CHAPTER I

INTRODUCTION

1.1 Statement of Problems

The major efforts of most of the agricultural based countries is to increase agricultural productivity and to improve the economic condition of the farmers through the introduction of improved agricultural technology. Because the majority of the population of less developed countries (LDCs) derive their livelihood from the agricultural production and new technology offers opportunity to increase their production substantially. Planting of fodder trees on private land is one of the agricultural technology that has been received a considerable attention during the years for the sustenance of the farming system. Of course such practice has long been practiced traditionally, but recently *agroforestry* is widely used to this concept (Luetel, 1991).

The hill economy of Nepal, is characterized by mixed farming system in which, tree, crop and livestock form the cornerstone of the system (Robinson, 1989). The conceptual model of mid hill farming system is presented in Figure 1. Livestock farming is one of the fundamental and integral part of socio-economic life of majority of rural people of Nepal, accounting 17% of agricultural gross domestic product (GDP), representing about 26% of country's agricultural GDP (DFAMS, 1990).

Especially, the mid hill rural development largely depends on the livestock sector, generating 27% of the total income (Dreischulte, 1992). Among livestock, ruminants constitute a renewable resource providing a variety of benefits to the farmers such as meat, milk, hides, draft power, manures and fuel (Pande 1990; Mathema 1980; Devendra 1987).

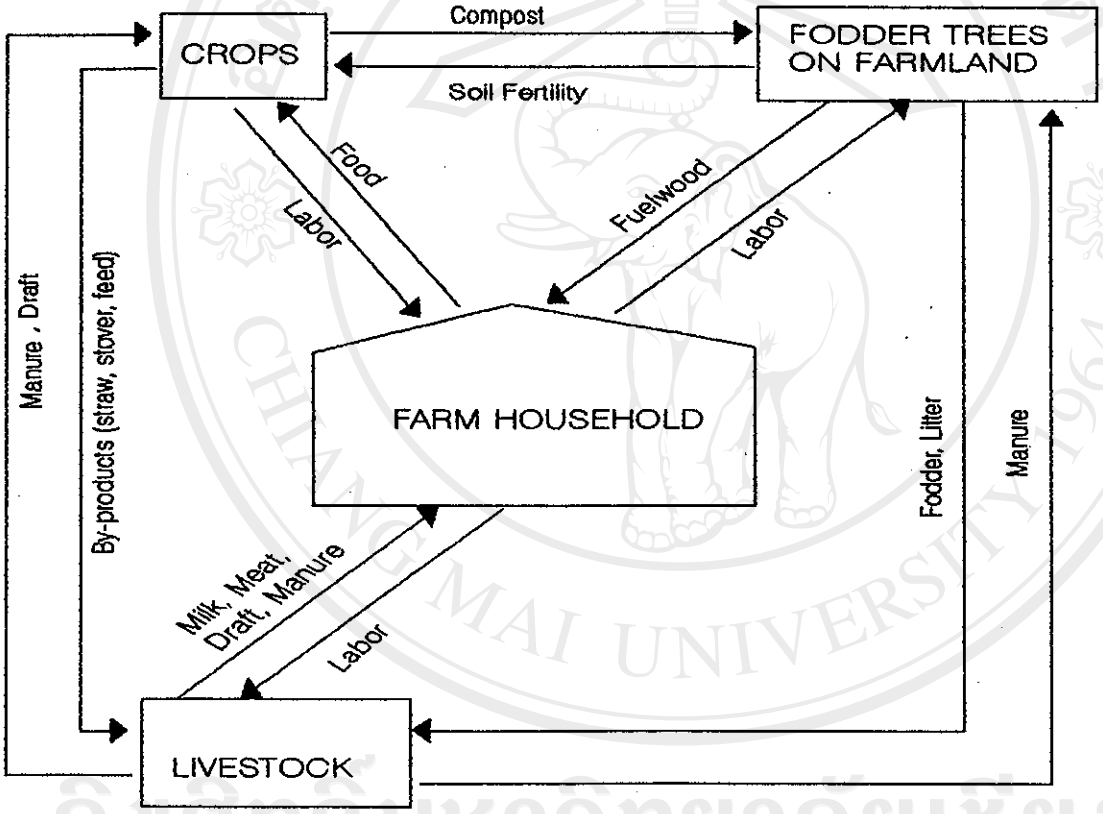

Figure 1 Conceptual Model of Farming System Components

Inspite of the great contribution from the livestock, the social-religious taboos of Nepalese culture has caused overstocking of unproductive livestock. Statistically (CBS, 1991) it is estimated that there are over 15.5 million heads of ruminants in Nepal, one of the highest per capita number in the world (Table 1).

Table 1 Livestock Population in Nepal (in 000 heads)

Livestock	Terai	Mid hills	High hills	Total
Cattle	2,242	3,242	800	6,284
Buffalo	920	1,772	303	3,003
Sheep	125	400	385	910
Goat	1,394	3,099	809	5,302
Swine	153	319	76	548
Poultry	2,510	6,431	1,217	10,158
Total	7,352	15,263	3,590	26,205

Source: CBS, 1991.
Note:Terai, Mid hills and High hills are the 3 ecological zones of Nepal covers, 17%, 68% and 25% of the total area of the country (CBS, 1991).

Hopkins (1983), revealed that in the hills the stocking rate is as high as 8 lu/hh[1], which is beyond the carrying capacity of land. The carrying capacity for grassland and forest is 0.54 and 0.31 lu/hh where as present stocking rate is 7 and 2.8 lu/ha or 13 and 9 times greater respectively (Rajbhandari and Shah, 1981).

Consequently, for the last two decades, in many areas, livestock numbers have been dropping without concurrent increase in productivity,

[1]lu/hh: Livestock unit per household; lu = standard unit for measuring livestock based on feed intake in relation to body weight.

where as the demand for livestock product is increasing with the increase in human population (Robinson, 1989). Rapid population growth, deforestation and depletion of communal (forest) resources by heavy lopping have led to environmental degradation and low productivity from the agriculture and forestry sectors. Pokherel (1992), reviewed that forest area in Nepal is disappearing at the rate of 84,000 ha/year, resulting in soil erosion and a consequent effect on environmental balance.

According to the survey of mid hills of Nepal, lack of fodder trees, inadequate pasture and grazing land are responsible for the low production performance of dairy animals apart from the other factors like disease and breed (Shrestha and Evans, 1984).

Pandey (1982), revealed that the shortage of fodder in Nepal is over 20% at the present assumption of 2 metric ton of dry matter per big lu per annum. Therefore in recent decades, difficulties being experienced by the hill farmers in meeting their daily requirements for food, fodder and fuel wood. Furthermore, non-accessibility communal resources have led to the inability of forest land to supply needs of people in sustainable basis.

Planting of fodder trees *(dale ghans)* on private land in this context holds potential benefits for slowing down the problem of fodder scarcity, soil erosion and providing energy inputs to ensure survival of

hill farming system. Hopkins (1983) stated that tree in the middle hills produce up to 70 kg of fodder per tree/year between 3-10 years. However, the crucial importance of fodder trees becomes apparent during the middle of dry seasons, when stored food supplies are dwindling (Arnold 1991; Robinson, 1989). According to Amatya (1991) about 40% of annual feed is supplied during the season. The importance of fodder tree not only lies in quantitative supplementation but also supply of high quality, nutritious greens throughout the year as some of these can withstand even in severe condition (Giri, 1990). Besides, fodder tree is only the component of significance as a source of leaf litter for compost, bedding materials for stall feed animals, potential use of hill waste land (terrace, riser)[2] and ensure efficient utilization of crop by-products. Additionally, tree fodder production is associated with a reduced cost of production (Singh, 1991).

Realizing the fact, Government and non-government (GO/NGOs) concerned with research and development have formulated a fodder improvement program under livestock development policy. To mobilize the plan, Gov/NGOs, have established nurseries in different areas, these have net work with district and village development committees. Fodder tree saplings (seedlings) of different species have been distributed either free of cost or very nominal price from these nurseries (Malla, 1987). The extension service has been provided to the farmers by JTs/JTAs[3] at the

[2] According to LRMP (1980) and Malla (1987) the terrace and riser covers 18% and 20% respectively.

[3] Junior and assistant Junior technicians

farm level. But, still the problem of fodder scarcity has not been overcome. Various studies revealed that production and distribution of seedling did not match with the plantation on the farm land even though plantation has been increased. The plantation of seedlings from nurseries has been found little as compared to the indigenous natural originated and regenerated on the farm land, even the species they are promoting may not be good enough qualitatively as well as quantitatively (Carter and Gronow, 1992).

This evidence of farmers use of fodder seedlings from sources other than nurseries might be the problems of adoption of such saplings. Since just introduction of any kind of technology (farming practice) is not enough, it should be socially acceptable too in order to meet the shortfall (fodder shortage), to improve the farmers' income and consequently to strengthen the overall economy of the country. Therefore it is essential to identify and analyze the factors that may be responsible for adoption or non adoption of fodder trees on farm land in order to design and implement proper policy measures so as to overcome the current problems of the fodder shortage.

1.2 Rationale

In view of the urgent need of increasing farm productivity (crop-livestock), and to arrest the problem of feed shortage, research on

adoption of the fodder trees have been considered important. However, research and development thrust in agriculture, especially in technology adoption have been mainly directed towards major food crops in many parts of the world. A finger countable number of research have come out in focus in case of fodder tree and its adoption.

It is well recognized that the viability of a technology under farm condition and its acceptability to farmers is determined by technical as well as non-technical factors (socio-economic) of farm households. Yet, little is known about such factors that may affect the farmers' decision making, whether to adopt or not and why.

Government as well as private agencies programs are mainly concerned with the distribution of seedlings. However, so far no attention has been paid in monitoring of the established fodder trees (Thapa, 1989). Therefore, it is imperative to analyze the level of success in term of adoption performance and its impact to local farmers, which have not been so far examined at the farm level.

1.3 Objectives of the Study

Given the above background, this study seeks to understand fodder situation and the key determinants of fodder tree adoption in the mid hill of Nepal. Specifically, the objectives of the study are:

1.3.1 To describe the farming system and socio-economic conditions of the study area with reference to fodder tree and livestock situation.

1.3.2 To measure the adoption performance of fodder trees in farm families.

1.3.3 To investigate and analyze the relationship between socio-economic factors and farmers' adoption of fodder trees in order to identify the farmers' characteristics associated with fodder trees adoption.

1.3.4 To assess farmers' perception about fodder tree distribution program carried out by government and private agencies.

1.3.5 To identify constraints and possibilities to increase fodder production.

1.4 Literature Review

Since the study is concerned with adoption of fodder trees as an agricultural practice (technology), the meaning and concept of adoption, factors and previous studies on the related topics are essential to be highlighted.

1) Meaning and Concept of Adoption

There are several meanings of the term "Adoption". Rogers

stated that adoption, is a mental process that an individual passes from first hearing about an innovation to the final adoption (Rogers, 1962 and Mosher, 1978). However, according to Feder (1985), the meaning of individual adoption differs from aggregate adoption (diffusion). The former (individual) deals with the behavior of individuals where as later one (diffusion) concerns more with the spatial dimensions of the process. To be an adopter an individual has to pass the process of adoption, which may follow specific and sequential patterns (Feder 1985) viz; awareness, interest, evaluation, trial, and adoption. Where adoption is the last stage in the acceptance of an innovation and is the outcome of a sequence of events. However, for new technology adoption, it follows a S-shaped curve, as an uneven process (Lionberger, 1960).

2) Factors Influencing Adoption

Regarding the adoption of technology, there may be number of factors that influence the adoption practice. These factors may vary among individuals in a group, regions and do not occur singly but multi-dimensional in nature (Ashadi, 1992). Furthermore, the nature and magnitude of the association are not similar, rather vary from place to place, time to time and practice to practice (Wahhab, 1979). Because innovations have been introduced in environments with different economic, social and political institutions (Feder, 1985) and farmers' behavior of are found to have been correlated with them. Farmers' characteristics as a decision making unit has an important role in perceiving the knowledge.

Similarly, social norms, values, attitudes and relationship between social system and the decision to adopt innovation affect the rate of adoption.

3) Previous Studies Related to the Subject

Studies on factors associated with the adoption of recommended farming practices have been carried out in a number of countries from the past to present. However, very few works had been performed on fodder tree adoption specifically. Therefore, adoption of other innovation and practices were reviewed.

Ayob (1979) reported that large farms were more likely to adopt the machine compared with small farms on his study conducted in the Muda region of Malaysia. A maximum likelihood regression coefficient with the asymptotic standard errors and ranks were used to determine the relationship with the variables.

Buddhapitag (1980), in Chiang mai province, Northern Thailand found that factors like age, farm size and level of income are closely related to the process of adoption. Further, it is reported that most of the adopters were young farmers with large holdings and income. The change agents with least social distances were found effective in bringing the agrarian changes in the Thai rural areas.

Sharma (1980), in his study on the adoption of modern farming

technique conducted in the Kavre district of Nepal observed that younger,high caste, owner-operator and technically informed farmers were likely to be more optimistic and consequently to be the adopters of new technique. Step wise regression technique was employed to estimate the relationship of the beliefs (expected yield) with adoption and the later with socio-economic factors and level of information.

Rawal (1981), analyzed the factors affecting the adoption of modern varieties in eastern Nepal and identified that farmers' education, farm size, exposure to extension and experience as significant factors influencing the promotion of modern variety of rice and wheat by the use of correlation matrix.

Tantry (1981), in his study concluded that young, educated, high income, location of village and more members in a household were important factors for the adoption of package of innovations. Costly and risk bearing innovations were found popular with large farmers, while small farmers were found more adoptive of labor saving technology.

A research study, concerned with the adoption conducted in Northern states Nigeria reported that the variables like literacy and contact with extension are significantly associated with the adoption of farm practices. A simple correlation analysis with .05 level of significance was used for testing the relationships between related variables and adoption of recommended farm practices. Step wise

regression was also used to test the predicted factor (Voh, 1982).

Malla (1983), applied the maximum likelihood logit analysis in his studies about the technology adoption by rice farmers in Dhanusa district of Nepal. Farmers who were co-operative members and exposed to extension activities were found more likely to adopters than others. Farmers' Age, family size, non-farm income were turned out significant factors in decision making.

Boon-a-nan (1988), employed probit model and used maximum likelihood test for estimation of the factors influencing the adoption of high yielding rice varieties (HYVs) in central plain of Thailand. From the results, it was found that farmers' attitude toward risk, contact with agricultural officials, and the profit difference between HYVs and local varieties were the important factors for the adoption.

A descriptive analysis of the adoption of fodder tree in south east Nigeria revealed that the reason behind the little diffusion of browse tree cultivation was due to the complex mutually reinforcing factors. However, division of labor, decision making within the household and tenure system of land and tree are the most significant determinants (Francis, 1989).

Harper (1990), viewed that extension activities at field days can significantly affect the adoption of new technologies like insect sweep

nets and treatment thresholds. Logit models, with maximum likelihood as a estimation technique at 20% significance level was used to analyze adoption decision.

Evidence from Bangladesh (Shah, 1992) revealed that farm income emerged as the most important predictor of adoption of farm practices. Extension contact, age, education and farm size were other significantly related factors to adoption of farm practices. Spearman correlation analysis and step wise multiple regression was used to understand the relationship and to identify the significant independent variables respectively.

Caveness (1993) conducted research in Senegal to evaluate the factors influencing the adoption and farmers' perception of agroforestry. Stepwise discrimination analysis was used to identify the factors. Land ownership and labor availability were identified as the two most significant factors that contribute to agroforestry adoption as measured by Wilks' ratio.