of the chain. The functions, in this case, include production, collection, trading and marketing. The second blocks represent the activities carried out to accomplish listed functions and third blocks – the major players involved in carrying out the functions and activities.

As seen in the diagram below, some players perform more than one function whereas the others are confined to only one function. For example, the road head traders both collect the product from farmers and village traders, and supply them to the regional traders. And they in turn supply to national traders/exporters.

The supporting service providers or the enablers, shown on the right hand block, assist and facilitate the players in carrying out their functions. The enablers are mainly the institutions - formal and informal, credit suppliers. The roles of the enablers can encompass several actors and functions in the value chain.

Large Cardamom Value Chain Map



Analysis of Value Chain and Price Margins

The analysis of price margins has been carried out by using a standard format that shows major costs, losses, margins and prices along the chain and the share of each players as the product moves from production to local traders, wholesale market and finally up to the exporters. The analysis is based on the information obtained along the Koshi corridor.

The Table below illustrates the price margin analysis of cardamom. It shows the analysis of per unit margins retained by the major players along the chain from producers to the exporters.

Value Chain of Cardamom (1Kg of Dried Cardamom)

Farmers/ Growers		Local traders		Wholesalers		Exporter	
Item	Cost	Item	Cost	Item	Cost	Item	Cost
Production cost		Assembling cost		Assembling cost		Assembling cost	
Seed materials	8.63	Cleaning/sorting	0.25	Sorting/tail cutting	3	Cleaning/sorting	1.5
Fuel wood	4	Packaging	0.14	Overhead cost	2	Overhead cost	1
Labor	56						
Others	4						
Total production cost	72	Acquisition cost	195	Acquisition cost	210	Acquisition cost	225
		Transfer cost	0.75	Trucking cost	1	Trucking cost	0.8
Post production	1.5	Total Assembling cost	196	Total assembling	216	Total Assembling cost	228

cost				cost			
Total Farm level	74	Total Trading cost	196	Total Wholesaler level cost	221	Total Export level cost	233
Losses	10	Losses	5	Losses	3	Losses	2
Margin	111	Margin	9	Margin	1	Margin	15
Average farm gate price	195	Assembler level price	210	Wholesale level price	225	Wholesale level price	250

Note: Calculation based on field study

Farmers/Growers

As seen from the table above, the farmers/growers share the largest chunk of margin, compared to others along the chain. Total production cost calculated at full maturity of the plantation is Rs.72 per kg of dried cardamom. With the post production cost included, the total farm level cost is around Rs.74 per kg.

Local Traders

Role of local traders along the value chain is equally important. The major costs incurred by them are acquisition, cleaning, packaging and transferring. The margin enjoyed by them is comparatively low, Rs.9 per kg.

Wholesalers

The wholesalers on the other hands also support value chain by bridging the farmers/traders with those of exporters. In many cases the wholesalers also act as exporter. The margin calculated for them is Rs.1 per kg.

Exporters

Exporters are the last rungs of the value chain. They usually collect the products from wholesalers and sometimes directly from the farmers/traders, depending upon their locality and accessibility. They are, in fact, the backbones and most sensitive lots of a value chain. They usually get a margin of around Rs.15 per kg depending on season and international markets.

Chapter III

LITERATURE REVIEW

Policy frameworks about NTFPs

Attempts at formulating a national level forest policy, National Forestry policy of 1976, recognized the need for improved management of NTFPs. This was followed during the 1980s and 1990s by the whole management of NTFPs. Prominent examples are the Decentralization Act (1982), the new trade policy (1982), the basic need program (1985), the Seventh and Eight Five year Plans (1985), the National Conservation Strategy (1988), the new industrial policy (1992) and the new forestry policy as outlined in the Master Plan for the Forestry Sector (Bhatta, 2006). These policies broadly support development in the NTFP sector by emphasizing income generation and poverty alleviation activities, creation of employment opportunities and promotion of local participation in decision-making. Features of some of the policies are summarized as follows:

The Master Plan for Forestry Sector (MPFS), (1988-2012)

NTFP and MAP utilization is dealt with in more detail in the MPFS where the area of “Medical and Aromatic Plants and other minor products” is defined as one of six primary development programs. This is the first official attempt to co-ordinate the NTFP sector into national action agenda.

It aims to meet the basic needs of rural people of Nepal. The forest based industries development plan of the MPFS emphasizes creation of jobs and processing facilities as well as cultivation many of widely collected medicinal plants.

Among the main policies objectives set out in the MPFS are:

- To contribute the growth of local economies by managing and developing forest resources and creating opportunities for income generation and employment.
- Develop the legal framework needed to enhance the contribution of individuals and communities for forest resources development, management and conservation (MPFS, 1988)

The Ninth Five-year Plan (1997-2002)

The plan puts more emphasis in promoting and management of NTFPs within the framework of community forestry for generating income and employment at the local level. The objective of this plan relate to NTFPs. It says that NTFPs are important to generate income and employment opportunities from forest resources and to conserve ecosystem and the biodiversity of Nepal. Priority is to be given to the poorer communities and people for overall development of the nation.

Forest Act 1993, Forestry Regulations 1995 and their amendments (2000), Guidelines for Community Forestry Development (2002)

The Forest Act, 1993 and Forest Regulations 1995, and guidelines for Community Forestry Development (2002) major forest policy which recommends NTFPs to incorporate in the forest operational plan and empowers CFUGs to manage and utilize the resources. These policies provide bases to inventories the resources, link them for the income generation, and prepare the management plan for management, processing and distribution of them. Further, royalty of all NTFPs are fixed.

Nepal Biodiversity Strategy Implementation Plan (2006-2010)

The overall goal of the Nepal Biodiversity Strategy Implementation Plan is to contribute to achieve the goals and objectives of Nepal Biodiversity Strategy through its successful implementation for the conservation of biological diversity, the maintenance of ecological process and systems and the equitable sharing of the benefits accrued. One of the objectives of NBSIP is domesticate NTFPs and explore marketing opportunities for poverty reduction by promoting biodiversity conservation within and outside the protective areas through community participation.

Herbs and NTFP Development Policy (2004)

This is the first comprehensive NTFP development policy in Nepal. According to this policy major NTFPs are prioritized for research and development purpose, short term and long term strategies have been formulated, branding of Nepal NTFPs have been initiated, processing,

taxation, income generation, linking with other financial institution for loan, monitoring and evaluation mechanism, declaration of pocket area development according to distribution has been purposed, and Herbs Network Co-ordination Committee has been formed to co-ordinate in the national level. Although, this policy looks comprehensive, implementation mechanism is failed.

According to this policy, community forest should include herbs and NTFPs development activities in their FOP and should provide appropriate skill, knowledge, as well as incentive to their users for conserving and utilizing herbs and NTFPs sustainably in their forest.

Policy for cardamom

Among various economic sectors, the government of Nepal has indicated that agriculture is one of the most important economic sectors. In fact, the government of Nepal also considers the agriculture sector as the lead sector for the economic development of the country and with this sector, it is aimed to reduce the percentage of poverty to 14 percent in the nation. Also, the government's agricultural plan (20 years) seeks to increase the amount of agricultural loans, and expand irrigation areas. Furthermore, agro-economic growth rate and food availability per person will be increased to 3 percent from 0.5 percent and to 426kg from 270 kg respectively. Both eighth and ninth plans have declared large cardamom as one of the major agro-commercials for the economic development of the Nation (Sharma, 1999) but it has not mentioned policies and programs specific to cardamom.

Types of cardamom

According to ANSAB (2005), there are sixteen varieties of cardamom in the world. Among them five types of large cardamom are in farming practices across Nepal – Ramsey, Golsey, Sawney, Chibesey and Dammersey. Ansari et al (2055B.S.) states that Ramshahi, Golshahi, Dambarshahi and Saune are the types of large cardamom that have been found cultivating in Nepal. In Nepal, Ramshahi, Golshahi and Dambarshahi are the types of cardamom that is cultivated most by the farmers (Krishi Suchana tatha Sancharkendra, 2062 B.S).

Limbu (1996) proclaims that in Nepal from the early history of large cardamom, there have been mainly four cultivated types existed such as Ramsey, Golsey, Sawney and Ramla. He mentioned that these types of large cardamom are locally called by different names in

different places. According to Mandal (2063 B.S), though the farmers in the eastern part of Nepal have been cultivating cardamom for a long time now, they have not been able to identify the types of cardamom they need to be cultivating. In any event, Ramshahi, Golshahi, Saune and Dambarshahi are the types that are recommended to cultivate. However Manandhar(2062 B.S) concluded that among different types of cardamom, Ramshahi, Golshahi, Dambarshahi, Saune, Chibae and Kantidar are the types that are being cultivated by farmers in Nepal.

Niraula (2051 B.S) also mentions that though different types cardamom are found in Nepal, from a business point of view, Ramshahi , Golshahi, Chibeshahi, Saune types are mostly found to be cultivated. According to him, the same species of cardamom are known by different names in different places. Ojha (2049 B.S) has noted 21 types of cardamom. Among the different types of cardamom Ramshahi, Golshahi, Dambarshahi, Saune, Chibe and Kantidar are the types that are frequently used for farming in Nepal. On the basis of their nature, the large cardamom cultivated so far, in Nepal have been four types namely Ramsey, Golsey, Saune and Ramla. These types are locally called by different names in different places. The common names used in Sankhuwasava district are Ramshahi, Golshahi and Chibeshahi. Other varieties are Dambershahi and Kantidar (Sharma, 1999).

Uses of cardamom

Cardamom oil is a precious ingredient in food preparations, perfumery, health foods, medicines and beverages. Cardamom seeds serve as an astringent, tonic, appetizer and diuretic (ANSAB, 2005).

Buckingham (2004) mentions that cardamom has a market in Northern Vietnam and Southern China for its culinary and medicinal use. It contains a number of aromatic and active ingredients.

Cardamom is mainly used as spices. It is also used in Ayurvedic preparation and is used as symbol of invitation to neighbors and relatives in any marriage or religious functions. It has medicinal values for different diseases. Its seeds are useful even in scorpion sting and snakebites Limbu (1996). Mandal (2063 B.S) mentions that cardamom is used in religious rituals and for Ayurvedic medicine preparation. It is used in medicine like *dashamularista birendramodak* and *chawanprash*. It is also used in cake, biscuits, coffee and meat to add flavor.

Maitra (2007) believes that cardamom is a very versatile spice having a wide range of culinary and therapeutic uses. It is an indispensable part of daily cooking rightly called the “queen of spices”. Niraula (2051 B.S) opines that cardamom is not only used in the form of spices but it is also popular for its medicinal value. Carbohydrate, protein and minerals are found in it. Besides, it contains a significant amount of volatile oil.

Ojha (2049 B.S) states that large cardamom has a great value in Ayurvedic medicine preparation. He mentions that thirty different types of Ayurvedic medicines can be prepared by using large cardamom. According to him, large cardamom is also used in preparing different medicines for different diseases like Kamalapitta, Bath, Damkhoki etc. Similarly, it can be used for preparing energy producing and blood purifying medicines.

However, cardamom is more commonly used as spices. Because of its attractive scent, it is used in tea, coffee, bakeries, meat, and drinks for flavoring. It can be used for Ayurvedic preparation. It can be the good medicine for diseases like Asthma. Some people use it as a symbol of invitation in religious functions (Sharma, 1999).

Sharma (2006) states that the capsules (fruit) of cardamom produced are used widely as a spice condiment and contain about three percent of essential oil rich in cineole. This plant also possesses the medicinal value. Sangraula (1989) states that at the beginning, cardamom was used by people only as the spices and goods for puja but now it is valued as an important exportable cash crops.

According to Thapa et al (2003), the large cardamom is a spice and condiment that has a global market value. It is a low volume, high value, non – perishable and non-nutrient exhaustive crop. The large cardamom agro forestry also provides much needed fodder and fuel to mountain households

Agro-Climate requirements for cardamom cultivation

ANSAB (2009), states that Cardamom is cultivated in an altitude range of 600m to 2000m above sea level where annual rainfall is between 1,500 mm to 2,500 mm and temperature varies from 8⁰c to 20⁰c. According to (Ansari et al 2055B.S), shady areas are appropriate for cardamom cultivation. Temperatures between (15-25)⁰c and annual rainfall of (2000-2500)mm is required. Trees should be planted in the cardamom cultivation area since they protects the plant from extreme sunlight and fog.

FFTC (1998-2007) states that cardamom, a perennial cash crop requires cool, moist upland environment. Jimée (2053 B.S) has mentioned that shadow and humid land is necessary for

cardamom plantations. Temperature of (8 to 20)⁰c is ideal for cardamom cultivation and favorable rainfall is 600 to 5000mm. Limbu(1996), opines that the large cardamom plants are usually grown in moist evergreen location at the altitude between 700 to 2000 meters above the sea level. Frosts and hailstorm are injurious to plants. According to him the lower altitudes of cooler area and higher altitudes of warmer areas are found well suited for its cultivation. Mandal (2063 B.S) says that abundant moisture and shady area is needed for cardamom cultivation. Trees like utis, malaejo, chilaunae and siris are used to provide shade. Suitable temperatures for their cultivation ranges from (10-25) degree Celsius and (2000-2500) millimeter annual rainfall is required.

Niraula(2051 B.S) mentions that moist and shady areas are appropriate for its cultivation. Its cultivation is done in the sloppy areas. Even though its cultivation can be done at the altitude between 1800 to 6700 feet, from a business point of view, it is appropriate to cultivate this crop at the altitude between 3000 to 5000 feet.

Cardamom requires cool shade and abundant moisture in the soil but it does not tolerate water logging. (Ranjit et al 1975).

Sharma (1999) states that elevation, moisture and shade are the fundamental factors for successful cultivation of cardamom. Hence, the cardamom area mainly lies in the higher elevations of the eastern mountains of Nepal.

Sharma (2006) mentions that the large cardamom is a perennial cash crop grown beneath the forest cover on marginal lands. It is widely cultivated under the nitrogen-fixing Himalayan alder (*Alnus nepalensis*), a practice modified by people to maintain soil fertility and increase productivity.

Sharma et al (2000) mentions that Large Cardamom, A plant native to Sikkim Himalaya has been a boon to the mountain people of the area. It is a perennial cash crop grown beneath the forest cover on marginal lands.

Economic benefits of cardamom cultivation

Cardamom cultivation requires no external inputs. A high-value, low volume crop, which can be stored for sometime, is comparatively easy for slope land farmers to market and its cultivation is contributing to the upliftment of socio-economic status of the farmers (FFTC, 1998-2007).

Jimee(2053 B.S) has concluded that cardamom cultivation is flourishing especially in eastern part of Nepal and the living standard of the cardamom farmers have been gradually rising.

Limbu(1996) believes that farmers are found to distribute their incomes from cardamom to the various sectors such as education, medicine, food, clothing, and in religious matters in Morang VDC .

Niraula (2051B.S) believed that cardamom farming could be a major source of getting foreign currency into the country. It has great value in Ayurvedic medicine preparation. All the hilly districts are more or less conducive to cardamom farming. Besides, cardamom cultivation has increased employment opportunities while it restricts the migration from hill areas to Terai.

Ranjit et al (1975), in their field document have reported that cardamom cultivation has increased the economic status of the cardamom farmers. Cardamom is a very important cash crop because of its demand and high market value it commands. According to Sharma (1999), large cardamom cultivation has played a vital role in the economy of eastern hilly regions such that it is a purely exporting commodity for earning foreign currency.

Sangraula(1989) believes that cardamom farming can be a major source of getting foreign currency into the country. He states that hilly districts are more or less possible for cardamom farming. It restricts the migration from hill to Terai. Similarly Sharma (2006) has also mentioned that the net income from large cardamom is higher than from other cash crops throughout the period. The income from the large cardamom has been substantially higher than for other livelihood options. It has been the boon to the people of Sikkim for a very long time.

Role of cardamom cultivation in biodiversity conservation

(Buckingham, 2004), Cardamom requires partial shade and cool temperature so for these reasons farmers utilize forests for its cultivation. According to the University of Edinburgh (2005), cardamom cultivation requires that the farmers select a suitable forest patch, clear the lower levels of vegetation and replace them with cardamom plants. Once the cardamom plants are fully grown, the farmers must continue to weed the area, removing all other competing vegetation, preventing any natural reproduction of the forests.

Fernando (2003) says that the correlation between cardamom and the lush green forest is ironic. Cardamom is undergrowth, which needs the shade of forest canopy for its survival. However, the cultivation necessitates clearing of the shrubs and undergrowth, which prevents the growth of saplings of the large canopy trees. Again, the fuel wood for kilns used for cardamom's processing is another contributory factor to the destruction of forests.

Forest gardens of cardamom are lower in biodiversity value than wild forests, as cardamom replaces a number of under-story species. This can affect not only the availability of other plant species but also of animal species feeding on such plants. (Foppes et al 2000). Similarly Magraw (2004) says that intensive management in cardamom plantations appears to be the greatest factor, causing lower species diversity in the forest. Management directly influences the entire plant community. Diversion of water to cardamom plantations makes the habitat more favorable to mesic species. The ground cover in cardamom plantations is thinned several times yearly to reduce inter specific competition and increase flower production, pollination and hence food production. This keeps the vegetative ground cover comparatively low and depresses species richness. Thus the cardamom plantations are not viable conservation alternatives for primary forest.

Reyes et al (2006), affiliated with Viikki Tropical Resource Institute, Tanzania proclaims, "Cardamom growing in natural primary forest is not sustainable in the long run. It also accelerates forest clearance. Since farmers argue that forest areas already thinned for cardamom cultivation are easier to clear completely afterwards for annual crops. Cardamom crops are still economically so tempting that sustainable cultivation method available should be considered seriously to prevent further land degradation and aggravation of poverty. A combination of well managed multiple use of agro forestry with protected natural forests and additionally, perhaps with intensively managed forest plantations, could contribute both to better livelihoods and to better management of biodiversity that depends on primary forest and is still directly threatened by cardamom cultivation.

Sharma (2006), states that cardamom agro forestry system under the Himalayan alder are more productive as they have faster rates of nutrient cycling than others. The trees also support birds and other wild life and this influences the ecological structure and functioning of the agro forestry system. Having same opinion, Sharma. H.R (2006) also mentions that large cardamom cultivation provides ecological benefits such as soil conservation, soil

fertility maintenance and extension of forest cover with intact tree biodiversity in existing farming system.

A good Himalayan example of a cash crop is the large cardamom (*Amomum subulatum*), which perfectly meets the mountain specificity requirements. This is a perennial cash crop grown under tree cover as agro forestry, providing the mountains with both agricultural and forestry benefits. The practice helps in soil and water conservation while maintaining tree biodiversity. Environmentally, it provides the supporting services contributing to both regulating and provisioning roles, most desired for both the mountain communities and downstream communities. Thapa et al (2003).

Synthesis of literature review

Large Cardamom is a perennial cash crop. It has importance in Ayurvedic preparation and is also known as “queen of spices”. There are different types of cardamom. The same species of cardamom is known by different names in different places. Cardamom cultivation area mainly lies in the higher elevations of eastern mountain. Large cardamom cultivation has played a vital role in the economy of the hilly parts of the eastern region. It has restricted the migration from hill to Terai. It is a major source of getting foreign currency into the country.

Since every thing has its pros and cons, besides having its medicinal and economic value, Cardamom cultivation is not sustainable in the long run, as it has been seen that its cultivation is accelerating forest clearance. It has been stated that intensive management in Cardamom cultivation may be one of the factors for causing lower species diversity in the forest area but while reviewing different literatures about cardamom cultivation both national and international, in Nepalese context, there is not much studies\documents available about the affect of cardamom cultivation on bio-diversity conservation. Thus, my study is focused to find out the relation between cardamom cultivation and its market as well as its relation in biodiversity conservation.

Conceptual framework of the study

The conceptual framework is drawn based upon the objectives, literature review and the field situation. The framework shows the different factors affecting the status of cardamom cultivation and its effect in the biodiversity conservation and rural livelihood.

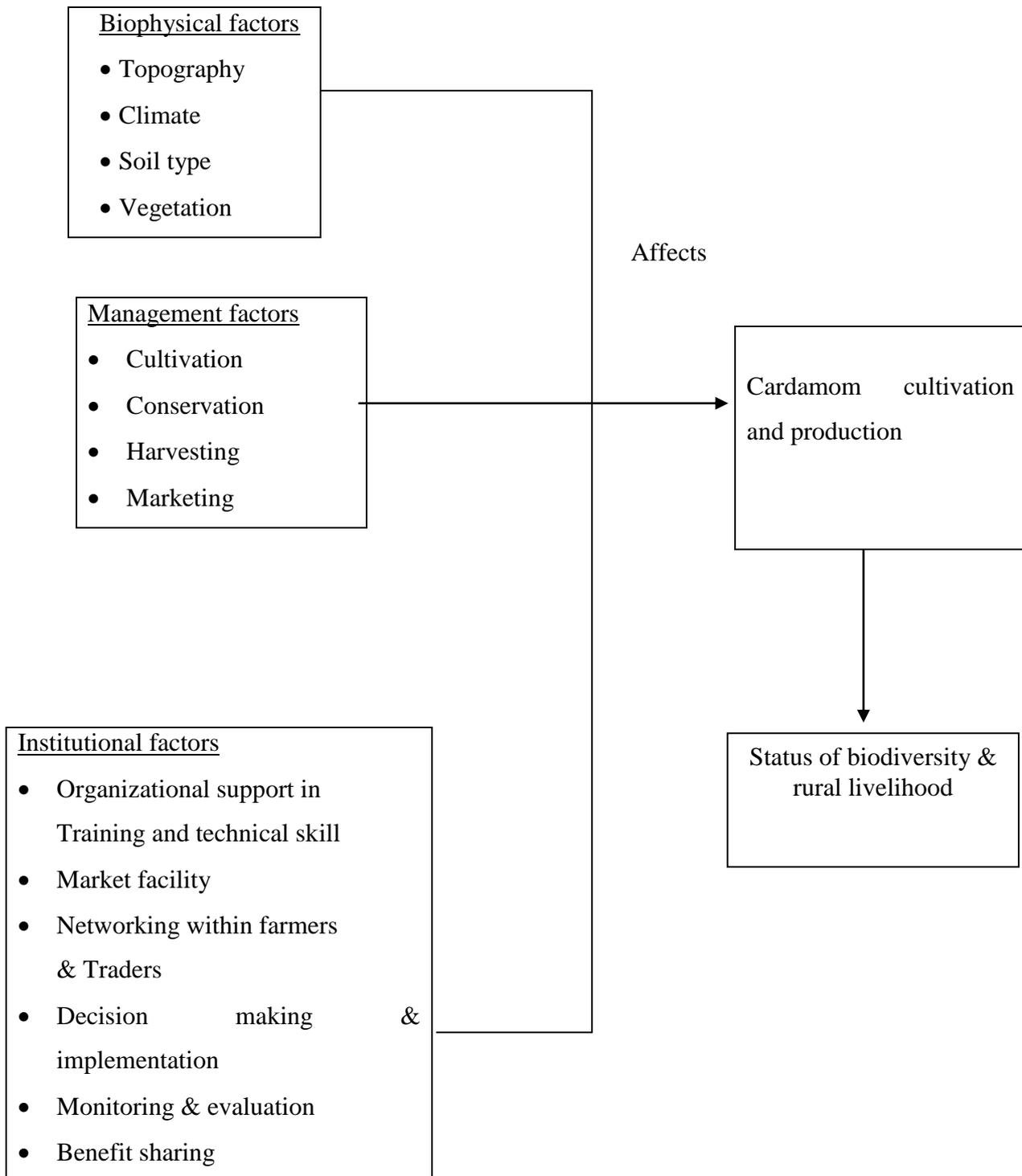


Figure: Conceptual Framework showing different variables affecting cardamom cultivation

CHAPTER IV

MATERIALS AND METHODS

The study is concentrated on the cardamom cultivation and its international market and its effect on rural livelihoods and biodiversity conservation of the study area. Primarily, the study is based on primary data. Such primary data were collected from the cardamom cultivators, the government officials, business community and various NGOs and INGOs of the study area and were analyzed. . Secondary data were also used for making the study more realistic and informative. Thus the research design was helpful to describe the overall aspects of the related topic.

Literature Review

Some Secondary data were used in this study which were collected through extensive literature review from the organizational visit, desk study and Internet surfing (Annual reports, books, thesis, reports, journals, papers, etc.) Data published by other governmental and non-governmental agencies were also used in thesis as references.

Direct Observation

In-depth survey and direct observation was conducted in the field to observe the status of cardamom cultivation in two VDCs (Diding and Matshya pokhari). Visit to the households adopting cardamom cultivation and those working as a labor in cardamom field was conducted.

Questionnaire Survey

Survey research is undoubtedly the most common research method. It is probably the best method available to the social researcher who is interested in collecting original data to describe a large population to be observed directly. With these face-to-face interviews, it was easier for the interviewer to probe for additional information.

A set of standard questionnaires was prepared after a pre-test in study area. A random sample of 79 households, both cardamom cultivators and neighboring community was taken. The questionnaire was especially designed to document the status of cardamom cultivation, status

of biodiversity in cardamom cultivation area, effects of cardamom cultivation in the rural livelihoods and to compare cardamom cultivation with other income generating alternatives.

Interviews with Key Informants

A separate questionnaire was prepared to take interview with key informants. The key informants selected were staffs of DADO, SODEC, CODEF, ECO-HIMAL, FECOFUN, TEF, DFO and Nepal Chamber of Commerce and Industry.

Focus group discussion (FGD)

Focus group discussion helped to get the reaction of a small group of people. Total of 6 FGD was conducted. Minimum of ten individuals had taken a part in every discussion.

Data processing and analyzing

Data processing consists of examining, categorizing, coding, editing, tabulating and recombining the evidences. Simple statistical tools such as frequency, percentage and average were used. Likewise Microsoft word, Excel and SPSS10.5 were used as computer facilities. Results were presented in charts, figures and tables. Interpretations were made on the basis of results, which were assisted by qualitative and quantitative data\ information available from both primary and secondary sources.

Information will be analyzed from different angles such as socio-economic and environmental aspect.

Materials and Equipment

Some basic research materials such as research schedule, set of questionnaire, set of checklist etc were used throughout the research. Similarly, some equipment such as camera was used betterment of the study.

Research Process

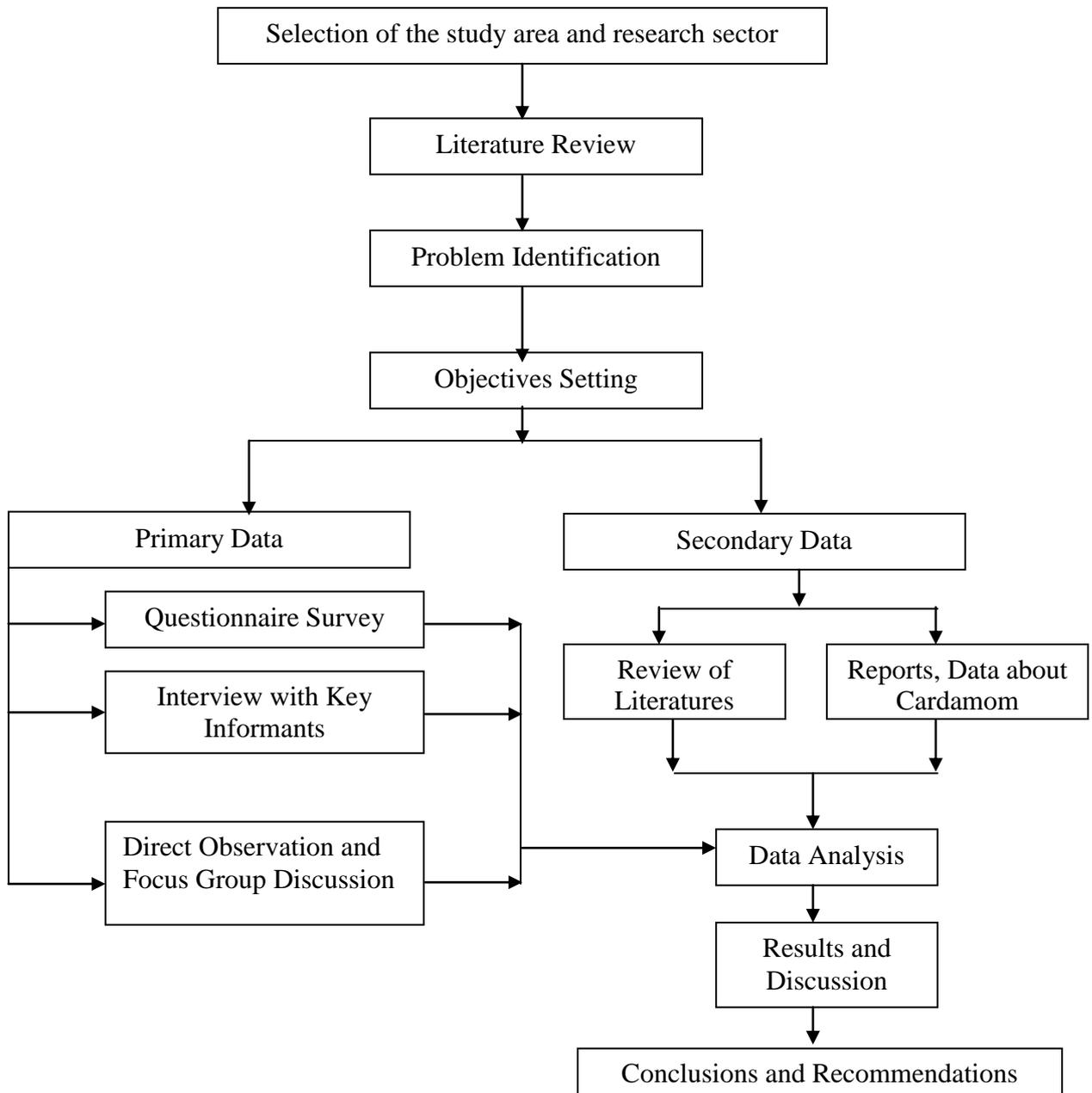


Figure: Logical Flow Chart of the Research

Chapter V

MARKETS AND INTERNATIONAL MARKETS

Large cardamom is one of the major spices exported to international markets from Nepal. The government of Nepal has identified cardamom as an export oriented commodity along with tea and coffee. However, Nepal is still not in a position to export cardamom directly to the third countries and cash in foreign currency. India still remains as major markets for Nepalese cardamom. It is learned that the product after sorting and grading in India is further exported to the Middle East (Arabian countries) via Pakistan.

As most of the producing areas are remote there are no buyers available within the vicinity and farmers have to carry the produce long distances. In need of money some farmers still take advances from the local village merchants and settle the loan with interest by selling the produce to them. In another instances, traders buy the crops in the field itself before harvest. The process is known popularly as Dahadani. The farmers harvest the crop, dry it and dispose to the merchants who paid advance. The system seems to be handy to those who are in need of cash in advance, but the prices paid are far below average.

Nepalese cardamom exporters/wholesalers are mainly based in Birtamod (Jhapa) and Biratnagar. They collect the products from major wholesalers/Traders located in Dharan (Sunsari) and Fikkal (Ilam). The wholesalers/traders in Fikkal collect the products along the Mechi corridor - Biblyate, Nepaltar, Ranke (in Ilam), Phidim, Gopetar (in Panchthar), Fungling, Sighapur (in Taplejung) and Dharan based traders collect cardamom along the Kosih corridor - Hile (in Dhankuta) and Basantpur (in Terhathum).

The small traders/merchants located along the highways collect cardamom either directly from the growers or from village merchants spread all over the cardamom growing areas. Birtamod is the main cardamom trading centre whereas Dharan and Fikkal are two main sub centers in Nepal. Large cardamom from the major producing districts Ilam, Taplejung and Pachthar are brought to Birtamod. The other main sub center is Hile where the products from Sankhuwasabha, Terhathum, Bhojpur and Dhankuta are brought. Each District Development Committee (DDC) levies tax on cardamom consignment, transferring out of the district. The tax varies from one district to another. For example, Dhankutta DDC charges NRs.3.00/kg whereas the rate for Ilam is only NRs.1.00/kg. Sometimes traders have to pay the tax more than once. Cardamom purchased in Taplejung district is taxed before it leaves the district. If

this produce is retained in Panchthar district for more than 24 hours, tax must be paid for that district too.

Tax incidence can happen again if the same produce is passed through another district and stocked there for more than 24 hours. (ITC - UNCTAD/WTO, 2007). Besides DDC tax there is a score of other informal tax to be paid along the highways incurring additional burden to the traders.

Traders

Village Level Traders

The role of village level traders is tremendous where small cardamom growers are concerned. These traders are helpful to those growers who have small quantity of produce. They collect from their farm gates and transfer them to either road head collection points or to the district traders/merchants. The products from farms to road heads are transferred either by mules or by porters. From road heads they are transferred by tractors and/or trucks.

Road Head Traders

Road head traders engaged in cardamom collection are rare. There are some along the Mechi highway engaged in collecting at road heads and transfer the products to Fikkal. In fact, these collectors are involved not only in trading, they provide credit services as well in off seasons.

Pricing

Farm Gate Price

Pricing of any commodity is based on demand and supply configurations. Whenever demand of any product increases, the price associated with it increases accordingly. Same principle applies to pricing of large cardamom. Due to non-existence of any central marketing facility or an auction house in the country, the price of the commodity is dictated by the terminal markets in India. The price during last few years has been increasing gradually. The monthly wholesale price of the commodity in the previous fiscal year as recorded in Birtamod Wholesale Market is presented in the table below. Indeed there is not much price variation between minimum and maximum prices. The reason may be due the non existence of grading.

Export and Import of cardamom

Nepal is the top producer of large cardamom followed by India and Bhutan. The bulk of the entire production is consumed in India. In the countries other than India, there is preference for scientifically cured quality cardamom with good colour. Pakistan is the single largest market followed by UAE and Afganistan. The major markets in India are Amristar, Kolkata, Delhi, Guwahati and Kanpur. In India, the major commercial grades of Large Cardamom are Bada dana, Chotta dana, Kainchicut and non-kainchicut. India is the largest market for Large Cardamom produced by Nepal and Bhutan.

Cardamom production and livelihoods

Large cardamom is native non-timber forest product of potential economic benefits.

It is used in Ayurvedic preparation and spices. According to the botanical classification the large cardamom is grouped as part of the Zingiberaceae tribe. Its nomenclature is derived from the scientific-name *Amomum subulatum* Roxb. It is vastly different from the small type of cardamom, which is botanically known as Ellettaria cardamom, which used to be cultivated mostly in South India, Sri Lanka and Guatemala.

Large Cardamom, which is also known as Alainchi in Nepal was simply used as offering to God or Goddess in religious ceremonies in the past but now, its scope has broadly been widened. Firstly, it has been a very profitable cash crop to earn foreign currency for the country as well as in raising the economic status of the farmers. It has been shown that in 2047/2048 B.S Rs 9,36,00000 income was obtained from cardamom's total export whereas in 2049/2050 B.S the income from the total export was further increased to Rs 12,72,14000 (Niraula, 2051B.S).

Secondly, it is an effective and useful raw material for Ayurvedic preparation. Various types of large cardamom mixed medicines can be found in the market. Thirdly, it is one of the most popular and oldest spices. It has an appealing scent and can be used in flavoring different types of food and sweets. That is why it is also known as the 'Queen of spices'. Fourthly, it is grown in the waste and sloppy lands of hills with the natural shading of evergreen forest like Uttis (*Alnus nepalensis*) and Siris. (Niraula, 2051B.S) reports that Cardamom cultivation is very helpful in preventing overflows of water bodies and, it prevents land from drought and erosion. Again Cardamom cultivation has contributed to supporting rural livelihoods by creating employment opportunities, thus preventing out migration.

The eastern mountain districts of – Taplejung, Panchther, Ilam, Dhankuta, Bhojpur and Sankhuwasava are well known for large cardamom farming in Nepal. Cardamom farming is widespread in many VDCs in Sankhuwasava district. Madi Rambeni, Madi Mulkharka, Mawadin, Mamling, Jaljala, Nundhaki, Siddhakali, Barhabise, Diding and Matshya Pokhari etc are some of the main VDCs that grow large cardamoms intensively in Sankhuwasava district.

The National sample census of agriculture 2001/02 shows that the total area of cardamom farming in Sankhuwasava district is 1,117.6 hectare, and the number of total holdings of cardamom is 2,727, while the total area of cardamom farming and the number of total holdings of cardamom in the census 1991/92 were 755 hectare 2,418 respectively. This shows that the number of cardamom growers as well as the area of cardamom farming has been increasing.

Though cardamom farming in Nepal does not have a long history, many farmers are interested in its cultivation due to its bright prospects. Farmers, wage laborers, and economically poor people are involved in cardamom cultivation.

In any event, excessive cardamom cultivation - raises the question about the threat that it poses to the forest resources and its biodiversity. The forests of Nepal provide a variety of tangible and intangible benefits, which are crucial for the sustainable livelihoods of the rural population. Although some farmers have gained substantial economic benefits from the cardamom cultivation, the loss of biodiversity may imply more risks to the local livelihood caused by cardamom cultivation

Chapter VI

RESULTS AND DISCUSSIONS

This chapter has four parts. The first part (A) documents the status of cardamom cultivation where the analysis and discussion is done on the beginning years of cardamom cultivation by the sampled households. Also, there are analysis of major seasons and areas for cardamom cultivation, diseases affecting cardamom cultivation, species of cardamom cultivated in the study area, annual average production of cardamom, drying techniques used, major areas of expenses in cardamom cultivation, market information, and earnings made from cultivating cardamom, availability of manpower for the processing. , The institutions providing credit, major organizations involved in cardamom promotion and potentials and constraints associated with cardamom cultivation will also be examined.

The second part of this chapter (B) presents the status of bio-diversity in cardamom cultivation area, which describes the type of land as well as size of private and community forest used for cardamom cultivation, time period taken for cardamom field preparation, trees and shrubs used for shading, plant species, wild animals and birds affected by cardamom cultivation, source of energy used to dry cardamom, effect of cardamom cultivation on forest resources, livestock holding as well as its effect on neighboring community for the collection of firewood and grasses from cardamom cultivated area.

Effect of cardamom cultivation in rural livelihood is described in third part(C), where the area of expenditure of income made from cardamom cultivation is assessed i.e. expenditure on education, food, clothing and medicine before and after cardamom cultivation is analyzed. This section of the study has also tried to find out if the cardamom cultivation has increased labor demand or not and whether it has affected people depending on forest for their livelihood.

Comparison of cardamom cultivation with other income generating alternatives is done in fourth part (D). Part D will examine enterprises that are preferred by the sampled households as well as cardamom cultivation and other enterprises. In addition, the annual earnings from the labor wage in cardamom and other enterprises will be assessed.

A. Document the status of cardamom cultivation

Cultivation practices

Beginning years of cardamom cultivation by the sampled HHs

Years (B.S)	No of households
2036-2047	11
2048-2052	20
2053-2057	20
2058-2061	23

The table shows the number of households involved in cardamom cultivation from 2036 to 2061 B.S. In the beginning year i.e. from 2036 to 2047 B.S, there were only 11 households involved in cardamom farming. Later in the year 2048 – 2052 B.S there were 20 households involved in its farming and in the year 2058 –2061 B.S the number of households were 23 which shows that the number of households involved in cardamom farming are increasing every year.

The reason behind the increasing trend in cardamom farming may be due to unfamiliarity of its commercial value and lack of foreign value in early years. Its plantation rapidly increased after 2048 B.S, which might be due to the innovation in foreign market that increased the price of cardamom, and other benefits like no requirement of hard labor and unlike other traditional crops it is not affected much by natural disasters.

Major seasons for cardamom cultivation:

According to 75.94% of the respondents, cardamom is cultivated in the month of Jesth and Ashad and according to 13.9%, Baishakh, Jesth and Ashad is suitable for cardamom cultivation whereas 10% of the respondents said that Shrawan and Jesth is the major season for cardamom cultivation.

Eventually it can be concluded that the months of April and May are appropriate for cultivating cardamom and generally harvesting is done from September to December.

Major Areas\VDCs for cardamom cultivation:

Elevation, moisture and shade are the fundamental factors for the successful cultivation of cardamom. The limit of elevation for successful cardamom cultivation appears to be 2000-7000 feet but the more productive range lies between 3000 to 6500 feet. Large cardamom is susceptible to wind and therefore areas exposed to high winds are not suitable. Since this type of climatic condition and topography is not found everywhere, so there are only some specific areas which meet these conditions and where cardamom can be cultivated.

Diding, Matshya pokhari, Barhabisae, Jaljalae, Nundhaki, Madi Rambeni are the major Areas\VDCs in Sankhuwasava District which meet the above climatic conditions and where cardamom is extensively cultivated.

Types of diseases that exist in cardamom farming

One of the main reasons behind reduced production of cardamom in the study area might be due to the problem caused by the diseases in cardamom plants. Diseases like Chhirke, Furke, Jhusilkira, Ganokuhine and Dadhuwa were found to be affecting cardamom plants in the study area.

Table below shows the existence of different diseases in cardamom farming. Out of 79 respondents taken for the survey 66 i.e. 83.54 percent of respondents found diseases in their cardamom farming. Mainly five types of diseases were found in the VDCs namely Chhirke, Furke, Jhusilkira, Ganokuhine and Dadhuwa. Out of five diseases noticed, Furke and Chhirke have widely affected the farming whereas affect caused by Jhusilkira was found be least.

Distribution of types of Diseases existed in Cardamom Farming

Name of the disease (Local name)	No. Of HHs	% Of HHs
Chhirke	15	22.72
Furke	18	27.27
Jhusilkira	4	6
Ganokuhine	6	9
Dadhuwa	5	7.57
Furke+Chhirke+ Ganokuhine	10	15.15
Ganokuhine+ Dadhuwa	8	12.12

Total	66	100.0
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The diseases mentioned above were the main diseases and was the major problems for cardamom farming. The diseases not only reduced the amount of the production but also made the production nil in some places. Even though the diseases have affected the cardamom farming, out of 79 sampled households only two households have used pesticides to control the diseases whereas 74 households were ignorant about the use of pesticides. Thus due to the lack of knowledge and medical facilities farmers were unable to combat these problems.

Species of cardamom:

The type of large cardamom cultivated in Diding (ward no: 2,3,4,5) and Matshya Pokhari(ward no:2,5) was Ramshahi while other varieties were cultivated in small scale. Ramshahi was found to be the most popular species among farmers in these VDCs as it was supposed to give little more production compared to other varieties. Topography and climatic conditions are the factor that determines the species of cardamom to be cultivated and in these VDCs the climatic condition and topography favored the cultivation of Ramshahi species.

Species of cardamom cultivated by Sample HHs:

Species\Varieties	No of HHS	Percent
Ramshahi	41	51.9
Golshahi	5	6.3
Ramshahi+Golshahi	17	21.5
Chibe	1	1.3
Not known	9	11.4
Dambershahi	2	2.5
Ramshahi+Chibe	2	2.5
Dambershahi+Ramshahi	2	2.5
Total	79	100.0

Generally four species of cardamom were cultivated, which were Ramshahi, Golshahi, Chibe and Dambershahi. The Ramshahi species had occupied first in cultivation by 51.9% and least was Chibe by 1.3% whereas both Ramshahi and Golshahi were cultivated by 17% of households. 9% of the households were unknown about the species of cardamom they have been cultivating.

Average annual production of cardamom:

Table below shows the data about the annual average production of cardamom in the sampled wards. The average annual production ranged from 60kg in Diding(ward no:4) to 362.2kg in Diding(ward no:5).

Average annual production of cardamom:

VDCs	Quantity (kg)	Average (kg)
Matshya pokhari(wardno:2)	2780	185.3
Matshya pokhari(wardno:5)	2335	180
Diding (ward no: 5)	6520	362.2
Diding(wardno:4)	600	60
Diding(wardno:3)	2720	226.6
Diding(wardno:2)	2820	256.4
Total	17,775	225

The minimum production in Matshya pokhari (ward no2) was found to be (0, 40) kg and maximum was 1320kg. Similarly in Matshya pokhari(ward no5)the production ranged from 40kg to 880kg. In Diding ward no4, annual production ranged from (0, 80) kg to 240kg. In Diding ward no3, the annual production ranged from 20 kg to 400 kg and in Diding (ward no 5), annual production ranged from 120 kg to 560 kg.

The variation in the production might be due to the difference in size of the plantation area, diseases, method of cultivation and the appropriate climatic condition.

Drying

All, more or less the households used traditional dryer (bhatti) for drying cardamom. This technique consumes much more firewood than the modern dryer, and the quality of the cardamom also degrades when the traditional dryer is used. Under this system, the cardamom comes in direct contact with the smoke and turns the capsule to a dark brown black color with a smoky smell.

Reasons for not using modern Dryer:

Reasons	Frequency of HHs	Percent
Lack of idea	42	53.2
Economic cause	6	7.6
Lack of idea, economic cause	26	32.9
Missing System	5	6.3
Total	79	100.0

Table above shows that 53.2 percent of households had not used modern dryer due to lack of information. Also, 7.6 percent of households didn't use it due to poverty as they cannot invest the huge amount of money in construction of modern dryer. 32.9 percent of households used traditional dryer due to both lack of idea and economic cause. 6.3 percent of households did not answer the question as they were not involved in cardamom cultivation and some didn't respond, as their cardamom had not come into production stage.

Though sampled households wanted to dry cardamom using modern techniques, several constraints like lack of idea, lack of knowledge and poverty were restricting them to use modern dryer and again lack of support to provide modern dryer from government and non-government organizations might be another cause that compelled the cardamom cultivators to use traditional dryer as they had no other options beside using it to dry their cardamom production.

Investments

Table below shows the amount of money invested annually in areas of cardamom cultivation. Large portion of investment was done in intercultural operations followed by marketing expenses and plantation respectively. Expenses in the plantation was not done annually because once the cardamom plant starts to give fruit, plantation was done separating it from clump, as rhizoming method was popular for propagation.

Major Areas of expenses for cardamom cultivation:

VDCs	Plantation	Intercultural operation	Marketing expenses	Drying (No of trees)
Matshyapokhari	68,000	1,86,000	1,33,040	94

(Ward - 2 &5)				
Diding(Ward -5)	63,040	2,58,460	84,200	129
Diding(Ward -4)	11,600	23,690	6060	44
Diding(Ward -3)	40,000	1,18,200	47,200	68
Diding(Ward -2)	44,240	1,24,540	54,170	100

Propagation from seed or nursery method was not introduced in the study area. Thus expenses on the plantation were minimum compared to other areas of expenses. Labor cost was included in marketing and intercultural operation from which we can assume the role of cardamom cultivation in providing employment opportunities.

Large numbers of trees were required to dry cardamom pods. About 435 trees both large and small were needed to dry 17,775 kg of cardamom, which is not considered to be beneficial in terms of conserving forest resources.

Cardamom cultivators had not kept records of expenses and number of trees used to dry cardamom thus the information shown on table 7.6 was based on their mere recalling so the records they provided on the major areas of expenses are approximate not exact.

Marketing

Mainly four aspects of marketing i.e. market, transportation, communication facility and price are provided by table below. The table shows that 58.2 percent of households had taken their cardamom to the local market (Khandbari) where the local business people bought their cardamom while 12.7 percent of households sold it to moneylenders of the village and 24.1 percent of households sold to the broker who visits the field\home of the farmers and fixes the price on the spot.

Market information of the sample HHs:

Places taken to sell cardamom	No of HHs	Percent
Local market	46	58.2
Money lenders of village	10	12.7
Broker	18	22.7
Missing System	5	6.32

Total	79	100.0
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Transportation

Means of transport	Frequency	Percent
Porter	79	100.0

Communication facility

Response	Frequency	Percent
Yes	3	3.8
No	76	96.2
Total	79	100.0

Price

Price Fixer	Frequency	Percent
Broker	58	73.4
Business community	11	13.9
Broker+ business community	3	3.8
Cardamom producer	2	2.5
Missing System	5	6.3
Total	79	100.0

100 percent of sampled households used porter as a means of transportation to carry their production to the local market due to the unavailability of proper road condition for which they have to pay 6/7 rupees per kg to the porter. So, to avoid transportation costs, some farmers sold the cardamom to the moneylenders of the village and broker. Again another reason might be because farmers received credit from local businessmen and moneylenders of the village before the period of harvesting to fulfill their necessities, the farmers were compelled to sell the cardamom to the local businessmen or moneylenders at a pre-fixed rate. Only 3.8 percent of households got communication facility to know about the price of cardamom whereas 96.2 percent of households lacked communication facility to know about the price of cardamom and this was the reason why they didn't get the actual price of cardamom and was cheated by middle man\broker.

The price of 73.4 percent of the sampled household's produced cardamom was fixed by broker, whereas 13.8 percent of the sampled household's produced cardamom was fixed by business community and only 2.5 percent of the sampled household's produced cardamom was fixed by cardamom producer himself.

Here the business community means those who had their permanent shop in the VDC. They provide credit to the farmers in the period of economic crisis with the view that in future they could procure the production of farmers. After collecting the cardamom they sell it to the wholesalers, which may be from Basantapur, Hilae or Dharan.

Like the local businessman, the moneylenders are those traders who want to get the product at cheap price. They make an advantage by lending credit to the farmers when they are in need. The lenders fix the rate of cardamom and book certain quantity of cardamom from the producers. When the crop is harvested, the moneylenders go to farmers door to door for cardamom collection at the pre-fixed rate and thus the farmers have no option to sell their products at the low rate. Therefore the cardamom producers are not able to gain as much advantage as possible from their production.

Earnings

12.65 percent of households had not received any income from cardamom cultivation. This was because some did not have a place for cardamom cultivation while others' cardamom had not reached the production stage yet. 7.59 percent of households annual income ranged from Rs 1, 20,000-2,40,000 while 16.45 percent of households annual income from cardamom cultivation ranged just from Rs2500 to 9750, which shows the variation in earnings from cardamom cultivation.

Annual earnings made from cardamom cultivation

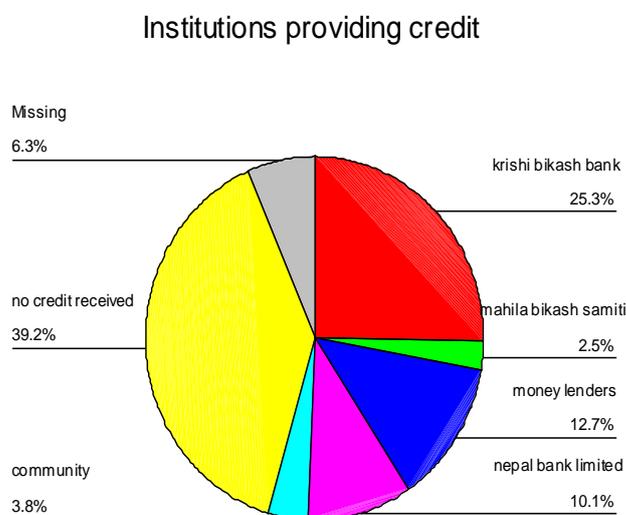
Annual earnings (Rs)	Number of HHs	Percentage of HHs
2500-9750	13	16.45
10,000-18,000	17	21.5
22,000-24,000	5	6.32
30,000-37,200	10	12.65
40,000-45,000	6	7.59
54,000-67,500	5	6.32
70,000-90,000	7	8.86
1,20,000-2,40,000	6	7.59
0	10	12.65

This variation might be due to the difference in the size of land area used for cardamom cultivation, another cause might be due to the difference in price received after selling produced cardamom, as government has not fixed cardamom price rate so some cultivators sell their production at high rate while some at low rate.

Availability of sufficient manpower for the processing of cardamom:

Out of 79 respondents, 74 were cardamom owner and they said that it was easy to get manpower for the processing of cardamom cultivation and mostly these workers were from those VDCs where cardamom was not cultivated as climatic condition and topography was not suitable for the production of cardamom.

Institutions providing Credit:



Institutions providing Credit

Among 79 households, 43 households i.e. 54.4 percent have received credit and 39.2 percent did not receive credit from any financial institutions and those who received credits were using both institutional and local lenders.

25.3 percent of the households received credit for cardamom cultivation from Agriculture development bank .The second source Nepal bank limited from where 10.1 percent of the households had received credit. Moneylenders and community were other sources from whom people took loan and the percentages were 12.7 and 3.8 respectively

Even though the majority of respondents received credit from Agriculture development bank, some of the respondents opined that it takes long period of time to fulfill the process for

getting agriculture loan from Agriculture development bank so they prefer money lenders and business community who easily provide them credit at high interest rate.

Major organizations involved in cardamom cultivation promotion

Very few organizations were involved in cardamom cultivation promotion. Out of 79 respondents interviewed only 16 i.e.20.3% named the name of organizations involved in cardamom cultivation promotion while other i.e.79.7% had no idea about it. According to 20.3% of respondents, ADB, SODEC, Alainchi Kendriya Karyalaya, Sahakari Mahasangh and Krishi Baghbani were the organizations involved in cardamom cultivation promotion and from the Table below it can be assumed that compared to other organizations, SODEC was leading organization that has been promoting cardamom cultivation by providing cardamom plants and conducting skill development trainings.

Major organizations involved in cardamom cultivation promotion

Name of the organizations	Response	
	Frequency	Percent
ADB	3	3.8
SODEC	7	8.9
Alainchi Kendriya Karyalaya	2	2.5
Sahakari Mahasangh	1	1.3
Krishi Baghbani	3	3.8
Total	16	20.3

But from the observation and checklist survey, other government and non government organizations like DDC, DADO, CODEF, ECOHIMAL, TEF and Udhyog Banijya Sangh were found to be involved in cardamom cultivation promotion in many possible ways like generating awareness among cardamom cultivators, providing new plants of cardamom and credit facilities, supplying modern dryer, conducting training on harvesting and cultivation etc.

Training received for cardamom cultivation

Only 7.5 percent of the respondents had received training for cardamom cultivation whereas 92.4 percent of the respondents didn't receive any training for cardamom cultivation. It was due to none of the private organizations and government was involved in providing training for cardamom cultivation. Whereas those who got training for cardamom cultivation had received it from another District which was Ilam.

Existing potentials and constraints of the cardamom cultivation

Detailed questionnaires were used to identify the existing potentials and constraints of cardamom cultivation. Information gathered from them was analyzed and the results obtained are tabulated in table.

Potentials and constraints of cardamom cultivation

Potentials	Response		Constraints	Response	
<ul style="list-style-type: none"> • Good source of income (fulfillment of basic needs) 	74	93.67%	<ul style="list-style-type: none"> • Lack of proper marketing strategy 	72	91.13%
<ul style="list-style-type: none"> • Involves no hard labor 	40	50.63%	<ul style="list-style-type: none"> • Diseases 	66	83.5%
<ul style="list-style-type: none"> • Easy availability of seeds 	10	12.65%	<ul style="list-style-type: none"> • Damage caused by animals 	40	50.6%
			<ul style="list-style-type: none"> • Transportation problem 	49	62%
			<ul style="list-style-type: none"> • Lack of training 	52	65.8%
			<ul style="list-style-type: none"> • Unavailability of seeds (Seeds locally not available)) 	67	84.8%

Despite having several constraints, the cardamom cultivation has been highly appreciated by the farmers. Approximately 93.67% of farmers considered this as a good source of income. Among the constraints, lack of proper marketing was the major problem with 91.13% followed by unavailability of seeds (84.8%) and harm caused by disease (83.5%) respectively. Here the important point to be remembered was that farmers were very much attracted towards cardamom cultivation as the income obtained from cardamom cultivation was more than other traditional crops like paddy, maize and rice hence contributing in the economy of the village and uplifting the socio-economic status of the cultivators. Even though some of the constraints were associated with cardamom cultivation, these constraints were minimal compared to constraints associated with other traditional crops, which are prone to natural disasters and involves hard labor with sometimes no benefit at all.

Status of biodiversity in cardamom cultivation area:

Type of land used for cardamom cultivation

Large cardamom is grown mainly in the sloppy, moist land under the natural shade of evergreen forest. Mixed type of land was used for cardamom cultivation. Table below shows that 63.3% of the cardamom cultivators used crop field, grazing land, private forest and

community forest for cardamom cultivation. While private and community forest was only used by 11.4% of the cardamom cultivators. 12.7 and 7.6% of cardamom cultivators used community and private forest for its cultivation respectively. 5 % of the respondents didn't have area for its cultivation.

Type of land used for cardamom cultivation

Type of land	Frequency	Percent
cropfield+grazingland+(private+community) forest	50	63.3
Private forest	6	7.6
Community forest	10	12.7
Private forest +community forest	9	11.4
Missing system	4	5
Total	79	100.0

Size of private forest and community forest for cardamom cultivation

Here it can be seen that more area of private forest is being used for cardamom cultivation than the area of community forest. Crop field and grazing land comes under private forest.

Table 7.12 Size of private forest and community forest for cardamom cultivation

Name of VDCs	Area of private forest (Ropani)	Area of community forest (Ropani)
Matshya pokhari (Ward no 2&5)	128	114
Diding(ward no 5)	115	83
Diding(ward no 4)	11	6
Diding(ward no 3)	75	60
Diding(ward no 2)	47	35
Total	376	298

In compare to other sampled wards Matshya pokhari(Ward no 2&5) had occupied more area for cardamom cultivation and Diding(ward no 4) had occupied least area for cardamom cultivation .Among the sampled wards, neighboring community was only found in Diding(ward no 4).

Time period for cardamom field preparation:

Time period for cardamom field preparation

Time period	Response	
	Frequency	Percent
One week	18	22.8
Fifteen days	40	50.6
One month	12	15.2

2 months	9	11.4
Total	79	100.0

Only initial cardamom field preparation takes more time as they need to clear the place and plant new trees for shading cardamom plants so initial field preparation required more time that is from one year to three years but once the trees were grown for shading the cardamom plants, field preparation do not require much time. Time period for cardamom cultivation after that ranged from one week to two months. According to the respondents length of the time was also dependent on the number of labors involved in field preparation.

Trees or Shrubs used for shading:

Trees or Shrubs used for shading

Name of tree species (Local name)	Response	Percentage
Uttis	72	91.13
Bilaunae	41	51.89
Chilaunae	32	40.5
Katus	20	25.3
Malta	17	21.5
Patlae	16	20.25
Jhinguni	14	17.7
Byapari	6	7.59

Majority of respondents i.e.91.13% used Uttis for shading. According to them, leaves of this tree species easily decompose thus providing manure for cardamom plants and firewood for cardamom cultivators. Least respondents i.e. 7.59% preferred Byapari for shading cardamom plants. But these species like Byapari, Chilaunae, Katus,Bilaunae,Malta, Patlae, Jhinguni and Uttis were used in combination with each other for shading cardamom plants .

The agronomic yield of cardamom increases under the canopy of Uttis. Litter production and its disappearance rate were also higher in the Uttis-cardamom stand. The cardamom based agro forestry system under the influence of uttis was more productive with faster rates of nutrient cycling but cardamom cultivation has somehow supposed to contribute monoculture practice grown under the shade of same species of trees and removing other species of plants or trees.

Plant species that are disappearing or endangered by cardamom cultivation:

Plant species that are disappearing or endangered by cardamom cultivation

Plant Species (Local name)	Scientific name	Frequency of respondents (decreased)	Percent of respondents (decreased)
Sisnu	<i>Urtica dioica</i>	62	78
Chiraeto	<i>Swertia chiraiti</i>	47	59
Patlae		9	11
Jhinguna		17	22
Chap		15	19
Chilaunae		6	8
Saplings (Grass)		40	51
Katus		26	33
Banmara		30	38
Amliso	<i>Thysanolaena maxima</i>	20	25
Unue		15	19
Byapari		4	5
Malta		3	4
Bilaunae		5	6
Titaepati	<i>Artemisia vulgaris</i>	4	5
Indreni		2	3
Chabo	<i>Piper chaba</i>	3	4
Gurash	<i>Rhododendron arboreum</i>	5	6
Angaeri		8	10
Mauba		2	3
Bnangrae		1	1
Burma		2	3
Budo-okhati		3	4
Kamlae		5	6
Pirae		2	3

After planting cardamom, farmers gradually convert the forest into the single species forests as they remove a variety of tree species to allow light in and for use as fuel for drying cardamom pods. Once the cardamom plants are fully grown, farmers continue to weed the area, removing all other competing vegetation and preventing any other natural reproduction of forest. Table above adds support to the above statement. Above table shows that 78 percentage of households believed that Sisnu was most affected by cardamom cultivation. 59 percentage of households believed that NTFP like Chiraeto was affected by cardamom cultivation whereas 51 percentage of household believed that saplings were affected by cardamom cultivation. Similarly species like Banmara, Katus, Amliso, and Unue were also seriously affected by cardamom cultivation. From the observation, it can be assumed that cardamom cultivation might cause virtual monoculture and may reduce the richness and

diversity of other species. As cardamom cultivation flourish under the canopy of certain species of plants\trees, farmers prefer only those species and remove other species of plant, which later may be endangered or extinct.

Endangered wild animals

Endangered wild animals

Name of wild animals	Increased		Decreased	
	Frequency	Percent	Frequency	Percent
Tiger	4	5	26	32.9
Bear	6	7.6	27	34
Deer	9	11.4	18	22.8
Squirrel	2	2.5	-	-
Kala(Local name)	5	6.3	-	-
Jackel	2	2.5	15	19
Ghoral	1	1.3	5	6.3
Leopard	-		5	6.3
Common Mongoose	3	3.8	1	1.26
Jungle cat	1	1.3	2	2.5
Porcupine	3	3.8	3	3.8

Among the 79 respondents interviewed, 43 i.e. 54.43% said that the number of wild animals were same as they used to be before cardamom cultivation. While mixed view were obtained from the remaining respondents.39.2 percent of the respondents believed that the number of Tiger has decreased while only 5% believed that number has increased. Similarly 34.2 and 22.9 % of the respondents opined that the number of Bear and Deer has decreased respectively but 7.6 and 11.4 % of the respondents believed that number of Bear and Deer has increased. Equal percent of respondents i.e. 3.8 % said that the number of Porcupine has both increased and decreased.

However, from the Table above, it can be concluded that Tiger, Bear and Deer were mostly affected by cardamom cultivation. From the survey it was also found that before cardamom cultivation, people were attacked by wild animals several times but according to them nowadays they don't have any fear of wild animals attack. According to some respondents, the number of wild animals has decreased not due to cardamom cultivation but it was due to prey done by some people and its number had already been decreased before cardamom cultivation.

Since cardamom cultivation is done in the forest area, people's movement and clearance of the forest area has an effect on wild animals by reducing their species and numbers. Though cardamom cultivation might be one of the factors for the reduced number of wild animals,

other causes like illegal prey and increased population might also be the contributing factor on the reduced number of wild animals.

Endangered birds

Endangered birds

Name of birds	Number of Respondents			
	Increased		Decreased	
	Frequency	Percent	Frequency	Percent
Eurasian Tree sparrow	-	-	14	17.7
Eurasian jay (crow)	1	1.3	6	7.6
Kalij pheasant (Kalij)	5	6.3	19	24
Red-Jungle fowl (Lueche)	3	3.8	12	15.2
Crested Treeswift (Gauthali)	1	1.3	4	5
Barred cuckoo Dove(Dukur)	2	2.5	7	8.9
Jungle Myna (Rupy)	4	5	7	8.9
Tibetan partridge(Piura)	-	-	5	6.3
Grey Treepie(Kokalae)	-	-	3	3.8
Yellow-Footedgreen pigeon(Halaeso)	2	2.5	-	-
Red-vented Bulbul(Juraeli)	-	-	1	1.3

Among 79 respondents interviewed, 46 i.e. 58.2 percent said that cardamom cultivation has no effect on the decreasing population of birds. According to them the types/ species of birds before and after cardamom cultivation is same.

The table shows that Khalij pheasant, Eurasian tree sparrow and Red –Jungle fowl were mostly affected by cardamom cultivation. 24%, 17.7% and 15.2% of respondents opined that the number of khalij pheasant, Eurasian tree sparrow and Red –Jungle fowl has decreased after cardamom cultivation while 6.3% and 3.8% of the respondents believed that the number of khalij pheasant and Red –Jungle fowl has increased after cardamom cultivation respectively. It shows that majority of respondents believed that there cardamom cultivation has affected on the types and population of birds after cardamom cultivation.

Some i.e. 2.5 % of respondents stated that number of yellow-footed green pigeon has increased but according to them it was not due to the cardamom cultivation.

However, it can be concluded that the cardamom cultivation might have affected the types/ species of birds.

Source of energy to dry cardamom:

Hundred percent of respondents used firewood for drying cardamom. The existing traditional practice of curing and drying the cardamom requires direct heating using firewood. Large amount of firewood was required to dry less amount of cardamom and the exact amount of firewood required was not possible to estimate, as the respondents were not able to answer the quantitative amount of firewood that was required to dry cardamom since they didn't keep records about it.

Pressure on forest resources:

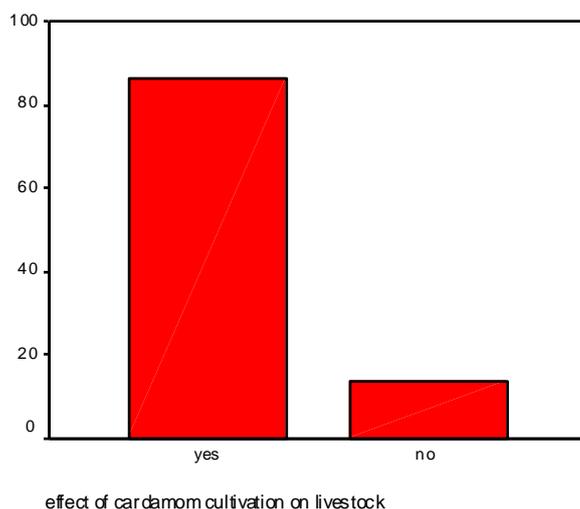
Majority of the respondents i.e.53.2% argued that Cardamom cultivation has not any effect on forest resources while 46.8 percent of the respondents believed that cardamom cultivation creates pressure on forest resources

But even though majority of respondents believed that cardamom cultivation has not created pressure on forest resources, it would be wrong to say that cardamom cultivation doesn't exist pressure on forest resources.

Livestock Holdings

The number of households holding livestock was not high. The types of livestock reared were more or less same by all households. The livestock include cow, buffalo, goats, ox, sheep, pig and chicken etc. However, the respondents were not much satisfied by the income they made from livestock raising. In fact according to them they reared livestock just for meat, milk and fertilizers.

Effect of cardamom cultivation on livestock raising



Effect of Cardamom cultivation on Livestock

On interviewing the respondents, they had almost similar opinions on effect of cardamom cultivation on livestock raising. 86.1 percent of respondents believed that cardamom cultivation has decreased the number of livestock whereas only 13.9 percent believed that cardamom cultivation has no effect on livestock raising.

Number of livestock before and after cardamom cultivation

Livestock type	No of heads before cardamom cultivation	No of heads after cardamom cultivation
Goat	389	194
Buffalo	95	36
Cow	149	74
Ox	85	96
Sheep	155	68
Pig	53	43

Table shows the number of livestock reared before and after cardamom cultivation, which clearly indicates the decreased number of livestock after cardamom cultivation but in case of Ox, the number of Ox was found to be increasing. From the observation, it can be said that people lacked interest in rearing livestock due to limited grazing area and in addition to this, leaves of cardamom were also harmful for animals as animals died after consuming it.

Increased Disease to livestock after cardamom cultivation

Increased Disease to livestock after cardamom cultivation

Response	Frequency	Percent
Yes	60	75.9
No	19	24.1
Total	79	100.0

About 75.9 percent of respondents revealed that their livestock had contracted a disease after grazing on the cardamom field. According to them, it was hard for the livestock to digest the leaves of cardamom plant due to the leaves' roughness. Villagers didn't allow their animals to graze freely due to cardamom cultivation. Most of the villagers tie their animals at home and brought the grasses for them. While 24.1 percent of respondents disagree that disease was found increased to livestock after cardamom cultivation.

Finally, it is concluded that increment in cardamom cultivation has an adverse effect to livestock and vice-versa. Farmers in the study area are more in favor of cardamom cultivation as it gives far more income than livestock rearing.

Collection of firewood and grasses from cardamom cultivation area:

Response	Frequency	Percent
Yes	25	31.6
No	49	62.0
Missing System	5	6.3
Total	79	100.0

Above Table shows that out of 74 cardamom owners, 25 i.e. 31.6 % only allowed others to collect firewood and grasses from their cardamom cultivation area and it was also not done on the regular basis. While 49 i.e. 62% didn't allow others to collect firewood and grasses from their cardamom cultivation area until and unless they(neighboring community) do something for the cardamom owner.

Availability of firewood, grasses from cardamom cultivation area to neighboring community:

Availability of firewood, grasses from cardamom cultivation area to neighboring community

Response	Frequency	Percent
Yes	2	2.5
No	3	3.8
Missing System	74	93.7
Total	79	100.0

Out of 5 neighboring communities, 2 i.e.2.5% said that they were allowed to use firewood and grasses from the cardamom cultivated area. Whereas 3.8% said that they were not allowed to use firewood and grasses from cardamom cultivated area without paying money or working for the cardamom owner.

Therefore, neighboring communities had some problems in collecting firewood and grasses.

C. Effects of cardamom cultivation in the rural livelihoods

Role of cardamom cultivation in fulfilling basic needs and its effect in income of the surrounding community.

The study was conducted to acquire information about the effects of cardamom cultivation in fulfilling the basic needs. Hundred percent of respondents believed that cardamom cultivation has been contributing to fulfilling their basic needs by providing money as their incomes have increased after adopting cardamom cultivation.

According to them, cardamom cultivation was more beneficial than cultivating traditional crops, rearing livestock and other livelihood activities and they believed that the income of the

surrounding community has increased after adopting cardamom cultivation and the reason to support their view is listed below in the table.

Outcomes of increased income due to cardamom cultivation

Reasons	Response	
	Frequency	Percent
Better houses	68	86.07
Basic needs fulfillment	74	93.7
Better education	45	57
Easy availability of loan	61	77.2

Assessment of the area of expenditure of income made from cardamom cultivation

The study made an attempt to assess the area of expenditure of the income made out of cardamom cultivation and the result obtained are represented in the table below.

The major sectors that the sampled households spend their income from large cardamom cultivation were education, medicine, food, cloth, religious matter, payment of loan\ debt and decorating home.

A maximum amount of the income was being spent on education sector, which was a hopeful symptom of increment in the literacy rate of the sampled population followed by expenditure on food, clothing and medicine

From the table below (survey) respondents informed that high percentage of them were able to provide their children with better education after adopting cardamom cultivation. They could spend on their childrens' education with more ease than they did before. Many of them had shifted their children from ordinary schools to the boarding schools as a result of their improved economy due to cardamom cultivation.

3.8 % of respondents spent above 60,000 to provide quality education for their children after adopting cardamom cultivation. Before cardamom cultivation, none were able to spend that much amount in educating their children. Similarly there were 65.8% of respondents who spent just 0-5000 Rs on education while now the number of respondents spending fewer amounts in the education sector has reduced to 45.6%

Expenditure on education sector

Rs \Year	Before cardamom cultivation		After cardamom cultivation	
	Response	Percentage	Response	Percentage
0-5000	52	65.8	36	45.6
5000-15,000	20	25.3	13	16.4
15,000-30,000	7	8.9	10	12.7

30,000-45,000	-		8	10.1
45,000-60,000	-		9	11.4
60,000>	-		3	3.8
Total	79	100	79	100.0

Expenditure on Food, clothing and medicine

Rs\year	Food and clothing				Medicine			
	Before Cardamom cultivation		After Cardamom Cultivation		Before cardamom cultivation		After cardamom cultivation	
	No	%	No	%	No	%	No	%
0-5000	-	-	-	-	44	55.7	21	26.6
5000-15,000	33	41.8	32	40.5	25	31.6	32	40.5
15,000-30,000	35	44.3	19	24	10	12.7	26	32.9
30,000-45,000	11	13.9	13	16.5	-	-	-	-
45,000-60,000	-		15	19	-	-	-	-
Total	79	100.0	79	100.0	79	100.0	79	100.0

High percentage of respondents responded that after cardamom cultivation, they had better access to basic needs like food, clothing and they believed that they could now spend and provide better medical facilities than before.

Similarly, there was an improvement in the food habits indicated by the increased frequency of meat consumption. Before cardamom cultivation, there were no respondents able to spend money in the range between Rs 45,000 to 60,000 on food and clothing but now after cultivating cardamom there were 19% of the sampled respondents able to pay that amount on food and clothing.

Similarly, after adopting cardamom cultivation, 32.9% of the respondents can spend up to 15,000 to 30,000 Rupees on medicine while before cardamom cultivation there were only 12.7% of respondents able to spend that amount.

Therefore, the effect of cardamom cultivation in rural livelihoods was found to be very positive resulting in better education, better access - to medical facilities and improved eating and clothing habits among the cardamom cultivators in the study area.

Increased labor demands due to cardamom cultivation

Increased labor demands due to cardamom cultivation

Increased labor demand	Frequency	Percent
Adult (male member)	15	19.0
Adult and Women	48	60.8
Adult, Women and Child	16	20.3
Total	79	100.0

Cardamom, according to cultivators does not require a lot of attention, except at the initial stages when the crop has to be protected and during the field preparation when trees are felled to clear the place.

60.8 % of respondents believed that labor demand on adult and on women was high due to cardamom cultivation. 20.3% of the respondents opined that cardamom cultivation has increased labor demand on adult, women and child whereas only 19% believed that it has increased labor demand only on adult (male member) thus not affecting school going child and women.

However, instead of saying it has increased labor demand on men, women and children it would be better to conclude that due to cardamom cultivation not only men but also women were getting employment opportunities.

Cardamom cultivation affecting people depending on forest for their livelihood

During cultivation, large numbers of trees are felled and this is repeated when the processing of cardamom commences. The wide spread cultivation of cardamom under the forest canopy has added not only to the ecological burden but also it has affected the rural livelihood.

Cardamom cultivation affecting people depending on forest

Forest products	Frequency	Percent
Reduced grazing land	28	35.44
Reduced (grazing land+firewood)	13	16.45
Reduced(grazingland+grasses+firewood+NTFPs)	6	7.59
No affect	32	40.5
Total	79	100

During cultivation, large numbers of trees are felled and this is repeated when the processing of cardamom commences. The wide spread cultivation of cardamom under the forest canopy has added not only to the ecological burden but also it has affected the rural livelihood.

Above table shows the percentage of the sample size being affected as well as not affected by cardamom cultivation. Majority of respondents i.e. 35.44 % said that cardamom cultivation has reduced the size of grazing land .16.45 % of the respondents believed that cardamom cultivation has reduced both grazing land and firewood for the local people whereas 7.59% of the respondents said that cardamom cultivation has reduced NTFPs followed by reduction in grazing land, grasses and firewood

Among 79 households, 32 i.e. 40.5 % believed that cardamom cultivation has not affected the people depending on forest for their livelihood in fact they believed that it was more easy for them to get firewood after cardamom cultivation because they believed that due to cardamom cultivation forest area has increased and it was more convenient for them to collect firewood and grasses.

While from the study it was assumed that there was inequity in using forest products from cardamom-cultivated area. Only those cardamom owners occupying large chunk of lands were facilitated with the forest products and grasses while on other hand neighboring community and cardamom owner having small land area were having problems with less grazing land and insufficient amount of firewood.

Comparison of cardamom cultivation with other income generating alternatives to identify whether this is better income generating option or not:

Comparisons of cardamom cultivation with other income generating options

Comparisons of cardamom cultivation with other income generating options

Name of VDCs	Name of enterprises	Size of land holdings {Ropani}	Annual investments (Rs)	Annual income (Rs)
Matshya pokhari (Ward no 5 and 2)	Cardamom	242	3,87,040	7,99,500
	Crops	324	2,49,800	3,82,500
	Live stocks	Not available	35,200	Not available
Diding (Ward no 5)	Cardamom	198	4,05,700	1,092,450
	Crops	187	1,43,000	2,49,050
	Live stocks	Not available	28,100	Not available
Diding (Ward no 4)	Cardamom	17	41,350	83,000
	Crops	114	68,000	1,38,500
	Live stocks	Not available	10,400	Not available
Diding (Ward no 3)	Cardamom	135	2,05,400	4,11,500
	Crops	125	90,000	1,49,100
	Live stocks	Not available	15,100	Not available
Diding (Ward no 2)	Cardamom	82	2,22,950	5,24,600
	Crops	261	1,20,000	2,19,000
	Live stocks	Not available	19,500	Not available

An attempt was made to compare cardamom cultivation with other livelihood opportunities such as annual crop (rice, paddy and maize) cultivation and livestock raising. Hence, it can be concluded that cardamom cultivation was far more beneficial than annual crop cultivation and livestock raising. The income, which they made from cardamom cultivation, was almost more than double than investment made. While in case of annual crop cultivation, it was just a little bit more than the investment. Respondents lacked interest in cultivating annual crops. According to them they were compelled to cultivate it just for the sake of having rice. According to them the amount of production, which they get from annual crop cultivation, was not sufficient for them to feed their family. They lived on sparse rations of rice, lentils and vegetables. Food was never enough to fill their hungry bellies. Again another crucial reason for which they don't want to cultivate it was due to the harm caused by natural disasters like rain and hailstorm. According to them, in case of cardamom cultivation, rain and hailstorm can only reduce the amount of cardamom but in case of annual crops these disasters damage their whole production there by wasting their time, energy and resources.

Regarding livestock raising, the farmers were not able to estimate the size of land holdings for livestock raising as well as they do not have record about the annual income which they made from livestock raising. Farmers do not have separate land for livestock raising and about the income they obtained was not on an annual basis. They got the money from the livestock by selling their meats and milk and sometimes they got it by selling the livestock itself, which was not done regularly.

Thus cardamom cultivation tends to be beneficial by having positive effects on the quality of life.

Preferred enterprises by the sampled households

Preferred enterprises by the sampled households

Preferred enterprises	Frequency	Percent	Valid Percent
Cardamom	53	67.1	67.1
Cardamom,Tea	11	13.9	13.9
Tea	5	6.3	6.3
NTFPs	4	5.1	5.1
Shopkeeping	2	2.5	2.5
Cardamom,Tea,Vegetables	1	1.3	1.3
Cardamom,Tea,Rice,Maize,Millet	1	1.3	1.3
Amliso,Tea	1	1.3	1.3
Tea,Amliso , vegetables	1	1.3	1.3
Total	79	100.0	100.0

Survey was conducted to have information about preferred enterprises by the sampled households and the result obtained is tabulated in the table above.

Majority of the respondents were interested in cardamom cultivation. Out of 79 respondents interviewed, 53 i.e. 67.1 % were interested in cardamom cultivation even though most of them were facing the problem of diseases and low production. 13.9% of the respondents preferred both cardamom and tea cultivation while 6.3 % of respondents preferred tea cultivation. None of the respondents had interest in cultivating cereal crops because according to them cultivating cereal crops requires hard labor with no benefit at all.

Cardamom cultivation had changed their income level which not only made them economically strong but it had also bought a significant change in their expectations. Its cultivation is able to uplift the living standard of people by improving their status to spend on children's education, medicinal facilities. In addition to this they also have improved food and clothing habits. On the other hand some had savings to some extent thus able to free themselves from the debts.

People were also found to be interested in tea cultivation. It was because many farmers were suffering from the problem of diseases and low production cultivating cardamom. People had similar expectations about benefits in cultivating tea as that of cardamom cultivation.

Many farmers in the study area were enjoying the benefits of tea cultivation. According to them, they can earn weekly income from tea cultivation. The benefits of tea and cardamom cultivation are less labor consuming, one time investment and high market value.

Thus farmers were interested in cultivating cash crops rather than traditional crops due to the much more benefits incurred by cash crop cultivation.

Annual earnings from wage in other enterprises

The wages received from cardamom and other enterprises were found to be the same. All the respondents agreed that they got the amount of Rs150 without food while the amount of Rs100 was given with food. The rate was fixed and equal for all of the respondents interviewed.

E: OPINION OF DEVELOPMENT WORKERS

Various government and non governmental organizations like SODEC, DADO, CODEF, ECOHIMAL, TEF, DFO, FECOFUN and Nepal Chamber of Commerce and Industry were questioned about their opinion on cardamom cultivation and its effect in rural livelihood and bio-diversity conservation and to identify their role and recommendations for the promotion of cardamom cultivation.

SODEC: Cardamom cultivation is very beneficial to local people. It has a significant role for socio-economic improvement fostering increment in income levels. Due to its cultivation, other livelihood opportunities have decreased with the decrease in number of livestock. Since it is cultivated in forest areas, the density of forest has decreased while the land area has increased. Despite having several benefits in its farming, the government has not made any policy and program in relation to cardamom cultivation\promotion. The appropriate organizations and line agencies that have been working in its promotion are Alainchi baishask sangh and DADO respectively. SODEC has been doing some activities for its promotion by providing plants and giving training to skilled developments. For the promotion of cardamom cultivation, it has recommended that District development office should work in its promotion, making good vision and line agencies like DADO come forward in its promotion by providing training and modern technology.

DADO: Sankhuwasava District has become prosperous and rich due to cardamom cultivation. Cardamom farming is not a labor intensive work and done in a wasteland where other crops cannot be cultivated so it has not decreased other livelihood opportunities. Its cultivation has decreased biodiversity thereby decreasing the population of wild animals. Even though its farming has affected biodiversity, preference should be given to cardamom cultivation rather than biodiversity conservation as people's needs should be fulfilled first. The government also has the policies and programs in relation to cardamom cultivation promotion. Socio-economic assessment has been done by government for its promotion like Income per unit area due to cardamom cultivation was assessed. According to DADO, Udhyog Banijya Sangh was an appropriate line agency involved in its promotion that collects and distributes its production. In addition to this they have provided modern dryer and conducted training in different places. DADO has recommended that for the promotion of cardamom cultivation

first the disease should be controlled using pesticides, Nursery should be formed, plantation from seeds must be introduced, skill development trainings should be conducted, There must be a provision of solar dryer and finally Cardamom production must be channelized with market

CODEF: Socio- economic status of district has increased due to cardamom cultivation. Other livelihood opportunities have also increased, as it is not a labor-intensive work.

Its cultivation has affected promotion of other NTFPs. There are many organizations working in the promotion of cardamom farming like: SODEC, ECOHIMAL and CODEF itself. CODEF is providing skill development training in its cultivation. As about government policy and program concerned, there isn't any policy and program in relation to cardamom cultivation\ promotion. Alainchi Uthpadak Sangh is an appropriate line agency that is involved in its promotion but it is more focused in registering land in the name of cardamom owner and so far environmental and socio-economic assessment is not done by government. For the promotion of cardamom,

Awareness should be generated through NGOs and line agencies, Policy in relation to cardamom cultivation promotion should be formed, Skill development training should be given and

Modern dryer should be supplied.

ECOHIMAL: Cardamom cultivation is a major source of income in Sankhuwasava District but the farmers are not getting as much benefit as they used to get before. Cardamom cultivation has positive effect on education sector as well as life standard of farmers are also found to be uplifted. Besides cultivating cardamom, people are also found to be interested in tea cultivation.

Cardamom farming has decreased bio-diversity creating monoculture cultivation and new plants are suppressed as well as wild animals are also affected by its farming. Government has some policy and program in relation to cardamom cultivation promotion like they provide plants in discount rate and it is also providing training for disease control. There are some organizations like SODEC, Agriculture office and ECOHIMAL itself are contributing in its cultivation.

ECOHIMAL is providing plants, conducting training on harvesting and cultivation and supplies modern dryer. For the promotion of cardamom cultivation and bio-diversity conservation, there must be the demarcation of private and government land because elite

groups have occupied large forest area which is the property of government. Since cardamom cultivation affects biodiversity conservation, cardamom cultivation within community forest area should be prohibited with the generation of alternative livelihood options.

TEF: Cardamom cultivation has improved socio-economic status of Sankhuwasava District, restricting out-migration thus fulfilling basic needs with the high consumption of meat and better infrastructures. It has some negative effect on biodiversity conservation affecting some NTFPs like *loadshalla*, *Lokta*, *Argeili* and *Panchaaulae*. Government has some policy and program in relation to cardamom cultivation/promotion. They have provision of providing loan at minimum interest rate. ADB is an appropriate line agency that provides loan and seeds to the farmers. Some of the organizations like ECOHIMAL, SODEC and TEF itself are working in cardamom cultivation promotion. TEF is also providing seeds and suggestions, which will benefit both cardamom cultivation as well as conserving biodiversity. Since, large area of the community forest is in the hand of selected people, there must be equal distribution of the land for the sustainable rural livelihood, VDCs and DDCs must make strategies focusing poor and suppressed people, There should be networking within farmers and Market facility should be provided for the promotion of cardamom cultivation.

DFO: Cardamom cultivation has an adverse effect on biodiversity. Many species are lost due to its farming. In order to protect biodiversity loss due to cardamom farming, government will have some policies and programs in the near future such as prohibiting cardamom farming in the national forest. Similarly, in community forest also further cardamom cultivation will not be allowed.

Instead of this farming other livelihood opportunities will be encouraged. So far, government has not done any environmental and socio-economic assessment for the promotion of cardamom cultivation and it can be said that conservation of biodiversity and the cultivating of cardamom cannot be done at the same time.

FECOFUN: Since cardamom is cultivated in the forest area, it has severely affected biodiversity. Valuable species like *chop* is destroyed and many other small species of plants are also affected by its cultivation. In addition to this, lots of trees are felled to dry cardamom-decreasing density of forest area. In Sankhuwasava District, cardamom is cultivated in both private and community forests. In the case of a community forest, some have occupied large chunks of land while some don't even have a stake in it. The lack of equity in the distribution

of community forests for cardamom cultivation is a burning issue. The poor are becoming poorer while the wealthy are becoming wealthier.

People have benefited from cardamom cultivation only for a certain period of time after which the place where cardamom cultivation was done becomes worthless for the production of any other species. In this case the rich and influential people have other options but for poor they are impelled to live there. So the motive of FECOFUN is to discontinue people cultivating cardamom in community forests.

Nepal Chamber of Commerce and Industry: Cardamom cultivation has improved socio-economic status of Sankhuwasava District so for its promotion Nepal Chamber of Commerce and Industry is providing training for cardamom cultivators hiring some trained manpower. It has supplied some modern dryers in the district and has also distributed hybrid plants for high production. Even though farmers are producing cardamom, they are not able to reap benefits from its production due to the lack of market facility. Hence, farmers should be facilitated with a communication facility for the systematic market of cardamom. In addition good storage systems should be developed for combating price fluctuation.

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a conclusion of the results of this study, and provides recommendations for the stakeholders concerned. This conclusion section also attempts to synthesize the results of specific objectives. The recommendations section consist of some fundamental recommendations to the stakeholders.

Conclusion of the study

Large cardamom (*Ammonum Sublatum Roxb*) is a major cash crop for Nepal. Its cultivation has expanded to 39 Districts among which Sankhuwasava district is also one of the leading district in production of cardamom where 3,259 Hectare of land is occupied by cardamom farming (Karki, 007). Cardamom has been in demand for both its aromatic and medicinal purpose.

Monthly mean temperature of 30⁰C in June, July to about 6 ⁰C in December to January accompanied by constant relative humidity is very good for the crop. Elevation, moisture and shade are the fundamental factors for successful cardamom cultivation. The limit of elevation for productive cultivation is from 3,000 to 6,500 feet. These climatic requirements are fulfilled by only some specific areas of Sankhuwasava district like Diding, Matshya pokhari, Barhabisae, Jaljalae, Nundhaki and Madi Rambeni.

Among different species of cardamom, Ramshahi was popular in the study areas. 51.9% of the sampled households had cultivated Ramshahi while other varieties were cultivated in small scale. Plantation, intercultural operation, marketing and drying were the major areas of expenses for cardamom cultivation.

Annual average production of cardamom ranged from 60kg in Diding(ward no 4) to 362.2 kg in Diding(ward no 5). Similarly variation in earnings like there were 16.45% respondents having annual income range between Rs 2,500 to 9,750 and 7.59% having annual income range between Rs1, 20,000 to 2,40,000.

About 83.54% of the sampled household's cardamom farming was affected by diseases and due to the lack of knowledge to use pesticides they were unable to combat with these problems.

All, more or less sampled households used traditional dryer to dry cardamom. The reason behind using traditional dryer was due to lack of idea, economic cause and lack of support from government and non governmental organizations to provide modern dryer but during visit o several organizations, organizations like DEC, CODEF, ECOHIMAL, TEF, DADO, ADB and Nepal Chamber of Commerce and Industry were conducting some activities like providing cardamom plants, seeds, loan, conducting skill development trainings on harvesting and cultivation, supplying modern dryer for the promotion of cardamom. The market for cardamom in the VDCs was not organized with the transportation problems, lack of communication facility and fluctuating price of cardamom. Hundred percent of the sampled households used porter as a means of transport to carry their production to the local market, 96.2% of the respondents lack communication facility, 73.4% of the price of cardamom was fixed by broker and only 2.5% by cardamom producer himself this was the reason for which the farmers didn't get the actual price.

Despite having several constraints, many advantages were associated with cardamom cultivation. Hundred percent of the respondents believed that cardamom cultivation has been contributing in fulfilling their basic needs with a provision of easy availability of loan, better houses and better education. In addition to this they were now in position to spend money on medicine, food, cloth, religious matter and payment of loan. 3.8% of the respondents spend above Rs 60,000 annually to provide quality education for their children, which was a hopeful symptom of increment in the literacy rate. Similarly, 19% of the respondents spend annual money in the range between Rs 45,000 to 60,000 on food and could spend up to Rs 15,000 to 30,000 on medicine.

Compared to traditional crops, the income from cardamom was three to four times higher. An increase in income has enabled rural households to send their children to school who in the past had to work for household income needs but now they are in position to install solar electricity, bring piped water in addition to providing income opportunities to women and the landless during the harvesting season.

However, despite the advantages, the farmers were not been able to reap the benefits due to some major obstacles like low quality cardamom due to the use of inappropriate drying techniques, narrow market base, disease and lack of capacity of the producers and traders to access, understand and capture overseas market which is further complicated by the lack of support from the policy makers and planners at the higher level.

Role of cardamom cultivation in bio-diversity conservation:

The cultivation of cardamom requires shade and cool temperature and for these reason it is cultivated in forest areas. Both community and private forest in Sankhuwasava District is being used for its cultivation. Approximately the sampled households had occupied 376 Ropani of private forest and 298 Ropani of community for cardamom farming. Since it is grown under the shade of trees, 91.13% of the sampled households had used Uttis in combination with other small trees to shade their cardamom plants and many other plant species like Sisnu (*Urtica dioca*), Chiraeto (*Swertia chiraiti*), Saplings, Banmara, Katus, Amliso (*Thysanolaena maxima*) and Unue were removed. Similarly wild animals and birds like Tiger, Bear, Deer and Jackle, Eurasian Tree Sparrow, Red-Jungle fowl, Barred Cuckoo Dove and Jungle Myna were also reduced by cardamom cultivation.

Cardamom cultivation has also affected the numbers of livestock as its leaves were harmful for animals and by reducing the grazing area.

Finally, it can be concluded that though some constraints were associated with cardamom cultivation, from the socio-economic perspective, it was beneficial to the rural livelihoods but from the environmental aspect it has somehow affected biodiversity conservation thus leading to the demise of some species and creating monoculture in cultivation.

Recommendations

Recommendations for stakeholders

- Many forest related Acts, rules and regulations like NBSIP(2006-2010), Forest Act 1993 and Regulation 1995, Herbs and NTFP Development policy 2004 have not specific provision for cardamom cultivation in Nepal. Therefore, national policies should develop policies for cardamom cultivation in Nepal.

- The emphasis should go on the improvement of the market facilities. Provision of the appropriate storage and information systems may earn communities greater benefits. When the cardamom producers are not fully aware of who the potential buyers are, they are paid much less price as compare to what an informed producer may be able to fetch. Thus an appropriate system is recommended to overcome the losses faced by the local producers. Government support to the farmers in terms of marketing their products is suggested because this can work as an incentive for the farmers to produce more.
- Lack of agriculture fund was another problem in the VDC. Although loan and credit were provided by ADB\N it was not sufficient. The farmers were compelled to take credit from the moneylenders, which have exploited the farmers. For this, both short term and long term loans need to be provided by the ADB\N. For this sufficient loan should be allocated in this sector.
- The existing diseases and pests have reduced the amount of production. Plantations were done by cutting rhizome, which is affected more by different diseases than planting. Addressing this requires strong technical support so the government should provide the facility for treatment otherwise, cardamom farming will be on the decline.
- The farming method was traditional in the VDC. Neither the farmers were educated nor were they assisted by J.T.A s. New techniques were not introduced to the farmers. The District agriculture development offices should arrange the trainings, seminars or workshops to train the Farmers.
- Processing of large cardamom and its storage should be modernized. Farmers dry the cardamom in local dryer, which doesn't prepare qualitative product. Thus drying, grading, packing, storing should be done using modern techniques and technical tools.

Recommendations in terms of Biodiversity conservation:

- Attention may be required by Government to find suitable ways to support farmers in ensuring biodiversity maintenance in the forest areas, which is now being used for cardamom cultivation.
- Government should provide an effective basis for collaborative management of forest resources between cardamom user groups and district authorities that supports local livelihoods and maintenance of forest biodiversity.

Recommendations for further studies:

- Not many studies were found on the impact of cardamom cultivation on bio-diversity conservation in Nepal. Therefore, researchers are encouraged to conduct such studies.

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ANNEXES

Annex I: Questionnaire for household survey

Respondent Number:
Household Survey

Date:

Name of the respondent:

Cardamom owner:

Neighboring community:

Name of VDC:

Name of Village:

Tole:

Ward No:

Did you migrate to this place?

Yes () No ()

If yes, from which place, when and why?

Appendix 1

Document the status of cardamom cultivation

Cultivation practices

1. Since when you started to cultivate cardamom?

Year

2. Which is the major season for cardamom cultivation?

3. Which is the major areas\ VDCs for cardamom cultivation?

4. Do you find any diseases in your cardamom farming?

Yes () No ()

5. If yes, what are those diseases? Name them

6. Do you use any pesticides\ insecticides to control diseases and pest in cardamom farming?

Yes () No ()

7. What are the types of cardamom that you are cultivating?

Production

8. What is average annual production of cardamom in your field?

.....kg\year

Drying

9. Which type of Bahtti do you use for cardamom drying?

I) Traditional () II) Modern ()

10. If traditional, why don't you use modern Bahtti?

a) Lack of idea () b) Marketing ()
c) Transportation () d) Storing ()
e) Others ()

Investments

11. What are the major areas of expenses for cardamom cultivation? Please list down sequentially.

12. How much do you spend in these areas?

Plantation
Intercultural operation
Harvesting expenses
Drying expenses
Marketing expenses
Labor cost
Firewood cost

Marketing

13. Where do you sell the produced cardamom?

a) Local market b) money lenders of village
c) Wholesalers e) Others

14. What are other marketing centers for cardamom beside local market?

15. What is the cost of transportation to supply cardamom in a major trading center?

16. Who fixes the price of cardamom?

I) Cardamom producer II) Broker
III) Business community IV) others

17. Are you getting communication facility to know the market price of cardamom?

Yes () No ()

18. If yes, what type of communication means that you are using

19. Which means of transport do you use for produced cardamom?

Earnings

20. How much do you earn from cardamom selling?

- I) Amount of produced dried cardamom
- II) Rate of dried cardamom
- III) Total

21. Could you estimate your annual income from cardamom cultivation?
.....Rs\ year

22. What is your land holding size used for cardamom farming?
.....ropani\ hectare

23. Are you getting sufficient manpower and land for production and processing of cardamom?

- I) Yes () II) No ()

24. Are you getting credits from financial institutions for cardamom cultivation?

- I) Yes () II) No ()

25. If yes, what types of financial institution are you getting credit from?

- I) Nepal bank limited () II) ADB\N ()
- III) Local businessman () IV) Money lenders ()
- V) Others ()

26. What are the major organizations involved in cardamom cultivation promotion in your areas\ Districts? List the names and location of their offices.

27. What are the challenges and potentials of cardamom cultivation in this area? Discussion will be done with owners and neighboring community.

Socio-economic information

Land Cultivated	Crops in a Year	Production	Prevailing Price (Rs)	Total
Khet				
Pakho/Bari				

Livestock Holding

S.N.	Livestock type	Heads
1.		
2.		
3.		
4.		

5.		
6.		
7.		
8.		
9.		
10.		

28. Did you get any training for this farming?

I) Yes () II) No ()

29. Do you like to extend cardamom cultivation?

I) Yes () II) No ()

Appendix 2

Status of biodiversity in cardamom cultivation area:

1. What type of land do you use for cardamom farming?

- a) Waste land () b) Crop field () c) Dry field ()
d) Sloppy land () e) Grazing land ()
f) Private Forest () g) Community Forest ()
g) Others ()

2. How much land of community forest has been using under cardamom cultivation?

- a)..... ropani b).....hectare

4. When do field preparations occur?

- a) one year prior to cultivation b) Two year prior to cultivation
c)

5. How long does it take for cardamom field preparation?

6. Which trees or shrubs do you use for shading?

- a) Uttis () b) Shirish ()
c) Other ()

7. Name the plant species that is being disappeared or endangered by cardamom cultivation.

8. What is the source of energy to dry cardamom?

- a) Firewood () b) Electricity ()
d) Others ()

9. How much firewood is extracted from forest for drying cardamom pods at harvest?

10. Do you think that cardamom cultivation has increased the pressure on Forest resources?

11. Has cardamom cultivation restricted wild lives for feeding and movement?
 a) Yes () b) No ()

12. List down the wild animals available before cardamom cultivation.

13. List down the wild animals available after cardamom cultivation.

14. List down the birds available before cardamom cultivation.

15. List down the birds available after cardamom cultivation.

16. Has cardamom cultivation decreased the number of livestock ?
 a) Yes () b) No ()

S.N.	Livestock type	No of Heads before Cardamom cultivation	No of heads after Cardamom cultivation

17. Do you allow collecting firewood, grasses and other products of NTFPs from cardamom cultivation area? (Owner)
 a) Yes () b) No ()

Can you use firewood, grasses and other products of NTFPs from cardamom cultivation area? (Neighboring community)
 a) Yes () b) No ()

18. If yes, is this regularly or occasionally done?

19. What are the forest products you have been collecting from the cardamom cultivation areas?

c) Increased labor demand on child ()

7. Has its cultivation affecting the people depending on forest for their livelihoods?

a) Yes b) No

• If yes, can you explain how?

a) Reduced forest area\ grazing land ()

b) Reduced grasses for livestock ()

c) Reduced firewood ()

d) Reduced NTFPs for enterprises ()

Appendix 4

To compare cardamom cultivation with other income generating alternatives to identify whether this is best income generating option or not

1. How much income are community members earning from enterprises other than cardamom?

Name of enterprises	Size of land holdings	Annual investments	Annual income
Crops			
Livestock			
NTFPs			

2. Which enterprises do you prefer cardamom or other? Please explain

3. What is your annual earning from labor wage in other enterprises? (I.e. job assurance)\
Daily wage rate for one day

Annex II: Questionnaire for Development workers:

1. Do government has any policy and program in relation to cardamom cultivation/ promotion?

Yes () no ()

If yes, please explain.

2. What are the organizations working in promotion of cardamom cultivation in the district?
List the names

3. What are activities\ programs that you are doing in the promotion of cardamom cultivation?

4. Which are the appropriate line agencies involved in the promotion of cardamom cultivation?

5. Has government done any environmental and socio economic assessment for the promotion of cardamom cultivation?

6. What is your observation about effects of cardamom cultivation in terms of?

a) Income:

b) Livelihoods opportunities (increased \ decreased):

c) Biodiversity (increased \ decreased \ not known):

7. Is there any indirect benefit of cardamom cultivation?

8. What are your recommendations\ suggestions for sustainable cardamom cultivation?
(Cardamom promoters)

Annex III: Details of Households number and population of study area

Matshya Pokhari

Ward no	No of HHs	Male	Female	Total
2	141	325	373	698
5	98	240	246	486

Diding

Ward no	No of HHs	Male	Female	Total
2	57	135	161	296
3	62	172	170	342
4	49	140	141	281
5	95	245	236	481

Source: CBS,(2010)

Annex IV: NTFPs prioritized for Research and Development:

S.N	Nepali name	Scientific name
1	Panch Aule	<i>Dactylorhiza hatagirea</i>
2	Kudki	<i>Neopicrorhiza scrophularifolia</i>
3	Jatamasi	<i>Nardostachys grandiflora</i>
4	Sugandhawal	<i>Valeriana jatamansii</i>
5	Chiraito	<i>Swertia chirayita</i>
6	Sarpaganda	<i>Rauwolfia serpentina</i>
7	Yarsagumba	<i>Cordyceps sinensis</i>
8	Lauthsalla	<i>Taxus baccata</i>
9	Timur	<i>Zanthoxylum armatum</i>
10	Satabari	<i>Asparagus racemosus</i>
11	Dhasingre	<i>Gaultheria fragrantissima</i>
12	Bojho	<i>Acorus calamus</i>
13	Tejpat	<i>Cinnamomum tamala</i>
14	Rittha	<i>Sapindus mukorossi</i>
15	Gurjo	<i>Tinospora sinensis</i>
16	Bis	<i>Aconitum spicatum</i>
17	Laghupatra	<i>Podophyllum hexandrum</i>
18	Pasadbhad	<i>Bergenia cilliata</i>
19	Pipla	<i>Piper longum</i>
20	Jhau	<i>Lichens</i>
21	Padamchal	<i>Reheum australe</i>
22	Majhitho	<i>Rubia manjith</i>
23	Sughandhakokila	<i>Cinnamomum glaucescens</i>
24	Atis	<i>Aconitum heterophyllum</i>
25	Okhar	<i>Juglans regia</i>
26	Nim	<i>Azadirachta indica</i>
27	Bhyakur	<i>Dioscorea deltoidea</i>
28	Guchhi chau	<i>Morchella spp.</i>
29	Jangali Sayapatri	<i>Tagetes minuta</i>
30	Amala	<i>Phyllanthus emblica</i>

Source: Seminar presentation and discussion on Herbs, Herbal products and Species, CECI, (2005)

Annex V: Study Area Map



