

CHAPTER I

INTRODUCTION

1.1 Background

1.1.1 Situation of Agriculture and Forestry in Nepal

The economy of Nepal is dominated by the rural sector, based on agriculture. About 80 percent of the population derive their livelihood directly from this sector. Moreover, the agriculture sector contributes 38 percent to the total national GDP (CBS, 2012). Rapid population growth and resource constraints are putting severe pressure on the subsistence economy. Small landholdings and fragmentation of land has caused shifting cultivation, intensive land use, deforestation, soil erosion and loss of productivity of the agricultural land (Shah and Schreier, 2007).

The agricultural systems are heavily dependent on forest products that serve directly as a source of nutrients through fodder and leaf litter and indirectly as fuelwood, food, medicine and construction materials (Amatya, 2008). It has been estimated that for sustaining 1 ha of agricultural land, 2.8 to 18 ha of forestland is required. Denholm (2007) estimates that 3.5 to 6 ha of forestland are needed to support 1 ha of cropland. As to maintain the desired ratio, more and more trees on private land become a necessity to the farmers. It is very hard to maintain desired ratio only through community or natural forest. Thus, growing more trees on private land has become essential for the hill farmers.

Nepal is one of the few countries in the world where people to a large extent are dependent on agriculture and forest resources for their subsistence. As the economy is predominantly agro-based, forest plays an utmost role in almost all rural areas. More than 76.3 percent of total energy source and 40 percent of fodder needs are met by forest (MOPE, 2009). Unfortunately, the land occupied by forest areas is decreasing by leaps and bounds. The percentage of forestland was 45 in year 1964; whereas it has become 29 percent in the year 2003. The annual deforestation rate is 2.3 percent in hilly areas and 1.3 percent in the terai. Overall forest cover is reducing at an alarming rate of 1.7 percent each year (MOFSC, 2010).

The principal problems of Nepal's agriculture are: declining productivity and increasing human and livestock populations. When this situation combines with forest depletion, it further ramifies the problems. Overcoming this requires better understanding of the present status of the agricultural systems in the three major agro-ecological regions i.e. the mountain, the hill and the terai (Basnyat, 1995).

Neupane *et. al.* (2011) discuss about the significance of forests and the reasons why the forestlands are decreasing in this manner. The majority of people have to use forest products for shelter, food, cooking, heating, livestock feeding, and for compost manure preparation. Till 1980s, the government of Nepal heavily exploited the forest resources in order to generate revenue. Most of the accessible forests of lowland and mid-hills were severely degraded through the over-exploitation and the expansion of agricultural land.

Therefore, agroforestry is greatly needed in Nepal because of its potentiality of production and vitality for removing the pressures on community forests through agroforestry practices on private lands. Livestock is also an inseparable part of the farming system, generating 37 percent of the total income of the hill population and providing 55 percent of on-farm income to small farmers (Neupane *et. al.*, 2011).

1.1.2 Agroforestry

The mid-hills are characterized by the poor state of forest. These areas account for a third (24 %) of the country's total lands, but accommodate nearly half (44 %) of total country total population. Despite the wide spread deforestation, over one-third of Nepal's forests are found in these areas (Hobley, 2010).

Evans (2006) concludes that to reduce demand from the remaining natural forest and to facilitate the establishment of government and community forest plantations, agroforestry has been proposed as a viable land use option for both private and public lands. Agroforestry is now being proposed as a land use system, which has potential to reduce forest destruction and to increase overall productivity of the land.

Agroforestry in the mid-hills connotes energy plantations, fodder parks with silvi-pastoral system, growing of multipurpose trees under social forestry, horti-silvicultural system, grafting of economic species on wild trees, watershed management, and wildlife management (Kanel and Sharma, 2009).

Agroforestry programs are being practiced in mid-hills by GOs and NGOs in the countries of Bangladesh, Bhutan, China, India, Pakistan, and Nepal. All of these countries face problems of coordination among concerned agencies and of weak extension systems. Yet the great advantage is that farmers already practice various forms of indigenous agroforestry so that such systems are already compatible with their customs and perceptions. The wide variety of agroforestry systems, combining different plants and animals in space and time, facilitates their incorporation into the diverse and extreme conditions of the hilly landscape (Chalise *et. al.*, 2004).

1.2 Statement of the Problem

Forests are an integral component of the farming system of Nepal. Therefore, the sustainability of the two is inseparable. However, Nepal has perceived rapid decline in its forest resources and degradation of other resources in recent decades (Maharjan, 2008).

Poor facility and access to agroforestry , the community, especially women suffer from poor level of household level income. Their dependency to men in terms of financial assets is in increasing trend among mid hills of Nepal. The average working hour of women at household level in Nepal is 15-16 hours per day. The average workload of women at household level is intensified by the poor facility of agroforestry in the mid hills. Moreover, absence or negligible presence of agroforestry committee has render women in passive decision making role. Similarly, the scenario is intensified by the poor leadership development capacity of women in the absence of agroforestry (Neupane *et. al.*, 2011).

Agroforestry has a painstaking role in farm household income and in social aspects like: reduction of workload of women in the household level, increment in active decision making role of women in the community, and leadership development of women in the society.

Basically, the study attempts to answer the following questions:

1. Agroforestry components contributing for the farm household income?
2. Agroforestry factors influencing community forestry management?
3. Agroforestry contributing in drudgery removal of women at household level?
4. Agroforestry role in active decision making role of women in the community?
5. Agroforestry contributing in leadership development of women in the study area?

1.3 Scope of the Study

In the mid-hills of Nepal, livestock is a major income-generating sector for rural households. For the production of milk and compost, farmers keep livestock, and they require more fodder to feed to them. There is a crisis of energy and management of natural and community forest by users, as they cannot acquire ample fuelwood, fodder and timber easily. Even though the share of traditional energy has decreased from 96 to 86 percent over the past decade, the share of fuelwood in the total traditional source has been growing in proportion to the population growth (MOPE, 2009).

Agroforestry is a collective name for land use systems in which woody perennials (trees and shrubs) are grown in association with herbaceous plants (crops, pastures) and/or livestock in a spatial arrangement, a rotation or both, and in which there are both ecological and economic interactions between the tree and non-tree components of the systems. Moreover, the study will assist in identifying some information gaps in: household income level, household workload of women, and leadership development of women. Similarly, it also assists in suggesting possible improvements for effective development intervention of NGOs and participation of program beneficiaries. The findings of the study will also help researchers with information to compare the result of similar studies.

1.4 Objectives of the Study

The general objective of this study is to analyze the impact of agroforestry as a viable base for rural development in Paanchkhaal VDC of Kabhre district, Nepal.

The following are the specific objectives:

1. To identify the agroforestry system's major components that contributes to farm household income.
2. To assess the impacts of agroforestry on community forestry management.
3. To identify the impacts of agroforestry on reduction of household workload or drudgery of women.
4. To know the contribution of agroforestry in active decision making role of women in the community.
5. To find the role of agroforestry on leadership development of women.

1.5 Organization of the Thesis

The thesis is divided into six chapters and each chapter includes many sections and subsections. Chapter I deal with the background of the study, scope of the study, objectives of the study, statement of the problem. Chapter II deals with the review of literature covering the concept of agroforestry and rural development, importance of agroforestry, agroforestry and household income, agroforestry and household workload, agroforestry and decision making, and agroforestry and leadership development. Similarly, Chapter III describes the methods, tools and techniques used for the collection of data and their analysis. Chapter IV deals with the brief introduction to Kabhre district and the principal description of the study sites Chapter V is the most crucial part of the study, which includes in-depth discussion on the households according to the objectives. Finally, conclusions are provided in Chapter VI.

CHAPTER II

REVIEW OF LITERATURE

2.1 The Concept of Agroforestry

The establishment of ICRAF in 1977 was a remarkable event in the area of agroforestry research. The mandate of the Council is to initiate, stimulate, and support research leading to more sustainable and productive land-use in developing countries through integration of better management of trees in land-use system.

A definition of agroforestry proposed by the ICRAF gained wide acceptance: "Agroforestry is a collective name for land-use system and technology where woody perennials are deliberately used on the same land-management units as agricultural crops and/or animals, in same form of spatial arrangement or temporal sequence. In agroforestry system, there is both ecological and economical interaction between different components" (Gorden and Bentely, 2010).

Agroforestry is an old concept but a modern science. Forest trees, agricultural crops and livestock have been rationally raised together on small farms throughout the world. This concept first came in hilly domains due to relatively higher population density, small landholdings and fragmentation of land that compelled farmers to adopt an integration approach. Similar definition follows: "Agroforestry is a system where forestry practices are mingled with agricultural and allied activities." The principle of an agroforestry system is to optimize production and economic return per unit area. In Nepal, there are innumerable traditional and modern agroforestry models in operation (Amatya, 2008).

The taungya (taung = hill, ya = cultivation) is the most popular and a very ancient agroforestry system originated with Burmese hill farming experiences using teak (*Tectona grandis*) as the forest crop and later spread through Asia to Africa and Latin America. However, the scientific approach to this system has been realized of late. In

Nepal, too, taungya system was very accustoming, whilst agroforestry was not promising. It has become increasingly popular not solely due to the regeneration techniques, but due to agro-crops, which are intercropped on a newly regenerated area. Thus, trees are benefited from agronomic practices.

Agroforestry is the comprehensive term for different forms of land-use, combining trees and shrubs with agricultural plants and/or livestock on the same unit of land either alternately or at the same time, using management practices suiting the socio-economic conditions of the people, and the system is ecologically and economically viable. These land-use systems are based on increasing the productivity of the system by taking advantage of perennial species and supply of food to the people and fodder to the animals, without endangering or destroying the natural resources.

Karki (2009) states that agroforestry is a land-use system where field crops and woody perennials are integrated in such a way that is scientifically sound, ecologically desirable, practically feasible, and socially acceptable to the farmers. He further mentions that agroforestry is a set of technologies or practices, as distinguished from a program or policy. Certain agroforestry technologies do have noteworthy applications in social forestry or community forestry programs.

Kafle (2007), viewing the scope of farm and agroforestry practices in Nepal, states that the farm forestry project was launched for the first time in 1983 with the general objective of encouraging farmers to grow trees in their farmlands to meet their growing needs of fuel wood, fodder, timber, and green manure, thus decreasing the pressure on natural forests and assisting to uplift the socioeconomic condition of the people by themselves. The project has been involved in both research and technology transfer activities in three agro-climatic zones: mid-hills, inner-terai, and terai.

Agriculture and forestry are two indispensable sectors in the economics of the Asian regions. Most of the accessible forest areas have already been converted into agriculture and other form of land-use or it is in the process of conversion. Conflict of

land-use between agriculture and forestry sector has led the idea of adopting an alternative land-use technology called agroforestry as a part of the solution (Gorden and Bentely, 2010).

Agroforestry entails the concept of using trees as a component of the overall management of land resources to meet the needs of the people for food, fuel, shelter, and income. The management system used need to be socially, culturally, economically and environmentally acceptable, to maximize total output at given levels, and to minimize damage to the environment. It can be compared with the multiple cropping system of an agriculturist. It is primarily a development strategy to eradicate poverty, especially of the marginal and deprived sections of people.

Whatever the definitions, agroforestry connotes using trees on farms. It is an ecologically based natural resources management system that sustains production and benefits all those who use the land by integrating trees on farms and in the agricultural landscape. The integration of farmers into forest management scheme through the use of "compromise" land-use system based on agroforestry may be one of the few realistic ways of sustaining forestry production on agriculturally pressured forestland.

2.2 The Concept of Rural Development

Rural Development is not a new notion in Nepal. It is the synthesis of various attributes that have gone into its making in the past. It has primarily two elements, i.e. rural community and its development. By rural community we conceptualize a social body, which has cohesion, solidarity, spiritual quality of cooperation, interpersonal respect, and a certain degree of responsibility. The word 'development' on the other hand, implies: technology, administration, supplies, services, methods and procedures, plans and programs, processes, and progress. Rural Development covers a wide spectrum of activities encompassing improved productivity, increased employment and thus higher income for target groups, as well as minimum acceptable level of food, shelter, education, and health (Adhikari, 2007).

Siwakoti (1997) states that term rural development is of official interest and widely acclaimed in both the developed and the developing countries of the world. There is, however, no universally acceptable definition, and the term is used in different ways and in divergent contexts. Rural development connotes the overall development of rural people. In this sense, it is a comprehensive and multidimensional concept. It encompasses the development of agriculture, cottage industries and crafts, socio-economic infrastructure, community services and facilities, and human resources in rural areas. As a phenomenon, it is the result of interaction between various physical, technological, economic, socio-cultural and institutional factors. As a strategy, it is designed to improve the economic and social well-being of a specific group of people.

Ojha and Adhikari (2002) give their combined views on rural development, describing integrated rural development as a method, a process, and an objective. According to them, it is a method that seeks to involve all the people and encompass all phases of rural life. It is a process that seeks to transform traditionally rural occupations towards a greater reliance on science and technology. It is an objective that seeks to improve the quality of life of all the people. Rural development provides the opportunities for all the rural people to earn a living standard and to have socio-economic institutions and services similar to those of urban regions.

Rural development is a strategy to improve the economic and social life of specific group of people, the rural poor. It involves extending the benefits of development to the poorer among those who seek a livelihood in the rural areas. The group includes small-scale farmers, tenants, and the landless. A national program of rural development should be a mix of activities, including projects to raise agricultural output, create new employment, improve health and education, expand communications and improve housing (WB, 1975).

2.3 Importance of Agroforestry Systems

There are two fundamental ways of arriving at agroforestry by integrating trees into farming systems or by integrating farmers into forests. Appropriately selected woody

components may contribute to both the productivity and sustainability of farming system on marginal land in several ways: by enhancing the production of organic matter, by maintaining soil fertility, by reducing soil erosion, by conserving water and by creating more favorable micro-climate for associated crops and livestock.

The farming systems in Nepal make heavy demands through forests. They are based on strategies to manage forest, pasture, and arable land simultaneously and in an integrated fashion to acquire: food, shelter and clothing. Growing trees in and around farmstead, dry and wet terraces and on river banks are vital for Nepalese farmers who farm the smallest arable land area per capita on the globe. Thus, farmers have combined agriculture and forestry into one practice, which is of diverse forms, types, and systems (Basnyat, 1995).

Agroforestry could serve as one of the appropriate remedial measures for checking resource degradation and deforestation, as trees are considered multifaceted resources of poor people and the best protectors of the fragile mountain environment. The continuity of cover provided by these perennials may reduce soil erosion, lower the rate of evaporation from the soil, ameliorate the microclimate and allow root systems for more efficient use of soil nutrients than is the case in monoculture systems. There is growing evidence that in some circumstances, agroforestry is more profitable than forestry alone, and may have a number of social advantages from both the farmers and nation's point of view (Neupane *et. al.*, 2011).

The concept of balancing the intensification of agricultural production, horticulture, agroforestry components and animal husbandry into a manifold ecological farming or so called conservation farming is the integration of the sub-components of the mixed farming system. This includes the use of all wastes, reconciling of all nutrients and biomass produced within the system, reducing, possibly eliminating the use of pesticides and mineral fertilizers by adopting biological control measures, and using resistant varieties and organic fertilizer. Thus, this avoiding production risks and strengthening

self-sufficiency of farm and rural communities, leading eventually the situation of conservation farming (Bhattarai, 2005).

Agroforestry integrates trees with crops and /or animals with the main objectives of reducing risk and increasing total productivity. Farmers have historically used indigenous mixed cropping practices to minimize the risk of total crop failures by growing a variety of crops on the same piece of land.

Amatya (2008) states that tree farming as a business is comparatively new in Nepal. Forest plantations on public lands have been raised in Nepal for over 35 years for fuel, fodder, timber, leaf litter and other products. Financial analysis of Nepalese agroforestry models, especially those with less than 20 ha indicate that the IRR per ha is 8.5 percent. A plantation size of 20 ha would be optimal for both economic and ecological considerations.

Although many of the recent research thrusts in agroforestry have been directed toward the integration of trees into farming systems, agroforestry also has a role to play in the preservation of forests and the improvement of forests as a means of producing fuel wood, timber, fodder, building poles and other forest products on farmland. Thus, agroforestry can significantly reduce the demand on forests and other natural woodlands. Decreasing numbers of fodder trees in forests and marginal areas increasingly shift the pressure towards private land. At the same time, the quality and numbers of private fodder trees are decreasing due to heavy lopping. Therefore, the planting of multipurpose tree species in and around the farmland is realized to be crucial for sustaining the hill farming systems.

2.4 Agroforestry and Household Income

Bamboo, an important agroforestry component, is dominant in the rural farming systems of both the terai and mid-hills of Nepal. It is mainly grown in homesteads and degraded lands, and helps sustain livelihoods of many rural people that include socially and economically disadvantaged groups. Very few species can match bamboo in terms of

usage, as it is flexible, easy to bend and split into small pieces with superior strength. It can be used for house construction, furniture, woven products, small household utility items and leaves fodder bank to be used during the scarcity and in dry season. Tender bamboo shoots provide valuable sources of nutrients for human consumption along with some medicinal uses (Das, 2011).

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Agroforestry system serves to empower women through the income generation component of the programs along with an improvement in their overall quality of life. The research experience has shown that more emphasis should be given on training and awareness, and also to strengthen the capacity building women group implementing these programs particular in the rural sector, is an important pre-requisite for achieving a high rate of success in the application for raising income at households and communities. The program for awareness training, skill development and entrepreneurship among women have to be carefully structured. Through a judicious combination of micro-credit schemes and incentives given for women through financial institutions, and state departments, women can be encouraged to take up all the economic opportunities, where they can perform(Gorden and Bentely, 2010).

2.5 Agroforestry and Household Workload

During the course of the implementation, various organizations have realized that agroforestry systems have proven to be more than an energy saving fuel efficient like improving the economy and environment of large number of families, removing the drudgery from women's lives and bringing empowerment to women through enhanced status and self-confidence (Bhattarai, 2005).

The change in the agroforestry system in the last decade of this century when women began to be recognized as an important category of managers of domestic energy for productive and reproductive purposes, and the need for these to be sustainable, thereby reducing the pressure of household level workload to them (Basnyat, 1995).

The results of agroforestry programs conducted consistently all over Nepal through their large network of branches have shown highly beneficial results for rural and urban women, minimizing their drudgery and saving them from smoke related diseases, too (Das, 2011).

Several studies on agroforestry and rural women have shown that, confronted with changes in fuel and biomass availability, rural households are being forced to make various adjustments that adversely affect their living standards, workload and consumption. The adjustment produces negative effects on working patterns; on family nutrition and health (Gorden and Bentely, 2010).

2.6 Agroforestry and Decision Making

Household composition and allocation of responsibilities to different family members plays an important role in farm management. Division of family chores by gender influences how resource allocation decisions are made. It should be emphasized that "gender" refers particularly to women. For example, studies have shown in some countries that women tend to prefer the planting of trees for fuelwood, fodder and fruit while men are said to prefer the production of timber that can be sold commercially. This

has much to do with women's role in fodder and fuelwood collection. A prompt decision can take them far away from the heavy labour requirement to the women. Also children are often involved in fuelwood gathering. These children and the elderly often play an important role in caring for livestock, or have other functions in the vicinity of the homestead (Amatya, 2008).

The results of the agroforestry system show that the household socio-economic factors that encouraged high women contributions to farm decision making were their number of years of formal education and farming experience, financial contributions to household farming activities, number of hours spent in the farm, and farm size. Also, the societal constraints militating against women's contributions to farm decisions were identified and grouped into (a) techno-institutional constraints such as lack of extension programs and access/awareness of non-governmental organization (NGO) programs for women, insufficient knowledge of farm credit sources etc.; (b) socio-personal constraints such as misconceptions that women farmers do not have farming ideas, women are supposed to be subordinate to men in farming, low self confidence by women etc.; (c) economic/financial constraints such as low or lack of financial contributions to farming activities and access to credit support groups such as cooperatives, unwillingness of women to invest in a male-dominated agroforestry system. These observations underscore the need for special programs that empower and recognize women, especially through education, finance and information (Gorden and Bentely, 2010).

Currently women contribute very little to decision making and their income is much lower than men. But when the situation is conducive, that is, women have rights to the land and can contribute to household and community income and markets - their potential for participation and decision making role is far higher (Hobley, 2010).

2.7 Agroforestry and Leadership

Various programs for the empowerment and leadership promotion of women through the access to agroforestry system. The aim of these programs is not to alter or change the respective roles of men and women but to promote leadership capacity of

women, thereby enabling women to carry out their work more effectively and efficiently (Das, 2011).

Most of the studies of on agroforestry system talk about the bad environmental effects but fail to recognize the growing problems and untold miseries that the poor rural, who have to face to poor leadership capacity. The study describes some initiatives of the project to increase women's participation and leadership promotion in agroforestry system. The project is implementing training, demonstration and extension, monitoring and user's training to empower women (Hobley, 2010).

CHAPTER III

METHODOLOGY

The field survey for the study was accomplished during February- March of 2013. The study is largely of impact evaluation type.

3.1 Unit of the Analysis

The researcher has acquired in-depth information about the local agroforestry at three levels:

Ward level: Ward number 3 (Bhamarkot), 4 (Bhakhreldi) and 7 (Kafledi) of the Paanchkhaal VDC, where GOs, NGOs and INGOs are operating.

Household level: Visit to forty-nine households' respondents, who are program beneficiaries and non-beneficiaries.

User group level: The users from five community forestry user groups (Ratomato, Thuliban, Dhaireni, Bhasme and Solethape) have been approached.

3.2 Sampling Design

The sampling design that was used for the study was a two-stage stratified sampling and the study sites were selected purposively in order to make fair representation of agroforestry systems and community forestry management. The respondents were selected using the following sampling technique.

The population list (at household level) of the study area (ward numbers 3, 4 and 7) was obtained from ECDO. Then the population was classified into three categories: 'upper caste' (Bhramin and Chettris); 'lower caste' (Biswokarma, Sarki, Damai); and 'others' (Shrestha, Gurung, Magar, Lama, Giri). All the names were listed by caste and 20 percent sample were chosen randomly by lottery method from each three levels of

classification. The total number of sampled households was 49 and the sample size was determined by using the following formula:

$$n = \frac{N}{100} \times 20$$

Where, N = Total number of households

n = Number of sampled households

Table 1: Number of sampled households by ward in Paanchkhaal VDC

WN	Total number of households (N)	Number of sampled households (n)	Percentage
3	70	14	28.6
4	85	17	34.7
7	90	18	36.7
Total	245	49	100.0

Source: Field survey, 2013

3.3 Research Instruments

The study utilized survey questionnaire method to acquire information from the sampled households. Applying both qualitative and quantitative research approach, the information were gathered with a set of semi-structured questionnaires, direct observation and various checklists for the key informant interviews.

On the onset of the research, the researcher pre-visited the study sites and informal discussion were carried out with clan elders, former VDC representatives, local NGOs, and other key informants in order to trace the actual status of agroforestry activities in the farmers' field, the influences of agroforestry project, and the conservation measures undertaken.

3.4 Data Collection

The data and information for the study were gathered during March 2013. The interviews of respondents were taken at places and time of the respondents' convenience for them. Before interviewing, the purpose of the interview was explained to them clearly.

3.4.1 Primary Data Collection

The study was both qualitative and quantitative. In pursuing the objectives of the study household questionnaire survey, key informants interview, direct observation and informal interviews were carried out for obtaining the data and related information.

The household questionnaire survey mainly focused on the research objectives. As the total number of households is 49, it was not possible to meet all the respondents at their homes. Thus, 60 percent of the questionnaires were completed in the farmers' (respondents') fields and the rest 40 percent at their homes.

Key informant interview was the second type of tool used to gather in-depth information. Checklists were prepared to guide interviews of the following key informants (a sample of checklists is attached in Appendix 2).

Non-governmental sectors: Former VDC chairperson; School Teacher; LGN CEAPRED; Leasehold Ranger; and the Community Forestry Member.

Governmental organizations (GOs): District Forest Office (DFO); District Agriculture Development Office (DADO); District Development Committee (DDC); and the Village Development Committee (VDC).

Direct observation and informal interviews did play a crucial role in the information collection.

3.4.2 Secondary Data Collection

The secondary data and information were gathered by reviewing the available resources and documents from various offices, organizations, VDC and DDC. The general information about the VDC was gathered from DDC, Dhulikhel, and VDC, Paanchkhaal and ISRSC, 2011. The researcher visited libraries of NARC, ICIMOD, TU and government offices to acquire other information through literature review.

3.5 Data Analysis

The data collected from primary and secondary sources were classified and then tabulated for obtaining all the answers to the research questions. The available information from question sheets were tabulated and analyzed manually.

Descriptive statistical tools like frequencies, percentages, means and standard deviation were used to present the general findings of the study. Mostly tables, but graphical figures, too are used for describing the information.

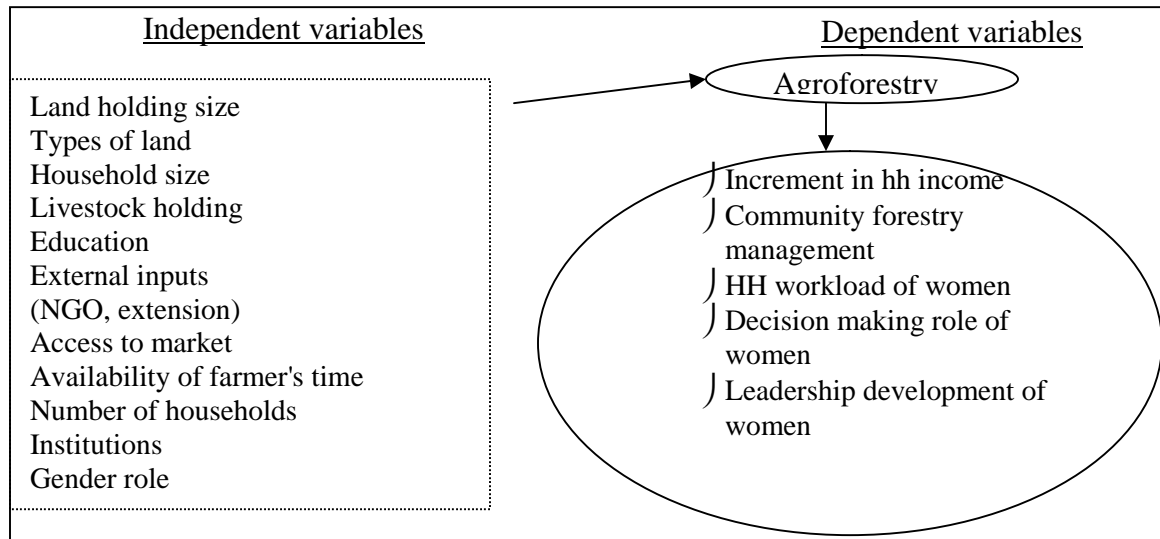
3.6 Conceptual Framework

The increment or decrement on these variables: land holding size, types of land, household size, livestock holding, education, external inputs (NGO, extension), access to market, availability of farmer's time, number of households, institutions, gender role affects the agroforestry system as a whole, thereby the household income, community forestry management, household workload of women, decision making role of women ,and leadership development of women.

Agroforestry adoption by farmers brings significant economic benefits, increases the level of farm income due to improved and sustained productivity. So, the agroforestry practices increase the income of the households and might alter the economic status of the local farmers in the study area. Also, the pressure on community forest reduces due to the availability of fodder/forage, fuelwood and timber in their own land. Likewise, reduction in household workload of women, increment in active decision making role of women in the community, and leadership development of women in the society due to

the presence of agroforestry system. Considering these assumptions, the conceptual framework was designed for the study, which is presented in Figure 1.

Figure 1: **Conceptual framework of the study**



3.7 Limitation of the Study

Since the study was confined to three selected wards (numbered 3, 4, and 7, respectively) representing five community forests, the findings will not necessarily represent the overall situation in other areas of the country.

Most of the information collected was based on the results of the household questionnaire survey and key informants interview. In general, farmers and local key informants do not maintain records, so the figures obtained were mostly subjective. Therefore, it is suggested that these estimates be interpreted with caution.

CHAPTER IV

DESCRIPTION OF THE STUDY AREA

4.1 District Background

Kabhrepalanchowk¹ is one of the districts of the Nepal's mid-hills in the central development region, and its elevation ranges from 1000 to 3018 masl. The District extends between 85⁰24' - 85⁰59' N longitudes, and 27⁰20' - 27⁰35' E latitudes. The bordering districts are Ramechhap and Sindhuli in the east, Kathmandu, Bhaktapur and Lalitpur in the west, Sindhupalchowk in the north, and Sindhuli and Makwanpur in the south. The total area occupied by the District is 1396 square kilometers (ISRSC, 2011).

The District has a total population of 341354, out of which, male population is 168172 (49.27%) and female population 173183 (50.13%). The total number of households in the District is 59606 and the average household size is 5.7 (ISRSC, 2011).

The kabhre is one of the most densely populated districts of Nepal and this together with its proximity to Kathmandu, has resulted in severe pressure to the supply of agricultural and forest products. The various land-use types of the district are presented in Table 2.

Table 2: **Distribution of land by type and use**

(Area in hectare)

Physical zone	Agriculture		Pasture	Forest	Others	Total
	Cultivated	Non-cultivated				
Mid mountain	35760	24754	3741	72950	1255	136460
Siwalik	682	403	5	2851	85	4026
Total	36442	25157	3746	73801	1340	140486

Source: ISRSC, 2011

¹ Henceforth written as Kabhre

4.2 The Area under Study

4.2.1 Basic Geographic and Demographic Information

The study area is located in Paanchkhaal VDC of Kabhre, some 40 kilometers east of Kathmandu and with the elevation of 850 masl. The Arniko highway, which connects Kathmandu with Tibet, is passing throughout the study area. Because of good accessibility, all the inhabitants are influenced by the market economy. However, farming is still the major economic activity. According to ISRSC (2011), the total population is 4816 (2398 male, 2418 female), the total number of households is 860 and the average household size is 5.60. Similarly, total number of households in the study sites, i.e. 3, 4 and 7 wards combined is 245.

4.2.2 Climate and Vegetation

The climate of the study area is sub-tropical and the maximum temperature and the highest rainfall occur in the month of July. The vegetation represents mixed hardwood natural forest and pine plantation. Hill sal (*Shorea robusta*) forests and alder (*Alnus nepalensis*) forests are found in lower elevation and erosive landslide areas, respectively.

4.2.3 The Farming system

Generally, the agricultural land of the site is divided into khet (wet land/low land) and bari (dry land/upland) according to land orientation and cropping pattern of Nepal.

Khet refers to the land where water retains on the surface or upper soil layer, making it suitable for paddy cultivation. Paddy is the staple food for the livelihood in the study area as well as throughout the country. Farmers measure their wealth according to the amount of khet they possess. Khet land is lower slope, leveled, and irrigated terrace land, which is generally used for cultivating rice during the monsoon season and sometimes wheat or potatoes during the winter.

Bari refers to the land other than the wetland, which is generally non-irrigated and rainfed. Bari is usually upper-slope, out-sloping and rain-fed terrace land, which is

generally used for growing maize and millet. Farmers produce maize, mustard, tomato and other green vegetables in bari land.

Farmers are reaping three crops a year from khet: two crops of paddy and one wheat or potato. Moreover, farmers are also involved in off-season vegetables production with the assistance of different NGOs. Thus, the farmers do cultivate one crop of paddy, followed by wheat / maize, potato / tomato or green vegetable cultivation in khet whilst, maize, wheat or tomato or other green vegetable in bari in relay. Farmer's decision for cultivation depends on the following: income of the household, market value of the products, farm size and household size. Similarly, personal interests as well as environmental condition also affect the choice of crops. The cropping pattern of Paanchkhaal VDC is depicted in Table 3.

Table 3: Cropping pattern of Paanchkhaal VDC

Land type	Cropping pattern
Khet	Paddy - tomato - maize Paddy - potato - tomato Paddy - potato - capsicum / green vegetable
Bari	Maize - fallow - fallow Maize - mustard / wheat - fallow Maize - wheat - tomato / green vegetable Maize - potato / green vegetable - fallow

Source: DADO, 2012

4.2.4 Community Forests

The study area has five community forests managed by users in different locations. Among them, one is not handed over to the users. Villagers are not restricted to the membership of a single community forest. Some of the users are registered in two community forests. All the community forests have their own operational plan and constitution for the utilization of forest products, management, and the punishment for the violation of rules and regulations. The details of community forests are given in Table 4.

Table 4: Community forests of the study area

(Area in hectare)

SN	Name of the forest	Total area occupied	Number of sampled households
1	Ratomato	108	11
2	Thuliban	63	15
3	Dhaireni	15	12
4	Bhasme	13	6
5	Solethape	25	5

Source: DFO, 2012

4.2.5 Development Activities

There are many NGOs, INGOs and local level organizations working in the study area with various objectives. LGN, NACRMP, Dairy Cooperatives, CEAPRED and local organizations are some of the organizations operating in the study area.

NACRMP is working with the goal to facilitate community forestry user group in terms of management and utilization of the forest. Leasehold forests help the poor farmers by providing unproductive land on lease for a certain period of time. Distribution of seeds of improved varieties of grasses is the main focus of this program.

Dairy cooperative groups are involved in the raising and management of fodder and pasture in the study area. There are principally two organizations, i.e. CEAPRED and LGN operating at farmers' level with the objective of raising socio-economic level of local farmers through agroforestry system and off-season vegetable production.

CHAPTER V

RESULTS AND DISCUSSIONS

This chapter deals with results and discussions simultaneously from the analysis of data obtained from the study sites, utilizing different techniques to acquire detailed information. It is classified into five different sections according to the objectives, which are general household information, farm household income from agroforestry and community forestry management, role of agroforestry in reduction of workload or drudgery of women at household level, outcome of agroforestry in active decision making role of women, and level of leadership development of women through agroforestry.

5.1 General Household Information

The general household information encompasses general household characteristics, educational status of the household member, ethnicity and livestock holding size in the study sites.

5.1.1 Household Characteristics

The general distribution of sampled households in the study sites according to ward, gender, age group, caste and household size is presented in Table 5.

Table 5: Distribution of the sampled household population by ward, age and gender

WN	Household population	Household size	Total population	Male age groups (in years)			Percent of male population	Female age groups (in years)			Percent of female population
				<15	15-60	>60		<15	15-60	>60	
3	14	6.0	84	15 (18.0)	18 (21.0)	7 (8.0)	47.6	16 (19.0)	20 (24.0)	8 (10.0)	52.3
4	17	5.8	100	20 (20.0)	22 (22.0)	7 (7.0)	49.0	22 (22.0)	24 (24.0)	5 (5.0)	51.0
7	18	5.5	99	18 (18.0)	24 (24.0)	7 (7.0)	49.5	20 (20.0)	26 (27.0)	4 (4.0)	50.5

Source: Field survey, 2013

Note: Figures in parentheses are percentages.

The total number of sampled households is 49 and the average household size is 5.8, which is slightly higher compared to district and national household average sizes of 5.47 and 5.45, respectively (CBS, 2012).

The highest percentages of male and female population are found in the 15-60 years age group. The average percentage of male population is 48.7, which is slightly lower compared to district and national averages of 49 and 49.9, respectively. Similarly, the average percentage of female population is 51.3, which is slightly higher compared to district and national averages of 51 percent (CBS, 2012).

5.1.2 Ethnicity and Caste

Two principal ethnic groups are found in the study sites: Indo-Aryans and Tibeto - Burman. The 'upper caste' and the 'lower caste' represent Indo-Aryans. Similarly, the Tibeto-Burman is represented as 'other caste' for the study. Sapkota, Kharel, Pandey, Parajuli, Nepal, Thapa, Acharya, Upreti, Khadka, Dahal are included under the 'upper caste' category. Likewise, Nepali, Pariyar, Sunuwar and Biswakarma are put under 'lower caste' category. Tamang, Shrestha, Rai, Danuwar, Magar and Gurung are considered under 'other caste' for the study. The distribution of caste is presented in Table 6.

Table 6: **Distribution of households by caste and ward**

Caste	Number of households by ward		
	Ward 3	Ward 4	Ward 7
Upper caste	7 (50.0)	9 (53.0)	9 (50.0)
Lower caste	2 (14.0)	3 (17.0)	7 (17.0)
Other caste	5 (36.0)	5 (30.0)	6 (33.0)
Total	14	17	18

Source: Field survey, 2013

Note: Figures in parentheses are percentages.

The average percentage of households of 'upper caste' is found to be 51, which is relatively greater compared to the national average of 40.3 percent .The result seems to

be relatively greater compared to the national average, due to the absence of Madeshi caste ² (which contributes 9 percent to the total population of the country) in the study area (Gurung, 2010).

Similarly, the average percentage of 'other caste' is found to be 33, which is slightly greater compared to the national average of 26 percent. Likewise, the average percentage of 'lower caste' is traced to be 16, which is also slightly above the national average of 10 percent (Gurung, 2010).

In all the three categories of caste, the average percent of distribution of households in the wards seemed to be higher compared to the national average, which might be due the absence of 'Madeshi caste' in the study site.

5.1.3 Educational Status

Basically, in the context of Nepal, the entire members of a household are not literate. Therefore, the educational levels of households are studied into four categories: 'Illiterate', 'Literate', 'Under SLC', and 'Above SLC'. The individual, who cannot read and write is included under 'Illiterate' level. Similarly, who can read and write their names and do have informal education (under the grade of four) is categorized under 'Literate' level. Likewise, individual in between four to ten grades and those who discontinued the study in between is categorized under 'Under SLC' level. Furthermore, the college level education including: intermediate, bachelor and master's and above is categorized under the 'Above SLC' level. The distribution of household population by sex and education level is presented in Table 7.

² Those people dwelling in the terai and speaking languages such as Bhjojpuri and Maithili.

Table 7: Distribution of household population by sex and education level

Educational level	Ward 3		Ward 4		Ward 7		Total percent
	Male	Female	Male	Female	Male	Female	
Illiterate	2 (5.0)	10(27.0)	3 (5.0)	12(32.0)	5 (8.5.0)	18(41.0)	19.7
Literate	20(68.0)	30(54.0)	35(58.0)	14(37.0)	38(63.0)	16(36.0)	52.7
Below SLC	8(18.0)	5(14.0)	14(23.0)	8(21.0)	12(20.0)	8(18.0)	19.0
Above SLC	4(9.0)	2(5.0)	8(14.0)	4(10.0)	5(8.5.0)	2(5.0)	8.6

Source: Field survey, 2013

Note: Figures in parentheses are percentages.

Table 7 reveals that the average total percentage of literacy is 52.7, which is slightly lower compared to the national average of 53.7 percent (CBS, 2012). In all four levels, the females are observed to be marginalized compared to the males in terms of educational attainment. The highest and the lowest percentages of female illiteracy are seen in ward numbers 7 and 3, respectively.

5.1.4 Livestock Holding Size

The number of livestock raised in the study sites depends on the types of livestock. For instance, few households have poultry farm, but quantitatively the number of birds are high compared to other livestock types. The total number of goats is 147, whereas cows and buffalos together are 145. Only five households in the 'lower caste' groups are raising pigs and only one household is raising duck and pigeon.

The average number of cattle and buffalos (together) per household is 5, which is slightly greater compared to the national average of 4.8 (CBS, 2012). Table 8 presents the average livestock size per household and the purposes for which they are reared.

Table 8: Average livestock size per household and the purpose of rearing

Type	Average size	Purpose
Goats	3.0	Meat, manure
Cattle	4.8	Milk, manure, religious
Buffaloes	5.2	Milk, manure, meat
Chicken	35.0	Egg, meat
Pigs	0.045	Meat
Duck/Pigeon	0.036	Meat

Source: Field survey, 2013

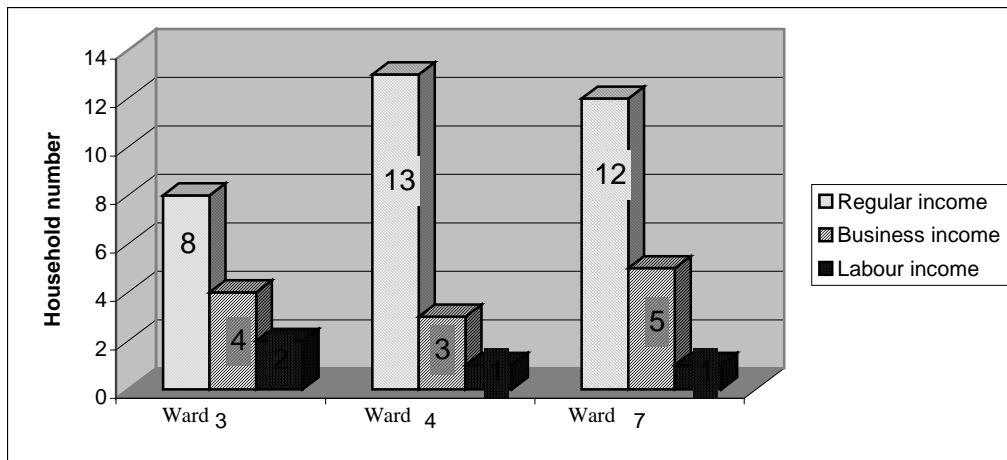
5.2 Farm Household Income from Agroforestry

Income from the sale of selling forest trees, livestock products as well as agricultural crops is included in the household income from agroforestry. This section describes the sources of income, and the income generated from different agroforestry products.

5.2.1 Sources of Income

The identifiable source of income in the study sites is of various types. The households are primarily depending on three categories of income, i.e. regular income, business income, and income from labor work. Regular income refers to the income from agriculture and regular jobs (GOs and NGOs). Likewise, income from business entails all income earned from a range of activities such as small teashops, food shops, and poultry to private businesses. Similarly, income from labor includes daily remuneration and wages earned from manual works. The detailed sources of income in the study sites are given in Figure 2.

Figure 2: **Distribution of household based on income sources**



Source: Field survey, 2013

Figure 2 shows that the highest percentage (75%), or 13 of the households in ward number 4 earn income of the regular type regular income in ward number 4. Similarly, in ward number 7, the lowest percentage (65%), or 12 of the households income is of the regular income type. Likewise, the highest percentage (30%), or 4 of the households and the lowest percentage (20%), or 3 of the households income through business is seen in ward numbers 3 and 4, respectively. Furthermore, the highest percent (10%), or 2 and 1 of the households income through labor is observed in ward numbers 3 and 7, and the lowest percent (5%), or 1 of the households income through labor is observed in ward number 4. The average income (in %) of regular, business and labor in the study sites are 70, 25 and 5, respectively.

5.2.2 Income from Different Products

Timber, fruits, fuelwood, agricultural crops (cereals, oilseeds and vegetables and milk) are the common products that the people sell to generate income. Notably, the households do not sell fuelwood in the market, but they utilize it for domestic cooking and heating purposes, whose economic value is presented. There is a trend of selling mango trees for fuelwood, if the trees are old, or at least beyond juvenile stage of growth. Likewise, they do eat some amount of fruits, cereals and milk, and also utilize timber in constructing their houses.

Wickramasinghe (2008) in his comparative study of sources of tree products and tree use practices of small farmers in South Asia describes that roughly 50 percent of the tree products are acquired from home gardens in Bangladesh, whereas the corresponding percentages for Nepal and Sri Lanka are only 18 and 22, respectively. In Nepal and Sri Lanka a substantial proportion of tree products are also obtained from the state and common forests as well as scattered trees in the farmlands as important sources of supply. He further mentions that nearly 40 percent of the tree species are fruit/food-producing species. The multiple sources of supply are relatively high in Nepal, whereas home gardens, scattered trees on farmlands, common and state forests do all contribute significantly to household requirements of timber and fuelwood. The households consume about 10 percent (except cereal crops) of the total produce, but this varies according to size of the household, types of products and the economic status of the household. The detailed information regarding income of households from different products is provided in Table 9.

Table 9: Household income from different products

Source	Income (NRs / year) by ward		
	Ward 3	Ward 4	Ward 7
Trees	54,000(3.9)	78,000(4.6)	76,000(4.2)
Fruits	28,000(2.0)	56,000(3.4)	72,000(3.9)
Fuelwood	30,625(2.2)	42,925(2.5)	48,500(2.7)
Agricultural crops (cereals + vegetables)	6,50,000(46.9)	8,55,000(50.0)	9,25,000(50.0)
Milk	6,25,000(45.0)	6,75,000(39.5)	7,25,000(39.2)
Total	13,87,625	17,06,925	18,46,500

Source: Field survey, 2013

Note: Figures in parentheses are percentages.

Table 9 reveals that the highest percentage (46.9%) and the lowest percentage (2%) in ward number 3 are observed in agricultural crops and fruits, respectively. Similarly, the highest percentage (50%) and the lowest percentage (2.5%) in ward

number 4 are observed in agricultural crops and fuelwood, respectively. Likewise, the highest (49%) and the lowest (2.5%) percentages are observed in ward number 7 in terms of agricultural crop and fuelwood, respectively.

In all the three wards (3, 4 and 7) the highest percentage of households income is seen contributed by agricultural crops. Out of total income, the highest percentage (49%), followed by 41.2 percent of the income is contributed by agricultural crops and milk, respectively. The lowest proportion (2.5%) of income is contributed by fuelwood.

5.3 Impacts of Agroforestry

There is a general need for agroforestry in Nepal due to its potential contribution in the production and management need of community forests. Trees of different species in private land not only fulfill the household demand for timber, fuelwood, fodder, but also significantly contribute in the management of community forests. People from the adjacent community forests area are less interested to expand community forests for collection of forest products, or they require fewer amounts of forest products than before.

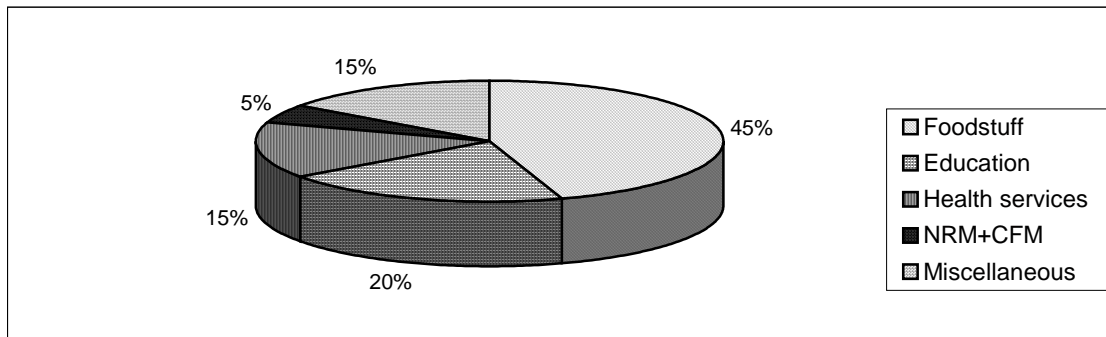
Access to alternative fodder sources is declining, as government forests are gradually being handed over to local communities and rules and regulations are enforced, which allows fodder collection only for certain period of the year. As fodder scarcity increases, there will rise in the values of trees planted on farmland. Therefore, agroforestry can substantially reduce the pressure on community forests and assist in the management of community forests.

This section is divided into four subsections: (i) allocation of the income for community forestry management, (ii) removal of drudgery or household workload of women (iii) increment in active decision making role of women through agroforestry, and (iv) leadership development of women through agroforestry.

5.3.1 Allocation of Income for Community Forests Management

The higher the level of income, the greater will be the degree of freedom to farmers to spend more money in social and environment management, development and protection. Poverty reluctantly dooms people to exploit natural resources including community forests, thereby degrading forests and the environment. Figure 3 explains in detail how the households have spent their income for natural resource management including community forestry in the study sites.

Figure 3: **Allocation of household income for community forestry management**



Source: Field survey, 2013

Foodstuff includes all nutritious diets (stable and non-stable). Education includes primary education to university level education. Health services include primary health care and the cure of chronic diseases. Natural resource management includes management of soil, water, and forests. Likewise, the miscellaneous category includes entertainment, petty expenses, donation, clothing and overhead.

Figure 3 reveals that 40 percent (20 % education, 15 % health and 5 % NRM and CFM) of the household income is allocated directly or indirectly for natural resource management including community forestry. Allocating 20 percent of the income for education will raise the level of knowledge, skills, attitude and experience of the dwellers in the study sites, thereby assisting in local NRM and CFM. Likewise, allocating 15 percent of the income for health services increases the productive hours and manpower, thereby assisting in the NRM and CFM. Similarly, investing 5 percent of the income, in NRM, including CFM, directly assists in the management of community forests in the study sites.

5.3.2 Drudgery Removal and Utilization of the Spared Time

Basically, the distance to community forests is directly proportional to women's and children's work and drudgery, i.e. the longer the distance, the greater will be the drudgery and work for women and children. Cooking and taking care of cattle constitute the major tasks for women and children, because they have to collect fuelwood for cooking and heating, fodder and leaf litter as the bedding material for livestock. They collect those products from community forest as well as from their own farmland. The depletion of forests by leaps and bounds has substantially increased women's and children's workload to go and collect forest products. York (1990) estimates that in some parts of the Himalayas, women and children spend 100 days a year to gather fuelwood and fodder. A recent study in Nepal, carried by International Food Policy Institute, has indicated that the destruction of forest resources has added one hour per day to the time required for women to collect fuelwood and fodder. The detailed descriptions regarding distance between the households and the community forests are presented in Table 10.

Table 10: Distances between the household and the community forests

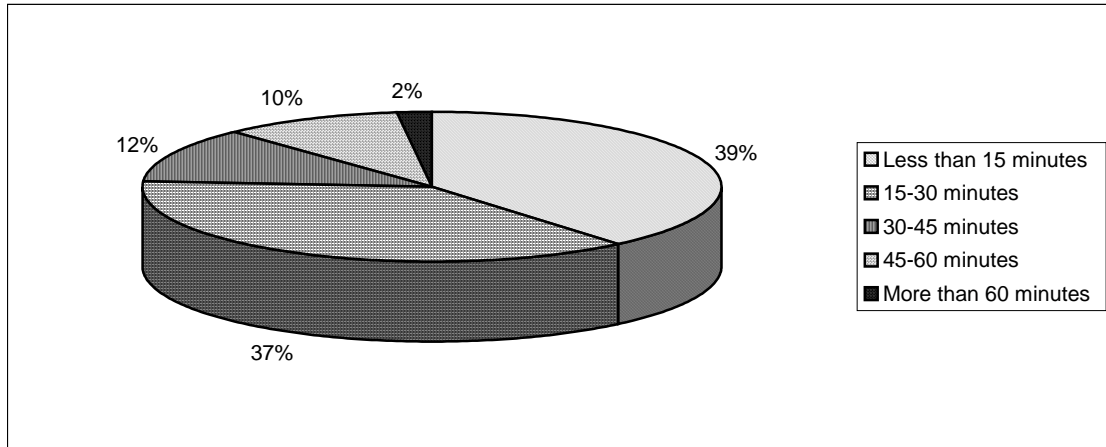
Forest	Distance to community forests (in minutes)					Total
	< 15	15 - 30	30 - 45	45 - 60	> 60	
Ratomato	2	6	1	1	1	11
Thuliban	8	3	2	2	0	15
Solethape	2	5	3	2	0	12
Bhasme	4	2	0	0	0	6
Dhaireni	3	2	0	0	0	5
Total	19	18	6	5	1	49

Source: Field survey, 2013

As shown in Table 10, 19 households need to walk for less than 15 minutes to reach community forests, followed by 18 households who require covering 15 - 30 minutes walking distance to reach the community forests. Likewise, the distances 30 - 45 minutes' and 45 - 60 minutes' walk are 6 and 5, respectively. Only one household need to

walk more than 60 minutes to reach the community forests. Figure 4 shows the percentile view regarding the distance to be traveled to reach community forests.

Figure 4: **Distance to be covered by the households to reach the community forests**



Source: Field survey, 2013

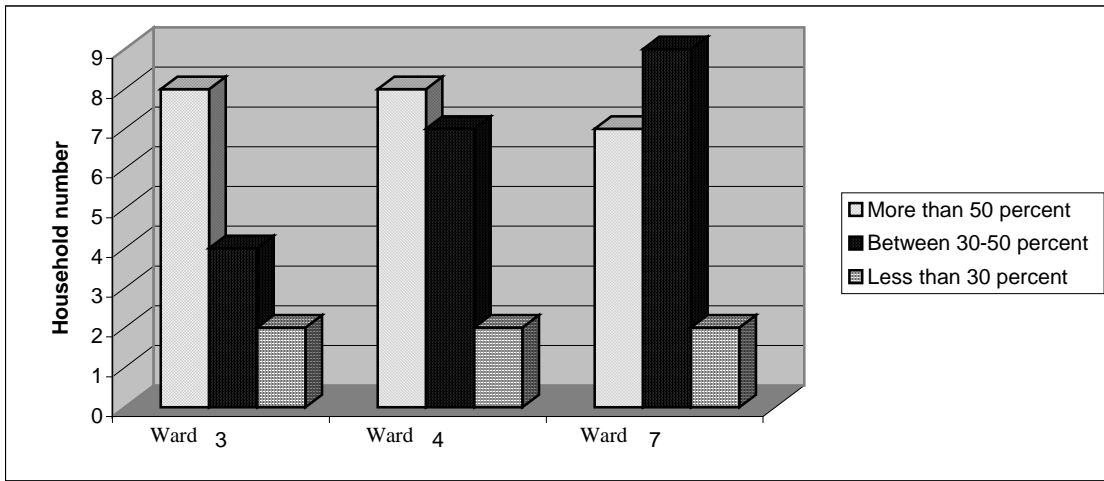
As seen from figure 4, the highest percentage (39%) of the households opined that they need to travel < 15 minutes to reach community forests, followed by 37 percent, who require 15 - 30 minutes to reach, community forests. Likewise, 12 percent and 10 percent of the households opined that they need to travel 30 - 45 minutes and 45 - 60 minutes, respectively to reach community forests. Similarly, only 2 percent of the households opined that they require more than 60 minutes reaching community forests.

It is found that the introduction of agroforestry in the study area has reduced the household workload to women, thereby utilizing time for devoting times for the study of children and in income-generating and allied activities, (such as weaving and micro-enterprises) for the women.

5.3.3 Minimization of Passive Decision Making Role of Women

Passive decision making connotes no meaningful decision making role of the women, particularly induced by man, to meet different purposes. The percentile view regarding the minimization impact of passive decision making is presented in Figure 5.

Figure 5: **Minimization of passive decision making role of women in the community through agroforestry.**



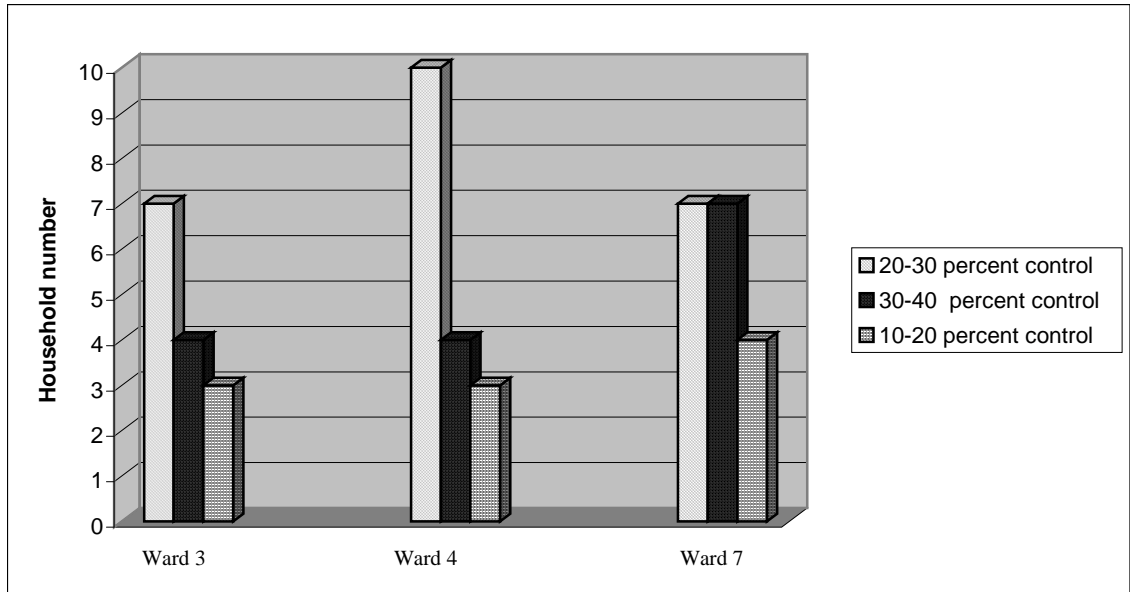
Source: Field survey, 2013

Figure 5 obtained from the data on study sites reveals that the highest percentage (60%), or 8 of the households opined that passive decision making of women was reduced by more than 50 percent in ward number 3. Likewise, the lowest percentage (10%), or 2 and 2 of the households opined that passive decision making was minimized by less than 30 percent in all (3,4 and7) ward numbers. Similarly, the highest percentage (50 %), or 9 of the households opined that reduction of passive decision making of women in ward 7 was by 30 - 50 percent. The lowest percentage (30%), or 4 of the households opined that reduction of passive decision making was 30-50 percent only in ward number 3. The finding obviously reveals that there is a directly proportional relationship between agroforestry development and active decision making role of women in the community.

5.3.4 Leadership Development of Women

Agroforestry is directly proportional to the increment in the leadership role of women in the community. Moreover, with the formation, strengthening and capacity building of institutions like: groups, committee, and executive committee create the avenue for leadership development among the women. The detail of percentile views regarding leadership development is provided in Figure 6.

Figure 6: leadership development



Source: Field survey, 2013

Figure 6, acquired from the data on the study sites shows that the highest percent (60 %), or 10 of the households viewed that leadership development by agroforestry is 20-30 percent in ward number 4. Likewise, the lowest percentage (40 %), or 7 of the households opined that non- development of leadership by 20 - 30 percent in ward number 7. Similarly, the highest percentage (20 %), or 3 and 4 of the households opined that non- development of leadership was reduced by 10 - 20 percent in ward numbers 3 and 7. The lowest percentage (15 %), or 3 of the households perceived that non-development of leadership was reduced by 10 - 20 percent in ward number 4. Furthermore, among the 30 - 40 percent leadership development category, the highest percentage (40 %), or 7 of the households and the lowest percentage (25 %), or 4 of the households are in ward numbers 7 and 4, respectively.

CHAPTER VI

CONCLUSIONS

This chapter deals with conclusions based on the data and information traced for the study. This section deals with conclusions derived from results and discussions, based on the analysis of responses received through household interviews.

6.1 Conclusions

The study examined the impact of agroforestry as a viable base for rural development in Paanchkhaal VDC of Kabhre district. The number of the households and the average household size are more or less similar in ward numbers 4 and 7, while they are different in ward number 3. The highest number of respondents belong to 'upper caste', followed by 'other caste' and 'lower caste'. The largest groups of household members fall in the 'literate' category, whereas female and 'lower caste' literacy is relatively low.

Land ownership is mostly inherited from parents. Farmland is basically of two types i.e. khet land and bari land. Khet land generally lacks trees and is dominated by paddy cultivation. Likewise, bari land contain tree species and maize and millet crops are generally grown on them. The average land holding size of the study sites is less than the national average. The majority of the households opine that the quality of khet land is comparatively good and that of bari land is medium. The majority of the households have multi-purpose tree species, mainly grown on bunds, terrace risers, edges of bariland and frontiers of other farmer's land. Hardly anyone is willing to grow trees on khet land. The majority of the households grow vegetables either in kitchen garden or in bari land and paddy in khet land. Similarly, they grow potatoes, tomatoes and others (bitter gourd, brinjal, bean, pea, cucumber, cauliflower and capsicum) in their farmland. The majority of the households produce food sufficient, for 9-12 months.

Regular income, which refers to the income from agriculture and regular jobs (GOs and NGOs) is the dominant source of income. Timber, fruits, fuelwood, agricultural produce (cereals, oilseeds and vegetables) and milk are the common commodities that the producers sell to earn cash. The income of the majority of the households comes from the sale of agricultural crops, followed by milk.

In all the three wards (3, 4 and 7) the highest percentage of households' income is seen contributed by agricultural crops. Out of total income, the highest percentage (49%), followed by 41.2 percent of the income is contributed by agricultural crops and milk, respectively. The lowest proportion (2.5%) of income is contributed by fuelwood. 40 percent (20 % education, 15 % health and 5 % NRM and CFM) of the household income is allocated directly or indirectly for natural resource management including community forestry. Allocating 20 percent of the income for education will raise the level of knowledge, skills, attitude and experience of the dwellers in the study sites, thereby assisting in local NRM and CFM. Likewise, allocating 15 percent of the income for health services increases the productive hours and manpower, thereby assisting in the NRM and CFM. Similarly, investing 5 percent of the income, in NRM, including CFM, directly assists in the management of community forests in the study sites.

Basically, the distance to community forests is directly proportional to women's and children's work and drudgery, i.e. the longer the distance, the greater will be the drudgery and work for women and children. Cooking and taking care of cattle constitute the major tasks for women and children, because they have to collect fuelwood for cooking and heating, fodder and leaf litter as the bedding material for livestock. They collect those products from community forest as well as from their own farmland. The depletion of forests by leaps and bounds has substantially increased women's and children's workload to go and collect forest products.

The highest percentage (39%) of the households opined that they need to travel < 15 minutes to reach community forests, followed by 37 percent, who require 15 - 30 minutes to reach, community forests. Likewise, 12 percent and 10 percent of the

households opined that they need to travel 30 - 45 minutes and 45 - 60 minutes, respectively to reach community forests. Similarly, only 2 percent of the households opined that they require more than 60 minutes to reach community forests.

It is found that the introduction of agroforestry in the study area has reduced the household workload to women, thereby utilizing time for devoting times for the study of children and in income-generating and allied activities, (such as weaving and micro-enterprises) for the women.

Agroforestry is directly proportional to the increment in the leadership role of women in the community. The study site shows that the highest percent (60 %), or 10 of the households viewed that leadership development by agroforestry is 20-30 percent in ward number 4. Likewise, the lowest percentage (40 %), or 7 of the households opined that non- development of leadership by 20 - 30 percent in ward number 7. Similarly, the highest percentage (20 %), or 3 and 4 of the households opined that non- development of leadership was reduced by 10 - 20 percent in ward numbers 3 and 7. The lowest percentage (15 %), or 3 of the households perceived that non- development of leadership was reduced by 10 - 20 percent in ward number 4. Furthermore, among the 30 - 40 percent leadership development category, the highest percentage (40 %), or 7 of the households and the lowest percentage (25 %), or 4 of the households are in ward numbers 7 and 4, respectively. Strengthening and capacity building of institutions like: groups, committee, and executive committee create the avenue for leadership development among the women.

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APPENDIX

1. Questionnaire for Household Survey

VDC: _____ Surveyor's name: _____
Ward no: _____
Household number: _____
Household information: _____

Respondent
name: _____

Sex: Male Female

Marital status: Married Unmarried

Level of education: _____
 Illiterate Under SLC
 Primary Above SLC

1. Household size

Age group (Year)	Name of person	Gender		Education level	Working	Not working	Remarks
		Male	Female				
Below 15							
16-30							
31-45							
45-60							
Above 60							
Total							

2. Land use

2.1 How much land do you have? (bigha/ropani/kattha) _____

2.2 Cultivated land

Own land cultivated by farmer _____

Leased in _____

Leased out _____

Others _____

2.3 Non-cultivated land

Unproductive (bari/pakho/kanla) _____

Others _____

2.4 How did you get the land you are using?

Inherited from husband or wife side

Purchased personally

Both
other

3. Livestock information

3.1 Livestock holdings:

- | | |
|----------------------------|-------------------|
| a. Number of goat _____ | Value (NRs) _____ |
| b. Number of buffalo _____ | Value (NRs) _____ |
| c. Number of cow _____ | Value (NRs) _____ |
| d. Others _____ | Value (NRs) _____ |

3.2 Milk production:

- | | |
|----------------------------|-------------------|
| a. Litre/day buffalo _____ | Value (NRs) _____ |
| b. Litre/day cow _____ | Value (NRs) _____ |

3.3 How do you feed to livestock?

- Stall-feeding
- Free-grazing

3.4 Which species do you have in your farmland?

- | | |
|-------------------|--------------------|
| Fodder _____ | Grasses _____ |
| Fruit trees _____ | Timber/Poles _____ |
| Fuel wood _____ | |

3.5 How much obtained from farmland (doko/bhari/day)?

Items	Quantity (doko/bhari)	Remarks
- Fodder		
- Fuel wood		
- Timber / poles		

3.6 How much of fuel wood needs are fulfilled from farmland (bhari/day)?

3.7 When do you lop fodder trees in the farm (month)? _____

3.8 How do you fodder trees?

4. Cropping pattern/ food production

4.1 What types of crops you been cultivating since the past 5 to 10 Year?

4.2 Which combination of crops do you prefer according to your experience (soil erosion/income)?

4.3 Please tick the items given below that are present in your farmland?

- | | |
|-------------|-------------------------|
| Tree | Fuelwood |
| Fruit trees | Vegetable |
| Grasses | Fish ponds |
| Be-keeping | Crop (annual/perennial) |

4.4 How much of the above items did you produce last season?

Items	Quantity	Value (Cost)	Remarks
- Trees	-----	-----	
Fruit trees			
Grasses			
Bee keeping			
Fuelwood			
Fish ponds			
Crop (annual/perennial)			

4.5 For how many months do the food crops from your farmland meet the your domestic food requirement?

4.6 Do you use manure in the farmland? If yes, what types and how much are you using? If no, why?

Compost _____ Chemical fertilizer _____

4.7 What management practices are you doing in your farmland agro forestry system?

4.8 Have there been changes in the land tenure of his household? Yes/ No

4.9 What types of change did you find? Who owns the farm (husband / wife/ all members)?

4.10 Who decides on what be painted in the farmland?

4.11 Who is responsible for deciding on the income use?

4.12 From when are you practicing such type of agro forestry practices?

4.13 When do you grow vegetable (month)?

4.14 Where do you sell your produce?

Local market
Others place

4.15 Source of the seeds / plant

5. Community forestry

5.1 How far is the community forest from your place?

5.2 Are you a member of community forest?

- 5.3 What are species you find the community forest?
- 5.4 What types of forest products are you sing from this forest?
 Tree Fodder
 Grasses Poles
 Others
- 5.5 How often do you visit to collect those things (daily / weekly / monthly / yearly)?

5.6 How much do you collect?

S.N.	Items	Quantity (bhari / doko)	Value NRs	Time spent
1	- Fuelwood			
2	- Timber/ poles			
3	- Fodder / grasses			
4	- Others			

5.7 What Management activities are you doing within community forest?

S.N.	Items	Management system	Time spent	Remarks
	- Plantation - Protection - Utilization			

6. Household Income

- 6.1 Who much money does you have to pay for the collection of those forest products
 Fuelwood _____ NRs Timbers _____ NRs.
 Fodder _____ NRs Grasses _____ NRs.
 and other _____ NRs. Grasses _____ NRs.
- 6.2 How much do you earn from:
 Regular job _____ NRs. Part time labor _____ NRs
 Business _____ NRs. Cottage industry _____ NRs.
 Others _____ NRs
- 6.3 What are you doing with your agroforestry products?
 Own consumption
 Sale

7. Labor use

Is the household labor sufficient for all farm activities?

Yes

No

7.2 If no, how are you managing?

Hiring

Relatives

Others

Labor exchanges

7.3 How many additional do you need per year (mandays per year)?

7.4 For which practice do you need more labor?

8. Agroforestry specific

8.1 What are the objectives of having agroforestry system?

8.2 What are the constraints for having agroforestry system in your farmland?

8.3 Do you think that agroforestry has contributed for community forestry management?

Yes

No

If Yes, by how much?

Less than 30 percent

Between 30-50 percent

More than 50 percent

8.4 Do you think that agroforestry had contributed for community forestry management?

Yes

No

If Yes, by how much

10-20 percent

20-30 percent

30-40 percent

More than 40 percent

8.5 Do you think that agro forestry had contributed for household workload of women?

Yes

No

If Yes, by how much

10-20 percent

20-30 percent

30-40 percent

More than 40 percent

8.6 Do you think that agro forestry had contributed in decision making role in the community?

Yes

No

If Yes, by how much

10-20 percent

20-30 percent

30-40 percent

More than 40 percent

8.7 Do you think that agro forestry had contributed in leadership role in the community?

Yes

No

If Yes, by how much

10-20 percent

20-30 percent

30-40 percent

More than 40 percent

2. Checklist

Name of the respondent:

District office:

Questions

1. What types of support are you giving to the farmers?
)
) Seedling/seed
) Technical assistant
) Small grants
) Involving participants in the training/workshop seminars and field visit
2. Are the practicing agroforestry system? What type of integration of crops do they prefer?
3. What types of combination of crops have you seen in the farmers land?
)
) Tree with _____
) Vegetable _____
) Fruit tree _____
) Grasses _____
) Food grain _____
) Others _____
4. Are you satisfied with the farmers managing their community forest? Yes or No, Why?
5. What types forest products are the farmers taking from the community forest?
6. Are the farmers getting income from their agroforestry system? What types of products are they selling?
7. Do you know the positive and negative effects of agroforestry system on the community forestry? If yes, what are they?
8. Do the agroforestry contribute in reducing workload of women? It yes, by what percentage?
9. Do the agroforestry contribute in decision making role of women? It yes, by what percentage?
10. Do the agroforestry contribute in leadership role of women? It yes, by what percentage?
11. Are there any types of conflict among in the farmers in practicing agroforestry system and management on community forest?

11. Are you visiting farmers' land from your office? What types of agroforestry can you see in farmers' hand?
12. Are they interested to participate in the trainings, workshops, seminars, and study tours? Which is educational for the agroforestry practices?