

An Assessment of the Dependency of Farmers on Bamboo Resource for Rural Livelihood in Lalitpur District, Nepal



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ABSTRACT

This study assesses the dependency of farmers on bamboo resource for rural livelihood in Lalitpur district of Nepal. Bamboo is known as a key resource for people and it is one of the income generating sources for poor and landless people in Nepal. Many rural communities of Nepal have been cultivating and managing bamboo in homesteads as well as in Community Forests (CF). The study is based on the sustainable livelihoods approach and employed qualitative and quantitative research methods. A total number of 71 households from 3 villages in Badikhel Village Development Committee (VDC) were selected from Pahari caste for this research. The study found that bamboo craftmaking is the traditional occupation of Pahari households (producing handicrafts such as dalo, naglo, chalno and rack). The study further shows that bamboo craftmaking significantly contributes to the livelihoods of poor Pahari households (e.g. to cope with food insecurity), however, their income from bamboo crafts is lower compared to medium and rich wealth categories. Reasons are small landholding size, lack of adequate knowledge and skills, lack of bamboo raw materials, market and financial support to run the enterprise in a sustainable way. As the Community Forest User Groups (CFUGs) started large scale bamboo plantation in CF, timber prices and demand of handicrafts in urban areas increased, which is a high potential for selling bamboo culms for supplementing timber and crafts in future.

Key words: *Bamboo Resource, Non-timber Forest Product (NTFP), Rural Livelihood, Pahari caste, community forest, Community Forest User Group*

KURZFASSUNG

In der vorliegenden Studie wird die Abhängigkeit der ländlichen Lebensqualität von Bauern in der nepalesischen Region Lalitpur untersucht. Bambus gilt als Hauptrohstoffquelle für Menschen aller Altersstufen. Er ist eine Einkommensquelle für Arme und Menschen ohne Landbesitz in Nepal, wo er im Haushalt und zur Handarbeit benutzt wird. Die vielen ländlichen Gemeinschaften Nepals kultivieren und bewirtschaften Bambus sowohl auf ihren Gehöften als auch in sogenannten "Community Forests (CF)" und bauen ihre Lebensgrundlage auf dieser Rohstoffgrundlage auf. Die Studie gründet auf dem 'Sustainable Livelihoods'-Ansatz und verwendete qualitative und quantitative Methoden der Datenerhebung. Für diese Untersuchungen wurden 71 Haushalte der Pahari Kaste aus 3 Dörfern im Badikhel Village Development Committee (VDC) ausgewählt. Die Studie ergab, dass die Pahari Kaste traditionell Handarbeiten aus Bambus wie "dalo", "naglo", "chalno" und "rack" zur Sicherung ihres Lebensunterhaltes herstellen. Die Studie zeigt, dass vor allem arme Pahari Familien diese Handarbeiten existenziell zur Sicherung ihres Einkommens benötigen. Der Erlös aus dem Verkauf solcher Handarbeiten ist jedoch gering und daher befinden sich diese Haushalte ständig am Existenzminimum. Die Gründe für die schlechte Situation dieser Familienunternehmen sind der geringe Landbesitz, fehlendes fachspezifisches Wissen, Rohstoffknappheit und eine nur unzureichende finanzielle Unterstützung der Unternehmen. Während der Gemeinschaft Waldverbraucher (CFUGs) Gruppierung, hat große Bambuspflanzung in CF angefangen, bewertet Bauholz und Nachfrage der Handarbeiten in städtischen Gebieten vermehrt, der ein hohes Potential zum Verkaufen von Bambus culms für Ergänzenbauholz und Handwerke in Zukunft ist.

Schlagwörter: *Bambus als Rohstoff, Nichtholzprodukte, Existenzgrundlage im ländlichen Raum, Pahari Kaste, "community forest", "Community Forest User Group"*

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ABBREVIATIONS

ANSAB	Asia Network for Sustainable Agriculture and Bio-resources
BBIGA	Bamboo-based Income Generation Activities
BCR	Benefit-Cost Ratio
CBS	Central Bureau of Statistics
CECI Nepal	Canadian Center for International Studies and Co-operation
CFC-TIS	Community Forestry Component Tree Improvement and Silviculture
CFP	Community Forestry Programme
CF	Community Forest
CFUG	Community Forest User Group
CIFOR	Centre for International Forestry Research
CSAE	Centre for the Study of African Economies
DANIDA	Danish International Development Assistance
DDC	District Development Committee
DFID	The UK Department for International Development
DFO	District Forest Office
DoF	Department of Forest
FAO	Food and Agriculture Organization of the United States
FINNIDA	Finnish International Development Agency
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GTZ/PSP	German Technical Co-operation/Private Sector Promotion
HHs	Households
HJS	Himalayan Journal of Science
HIRI	Himalayan Resources Institute
HMG/N	His Majesty's Government of Nepal
ICIMOD	International Centre for Mountain Development
IGAs	Income Generating Activities
IIED	International Institute for Environment and Development
INBAR	International Network of Bamboo and Rattan
INGO	International Government Organization
IDRC	International Development Research Center
IRR	Internal Rate of Return

IoF	Institute of Forestry
IRD	Integrated Rural Development
IUCN	World Conservation Union
KIS	Key Informant Survey
MFSC	Ministry of Forests and Soil Conservation
MRM	Multiple Research Methodology
NARC	Nepal Agriculture Research Council
NARMSAP	Natural Resource Management Sector Assistance Programme
NGO	National Government Organization
NPR	Nepalese Rupees
NTFP	Non-timber Forest Product
NWFP	Non-wood Forest Product
NUKCFP	Nepal UK Community Forestry Project
OEAD	Austrian Exchange Service
OP	Operational Plan
PRA	Participatory Rural Appraisal
RES Nepal	Resource and Environment Conservation Society Nepal
RTC	Regional Forest Training Center
SDC	Swiss Development Co-operation
SEAGA	Socio-Economic and Gender Analysis Programme
SL	Sustainable Livelihood
SLA	Sustainable Livelihood Approach
SNV-Nepal	The Netherlands Development Organization-Nepal
SS	Sample Survey
UN	United Nations
UNDP	United Nations Development Programme
UNEP-WCMC	United Nations Environment Programme- World Conservation Monitoring Centre
VDC	Village Development Committee

CHAPTER 1: INTRODUCTION

1.1 Background

Different forest types and ecological regions are recognized in Nepal based on bio-climatic conditions; thus demonstrating the extreme ecological variations of mountainous regions. With the great variation in altitudinal range in the world within a narrow width of about 150-200 km, Nepal has at least 75 distinct vegetation types and rich flora, estimated to comprise about 7000 species of higher plants (Bhattarai, 1996). Valley vegetation is rich with undisturbed forests. Firewood is the primary energy source in the rural households which explains deforestation of easily accessible areas. Overgrazing has destroyed many valuable plant species, degrading the ecosystems along with many other operations including shifting cultivation. It is said that during the last two decades, more than half a million ha of forests have been destroyed in Nepal.

Forest plays a significant role to the livelihoods of people. Rural people rely on forest for fuel-wood, fodder, fibre, litter, medicinal plant for their daily needs. It is one of the integral components of the Nepalese farming system. It supplies people with the opportunities of direct and indirect employment. People are earning a part of their livelihood from selling non-timber forest products (NTFPs) available in the forest.

Non-timber Forest Products (NTFPs), also called 'minor' forest products are all forest products other than timber and fuel-wood. NTFPs provide a range of products which, when incorporated into the livelihood strategies of rural people aid in reducing their vulnerability to risks (Neumann & Hirsch, 2000). These products are used for food, energy, shelter, medicines, tools and fibre. They are used to meet basic needs, are sold in local, regional and national markets to generate cash and, serve an important gap filling or safety-net function (Chopra, 1997; Khare et al., 2000; Shackleton et al., 2002; Angelsen & Wunder, 2003). Over the last decade, research has elucidated the value of NTFPs both to rural livelihoods and as an alternative land-use option and, has found the value of NTFPs to be considerable (Shackleton et al., 2001). In Southeast Asia, at least 29 million people depend on NTFPs for subsistence income (HMG/N/MFSC, 2002). In Nepal, NTFPs are becoming increasingly important in local economies. It has been playing an important role in the subsistence of rural peoples' livelihood. NTFPs constitute one of six forestry programmes in

the Master Plan for the Forestry Sector, 1988, where seven marketed NTFPs are singled out for promotion, including medicinal and aromatic plants, Lokta paper, pine resin, katha (*Acacia catechu*), sabai grass, cane and bamboo. The issues of NTFPs were addressed in the Forest Act 1961 to some extent in Nepal. About 800 species of NTFPs are used locally to provide medicines, food, oils, fibres, dyes, tannins, gums, resins, incense, building materials, different handicrafts and agricultural implement. In Nepal, 5% of total Gross Domestic Product (GDP) comes from the trade of NTFPs (Subedi, 1999). NTFPs contribute significantly to the household economy of rural people residing adjacent to forests in most parts of Nepal. They are considered public resources and majority of them fall under open access resources without restriction on collection.

Bamboo (*Bambusa sp.*) is an integral part of forestry and one of the major NTFPs in the tropical and sub-tropical forests in Asia and also in some private lands. Bamboo is called "the poor man's timber" in China, "the friend of the people" in India and "the brother" in Vietnam (INBAR, 2003). There are 53 species of 12 genera bamboos are reported in Nepal (Das, 2002). Mainly the bamboo species found in Nepal are *Dendrocalamus strictus*, *Bambusa nutans*, *B. balcooa*, *B. tulda*, *B. nutans* (sub species, *nutans*), *Dendrocalamus giganteus*, *D. hamiltonii* and *D. hookerii*. The natural range of bamboo species extends from Terai (flat plains) to the high mountains (50-4000m) (Jackson, 1987; Das, 1988; Stapleton, 1994). Bamboos are abundant in eastern, central and western parts of Nepal. Far western regions of Nepal are yet to be explored. The importance of bamboo in the predominantly agricultural economy, particularly the rural economy, of Nepal is well recognized. Bamboo products are in great demand among farmers, artisans, and rural and urban enterprises for fodder, construction materials and a host of domestic uses like weaving. In terms of utilization, weaving is the most popular as 70% of the farmers grow bamboo on their farms and around homesteads (Karki, et al. 1996).

Bamboo is a perennial woody grass and belongs to the *Gramineae* family. It is naturally distributed in the tropical and sub-tropical belt between approximately 46° north and 47° south latitude, and is commonly found in Asia, Africa and Central and South America (FAO, 207). It is an extremely a diverse plant, which easily adapts to different climatic and soil conditions. In the bamboo growing countries, it is closely associated with indigenous culture and knowledge and is widely used for housing, forestry, agro-forestry, agricultural activities and utensils. Bamboo use and trade have been growing rapidly in recent years. Bamboo is

becoming popular as an excellent substitute for wood in producing pulp, paper, board and charcoal.

They are found in the natural forest in association with other species, but they are very much planted around villages and on private land (Shrestha, 1998). Bamboo is also widely spread outside forests, including farmlands, riverbanks, roadsides and urban areas. Bamboo is one of the fastest-growing plants on earth, gaining approximately 121 cm in 24 hrs (Ueda, 1974). It has ability to grow on marginal and waste lands, rapid growth habit, low cost extraction, low-cost processing, multi-functionality-make them important for subsistence and income needs of rural communities, especially those with few alternative resources or employment opportunities. It is quickly changing its image from the 'poor man's tree' to a high-tech, industrial raw material and substitute for wood. It is an increasingly important economic asset in poverty eradication and economic and environmental development. Now the use bamboo is growing rapidly in Latin America and Africa as well. In some countries, the processing of bamboo is growing from low-end crafts and utensils to high-end, value-added commodities such as laminated panels, boards, pulp, paper, mats, prefabricated houses, cloth and bamboo shoots. The traditional use of bamboo has become part of Asian culture. Bamboo can be called the backbone of Nepal's rural culture. Bamboo has many small but important uses such fishing rods, flutes, fishing traps, handicrafts, walking sticks, packing cases for teas and fruits, cages for poultry, pipes for water supply and irrigation, cradles, cart yokes, bullock carts, ladders, winnows and sieving for cleaning grains (Das, 2002).

In the eastern region of Nepal, bamboo is extensively found on both farm and non-farm lands. There are a large number of bamboo farms, ranging in area from 1.25 to 2.5 ha, in the eastern Terai (Chowdhary, 2003). In the low lands, natural stands are found mixed with deciduous subtropical forest vegetation. Natural stands, however, are suffering from a lack of management, lack of development schemes, unsustainable harvesting and outdated silvicultural technologies. About 66% of the bamboos are grown for commercial purposes and an equal percentage of growers are interested in expanding bamboo farming (Shrestha, 1994).

Bamboos are endemic to all the three major ecological zones of Nepal: Terai, Midhills and Mountains (Karki et al. 1996). However, they are more concentrated and show larger diversity in the eastern half of the country, from the Annapurna to the Kanchanjunga ranges of the Himalayan Mountains. Species abundance is directly related to the amount and

distribution of rainfall, with areas that receive well-distributed and greater rainfall, such as Pokhara and Illam regions, having the largest number of bamboo species. Nepal has both tropical bamboos found in South-East Asia and temperate bamboos found in Tibet and Bhutan (Karki et al. 1998)

1.2 Problem Statement

The improvement of livelihood of rural community is one of the major issues in the economy of Nepal. Thousands of tons of NTFPs are collected from forestland and traded to India from different parts of Nepal annually. Few species are traded with adequate management and many species are being over-exploited. Several species of NTFPs are overused and degraded (Sharma 1996; Subedi 1997). The reason for overuse and degradation are lack of knowledge and local control over these resources, rural poverty, increasing external market demand and social and cultural traditions. According to Chhetri et al. (2000) and Ojha (2001), the government of Nepal is committed, as a part of the community forestry initiatives for transferring right of forest management and use through local communities. However, there is still a number of policy and practical issues that need to address the potential of NTFPs as source of livelihood, economic growth and biodiversity conservation. The NTFPs species are over exploited and degraded under Community Forest (CF) management (Edward 1994; 1996a; 1996b; Malla et al. 1995; Sharma 1996; Subedi 1997). The lack of knowledge and local control over resources, rural poverty, increasing external market demand and social cultural practices are considered as the causes of NTFPs degradation. Consequently, NTFPs are largely threatened due to very little research on biological, commercial, socio-economical and institutional aspects.

Bamboo-based enterprises are an important source of employment for both the rural and urban work-force. Out of the estimated 12% contribution to the national GDP by the forestry sector, the share of bamboo is appraised to be only about 1-2% (Karki et al., 1995). This is mainly because of the lack of processing at the production sites and rural areas, where production costs are relatively low and most of the products go to meet subsistence needs. Most bamboo products such as mats, baskets and household items are manufactured by local farmers and artisans and sold in local markets. The national market, though strong, does not receive products from all the regions owing to the lack of a transportation network and a well-established marketing system. The only item that receives significant value addition is furniture, for which national and international markets are now slowly emerging.

Considering the abundance of human resources and the richness of indigenous craftsmanship, this is one area where Nepal can gain a comparative advantage, provided the work-force could be trained to improve their skills and enterprises assisted in value-added processing and marketing

Natural bamboo resources in Nepal have considerably dwindled during the last three decades. This is primarily owing to the large-scale destruction of the habitat of bamboos resulting from encroachment and release of forest land for agriculture, shifting cultivation, negligence in the management of natural bamboo stands, and the lack of an appropriate policy governing the resources. Although statistics on actual economic contribution of bamboo is not available, bamboo harvested from natural forest and farmland, makes significant contribution to household economy of many communities in rural Nepal (Das, 2002). Financial analysis of bamboo propagation done by Uriarte and Pinol (1994) in Philippines showed that a one-hectare bamboo farm has a benefit-cost ratio (BCR) of 1.82 and an internal rate of return (IRR) of 31%. The sensitivity analysis showed that profitability is twice more sensitive to a change in the price of bamboo poles than to the change in production cost.

Nature has given us valuable resources but our knowledge is very limited. So far, we are not able to utilize them in proper way. They have not thought about rural livelihood in large scale but only in particular area excluding community cultivation. Trading of NTFPs such as bamboo seems to be profitable and easy work to earn money. But no detailed studies have yet been conducted on the socio-economics of bamboos other than in eastern Nepal (Das, 1999). Due to the inadequate field survey, the biology, ecology and uses of bamboo in Nepal is little known. INBAR, Institute of Forestry (IOF) and Department of Forestry (DOF)/Government of Nepal conducted very limited study and research in this sector. The many rural communities in different parts of the country are cultivating and managing bamboo successfully and depending bamboo for their survival; however, they lack adequate technical knowledge and technology in terms of preparing plan and implementation of harvesting, processing, marketing, utilization and trading system.

1.3 Rationale of the Study

In Nepal, people are familiar with bamboo use as construction materials and various products made from it and their use. Farmers are growing bamboo in their private farm lands and community forests and adopting the traditional methods of production, management and marketing of their products. Most producers are poor and cannot venture for commercial production and marketing. Nepal is a country with different castes, ethnic religions and linguistic variations. The ethnic communities of Panjiyar of hill origin and Dom and Mahali of Terai origin are heavily depend on bamboos for their survival (Das, 2002). Most of the Marginalized people like Magar, Chepang, Tharu, Dalits/untouchable castes (esp. doms, dushads, musharams) etc. are involved in bamboo crafts in the Terai region (Adhikari, 2008). These people are making many bamboo woven products, handicrafts and furniture for their income. This is the situation of some ethnic minorities who have been heavily depending on bamboo resource for their subsistence livelihood.

According to a research done by Das, 2002, bamboos are also now increasingly introduced in community forests. Promoting plantation and management of bamboo in community forest may work as a livelihood strategy for the socially and economically disadvantaged groups. Sustainable management of bamboos, an important renewable natural resource, can help in reducing poverty. It is very important and integral component of rural farming system, as they play critical role in rural economy and help to sustain livelihoods of many rural households. Many of the marginal land which is not suitable for agriculture and community forests that possess degraded land, e.g., riverside flooded area, eroded land, fallow land and land damaged by overgrazing can be tapped for bamboo plantation. As it takes minimum time to give yield it could be a good income source for these ethnic groups. It can also help in reducing pressure on timber species, which take long gestation period to give merchantable product.

On the other hand, only very few studies/researches has been carried out about bamboo and rattan in the country. The private sector has not taken full advantage of the current policy provision of leasehold and private forestry to invest in the area of plantation establishment of improved bamboo species. Trained manpower and efficient management system is not developed for improved collection, processing, and utilization of bamboo and rattan through government initiatives. Good marketing infrastructure and reliable information system is not developed mainly to address the issue of lack of awareness on the part of

consumers of price and competitiveness of bamboo products. Technology transfer from neighbouring countries such as India and China is vital to develop improved production systems and in-country processing facilities which can be obtained through either bilateral cooperation or through foreign investment. Similarly, the existing indigenous conservation, management and utilization system of bamboo resources need to be promoted to prevent depletion of natural resources from its natural habitat. Therefore, detailed study about bamboo production-to-consumption system in Nepal could assist decision makers to identify the constraints and opportunities in this sector which could be the basis for possible development interventions to boost the bamboo resources conservation.

1.4 Research Objectives

Regarding the development problems on bamboo sector in the country, the general objective of the research is to assess the contribution of bamboo resource for rural livelihoods of local farmers in Lalitpur district of Nepal.

The specific objectives of this research are as follows:

1. To analyse and compare the dependency of bamboo based livelihood activities in different wealth categories of farmers.
2. To identify the problems and opportunities of bamboo enterprise in improving rural livelihoods of smallholder farmers.

1.5 Research Questions

Based on the specific objectives of the research, research questions are particularly focussed on the existing indigenous knowledge and skills on bamboo resource utilization, management and conservation and its contribution in the local people's livelihood as follows;

- 1.1 What are the existing knowledge and skills of the farmers about bamboo resource utilization, management and conservation in practice?
- 1.2 How does bamboo crafting contribute to rural livelihoods of small holder farmers as a livelihood strategy to compensate for the dwindling agricultural production?
- 1.3 Why do local farmers prefer bamboo enterprise as main livelihood alternatives?
- 2.1 What are the major problems on bamboo sector faced by the local farmers?
- 2.2 What are the future opportunities of bamboo based income generating activities in improving the rural livelihoods of smallholder farmers?

CHAPTER 2: LITERATURE REVIEW

2.1 Global Trends of Bamboo Resource

Bamboo is an ancient woody grass that numbers upto 90 genera and 1500 species of which only about 50 species are domesticated so far (FAO, 2005). It is found in tropical, subtropical and often temperate zones. Besides traditional use of construction, furniture, handicrafts and food, bamboo is increasingly being recognized as an environmentally friendly and cost-effective wood substitute for producing pulp, paper, boards, panels, flooring, roofing, composites and charcoal. Bamboo shoots are rich in fibre and are competing vigorously in the international vegetable market. In addition, bamboo has significant potential to help cope with wood shortages, reduce deforestation and reverse environmental degradation. According to FAO (2007), only 10 to 20% of bamboo consumed reaches international markets, the value of annual trade is about US\$5 to \$7 billion.

The International Network for Bamboo and Rattan (INBAR), headquartered in Beijing, China, through participating organizations and individuals from all countries, develops and assists in the transfer of technologies and solutions to benefit people and their environment. In collaboration with the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), INBAR has developed an innovative approach to quantify and map the likely range and distribution of bamboo species (Bystriakova et al, 2003b).

Bamboo is one of the most important NTFPs in the world trade and totalling about US\$37.56 million annually (Iqbal, 1995). More than 1 billion people live in bamboo houses globally. About 2.5 billion people in the world depend economically on bamboo (INBAR, 1999) and international trade in bamboo amounts to about US\$2.5 million (INBAR, 2005). It is the most universally useful plant known to mankind and approximately 2.5 billion people, mostly the poor in developing countries, depend on it for a wide range of uses and livelihoods (Anon, 1997). Bamboo and rattan represent an annual commercial value of over US\$ 14 billion globally (Anon, 1997). The socio-economic benefits attributed to this plant includes enhancement of women's and marginalized groups' economic position and mainstreaming of the rural poor in market economies. Market-driven changes in the bamboo sector have encouraged communities previously not involved with the resource to enter a bamboo based

economy. Traditionally, bamboo was used for domestic purposes and supplies were extracted based on need. Now, additional applications of bamboo have propelled it into new domestic and international markets, increasing profits and income for most participants in this sector.

Bamboo is becoming increasingly important for several developing countries in South and Southeast Asia because of the employment it offers to otherwise marginalized groups. However, expansion of the bamboo sector has not received the support required to ensure ecological and socio-economic sustainability. Instead, the focus has been on profits and industrializing bamboo production. To generate widespread benefits, external support should foster bamboo development close to the resource base to enable growth in communities most dependent on it. The Asia and Pacific region is the biggest net importer of forest products in the world but the largest exporter of Non-Wood Forest Products (NWFPs) especially the bamboo and rattan, amounting to some US\$2-3 billion annually (FAO, 2007). Bamboo culms (stems) have been traditional substitutes for timber in construction and scaffolding, and these uses remain vitally important in Asia today. Bamboo furniture and flooring are gaining market share, with new and innovative designs contributing to this growth. China and India have the world's largest bamboo resources and China is the world's largest producer of commercial bamboo production (UN, 2004). India reports 9 million hectares of bamboo forest and clumps, China counts 7 million hectares of bamboo, including 4 million hectares of plantations, and Ethiopia has 2 million hectares. Latin America is presumed to have 11 million hectares of bamboo, excluding the Andes (Jiang, 2002).

The bamboo sector provides part-or full-time employment for more than 5 million people in China (Ruiz-Pérez et al., 2001). More than 50% of the 125 recorded bamboo species are present in North-east India with a high degree of endemism and population density per given land area (Tewari 1992; Kochar et al. 1992). India's annual harvest totals approximately 4 millions tones, with slightly more than half used in rural construction and scaffolding (Ganapathy, 2000). Most of the remainder is for making pulp and paper. Bamboo is also used extensively to make paper in Bangladesh, China, the Philippines, Thailand and Viet Nam. The results from two joint studies by UNEP-WCMC and INBAR showed that over 400 bamboo species are potentially threatened by the destruction of naturally regenerated forest

cover, thus conservation and sustainable management of wild bamboo populations should have high priority (Bystriakova et al., 2003b).

About 80% of bamboo area is distributed with the southern tropical region of Asia and Africa and South Africa are poorly populated with bamboo (Kigomo, 1988). In the Global forest Resources Assessment 2000-FRA 2000 (FAO, 2001a), although bamboo data were not requested or specified, eleven countries-eight from Asia, one from Africa and two from Central and south America-provided data on the context of the bamboo forests. Interestingly, India, which has the largest area of bamboo resources in the world, did not present data on their extent. Pabuayon and Espanto (1997) reviewed that China, India, Indonesia and the Philippines focused primarily on markets and trades rather than resources.

Nepal has only 25 naturally occurring species and no native and introduced species (Ohrnberger, 1999; Londono, 2001) whereas China has 500 native species, 10 introduced species and 626 naturally occurring species and India has 119 native species, 25 introduced species and 102 naturally occurring species. This data shows that Nepal has only natural bamboo but need to introduce other bamboo species for plantation in the forest as well as in the private forest. China has the highest bamboo diversity in Asia, with over species, followed by Japan, India, Indonesia, Myanmar and Malaysia, each with more than a hundred species.

Asia remains the richest continent with about 65% of total world bamboo resources followed by America, 28% and Africa, 7%. India has occupied 30%, China-14%, Indonesia-5%, Equador-4%, Myanmar-2%, Vietnam-2% and remaining other countries-43% of the total bamboo resources (FAO, 2007). Sixteen countries in Asia together reported a total of close to 24 million hectares of bamboo forest, constituting some 4.4% of the total forest area where as 2.7% hectares of bamboo forest was reported by six countries (Ethiopia, Kenya, Nigeria, Uganda, Tanzania and Zimbabwe) in Africa. In Latin America, at least 10 countries have significant bamboo resources and a total of over 10 million hectares is considered a realistic estimate for the region. Among them, Brazil, Chile, Colombia, Equador and Mexico have the richest bamboo resources.

In Asia, the major bamboo producing countries are India (almost 11.4 million ha.) and China (over 5.4 million ha.), followed by Indonesia (2 million ha.) and Lao People's Democratic

Republic (1.6 million ha.). Over the last 15 years, the bamboo area in Asia has increased by 10%, primarily due to large-scale planting of bamboo in China and to a lesser extent, in India (FAO, 2007).

2.2 Bamboo Resource, Sustainable Forest management and Rural Livelihood

Bamboo is a highly renewable material. It is one of the earth's fastest growing plants for re-greening of degraded lands. Bamboo needs no replanting, grows without fertilizers or pesticides and is harvested from controlled stands with an astounding growth cycle of three to five years. Among more than 1200 species of bamboo in the world, moso bamboo (*Phyllostachys pubescens*) is the most preferred species for its versatility, renewability and beauty. Importantly, Moso bamboo is not a species consumed by the panda. It plays an important role in the reduction of timber consumption, environmental and forest protection, poverty alleviation, and sustainable development of rural economies.

Environmental degradation is a common phenomenon in mountainous regions. The hill slopes are cleared and terraces are built as land for agriculture. Opening up exposed slopes leads to the washing away of soil. The incessant actions caused by rain, storms, lightning, earthquakes, mining, overgrazing, burning of vegetation and other operations greatly contribute to soil erosion and environmental degradation. Top-soil washing by rainwater and riverbank cutting by flood during monsoon is common in Nepal. Between 30 and 75 tons of soil are washed away annually from each ha of deforested land, depleting 249 million cubic meters of soil per year (Wilson, 1998). This miserable depletion of soil could be minimized by planting bamboo whose rhizomes and roots have good soil binding capability (Poudyal, 2000). The surface roots which are relatively short grow to form dense clumps which hold the soil together, preventing surface erosion. Thus, the valuable top soil of Nepal could be protected through planting bamboo along the banks of every river or stream from Mechi in the east to the Mahakali in the west. The availability of bamboo and rattan resources has to be critically assessed against a background of the fragility of mountain slopes and the loss of biodiversity. Bamboo is a renewable alternative resource for agro-forestry production. Many of the Community Forest User Groups (CFUGs) in Nepal have started bamboo plantation in their community forest as a source of income which is also easily access to the CFUG members for bamboo based income generating activities and for the sustainable management of their own forest.

2.3 Situation of Bamboo Resource in Nepal

In Nepal, Bamboo is commonly known as 'Bans'. Out of the 75 districts of Nepal, 73 are known to have one or more species of bamboo. Altogether, 12 genera and 53 species of bamboo are found in Nepal (Das, 2002). Bamboos are mainly distributed in the tropics and sub-tropics mainly in mixed forest with other trees, usually as an understory and private land. Due to prevalence of more humid climatic conditions, eastern half of the country has a higher biodiversity than the western half. The total coverage of the area is estimated to be around 63,000 ha out of which 60% is estimated to be in the natural forests (Joshi and Amatya, URL <http://www.inbar.int/documents/country%report/nepal.htm>). Annual production of bamboo culm is estimated at 3.01 million out of which 2.64 is internally consumed and around 0.64 m. culms are exported to India (Poudyal, 1992 and Karki et al., 1995). The estimated production, consumption and percentage sold of bamboo stems in Nepal is shown in Table 1. Similarly, the distribution of various bamboo species found in different ecological zones of Nepal and their uses is shown in Table 2.

Table 1: Estimated production, consumption and percent sold of bamboo stems

Region	Annual Production (million stems)	Estimated consumption of stem/HH/year	In-country consumption (million stems)	Export (million stems)
Eastern	1.22	42	0.98	0.24
Central	1.23	60	1.10	0.23
Western	0.29	52	0.29	
Far western	0.27	28	0.27	
Nepal	3.01	45.5	2.64	0.46

Source: Poudyal 1992 and Karki et al., 1995

Bamboos are domesticated in large number of bamboo farm, with an area of 1.25 – 2.5 ha each in size, in the eastern Terai (Karki et al 1996) and 0.25- 0.50 ha in central Terai regions of Nepal (Chowdhary, 2003). It is extensively used by Nepalese for fodder, to make traditional baskets, mats and furniture, storage bin, utensils, nanglo, challo and as building material in rural areas. The habitat of commercially exploitable bamboo and cane has been reduced to the brink of disappearance. There are still few scientific data on the identification, distribution, uses and development prospects of bamboo, although this multiple use plant is an integral part of Nepalese life. Bamboo and cane are used traditionally in Nepal. At present, there is no significant export of bamboo in Nepal. A long term development program under the Ministry of Industries has been proposed to provide raw materials for

cottage industries and to contribute to the basic needs policy of the Government of Nepal. Now, the bamboo crafting and bamboo housing is introduced intensively within this last decades.

Table 2: Major bamboo resources in Nepal

S.N	Local Name	Scientific Name	Ecological Zone
1	Tharu bans, Seti bans	<i>Bambusa tulda</i>	Mid-western Nepal
2	Pahelo bans	<i>Bambusa glaucencens</i>	Kathmandu
3	Mokla bans	<i>Bambusa sp.</i>	Eastern Nepal
4	Kante bans	<i>Bambusa arundinacea</i>	Western Nepal
5	Dhanu bans	<i>Bambusa balcooa</i>	Western Nepal
6	Mal bans	<i>Bambusa nutans</i>	Eastern Nepal
7	Koraicho bans	<i>Bambusa oxytenathera</i>	Terai and Siwalik of east
8	Phosre bans, Khasre bans	<i>Dendrocalamus sp.</i>	Eastern Nepal
9	Tama bans, Ban bans, Choya bans	<i>Dendrocalamus hamiltonii</i>	Common in eastern Nepal
10	Kalo bans, Bhalu bans	<i>Dendrocalamus hookeri</i>	Eastern Nepal
11	Kath bans, Lathi bans	<i>Dendrocalamus strictus</i>	East to west
12	Dhungre bans	<i>Dendrocalamus sp.</i>	Eastern Nepal hills
13	Nibha bans, Lyas bans	<i>Dendrocalamus patellaris</i>	Eastern Nepal
14	Bhalu bans	<i>Dendrocalamus giganteus</i>	
15	Malingo, Nigalo	<i>Drepanostachyum</i> <i>Arundinaria recemosa</i>	East to west
16	Malingo	<i>Arundinaria maling</i>	Eastern Nepal
17	Padang	<i>Drepanostachyum</i> <i>hookerianum</i>	East hills
18	Gopi bans	<i>Cephalostachyum capitatum</i>	

Source: Jackson 1987; Stapleton 1994

In general, bamboo offers many opportunities because it serves both production and conservation purposes. Bamboo has long been cultivated in villages and historically, the rural poor have been the prime users of naturally regenerating bamboo in Nepal. However, farmers have knowledge of bamboo cultivation on a limited scale (Banik, 1996). Bamboo was rarely planted on forest land and there was little knowledge of bamboo afforestation and

reforestation in the past. In the last two or three decades, population growth and new bamboo processing opportunities have led to the overexploitation of bamboo resources in Nepal. These factors have contributed to the development of bamboo plantations. The traditional propagation methods have relatively low cost and do not require skilled labor, but they are not always applicable to large scales areas. While micro-propagation is currently used primarily in ornamental horticulture, it can also be applied in large scale initiatives. Approximately 30% of the total area of bamboo in Asia is planted (FAO, 2005). Still in Nepal, micro-propagation is not adopted in large scale however it is introducing slowly in farmers level also. It is because of the little knowledge about bamboo utilization, management and conservation in farmers' level.

2.4 Importance of Bamboo Resource for Rural Livelihood in Nepal

93 percent of the Nepali labor force are rural based and they practice subsistence agriculture, (sharma 1989, Amatya and Newman 1993), these people deal with NTFP in one or the other. In the Forestry Master Plan, a need to develop NTFPs especially lokta paper and bamboo was recognized. It is estimated that about 3.3 million farming families are somehow involved with the bamboo sub-sector either as producers or users of bamboo based products (Pant, 2006). If the bamboo and other NTFPs are developed, it can contribute much more to the regional and national economy. However, the government has not considered bamboo and other NTFPs as important as other sectors, because they were considered easily accessible, cheap and their potential to the regional and national economy is not well understood. Their importance is put in periphery in order to give priority to development of physical infrastructure supporting agriculture, tourism and industry and hydropower industry.

Bamboo plays a vital role in the Nepalese economy and has very wide and diverse uses in Nepal. It is the most used plant species among the majority of Nepali people. Bamboos are found both in natural forest and as plantation in farmlands (Karki et al 1995 and Poudyal 1992). Bamboo is distributed in all the ecological zones. However, bamboo diversity is high in eastern half of the country. Bamboos are used in domestic, construction and industrial purpose on the basis of their thickness and physical properties. Large diameter with less hollowness bamboo is generally preferred for construction purposes, where as medium diameter with easily splitable and highly elasticity bamboos are preferred for weaving

purposes. The most important species of bamboo found in Nepal and their major uses in Nepal are shown in Annex I.

Bamboos are used in more than 180 ways in Nepal (Das, 2002; Paudyal, 1991). However, there are 14 principle uses of bamboo in eastern Nepal such as container, pillar for shelter or drying rack, roof beam or truss, thatch supporting lattice, fence post, fencing rails (split), flooring/ceiling (split), wall paneling (split), split and woven mats and paneling, split and woven and trays, crushed and woven paneling split bands for tying choya, fodder and fuelwood (Seeland, 1980; Stapleton, 1982). Because of its multiplicity uses, bamboo has been an important source of income, sustaining the livelihoods of bamboo grower households, craft workers and traders.

Bamboos are grown mostly in homestead and unproductive land and are common in the natural forest in Nepal (Das, 1998). It plays important role in the rural livelihood that includes socially and economically disadvantaged groups (Das, 1992; Das 1999; Thapa et al., 1998). Marginal farmers use bamboo culms for weaving purposes than others. On the other hand, they donot sell them more in the market. The survey showed that the average number of bamboo culms sold in eastern Nepal was 152 and average income from sale of bamboo NPR. 6,257 (Das, 2002). Sale of woven products and crafts are major source of livelihood for many crafts maker in eastern Nepal. According to Das (2002), bamboo price has been increased about threefold in eastern Nepal between 1992 to 2002 of the medium sized diameter bamboos. Major factors affecting the price increment are socioeconomic condition of the household, willingness to sell and awareness of its demand in the local and area. Moreover, distance from market to bamboo growing areas, availability of transportation facility, the price of bamboo culms differ based on their purpose of use (Table 3).

Table 3: Pricing of bamboo in different forms

Types of bamboo	Price (NPR.) at farm gate	Retail (Eastern Nepal)	KTM
Weaving bamboo	30	60	100
Construction	25	56	88
Bamboo	43	70	113
Scaffolding	10	26	46

Source: Das, 2002

The income from the sale of woven products and crafts is the main sources of livelihood for many craft makers in eastern Nepal (Das, 2002). Due to the attractive income from bamboos, number of new craft makers came into the profession. Most of the income of the rural family in Terai and hills come from the bamboo crafting who are engaged in bamboo based income generating activities. Most bamboo workers and weavers in Nepal are illiterate and live in small hutments under conditions of perpetual poverty and ill health (Adkoli, 1995). Community forest User Group (CFUG) members cultivate bamboos in the allocated land of community forest in the eastern Nepal for their income generation. In a survey conducted in 6-community forest of Saptary district (Chowdhary, 2003) shows that out of 1732 households of CFUG members, 467 (26.96%) households were directly involved in bamboo-based income generation activities (BBIGA). Similarly, a study carried out in 13 community forest of Churia Watershed Management Project, Sarlahi- Mahotari, shows that out of 2994 households, 2343 (78%) of them have planted bamboos in their private land. All of the community forests have planted bamboos in their community land for income generation of community members, meet the domestic uses and rehabilitate the degraded lands (Chowdhary, 2003)

There are more than 25,000 families from excluded/ethnic groups involved in bamboo related livelihood activities in Eastern Nepal alone (Pant, 2006). In rural areas, bamboo is used in construction, fencing and storage basket, winnows, sheaving, hand fan, chicken/bird/pig cage, stool, big-eyed basket, mats, furniture and bamboo shoots. Similarly, bamboo product sold in the rural area is bamboo parquets, rack/book case, mat, bamboo paneling, handicrafts, furniture, baskets and bamboo raft/poles. In urban areas, bamboo is used in construction, flooring and home furniture. Bamboo shoots are also consumed as a delicacy. The bamboo sub-sector has potential to create rural employment through increased cultivation or by increasing value-adding activities. Several development projects are already supporting the bamboo sub-sector. However, most of these projects approach the sub-sector either from an environment/forestry or a livelihood perspective with limited support to address market related issues. Very few products are made for the export quality in the town areas. Mostly bamboo culms/products are sold in the town areas. Most commonly traded bamboos are *Dendrocalamus hamiltonii*, *D. hookerii* and *D. undulates*, *Bambusa arundinacea* and *Drepanostachyum*.

CHAPTER 3: RESEARCH METHODOLOGY

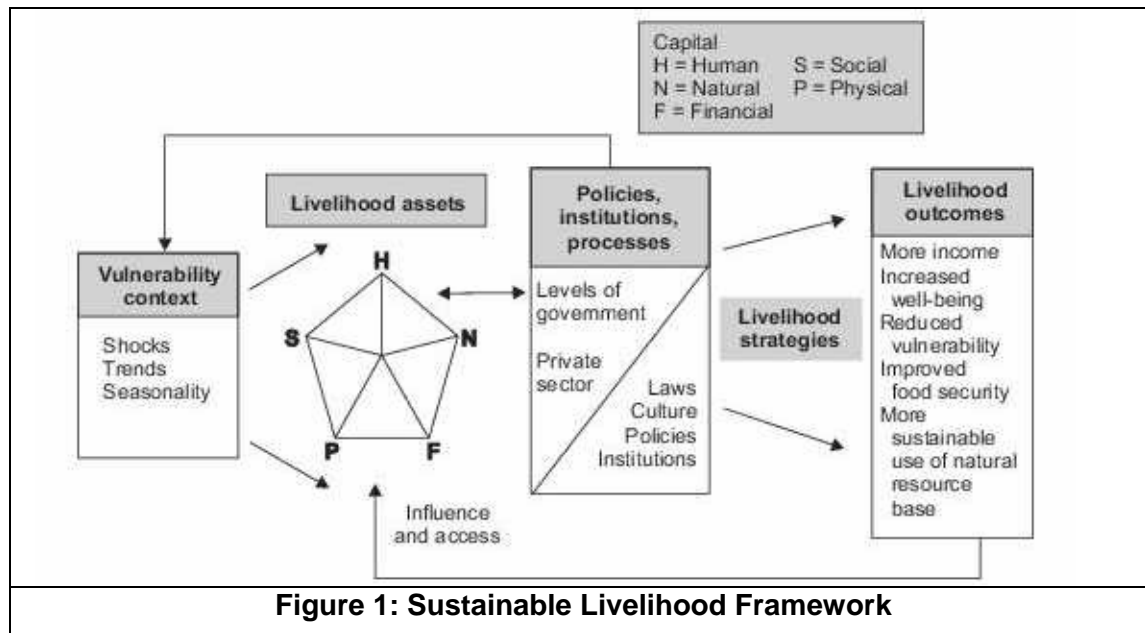
3.1 Sustainable Rural Livelihood: Concepts and Approach

The concept of sustainable livelihood was first used as a development concept in the early 1990s. Chambers and Conway (1991) defined a sustainable livelihood as follows: *'A livelihood comprises people, their capabilities and their means of living, including food, income and assets. Tangible assets are resources and stores, and intangible assets are claims and access. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets in which livelihoods depend, and has net beneficial effects on other livelihoods. A livelihood is socially sustainable which can cope with and recover from stress and shocks, and provide for future generations.'*

The Sustainable Livelihoods Approach (SLA) provides a conceptual tool for improved understanding of the context in which people live. It is based on the principles of best practices i.e. people centred, holistic, flexible and dynamic. It places people at the centre of development, and views people as having access to assets (human, natural, social, physical, financial) which are mediated through the prevailing social, institutional and organizational environment. It is mainly centred on people and their livelihoods. Many multi-lateral, bi-lateral, and non-government agencies believe that using a sustainable livelihoods approach is a sensible and practical way of thinking about, planning and implementing development. The UK Department for International Development (DFID) was one of the first proponents of the SLA.

Livelihoods are based on income (in cash, kind, or services) obtained from employment, and from remuneration through assets and entitlements. The SL approach builds on the Integrated Rural Development (IRD) model, participatory development and basic needs approaches, food security studies, and sector-wide approaches (DFID, 2003) and incorporates other types of analyses related to households, gender, governance and farming systems to arrive at a more holistic understanding of poverty (Farrington et al., 1999). The SL approach shifted the focus to poor people to overcome this overly narrow type of analysis. The focus on people rather than on resources, structures, or physical areas entails a bottom-up approach that encompasses both the macro- (policy) and micro- (users, field) levels. Chambers and Conway's work focused on how rural households and members within households diversify their activities to increase income, reduce vulnerability and improve the

quality of their lives. They argued that a livelihood is sustainable if it: ‘. . . can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and . . . contributes net benefits to other livelihoods at the local and global levels and in the short and long-term’ (Chambers and Conway, 1992).



Source: DFID, 2003

The livelihoods of rural households throughout the developing world are inherently fragile, exposed to a range of shocks, trends and seasonal fluctuations over which households have limited or no control (DFID, 1999). In seeking sustainable livelihood outcomes, households may draw from their asset base, categorized by DFID (1999) to include human, social, natural, physical and financial capital. These assets seldom contribute positively in isolation and therefore where possible households invest in a range of these. Poor households are particularly constrained and therefore how they manage and mix their available assets is fundamental to survival (Block & Webb, 2001). Access to these capital groups informs the livelihood strategies households pursue in their attempts to achieve and maintain a sustainable livelihood. Research at a global scale has identified that rural households adopt a range of livelihood strategies, draw from a diversity of income sources and invest in an assortment of assets not only in an endeavor to achieve their livelihood outcomes but also to provide a buffer to risk (Ellis, 2000; Block & Webb, 2001; Shackleton et al., 2001; Niehof, 2004; Bryceson & Fonseca, 2006).

Livelihood outcomes are the achievements of livelihood strategies, such as **more income** (e.g. cash), **increased well-being** (e.g. non material goods, like self-esteem, health status, access to services, sense of inclusion), **reduced vulnerability** (e.g. better resilience through increase in asset status), **improved food security** (e.g. increase in financial capital in order to buy food) and a more **sustainable use of natural resources** (e.g. appropriate property rights). They might give us an idea of how people are likely to respond to new opportunities and which performance indicators should be used to assess support activity. Livelihood Outcomes directly influence the assets and change dynamically their level-the form of the pentagon, offering a new starting point for other strategies and outcomes.

The livelihoods of poor, rural communities are often insecure and vulnerable to adversity, consequently people adopt a range of livelihood strategies including formal and informal employment, pensions, migrant remittances, the use of natural resources (for subsistence and sale), arable production, animal husbandry and claiming through social networks (Shackleton et al., 2001). Through these multiple strategies, people aim to secure their livelihoods and achieve multiple and desired livelihood outcomes. A sustainable livelihood is one that can recover from shocks and maintain and improve its assets without impacting unsustainably on the available natural resource base (DFID, 1999). People have access to combinations of assets: how they use these and what attempts they make to acquire further assets plays a fundamental role in their livelihood outcomes. In the case of communities whose access to certain assets is limited, how they combine and protect their existing assets is often crucial in ensuring survival (DFID, 1999). A livelihood strategy comprises “capabilities, assets and activities required for a means of living” (DFID, 1999). Within the livelihoods approach, these strategies and assets cannot be considered in isolation but rather as a suite of activities/assets that together contribute to reducing a household’s vulnerability.

3.2 Conceptual Framework

Following the sustainable livelihood approach, the researcher have operationalized and developed own research concept/framework based on the research objectives and research questions which is shown in the figure 2. In the research framework, there are 3 categories of farmers i.e. rich, medium and poor. Bamboo enterprise is their main livelihood strategy combined with agricultural production, paid employment and remittances. Based on the 5 livelihood outcomes in SLA, this research is only focused on the 2 livelihood outcomes i.e.

increased income and improved food security. The result is focused on the dependency of the three categories of farmers on bamboo enterprise for their household income and food security and the driving factors for the adoption of bamboo occupation and opportunities of bamboo enterprise for the future generation. There are 3 livelihood strategies namely distress, maintenance and progress strategies and the research is focused on which categories of farmers are on which strategies for the livelihood outcomes from the bamboo enterprise i.e. increased income and improved food security. In this way, bamboo enterprise is running in the rural communities as a main livelihood strategy.

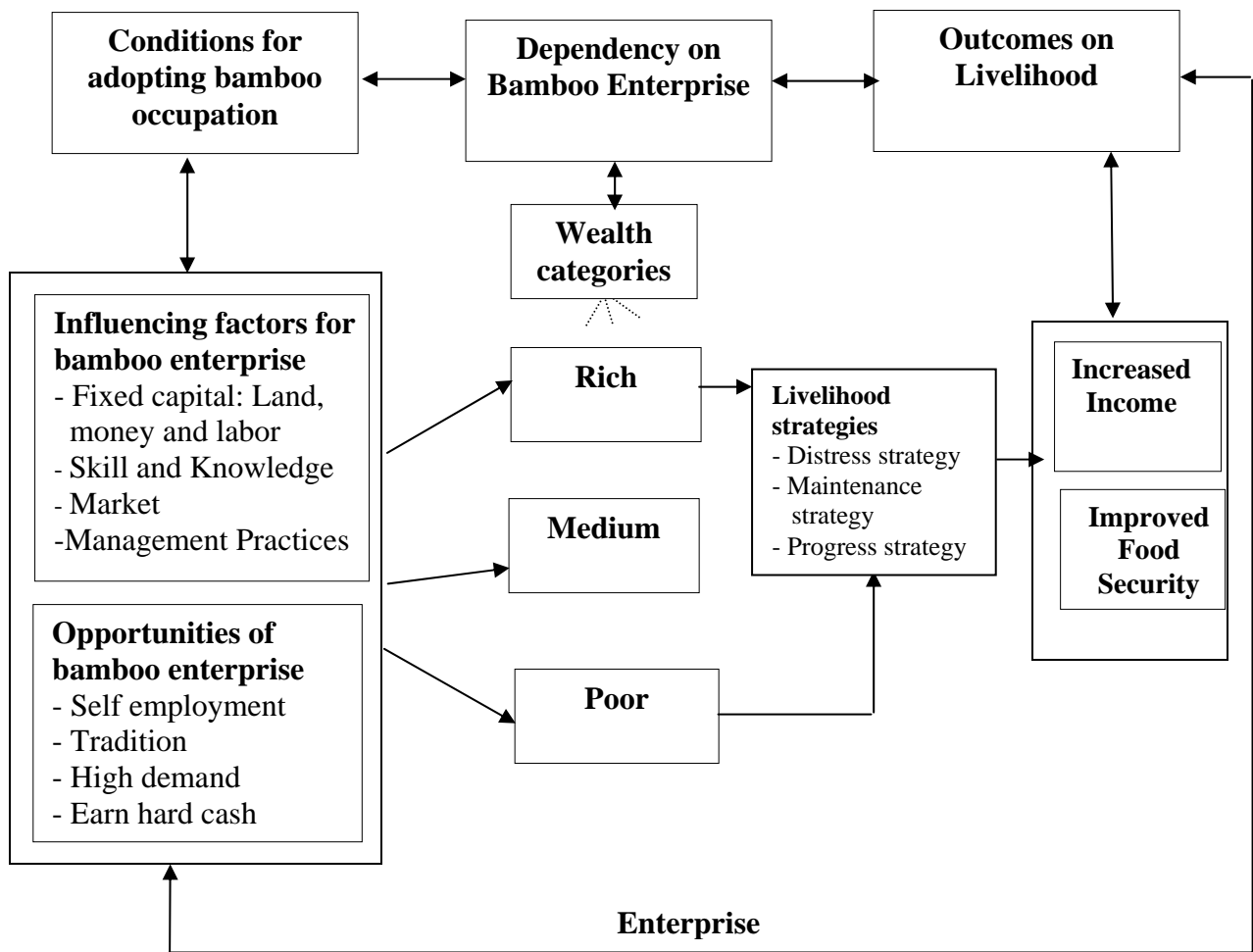


Figure 2: Conceptual framework of the study

These are operational definition of some terms used in the conceptual framework.

Distress Strategy: It is a livelihood strategy in which people only survive their livelihood at subsistence level from different livelihood alternatives.

Maintenance Strategy: It is a strategy in which people maintain their living status not only for survive from different livelihood options.

Progress Strategy: It is a strategy in which people progress their livelihood status through different livelihood options.

3. 3 Research Approach

This is a case study research of deductive nature. Deductive approach begins with the theoretical statements which outlines the logical connection among concepts/statements and moves towards concrete empirical evidence. In this research, abstract concept about the contribution of bamboo crafting for rural people's livelihood was first developed based on previous professional research work and thereafter, attempted to support or not the theoretical statements by the collected data and results from empirical data in a wide variety of farmers.

Based on the audience and use of research, this is an applied research. Applied research designed to offer a practical solution to a concrete problem or address the immediate and specific needs of clinicians or practioners (Neuman, 2006). It relies on a quick, small-scale study that provides practical results that people can use in the short term. It develops a long-term general understanding about bamboo crafting and its role in their livelihoods and results can be used by general practioners, farmers, NGOs/INGOs for further improvements in this sector. The major research approaches used for data collection are exploratory and explanatory. The research explores degree of dependency of farmers on bamboo crafting for rural livelihood in Nepal and explains the problems and opportunities regarding bamboo enterprise and its sustainability.

3.4 Research Process/design

The research was started with brining thoughts on identifying the problem areas based on literature reviews and preparing scientific research proposal based on the concept developed. During the preparation of proposal, various ideas about the topic were taken

from different bamboo experts and professionals by direct contact, telephone conversation and e-mails. Series of discussion with supervisor and co-supervisor encouraged critical thinking on concepts used in this research. Colleagues and other forestry professionals also provided valuable inputs for preparing concept during informal discussions. Several discussions with supervisor, co-supervisor and various national as well as district level line agencies and stakeholders were carried out. HHs survey questionnaires and checklist for focus group discussion, key informant survey and wealth ranking was developed in the university and finalized after the discussion with supervisor and bamboo experts.

Discussion with local facilitators and stakeholders helped in planning the field work. Pre-field visit was carried out and questionnaire and check lists were pre-tested before the actual field work and corrected for actual field survey. Data were collected using various methods after the consultation with supervisor, co-supervisors and experts. After completing fieldwork, first hand information was discussed with local leaders, district level stakeholders and experts. Post-field visit was also carried out for taking some missing data. Compilation of data, analysis of the data, reporting of the results and discussions with the supervisor and supervisor led to the conclusions and recommendations and final thesis preparation (Figure 3).

Out of 262 HHs distributed in the study area, only the households from Pahari castes (237 HHs) were selected purposively from 3 villages for the research who are heavily dependent on bamboo craftmaking for their livelihood. From participatory well-being ranking, selected households were ranked as rich, medium and poor classes. Among the 237 pahari HHs, 71 HHs (30% of the total pahari HHs) were selected from each wealth categories of farmers randomly. To analyse the level of annual income from bamboo enterprise in different wealth classes of farmers (rich, medium and poor), a statistical method i.e. one-way ANOVA table was used. One-way ANOVA table gives more accurate result by using all model assumptions. In this research, multiple comparisons, homogeneity of variances and homogenous sub-set groups were used and analysed.

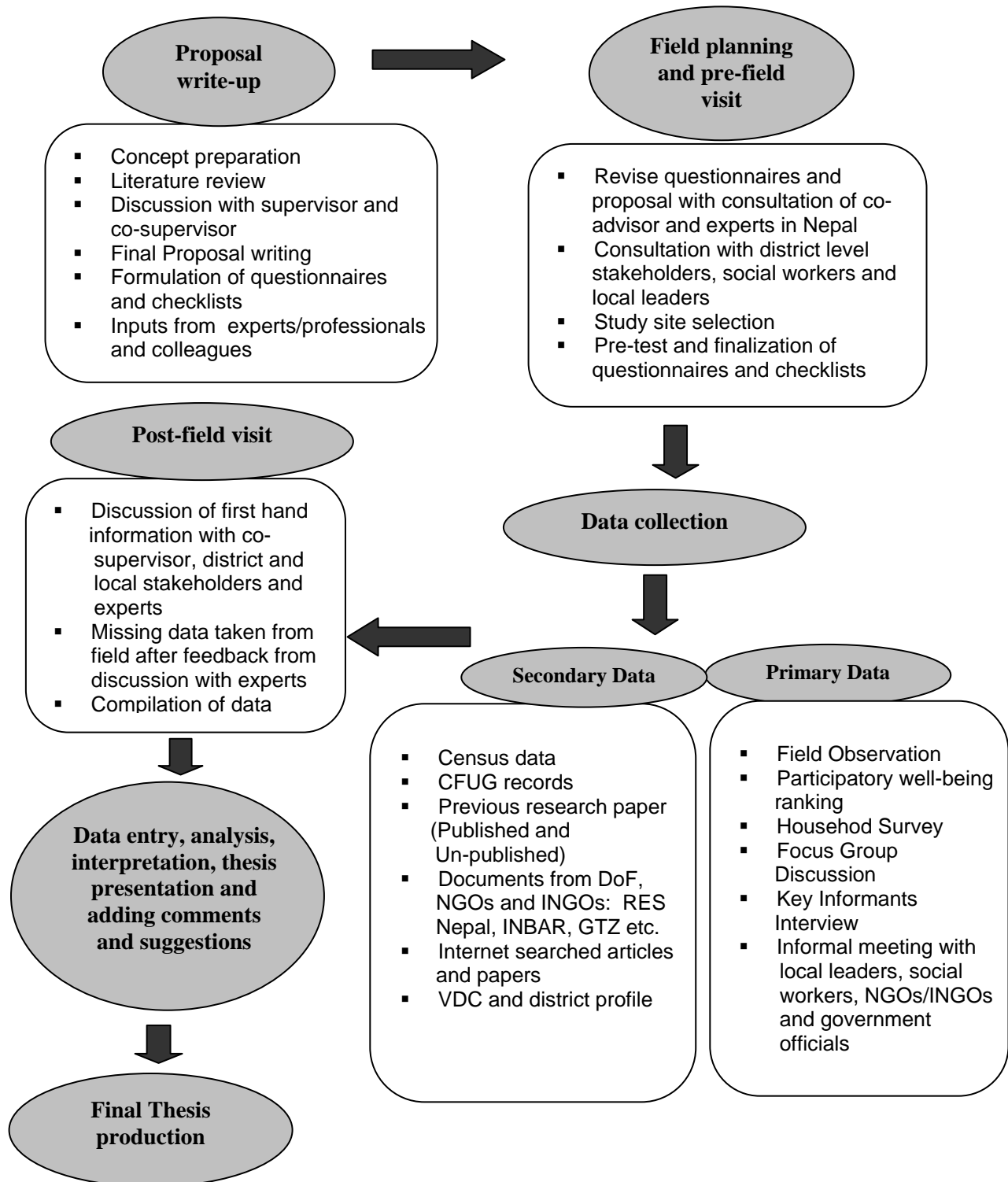


Figure 3: Overall research process

3.5 Research Site Selection

This research was conducted in the Badikhel Village Development Committee (VDC) of Lalitpur district in the central region of Nepal.

3.5.1 Consultation with experts

Before selecting the site, basic information was collected from different parts of the country where farmers are involved in bamboo based family occupation at different level. During that time, several meetings and informal discussion was carried out with the professionals of local Non-government Organizations (NGOs), Resource and Environment Conservation Society Nepal (RES Nepal), International Network for Bamboo and Rattan (INBAR), German Technical Co-operation (GTZ), DoF and DFO and some small cottage industries in the local areas who are working in the bamboo sector and have more knowledge and idea about situation of bamboo resource use, conservation, management and marketing. Based on the objective of the research and discussions with bamboo experts and co-supervisor, Badikhel VDC of Lalitpur district was selected as a study area for this research.

3.5.2 Criteria for site selection

The majority of the community residing in these areas are bamboo occupational caste i.e. Pahari (one of the marginalized hills ethnic caste of Nepal). Bamboo craftmaking, along with agriculture, are the main income source of the Pahari people. The Paharis living on traditional bamboo works for ages. On the other hand, series of studies and researches about traditional handicrafts of bamboo for socio-economics of rural people are carried out in eastern Nepal. Although, this site is very near from the capital city, Kathmandu, the research about Pahari households' tradition about bamboo craftmaking and its importance for their subsistence livelihood is still lacking. We cannot find detailed information and research articles about pahari household, their tradition and bamboo crafting.

After VDC selection, continuous discussion was carried out with officials of DFO in Lalitpur and Badikhel range-post and 3 villages were identified for conducting this research which met the following criteria on the basis of their experience and observations.

- Villages with majority of the Pahari households
- Maximum number of bamboo entrepreneurs as a small scale business in each villages
- Households with heterogeneous structures in terms of economic class

3.6 Brief Description of Research Site

3.6.1 General overview of Nepal

Nepal is a relatively small country, with a total land area of 147,181 km² supporting monsoon subtropical forests in the south and deciduous and coniferous temperate forests extending to arctic conditions in the north. The country is situated between the two most populous countries of the world, India in the east, south, west and China in the north. Situated in the lap of Himalayas, Nepal is located in between the latitude 26° 22' N to 30° 27' North and 80° 04' to 88° 12' East and elevation ranges from 90 to 8848m. The average length being 885 km (east to west) and average breadth (north to south) is about 193 km. It has varied climatic conditions from the hot Gangetic plain to the world's highest peak. In the geographic diversity and varied climatic conditions, census 2001 enumerated more than 100 caste/ethnic groups. Population projected for the year 2005 is 25342638, among them 1268375 (50.05%) male and 12657263 (49.95%) female (CBS, 2005). As current population growth is 2.25% per annum (CBS, 2001). The average household's size is 5.44 and literate population is 54.01% (CBS, 2001).

3.6.2 Lalitpur District

Lalitpur district is one of the 75 districts of Nepal which adjacent to the capital city, Kathmandu. It is a mountainous district of Bagmati zone in the central development region. Its district headquarter is Patan which covers an area of 392.84 km² (District Profile, 2004) and has a population of 337,785 out of which 48.95% are male and 51.05% are female (CBS, 2001). It has 41 VDCS and one sub-metropolitan i.e. Lalitpur sub-metropolitan. This district is one of the district of Kathmandu valley and has religious importance. It lies on north latitude: 27° 22' to 28° 50' and east longitude: 27° 22' to 28° 50'. It is distributed in 457m from the mean sea level to 2831m. Due to a high altitudinal differences, sub-tropical, warm temperate and cool temperate climate are mainly found in the district. About 1/3rd of the district lies in the Kathmandu valley and 2/3rd lies in hills and mountains (District profile, 2004). Total number of households is 68,922 and annual population growth rate is 2.73%. Literacy rate of this district is 70.8% which is higher than country's average literacy rate of 54.1 % (CBS, 2006).

Among the total area of the district, agriculture land occupies 147.62 km², forest occupies 197.97 km² and remaining area is occupied by shrubs and grazing land (District profile, 2004). The district is rich in NTFPs which are used for the preparation of different ayurvedic

medicines such as neem (*Azadirachta indica*), gurjo (*Tinospora sinensis*), black yam, tejpatta (*Cinnamomum tamala*), pakhanved (*Bergania ciliate*), Jethimadhu (*Glycyrrhiza glabra*), Dhasingre (*Gaultheria fragrantissima*), timur (*Zanthoxylum armatum*), jatamasi (*Nardostachys grandiflora*) etc. The total area of the community forest is 12,561 ha out of which 10,727.45 ha forest is handed to the community and 178 Community Forest User Groups (CFUGs) are established in the district till now (District profile, 2004).

About 46 ethnic group and castes such as Bhramin, Chhetri, Newar, Tharu, Tamang, Magar, Muslim, Sarki, Thakuri, Damai, Gurung, Rai, Yadav, Chepang, Kumal, Sherpa, Pahari etc. are found in the district (CBS, 2001). Out of 321 small cottage industries registered in the small cottage industry office in Lalitpur district, 21 industries are handicraft making industries (District profile, 2004). Many INGOs such as Helvetas-Nepal, Luthern Nepal, World Conservation Union (IUCN), German Technical Co-operation (GTZ), Oxfam, Swiss Development Co-operation (SDC) etc are working in the district in various development activities.

3.6.3 Badikhel VDC

Badikhel VDC is one of the VDC in Lalitpur district having a total households of 527 with a population of 3212 out of which 48.62% are female and 51.38% are male (VDC profile, 2003). It is about 15 Km far from the capital city centre Kathmandu and 12 Km far away from the district headquarter. The VDC has access road facility from the district headquarter and capital city Kathmandu. Among the total area of Badikhel VDC, about 35% land is agriculture land which is suitable for crop production whereas 44.04% is productive forest, 0.75% marginal land and 0.83% is grazing land. Most of all the forest is owned by the community under CFUG.

The Badikhel VDC is also rich in different types of major NTFPs found in the district. There are 4 CFUGs which covers most of all HHs of 9 wards in the VDC (Table 4). In total, there are 13 women community groups through which they conduct awareness raising programs about agriculture, forest education, health and sanitation etc. Resin extraction from the pine forest is the major income source of CFUGs and timber selling to the community members at very low price is also an another source of income.

Table 4: Details of CFUGs in the study area

S.N.	Name of CFUG	VDC/ward. No.	Area (ha.)	HHs involved
1	Kumari	Badikhel-4, Dandagaun	46	129
2	Bandevi Shanti	Badikhel-5, Thulo khola	89.36	76
3	Chandaul Masdanda	Badikhel-6, 7 & 8	102.32	179
4	Gyalindaha	Badikhel-9	14.00	71

Source: DFO, Lalitpur; Fiscal year 2060/61 BS

The majority of people (80%) belong to medium class family, 15% poor class and only 5% are upper class or rich class family (VDC profile, 2003). There are various casts of people living in this village, but the village is dominated by an indigenous group called “Pahari” (people of the hills). In an average, 52% of households are pahari, 45% are Bhramins/Chhetris (higher castes) and 3% are others like dalits (untouchable castes) and newars (ethnic castes of Kathmandu valley) (VDC profile, 2003). Paharis are dominated in most of the CFUGs. Majority of the people are Hindus but some Buddhist and Christians are also living in these areas.

In Badikhel VDC, 40.78% of the people are illiterate, 47.81% are just literate or have minimal education whereas only 11.47% are well educated (VDC profile, 2003). Female are less educated than male. 51.59%% of the female population are illiterate, 42.25% are just literate or have minimal education and only 6.15% are educated.

Irrigation is the main problem in the VDC for agricultural production. Only 40.32% of the land is irrigated and remaining 59.68% of land is non-irrigated so farmers totally depend on rain water for agricultural production in these lands. Limited numbers of small cottage industries are run in the VDC: 2 rice mills, 1 registered furniture industry and 15 unregistered furniture industries (VDC profile, 2003). The land and climate of Badikhel have great potential for commercial horticulture as numerous fruits and vegetables, particularly grapes, already grow in the area.

3.6.4 Description of study area

The research is only focussed in the Pahari households covering 3 villages in Badikhel VDC as shown in Table 5.

Table 5: Details of selected study site

S.N.	Name of the village	VDC/ward No.
1	Danga Gaun	Badikhel-4
2	Thulo khola	Badikhel-5
3	Majh Gaun	Badikhel-7

Paharis are local tribal community of Nepal. Although, Paharis are distributed in 42 districts of Nepal, they mostly inhabit in Ramechhap, Kavre, Sindhupalchowk, Lalitpur and Rautahat districts. According to the Department of Central Statistics, Pahari have a total population of about 12,000. They have their own language and culture. The Paharis family members (both women and men) of these villages intensively work with bamboo to make a variety of crafts which they sell in the local markets. The Paharis, who have low awareness level about education, normally prefer to involve their children in their traditional profession i.e. bamboo craft making from early ages instead of sending to the schools.

These 3 studied villages of Badikhel VDCs are adjacent to each others. Majority of ethnic composition is pahari (90%) followed by Bhramins/Chhertris (7%) and remaining 3% are others (Newars, Dalits etc.) (own survey, 2007). Their local marketing centre Badikhel bazaar. Majority of VDC population (49.7%) are living in 3 villages (VDC profile, 2003). In the study area, majority of population are medium class HHs in 3 villages and the distribution of poor HHs is high in Dandagaun village (31.1%) than other 2 villages (Table 6). Table 7 shows the distribution of pahari population in 3 villages according to the economic status of household.

In the study area, the total population of the sampled households (n=71) is 373 out of which 52% are male and 48% are female (own survey, 2007). Table 8 shows the distribution of sampled HHs according to well-being and village. The 75% of poor Paharis house is made of up mud and weak stones (own survey, 2007).

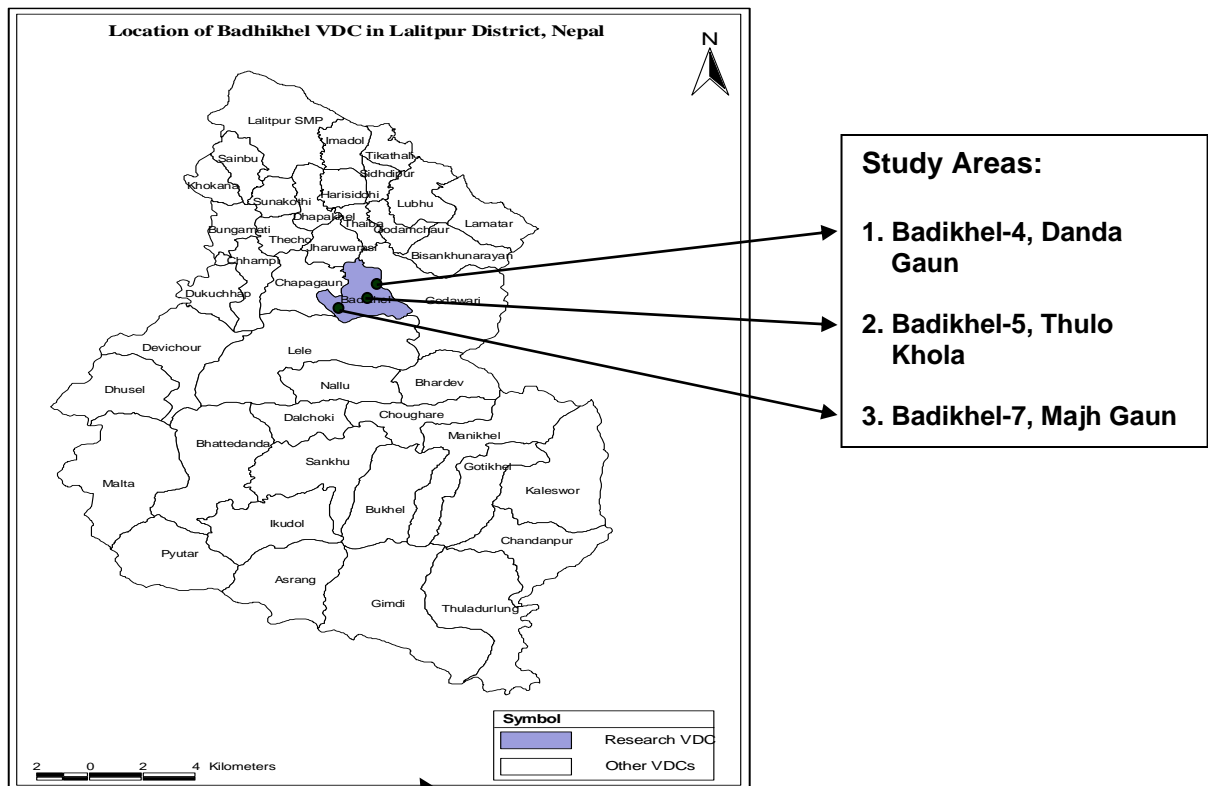


Figure 4: Brief overview of study area

Table 6: General overview of research sites

S. N.	Name of the Village	Total HHs	Well-being status			HHs other than Pahari	Pahari HHs
			Rich	Medium	Poor		
1	Badikhel-4, Dandagaun	103	17 (16.5%)	54 (52.4%)	32 (31.1%)	21 (20.4%)	82 (79.6%)
2	Badikhel-5, Thulo Khola	80	22 (27.5%)	47 (58.8%)	11 (13.7%)	1 (1.2%)	79 (98.8%)
3	Badikhel-7, Majhgaun	79	22 (27.8%)	44 (55.7%)	13 (16.5%)	3 (3.8%)	76 (96.2%)
Total		262	61 (23.3%)	144 (55.0%)	57 (21.7%)	25 (9.5%)	237 (90.5%)

Source: Own investigation by participatory well-being ranking, August 2007

Table 7: Distribution of pahari population by wellbeing

S. N.	Wealth Categories	Total Pahari HHs	Dandagaun (Badikhel-4)	Thulo Khola (Badikhel-5)	Majhgaun (Badikhel-7)
1	Rich	50 (21.1%)	9 (11.0%)	22 (27.8%)	19 (25.0%)
2	Medium	136 (57.4%)	45 (54.9%)	47 (59.5%)	44 (57.9%)
3	Poor	51 (21.5%)	28 (34.1%)	10 (12.7%)	13 (17.1%)
Total		237	82	79	76

Source: Own investigation by participatory well-being ranking, August 2007

Table 8: Distribution of sample by village and wellbeing

S.N.	Wealth Categories	Danda Gaun	Thulo Khola	Majhgaun	Total sample (30%)
1	Rich	3	6	6	15
2	Medium	13	14	13	40
3	Poor	9	3	4	16
Total		25	23	23	71

All the household members of 3 villages are involved in CFUGs for community forest management, utilization and conservation at local level. The household members of Dandagaun village are involved in Kumari CFUG, HHs of Thulo khola are involved in Shanti Bandevi CFUG and Chandol Masdanda CFUG covers all HHs of Majhgaun village. Major species compositions in community forest are sallo (*Pinus sp*), chilaune (*schinma wallichii*), katus (*Castanopsis sp*), uttis (*Alnus nepalensis*), lapsi (*Choerospondias axillaries*), bamboo (*Bambusa sp.*), nigalo (*Drepanostachyum sp*) and bakaino (*Melia azedarach*).

3.6.4.1 Education status

The overall literacy percentage of respondents is high however, the large population is only under School Leaving Certificate (SLC) in Pahari households and only a small population has higher education. There is significant difference of illiteracy rate between rich, medium and poor categories of male and female members in their household. The illiteracy rate of both male and female is low in poor HHs as compared to medium and rich class HHs. Overall literacy percentage is high in rich and medium economic class than poor (Table 9). According to a local teacher Bir Bahadur during informal talking, about 4-5 persons so far have passed bachelor's degree, 12/13 intermediate and about 25 School Leaving Certificate (SLC) from the village where about 1500 Pharis are living.

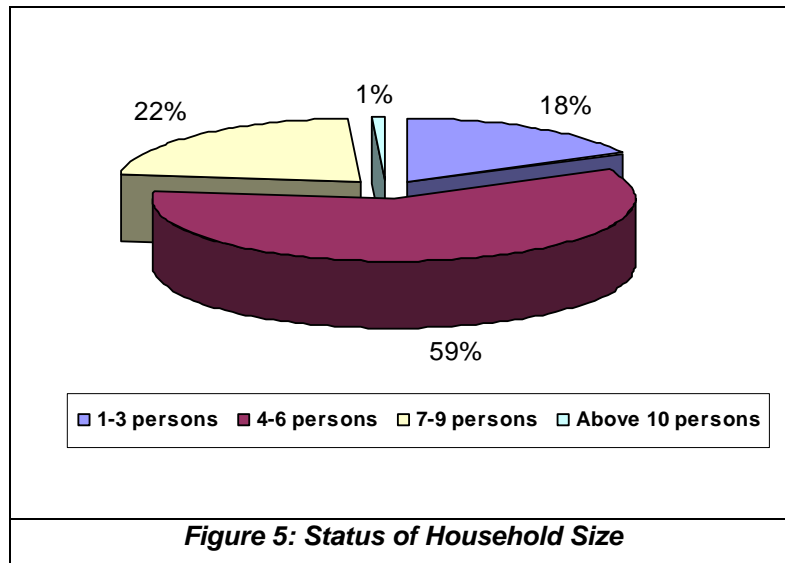
Table 9: Education status by economic class

Economic class	Population					Total
	Gender	Illiterate	Just literate	Under SLC	Higher education	
Rich (n=15)	Male	6 (12.8%)	8 (17.0%)	27 (57.4%)	6 (12.8%)	47
	Female	10 (28.6%)	5 (14.3%)	20 (57.1%)	0	35
Medium (n=40)	Male	22 (20.6%)	24 (22.4%)	57 (53.2%)	4 (3.8%)	107
	Female	30 (29.1%)	19 (18.5%)	54 (52.4%)	0	103
Poor (n=16)	Male	13 (33.4%)	10 (25.6%)	16 (41.0%)	0	39
	Female	25 (59.5%)	6 (14.3%)	11 (26.2%)	0	42
Total		106 (28.4%)	72 (19.3%)	185 (49.6%)	10 (2.7%)	373

Source: Field survey, August 2007 (n=71)

3.6.4.2 Household size

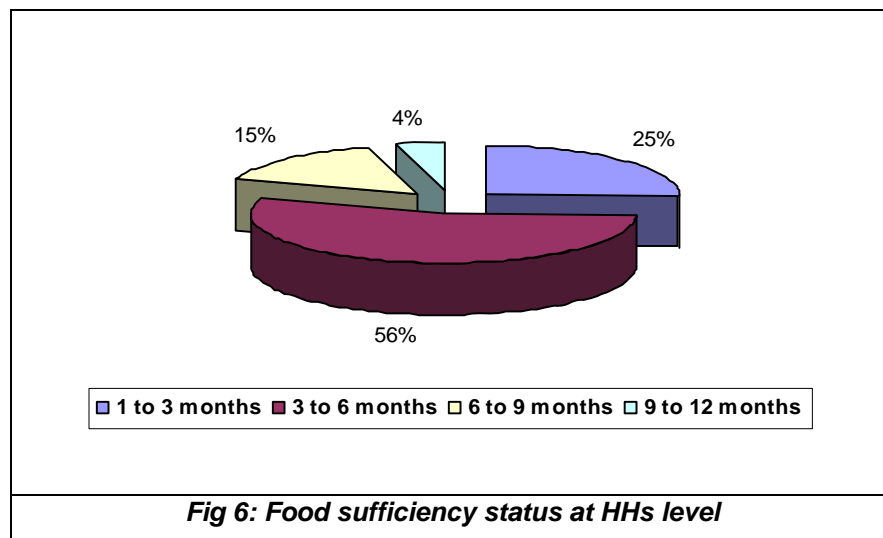
The average household size of the respondents is 5.5 which is quite similar to the national average of the country i.e. 5.4 persons per household. The majority of the households have 4-6 members and very little households have 10 or above members in their family (Figure 5).



Source: Field Survey, August 2007 (n=71)

3.6.4.3 Food sufficiency status

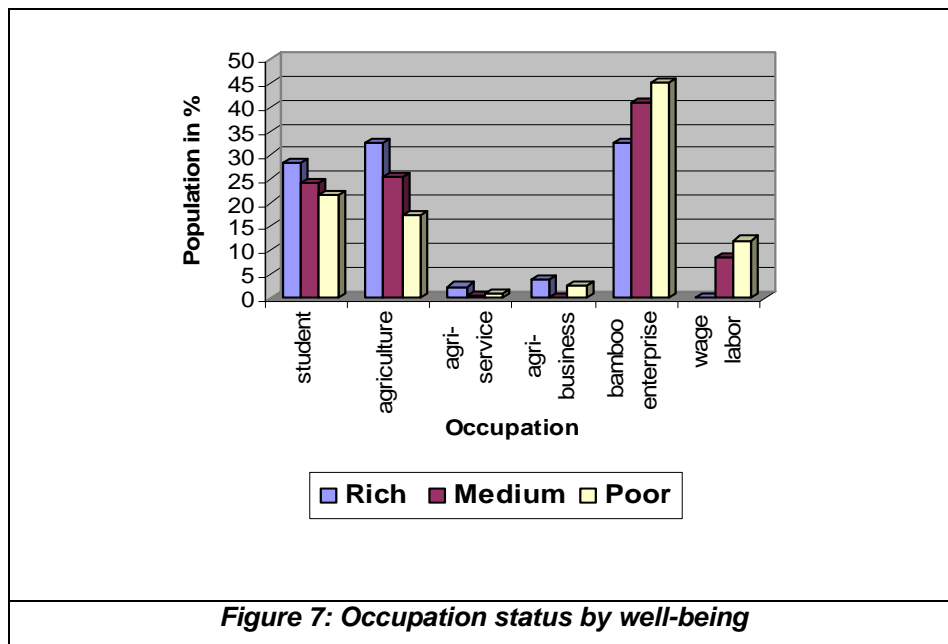
In the study area in general, Paharis have less land which is not sufficient to feed their family for whole year. Majority of the Paharis have less than 0.5 ha of irrigated and non-irrigated land. Poor households have relatively less land (less than 0.18 ha) than medium (0.18-0.36 ha) and rich class HHs (more than 0.36-0.5 ha.) which is not sufficient for agricultural production (Field survey, 2007). Besides from agricultural production, respondent households feed their family members from the alternative income sources for whole year such as from wage labor, other small business, bamboo enterprise etc. The overall data shows that about 80% HHs have food sufficiency only for 1-6 months and remaining 20% HHs have food sufficiency more than 6 months (Figure 6).



Source: Field Survey, August 2007 (n=71)

3.6.4.4 Occupation status

Agriculture and bamboo enterprise is the primary occupation of the farmers in the research site. The majority of the occupation of poor and medium class Pahari HHs (selected respondents households) is bamboo enterprise whereas agriculture is the main occupation of rich HHs followed by bamboo enterprise, student and other businesses. Minority of the poor and medium class HHs also dependent on wage labor in neighboring and distant villages for their survival (Figure 7).



Source: Field Survey, August 2007 (n=71)

3.7 Units of Analysis

Unit of analysis is one of the most important ideas in a research project. It could be individuals, groups, artefacts (books, photos, newspapers), geographical units (town, census tract, state), and social interactions (dynamic relations, divorces, arrest). It is the key in concept development, empirically measuring or observing concepts and in data analysis (Neuman, 2006). Researchers fit a concept to the specific type of unit they wish to analyze. In this study, individual household as a sampling unit was used from different wealth categories and all 71 individual HHs are the units of analysis.

3.8 Data Collection Methods/Processes

For the purpose of this research, an approach which uses quantitative data in conjunction with qualitative data was considered to be the most appropriate. Qualitative data can help to assess the validity of analysis based on quantitative data and possibly provide seemingly contradictory findings to quantitative data, revealing important issues that need further exploration. While qualitative methods assist local people to assess and communicate information about their situation, in-depth information about the respondents' special needs, resources and constraints can be gathered (FAO, 2004).

3.8.1 Primary data collection

Primary data collection method is the best source of information collection. From this method, first hand experience of the respondents could be recorded. Clearly demarcated interest could be identified based on age, style of living, sex, education and other divisions in society. There are several methods of primary data collection. In this research, some participatory rural appraisal (PRA) tools were used which is discussed below.

3.8.1.1 Preliminary preparations/pre-field visit

Before starting the field work, basic information about the research site was gathered by consulting with the officials of Badikhel range post, CFUG committee members, local leaders, community workers etc. The purposes, methods and schedule about the research work were well informed and described to them and also requested to participate and co-operate during the whole research work. District Development Committee (DDC), VDC, DFO, Small Cottage Industries, NGOs/INGOs professionals were also pre-informed about the research work that made easy for gathering more information about the research. A questionnaire format was developed and pre-tested by asking some farmers. After the pre-field visit, questionnaire format was redrafted consulting with co-supervisor and bamboo experts for final survey as per the experience of pre-test. The questionnaire used for the survey was developed in Nepali language for the convenience of respondents.

3.8.1.2 Participatory well-being ranking

Traditionally, participatory wealth ranking exercises were favoured mainly by sociologists and development practitioners. But the use of participatory methods in conjunction with other more formal methods has increased recently. This is particularly true in poverty studies that focus on understanding of rural livelihoods in developing countries (Kebebe, 2007).

Participatory well-being ranking was carried out in 3 villages separately by organizing 3 informal meetings. For this purpose, meta-card was used. The name of head member of each HH was written in meta-card by marker and all meta-cards were spreaded in the group meeting. The total list of farmers was taken from Badikhel range-post. Participants were first decided to rank 3 classes of wealth categories i.e. rich, medium and poor. Similarly, they developed criteria of wealth ranking for rich, medium and poor class farmers with the help of facilitators and researcher. Then, farmers put meta-card with name of richest person in their village in one block, similarly, meta-card with name of medium class person in another block and meta-card with poorest person in the next. All farmers were agreed for making these 3 blocks in a participatory way. Facilitators and researcher were only facilitating the process of ranking. All HHs with the meta-card were compared to each of the 3 blocks and put in the blocks. Sometimes, farmers were not agreed to put some meta-cards in the blocks represented by rich, medium and poor class farmers. In that case, they discussed more in the group and finalized. This made the triangulation for accurate well-being of the farmers. At last, all meta-cards were counted from each 3 blocks and recorded the number of HHs in each block. This method was very useful for well-being ranking of rural community because they ranked them by themselves. Participatory well-being ranking is becoming popular in many developing countries like Nepal. Major criteria used for participatory well being ranking during field survey are given in Annex II.

3.8.1.3 Household survey

A semi-structured survey was conducted in the selected respondent (bamboo entrepreneurs) HHs of the research site. Local level facilitators who have more knowledge about their locality and bamboo resource utilization, management and conservation and researcher himself were intensively involved in the whole survey. A total of 71 HHs only from the Pahari castes were selected for household survey. Direct (face-to-face) interview was applied for information collection. The already developed questionnaire was asked in each selected rich, medium and poor class HHs in all 3 villages. Both open-ended and close ended questions were developed for collecting detailed information about the research topic. A detail of HH survey questionnaire is given in Annex III.

3.8.1.4 Direct observation

During the research period, the researcher visited the respondents' house to house as well as in their community forest. The activities of users such as cultivation of bamboo, its management practices and present status of bamboo in their private land and also in CF

was observed directly in the field by transect walk. Informal interviews and discussions at homestead and teashops were also made several times. This method was useful to the researcher for both in-depth information collection and triangulation of information.

3.8.1.5 Focus group discussion

A focus group discussion (FGD) is a form of qualitative research in which a group of people talk freely and spontaneously about a certain topic. In FGD, Questions are asked in an interactive group setting where participants are free to talk with other group members. Its purpose is to obtain in-depth information on concepts, perceptions and ideas of a group. The idea is that group members discuss the topic among themselves, with guidance from the facilitator.

Based on the objective of the research, 4 FGDs (one women FGD with rich, medium and poor; 3 mixed FGDs with only the rich, medium and poor HH respondents) were conducted in the Pahari community. Local facilitators and range-post officials from DFO helped to organize all FGDs in range-post office. For women FGD, 5 women from each of the wealth categories were selected and a total of 15 were taken randomly. Similarly, equal number of participants (both male and female) was selected for mixed FGDs with rich, medium and poor HH respondents separately and a total of 12 participants (6 male and 6 female) were selected for each FGD. Reasons for the selection of bamboo as most important livelihood options, different uses of bamboo resource, major bamboo crafts made by them, cost-benefit situation of bamboo crafting, marketing of bamboo crafts, problems and opportunities of bamboo enterprise were mainly discussed during focus group meeting. This method was also useful for the triangulation of data from household survey. The detail of checklist for FGD is given in Annex IV.

3.8.1.6 Key informant interview

The key informant interview involves identifying different members of the community who are especially knowledgeable about a topic and asking them questions about their experiences working or living within a community. In this research, Key informant interviews were taken from 6 respondents (2 from social workers, 2 from local leaders, 2 from bamboo entrepreneurs). The information about bamboo resource and their existing condition, market price, cost-benefit situation of bamboo crafts, their management practices, NGOs/INGOs and government initiatives in bamboo sector etc. was discussed with the key informants.

The information taken from key informants were used for triangulation of HHs surveyed data. The detail of checklist of key informant interview is given in Annex V.

3.8.1.7 Post field visit

After completing the field work, the first-hand information was discussed with co-supervisor, district and local level stakeholders and bamboo experts. A short post-field visit was carried out for taking some missing information and clear about some confusion in the information collected during the main field work.

3.8.2 Secondary data

Secondary data is needed for investigating the local context by providing the necessary background information. Common sources of secondary data for social science include censuses, large surveys, and organizational records. They are qualitative and quantitative. In this research, the relevant qualitative data were taken from CFUG records and minutes, and quantitative information were taken from Central Bureau of Statistics (CBS), VDC and district profile, previous published and unpublished research papers, national and international journals, documents from DoF, DFO, NGOs/INGOs such as RES Nepal, INBAR, GTZ, International Centre for Mountain Development (ICIMOD) and some articles and papers from internet.

3.9 Data Management

The first-hand collected raw data was entered in statistical software called Statistical Package for the Social sciences (SPSS). When transferring the data from paper to computer it is important that the information is complete and that checks are made if the electronic copy is a faithful transcription of the originals. This strategy should avoid inherent bias. The backup file was generated in order to avoid a loss of data. After managing the data, different statistical measurements were used for the further calculation according to the objective of the research.

3.10 Data Analysis

Quantitative data were subsequently analysed by SPSS using descriptive statistics, cross-tabulations and one-way ANOVA and also by using Microsoft excel. Qualitative (non-numerical, in-depth information etc.) were incorporated into the analysis which supported the numerical findings which established a clear and credible links between the qualitative and the qualitative information in the final analysis. Based on the specific objectives of the

research, knowledge about bamboo resource utilization, management and conservation, level of income from bamboo enterprise than other household activities among different wealth categories at the household level, cost-benefit situation of bamboo enterprise and constraints and opportunities of bamboo crafting were analyzed using information from household survey questionnaire, FGD and key informant interview. These comparisons made highly differentiated results.

In order to create a full picture of the food security situation within the different wealth categories of HHs and the impacts of bamboo crafting on it, a triangulation approach was used. Triangulation means using a range of methods and tools and with these types of information to cross-check information from various sources. For this reason, the information obtained from focus group discussion, key informants interviews, various informal was compared which provided meaningful results to the research questions.

3.11 Scope and Limitation of the Study

The findings of the research are expected to help policy makers, NGOs, INGOs and other relevant institutions for further planning. Having a good knowledge and skills about cultivation, management, marketing and benefit earning from bamboo resource is a key to the successful incorporation of relevant objectives in development policies and programs. Analysing the contribution of bamboo resource to rural people's livelihood at the household level provides the chance to identify feasible local priorities and opportunities which can be further integrated into planning strategies to create deeper understanding among farmers and governments of the benefits from bamboos. Researchers, academicians and nature conservationists could make use of the findings through gaining deeper insight into the situation within the households and the interactions of the indicators at this level for further research and guidance in this sector.

The following limitations were encountered during field work as well as data analysis.

- The field work of this research was carried out in rainy season. As agriculture is the backbone of Nepalese farmers, rainy season is very busy time of farmers for rice cultivation. Due to their busy time and continuous raining, researcher faced problems for conducting FGDs and HHs survey and taking more information about the research.
- It was very difficult to convince farmers for real information collection because farmers were expected to do something for the promotion of bamboo enterprise in their village. The fact is that these villages are very near from the capital city, Kathmandu but they are in shade and backward from any development activities.
- Due to the lack of researches on socio-economics of bamboo resources in central and western parts than eastern parts of Nepal, sufficient literatures and socio-economic information in this research is lacking.

CHAPTER 4: RESULTS

4.1 Indigenous Knowledge and Skills on Bamboo Resource Utilization, Management and Conservation

4.1.1 Species distribution

Among various bamboo species found in different parts of the country, only few species are found and used by the local people for different purposes in the study site. The major species noticed during the field survey and their uses based on their farmers' experience are given in the Table 10. The majority of the species are '*Tama Bans*' in the study area. However, *Tharu Bans*, *Nigalo* and *Dhanu Bans* are also found. *Tama Bans* is used extensively by the local people for making different traditional bamboo crafts as shown in the table 10.

Table 10: Major bamboo species and their uses in the study area

SN	Local name	Scientific name	Uses
1	Tama Bans	<i>Dandrocalamus hamiltonii</i>	Traditional bamboo handicrafts like dalo, naglo, chalno, dustbin, tray, lampshed, penshed, temple etc.
2	Tharu Bans	<i>Bambusa tulda</i>	Building construction, rack, furniture, hanger, chair etc.
3	Nigalo	<i>Drepanostachyum sp.</i> <i>Arundinaria sp.</i>	Ring of batch, finishing the edge of nanglo, photo frame, pen box, watch frame, doko, storage bin, thunse etc.
4	Dhanu Bans	<i>Bambusa balcooa</i>	Bhakari, doko, thunse, furnitures etc.

Source: Field survey, August 2007 (n=71)

4.1.2 Uses of bamboo resource

The Table 11 shows the degree of different uses of bamboo for income generation by 3 different wealth categories (rich, medium and poor). The majority of Pahari HHs (60%) uses bamboo resource for craftmaking only for their livelihood and income generation and remaining 40% HHs use bamboo for craftmaking, fodder for livestock and fuel-wood for cooking and other household activities. Data shows that poor class families use bamboo more only for craftmaking than medium and rich class families and minority of HHs use bamboo for fodder, fuelwood and other purposes.

Table 11: Use of bamboo for income generation by respondents (economic class-wise)

Economic class	Purpose of use		
	craftmaking only	Craftmaking and fodder	craftmaking, fodder and fuel-wood
Rich (n=15)	9 (60%)	1 (7%)	5 (33%)
medium (n=40)	23 (57%)	10 (25%)	7 (18%)
poor (n=16)	11 (69%)	3 (19%)	2 (12%)
Total	43 (60.56%)	14 (19.72%)	14 (19.72%)

Source: Field survey, August 2007 (n=71)

Similarly, the data from the field survey shows that farmers in Dandagaun village use bamboo more only for crafting than Thulo Khola and Majhgaun village (Table 12). It means that Dandagaun village is more dependent on bamboo craftmaking than other two villages for their livelihood and income generation as more poor class farmers are living in Dandagaun village.

Table 12: Use of Bamboo for income generation by respondents (Village-wise)

Village	Purpose of use		
	Craftmaking only	craftmaking and fodder	craftmaking, fodder and fuel-wood
Dandagaun (n=25)	19 (76%)	3 (12%)	3 (12%)
Thulo Khola (n=23)	10 (44%)	6 (26%)	7 (30%)
Majhgaun (n=23)	14 (61%)	5 (22%)	4 (17%)
Total	43	14	14

Source: Field survey, August 2007 (n=71)

Based on the use pattern of bamboo resource by local people noticed in 3 villages, bamboo has economic, cultural/religious, food and ecological importance in rural communities in Nepal (Box 1).

Box 1: Uses of bamboo resource by local people in Badikhel VDC

Economic: Bamboo is cheap and abundant and has potential to create rural employment. Bamboo culms and crafts are commercially important for cash income in addition to subsistence use. Farmers in Badikhel VDC are involved in different bamboo crafts like baskets, storage bin, nanglo, racks, chair, furniture, dalo, penshed, lampshed, batch, watch frame etc. and earn cash by selling them.

Construction material: The mature bamboos are used for building houses. In the traditional Nepali houses, almost all the components (like walls, floors, roof, doors, windows, and stairs) are built with bamboo. In the remote villages, footbridges are made using with bamboo poles tied with bamboo lashings.

Food: Bamboo shoots are eaten as vegetables and pickles when they are young. It provides a nutritional source of food which can be made into bread, cakes and cookies.

Fodder and fuel-wood: Dry bamboo culms are used for fuel-wood in rural areas. Bamboo leaves are used as an important fodder for livestock in Mid hills and Terai region.

Cultural/religious value: The cultural attachment of bamboo in Nepal is very old and interesting. Freshly cut stems of small sized bamboo species are very essential in marriage and other ceremonies of the Hindus in Nepal. Equally important is its need for carrying the dead body to the funeral site in bamboo stretches.

Ecological importance: Bamboo plant offers a range of ecological benefits such as: neutralize acidic soil; produce biomass; generate extensive rhizome networks; and bind soil. In the hills, bamboos are grown in the gullies and on the edge of terraces in such a way that soil erosion due to heavy rain and wind damage can be minimized. Bamboo takes more CO₂ and produces 30% more O₂ than a tree. Small stand of bamboo may reduce the temperature of a garden by as much as 10 degrees (Alexander, 1996).

Medicinal importance: It also has medicinal values and is used in Ayurvedic medicines for blood purification, leucoderma and treatment of inflammatory conditions. It can also be used for the treatment of asthma, cough, paralytic complaints and other debilitating diseases.

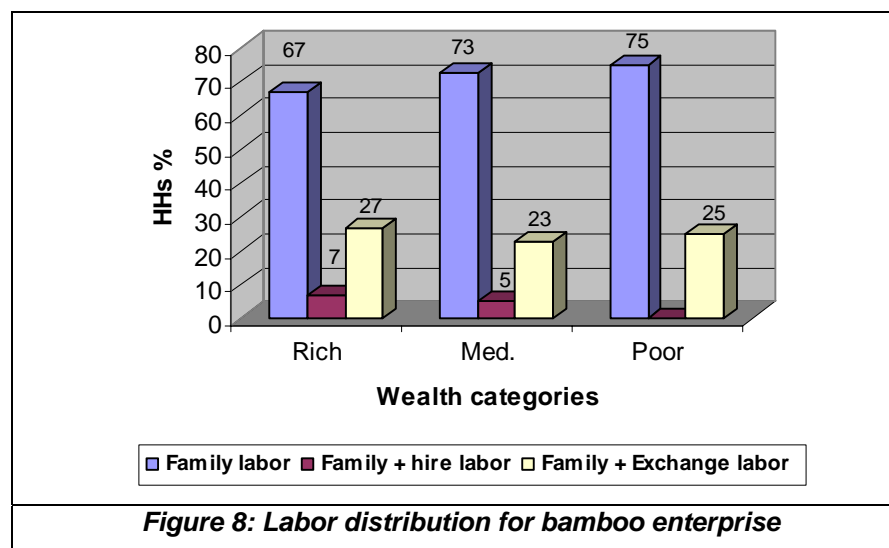
Entertainment: Bamboo also provides entertainment for the young and the old, as they sit in the village homes singing the folk songs in the tunes of bamboo flute.

Source: Field survey, August 2007

4.1.3 Bamboo products and their involvement

Bamboo craftmaking is the traditional occupation of Pahari HHs since hundreds of year. Pahari households are producing only the traditional crafts like nanglo, dalo, chalno racks, baskets etc. which have high competition in the market and they cannot get remarkable benefits from these goods. They have less land for agricultural production and most of the family members are not well educated so that they are not able to go outside in

NGOs/INGOs and government job. They are earning hard cash when they need and even when they have hand to mouth problem. They can run their enterprise in a small scale by utilizing their own knowledge and skills and follow the principle of 'learning by seeing and doing by learning' from family members. They have experienced that wage labor cannot be found all the year round but they can engage in bamboo enterprise in whole year. Even they can continue their enterprise in unfavorable weather conditions if raw materials are stored. During the field survey, it was reported that majority of the labor used in bamboo craftmaking is only family labor and sometimes exchanged labor among farmers. Sometimes, rich and medium class families also use hire labor to some extent (Figure 8). It shows that bamboo craftmaking have created self employment to the family members which is the major income source to feed their family members.



Source: Field survey, August 2007 (n=71)

Men, women and children all are involved in bamboo enterprise however their degree of involvement is different. Generally, men are engaged more for craftmaking including harvesting and other silvicultural treatments. Due to the lack of bamboo raw materials in their own land and their vicinity, men have to invest most of the time for searching bamboo raw materials, harvesting and transportation from distant villages. In general, Women are involved more time in household activities so involvement in bamboo enterprise is less as compared to men. The rich class families involve less time (both men and women) in bamboo craftmaking and remaining time they spend on agriculture, business and other services. The degree of involvement of poor and medium class families (both men and women) in bamboo craftmaking is high than medium and poor class families (Table 13).

Table 13: Involvement of family members in bamboo enterprise

Family member	Degree of involvement	Involvement (%)		
		Rich (n=15)	Medium (n=40)	Poor (n=16)
Men	>50% time	40.3	77.5	75.0
	26-50% time	59.7	22.5	18.8
	1-25% time	0.0	0.0	6.3
Women	>50% time	30.0	50.0	41.3
	26-50% time	46.7	35.0	46.2
	1-25% time	23.3	12.5	12.5
	Not involved at all	0.0	2.5	0.0
Children	1-25% time	30.3	45.5	51.5
	Not involved at all	69.7	57.5	48.5

Source: Field survey, August 2007 (n=71)

Box 2: Situation of bamboo enterprise in study area, a case study

One of the respondent, **Bhim Bahadur Pahari** (medium class family), 55 years old, Badikhel-7, Majhgaun said, "I started bamboo work when I was 15 years. At that time, all of my family members worked on bamboo enterprise including my father and grandfather. This is our traditional occupation since hundreds of year and we are also not more educated than other castes." He learned bamboo works from his family. Before 40 years, he worked in Balaju Bet/Bans Factory for one year as a foreman and trainer too. After gaining some practical knowledge, he started small bamboo enterprise business using his own knowledge and skills what he learned. At that time, he got more benefit from this business. He made bamboo crafts like kisti, lampshed, penshed, chair, table, rack and nanglo according to the market demand. But for the time being, bamboo market was more competitive and local people produce same bamboo crafts without surveying market demand. As result, they couldn't get reasonable price from bamboo crafts. Hence, their business is now decreasing day by day. He again said, 'I know and I have experienced that bamboo enterprise is more beneficial than other but we are facing problems like lack of proper marketing channel, formation of farmers club or co-operatives, explore distant market network etc. If we solve these problems, then it has still the opportunity of bamboo enterprise in our locality.' His experience is that the bamboo goods from factories are more expensive than goods from farmers because factories consider the quality of the products as well. He says confidently, 'I can conduct bamboo enterprise related any training to the neighbors in the village if some organizations and government body wants to invest on bamboo enterprise in this area.'



Source: Own investigation, August 2007

4.1.4 Bamboo resource conservation practice through community forest

All pahari HHs are involved in 3 CFUGs namely Chandol Masdanda, Bandevi Shanti and Kumari CFUG. After the realization of lack of bamboo raw materials in their own locality and difficulties of purchasing from distant villages, CFUGs have started bamboo plantation in their community forest before 4-5 years with the initiation of CFUG members through the financial and technical support from the district forest office. They have their own operational plan (OP) and according to the OP, they have a regular meeting and discuss about how to utilize their forest for fodder, firewood and timber and also plantation, management and conservation aspects. Now bamboo plantation is increasing in their community forest.

The executive members of the 3 CFUGS reported that they have not sufficient CFUGs fund so they cannot invest this fund to the CFUGs members especially the poor for different income generating activities. They invest their fund only for social works like road construction, community building and celebrating different festivals. The poor members of CFUGs during HHs survey reported CFUG committees do not want to invest CFUG fund as a loan for them because they do not believe that poor people can refund loan after the earning from income generating activities. CFUG committee members reported that CFUGs had invested their fund to the members before but they had problem of refunding. Therefore, they made a rule and started to invest their fund only for social works and not in other income generating activities for CFUG members. The survey found that 39.44% HHs reported there is equal opportunity of benefit distribution among poor, medium and rich members whereas 60.56% reported that benefit distribution is not equal among them (Table 14).

Table 14: Equal opportunities of benefit distribution from CFUGs Activities

Wealth Categories	Equal opportunities from CFUG	
	Yes	No
Rich (n=15)	13 (86%)	2 (14%)
Medium (n=40)	15 (37.5)	25 (62.5%)
Poor (n=16)	0 (0.00%)	16 (100%)
Total	28 (39.44%)	43 (60.56%)

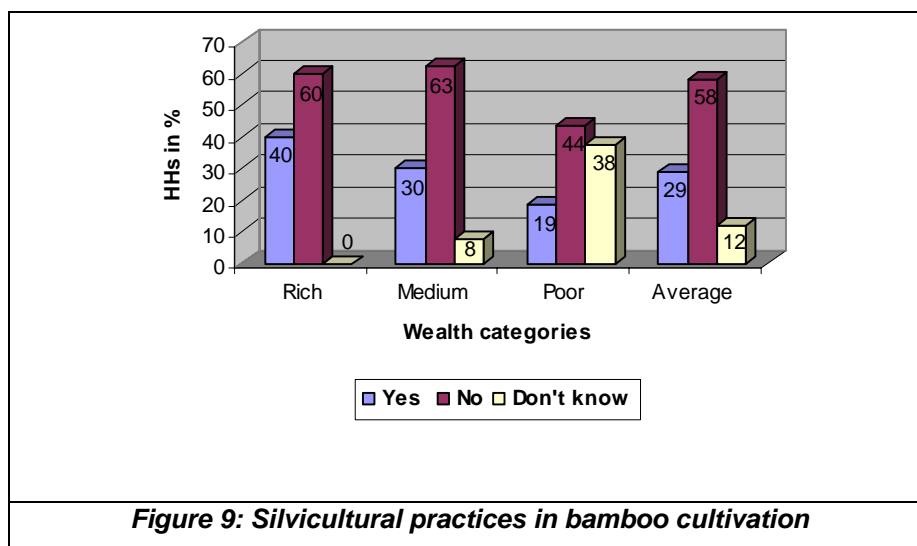
Source: Field survey, August 2007 (n=71)

4.1.5 Propagation

In the study area, most of bamboo plantation in the homesteads is natural regeneration. The most common method of propagation adopted is by the use of rhizome cuttings in a traditional method. Farmers also know about the other methods of planting like culm cuttings and seed propagation which is more technical and more successful method of bamboo propagation. Local farmers lack knowledge about the improved methods of bamboo plantation. They have experienced that the success rate of propagation by rhizome cuttings is very less as compared to culm cuttings and seed propagation. Farmers have now introduced culms cuttings and seed propagation method of bamboo plantation with the technical support from district forest office in their community forest. District forest office has made aware about the importance of improved methods of propagation for large scale bamboo plantation where bamboo clumps are scarce and technical support to the CFUGs. Therefore, farmers are growing interest about scientific methods of bamboo plantation, utilization, management and conservation practices at local level.

4.1.6 Silvicultural practices

During the field survey, it was observed that most of the farmers have very few clumps (1-4 clumps according to wealth categories) of bamboo in their homesteads and they do not do any silvicultural operation in natural bamboo plantation. However, with the strong technical and financial support from the forest department, they have started bamboo plantation in the community forest in a small scale by the scientific method of cultivation. They have their own CFUG rule and every members of CFUG has to collect 2-3 rhizomes for plantation in the community forest and they get money (NPR. 50 per rhizome) from CFUG as an incentive. They have made rules that grazing animals are not allowed to graze in the plantation areas. In the growing stage, they do earthing, weeding, fertilization etc. and then in the later stage, they do not do any cultural practices. They also invest some CFUG fund for bamboo plantation. Mainly *Tama Bans* and *Nigalo* are planted in the community forest and they are in growing stage. Figure 9 shows that very few farmers realized bamboo needs silvicultural practices and initiating other neighbors for enhancing bamboo plantation. Majority of the farmers reported that bamboo does not need any silvicultural practices and some have no idea about bamboo management and conservation practices. This is due to the lack of technical knowledge about bamboo plantation, management and conservation at farmers' level.



Source: Field survey, August 2007 (n=71)

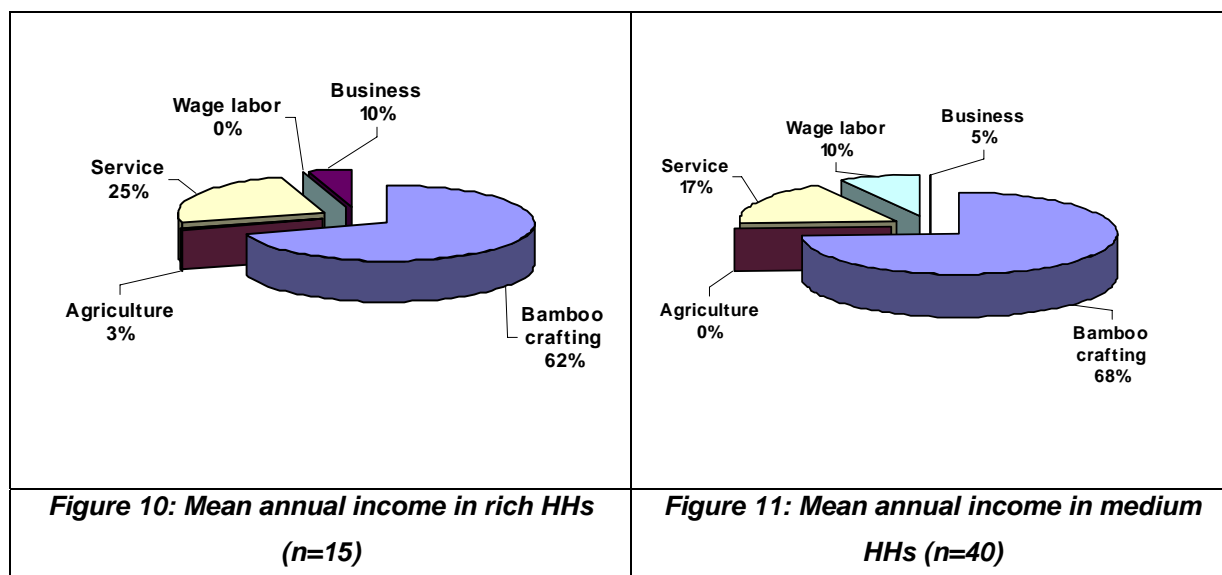
4.1.7 Bamboo harvesting and post-harvest treatment

Most of the bamboos are in natural plantation, so harvesting is difficult. It is believed that bamboo clump is suitable place for poisonous snakes that may be dangerous for harvesters. Therefore, farmers donot want to plant bamboo in their homesteads. The farmers in Badikhel VDC are using traditional method for bamboo culm harvesting usually done with the hand tools by clear feeling method. After harvesting, they use traditional method of drying and storage. They make small pieces of canes after harvesting and put it above the kitchen so that fire and smoke dry the canes and increase the storage capacity of canes. This is the easy method of post harvest treatment adopted by the farmers.

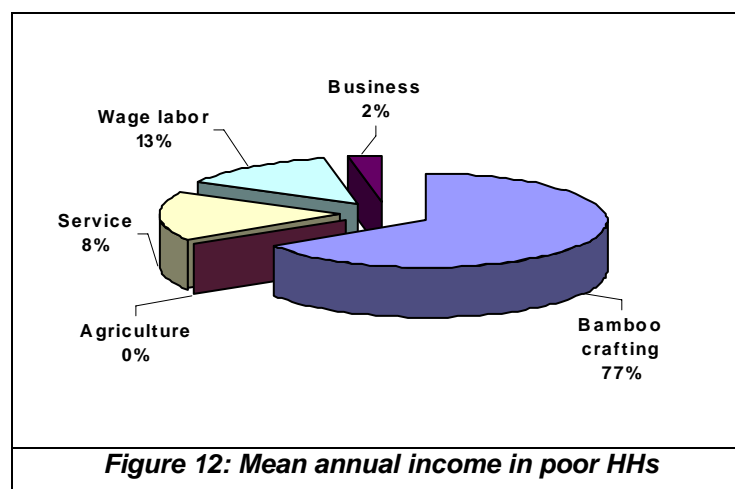
4.2 Livelihood Impacts of Bamboo Craftmaking

4.2.1 Bamboo craftmaking as a source of income

Different types of income sources and alternative livelihood options are found in surveyed villages in Badikhel VDC. It was reported that bamboo craftmaking contributes 62% of the total annual income in rich households (Figure 10) where as 68% of the total annual income in medium class HHs (Figure 11). In the poor households, bamboo crafting significantly contributes (77%) to the total annual income (Figure 12). It shows that bamboo craftmaking is the major income source for their livelihood in all economic classes of Pahari families.



Source: Field survey, August 2007



Source: Field survey, August 2007 (n=16)

4.2.2 Comparison of income in different wealth categories

One-way ANOVA: To compare the annual income from bamboo craftmaking in 3 wealth categories of farmers in Badikhel VDC, a hypothesis was tested by using one-way ANOVA test.

H₀: The annual income from bamboo craftmaking between 3 wealth categories of farmers (i.e. rich, medium and poor) is equal.

H₁: The annual income from bamboo craftmaking between 3 wealth categories of farmers (i.e. rich, medium and poor) is not equal.

The one-way ANOVA table (Table 15) shows that there is significant difference between the annual income from bamboo enterprise and economic class ($F(2,68) = 64606066.176$, $P < 0.05$). But the overall one-way ANOVA test does not give the accurate results. Thus, all model assumptions have been tested which is discussed below.

Table 15: ANOVA showing differences of mean annual income in 3 wealth categories

	Sum of squares	df	Mean square	F	Sig.
Between groups	912618485.91	2	456309242.95	64606066.17	0.0016
Within groups	4393212500.00	68	64606066.17		
Total	5305830985.91	70			

Source: Field survey, August 2007 (n=71)

The multiple comparisons by one-way ANOVA as given in Annex VI shows that there is significant difference of annual income between rich and poor $p = 0.001$ from all comparisons ($p < 0.05$) whereas the annual income between rich and medium is insignificant ($p > 0.05$) but significant by LSD ($p < 0.05$; $p = 0.047$). However, the annual income between medium and poor is insignificant ($p = 0.053$) by Scheffe's comparisons, there is significant difference of annual income between medium and poor class by other tests of comparisons ($p < 0.05$; $p = 0.001$, 0.002 and 0.047).

The test of homogeneity of variances (Table 16) table shows Levene's test for testing the null hypothesis that the within the group variances are constant across the group. In this condition, the formal test does not find any evidence for a departure from the homogeneity assumption ($p = 0.67$). It means that participants within the group are similar.

Table 16: Test of homogeneity of variances (n=71)

Levene Statistic	df1	df2	Sig.
.396	2	68	.674

Similarly, Table 17 shows the homogeneous subsets according to Tukey's and Scheffe's comparisons. It describes that poor and medium class are allocated to the same subset of class. Like-wise, the medium and rich are also allocated to same subset of class. From these two homogeneous subsets, we can conclude that there is significant difference between the

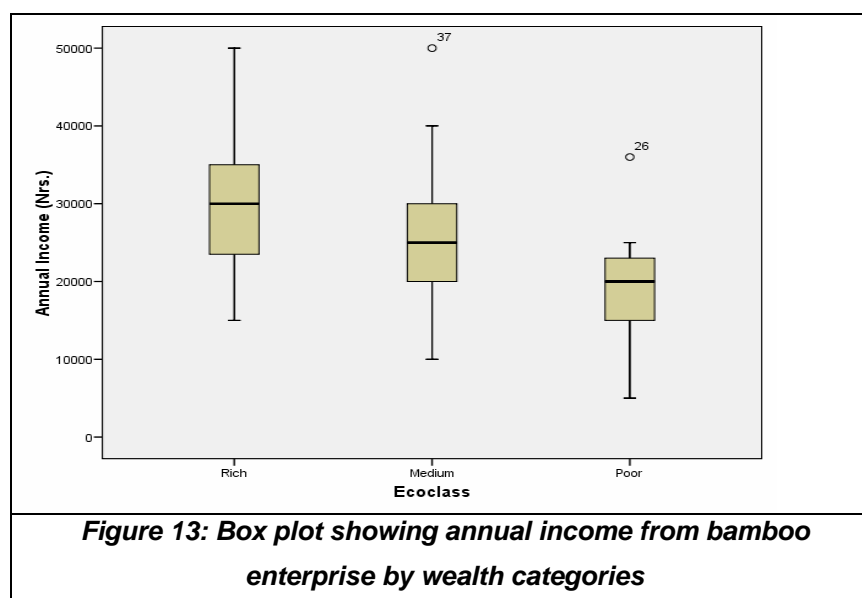
annual income from bamboo craftmaking of rich and poor classes of farmers. From the above all model comparisons by one-way ANOVA, the null hypothesis was rejected and concluded that there is significant difference between the annual income from bamboo crafting in rich, medium and poor classes of farmers. However, the result shows that there is small difference in annual income between medium and rich; and between medium and poor class farmers, in contrast, the annual income from bamboo craftmaking between rich and poor class families is highly significant.

Table 17: Homogenous Sub-sets (n=71)

		N	Subset for alpha = .05	
			1	2
Tukey HSD(a,b)	Poor	16	19187.50	
	Medium	40	25075.00	25075.00
	Rich	15		30000.00
	Sig.		.065	.143
Scheffe(a,b)	Poor	16	19187.50	
	Medium	40	25075.00	25075.00
	Rich	15		30000.00
	Sig.		.081	.169

Source: Field survey, August 2007 (n=71)

Box Plot: The boxplot shows that the variation of annual income from bamboo craftmaking in rich economic class is more than poor and medium class HHs and also the mean annual income is different in 3 economic classes. Some of the medium and poor class households have been indicated as possible outliers. It means that the mean annual income of some poor and medium households is deviated more from the mean. The range of annual income is high in rich and medium class Paharis than poor class HHs (Figure 13). It shows that the level of annual income of poor pahari families is less as compared to medium and rich class families however; bamboo craftmaking is main source of income of poor for their subsistence livelihood.



Source: Field survey, August 2007 (n=71)

4.2.3 Cost-benefit situation of bamboo craftmaking

Table 18 shows the cost of investment, selling price and net profit from different bamboo crafts made by the local Pahari farmers. It was found that the traditional crafts like dalo, nanglo, chalno, rack, basket etc. are less profitable than modern crafts like furniture, kisti, penshed, watch frame, table lampshed, bags etc. which are demanded in regional, national and international market as a gifts and decorative items. However, the Pahari families are involving more on traditional bamboo crafts than modern crafts.

Table 18: Cost and benefit situation of different bamboo crafts

Bamboo Crafts	Cost (NPR.)		Net profit (%)	Remarks
	Investment	selling price		
Dalo	50	90	80.00	It takes 1 days to finish one dalo (storage bin)
Nanglo	30	50	66.67	
Chalno	30	50	66.67	
Rack	50	90	80.00	It also takes more time to prepare one rack
Basket	50	90	80.00	
Furniture	250	550	120.00	It takes at least 3 days to make one chair
Temple	1000	2500	150.00	
Kisti	75	150	100.00	It requires more skills and knowledge and takes more time to prepare them
Penshed	100	200	100.00	
Watch Frame	80	200	150.00	
Lampshed	150	300	100.00	
Ladies bag	400	750	87.50	

Source: Field survey, August 2007

Box 3: Cost-benefit situation of bamboo craftmaking (farmers' experience)

There is much difference in benefit gained by using bamboo raw material from own farm land or purchased from distant market. According to farmers' experience, they pay one bamboo clump for 100-120 NCR (including transportation cost but excluding his own time consumption for going to distant market) from distant market. From one stump, they can make 10 nanglos and 4 dalos (approx.). 10 nanglos cost 400 NCR @ 40 and 4 dalos costs 320 NCR @ 80. For making 10 nanglos, one should spend 5 days at least. According to Buddiman Pahari (poor economic class respondent, Dandagaun), 'If we neglect the labor cost, then we see more benefit from this occupation. But if we consider labor cost, then net benefit is minimal.' Farmers lack knowledge about the record keeping system and cost-benefit analysis of the enterprise. Farmers are doing this occupation as a traditional occupation without cost-benefit analysis whether it is profitable or not. They also do not know which types of bamboo crafts have demanded in the market and gives more net benefit. This is a rough estimation of cost and benefit based on farmers experience in the study area during the field survey.

The cost of one bamboo stump = 120 NCR

Total cash earned by selling it = 720 NCR (by selling 10 nanglos and 4 dalos)

Labor cost (5 main days @ 60 considering as a family labor) = 300 NCR

Total investment = 120 + 300 = 420 NCR

Therefore, the net profit is 720-420 = 300 NCR

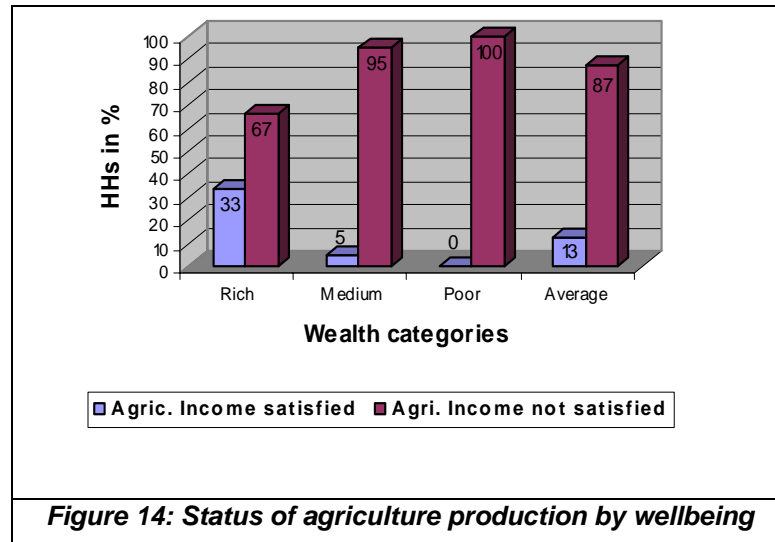
It shows that one farmer can earn 300 NCR after investing 5 man days for making 10 nanglos and 4 dalos. This is not a remarkable benefit but one can earn such money from home by utilizing his own skills and knowledge. If the enough raw materials are available in the locality, then the cost of investment will be low and net benefit will be increased.

Source: Field survey, August 2007

4.3 Bamboo Craftmaking as the Main Livelihood Alternatives**4.3.1 Status of Agricultural production**

The farmers have limited land for agricultural production. Nepalese usually take rice with curry and pulse twice a day as a lunch and dinner. Therefore, those farmers who have less land even cannot leave crop cultivation. Even if their land is not productive for agricultural production and not satisfied with the agricultural production, they do not want to use this small piece of land for other profitable income generating activities like bamboo enterprise, small scale vegetable farming etc. In the field survey, more than 85% HHs reported that they

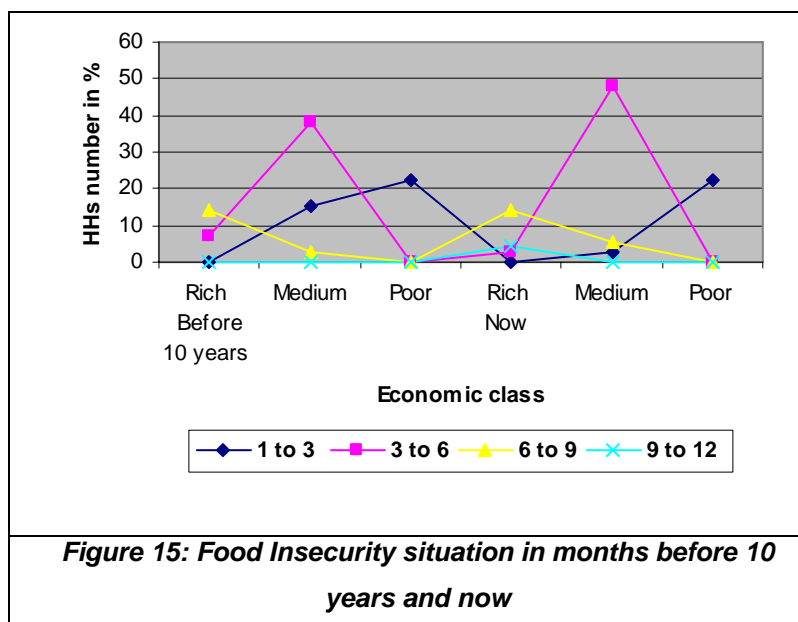
are not satisfied with the agriculture production (Figure 14). During the main cropping season, they exchange labor with each other for agricultural activities. As the bamboo craftmaking holds major income of the family of pahari HHs, they give more priority on bamboo craftmaking than agricultural activities therefore; they continue bamboo craftmaking during main agricultural season.



Source: Field survey, August 2007 (n=71)

4.3.2 Food Insecurity Situation

From the participatory wealth ranking carried out during field survey, it was found that majority of rich HHs have food sufficiency only for 6-9 months. Similarly, majority of the medium HHs have food sufficiency for 3-6 months whereas all the poor HHs have food sufficiency only for 1-3 months. Majority of pahari HHs have food insecurity situation 3-6 months every year because of the less and unproductive land for agriculture production. Therefore, they have to buy food for feeding their family members from other alternative sources of income. They stated that they buy food for household consumption from other alternative income source i.e. wage labor, small scale business, salary, bamboo crafting etc. Sometimes, they take loan from their relatives and neighbors. Therefore, bamboo is only the alternative income sources to fulfill their basic needs.



Source: Field survey, August 2007 (n=71)

When compared food security situation from 10 years before and now, it was found that their food insecurity situation has been decreasing smoothly and their livelihood status has been increasing mainly from the bamboo craftmaking in rich and medium class farmers. In poor HHs, all the HHs has the same status of food sufficiency before 10 years and now (Figure 15). It was observed during survey that Paharis donot want to keep more livestock. It is because of the grazing problem and bamboo work is easier than livestock rearing. As a result, land is becoming less productive due to the insufficient inorganic fertilizers (farm yard manure-FYM from livestock).

4.3.3 Adoption of bamboo craftmaking as a occupation

More than 85% of the pahari farmers are still involving only in traditional crafts like dalo, nanglo, chalno, rack, basket etc. by utilizing their traditional knowledge and skills (Field survey, 2007). Nowadays, the young generations are more educated and they are exploring the more demanded modern bamboo crafts like kisti, penshed, lampshed, watch frame, batch, bags, chair, table and other gift items which fetch better price in the market and more aware about how to make quality products so that they can compete in the local, national as well as international markets. The surveyed data shows that the lack of more land for agricultural production to feed their family members, lack of education, traditional occupation, regular income and utilization of skilled family labor are the main reason for adopting this occupation for their livelihood (Table 19).

Box 4: Bamboo crafting as main livelihood alternative, a case study

Harka Bahadur Pahari, resident of Badikhel-5, Thulo khola is 74 years old. He is from middle class family. His wife is 65 years old. His son has already separated from him and now he is living with wife in a small hut. They are illiterate and have very few land which supports to feed only 1-3 months and rest of the months, they have to buy food for their home consumption. For alternative income source, they make traditional bamboo crafts i.e. 'nanglo' and 'dalo' which are very much useful in rural areas for processing and storage of cereal crops. He is very old and cannot do hardworking in the field. Both of them make nanglo and dalo together and take to the distant village by carrying it in their shoulder. They don't sell in the local



and district market. Harka Bahadur says, 'We don't get reasonable price, if we sell in the local and district market. But if we sell in the distant villages, we get reasonable price.' Normally, they roam in rural villagers, sell the goods and exchange money in kind like rich, wheat and maize whatever they need. This system is commonly known as 'Barter system'. His experience is that if they sell nanglo and dalo in local and district market, they only get NPR 40 and 70 respectively but if they sell in the distant villages by bartering, they can sell in more price like nanglo in NPR 80-100 and dalo in 100-120. They are very happy and satisfied from their occupation. Generally, they barter nanglo and dalo in distant villages in Bhaisepati and Panga Bhanjyang of Lalitpur district which is far from their village. They earn about NPR 30-40 thousand annually by selling bamboo crafts which they use for buying food for 9 months and also for clothing, celebrating festivals and medical treatment. He again says, 'Bamboo craft making very easy and profitable occupation, however there are some marketing problems.' They have no anxiety about financial problem and they are spending their happy life with their own family job.

Similarly, Ramesh Pahari, Badikhel-7 is another respondent from poor class family. He is 32 years old and he has 9 members in his family including his father and mother. They have food sufficiency only for 2 months from agricultural production. Due to the more members in their family, some persons are involved in small vending business and sometimes work in home construction as contract basis. Their main income source is bamboo craftmaking. Every week, they make 15 dalos per week and 30 nanglos per week. They earn about NPR 2000-2500 per week in the dry season when more demanded. But this earning is not regular all the months. This earning is sufficient to feed their whole family in remaining 10 months and spend for other household activities. Ramesh says, 'bamboo crafting is our god, without bamboo craftmaking we cannot survive in the remaining 10 months. This occupation has given us the employment to our whole family for whole year.'

Source: Own investigation, August 2007

Table 19: Reason for adopting bamboo crafting as a main livelihood alternative

Reasons for adoption	HHs in %			Total HHs in %
	Rich	Medium	Poor	
Traditional occupation	26.6	2.5	0.0	9.8
Illiterate	6.7	2.5	0.0	3.0
Utilization of skilled family labor	26.7	0.0	0.0	8.9
Lack of more land	0.0	17.5	50.0	22.5
Regular income	0.0	10.0	0.0	3.3
Traditional occupation, illiterate and utilization of family labor	40.0	67.5	50.0	52.5

Source: Field survey, August 2007 (n= 71)

4.4 Problems/constraints in Bamboo Craftmaking

Majority of the farmers reported that lack of market and scarcity of raw materials are the major problems on bamboo craftmaking faced by the Paharis in the study area (Table 20). The major problems according to their ratings at local level are discussed below.

Table 20: Major constraints in bamboo crafting by respondents

Major Constraints	Total HHs in %
Lack of money	15.3
Small landholding	13.4
technology	5.6
Lack of market	40.2
Scarcity of raw materials	25.5

Source: Field survey, August 2007 (n=71)

4.4.1 Lack of proper marketing system

The main district marketing centre is Lagankhel, Lalitpur. It was found that farmers sell their bamboo crafts directly to the district market. But some local farmers are doing bamboo business as small vendor. Small vendors are local Bhote and Sherpa from Panauti of Kavre district and they supply these products to the remote villages themselves. There is strong competition between bamboo crafts in the district marketing centre Lagankhel where most of all the farmers take traditional bamboo handicrafts like dalo, naglo, chalno, basket, rack only. Most of the farmers sell their products to the vendors. But if they sell their products to

the distant village themselves by bartering, then they fetch more price than in local market. Generally, farmers take their bamboo crafts to the distant villages when they have more free time especially in winter and exchange cash with kinds by selling these crafts. In the women focus group discussion, one of the respondents, Maiti Pahari from Badikhel-7, Majhgaun said, 'There is no fixed price of our crafts in Lagankhel. We have to sell our products at very minimum price sometimes to the vendors or businessman because we cannot return these crafts if we cannot fetch better price; because we have to feed our family by consuming income from bamboo crafts every day.'

The surveyed data shows that the no fixed price and no guarantee of the bamboo crafts are the major problems regarding the marketing of bamboo crafts (Table 21). One of the poor respondents during HH survey, Govinda Pahari, Badikhel-7, Majhgaun said, 'A bamboo rack, which once used to be sold up to NPR. 250, now is sold at NPR 80/90 whereas the price of the bamboo culm which we have to buy, has increased from NPR 20/30 per culm to NPR 60/70 in distant villages and NPR 120-150 in neighbouring villages.' Therefore, farmers are afraid of producing bamboo crafts in large scale because of the lack of proper marketing channel and market price. They donot want to take more risks as a result, their enterprise is running in a subsistence level.

Table 21: Major problems regarding the marketing of bamboo crafts

Major problems reported	Total HHs
No fixed price	20 (28.16%)
lack of marketing information system (MIS)	9 (12.68%)
No guarantee of the bamboo crafts	21 (29.58%)
Lack of Government policy	10 (14.08%)
Lack of institutionalization	6 (8.46%)
Strong competition between the craftsmen	5 (7.04%)

Source: Field survey, August 2007 (n=71)

During the field survey, it was observed that majority of poor and some medium class HHs sell their products mainly by bartering system whereas majority of rich families sell their bamboo products in local and district market centres. If the price of bamboo products sharply decreased and the price of raw materials sharply increased in case of Paharis in Badikhel, poor HHs are more affected because they are totally dependent on income from bamboo for hand to mouth problem. On the other hand, there is lack of marketing

information system. They do not produce bamboo crafts according to the market demand. They only visit local and district markets frequently but not regional and major city markets.

4.4.2 Scarcity of raw materials

The farmers only have 1-4 clumps of bamboo in their land depending on the wealth categories and availability of marginal and private forest which covers only less than 10% of the bamboo raw materials used for making crafts. More than 90% of bamboo raw materials they purchase from neighboring and distant village (Field survey, 2007). It was found that 28.17% HHs (only poor and medium HHs) have no bamboo clumps in their homesteads and remaining 71.83% HHs have bamboo clumps in the homesteads but in very few in numbers. The raw materials necessary for making their bamboo crafts are imported mainly from Lamatar (14km far) and Lubu (12km far), Banepa (40 Km far), Panauti (50 Km far), Bhaktapur, Nuwakot, and other peripheral areas such as Chhaling, Sisneri, Sitapaila, Nagarkot etc.

Farmers usually prefer middle aged Tama Bans (*Dandrocalamus hamiltonii*) culms (1-2 years of age) for making crafts. But it depends on the products what they are making. For making rack, furniture and dalo, they use older culms than for making nanglo, dalo and chalno. The price of bamboo culms is relatively higher in neighbors and neighboring villages. Those HHs who are other than pahari castes, they sell bamboo culms to them at a high price i.e. NPR. 120-150 per culm. Farmers do not want to buy raw materials from neighboring villages at higher costs because they cannot earn more profit from this high investment. Generally, they bring raw materials from distant villages at relatively cheaper price at harvesting site about NPR 40-60 per culm. When it reaches to the production site at their home including transportation cost and tax, each culm costs NPR 80-100. Farmers also reported that the imported bamboo raw materials are not guaranteed the quality for making crafts which can compete in the market.

4.4.3 Financial problems

Due to the high interest rate of loan from money lenders, farmers do not want to take large amount of money for investing bamboo enterprise. Therefore, they are involved in small-scale bamboo craftmaking. They revolve their cash earned by selling them which is only in subsistence level. Generally, they take loan from relatives with no interest or neighbours at very low interest rate.

Table 22 shows that more than 80% HHs reported that they take loan and less than 20% HHs donot take loan for the investment of bamboo enterprise. Although, farmers have financial problem to run their enterprise especially the poor class families, the majority of the HHs take loan at minimum interest rate of 0-12%. It shows that most of the rich farmers donot take loan for investing bamboo enterprise and majority of poor and medium HHs take loan at the low interest rate of 0-12%. Generally, they take loan from their relatives and neighbours, sometimes from money lenders and commercial banks, NGOs/INGOs etc. CFUGs are not investing their community fund to the individual group members for income generating activities.

Table 22: Interest rate of loan by wellbeing

Economic class	0-12 %	12-24 %	24-36 %	36-48 %	48-60 %	Donot take loan
Rich (n=15)	2 (13.3%)	1 (6.7%)	1 (6.7%)	1 (6.7%)	0	10 (66.6%)
Medium (n=40)	15 (37.5%)	5 (12.5%)	9 (22.5%)	3 (7.5%)	5 (12.5%)	3 (7.5%)
Poor (n=16)	7 (43.8%)	2 (12.5%)	3 (18.7%)	0	3 (18.7%)	1 (6.3%)
Total	24 (33.8%)	8 (11.3%)	13 (18.3%)	4 (5.6%)	8 (11.3%)	14 (19.7%)

Source: Field survey, August 2007 (n=71)

During the field survey, it was found that 49.3% HHs invest less than 25% of investment from outside source and more than 75% of the investment they revolve their income from bamboo crafting. Majority of the poor HHs invest only less than 25% money for bamboo enterprise where as majority of rich HHs invests more than 25% of money from outside source. Women are also access to mobilize financial resources because they are able to earn cash by involving in bamboo enterprise. They spend/invest earned cash in different household activities when both men and women are agreed and no control of financial resource over one another among the family in the pahari community.

4.4.4 Technical problems

The most common belief/superstition associated with bamboos is that it reduces the productivity of land where it grows. During the field survey, they argued that crop production declines considerably in the land adjoining bamboo clumps where its shade reaches. Another common belief is that women must not carry out bamboo planting and harvesting. If women plant and harvest them, they will become infertile and the bamboo will not grow. Due to these traditional believes, women are not allowed to plant bamboo. Farmers plant

bamboo only in the marginal land and private forest and they donot want to plant with agricultural crops in an agro-forestry system because they believe that crop production is reduced by shading affect of bamboo canopy. Neighbors also donot allow them to plant bamboo in the border of their land. These beliefs and superstitions have greatly affected **bamboo plantation** mainly in rural areas.

Lack of planting materials for plantation in the community forest in a large scale is another problem. They have only limited number of clumps in their homestead and they know vegetative method of propagation only by rhizome cuttings but have little knowledge about culm cutting and seed method of propagation. Bamboo planting material is also not commonly produced by the department of forest and private nurseries therefore, they are not easily available.

Lack of knowledge about management practices is another problem in bamboo sector. Farmers have traditional thinking in their mind that bamboo does not need cultural practices. On the other hand, harvesting of bamboo culms from natural plantation is very dangerous job if we cannot harvest it carefully, it might be very dangerous to the life of people. Artificial plantation of bamboo with better management practices like maintaining the spacing, thinning makes it easier for harvesting. Farmers are also not aware about the harvesting season of bamboo culms. If they harvest bamboo culms in January/February, then there is less attack of insects/pests and diseases during storage (own survey, 2007 from farmers' experiences). During survey, it was observed that overall 16.9% HHs have received training on bamboo craftmaking and designing at least one person from their family and remaining 83.1% HHs have not received any training on bamboo craftmaking, marketing management and plantation (Table 23). This data shows that majority of members who have received training are from rich and medium class households.

Table 23: Training received on bamboo enterprise

Economic Class	Yes	No
Rich (n=15)	6 (40%)	9 (60%)
Medium (n=40)	4 (10%)	36 (90%)
Poor (n=16)	2 (12.5%)	14 (87.5%)
Total	12 (16.9%)	59 (83.1%)

Source: Field survey, August 2007 (n=71)

Focus group discussion and key informant interview conducted during the field survey, it was found that pahari community who are doing bamboo crafting as the main occupation they lack sufficient knowledge and skills about bamboo craftmaking, bamboo plantation, management and harvesting. For the future continuation of bamboo crafting, 60% HHs reported that they have needed skill development training on bamboo crafting whereas 30% HHs reported that they have needed plantation, management and skill development training and remaining 10% HHs had no response about it.

Box 5: Skill development training on bamboo crafting, voice of the farmers

One of the poor economic class participant; Prakash Pahari, Badikhel-4, Dandagaun said, 'We need additional skill development trainings but we have no time to take such types of trainings. If we participate in the training the whole day, then we can't make bamboo crafts and can't sell; so we have no money. It means we have no food to eat ourselves and feed to the children. So, we are using the traditional knowledge and skills and making traditional crafts and living our life in subsistence level.'

Bir Bahadur Pahari, rich class of Badikhel-4, has taken 2 trainings from different handicraft clubs and organization: one is bamboo furniture making and another is bamboo craft designing. So, he has now enough skill about bamboo handicraft. He says confidently, 'I can produce any types of bamboo crafts which can compete in the market because I gained lots of knowledge and skills from trainings. But, we have marketing problems so we need market management training. Hence, we can develop market networks and supply our products to the different parts of the country and outside the country as well.'

Source: Own investigation, August 2007

4.4.5 Small landholding

Majority of the farmers in surveyed HHs have less than 0.5 ha of land for agricultural production. The limited landholding is not enough to increase bamboo plantation in their private land. They can only increase bamboo plantation in their community forest as a common resource. Hence, small landholding is another problem for the commercialization of bamboo enterprise in Pahari families.

4.4.6 Government policy/Institutions in bamboo sector

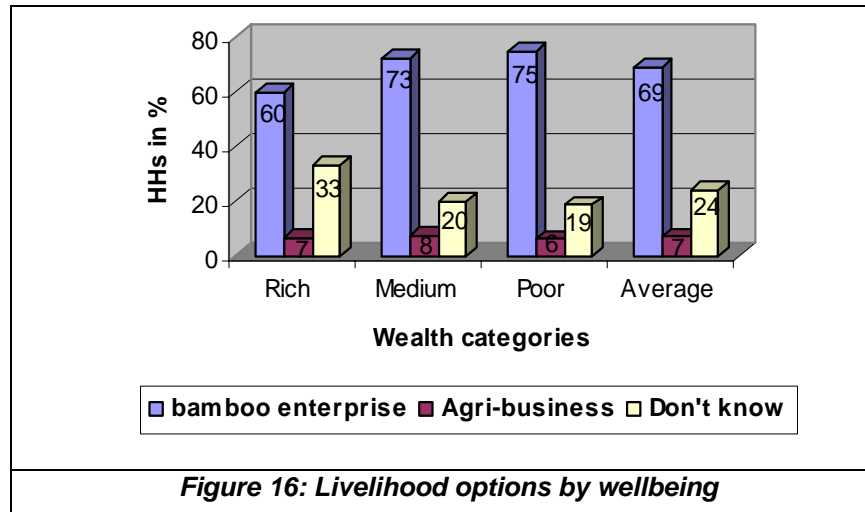
District Forest Office (DFO) through the Badikhel range-post are regularly doing training program about bamboo resource management and conservation. Subsidies are given to the local people through CFUGs for plantation and management as incentives for the promotion of bamboo enterprise under yearly plan of range-post. However, government initiation in this sector is very low and in range-post level, there are very little programs and budget in bamboo sector due to the lack of sufficient budget separated in this sector from the government.

Different institutions and organizations are working in Badikhel VDC in different development activities. These are Decentralized Local Governance Support Programme (DLGSP), Women Development Program (WDP), Educate The Children (ETC), Home Net Nepal, Janjati Federation, Mahila Utthan Kendra etc. They are working social mobilization activities in a group approach and also provide loans at low interest rate in a installment basis for different income generating activities such as livestock rearing, vegetable production, bamboo craftmaking etc. Sometimes, they conduct practical training on bamboo craftmaking. They are trying to link local farmers to regional, national and international markets. But their programs are not focused on bamboo enterprise for the Paharis. It was observed during the field survey that most of the incentives and facilities from organizations are taken by elite and supreme persons in the village and poor farmers have no or less access to take these facilities even sometimes they donot know about the programs. Many NGOs and INGOs are working in Lalitpur district but their program is not focused on bamboo enterprise for Paharis in Badikhel VDC.

4.5 Future Opportunities for Bamboo Based Livelihood Activities

4.5.1 Opportunities for livelihood improvement

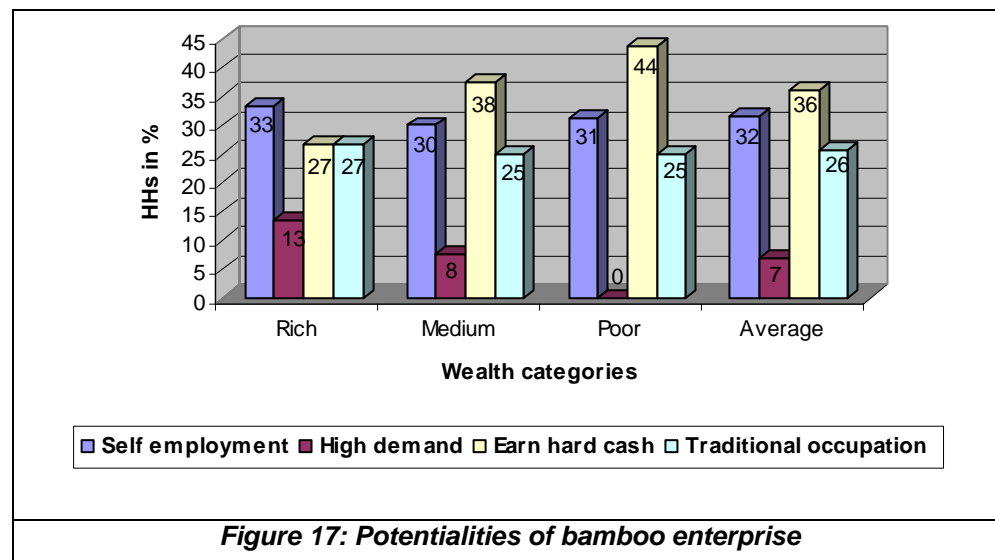
To analyse the livelihood options in the surveyed HHs for the betterment of their livelihood, the respondents were asked for different categories of livelihood options as a main livelihood alternatives. From the survey, majority of HHs reported that bamboo enterprise is the best livelihood option to uplift their living standard (Figure 16). Farmers were also asked about other alternatives like poultry farming, off-farm activities, tailoring, livestock rearing but they did not respond on these alternatives for their livelihood improvement. It shows that bamboo craftmaking is the best livelihood options in the Paharis living in Badikhel VDC.



Source: Field survey, August 2007 (n=71)

4.5.2 Potentialities of bamboo enterprise as a main occupation

Bamboo craftmaking is the main occupation of Paharis. The research shows that bamboo enterprise has potential to earn hard cash daily to fulfill their basic needs of the family and give self employment to the whole families. On the other hand, bamboo craftmaking is their traditional occupation so that they donot need to learn skills from outside about bamboo craftmaking. They also reported that traditional bamboo crafts are less demanded in the urban areas (Figure 17). These crafts (nanglo, chalno and dalo) are extensively used by the rural farmers in for harvesting and processing and storage of agricultural crops.



Source: Field survey, August 2007 (n=71)

4.5.3 Growing demand of bamboo craftmaking

Generally, rural farmers demand low price bamboo products and they do not consider the quality of the products. If the producers make high quality products using more skills and time, it has to sell at relatively higher price in which local people cannot afford it because they have very low willingness-to-pay (WTP) for it. Good quality bamboo crafts are not demanded mainly in the open market. Quality products are only demanded who order in a large scale from the organization or industry. Consumers pay more for the same good when there is demand but when there is no demand, they bargain more for the same product. Majority of people in Kathmandu valley is Newar castes. During the field survey, farmers reported that in one of the important Hindu festival i.e. Dipawali which is celebrated in October/November every year. Each Newar family needs one nanglo made by bamboo to pray god at that time so, it has religious importance in Newar society. In Kathmandu valley, there are about 5 millions Newar. At that time, 5 million nanglos are demanding in Kathmandu valley alone. If bamboo craftsmen sell one nanglo @ NPR 50 which costs NPR 25 millions. Therefore, nanglo is very demanding and fetch more price at that time every year. Badikhel VDC is very near from Kathmandu valley which they have access to sell their bamboo crafts. On the other hand, farmers have experienced that demand of modern handcrafted goods are increasing mainly in the urban areas. Therefore, there is high potentials of bamboo modern crafts for gifts and decorative items in the 3 major cities of Nepal i.e. Kathmandu, Lalitpur and Bhaktapur.

4.5.4 Sustainability aspect of bamboo enterprise

Sustainability aspect is one of the burning issues and it is very important to run every developmental activity in a long run. Sustainability of any program and activities depends on the ownership and availability of the resources, responsibility and awareness of local people, quality of work or products etc. For running bamboo enterprise in a long run at local level, there are many sustainability issues which have to be considered. During the field survey, farmers were asked with some the sustainability issues of bamboo crafting that which are more important in their local situation. Farmers reported that strengthening marketing system, availability of raw materials in their locality, and micro-finance and subsidies from the government are the major issues which have to be promoted for the sustainability of bamboo enterprise in a long run. On the other hand, they also stated that farmers' co-operative formation also makes bamboo enterprise more sustainable (Table 24).

Table 24: Sustainability aspects of bamboo enterprise

Sustainability aspects	Rich (n=15)	Medium (n=40)	Poor (n=16)	Total HHs
Co-operative formation	3 (20%)	4 (10%)	2 (12.5%)	9 (12.68%)
Strengthening marketing system and promoting bamboo crafts	7 (46.6%)	14 (35%)	6 (37.5%)	27 (38.02%)
Availability of raw material and promotion of bamboo plantation in CF	3 (20%)	9 (22.5%)	4 (25%)	16 (22.54%)
Advanced skill development training	1 (6.7%)	5 (12.5%)	1 (6.3%)	7 (9.86%)
Micro-finance and subsidies from government	1 (6.7%)	8 (20%)	3 (18.7%)	12 (16.90%)

Source: Field survey, August 2007 (n=71)

CHAPTER 5: DISCUSSION

5.1 Knowledge on Bamboo Resource Utilization, Management and Conservation

5.1.1 Indigenous uses of bamboo

Mature bamboo culms are used in Nepal in 220 ways (Poudyal, 1998). Thus, bamboo, without doubt, is an economic plant. They are extensively used for house construction, for walling of huts, thatching and roofing, grain storage (Bhakari), fencing, scaffolding, furniture, woven products (such as mats, baskets, trays, and winnows), agricultural implements and tool handles (NARMSAP, 2004). Bamboo leaves are importance source of fodder for livestock. The use of bamboo leaves increases lactation and milk production (Das, 1999). They are used for high quality paper making in India, China and Bangladesh (Sharma, 1988) but not in Nepal. In contrast, although, bamboo has diverse uses in rural areas of Nepal, it was found that Pahari caste uses bamboo culms mostly in traditional craftmaking such as naglo, dalo, chalno which are used for post harvest processing of agricultural products and also basket, rack, table, chair to some extent (See in chapter 4.3.3). Pahari families know about the different uses of bamboo but due to the unavailability of bamboo raw materials, they cannot use bamboo for different purposes.

The research conducted in eastern Nepal has found that the levels of bamboo growing vary significantly with wealth (Das and Seely, 1996). According to the research done by Karki et al. (1998), the land size is directly proportional to the amount of bamboo plantation. It is usually the rich HHs with large landholdings plant more bamboos than poor HHs with less land. The finding of this research is also true in this aspect. It has found that richer HHs have relatively more land and have more bamboo clumps but not in significant numbers only 2-5 clumps per household whereas poor HHs have hardly 1-2 bamboo clumps in their homestead and most of the poor has no bamboo clump in their homestead land. In the study, it has found that poor pahari HHs are involving more on traditional bamboo craftmaking than rich and medium class pahari HHs (See in chapter 4.3.2). In contrast, rich and medium HHs have somehow more knowledge and skills about modern bamboo crafts like rack, furnitures, lampshed, penshed, batch, watch frame etc. which are more demanded in the market. It means that the involvement of poor HHs in bamboo crafting is more but they are not earning more income from it.

Women are heavily involved in forest-based small-scale enterprises (FBSSE) in many developing countries (FAO, 1987; FAO, 1991). The situation is also similar in Nepal with a considerable amount of women are involved in this enterprise. Bamboo craftmaking is one enterprise where a considerable number of women are involved (Das, 1999). The above statements have proved the finding of this research. In Badikhel VDC, Pahari women are involved full time, or frequently part time especially the poor women. But the involvement of men and women depends on the labor available in their own family. Male can involve fully in their own profession like bamboo enterprise and other off-farm activities but women can't spend full-time always because of the fact that many women are household based family operations and care for their children. For more skilful and hardworking, men are engaged more than women (See in chapter 4.3.3).

5.1.2 Indigenous knowledge on bamboo plantation, management and conservation

In Terai regions of Nepal, bamboos are grown in homegardens, usually in mixture of fruit trees and other timber species (Das, 1998). In contrast, it was found that the majority of bamboos in the study area are from natural regeneration. In eastern Mid-hills and the Terai, in general, and particularly Illam and Sankhuwasabha districts and around Pokhara valley in western Nepal, there is greater bio-diversity of bamboos (NARMSAP, 2004). The finding of this research is different in this aspect because the study found that the diversity of bamboo species is low according to farmers' experience (See in Table 10).

In eastern Nepal, 2-3 bamboo species are grown by farmers and choice of species is based on the HHs demand. Usually different bamboo species are grown to meet different HHs needs. To grow more than one species is also a means to diversify risks (NARMSAP, 2004). In contrast, the study found that most of all the bamboos in their homestead are natural bamboos and some of them are planted in marginal lands, gullies and slopes and private forests. Paharis donot know about the species diversity found their locality. They are using only '*Nigalos*' and '*Tama Bans*' extensively for making bamboo crafts.

The standard management practices on bamboo are not seen practiced anywhere in Nepal. However, the places where there is a good market for bamboos, they are intensively managed and clumps are seen in good condition NARMSAP, 2004). According to the research done by Stapleton, 1987, the most common propagation of bamboo is by the use of rhizome cuttings. However, rhizome cuttings weigh 40 kg on average (Stapleton, 1987) and so impractical for planting-up large areas. This is the traditional method of planting

bamboo in Nepal for hundreds of years. Culm cutting is also practiced in vegetative propagation. Culm cuttings are much lighter, weighing about 0.5 kg (Storey, 1981; Stapleton, 1985b). This method is not popular in rural areas. Seed propagation is also practiced for commercial plantation but it needs more technical knowledge and skills. This practice is increasing mostly in the Terai region where there is large scale bamboo plantation in the community forest as well as in their homesteads. Similar result is found in this research that farmers are only using the traditional method of propagation by rhizome cuttings since hundreds of years. They lack more knowledge about the scientific methods of bamboo plantation, management, harvesting and post harvest treatment. However, nowadays, forest department have made aware to the rural farmers about scientific methods of planting and its importance in their livelihoods. Therefore, farmers are growing interest about bamboo plantation, utilization, management and conservation in local level and have started bamboo plantation in their community forest in a large scale. On the other hand, most of bamboo plantation in their homesteads is natural regeneration. Generally, natural bamboo doesnot require intermediate silvicultural operation. Therefore, farmers donot do any silvicultural practices in bamboo plantation in their homesteads.

The traditional believes and superstitions also affects on bamboo plantation. It was found that the common believes associated with bamboos is that it reduces the productivity of land where it grows and considerably reduces the crop productivity by shading affect. But the research done by Singh et al. 1992 found that the agricultural land near bamboos can be effectively utilized for growing ginger, turmeric, large cardamom, orchard grass and dinnanth grass upto a distance of 11-15 m fro the bamboo row. But the Paharis donot know that they can cultivate shade loving agricultural crops with bamboo plantation. Therefore, farmers plant bamboo only in the marginal land and degraded lands, gullies, slopes and private forests and donot plant with agricultural crops in an agro-forestry system.

One of the major objectives of community forestry program (CFP) is to reduce poverty in rural villages through various income generating activities (Adhikari, 2004). There are many studies about the contribution of CFP to poor supported programme. Maharjan (2001), Malla et al (2003), Uprety (2005), Devkota (2006) and Khadka (2006) have found that benefit distribution is unequal among poor, medium and rich where poor are getting less than other. Similar result is found in this research that there is no equal distribution of benefits among poor, medium and rich members and no poor focus program by the CFUGs (See in chapter

4.3.4). They donot invest CFUG fund for income generating activities and poor are less access to use benefits from CFUG activities.

5.2 Bamboo Craftmaking and Livelihood Strategies

In Nepal, most of the bamboo based enterprises are family based and are mainly in rural areas. Bamboo craftmaking requires very low capital investment and gives high financial returns whereas cereal crop (mainly rice, wheat and maize) cultivation is very labor intensive operation and gives smaller financial returns than from bamboos (NARMSAP, 2004). Therefore, many family based small bamboo enterprises are increasing in the rural areas where there is scarcity of cultivated lands. The finding of this research is also true with the above findings. Pahari caste is one of the marginalized ethnic minorities among different ethnic groups of Nepal and socially more deprived from other higher castes since hundreds of year. They are less educated and have not sufficient land agricultural production. As bamboo is the traditional occupation of the Paharis, family based small scale bamboo enterprise is the major occupation for their livelihood.

It has mentioned in the conceptual framework (See in chapter 3.2) that 3 types of livelihood strategies i.e. distress, maintenance and progress strategies were going to be tested for 3 wealth classes of pahari HHs for the level of income and food security. The interpreted result of different wealth categories and their livelihood strategies is discussed below.

Distress strategy and rural poor: The poor farmers, who have a very small and unproductive land, are more concerned with cereal and livestock production for their own consumption. However, rich and middle class farmers of the Terai are more interested in bamboos now than in the past (Das 1992). In contrast, due to less and unproductive land for agriculture in the pahari community, all pahari HHs are equally interested and involved in bamboo based family enterprise. However, involvement of poor HHs in bamboo craftmaking is higher as compared to rich and medium. The one research has shown that bamboo crafting has contributed 74% of the total annual HH income of poor come in Eastern Nepal whose food sufficiency is 1.56 month only (Chowdhary, 2003). It is quite similar in case of pahari castes whose main income source is bamboo craftmaking. Generally, poor HHs are dependent more in bamboo enterprise because the survey has shown that bamboo crafting has contributed more than 75% of the total family income of the poor Paharis (See in chapter 4.2.1).

On the other hand, the level of income from bamboo enterprise is also different in 3 wealth categories of pahari HHs. Although the dependency on bamboo for their livelihood is quite high in poor and medium class HHs than rich, average annual income is high in rich HHs than medium and poor (See in chapter 4.2.2). It means that poor pahari HHs cannot invest more input on bamboo craftmaking as a result; their income from bamboo is automatically less as compared to rich and medium class HHs. Due to this small-scale subsistence level of income and high dependency on income from bamboo crafting, their income is *not secured* for the betterment of their livelihood which only fulfils their subsistence need. Similarly, Poor HHs has relatively less land (<0.18 ha both irrigated and non-irrigated land) than rich and medium class farmers which is sufficient to feed their family hardly for 1-3 months (See in chapter 3.6.3.3 and 4.3.2). For their coping strategies on food insecure condition, bamboo craftmaking could be the best alternative for securing food. Therefore, poor farmers are *not secured* for food also. Their food sufficiency status has not changed since long time and struggling for hand to mouth problem. Due to insecurity of food and income from bamboo craftmaking, the livelihood of poor class Pahari farmers is in subsistence level and the livelihood strategy is *distress strategy*.

Maintenance strategy and medium class HHs: Most of the medium class HHs has comparatively more land (0.18-0.36 ha) than poor which is sufficient to feed their family only for 3-6 months (See in chapter 3.6.3.3 and 4.3.2). For remaining 6-9 months, they should fulfill their family food requirements from other alternative sources like bamboo craftmaking, wage labor, small scale business, service etc. Food sufficiency is also *not secured* in medium class pahari farmers. The survey has shown that bamboo has contributed 68% of the total family income from which they buy food for feeding their family (See in chapter 4.2.1). Likewise, medium class HHs has relatively higher annual income than poor hence their income is *average secured* for their livelihood (See in chapter 4.2.2). They can invest relatively more input for bamboo enterprise hence the average annual income from bamboo enterprise and other sources of income is *maintained* for food available to their family for the whole year. They are somehow improving their livelihood status from bamboo enterprise. Due to insecure food and average secured income from bamboo enterprise, medium class Pahari farmers are maintaining their livelihood status; therefore, their livelihood strategy is *maintenance strategy*.

Progress Strategy and rich class HHs: Majority of rich class farmers have more land (0.36-0.5 ha both irrigated and non-irrigated) than medium and poor class farmers. According to landholding size, they are not really rich. Only in the relative comparison during participatory well-being ranking, they are in rich class in their village situation. The agriculture production is sufficient to feed their family members only for 6-9 months. The rich pahari HHs are therefore *average secured* for food but not fully. However, no one has food sufficient for the whole year. During field survey, it has found that bamboo has contributed 62% of the total family income (See in chapter 4.2.1). Only a small portion of income they spend for buying food. Rest of the income they spend for other household activities and save for the future use. The annual income is relatively higher than poor and medium class HHs due to more investment in bamboo craftmaking. Other reason for earning high income from bamboo by rich class farmers is that they are not only making traditional crafts but also modern crafts like kisti, lampshed, penshed, watch frame, batch, bag etc. which are more demanding in the market and fetch reasonable price. Their income is therefore *very secured* and their livelihood status is increasing through bamboo craftmaking. Due to their average secured food and very secured income and food for the family, their livelihood status is progressing; therefore, their livelihood strategy is *progress strategy*.

In fact, bamboo craft making is easy occupation in the context of pahari households. They have sufficient skill and knowledge for making traditional crafts like dalo, nanglo, chalno, rack and basket in which their ancestors had been done for hundreds of year and they are following as their tradition. Most of the pahari HH members are illiterate so they have no access to professional and government job. Bamboo crafting is a family based job where all family members can sit in home and work together. Even dispassionate persons somehow can engage in bamboo enterprise. The students can also utilize their leisure time in the bamboo crafting as they already learned skills from the family members. Their skills and knowledge is transferred from one generation to next generation. Therefore, there is proper utilization of family labor in their own family level so bamboo crafting is a family project where everyone can work and earn money. They can earn hard cash by selling bamboo goods whereas they have to wait for a long time to take return from agricultural products. They can earn more income by investing less. The income from bamboo crafting covers schooling for their children, fooding, celebrating main festivals, clothing, medical treatment etc. for pahari families. All the family members are self-employed from this occupation.

5.3 Constraints in Bamboo Craftmaking

The handcrafted bamboo accounted for about 75 % of the current market need in Nepal (Shrestha et al, 2006). Bamboo market in Nepal is estimated at around NPR 1 Billion where 25,000 plus families from excluded/ethnic groups are involved in bamboo related livelihood activities in Eastern Nepal alone (Chowdhary, 2007). Bamboo market is estimated at around more than NPR 1 million only from Badikhel VDC (farmers' calculation during focus group meeting). One study done by Das (1999) in Eastern Nepal found that the major reasons for marketing inefficiency of bamboo enterprise are lack of transportation, competition among traders and marketing information. In contrast, there is a good transportation facility in Badikhel for importing bamboo raw materials and selling their products.

The major **marketing problems** for bamboo enterprise are no fixed price and guaranteed for the bamboo crafts, lack of marketing information system (MIS), strong competition between the craftsmen for traditional crafts and lack of institutionalization. Although the traditional bamboo products of the Pahari people like basket, nanglo, dalo, challo, racks and other household utensils are popular in the local markets, the price is going down by contrast to the usual hiking market price of all other daily goods. The major reason for this problem is that traditional bamboo products of Paharis could not compete with other modern handicrafts. On the other hand, there is strong competition traditional crafts among the craftsmen. On the supply study done among the urban entrepreneur by Pant 2006, it was found that there is lots of request for new products and their demand could not be adequately addressed. The finding of this research is also true in this line. Farmers are only limited to local and district marketing centers so they lack market information about the product and price in other major cities of Nepal. Surplus availability of plastic-made goods and commodities in cheap price is another problem which suppresses the use of bamboo crafts mainly in the rural areas. Due to the lack of institutional development like collection centre or farmers group and long term vision about marketing network, they have no guaranteed of their products for market promotion. Many of the entrepreneurs are working in isolation and there is no collaboration between them. There is no mechanism of certification of their products yet that's why they are not able to compete with the international market. On the other hand, high technology intensive bamboo goods produced by China and India are popular in the international market and Nepalese bamboo products are unable to compete with them. In addition, farmers donot do cost-benefit analysis of the bamboo products.

The price of the bamboo crafts is directly proportional to the quality of products. Because of the low purchasing capacity of the customers, they cannot buy bamboo crafts at a high price. People are willing to buy cheap and durable products. If farmers produce high quality products, they cannot sell easily in the market with reasonable price. Therefore, farmers are harassing in bamboo craftmaking and consequently the problem for the commercialization of bamboo enterprise.

Most bamboo-processing countries are facing a **shortage of raw material**. The increasing urban demand for housing materials on the one hand has increased the price of bamboo culms provided employment and benefited the rural HHs particularly rich ones and helped increase interest in bamboo planting (NARMSAP, 2004). On the other hand, it threatens bamboo craftsmen most of whom are non-growers as the increased cost of raw materials means reduced profit, which is not always enough to sustain livelihood. Similar result is found in this research. It has found that more than 90% of the raw materials are exported from outside mainly from distant villages (See in chapter 4.4.2). The increasing price of bamboo culms and unavailability of bamboo raw materials in the Badikhel VDC has increased the cost of investment in bamboo craftmaking means reduced net benefit from it. This is the great challenges for pahari castes to sustain bamboo crafting for their livelihood. The demand of *Tama Bans* and *Tharu Bans* is so high in Kathmandu valley for scaffolding the price has increased about 300% in the past 20 years (Poudyal, 1991). A survey has shown that there about 4604 house approved in 3 major cities (Kathmandu, Lalitpur and Bhaktapur) and requires 115,100 bamboo culms, which costs NPR 690,600 (Poudyal, 1991). It shows that the demand and consumption of bamboo culms is very high in Kathmandu valley. As the Badikhel VDC is very close from 3 major cities, Pahari farmers are facing the scarcity raw materials and high price bamboo culms because of the high demand of bamboo culms for house construction.

Restoring productive agricultural land to bamboo production is often difficult, as is seen in Nepal, where farmers' concerns for food security are more pressing. However, if bamboo product markets can be supported, partial conversion (in some cases, back) to bamboo land may assist farmers move from subsistence agriculture and into mixed farming and the cash economy (FAO, 2007). This is also true in case of Paharis in Badikhel. It has found that most of pahari households especially the poor have very **small landholding** which is not productive and sufficient for agricultural production to feed their family. However, farmers

are more concerned with food production even from a small piece of land and they donot know that cash economy other than subsistence agriculture can fulfills their food insecurity situation. Therefore, farmers donot want to leave subsistence agriculture and increase bamboo plantation in homestead land and they plant bamboo only in degraded land.

The small size of family-based bamboo enterprises not only render them vulnerable to competition but also hampers their transition to a larger, more viable size as they depend heavily on inputs from the entrepreneur and his or her family (NARMSAP, 2004). They are not able to draw rural credit facilities and donot have sufficient resources of their own to invest in bamboo craftmaking. The similar finding is also found in this research. Due to the **financial problems**, most of the poor and medium class farmers are running their bamboo enterprise in a small scale at subsistence level. In general, poor people are not access to financial resources at the time when they want to buy more raw materials for scarce season. Money lenders donot trust to the poor farmers for loan. Hence, lack of financial support is a constraint for the commercialization of bamboo enterprise for the Paharis.

The bamboo growers, traders, craftmakers and entrepreneurs donot have sufficient information on the **technical aspects** of bamboo growing and marketing (Das 1999; Das, 2002). Similar to this finding, it has found that sufficient knowledge about bamboo plantation, management are lacking in Paharis. Non-availability of planting stock is also a constraint for bamboo planting because it is traditionally propagated by rhizome cutting which is time consuming and bamboo seeds are not easily available as almost all the bamboo species flowers after a long interval (Stapleton and Tamrakar, 1983; Das, 1998). Similar to this finding, it has found that there is also scarcity of planting materials for large scale bamboo plantation in CF as well as in their homesteads. Similarly, CFUGs are involved in conservation and management of bamboos in their CF, but they lack information on appropriate propagation, harvesting and management techniques. In addition, they have not enough skills for making modern bamboo crafts.

Action oriented **policy from the government** has not started in this sector yet. Still bamboo promotion activities are lacking in these areas. Some Community Based Organizations (CBOs) and Local handicrafts clubs are working in Badikhel but poor focussed programmes on bamboo enterprise is still lacking. NGOs and INGOs working in Lalitpur district are not focussing their programmes on bamboo enterprise in Badikhel VDC. The main actors in the bamboo sector are small scale producers, large scale land owners, intermediaries,

craftspeople, urban entrepreneurs/industrial manufacturers, NGOs and Government. The government still could not collaborate with them to launch bamboo related programs and activities together in these areas and also could not develop networks among the actors. Similarly, government have not subsidized import tax of bamboo raw materials from distant places. Farmers are facing unwanted burden from the government officials during transportation of raw materials. However, farmers are supplying bamboo crafts to the different parts of country without paying tax.

5.4 Opportunities of Bamboo Crafting

Bamboo furniture is getting popular since it is cheap and lighter than timber based furniture particularly in Kathmandu valley (Poudyal, 1992). Due to the sharp increase in the price of timber, bamboos are increasingly used for construction and furniture. The bamboo based furniture, fancy basket-ware and high value decorative materials are increasing day by day in national and international market. In the line of this finding, it has found that Pahari HHs have opportunity to make modern bamboo crafts like furniture, decorative materials and other gift items for tourist attraction which are more demanding and fetch high price in the national and international market rather than traditional crafts.

The socio-economic research carried out in eastern Nepal found that bamboo is one of the most preferred species for planting and income generation programme by the Forest User Groups (FUGs) in their community forest (Das, 1998). Currently, 1400 handed over CFUGs have conserved and planted bamboos in their CF for rehabilitation and income generating activities in Nepal (Chowdhary, 2007). In the line of this finding, this study has found that the 3 CFUGs in the study area have started to plant *Tama Bans* and *Nigalos* in their CF. Therefore, they have opportunity to increase bamboo plantation in their community forest in a large scale which can fulfill their requirements of raw materials. Community members can buy enough bamboo culms in cheap price and pahari HHs can increase their bamboo craftmaking in a commercial scale and can earn more profits. In addition, a large amount of money which they spend on purchasing bamboo raw materials from outside is saved in their own CFUGs fund.

Bamboo has good opportunity for eco-housing in rural areas of Nepal (Chowdhary, 2007). Because of more than 30% of Nepalese people live under poverty line, who cannot afford for the brick built houses. In housing sector, an interest is growing for low cost annexes,

restaurants, weekend homes and residential homes (Adhikari, 2008). In the line of this finding, this research has found that about 75% of poor Paharis house is made up of mud and weak stones (See in chapter 3.6.3). If they have large scale bamboo plantation in their homesteads and CF, they can use bamboo as eco-housing material which is more economical. Similarly, bamboo culms are more demanding in Kathmandu valley for building construction which can be an opportunity for Paharis in Badikhel to earn income by selling bamboo culms in the market.

One of the options for sustainable supply of bamboo crafts and bamboo culms could be the bamboo co-operative formation as a group approach which also guaranteed their bamboo products. If their bamboo co-operative is registered and recognized as a institution, bamboo industries, organizations and intermediaries who need bamboo crafts and raw materials in a large scale can order through the co-operatives. On the other hand, any local organizations, NGOs, international donor agencies, can go through the co-operatives. Government can also co-operate with CBOs, NGOs, local handicrafts clubs and support technical as well as in small micro-finance activities. Farmers can also develop a global network of marketing channel. Co-operative can facilitate to establish collection centre in the village where the bamboo product and the price should be guaranteed. When product and the price is guaranteed, farmers feel safety from the enterprise that helps to enhance the commercialization of bamboo enterprise.

According to Chowdhary and Poudyal (2007), there are 66 bamboo and rattan industries in major cities of Nepal. They consume 3000 large sized bamboo culms and over 0.8 million Nigalo culms per annum, which cost about Rs. 0.6 million per annum. Similar to this research, the study found that as three CFUGs have already started *Tama Bans* and *Nigalos* in CF, they can supply large amount of bamboo culms in these industries and earn significant amount of money in their community fund.

The new shoots of some bamboo species especially the *Tama Bans* are used as vegetables and for making pickles which are very popular not only in Nepal but also in many south Asian and other countries in the world. The exports of bamboo shoots from Taiwan amounts to US\$50 million (Poudyal and Das 2002; Das, 2004). Pahari people also have opportunity to export bamboo shoots in national and international markets which is very demanding if they have enough bamboo clumps in their homesteads.

Bamboo farming and enterprise favors the development of small landholders and the use of intensive labor suited to the Nepalese quest of eliminating poverty by improving the means of livelihood of the rural poor (NARMSAP, 2004). Therefore, bamboo farming can be a powerful tool for the government to foster rural development. There is a potential for further income generation from bamboo craftmaking with better training for the craftmakers and other households who were not yet involved in such activities (Das, 1999). In the line of these findings, it has found that Paharis in the Badikhel VDC still an opportunity to make more demanded bamboo crafts for further income generation with better skill development trainings. Many NGOs, INGOs, local handicraft clubs and government can collaborate each other and launch intensive program on bamboo enterprise and livelihood promotion for rural poor in Badikhel VDC. Therefore, the government support for the intensive development of small bamboo farms owned by small farmers and the rural poor can be a strategic move in upgrading the quality of life of rural people.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Bamboo can play a crucial role in rural economy and help to sustain the livelihoods of many rural households. It is one of the income generating sources of rural poor and landless people in Nepal. Bamboo has many advantages such as it has potential to create rural employment through bamboo craftmaking, used as fodder for livestock and fuel-wood, construction material, bamboo shoots as vegetables and pickles and other ecological and religious importance. The study concludes that most of Paharis have less land for agricultural production which is not sufficient to feed their family more than 6 months and bamboo craftmaking is only the alternative income source to cope with this food insecurity situation as it is the traditional occupation of Pahari households for hundreds of years. As bamboo craftmaking is a family based occupation, all Paharis farmers are heavily involved in this occupation besides giving priority for schooling to their children for subsistence livelihood especially by the poor people. Although its multiplicity of uses, Paharis has mostly used bamboo resource for making traditional crafts such as nanglo, dalo, chalno and other utensils for household use which are high competition in the market. Therefore, they have not taken more profit from it as they expected. However, interest has increased nowadays on modern bamboo crafts from which they can make more profit according to the demand of modern handicrafts especially in urban areas.

The study also concludes that the lack of market, bamboo raw material, technical knowledge about bamboo plantation and management and skill development trainings, small landholding, subsidies and micro-finance from the government are the major constraints/challenges of bamboo craftmaking in the pahari households of Badikhel VDC. The Paharis have opportunity to large-scale bamboo plantation in Community forest by CFUGs themselves and with the initiation of forest department for technical as well as financial support to run their enterprise in a sustainable way. They have also the opportunity to shift from traditional bamboo craftmaking to modern crafts, develop market network through farmers' co-operative formation, multiple uses of bamboo resource to improve the livelihood status. The government can offer small loans through collateral schemes, provide trainings for skill development and help link craftsmen to the markets which can be powerful tool for the government to foster rural development and poverty reduction for the Pahari caste in Badikhel VDC. As the timber price has increased day by day, bamboo has taken the

place of timber in many household uses such as house construction, fuel and fodder and furnitures. Farmer's co-operative at village level can play critical role for market promotion and encourage bamboo craftsmen for large scale production and sustainability.

A lots of researches has been conducted on socio-economics of bamboo resource in eastern Nepal however, detailed studies have not yet been conducted on the socio-economics of bamboos in other parts of Nepal. Therefore, further research is needed on comparative study of bamboo crafting and other enterprises and impacts of bamboo planting on rural households' economy, comparative advantage of bamboos over other tree species and impact of bamboo planting on rural households' economy.

6.2 Recommendations

The researcher, on the basis of findings from this study suggests following recommendations for the promotion of bamboo craftmaking to the rural poor and for its sustainability.

- There should be a clear-cut government policy regarding bamboo resource utilization, management and conservation and financial support to the bamboo-based enterprise.
- Private sector such as Local CBOs, NGOs, INGOs etc. should be encouraged to invest in large-scale bamboo plantations and craftmaking.
- Further research on socio-economics of bamboo resource in Pahari community should be conducted.
- Effective programmes should be run for promoting the awareness of the Pahari people who are simple, humble, uneducated, and hardworking so that their livelihood status can be improved.
- Co-ordination among the different public and private agencies such as growers, collectors, craftsmen and intermediaries involved in the collection, processing and marketing of bamboo product should be enhanced.
- High technology intensive improved production system should be developed in order to compete bamboo products in international market.
- Government should encourage bamboo plantations in community forest through CFP by involving the rural communities in resource development for its sustainability.
- Poor focused programme should be implemented in bamboo sector.

- Skill oriented training on bamboo production, processing, utilization and marketing aspects should be conducted by the Institute of Forestry (IoF) and Department of Forest Training Division.
- Good marketing network and reliable MIS should be developed for market promotion.
- The tax of import and export for bamboo raw materials and bamboo crafts should be subsidized and unwanted burdens from government officials during transportation should be controlled.
- The education about the certification of bamboo products should be given to the bamboo craftsmen and CFUGs and government should initiate for certification process of bamboo products.
- Paharis should be encouraged for the multiple use of bamboo resource for income generating activities not only the traditional bamboo craftmaking.
- Paharis should also be encouraged for bamboo plantation in homesteads and unproductive agricultural land and more aware about cash economy than a food production to sustain a livelihood.
- Bamboo co-operative formation should be initiated at village level as an institutional development for commercialization of bamboo enterprise and for market promotion and encouragement of small-scale bamboo entrepreneurs.

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ANNEXES

Annex I: Most important bamboo species and their major uses in Nepal

S.N	Local Name	Scientific Name	Dia (cm)	Major uses
1	Bhalu bans	<i>Dendrocalamus giganteus</i>	≥30	Bucket and water container, post
2	Dhanu bans, bhalu bans	<i>Bambusa balcooa</i>	12-16	Scaffolding, storage bin, fencing, roofing
3	Kalo bans, bhalu bans	<i>Dendrocalamus hookerii</i>	≥8	Small poles, weaving, fodder, construction
4	Kante bans	<i>Bambusa arundinacea</i>		Construction of building
5	Kath bans, Lathi bans	<i>Dendrocalamus strictus</i>	≥7	Rafter and post, walking stick, fuel, charcoal, construction
6	Koraicho bans	<i>Bambusa oxytenathera</i>		Fencing, weaving, construction
7	Mal bans	<i>Bambusa nutans</i>	9-12	Construction purpose, fencing, fodder
8	Mokla bans	<i>Bambusa sp.</i>		Construction, woven mats
9	Nibha bans, Lyas bans	<i>Dendrocalamus patellaris</i>	≥4	Flute, weaving
10	Pahelo bans	<i>Bambusa glaucencens</i>	medium	Ornamental uses
11	Phosre bans, Khasre bans	<i>Dendrocalamus sp.</i>	2-5	Weaving, basket, fodder
	Tama bans,	<i>Dendrocalamus</i>		Multipurpose bamboo,
12	Ban bans, Choya bans	<i>hamiltonii</i>	8-10	construction material, weaving and bamboo shoots (edible)
13	Tharu bans, Seti bans	<i>Bambusa tulda</i>		Basket, scaffolding, low grate weaving
14	Malinge, Nigalo	<i>Drepanostachyum sp.</i>	2-5	Weaving, low grade shoots, basket and furniture making
15	Malingo, Nigalo	<i>Drepanostachyum Arundinaria recemosa</i>	2-4	Weaving, construction, mats, fodder, sticks

Source: Stapleton 1994; Karki 1995; Jackson 1994; Das 1998 and other sources

Annex II: Check-list for participatory well-being ranking

Rich Economic Class

- Rich Economic class
- Food sufficiency more than 9 months from agricultural production
- Government, corporate or NGO service holder
- Access to education
- House or land in the city
- Landholding > 7 ropani
- Having bank account and personal saving
- House constructed with brick, cement and concrete

Medium Economic class

- Food sufficiency 3-6 months from agricultural production
- Skilled and employed family members with simple jobs in government/private sector
- Able to schooling children
- Can celebrate festival without taking loan
- Land holding > 4 ropani
- House roofed with GI sheet and wooden wall

Poor Economic class

- Food security <3 months only from agricultural production
- Problem in schooling their children
- House roofed with thatch grass and mud wall
- Dependent on wage laborer in Nepal and India
- Very difficult to celebrate festival without taking loan
- Land holding < 3 ropani

Annex III: Questionnaire for Household Survey

Ecological zone.....Name of the village.....Economic Class:.....
Name of the respondent:.....Occupation:.....
Household sample no:.....Interviewer.....
Tole/ward no.:Date:.....
Education: Age:Sex:..... Marital Status:.....

Section A: General Information

1. Household size, sex composition and age structure

S.N.	Household Members	Age	Marital Status	Male	Female
1					
2					
3					
4					
5					
Total					

*1. Married 2. single 3. widow 4. divorced/ separated

2. Involvement of household members in different activities (above 10 years)

Occupation	Female	Male	Total
Student			
Agriculture			
Agriculture and Service			
Agriculture and business			
Bamboo enterprise			
Unemployed			
Wage labor			
Other Specify			

3. Educational status of household members above 5 years

S.N.	Level and education	Sex		Total
		Male	Female	
1	Illiterate			
2	Just Literate			
3	Primary			
4	Secondary			
5	Higher Education			

4. Food sufficiency

Months	Before (10 yrs)	Now
1-3		
3-6		
6-9		
9-12		

5. Land Holding Size and Tenure Status

Land Type	Local Unit (ropani)
Khet	
Bari	
Marginal Lands	
Private Forest	

6. Cropping Pattern

a) b) C) d)e)

7. Income sources and annual income

S.N.	Sources of Income	Income(Nrs.)
1	Agricultural Production	
2	Business (small scale/large scale)	
3	Salary	
4	Wage labor	
5	NTFPs (medicinal herbs, bamboo, broom and tree's)	
6	Others (Specify if any -----)	

8. Type of house (Please fill given codes in the box)

a) Type of House ☐ Codes: 1. Kachha (Mud), 2. Semi-Pakka (Stone), 3. Pakka (Brick and cemented)

9. Electrification ☐ Codes: 1. Yes, 2. No

10. Does anybody from the house go out of the village for livelihood (daily basis)? Yes/No

If yes, describe the reason:

Number of people _____ Place _____

11. Are you satisfied with the income from agriculture? Yes ☐ No ☐ Don't know ☐

12. Do you buy food grain from market? Yes/No

If yes then please specify: (from where, which months, quantity/months etc.)

Section B: Bamboo Related Information

13. Types of bamboo enterprise

- a) bamboo furniture b) bamboo basketry c) bamboo crafting
d) raw bamboo stems vending e) wood/ timber vending f) others (if any)

14. Uses of bamboo

a) Bamboo crafts (basket/furniture/other handicrafts) b) Construction materials as a supplement of timber

c) Fodder d) Fuel wood e) Others (if any....)

15. Types of bamboo species and their uses

S.N.	Types of Species	useful aspects
1		
2		
3		

16. Trend of involvement of men and women for making bamboo products

Group of family member	Degree of involvement			
	> 50% time	26-50% time	1-25% time	Not involved at all
Men				
Women				
Children (below 15 years)				

17. What are the major products of bamboo and who are engaged in making these products?

Bamboo goods	No. of HH members involved	Male made (amount /unit)	Female made (amount /unit)	Production per day
Doko, Dalo, Nanglo, Thunse, Chalno				
Furniture (table, chair etc.)				
Rack				
Basket				
Others (Photo frame, watch frame, batch, kisti, lampset etc.)				

18. Are you adopting this occupation before a long time? a) Yes/No

If yes, for how long have you been in bamboo enterprise and why you are adopting this occupation before a long time?

19. Categorise the availability of the bamboo raw materials from they are obtained

a) Abundant (100%) b) Moderate (50%) c) Scarce (125-50%) d) Less than 25%

20. If not sufficient and buy from fellow villagers, how much and what rate do you pay?

Amount Brought (local unit): Rate/unit (Nrs.):

21. Distribution of labour for bamboo enterprise

a) Hire labor (paid in cash or kind) b) Family labour (husband/wife and children)

c) Exchanged labor d) a and b e) b and c f) all above

22. At which aged bamboo raw material do you prefer for making goods?

a) Young aged). Middle aged/old aged

23. Plantation of bamboo: a) Community Forest b) Private/Marginal land c) Both

24. If you are planting bamboo in your community forest, how you are managing bamboo in your community forest (plantation, management, conservation, harvesting and marketing)?

25. Are you continuing your bamboo enterprise during peak agricultural production season?

a) yes, at full extent b) yes, to some extent c) not at all

26. Is there any reduction of agricultural production? Yes/No

If yes, what is the reason for this reduction?

27. What do you think about the costs and benefits situation of bamboo enterprise comparing to agricultural production and other household activities? Which is beneficial from the livelihood and economic point of view?

28. Cost and benefit situation of different bamboo products

S.N.	Types of products	Investment per product including labor cost (Nrs.)	Selling Price (Nrs.)
1	Doko, Dalo, Nanglo, Thunse, Chalni		
2	Furnitures (table, chair etc.)		
3	Rack		
4	Basket		
5	Photo frame, watch frame, batch, kisti, lampset etc.		
6	Others (If any...)		

29. Annual income from bamboo enterprise

Bamboo products	Amount Sell (No.)	Income per year (NCR)
Doko, Dalo, Nanglo, Thunse, Chalno		
Furnitures (table, chair etc.)		
Rack		
Baskets		
Photo frame, watch frame, batch, kisti, lampset etc.		
Others (if any...)		

30. Do you continue your bamboo enterprise in future? Yes/No

If yes, do you find it profitable? Yes/No

31. Where do you consume income of your bamboo enterprise?

- a) petty cash for household use b) built a house c) paying for hospital
d) paying school fees for children e) buying inputs for agriculture f) buying clothes
g) buying food for family h) other purposes (if any).....

32. How do you sell your products?

- a) Directly to the market b) Local vendors c) contractors or wholesalers d) All above

33. Where do you sell your product?

- a) On the farm b) Local market c) district/regional marketing centres d) Capital city

34. If selling on the farm, do you get reasonable price from your products? Yes/No

If no, why could not you take them to the district market centres where price is higher?

35. How frequently you or your household members visit market centres?

Market centers	Frequently	Occasionally	Rarely
Local market			
District/Regional			
Capital city			

36. Are you making good quality products and compete in the market? Yes/No

37. Do you think that bamboo would fetch higher price if quality is improved?

Yes ☐ No ☐ I don't know ☐

If yes, how can you improve the quality of your products?

38. Is there any improvement in household income? Yes/No

If yes, is there any change in the livelihood status of your family as compared to last 10 years? Yes/No

39. Did you or any of your family members receive Bamboo related training? Yes/No

If yes, what type of training you received and from whom?

Training type	Trained		Organized by
	Male	Female	

40. Do you need additional training to make better products? Yes/No

If yes, what types of training?

41. Do you have financial problems to run the enterprise? Yes/No

If yes, from where you take loan and how much interest do you pay?

Source	Interest rate in %
Relatives /friends	
Money lender	
Commercial Bank	
NGOs/INGOs	
Forest department/small cottage industries	
Local bamboo handicraft club	
Private bamboo factory/industries	
Own CFUG	
Other Specify.....	

42. Share of investment from outside sources (%)

a) less than 25 b) 25-50 c) 50-75 d) 75-100

43. If you have taken the loan from above sources, do you pay back on given time? Yes/No

44. Are you the member of community forest user groups (CFUGs)? Yes/No

45. Do you take loan from your CFUG fund for your bamboo enterprise? Yes/No

If no, who are more benefited?

46. Do you get loan at minimum interest rate from CFUG than other money lenders? Yes/No

47. Are you getting equal opportunities to participate in decision making, bamboo related training, exposure visits etc. related to bamboo enterprise? Yes/No

48. Does government or NGO/INGO extension staff make you aware of the economic value of Bamboos? Yes/No

If no, do you think that such service should be provided? Yes/No

49. Do you think bamboo in the private land/forests need cultural treatments? Yes/No

If yes: please describe

50. What are the major constraints have you faced to run the enterprise?

a) lack of money b) small landholding/lack of land c) no adequate skill and knowledge

d) lack of market e). scarcity of raw materials f) others (if any)

51. What are the constraints in regard to the marketing of bamboo products?

a) No fixed price b) Not guaranteed of the products for selling c) No fixed market

d) lack of marketing information system (MIS) e) lack of institutionalization of marketing system

f) inadequate steps by the government g) others (if any)

52. Which problems have you faced about bamboo plantation, management and harvesting?

53. Which opportunities do you see to improve the livelihood situation of yourself and your family?

a) Bamboo Handicrafts b) Agri-business c) Poultry farming

d) Tailoring e) Off-farm activities f) do not know

54. What are the potentialities of entrepreneurship/ enterprise development in your area in individual as well as in a group?

a) Self employment b) Traditional occupation c). Earn hard cash

d) High demand of bamboo handicrafts e) others if any.....

55. What should we do for the sustainability of this enterprise for long run?

a) bamboo enterprise co-operative formation b) availability of raw materials in the locality

c) promotion of bamboo plantation in their CF d) advanced skill development training

e) subsidies and micro-finance activities for bamboo enterprise from government

f) strengthening marketing system g) others (if any)

Annex IV: Checklist for Focus Group discussion

- Historical background of Pahari HHs and their traditional bamboo occupation
- Status of Agricultural production and Livestock
- Different income sources
- Involvement of labor for bamboo enterprise
- Major products of bamboo
- Cost and Benefit situation of bamboo craftmaking compared to other household activities.
- Reasons for adopting bamboo occupation as main livelihood alternatives
- Knowledge about bamboo plantation, utilization, management and conservation.
- CFUG and its role on bamboo enterprise promotion
- Skill development training on bamboo enterprise
- Types of support for bamboo enterprise from government and other organizations
- Major problems/constraints of bamboo enterprise
- Future Potentiality of bamboo enterprise for their livelihood
- Sustainability aspects of bamboo enterprise

Annex V: Checklist of Key Informants

- General information about the village, people, caste and ethnicity, occupation, agricultural production, livestock rearing, bamboo enterprise
- Alternative income opportunities
- Pahari households and bamboo enterprise
- Different uses of bamboo and major crafts they produce
- Bamboo resource and their existing condition in their homesteads and CF
- Demand of bamboo crafts and Pahari people's livelihood
- Market situation
- Cost and benefit situation
- Local knowledge about bamboo resource management and conservation
- Bamboo raw material availability and bamboo plantation in CF
- Role of NGOs/INGOs and government initiatives in bamboo sector
- Problems and opportunities of bamboo enterprise

Annex VI: Multiple Comparisons by One-way ANOVA

	(I)	(J)	Mean	Std. Error	Sig.	95% Confidence	
	Ecoclass	Ecoclass	Difference (I-J)			Interval	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
Tukey HSD	Rich	Medium	4925.00	2433.56	.114	-906.02	10756.02
		Poor	10812.50(*)	2888.76	.001	3890.77	17734.22
	Medium	Rich	-4925.00	2433.56174	.114	-10756.02	906.02
		Poor	5887.50(*)	2377.61031	.041	190.5437	11584.45
	Poor	Rich	-10812.50(*)	2888.76	.001	-17734.22	-3890.77
		Medium	-5887.50(*)	2377.61	.041	-11584.45	-190.54
Scheffe	Rich	Medium	4925.00	2433.56	.137	-1165.39	11015.39
		Poor	10812.50(*)	2888.76	.002	3582.88	18042.11
	Medium	Rich	-4925.00	2433.56	.137	-11015.39	1165.39
		Poor	5887.50000	2377.61031	.053	-62.86	11837.86
	Poor	Rich	-10812.50(*)	2888.76	.002	-18042.11	-3582.88
		Medium	-5887.50	2377.61	.053	-11837.86	62.86
LSD	Rich	Medium	4925.00(*)	2433.56	.047	68.9032	9781.09
		Poor	10812.50(*)	2888.76	.000	5048.06	16576.93
	Medium	Rich	-4925.00(*)	2433.56	.047	-9781.09	-68.90
		Poor	5887.50(*)	2377.61	.016	1143.05	10631.94
	Poor	Rich	-10812.50(*)	2888.76	.000	-16576.93	-5048.06
		Medium	-5887.50(*)	2377.61	.016	-10631.94	-1143.05
Bonferroni	Rich	Medium	4925.00	2433.56	.141	-1048.53	10898.53
		Poor	10812.50(*)	2888.762	.001	3721.61	17903.38
	Medium	Rich	-4925.00	2433.56	.141	-10898.53	1048.53
		Poor	5887.50(*)	2377.61	.047	51.31	11723.68
	Poor	Rich	-10812.50(*)	2888.76	.001	-17903.38	-3721.61
		Medium	-5887.50(*)	2377.61	.047	-11723.68	-51.31

* The mean difference is significant at the .05 level.

Annex VII: Some Research Related Photos from Field



Pahari Community in Badikhel VDC



Bamboo Plantation in Community Forest



Participatory Well-being Ranking



Discussion with DFO official and CFUG Committee



Women Focus Group Discussion



Mixed Focus Group Discussion with Poor



Household Survey



Bamboo Harvesting



Involvement of All Family Members in Bamboo Craftmaking



Bamboo Rack



Storage Bin (Dalo) from Bamboo



Bamboo Crafts in Ktm Market