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AN INVESTIGATION OF AN INDIGENOUS KNOWLEDGE SYSTEM AND MANAGEMENT PRACTICES OF TREE FODDER RESOURCES IN THE MIDDLE HILLS OF CENTRAL NEPAL

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Eric Philip Rusten

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of the requirements for

Ph.D. degree in Forestry

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AN INVESTIGATION OF AN INDIGENOUS KNOWLEDGE SYSTEM AND MANAGEMENT PRACTICES OF TREE FODDER RESOURCES IN THE MIDDLE HILLS OF CENTRAL NEPAL

By

Eric Philip Rusten

A DISSERTATION

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ABSTRACT

AN INVESTIGATION OF AN INDIGENOUS KNOWLEDGE SYSTEM AND MANAGEMENT PRACTICES OF TREE FODDER RESOURCES IN THE MIDDLE HILLS OF CENTRAL NEPAL

By

Eric Philip Rusten

Tree fodder (vegetative matter harvested from trees, shrubs or woody vines) is a primary constituent of animal feed in Nepal. An estimated national average fodder deficit of 20 percent often results in undernourished and underproductive draft animals, a reduction in the production of meat and milk products, and limited dung production. Farmers' efforts to meet their fodder demand often result in increasing exploitation of fodder sources, contributing to the degradation of forest and pasture resources. There is evidence that tree fodder shortage also motivates farmers to intensify cultivation and management of fodder trees on private land.

Understanding the dynamics of indigenous resource management systems can potentially benefit natural resource development efforts. The primary purpose of this research was to investigate an indigenous knowledge system surrounding the management, cultivation, and use of private tree fodder resources in one village area in the middle hills of Central Nepal. A system used by farmers to classify and evaluate animal fodders was investigated with specific reference to gender.

A multi-method research strategy, composed of five distinct methods: participant observation; a household survey; a private tree inventory; ethnographic interviews; and the repertory grid and triad test, was employed. This facilitated the collection of different types of data, and it helped overcome many of the problems endemic to cross-cultural research. During this study only local villagers were used as research assistants.

This research demonstrated that there is more to the collection, management, and use of tree fodders than may be perceived by outsiders. The research has shown that knowledgeable villagers can evaluate the quality of different fodders and provide good feed to their livestock by using three main tools: 1)their extensive knowledge about fodder species; 2)their knowledge system of fodder classification and evaluation; and 3)their skillful qualitative analysis of available fodders. This research has shown the dynamics of a complex cognitive systems that impresses order on the apparent disorder of variables involved in the management of tree fodder. It has also shown that indigenous knowledge systems research can help improve our understanding of complex rural farming systems.

Dedicated to my parents,

and

most of all to my wife and children.

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Chapter 1

INTRODUCTION AND BACKGROUND OF THE RESEARCH

1.1 The General Tree Fodder Situation in Nepal

Tree fodder[1] is a primary constituent of all animal feed used in Nepal. The percentage of tree fodder to total fodder consumed in Nepal exhibits considerable seasonal, geographic, and environmental variation. Annually, for the country as a whole, it is estimated that over 50 percent of all fodder is acquired from tree fodder sources (Panday, 1982). Other estimates are: 30 percent (Fonzen and Oberholzer, 1984); 35 percent (Brewbaker, 1983); 71 and 87 percent (Singh, *et al.*, (1984); and 90 percent (Alirol, 1979). To meet their fodder demand, farm households collect tree fodder from both private and public sources. In national estimates, private trees contribute on average one-fifth of tree fodder demand, and in some areas 50 percent or more of tree fodder comes from private trees (Wyatt-Smith, 1982; Mahat, 1985; and Condori, 1985). Fox (1983) collected detailed agricultural data from households in one middle hill community in Nepal for one year. Based on this data, he determined that an annual average 13 percent of total fodder demand is met from tree fodder resources, with 72 percent of this demand being met from private trees. A similar value is provided by Griffin, *et al.* (1988) who estimates that only 20 percent of fodder comes from public forests. The variation in these estimates suggests the importance of geographic,

[1] Tree fodder is defined as any combination of leafy matter, nuts, fruits, and flowers, either fresh or dry, that are harvested from woody plants, either trees, shrubs or vines. Even though the primary end use of tree fodder is animal feed, some types of fodder trees also provide important inputs into compost and animal bedding. Many fodder trees also have a multipurpose character, providing fuelwood, human food, and other important products.

environmental, seasonal, and socioeconomic variables to the supply of, and demand for, this resource.

Large and medium sized ruminants, including cattle, yak, buffalo, goats, and sheep, are integral components of different farming systems in Nepal (Macfarlane, 1976; Bajracharya, 1983a; Tulachan, 1985; Uprety, 1986; Gurung, 1987). In many areas of Nepal, fodder resources of all types are insufficient to meet the nutritional demand of these animals. Panday (1982) estimates that there is a national average fodder deficit (from all sources) of 20 percent. A more optimistic figure from a Nepalese government report (HMG, 1988) estimates that there is a 5.7 percent fodder surplus nationwide.[2] For the mid-mountain area of the Western District of Nepal (where this dissertation research was carried out), there is an estimated deficit of 5.1 percent.[3] On a more general level, Hopkins (1983) concludes that "the small farmer (in Nepal) is in a grossly energy deficient situation" in terms of supplying fodder for their draft animals, which are estimated to cultivate over 75 percent of all farm land in Nepal, and for other large and small ruminants.

One result of this energy deficiency is that draft animals are undernourished and therefore underproductive. This may result in a reduction in food production due in part to a decline in timely planting capacity (Singh, *et al.* 1984), and to shortages of manure (Arins, 1987). Another consequence of fodder shortages is

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[2] It should be noted that the Master Plan estimate is based on aggregate land type data and does not account for differences in accessibility and proximity of farming communities to public sources of tree fodder. Since there are areas of forest land that are inaccessible to farming communities, this figure overestimates tree fodder supplies at the household level.

[3] This deficit figure is also probably underestimated.

lower milk yields leading to a reduction in *ghiu* (ghee or clarified butter) production. For many Nepalese farm families, *ghiu* is an important cooking fat, seasoning, and an important source of cash income (Balogun, 1987a). It is conceivable that lower milk yields also contribute to lower standards of household nutrition and health, especially among children (Shrestha, 1988; Rusten, 1988).

Efforts by farmers to meet their fodder demand often result in increasing exploitation of all available sources of fodder. This contributes to a persistent pattern of forest and pasture resource degradation (Panday, 1982; Wyatt-Smith, 1982; Bajracharya, 1983b; Mahat, 1985; Gilmore, 1987; Wallace, 1988). There is evidence that shortages of public sources of tree fodder in some areas of Nepal are motivating farmers to intensify cultivation and management of fodder trees on their own land by expanding extant agroforestry systems (Fox, 1983; Campbell, *et al.*, 1987).

Farming communities are not alone in responding to this problem. Reforestation and afforestation of resource deficit areas, and the promotion of community forestry development activities are at present being undertaken by the national government and international donor agencies (Stewart, 1984). Additionally, scientific research on various aspects of this problem is in progress (Robinson, 1985). Much of this research is focused on productive, managerial, nutritional, genetic, and ecological aspects of different fodder species. A literature search suggests that less attention is being paid to socio-cultural aspects of tree fodder resource use, and that few studies have been conducted that identify indigenous techniques and underlying knowledge systems of tree fodder management and cultivation.[4] Surveys have illustrated and evaluated villagers' attitudes towards forest resources in Nepal (New ERA, 1980; Campbell and Bhattarai, 1980; Johnson, *et al*. 1982; Fox, 1983; New ERA, 1983; Balogun, 1987b; Metz, 1987). Although questions relating to tree fodder were included in these studies, little attention was paid to indigenous knowledge systems.[5] Some of these studies also focused on non-fodder aspects of forest resources, with specific emphasis on fuelwood.

Tree fodder resources are integral components of Nepalese farming systems and they can be considered a specialized use of forest and agricultural resources. Understanding the dynamics of indigenous management systems and traditional agroforestry practices of farmers in Nepal is an area of research that can potentially benefit natural resource development efforts. It is assumed that farmers themselves have such knowledge (Heuch, 1986; Panday, 1982; Schroeder, 1985), and that gaining an awareness and understanding of this knowledge, and incorporating it into programs that aim to alter land and resource use and management practices, will greatly enhance such programs chances of success. Therefore, research on indigenous knowledge systems of tree fodder management and use, specifically those attributes of management encompassing cultivation of fodder trees on private land, is warranted. Related to this is the need to explore human ecological relationships that exist between tree fodder resources and

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[4] The term management was initially used as the focus of this research. However, from the perspective of Nepalese farmers in the research area, this term was found to be inappropriate because there is no single, commonly used and understood Nepalese word for "management" of fodder trees or other natural resources. Discussions with farmers about their "management" of fodder trees in their farming systems, lead to the use of more appropriate terms, the Nepalese equivalent of "to cultivate," *umamu* or *launu*, in place of the relatively modern and uncommon term *byawasthaa garnu* (to manage).

[5] This concept is defined and discussed in Chapter 3, section 3.4 (see page 40).

Nepalese farming systems, and to study important socio-cultural and economic variables that may influence management and cultivation practices.

1.2 General Supporting Literature

The following examples demonstrate the breadth of work in the expanding and diverse field of indigenous knowledge research. Johnson, *et al.*, (1982) describe a local knowledge system for dealing with the management of natural hazards in a mountainous area in Nepal. Wilken (1972) describes numerous indigenous methods of microclimate management used by "traditional farmers" around the world to enhance agricultural productivity. Possey (1985), describes a highly complex system of forest resource management practiced by the Kayapo Indians of Brazil's Amazon Basin that is "socially and ecologically sound." The author concludes that the Indian's "indigenous knowledge is extremely important in developing new strategies for forest ... conservation, while improving the productiveness of these ecological systems." In another example, Scott and Gormley (1980) describe how pastoral development projects in the Sahel have often led to further resource degradation problems. According to the authors, these problems have arisen because projects have often neglected to learn about and understand traditional mechanisms of survival practiced by pastoral people of this region. In contrast, the authors describe an Oxfam project that was based on an understanding of pastoralists' survival strategies, and on the custom of "animal of friendship" relations. As a result of this improved and expanded understanding of an indigenous knowledge system, this project helped to improve herd productivity without creating a loss of adaptive abilities of the population.

Few studies have been found that specifically consider indigenous knowledge systems for the management of private or public tree resources in Nepal. A notable example is Molnar (1981), who carried out a month-long study on "The Dynamics of Traditional Systems of Forest Management in Nepal." By the author's own admission, the nature of this study, and the data collection methods used, precluded statements of statistical validity. Molnar emphasized the need for detailed research on indigenous knowledge systems of natural resource management. Messerschmidt (1987), drawing on his years of experience in Nepal, briefly discusses three cases of indigenous systems of forest resource management in Nepal, and he concludes that these systems:

> "(a)...reflect a rich body of indigenous technical knowledge of the bio-physical resource base and of the social resources and conditions necessary to maintain and manage natural resources effectively; (b)...closely involve the local people on a daily and seasonal basis; and, (c)...appear to be flourishing at the local level."

Brokensha and Riley (1980) describe the extensive base of knowledge developed by the Mbeere people of Kenya concerning vegetation found in their environment. They illustrate how Mbeere knowledge of specific indigenous species of fodder trees could be applied to help alleviate shortages of animal fodder in the Mbeere region. It is reasonable to expect that a similar situation exists for farmers in Nepal. Schroeder (1985) supports this position, in his description of research on an indigenous systems of knowledge surrounding rice cultivation from a village in central Nepal. Results from this research show that "(f)armers utilized very developed land and plant classification schemes" within their rice farming system. Research carried out in Mexico by Berlin, Breedlove, and Raven (1974) demonstrates the high degree of sophistication achieved by an indigenous system of plant taxonomy used by the Tzeltal Indians of Chiapas, Mexico. The classic ethnoecological work of Conklin (1957) presents a broader picture of the complex structure and function of the indigenous systems of resource management practiced by the Hanunoo people of the Philippines.

Farming systems research has also demonstrated the utility of investigating indigenous knowledge systems. Glass and Thurston (1978) describe how farmers have learned, through a process of "trial-and-error," to use natural forms of pest control in their farming systems. In a study of soil erosion in Colombian farming systems, Ashby (1985) investigated farmers' knowledge about soil types, soil erosion, and conservation practices. This study identified important socio-economic and political variables that influence the farmers' decisions to (or not to) over exploit and degrade their soil resources. This research demonstrated that indigenous knowledge systems of natural resource management do not function in isolation from internal and external social, economic, and political forces. Along a similar vein, a study in Kenya showed the importance of local social organizations to the functioning of an indigenous irrigation system (Fleuret, 1985). This study highlighted the close relationship that exists between the indigenous technical system of water management and extant systems of social organization that control the technology. Both the social and technical systems complemented each other and resulted in a system that was both technically reliable and socially efficient. A major reason that these two systems function well together is that they evolved together under the same biophysical and social conditions. In a similar case, Alverson (1984) presents a case study from Botswana to demonstrate how indigenous agricultural systems that consist of highly integrated social and technical elements are "capable of considerably greater production" than systems being promoted by aid donors. In concert with these studies, Olofson (1983) provides an overview of several different indigenous agroforestry systems that function in tropical areas around the world.

These and other studies strongly suggest that developing an understanding of indigenous knowledge systems surrounding natural resource use and management, is critical for effective development efforts.[6] The primary objective of the research presented in this dissertation was to investigate and describe an indigenous knowledge system for the use, management, and cultivation of private tree fodder resources. One likely application of this research will be to provide input into existing and planned development efforts designed to enhance the sustainability and supply of tree fodders in Nepal. A second application would be to demonstrate the efficacy of including local participation and use of local social and cultural resources in both research and development activities.

As Heuch (1986) comments "farmers in Nepal have had several generations of experience with tree fodder and have a wealth of knowledge that has barely been tapped by researchers," and such indigenous knowledge systems are, as Chambers (1983) states "an enormous and underutilized national resource." Klee (1980) supports this position clearly by stating:

> Various cultures [have] their own conservation measures. ... Too often, however, the modern-day resource manager pays little attention to what traditional cultures have to teach. Western [and Western trained] resource managers have much to learn from the long standing conservation practices of traditional societies." (p.1)

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[6] Additional examples of studies that emphasize the importance of indigenous knowledge research and describe case studies include: Bernard, 1972; Wilken, 1972; Netting, 1974; Bennett, 1976; West, 1978; Brokensha, et al. 1980; Orlove, 1980; Johnson, Olson, and Manandhar, 1982; Dunlap, et al. 1983; Berry and Thomas, 1983; Chambers, 1983; Brokensha & Castro, 1984; Messerschmidt, 1984; Ashby, 1985; Fleuret, 1985; and McNeely & Pitt (eds), (1985).

Warren (1976) elaborates further:

> "By delineating the indigenous systems for defining and classifying, for example, soils, plant pests, or plant varieties, a formal model of the local farmer's ethnoecological model would result. A comparison of the local model with the Western models would then be possible. The Western [or outside] advisor ... could then better understand the [indigenous] world of reality within which decisions are made and behavioral patterns produced." (p.310)

These statements by Heuch, Chambers, Klee and Warren summarize the primary purpose and rationale for carrying out the research described in this dissertation.

1.3 Outline of the Dissertation

This dissertation approaches the topic of indigenous knowledge systems of tree fodder use and management by first examining the general issues of tree fodder resources and indigenous knowledge systems research in Nepal. Chapter 2 introduces the research problem, and describes the research site. In Chapter 3, the conceptual and theoretical framework for this research is discussed. Included in this chapter are discussions of cross-cultural research, ethnoscience, indigenous knowledge, and personal construct theory, as they relate to the research carried out in Nepal. The fourth chapter articulates how the principles presented in Chapter 3 were applied to the research problem introduced in Chapter 2 in order to formulate the methodological approach used in gathering data. Research hypotheses and the research strategy are also discussed in Chapter 4. Research results are presented and discussed in Chapter 5, with implications of this research being addressed in the final chapter.

Chapter 2

INTRODUCTION TO THE RESEARCH PROBLEM & THE RESEARCH SITE

2.1 Introduction

This research arose from an intuitive belief that subsistence farmers living in the mid-hill region of Nepal have developed systems of knowledge surrounding their use, cultivation, and general management of private and public tree fodder resources. This assumption was, and still is, grounded in the belief that people know, in culturally specific and appropriate ways, a great deal about resources they depend on for their survival. However, this intuitive belief was not supported by a search of the literature on this topic specific to Nepal, beyond anecdotal accounts and hints, concerning the existence or character of an indigenous knowledge system surrounding tree fodder resources (Panday, 1982; Messerschmidt, 1984; Molnar, 1981, Heuch, 1986).

In contrast to the paucity of supporting literature specific to tree fodder in Nepal, is the existence of literature dealing with other systems of knowledge indigenous to other Nepalese cultural groups (Messerschmidt, 1987; Schroeder, 1985). In addition, a wealth of literature exists documenting knowledge systems for the management of natural resources by cultural groups around the world (Brokensha, *et al.*, 1980; Klee, 1980; Clay, 1988). However, it should not be assumed that knowledge systems employed by one cultural group can be used as a template to study another group, even if both groups share similar environmental and cultural characteristics. Examples drawn from the literature were used to guide the selection of appropriate research methods, and as examples of what may be learned (Werner and Schoepfle, 1987; Richards, 1980; Barker, 1977; Barker, *et al.*, 1977; Whyte, 1977; Schatzman and Strauss, 1973).

Due to the high degree of uncertainty associated with this research, and a lack of supporting literature specific to tree fodder in Nepal, a flexible open framework of strategies, hypotheses and methods was initially developed. As learning about the community and their fodder tree resources progressed, gaps in this open framework were filled, and the flexible structure of the research was modified and solidified. A gradual developmental and iterative process evolved between the initial research proposal, and what was learned about the community and tree fodder.

This research can be seen as involving two broad, interrelated research problems. First, there was the initial problem of formulating what eventually became the research methodology. Second, there was the stated research problem of learning about the indigenous knowledge system for tree fodder resources. As such, the progressive and iterative developmental process that resulted in the final research structure is considered as one of the major personal achievements of this research.

2.2 The Research Site

This research was carried out from November 1987 through June 1988 in Salija Panchayat of Parbat District in Central Nepal (see Map 1 and 2). After visiting several potential research sites, and talking with people working in different rural areas in Central Nepal, Salija Panchayat was selected as the research site. This selection was based on the following general criteria.

1. The site needed to have a sufficiently large population to permit effective analysis of research data.

2. The site needed to have different levels of tree fodder resource scarcity on both private and public lands, since relative scarcity of this resource was considered to be an important variable. However, the site should not be severely deficient in tree fodder resources.

3. The site needed to be between 1,500 m and 3,000 m in altitude. Much natural resource and farming systems related research has been carried out in Nepal at altitudes less than 1,500 m, while less has been carried out at higher altitudes. Therefore, a higher altitude site was selected.

4. The site needed to be inhabited by people who would be receptive to the research and researcher.

5. Requirements of the funding agency made it necessary for this research to be carried out within walking distance of Pokhara, Nepal.

Salija *Panchayat* was first suggested as a possible research site by staff at the Lumle Agricultural Centre (LAC), an agricultural research and extension center supported by British Technical Aid. Salija *Panchayat* is one of several *Panchayats* that comprise the target area for the extension and research work of LAC. Although LAC's interest in forestry activities in its target area is relatively recent, it had established and been supporting the Salija *Panchayat* tree nursery for the past 12 years. LAC was also in the process of intensifying their village-based forestry activities in village areas around Salija. The staff at LAC arranged for a visit to Salija, and after a reconnaissance of the village area, Salija was selected as the research site.

2.2.1 <u>General Site Description</u>:

Salija *panchayat*, (Lat. 23° 20' N, Long. 83° 38' E) consists of two village areas, Upper Salija and Lower Salija. The research area consisted of Wards 2, 6, and 7, of Upper Salija (for the remainder of this dissertation Upper Salija will

MAP 1

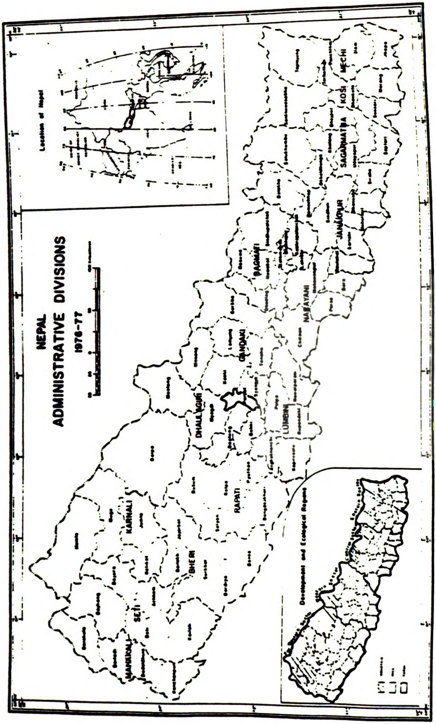

Figure 1

Map of Nepal and Parbat District

Map 2

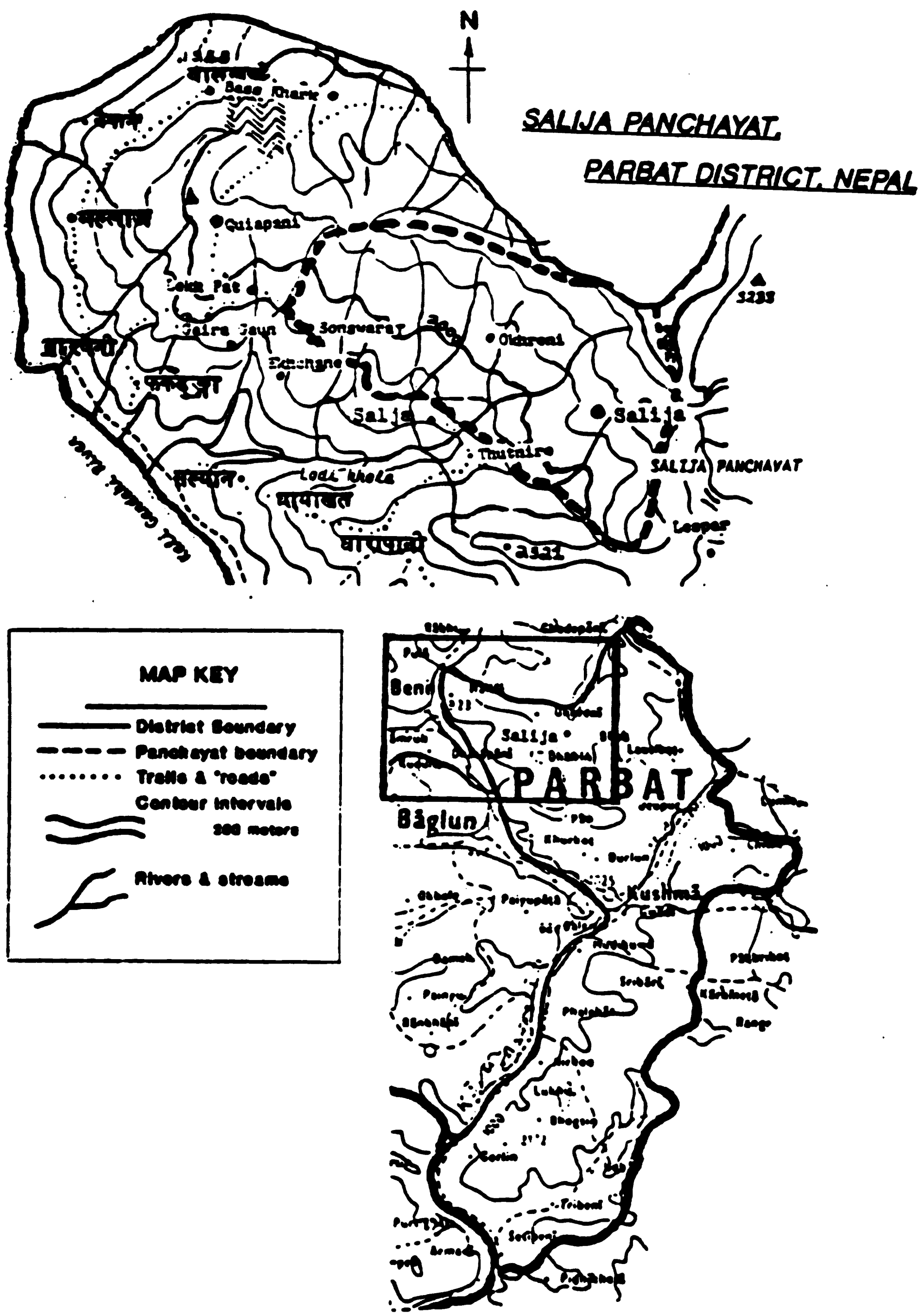

Figure 2

Map of Parbat District and Salija *Panchayat* be called Salija). These three wards lay side-by-side, east to west across a steep south-facing ridge and range in altitude between 1,800 to 2,300 meters.

The Eastern-most ward, Ward 6, is slightly higher in altitude than the other two wards. Because of this and its position at the blind-end of the steep valley that dominates Salija *Panchayat*, Ward 6 is not affected as much as Wards 7 and 2 by the flow of warm, and often relatively dry, air that rises from the valley floor. As a result, Ward 6 is generally cooler, and it is not uncommon for Ward 6 to be shrouded in a heavy blanket of clouds that rise from the valley bellow or push down on this village area from the high altitude hills to the north.

Ward 2 lies farthest to the west, at the end of the steep south-facing ridge of Salija *Panchayat*, overlooking the deep, narrow Kali Gandaki River Valley. This exposes Ward 2 and some of Ward 7, which is situated between Wards 2 and 6, to warm and often desiccating winds that flow north from the southern lowlands of Nepal. These differences in altitude, aspect, and exposure to warm air of the valleys below Salija, create daily and seasonal climatic differences between the three wards comprising the study area. Ward 6 is cooler and less dry than the other wards, with Ward 2 being the warmest and driest. As a result, the agricultural seasons of the three wards are slightly different. These slight climatic differences may also contribute to variation in survival, growth and choice of trees cultivated in each ward.

Unlike many areas of Nepal, the households in the study area are not organized in nuclear villages. Instead, they are dispersed across the southern face of the sloping ridge that forms most of this *panchayat*.[7] For this reason, the term village area is used when reference is made to the inhabited portions of the research area. The total area of the Salija Panchayat is 800 ha. Table 1, based on a 1976 survey of the Salija area (Wormald & Russell, 1976), shows the composition of land in this *panchayat*. In the 12 years since this survey, it is probable that the amount of land under forest cover has decreased significantly and the area of grass, scrub, and cultivated land has increased. This change can primarily be attributed to agricultural expansion and the degradation of forest area (Lumle, 1988).

The 1976 survey recorded 130 households in Upper Salija, and 1987 *panchayat* records show that this has increased to 190, a 46 percent increase. Some of this increase in the number of households can be accounted for through division of a father's land among his sons. Clearing of "unclaimed" land, agricultural expansion, and some out-migration, has absorbed the rest of this increase.

Table 1

Land Composition of Salija *Panchayat* (1976 Data)

Land Type	Hectares
Forest Land	234
Grass & Scrub Land	520
Cultivated Land	46
Total	800

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[7] Discussion with village elders suggests that Upper Salija was formed only two or three generations ago as a result of agricultural expansion from the lower altitude communities. One old gentleman said that his land exists today where his father's *goTh* (temporary shelter built on agricultural land that is only used from a few seasons of the year and that is quite distant from the main household) once was built.

Out of a total forested area of 234 hectares, there are three main forests within the *panchayat* that are used by the residents of Salija.[8] In the eastern region of Salija two forest areas are recognizable. First, there is a high altitude (2,200-2,800 m) well stocked forest dominated by *Quercus semecarpifolia* (*Kharsu*)[9] and *Tsuga dumosa* (*Gobre Salla*). The 1976 survey estimated this forest to be 68 ha in size. Even though this forest is seen as "well stocked," uncontrolled grazing of livestock and the collection of forest floor litter has profoundly altered this forest's character. Essentially no reproduction of valuable fodder species is seen in the forest, and in some areas there are few tree seedlings of any type. Several residents of Salija commented that "their forests were dead and dying" because there was very limited evidence of regeneration.

The second forest, at a lower altitude (1,900-2,200 m), is moderately well stocked and dominated by *Rhododendron spp*. (*Guraas*), *Lindera pulcherrima* (*Chamre Phe Phe*), *Neolitsea umbrosa* (*Phe Phe*), and *Alnus nepalensis* (*Utis*). This forest was estimated to be 34 ha. in area (1976 Lumle survey). Both of these forests appear to have fairly deep, fertile soils. To the west of these two forests is a high altitude, (2,200 - 2,800 m) poorly stocked, and degraded scrub oak forest dominated by *Quercus semecarpifolia*. This forest covers an estimated 58 ha in area, and has shallower, less fertile soils.

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[8] There are other more distant forests outside the *panchayat* that are occasionally used for some purposes by residents of Salija. However, because neighboring *panchayats* often compete aggressively for forest resources, uses of another *panchayat's* forest resources is limited.

[9] This is the Nepalese name for this species. Usually, the Nepalese name that is most commonly used by people of Salija, will follow the Latin name. In cases where the Latin name is not known, only the Nepalese name will be used and this will be typed all in italics.

Most households in Salija are located to the east and south, at lower altitudes than the three forest areas, and thus, the second and third forests come under the greatest pressure through the collection of fodder, fuel, timber, and uncontrolled grazing. The least degraded forest is only easily accessible to households in Ward 6, but households from Ward 7 occasionally collect fodder (especially during the winter months) and fuelwood from this forest. Few households from Ward 2 harvest resources from this more distant forest.

Chapter 3

CONCEPTUAL AND THEORETICAL FRAMEWORK

3.1 Introduction

Because of the great diversity of indigenous knowledge systems in the world, there is no single type of indigenous knowledge research. There is also no "cookbook" for carrying out research on indigenous knowledge systems. Each research initiative needs to draw on theory and methodology from a diverse array of disciplines that are appropriate to the needs of the research question and environment. Because of this multi-disciplinary character of indigenous knowledge research, formulating a conceptual and theoretical framework on which to base such research demands an interdisciplinary perspective. This research on indigenous knowledge of use, cultivation and management of tree fodder was thus approached from an interdisciplinary and cross-cultural perspective.

This research drew upon theoretical, conceptional, and methodological elements from three main areas of study within the general field of cross-cultural research. These include, 1) ethnoscience, 2) indigenous knowledge research, and 3) personal construct theory. Each of these topics is discussed individually in this chapter, however, inherent disciplinary overlap and the nature of this research required that they be used in an integrated manner. Along with this discussion, terms and concepts used throughout this dissertation are also defined in the following sections.

3.2 Cross-Cultural Research

In general, cross-cultural research can be discussed from two perspectives. One perspective, according to Brislin, Lonner, & Thorndike (1973), involves "the empirical study of members of various culture groups who have identifiable experiences that lead to predictable and significant differences in behavior." Most of such studies involve culture groups that speak different languages, live in different regions, and are members of different political units. These studies generally attempt to identify significant differences and similarities in human perception and behavior between various culture groups.

In the second perspective, cross-cultural research is not explicitly comparative in nature, but involves the study of members of one cultural group by someone from a dissimilar culture. The purpose of such cross-cultural studies is to learn about, understand, and express the insiders' view of some element or elements of the study group's perception and behavior in terms understandable to another culture group. This perspective of cross-cultural research was used in this research.

Before proceeding further, it is appropriate to present a definition of culture as used in this dissertation. In general, the term culture refers to the human-made portions of human environments, and peoples' responses to extant natural elements of their environment. Two additional definitions, suggested by anthropologists, expand on this idea and provide an operational perspective for this research. The first definition, from Kroeber and Kluckhohn (1952), emphasizes the role of human action and behavior:

> Culture consists of patterns, explicit and implicit, of and for behavior acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (i.e., historically derived and selected) ideas and especially their attached values; culture systems may on the one had, be considered as products of action, on the other as conditioning elements of further action. (p.180)

The anthropologist Goodenough (1967) complements this definition and expands on it with an emic (see page 36) perspective:

> What does a person need to have learned if he is to understand events in a strange community as its members understand them and if he is to conduct himself in ways that they accept as conforming to their expectations of one another? To describe the contents of such a body of knowledge is to describe a community's culture. (p.1203)

These three perspectives on culture provided an appreciation for the problems inherent in cross-cultural research. They also contributed to the formulation of a multi-method research approach that helped ameliorate many problems that were encountered during this research.[10]

Both perspectives of cross-cultural research are similar in terms of their approaches, and with respect to the types of problems inherent to cross-cultural research. All cross-cultural research must be concerned with whether the concepts used in the research, and those being investigated, have equivalent meanings for the different culture groups involved. In addition, cross-cultural researchers need to contend with the fact that proposed research methods may turn out to be inappropriate for interacting with members of different culture groups. Therefore, researchers must be flexible and creative in formulating the conceptual and theoretical framework on which their research in based, and in selecting, designing, and applying their research methods.

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[10] The term multi-method is used to describe how five research methods (participant observation; a household survey; an inventory of private trees; a fodder knowledge discussion guide; and a repertory grid) were used in a coordinated way to elicit data from the research community. These methods are discussed in Chapter 4.

3.3 Ethnoscience[11]

As stated previously, one of the primary goals of this research was to work with farmers in one community in the mid-hill region of central Nepal and identify, learn about, understand, and describe an indigenous system of knowledge surrounding tree fodder resources. A crucial part of this was learning enough about the indigenous knowledge system to be able to describe and explain it in native[12] terms, and to make this understandable to outsiders. This required the application of the ethnographic or ethnoscience research approach.[13]

Agar (1985) describes ethnography, or "folk description" as a form of social science research that "emphasizes encountering alien worlds and making sense of them." Complementing this, Warren (1976) states that "ethnoscience [is] a set of techniques that permits a formal understanding of indigenous knowledge systems." Central to this style of research is using the native perspective to develop an understanding of these "alien worlds," to learn the insiders' view of their world (Spradley, 1979; Werner and Schoepfle, 1987). To attempt to make sense of another culture's world using an investigator's preconceived categories or his or her own cultural frames of reference or world images, would distort the character of the natives' culture. As Frake (1964) explains, this would "obscure(s) the real content of [a peoples'] culture: how people organize their experiences conceptually so that it can be transmitted as knowledge from person to person and from

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11 Since several scholars have written extensively on ethnography and ethnoscience, a comprehensive discussion of this topic is not attempted here. Examples of this extensive literature include: Werner and Schoepfle, 1987; Manning, 1987; Agar, 1986; Emerson, 1983; Frake, 1983; Spradley, 1979; Tyler, 1969; and Wallace, 1962)

12 "Native" is used here as a technical term to denote a member of a specific social unit.

13 In some of the literature (e.g., Agar, 1985; and Werner & Schoepfle, 1987), and in this dissertation, both of these terms are used synonymously. A distinction is often made between "traditional ethnography" and "the new ethnography," with the latter being associated with the more recent term ethnoscience.

generation to generation." This focus on the native's perspective is embodied in the prefix, "ethno," which is used here and with other related terms (e.g., ethnobotany, ethnobiology, and ethnoecology) to denote a system of knowledge and cognition that is representative of a specific social or cultural group (Sturtevant, 1964).

As with many areas of research, there is a need to place limits on the scope of the research effort. Ethnoscientific research does not generally attempt to describe all elements of knowledge or cognition in a culture, such research is usually limited to one significant realm of cultural interest.[14] Manning and Fabrega (1976) emphasize this by stating that ethnoscientific research attempts:

> "to identify a particular area of socially significant interest ... elicit terms (lexemes) which refer to items in the phenomenal world, and to seek a set of rules which will explain the way the items in the phenomenal world are organized by group members."

The systematic study of native language or cognitive systems through formal linguistic techniques is central to ethnoscience research. Its purpose is to delineate indigenous values, classifications, and categories that exist within specific domains of knowledge (e.g., agriculture, medicine, resource management, agroforestry) (Warren, 1976). Berlin (1973) identifies three main areas of study within ethnoscience. They:

> "may be referred to as classification, nomenclature, and identification. In the study of classification, one is concerned with discovering those principles by which classes of organisms are naturally organized in the preliterate mind. Nomenclatureal studies are devoted to the description of linguistic principles of naming and conceptually recognized classes of plants and animals in some particular language. The area of identification deals with the study

[14] Werner and Schoepfle (1987) present a taxonomy of ethnography in which "holistic ethnography" is discussed as a subtype of ethnography that attempts to deal with all aspects of an entire social or cultural unit. According to these and other authors, holistic ethnography is understandably uncommon.

> of those physical characters utilized when assigning a particular organism to a particular recognized class." (p.259)

One aspect of this research focused on the first of these main areas of ethnoscience, i.e., classification.

Within the limits of a research effort, identifying lexemes and learning the rules surrounding their use, is only one part of ethnoscience. An attempt should also be made to understand the meanings of observed activities and behavior of members of the culture under study (Emerson, 1983). These two dominant themes of ethnoscience are necessarily intertwined. Linking them together are the realizations that: 1)the meaning of observed human behavior is rarely self-evident; and 2)the meanings ascribed to verbal labels do not necessarily predict actual behavior. Thus, to comprehend and make sense of observed behavior requires that we learn the natives' perspective of their environment and their actions, i.e., to learn both the language of cognition and of behavior.[15] Without this interplay between the native view as expressed in language, and exogenous observation of native practices, the cultural knowledge and meaning surrounding a behavior becomes distorted (Spradley, 1979). Agar (1983) describes this perspective of ethnography as a way to study cognition and behavior, as moving above the purely "lexical level ... to study lexically labeled categories." Analysis of properties of labeled categories shared by members of a culture can be integrated with observed behavior and decision making processes to render a higher level of

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[15] This point is especially important for learning about indigenous knowledge systems of rural non-Western cultures. Much of the knowledge that these people possess is not as explicit as that maintained by Western societies. Rather it is encoded within a complex or matrix of language and behavior, and it is rarely written down. The complexity of this relationship between rural people and their knowledge systems is magnified by the ecological links between their socio-cultural systems and their biophysical world.

understanding of the structure and function of a social unit. These two analytic approaches have become formally known as emic and etic approaches.

3.3.1 Emic and Etic Approaches:

Embedded within the ethnoscientific approach to social science research, and characteristic of the two perspectives of cross-cultural research discussed earlier, are the emic and etic approaches. These terms are not only the foundation on which approaches to cross-cultural and ethnoscientific research are formulated, but they are also the basic analytic and methodological perspectives used in carrying out ethnoscientific research (Brislin, 1980). Thus, a discussion of these terms is important in explaining the underlying approach taken in the research discussed in this dissertation.

The terms emic and etic appear to have been coined by Pike (1954) to denote two contrasting procedures of linguistic analysis. One, phon*etics*, classifies language based on the acoustic properties of sound, properties that are comparable across cultures. The other, phon*emics*, involves the classification of language in terms of its internal function in the culture in question, and is not comparable across cultures (Emerson, 1983). Use of these terms has since been expanded to differentiate two analytic approaches to social science research,[16] where:

1) 'etic' refers to "culture-free" elements of analysis, those that are universally applicable across cultures; and

2) 'emic' refers to analytic elements that are "culturally unique" or appropriate within only one cultural setting (Sturtevant, 1964).

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[16] In much social science research carried out today, these two approaches are rarely applied independently of each other, but are melded together to form a balanced approach.

The basic premise of emic and etic analysis according to Pike (1954) is:

> An etic analytical standpoint ... might be called "external" or "alien," since for etic purposes the analyst stands "far enough away" from or "outside" of a particular culture to see its separate events, primarily in relation to their similarities and their differences, as compared to events in other cultures, rather than in reference to the sequences of classes of events within that one particular culture. (p.10)
>
> In contrast to the Etic approach, an Emic one is in essence valid for only one language (or one culture) at a time. ... It is an attempt to discover and describe the pattern of that particular language or culture in reference to the way in which the various elements of that culture are related to each other in the function of the particular pattern, rather than an attempt to describe them in reference to a generalized classification derived in advance of the study of the culture." (p.8)

The field of ethnoscience, or the "New Ethnography" as it is also called (Werner and Schoepfle, 1987), is based, to a great extent, on the emic approach. Some proponents of ethnoscience have even claimed that the emic method of research is the only valid approach for the advancement of cultural anthropology (Pelto and Pelto, 1970).

In a critique of this perspective of the emic approach, Harris (1968) emphasized that semantic heterogeneity and intracultural variation are not accounted for by the emic approach, and he concludes that "the tendency to write ethnographies in accord with the emic rules of behavior result[s] in an unintentional parody of the human condition." To overcome these faults, Harris proposes an etic approach to social science research based primarily on intensive observation of actual human behavior. Even though eticists agree that verbal data can provide useful insights, they emphasize that verbal description should not be the main evidence for actual behavior. Results from etic research based on behavioral observation have shown that there are important discrepancies between what people do and what they say they do, and that accounting for these differences is essential for developing accurate ethnographic descriptions of cultural groups (Harris, 1974). However, etic based research demands more time (and therefore money) to carry out than most researchers have at their disposal. For this and other reasons, a composite emic/etic approach has become more common than either the purely etic or emic approaches.

Table 2, from Pelto and Pelto (1978), summarizes the basic difference between the emic and etic approaches. The differences between these two approaches, and in turn the differences between their practitioners, were the basis for one of the most important theoretical disagreements in cultural anthropology (Pelto and Pelto, 1978). As with many theoretical perspectives, there are few, if any, emic or etic purists. Much social science research melds these two approaches into a composite approach that allows researchers "to grasp the native's point of view, his {sic} relation to life, to realize his {sic} vision of his world" (Malinowski, 1922, as quoted in Pelto and Pelto, 1978) and evaluate this against observed behavior.

Composite emic and etic approaches to social science research have been adopted and adapted by many researchers who wish to comprehend and explain different aspects of human behavior and the interaction of people within their environments. These perspectives are useful, in that they can help researchers identify important indigenous cultural elements, and exogenous preconception. Even a composite emic and etic approach may not sufficiently account for potentially important cultural and environmental variables that may effect human behavior, perception, and cognition. The role of biophysical and social

Table 2

Comparison of Emic and Etic Research Approaches*

Emic	Etic
1. Primary method is interviewing, in depth, in the native language.	-Primary method is observation of behavior.
2. Intent is to seek the categories of meanings, as nearly as possible in the ways "the natives define things."	-Intent is to seek patterns of behavior, as defined by the observer.
3. The people's definitions of meaning, their idea systems, are seen as the most important "causes" or explanations of behavior.	-Impersonal, nonideational factors, especially material conditions, are seen as significant movers of human action.
4. Systems and patterns are identified through logical analysis, especially by quasi-linguistic analysis of contrasting sets.	-Systems and patterns are identified through quantitative analysis of events and actions.
5. Cross-cultural generalizations must wait for the conversion of culturally specific patterns and meanings into more abstract, intracultural categories.	-Cross-cultural generalizations can be made directly, by applying the same methods of observation, with the same outside-derived concepts, to two or more different cultures.
6. The methodological strategy is fundamentally inductive, for research cannot proceed until the "natives' categories of meaning" have been *discovered*.	-The methodological strategy can range from "pure induction" to various mixtures of inductive and deductive research.

*Source: Pelto and Pelto, 1978)

environments within and beyond the boundaries of communities under study may also need to be accounted for.

Ashby (1985) provides an example from Colombia which shows the importance of this in explaining apparent irrational behavior of farmers.[17] Ashby investigated land use practices that were responsible for extensive farmer-induced soil erosion in the highlands of Colombia. Her research showed that the interaction between inconspicuous historical, biophysical and social parameters

[17] The conclusion that the behavior of these farmers was indeed irrational, might have resulted if only an emic or etic approach to the research had been used. As Ashby explains, an outsider could easily be convinced of the irrationality of the farmers' behavior if conclusions were based on observation alone.

within and beyond the farming community produced conditions that made the farmers' behavior rational from their perspective.

To summarize, ethnoscience and the new ethnography, and the embodied emic and etic approaches, is not simply a study of people or culture, rather, it is a process of learning from people of a culture foreign to the researcher about their world (Goodenough, 1971; Spradley, 1979).

3.4 Indigenous Knowledge Systems

Indigenous knowledge systems research, which has gradually evolved into a fairly distinct field of enquiry, is one type of cross-cultural research that has its origins in ethnoscience. For this dissertation, indigenous knowledge is defined in abstract and literal terms as the sum of science, technology, environmental understanding, information, and social understanding (i.e., knowledge) possessed and used by a specific social unit in a defined locality (i.e., indigenous). Additionally, it is accepted that all social units, western and non-western, urban and rural, have their own indigenous knowledge systems. The simplicity of this definition avoids the problems that often accompany efforts to qualify the differences between indigenous knowledge and other systems of knowledge. Such comparisons often lead to the labeling of indigenous knowledge as "good or bad," "old or new," "scientific or unscientific," "traditional or modern." However, this definition does not completely suit the needs of this dissertation. Therefore, a more expansive definition of indigenous knowledge will be developed through a discussion on indigenous knowledge as it corresponds and contrasts with formalized and i

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and institutionalized western science and technology. Additionally, certain important issues related to indigenous knowledge will be presented.

Some of the differences between ethnoscience, and indigenous knowledge research are presented in Table 3. This information does not provide an adequate understanding of this relatively young field of study. The following discussion will examine the field of indigenous knowledge research in greater detail. In this dissertation the phrase indigenous knowledge is used instead of one of the many alternative terms present in the literature. As Barker *et al.*, (1977) explain:

> A number of not altogether satisfactory terms have been coined to cover the [study of indigenous knowledge systems]. ... [The terms] "ethno-science", "ethno-botany", "folk-medicine", "folk-ecology" carry undesirable "us-and-them" connotations. We propose "village science", intending it to refer to the scale rather than the quality of knowledge and investigation involved." pp.2-3.

Table 3

Distinctions Between Ethnoscience and Indigenous Knowledge Research

Ethnoscience Research	Indigenous Knowledge Research
1) applied over a broad range of topic areas;	- applied to a narrower range of topic areas;
2) linguistics is the dominant analytic tool;	- no dominant analytic tool used;
3) strongly associated with the disciplines of anthropology and sociology;	- not strongly identified with any specific academic discipline;
4) a mature well established field of study; and	- a relatively new field of study; and
5) a primary goal is the continued progress on the development of theories of human behavior.	- in addition to theory development, application to practical problems is an important goal.

Examples of some of these terms include, indigenous technical knowledge (IDS, 1979), folk science (Hunn, 1975), folk taxonomy (Berlin Breedlove, and Raven, 1968), traditional knowledge (Swift, 1979), traditional technology (Wilken, 1988), and peoples science (Richards, 1985). Besides these terms, there is a family of ethno-*terms*, as mentioned earlier, that populate the literature. There are semantic and content differences among these terms, but to a great extent they all draw upon a common conceptual basis. For this reason the term indigenous knowledge is used in this dissertation.

3.4.1 Indigenous Knowledge Defined:

The phrase indigenous knowledge and its many synonyms are used extensively and almost haphazardly in the literature, and except for the term ethnoscience, concise abstract definitions are rarely offered. For example, in the introduction to a major text on this subject (Brokensha, *et al.*, 1980), an abstract definition of indigenous knowledge was explicitly avoided. In place of a definition, this text presented a series of case studies of indigenous knowledge research, and readers were left to formulate their own definitions. This relative absence of definitions for indigenous knowledge is partly a reflection of the complexity and diversity of the ideas embodied within this concept. This may also be related to the relative immaturity of this field of research as compared with ethnoscience.[18] A final, and possibly more important reason for the apparent difficulty in defining indigenous knowledge, is our poor understanding of the structure and function of indigenous knowledge systems.

3.4.2 Misconceptions and Myths:

As mentioned above, the term indigenous knowledge can be used in a discussion of any society, but it is most commonly used (as in this dissertation)

[18] Studies of indigenous knowledge systems have been carried out for more than a century by anthropologists, but these have generally been presented within the context of ethnographic studies, and not as discrete entities. Within the last 10 to 20 years indigenous knowledge research has been undertaken and presented as a distinct field of study (Brokensha, *et al.*, 1980).

to represent that body of knowledge, science, technology, and environmental understanding that is used by rural people in non-western societies.[19] Swift (1979) emphasizes this distinction, stating that Western or international knowledge systems arose "essentially from the European scientific revolution of the 17th century," while the origins of non-Western knowledge systems are independent of this event.[20] This distinction between indigenous, non-western knowledge systems and their modern international scientific counterparts can be either useful or unproductive in formulating an understanding of this topic. It can be useful because it focuses the discussion and provides a point of comparison through which characteristics of each can be exposed. It can be unproductive because it can lead to pejorative judgments against the value, or even the validity, of indigenous systems of knowledge (Bell, 1979; Fuglesang, 1984; and Dove, 1984).

The term indigenous may incorrectly imply that the content of such knowledge systems originates solely from within the indigenous society in question. The bodies of knowledge of most, if not all, societies consist of a mix of knowledge, indigenous and exogenous in origin (Conklin, 1957; Johnson, 1977; IDS, 1979; and Brokensha, *et al.*, 1980). Along these same lines, indigenous knowledge has been contrasted with "modern knowledge," a comparison that carries the incorrect inference that indigenous knowledge systems are historical and not contemporary, and thus not growing, changing, or evolving. For example, Fonzen and

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[19] Since this research was carried out in a rural non-Western community, this type of society is the focus of this discussion. However, it is important to note that extensive indigenous knowledge systems, that may be quite dissimilar from "Western scientific" knowledge systems have also evolved in both Western and non-Western rural and urban societies.

[20] The term "international scientific" will be used in place of the term "Western" when talking about scientific oriented knowledge systems that have originated from the European scientific revolution. This type of knowledge system has become internationalized and is practiced by people in all countries of the world, thus it is no longer appropriate to refer to it as "Western".

Oberholzen (1984), in their description of an indigenous farming system in Nepal, comment that:

> "... it is evident that this is a purely subsistence system on which practically no improvement has been made over the past several decades." (p.196)

Apart from the absolute arrogance of this statement, there are serious problems due to the absence of supporting data. It is highly doubtful that historical data necessary for such a comparison are available, and thus one must question the validity of this statement.

Rural societies are not just vessels of static indigenous knowledge. As Johnson (1972) explains, new knowledge is generated within indigenous systems through processes of trial-and-error and experimentation. Conklin (1957), provided an example of this process in his description of the experimental plots maintained by Hanunoo people of the Philippines:

> "Cultigens of all sorts -- especially new or unfamiliar varieties -- are grown experimentally in small houseyard gardens as single objects of great horticultural interest." (p.110)

Support for this perspective also comes from Nepal. Whiteman (1985) describes a locally developed method used by farmers in the Jumla area (2,200 m in altitude) to overcome the difficulty of germinating rice in seedbeds flooded with very cold water. According to this research, farmers use a:

> "thin layer of a mixture of sifted compost and scorched cow dung [that] is sprinkled to blacken the soil surface [in rice seedbeds]. Thus, heat is absorbed and the water is warmed." (p.160)

This and other indigenous agricultural technologies allow farmers of this area to cultivate rice under harsh conditions with very short growing seasons. A final example of indigenous experimentation comes from Nigeria, where farmers have exhibited a tradition of agricultural experimentation. A scientist working in

Nigeria thought that he had made a breakthrough by discovering how to propagate yams from seed rather than via the usual vegetative methods. Later, this scientist learned of a farmer who had also succeeded in propagating yams by seed. However, this farmer had also learned that the second generation of yam tubers were much larger than the first generation tubers. In response to learning about this farmer's work, the scientist was reported to have said, "Thank God these farmers don't write scientific papers." (Howes and Chambers, 1980)

In addition to new knowledge generated at the local level, knowledge enters systems from the outside through processes of adoption, modification, and diffusion. Dommen (1975) and Sansom (1969) present two examples in which exogenous knowledge was adopted into and modified by indigenous systems. Similarly, Cashman (1988) describes how knowledge of alley cropping was adopted by farmers in rural Nigeria. These empirical examples are supported by observations of the large variety of relatively new food crops that have been adopted by farmers throughout the word. For example, in Nepal many varieties of domestic and "wild" vegetables, rice, wheat, and legumes, have gradually been incorporated into farming systems and developed through careful selection for important characteristics. Hatley and Thompson (1985), explain that extreme environmental conditions and traditions of "seed exchange between regions" have contributed to a regional farm-based collections of many wheat varieties with a diverse array of traits. They emphasize that:

> "This diversity [of wheat varieties] is not something that is just *there*; it has been created, is maintained, and is being continually modified and *developed* by the interplay of endless small decisions by millions of small farmers." (emphasis in original, p. 368)

Some of these varieties are only known and cultivated in limited and localized areas, while others are diffused across geographic, ethnic, and political boundaries (Witcombe and Rao, 1976). For example, during a stay in a Nepalese hill village Rusten (1988) met a farmer who pointed out a great variety of, trees, legumes, flowers, and other plants that he had collected from forests and from other farmers and established on his land. Not surprisingly, many of these plants had originated from his local area, but many had also been collected from fairly distant places. When asked about his reasons for collecting these different plants, he replied, "there is profit [benefit] in learning from other farmers."[21]

Another example from Sierra Leone shows that the existence and maintenance of plant varieties is not random or unplanned. Research by Squire (1943) on management practices of rice varieties by Mende farmers showed that:

> "There are at least fourteen and probably as many as twenty varieties [of rice] well known to farmers who can recognize them at once and unerringly when shown samples. Moreover, every precaution is taken to keep the varieties pure. Seed rice is reaped from the centre of fields while the borderline between fields of different varieties is eschewed. During the drying process the *padi* is carefully rogued before the seed is put away for the next planting. Almost everybody in the native village appears to be well acquainted with the varieties and the rogueing is generally done by women and even children...All the listed varieties are well liked and widely grown and each farmer may have several fancies. Some are reputedly quick, others heavy yielders; still other most suitable for certain types of 'bush' according to individual experience...Yet the subject has received but little attention judging by the absence of records and collections." (Squire, 1943, as quoted in Richards (1985), p.144)

Related to the erroneous ideas about the origin and evolution of indigenous knowledge discussed above, is the belief held by some Western and Western-trained researchers that farmers' knowledge is not "scientific." Schroeder (1985)

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[21] This same farmer also reported that he regularly cultivated 17 to 21 different types of rice that he recognized as distinct varieties. Each rice variety was either grown for specific consumptive purposes, e.g., medicinal, ceremonial, seasons, cash sale, and storage, or because they grew well under varying environmental conditions of soil type, altitude, water stress, etc.

confronted these beliefs during research on farmer decision making processes in Nepal. As described by Schroeder:

> "Agronomists, plant breeders, and other agricultural specialists expressed the view that farmer knowledge was not systematic, but that it consisted of simple memory of precedent or memory of what had worked well and what had failed in previous seasons." p.38

Results of Schroeder's research, however, discredits these beliefs:

> "... farmer knowledge was well organized and systematic. Knowledge was scientific in that farmers experimented with crops, varieties, and management, and used the results of their experiments both to help them determine subsequent agricultural strategies and to refine their model or theory of how agriculture take place. Farmers utilized very developed land and plant classification schemes to match cropping patterns and crop variety with each of the small fields that they farmed." (p.38)

In a similar example, Richards (1985) describes how Mende farmers of Sierra Leone, when presented with new varieties of rice, proceeded to carry out "quantitative input-output trials, using the same vessel to measure seed planted and harvested." They also performed "germination tests on rice of doubtful provenance" using a method similar to the "rag doll method recommended by the International Rice Research Institute." Richards qualifies these examples by stating that:

> "It must not be supposed, however, that these experiments necessarily share the same methodological assumptions or purposes as research-station experiments. Farmers may prefer the variety inherent in local planting material to the uniformity of pure line selections. ... (T)his preference reflects peasant concern to keep open as many options as possible in the face of environmental uncertainty." (p.145)

This qualifier does not in any way reduce the "scientific" character of Mende experimentation and rationale, but just offers a clarification based on the insiders' view.

Another myth about indigenous knowledge systems is that they are often spoken of as being born from the purely functional needs of people, and that they are primarily utilitarian in nature. It is true that much indigenous knowledge (and much knowledge associated with Western societies) that we are aware of is highly useful within the social systems in which it is utilized. However, not enough is known or understood about indigenous knowledge systems to support the universality of this judgment. As Howes (1979) emphasizes, "(l)abelling indigenous knowledge as utilitarian implicitly denies it an abstract or intellectual dimension, and effectively excludes from consideration its potential for independent development and growth."

3.4.3 Comparison and Contrast:

Acquiring an improved understanding of indigenous knowledge systems is not furthered by fabricating hierarchical labeling systems that relegate indigenous knowledge to "inferior" levels of intellectual endeavor. By not passing "judgment" on these systems, our understanding of them will be enhanced. Additionally, an improved understanding of these differences and similarities will potentially lead to more productive relationships between exogenous change agents and indigenous people. According to Howes (1979), furthering this relationship requires, "a systematic search for the abstract principles and categories which govern the ordering of the bodies of empirical" indigenous knowledge.

Indigenous knowledge, like international scientific knowledge, is based on the need to establish order from the perceived disorder of the world around us, and in turn, understand.[22] The utilitarian attributes of indigenous knowledge, although important, are not the exclusive stimuli for its creation, modification, and transmission. As Levi-Strauss (1966) explains, this striving for order "is equally

[22] It is important to keep in mind that there is no one type of order, i.e., one person's or culture's "order" may be another's disorder.

true [and characteristic] of all thought ..[and].. it is through the properties common to all thought that we can easily begin to understand forms of thought which seem very strange to us."

Two elements in this statement are especially important to developing an understanding of indigenous knowledge systems. First, Levi-Strauss's emphasis on order being a common thread linking all forms of thought provides insight into one potential avenue for investigating another culture's knowledge system. This course of research first requires critical components of a knowledge system be identified. Then the culturally defined system of order that all knowledge systems possess, and that link these components together and make them a functioning system, must be *learned*. Second, Levi-Strauss's allusion to a relationship between different forms of thought and order permits us to understand why different forms of thought "seem very strange to us." This "strangeness" is not intrinsic to the knowledge system itself, but an artifact of the outside observer and his or her nescience.

However, there are important identifiable differences and similarities between indigenous systems of knowledge and those based on institutionalized science. An awareness of such differences is important in that it can facilitate our ability to better understand both systems. However, a comparison between these systems should not form the basis of pejorative judgments against either. For any specific situation, a comparison between indigenous and international knowledge systems may lead to one of the following conclusions:

1) Indigenous knowledge is a misrepresentation of the facts, with science offering a more accurate explanation of some aspects of "reality." For example, the germ theory as an explanation of illness versus the psychosomatic explanation of some indigenous peoples.

2) Indigenous conceptualization of natural phenomena is comparable or superior to that offered by international science. For example, the classification of plants used by the Tzeltal Indians (Berlin, *et al.* 1974).

3) Indigenous and international scientific explanations diverge, but each possess qualities and insights that add to the understanding of natural phenomena. An example of this is the scheme for the classification of tree fodder used by hills farmers in Nepal that is discussed later in this dissertation (page 187).

In light of this, the following discussion is necessarily limited to generalizations, and there are bound to be exceptions to many of the statements which follow.

One important way that international science and indigenous knowledge are different is in the way that phenomena are observed. International science has at its disposal tools and technology that enable observation of phenomena to extend beyond the limits of human senses, while indigenous science is almost exclusively restricted to observations made by human senses with limited external help. One immediate result of this difference is in the content of these knowledge systems. For someone schooled in Western or international science, this difference in methods of observation might also be seen as a significant advantage of international science over indigenous systems. For many situations this is an arguably correct assessment. However, technology can only aid the exogenous process of observation, it does not necessarily make for superior observation.[23] Furthermore, technological aids may improve some aspects of observation by compensating for certain inadequacies in human sensory ability, while at the same time weakening the function of other skill levels of observation (Norman, 1981).

[23] Ultimately, all observation occurs at the level of the human mind. Thus, cognitive processes unique to each person influence what is "observed." Therefore, not everyone will necessarily observe with the same fidelity, even if they use the same technology.

Another important area of difference is between the reductionist process of international science, and what can be called the holistic process of indigenous science. One major goal of international science is to reduce natural phenomena to their simplest discrete elements. Then, by understanding the structure and function of phenomena at this reduced level an explanation of the gross phenomena may be developed. In contrast, indigenous knowledge systems seem to build an understanding of natural phenomena on observation at a component level, and on relationships between phenomena as they exist within larger social, biophysical and/or spiritual systems. For example, Burton and Kirk (1980) describe a study of different classification systems of human body parts used in three cultures. The people in their study classified and described, both functionally and structurally, individual external and internal body parts. However, in order to develop an understanding of some of the indigenous ideas surrounding body structure and function, it was necessary for these researchers to move beyond the level of discrete body parts and, "to take a holistic approach ... [and recognize] ... that the body is a system, and is perceived as such by people." Additionally, research on the Tsembaga people of New Guinea as reported by Rappaport (1984) provides an example of how an indigenous knowledge system can involve social, environmental, and spiritual variables.

Related to the reductionistic perspective discussed above, is the view presented by Richards (1985) that international science deals with "universals: principles that are true for all time and place. ... [Thus,] (s)cience derives its unique power to transform the world precisely because it is not confined to the particularities of time, place and special interest" (p.10). While indigenous knowledge systems, are more concerned with explanations and predictions related to the "particularities of time, place and special interest." This characteristic of indigenous knowledge systems as being localized and particularistic appears to be one reason for such systems having been ignored by Western and Western-trained scientists working in non-Western societies. Richards (1985), suggests that this prejudiced view of indigenous knowledge systems needs to be overcome, and that:

> "especial attention should be paid to the particularities of ecological relationships in the African environment [and elsewhere that are known by indigenous people]. ... Intellectuals, development agencies and governments have all pursued environmental management problems at too high a level of abstraction and generalization [with an over reliance on scientific universals]. Many environmental problems are, in fact, localized and specific, and require local, ecologically particular, responses." (p.12)

According to Howes and Chambers (1980), a comparison between international science and indigenous (science) knowledge can also be discussed on the basis of three interrelated criteria: "- as systems of classification; - as systems of explanation and prediction; [and] - in terms of speed of accumulation." These authors suggest that in terms of systems of classification, indigenous knowledge systems and international scientific systems are fairly comparable. In terms of systems of explanation and predictions, however, the level of comparability is less, with international science having more interpretive and predictive power. Under the final criteria, speed of accumulation, international science is seen to have a clear advantage over indigenous knowledge systems.

An explanation for the weak comparisons between indigenous and international scientific knowledge systems under the last two criteria are found in an examination of the position of "science" within Western and non-Western rural societies. In international scientific systems scientists exist within highly specialized niches. In contrast, the degree of specialization is less in non-Western agrarian societies.[24] However, in both Western and non-Western societies, knowledge is not distributed evenly across the society. Differences in distribution of knowledge exist both horizontally and vertically within societies, and can be evaluated in both qualitative and quantitative terms. However, research suggests that the degree of variance within this distribution of knowledge is less in non-Western societies than in Western social systems (Conklin, 1957, Berlin, *et al.*, 1974, Heinz and Maguire, n.d., Richards, 1985). The lower level variation may, in part, be due to three related factors: 1) similarities in subsistence strategies within specific social systems; 2) the nature of oral and observational mechanisms used to transmit knowledge from one generation to the next and among members of the society; and 3) the relatively high degree of interdependence that exists between members of social systems.[25]

Differences in the rate of development and dissemination of knowledge in international scientific and non-Western knowledge systems is another important distinction. Formalized and institutionalized systems of inquiry based on international scientific systems of hypothesis building and testing do not appear to have an analog in indigenous systems. This apparent lack of formalized "research" systems, coupled with absent or poorly developed non-oral mechanisms for recording and disseminating knowledge and discovery, reduces the rate at which knowledge is developed and diffused within and among indigenous systems. This

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[24] There are important exceptions, for example, medicine, religion, indigenous crafts, and trade and commerce. However, people working in these specialties will also generally have knowledge about farming practices and the local biophysical environment.

[25] The level of variance may increase as the heterogeneity of social systems increase, and as interdependence diminishes.

difference is closely related to another distinction between international scientific and non-Western systems of knowledge suggested by Howes and Chambers (1980):

> "Science is an open system whose adherents are always [at least in theory] aware of the possibility of alternative perspectives to those adopted to any particular point of time. (An indigenous knowledge system), on the other hand, as a closed system, is characterized by a lack of awareness that there may be other ways of regarding the world. ... (C)hanges that occur (in indigenous systems) are nearly all ... relatively minor 'puzzles' within an established 'paradigm' of thought. Science, in contrast, constantly carries with it the possibility of 'revolutionary change' in which one paradigm would be destroyed and replaced by another" (p.324).

This broad and general statement does offer some insight into the dichotomy between international scientific and non-Western systems of knowledge, and in theory it may be true. However, in practice, there are significant exceptions. For example, practitioners of international science are notorious for not being very "aware of the possibility of alternative perspectives" of the world, especially when they interact with people of other cultures. Furthermore, it is the indigenous systems of knowledge that are often being asked to undergo "revolutionary change."

Another, and possibly better, way of thinking about the ideas presented by Howes and Chambers is to examine differences in the links between international scientific knowledge systems and western culture, and those of indigenous knowledge systems and their cultures. In general, it appears that international scientific and technological knowledge has been artificially removed or isolated from other aspects of Western culture. Western oriented social systems have separated science and technical knowledge from every day life. Even within scientific disciplines there exist restrictive boundaries between related fields of study. In contrast, indigenous scientific and technical knowledge seem to be tightly encoded within the relationships between indigenous populations and their social

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social and biophysical habitat (Hatley and Thompson, 1985). It is an integral part of their lives and their culture. Richards (1985) describes this relationship as follows:

> "Scientists have what might be termed 'microscope' knowledge. Farmers are able to locate technical details in a social context. The two types of knowledge are complementary." (p.149)

This last point is one of the reasons for indigenous knowledge being so difficult to decipher. Such knowledge systems are often so tightly integrated within the whole complex of a culture that isolating it for study becomes both artificial and futile. Additionally, developing an understanding of an indigenous knowledge system demands that interpretation of identified elements of such systems be carried out within their cultural context. Contending with these and other problems requires that researchers tap a variety of research approaches and methods in carrying out their research (Whyte, 1977).

One such approach and method, used in this research, draws on the theoretical work of Kelly (1955) who developed the personal construct theory. It is not the intent of this dissertation to present a comprehensive discussion on PCT. Therefore, the following section only briefly discuss those aspects of this theory that apply to this research.[26]

3.5 Personal Construct Theory

3.5.1 Introduction:

As mentioned above, one of the keys to successful cross-cultural, ethnoscientific, and indigenous knowledge research is to formulate an

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[26] A number of texts deal extensively with this theory, examples include: Kelly, 1955; Bannister and Mair, 1968; Bonarius, 1965; Bannister, 1985; Moore and Golledge, 1976; Shaw, 1981)

understanding of the natives' view of their world. Achieving this goal is far easier said that done. To overcome some of these difficulties, ethnographers have developed a variety of research methods based on linguistics. However, for researchers who are not anthropologists, or not schooled in linguistics, these techniques can be arduous to apply, and produce results that may be less than satisfying. The approach that was selected by this researcher proved easier to understand and apply, and more relevant to the attainment of research goals is based on the Personal Construct Theory (PCT).

Besides being easier to comprehend and use, PCT and its primary research method, the repertory grid technique, are well suited to achieving a major goal of this research. This goal involved identification and analysis of an indigenous system of classification and evaluation of tree fodder resources used by farmers in one community in Nepal. In other words, this research undertook an investigation of aspects of a knowledge system surrounding the domain of tree fodder.

Investigating cognitive systems is problematic because cognitive representations[27] of elements of the perceived environment are not directly observable or measurable, and as Moore and Golledge (1976b) explain:

> "...internal representations [that exist within a cognitive system] must be inferred from one or more external, symbolic representations (e.g., sketch maps of a city, poems, or linguistic categories) or from other forms of observable behavior." (p.8)

Formulating an "inferred" understanding of a person's cognitive system requires that external observable elements, i.e., representations, be identified and analyzed.

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[27] The term representation, is used here in reference to knowledge and thought, in a similar way that other authors have spoken of "images" (Harrison and Sarre, 1971) that people construct of their world, or the "personal constructs" (Kelly, 1955) people formulate to organize knowledge of their environment. These "images" and "personal constructs" are thus representations of "things" or "mental objects" that cannot be directly observed. (Moore and Golledge, 1976).

Eliciting and analyzing this information with a minimum level of distortion is one major problem in achieving this inferred understanding. Compounding this, is the problem of re-formulating the native perspective in ways that will be meaningful to other cultures. In addition, even though information is elicited from people, the re-formulation and description of the indigenous knowledge systems is often carried out at the level of social groups. This "averaging" of individually based information to derive an understanding of an indigenous knowledge system at the societal level is, to say the least, problematic. For some situations, contending with these problems of identification, isolation, analysis, and re-formulation, that are endemic to indigenous knowledge research, is facilitated by the application of PCT and the repertory grid research technique.[28]

3.5.2 Basic Principals of PCT:

Personal construct theory and associated research methods were developed by Kelly (1955) within the field of interpersonal psychology. However, the ideas and methods embodied within this theory are sufficiently flexible to permit their application to other problems involving the understanding of cognitive systems at both the individual and community level. As Downs (1976) writes, Kelly's theory is "capable of organizing and making sense of our real world experiences, of providing insights into how the world works, of generating expectations of what might happen." Besides helping people understand and make sense of their own world, this theory is designed to help researchers understand how other people make sense of their world.

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[28] Using PCT and the repertory grid technique is only one possible way of getting at this understanding, other methods are described in Moore and Golledge (1976a) and Whyte (1977).

This quality of the PCT is a product of one of the major assumptions about human nature that is embedded within it. Kelly argues that hypothesis formulation and prediction are not solely the domain of scientists, but that all people construe,[29] or "place an interpretation" on their world in much the same way as scientists do. All people are like scientists in that we are all concerned with prediction and control of our environment (Bannister, 1962). This assumption has been summarized in the phrase "man-the-scientist," a phrase that has become synonymous with Kelly's theory. This assumption is also embedded within the concept of indigenous knowledge systems research, and thus forms a natural link between PCT and research into indigenous knowledge systems.

By taking this perspective, Kelly is emphasizing that as people observe and reflect on the world around them, they gradually develop "conceptual models [of their world] which are used in deciding on future action" (Harrison and Sarre, 1974). This analogy is <u>not</u> intended to suggest that all human mental behavior is equivalent to the scientific method.[30] However, Kelly does suggest that for a majority of people this analogy adequately explains the daily *interactional* relationships that occur between people and their environment. As Barker (1977) explains:

> "Individuals react to how something appears to be to them, rather than how it is in reality. Thus information is used in a way which is 'objective' or 'rational' to an individual and not necessarily in any 'real' sense. ... Individuals make observations of the real world, set up conceptual models of reality to interpret these observations, and use these interpretations to set up hypotheses of future events upon which they base their decisions about future actions."(p.4-5)

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[29] Construing, according to Kelly (1955) is "a way of seeing events that makes them look regular."

[30] It is interesting to reflect on the thought that the formal Western scientific method may have evolved out of this informal "scientific" characteristic that all people share. Just as other, possibly less formalized knowledge systems have also evolved from this basic and universal human quality.

This perspective on human behavior is consistent with and especially suited for cross-cultural, ethnoscientific, and indigenous knowledge systems research. Conceptual models that people formulate in an industrial society will likely be influenced by scientific and technological values and attributes of this society. In the same way cognitive systems of people of another culture are conditioned by a set of world experiences that, although different from those in an industrial society, are no less rational or scientific.

The basic premise of the PCT is that "a person's processes [e.g., perception, cognition, behavior] are psychologically channelized by the ways in which he {sic} anticipates events" (Kelly, 1955). Kelly uses the term "personal constructs" to define the psychological structures or channels that guide human processes. These personal constructs can be likened to perceptual and cognitive filters, for it is through these filters that people evaluate and interpret the world around them.[31] Accordingly, human behavior and indigenous knowledge systems, can be understood to the degree that construct systems can be subsumed, i.e, the degree to which we, as outsiders, can understand the structure and function of other peoples' cognitive filters, or construct systems. Two major implications can be derived from this statement: 1) human behavior can be viewed as anticipatory in nature rather than purely reactionary; and 2) the character of anticipation is dependent on, or "channelized" by the psychological interpretation of the environmental events.

[31] It is important to emphasize that these filters or "goggles" as Kelly calls them, are not passive tools of measurement. Rather, they are interpretations that are impressed upon events to help make sense of them.

All constructs can be differentiated and classified by the "nature of the control which a construct implicitly exercises over its elements" (Kelly, 1955). There are three classes of constructs: preemptive, constellatory, and propositional. The preemptive construct is a "nothing but" type of construct. For example, if a tree is perceived as a fodder tree, it is nothing but a fodder tree. The constellatory construct is used in stereotypes of typological thinking. For example, if a tree is perceived as a "good" fodder tree then it may also be seen as being nutritious, easy to collect, and good for milk production. The propositional construct carries with it no additional qualifications or implications, it is an "as is" construct. For example, if a tree is perceived as being a fodder tree, it may also be seen as a fuelwood tree, a timber tree, a fruit tree, or a shade tree, with no one of these representing the absolute truth about this tree. Each of these classes of constructs is progressively more open in the way that they allow people to construe[32] their world. It is suggested by Bannister and Fransella (1971) that the more propositional a person's constructs are the "richer" their world will be, and the less likely they are to be "trapped into a conflict which arises out of the rigidity of" their viewpoints.

One major value of this classification scheme is that it has the potential of helping researchers understand differences in the way that people in a community construe elements of their environment. Another major value is that it also has the potential to help researchers evaluate their own responses to different research situations. In this respect, a researcher with constellatory or propositional

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[32] Kelly (1955) defines construing to mean "placing an interpretation" on something a person observes in their environment; it is a process by which meaning is given to observations. The process of construing is a comparative process, whereby a person identifies the elements of an event that are similar to and different from the elements of other events. Thus, a person assembles bipolar constructs of similarity and contrast.

constructs may have greater success in dealing with cross-cultural research problems. Additionally, if a researcher were able to recognize that he or she was construing a research problem with either preemptive or constellatory constructs, an effort could be made to reconstrue, or reevaluate, the research using propositional forms of constructs.

Constructs have a dynamic character that is important to understand, since they are more than just simple discrete labels for elements in our world. Constructs are developed, applied, and evolve as we strive to understand how our dynamic world works so that we can continue to make predictions about future events. As Kelly (1955) stresses, "A meaningful construct is one which is designed to embrace the future rather than merely catalogue the past." The dynamic character of constructs is also related to their origin. As Kelly (1970) explains:

> "Neither our constructs nor our construing systems come to us from nature, except, of course from our own nature. ... We cannot say that constructs are essences distilled by the mind out of available reality. They are imposed *upon* events, not abstracted from them; that is from the person who is to use them." (p.13)

3.5.3 Constructs and Corollaries:

Within PCT, Kelly has developed a series of corollaries, each expanding on characteristics of personal constructs and on other aspects of this theory (see Appendix A for a complete outline of PCT). Those corollaries and other clarifications of this theory that are specifically important to this dissertation, are discussed in the following section. The PCT will be discussed as follows: 1) from the perspective of individuals; 2) from the perspective of communities; and 3) from the perspective of change and evolution. Examples are occasionally provided that demonstrate how aspects of this theory are related to this research.

3.5.3.1 **Individuals and Constructs:** As mentioned above, indigenous knowledge research aims to understand the native's view of one domain of the native's world. Thus, indigenous knowledge research is generally carried out with individual members of a community, and in some cases very few knowledgeable consultants are involved. This discussion focuses on a selection of Kelly's corollaries. It is used to both further our understanding of the PCT and to show how this theory might facilitate our understanding of indigenous knowledge at the individual level.

According to the "Dichotomy Corollary," people interpret aspects of their world by categorizing them as either different or similar to other elements. These differences are represented in terms, both verbally and non-verbally, that are meaningful to them. These personally meaningful terms of reference are Kelly's personal constructs. Kelly postulated that these constructs exist as bipolar scales that express meaningful contrasts between opposing psychological attributes of elements perceived in the environment. It is important to emphasize that the poles of a construct are seen as being psychological opposites, not necessarily as logical opposites. This is because the verbal labels that represent some poles of a person's constructs may not appear to another person or a researcher as logical opposites (Harrison and Sarre, 1974). This idea sets constructs apart from the idea of concepts. Concepts are conventionally expressed as logical opposites, i.e., black-not black or black-white, while constructs are not restricted to logical opposites. Someone may have the construct, blue-brown, that is useful in understanding some aspect of their world. As such, it is a *personal psychological* structure, and it is not necessarily logical -- however, it is used because it works (Downs, 1976).

It is also important to view the bipolar nature of constructs as gradients rather than as simple rigid dichotomies. A construct that functions as a gradient between two poles is built from dichotomous constructs, with the gradients or scales often representing a hierarchical ordering of constructs. More abstract constructs, e.g., good vs bad, are super-ordinate constructs, and they include less abstract subordinated constructs. "Thus "more greyness -- less greyness" is a further abstraction of the construct "black-white" (Bannister,1962).

Kelly's exact definition of a construct states that "a construct is a way in which two things are alike and by the same token different from a third." Kelly postulated that for a construct to be formed at least three elements have to be present. Two elements would form the similarity pole of the bipolar scale, and the third element would form the contrasting pole. Once a construct is formed, however, it can be applied against single or multiple elements. This concept of a triplet of elements being required for construct formulation is important because it provides researchers with the primary method of exposing sets of constructs that are used in discriminating or evaluating elements within a domain of knowledge.[33]

The "Range Corollary" postulates that each construct has a limited range of applicability. In Kelly's words, "a construct is convenient for the anticipation of a finite range of events only." He explains this concept with the example:

> "One may construe tall houses versus short houses, tall people versus short people, tall trees versus short trees. But one does not find it convenient to construe tall weather versus short weather, tall light versus short light, or tall fear versus short fear. Weather, light and fear are, for the most part, clearly outside the range of convenience of *tall vs. short*." (emphasis in original)(p.69)

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[33] This idea is discussed in greater detail in the methods section of this dissertation (see section 4.3.5, page 96).

Even though each construct has a limited "range of convenience" it does not mean that all constructs act in isolation from each other. On the contrary, constructs are characteristically interrelated. A person's constructs are formulated into mental models or a system of constructs that are used to make sense out of "the forest and the trees."

This idea of a construct system or mental model is based in part on Kelly's (1955) "Organization Corollary." As Kelly states, "Each person characteristically evolves for his convenience in anticipating events a construction system embracing ordinal relationships between constructs." This idea not only implies that a person's constructs are interrelated but that this "relationship is often one of inclusion or subsuming" (Bannister and Fransella, 1971).

Kelly (1955) explains that there are two ways for one construct to subsume another, "it may extend the cleavage intended by the other or it may abstract across the other's cleavage line." For example:

> "the construct *good vs. bad* may subsume, ... the two ends of the intelligent-stupid dimension. In this sense, "good" would include all "intelligent" things plus some things that fall outside the range of convenience of the *intelligent vs. stupid* construct. ... This is what we mean by extending the cleavage intended by the construct *intelligent vs. stupid*. ... An example of abstracting across the *intelligent vs. stupid* cleavage line would be the construct of evaluative vs. descriptive. In this case the *intelligent vs. stupid* construct would be subsumed as a dimension [of the evaluative pole of the superordinate construct. While another construct such as *light vs. dark* [would be subsumed as a dimension of the descriptive pole of the superordinate construct]." (p.57)

Figure 3 depicts the hypothetical relationships described in the quotation above.

These three corollaries, dichotomy, range, and organization, have important implications for understanding how people formulate individual knowledge systems, and they form cornerstones of this research.

An example, in the form of a possible scenario from a farm in Nepal, may help illustrate how the principles of personal constructs and these corollaries apply to a tree fodder knowledge system.

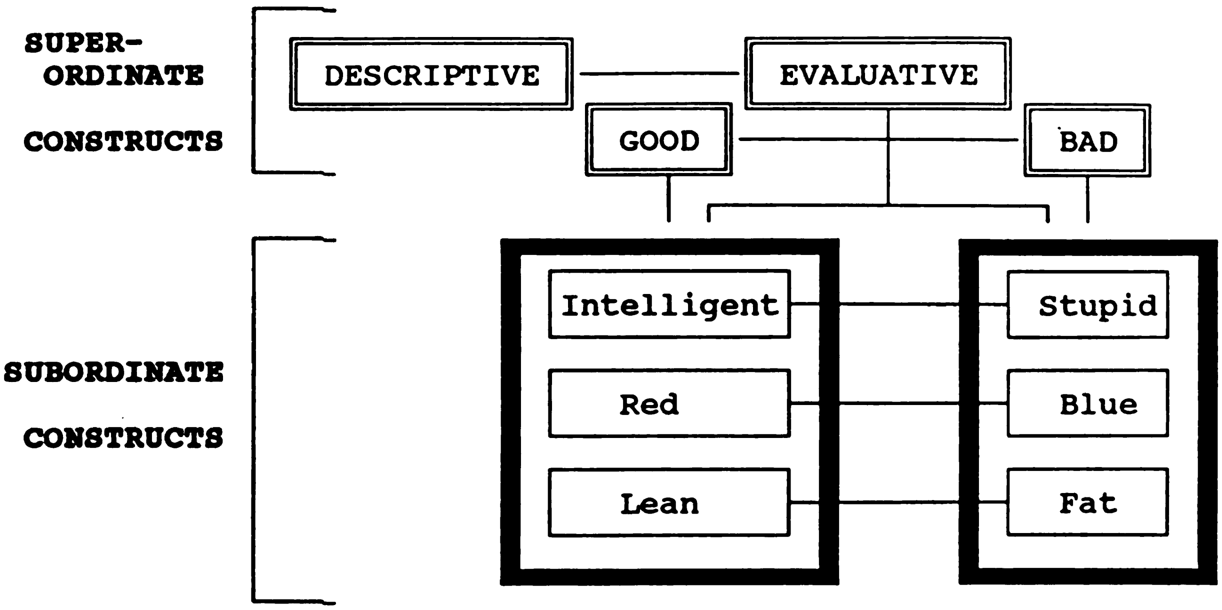

Figure 3

Depiction Of The Two Ways Constructs Can Be Subsumed

If a Nepalese farmer is presented with a familiar species of tree fodder she may evaluate or construe it to be nutritious for her livestock. She may thus form an expectation about the quality of this fodder and its effect on her buffalo and milk production. She may also view the tree the fodder came from as an excellent fuelwood tree. Alternatively, this same person, when provided with an unfamiliar species of tree fodder, that does not possess the characteristics identified with familiar nutritious fodders, may construe or evaluate this new fodder as not being nutritious. She may thus form a negative expectation about this fodder's quality and its effect on her buffalo and milk production.

This personal judgment about the quality of this unfamiliar fodder may persist, regardless of what an extension agent or other outsider has to report about the incredible levels of digestible protein per kilogram of dry matter of this fodder. She may also view this extension agent as being foolish and ignorant. It is also likely that this extension agent will leave this farmer convinced that she is an ignorant, irrational, backward peasant. However, what appears to the extension agent as an irrational reaction on behalf of this woman, is in fact a totally rational response in terms of this woman's knowledge and personal construct system.

3.5.3.2 **From Individual to Community**: To move from an understanding of knowledge systems at the individual level to that of the social group is facilitated by an examination of two other PCT corollaries, the "Individuality Corollary" and the "Communality Corollary."

In the "Individuality Corollary," Kelly states, somewhat obviously, that "persons differ from each other in their construction of events." By this Kelly is saying that each person views their situation through their own cognitive filters or construct systems. As Bannister and Fransella (1971) emphasize:

> "We differ from others in how we perceive and interpret a situation, what we consider important about it, what we consider its implications, the degree to which it is clear or obscure, threatening or promising, sought after or forced upon us." (p.22)

This corollary is not suggesting that people are not similar, it is only saying that each individual lives in what is essentially a unique world, a world that is uniquely interpreted by *personal* construct systems, and in turn uniquely experienced. This corollary explains one reason why it is necessary to elicit indigenous knowledge information from individuals. It also explains why it is difficult to formulate an understanding of a social group's *indigenous* knowledge system from a set of individual systems.

The PCT offers, through the "Communality Corollary," help in dealing with this problem. This corollary argues that when one person's construction of an experience is similar to one used by another person, the processes used by these two people are psychologically similar. It is important to emphasize that people are not similar just because they have experienced the same event, or because they use the same verbal labels to describe the same events. As Bannister and Fransella (1971) explain, people are similar:

> "because [they] construe, i.e., discriminate, interpret, see the implications of events, in similar ways. They are similar in so far as, and with respect to, events which have the same meaning for them." (p.30)

One important implication of this corollary to indigenous knowledge research is that by identifying similar patterns of categorizing, classifying, and evaluating (i.e., construing) used by members of a population, important domains of knowledge within an overall knowledge system can in turn be identified. Similarity among people is rooted in similar patterns of discrimination and evaluation (i.e., construction) within and between sets of objects. It thus becomes possible to formulate a set of constructs that can be said to be used by most of the members of a population when they deal with a certain domain of their environment (Downs, 1976).

3.5.3.3 **Evolution of Constructs**: In this theory, a person's constructs are considered as testable hypotheses, not simply rigid tools of measurement and comparison. Each person continually interprets and evaluates events within their environment through their construct systems. It is through this continual process that a person discovers that which is replicated and thus predictable. In this way, PCT accounts for change, growth, and evolution within the personal construct systems of people, and thus in their knowledge systems. This aspect of PCT is expressed within the "Experience Corollary," which states that: "A person's construction system varies as he {sic} successively construes replications of events."

As Kelly emphasizes, the succession of events that confront people throughout their lives subjects their personal construct systems to a validation process, and thus, the construct system undergoes progressive evolution. However, it is not merely the series of events confronting a person that brings about experience or the evolution of the construct system. Each new event exists concretely, and it is only through the process of abstracting them through successive acts of construing and reconstruing that they become experiences.

Since every act of construing or reconstruing is essentially an act of prediction, one of three options may result. The elements that are construed may: 1) turn out to be what was predicted and the construct is validated; or 2) turn out to be the opposite of what was expected and thus the construct is invalidated; or 3) the elements may be outside the range of convenience of the construct. If either of the last two options occur in a recurrent manner, than a person may modify the individual construct or part of a construct system.

Another aspect of change and construct evolution is expressed by the "Modulation Corollary," i.e., "the variation of a person's construct system is limited by the permeability of the constructs within whose range of convenience the variants lie." This corollary is one articulation of Kelly's belief that a person is a "form of motion," not a static being that is only occasional prodded into action. However, not all "motion" necessarily results in change, and not all acts of construing and reconstruing new events lead to modification of personal constructs.

Change of a person's construct is "modulated" by the range of convenience that embodies each construct. This can be explained in terms of the construct *permeable - impermeable* (this may also be though of elastic - inelastic),[34] that refers to the degree to which any construct can accommodate new elements within its range of convenience and generate new associations. Some constructs are fairly inelastic, for example, the construct fluorescent versus candescent can easily be construed against sources of light, yet it would be rare to find its range of convenience stretched beyond this. Conversely, some constructs, such as *good vs. bad*, are quite elastic and appear to have an extensive range of convenience (Bannister and Fransella, 1971).

Not everyone's construct systems are equally permeable or elastic. Given a set of events, some people will construe them with constructs that have limited ranges of convenience, while others will construe these same events with a more elastic set of constructs. This idea of difference in the permeability or elasticity of the personal constructs of different people helps to explain apparent variation in the propensity of people to accommodate new elements in their lives and change. This also helps explain differences in the rate of diffusion of knowledge within a community.

These aspects of the PCT strongly support the belief that indigenous knowledge systems, at both the individual and societal level, are dynamic evolving systems. It also provides insight into the processes by which it evolves, and helps to explain variations within the distribution of knowledge systems across a

[34] Kelly uses the term permeability to express the idea of the ability or inability of a construct to "absorb" and accommodate new events. I prefer the term elasticity, to express the idea of a construct expanding to encompass or include new events within its range of convenience.

population. For example, if a new species of tree fodder or a new lopping regime were introduced into a community, some farmers would possibly never abstract these events and thus their construct system would remain unchanged by them. Other farmers, however, would most likely test their construct systems against these new events, and through the processes of construing and reconstruing, their construct systems might in turn be modified. If the change agents involved with these new events were aware of aspects of the community's knowledge or construct system from the start, it might be possible for this introduction to be accomplished in a way that would take advantage of the farmers' construct systems and their construing processes, thus encouraging this modification in a predictable way.

3.5.4 Conclusion:

Besides the explanatory power of this theory, one of the most important features of the ideas in the PCT is that they form an integrated methodology that can be used with literate and illiterate people of different cultures. As Barker (1977) explains, this "theory about the way people behave (personal construct theory) can be intimately linked to the elicitation techniques used to implement it." The major elicitation technique that is used in PCT is the repertory grid, and this will be discussed in Chapter 4. This intimate relationship between elicitation techniques and analytical and evaluatory methods is especially important for research into indigenous knowledge systems of non-Western social groups.

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CHAPTER 4

RESEARCH PROBLEM AND METHODOLOGY

4.1 Problem Statement

This research was carried out from November 1987 through June 1988 in the Panchayat[35] of Salija of Parbat District in Central Nepal (Map 1, page 24, and Map 2, page 25). Its primary purpose was to investigate attributes of the indigenous knowledge system surrounding the management, cultivation,[36] and use of private tree fodder resources in one village area of one *panchayat* in the middle hills of Central Nepal. Associated with this was the investigation of a knowledge system used by farmers in the study area to classify and evaluate animal fodders. Additionally, socio-economic variables that were thought to influence management and cultivation practices of private fodder trees were investigated. The following is a list of the main questions that were addressed:

A. What do farmers know about tree fodder and the management of this resource?

B. Is there a system for the classification and/or evaluation of tree fodders, and if there is, what is the character of this system?

C. What are the stated perceptions about cultivation, use, preference, and management of tree fodder resources. What actual actions are taken by people and social groups to manage fodder tree resources?

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[35] A *panchayat* is the basic political unit in Nepal, each one is divided into 9 wards (*wadaa*). The demarcation of each ward is based on population size and natural geophysical boundaries. Each ward also has its own elected official, the ward chairman.

[36] This term includes both planting and maintenance of woody vegetation on private land. Planting is the purposeful establishment of trees and/or shrubs by seed, seedling (either from a nursery or transplanted from forests or private land), or by vegetative propagation. Planting does not include the more passive process of allowing or promoting a naturally occurring seedling to grow. By planting trees or shrubs farmers purposefully increase the quantity and/or the diversity of vegetation growing on their land, and this is importantly different from just allowing already established vegetation to grow. Through planting, farmers purposefully alter the biophysical structure and function of their landscape.

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D. Who, in farming households, is primarily responsible for different management activities of private fodder trees, and how are management responsibilities distributed among household members?

E. What variables influence management activities, and what is the nature of the relationships among these variables, and private fodder tree management?

Addressing these questions and developing an understanding of indigenous knowledge systems surrounding tree fodder required the use of a multi-method research approach composed of five distinct methods.[37] The first of these methods, participant observation, incorporated daily observations of village life with informal opportunistic discussions with residents of Salija. This offered the principal investigator opportunities to experience the daily routine of village life, and enabled him to learn first-hand what it is like to cut and carry tree fodder and feed livestock. The second method involved the use of a formal survey questionnaire that measured socio-economic variables at the household level. (Appendix B) This was closely associated with the third method, an extensive inventory of trees growing on land owned by the households that participated in the survey. (Appendix C) The fourth method involved the use of an informal interview/discussion guide that gave structure to informal interviews with purposively selected village residents. (Appendix D) The final method made use of the repertory grid technique and triad test. This technique provided data that was used to formulate a description of a system of classification and evaluation of fodder types used by residents of Salija.

[37] These are: participant observation; household survey; inventory of private tree holdings; fodder tree knowledge discussion guide; and the repertory grid and triad test. These are discussed in Chapter 4.

This multi-method approach facilitated the collection of different types of data and information essential to achieving the research goals, and it helped to overcome many of the problems endemic to cross-cultural research (as discussed in Chapter 3). Even though each of these methods was applied individually, they were developed and used in an integrated manner. Furthermore, the resultant data were analyzed both individually and collectively.

4.2 Research Strategy

Much research in both the natural and social sciences is designed around the "received view," which, according to Agar (1986) "centers on the systematic test of explicit hypotheses." This rigorous process has proven successful for many research problems, especially those that emphasize scientific hypothesis testing. However, for some research problems, especially field research in the social sciences (where the researcher must assume the role of a *learner*), this approach may prove less satisfactory (Glaser and Strauss, 1967; Spradley, 1979; Agar, 1986; Turner, 1982). Glaser and Strauss (1967) take a somewhat radical perspective on this point when they advocate that researchers should enter the field as nearly tabula rasa as possible -- "without any preconceived theory that dictates ... relevancies in concepts and hypotheses." These authors do, however, recognize the need to have a general sociological perspective, questions of interest, and a focus. Spradley (1979) supports this position by outlining some basic differences between subject-oriented and informant-oriented research:

"Social science research that uses subjects usually has a specific goal: to test hypotheses. Investigators are not primarily interested in discovering the cultural knowledge of the subjects; they seek to confirm or disconfirm a specific hypothesis by studying the subjects' responses. Work with subjects begins with preconceived ideas; work with informants begins with naive ignorance. The major differences (between these two research orientations) can be summarized by noting the fundamental questions asked by each approach.

Research With Subjects	Research with Informants
1. What do I know about a problem that will allow me to formulate and test a hypothesis?	- What do my informants know about their culture that I can discover?
2. What concepts can I use to test my hypothesis?	- What concepts do my informants use to classify their experiences?
3. How can I operationally define these concepts?	- How do my informants define these concepts?
4. What scientific theory can explain the data?	- What folk theory do my informants use to express their experiences?
5. How can I interpret the results and report them in the language of my colleagues?	-How can I translate the cultural knowledge of my informants into a cultural description my colleagues will understand?" (pp.29-30)

Schatzman and Strauss (1973) take a similar perspective:

> "The automatic use of formally stated hypotheses, and statements of "the problem" may make it easier to program action, but it will also limit the kinds of experience that [the researcher] will tolerate and deal with. In original research there is less likely to be a conceptual closure to inquiry, for as the work of discovery continues and new kinds of data are conceptualized, new problems and hypotheses quite naturally will emerge." (pp.12-13)

The nature of this research required that it be approached in a manner similar to that advocated by these authors. Accordingly, only the five broad questions mentioned above were formulated before entry into the field. However, these questions were not initially articulated as formal hypotheses. This was avoided at early stages in the research because no testing procedure was involved and it was felt that formalized hypotheses might have inhibited the learning process. As research and learning progressed, aspects of these broad questions were gradually refined into more specific questions and hypotheses. Many of these hypotheses were replaced by others or became refined into formal hypotheses. Aspects of the research methodology, specifically the household survey and the private tree inventory, grew from this gradual development of hypotheses and research questions. Thus, as research progressed three elements evolved: one involved formulating a descriptive understanding of the research community; a second aspect was oriented towards addressing the research hypotheses; and the third aspect focused on the *discovery* and explanation of an indigenous knowledge system for tree fodder. A major focus of this last portion of the research involved an investigation into an indigenous system for classifying and evaluating tree fodder resources.

4.2.1 Research Hypotheses:

The following section presents the research hypotheses that were ultimately formulated. These hypotheses were determined, to a great extent, by the character and structure of the household survey and private tree inventory. Although most of the data used to test these hypotheses came from these two instruments, information gathered from other research methods was also applied.

4.2.1.1 **Hypothesis Set #1:** Are private tree planting practices random, that is, are certain species cultivated in association with different planting areas within a farming system? Are there associations between the cultivation of different tree species with different cultivated crops?

1)$H_{(r)}$ = The cultivation of fodder trees (i.e., where they are grown) on private land is not random.

4.2.1.2 **Hypothesis Set #2**: Will men and women share common domains of knowledge about fodder tree use, cultivation and management? Will men and women have unique gender related domains of knowledge? These questions are based on the realization that divisions of labor based on gender are common in rural Nepalese households (Bennett, 1983; Molnar, 1981b). These questions were also inspired by research carried out by Richards (1977) on differences in rice classification between men and women in Kogbotuma, Sierra Leone. Further motivation came from Chapman's work in Bihar, India (1977) where it was determined that women were better at distinguishing between different varieties of rice than men. Results from research by Heinz and Maguire (n.d.), with the !Ko Bushmen on gender related differences in knowledge about vegetation, provided an alternative perspective on these questions.

Is it possible that species preference within different classes of tree types will differ between men and women? Will verbal labels used by men and women to describe and differentiate between tree fodders differ? The rationale for these questions is also based on knowledge about the division of labor between men and women concerning tree planting, cultivation, and livestock rearing.

However, as many fodder trees have a multiple number of important uses, e.g., medicinal and food uses, and some have negative attributes, e.g., shading effect, providing a habitat for pests, etc. the evaluation of such attributes may vary between men and women. Because of this, it was believed that the association of gender with fodder tree knowledge and tree preference might prove to be weak. Regardless, this focus provides direction for studying potential gender related differences associated with knowledge and attitudes about fodder trees.

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$2)H_{(r)}$ = There are differences between the domains of knowledge of men and women regarding tree fodder use, cultivation and management.

$3)H_{(r)}$ = Some of the verbal labels used by women and men to evaluate and differentiate between tree fodder types will be equivalent, while others will be different.

$4)H_{(r)}$ = There are differences between tree species preference within classes of tree types between men and women.

4.2.1.3 **Hypothesis Set #3**: Will the variables: fodder demand; land size and character; access to public sources of fodder; and family size and composition, influence the cultivation and management of fodder trees on private land?

$5)H_{(r)}$ = The number of fodder trees per household is significantly correlated with the number of livestock units per household.

$6)H_{(r)}$ = The number of fodder trees per household is significantly correlated with the composition of household land.

$7)H_{(r)}$ = The number of fodder trees per household is significantly correlated with household size.

4.2.1.4 **Hypothesis Set #4**: Has the cultivation of fodder trees on private land increased in the recent past? Such an increase may be the result of several forces: 1) an increasing shortage of fodder from all sources; 2) a belief, held by the farmers, that public sources of fodder will continue to diminish; 3) a gradual decline in the size of households resulting in a loss of household labor; 4) an increase in the number of children who attend school and eventually migrate from villages (again a loss of household labor); and 5) a lack of faith in government regulations governing community, national, and private forests.

$8)H_{(r)}$ = The number of fodder trees that are "planted" each year per household has increased in recent years.

4.2.2 Sampling Procedure[38]

Due to time and resource limitations, this study focused on only three of the nine wards in this *panchayat*, Wards two, six and seven. The purposive selection of these three wards was based on the expert judgment of Mr. Judhbir Pun, the resident forester of Salija for the last 12 years.[39] Mr. Pun was asked to select three of the nine wards that form Salija *Panchayat* based on his judgment about which wards were:

(1) "richest" in terms of private fodder tree planting;

(2) "poorest" in private tree fodder planting; and

(3) the ward judged as being midway between these two extremes.

The accuracy of this subjective judgment was validated by a reconnaissance of all nine wards of this *panchayat*, and through the results of the private tree inventory.

Lists of all households present in each of the three wards were prepared by each ward chairman.[40] These lists consisted of the names of each head of household, the household head's gender, an official estimate of the amount of land owned by each household, and the household's caste composition. A summary of household data is presented in Table 4. Potential consultants for the private tree inventory and household survey were selected randomly from each ward list. A random process was used for the following reasons:

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[38] Sampling in rural areas of Nepal is very problematic. Help with the design of this sampling procedure was received from several people with experience in designing sampling procedures for populations in hill areas of Nepal. Those providing advice included: Dr. Kaji Shrestha, Dr. J.G. Campbell, Paul Balogun, and Dr. Janet Seeley.

[39] Mr. Judhbir Pun is employed as a forester by the Lumle Agricultural Centre, the regional research and extension station that is managed and supported by British foreign aid. He is a native resident of Salija, born and raised in Ward 6.

[40] A ward chairman is elected by the adult members of each ward to represents them in *panchayat* matters.

1) The ward level data showed that members of Wards 2 and 7 were all members of the *Pun* caste[41], and Ward 6 had only 8.5% non-*Pun* residents;

2) Also, the estimated size of landholdings were fairly normally distributed within each ward and across all three wards.

Approximately 25 percent of the households from each ward were selected, this resulted in a final sample population of 54 households, twelve from Ward 2, fifteen from Ward 7, and twenty seven from Ward 6. Each ward's sample

Table 4

General Statistics for Wards 2, 6, & 7

	Total # of Households	Caste Composition	Heads of Household Females	Males
Ward 2	60	Pun (100%)	4	56
Ward 6	94	Pun (91.5%) Damai (5.3%) Kami (3.2%)	8	86
Ward 7	46	Pun (100%)	3	43

consisted of approximately half women and half men, alternative consultants were also selected. The list of potential consultants included more potential participants than were needed in the final sample so that alternative consultants could be selected if people in the initial sample population were not available at the time of the survey. As it turned out, every one of the alternative

[41] The *Pun* caste is part of the larger Magar caste group (an alternative spelling is Mangar).

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consultants were needed to satisfy the desired final sample size for each ward. A summary of the sample population is presented in Table 5.[42]

Table 5

Composition of the Sample Population

	# of Sample Households	Caste Composition	Consultants	
			Women	Men
Ward 2	15	Pun (100%)	8	7
Ward 6	27	Pun (88.8%) Damai (3.7%) Kami (7.5%)	14	13
Ward 7	12	Pun (100%)	6	6
TOTAL	54	-	28	26

4.2.3 <u>Research Consultants and Assistants</u>

Residents of Salija were involved in this research in two primary ways: 1) some residents were hired by the principal investigator as research assistants, interviewers, and to carry out the private tree inventory; 2) other residents were selected from the general population and asked to provide data and information. The local women and men of Salija who participated in this second aspect of this research are referred to here as consultants. The term consultant is used in place of the more common, and somewhat pejorative, terms subject, informant, and respondent. The term consultant more accurately reflects the role that these villagers had in this research. This term was also used to accord these

[42] Prior to drawing the sample there were plans for carrying out a separate survey of all households headed by women. However, since the selected sample contained seven of the 15 households headed by women it was decided that a separate survey of this population was not necessary.

participants the respect they deserve as the advisers and teachers of the principal investigator, and as people who possess unique and valuable knowledge.[43]

Besides being the primary source of data and information used in this research, consultants also helped in development and implementation of the survey instrument, the inventory form, and the fodder knowledge discussion guide. Their help was especially important in the development of the fodder knowledge discussion guide (see section 4.3.4, page 94). A majority of the questions that make up this guide came from discussions with several consultants and the two primary research assistants.

There were two groups of consultants. The first group consisted of those who were selected randomly from the household lists of each ward and participated in the survey and private tree inventory. The second group consisted of people that were selected purposively from all members of the research population. Some of the people in the second group participated in informal interviews and others took part in the repertory grid and triad test activities (see section 4.3.5, page 96). The selection of this second group of consultants was based on the following criteria:

1) the person needed to be knowledgeable about tree and vine fodders; and

2) the person needed to be able to participate effectively in these activities and work directly with the principal investigator.

Certain potential consultants were excluded because they were hard of hearing, others were eliminated because they were too young. This last attribute was especially important for selecting women consultants who tend to become less shy in front of men, especially foreigners, as they get older. Also, older consultants

43 A more detailed rationale for using this term is provided by Werner and Schoepfle (1987).

were found to be much more knowledgeable about tree and vine fodders than younger residents. An attempt was made to work with women in their thirties, but their shyness with the principal investigator made this impossible.

All research assistants were native residents of Salija.[44] The decision to hire community members as research assistants was not based on the need to conserve money as sufficient funds were available to hire more highly educated and experienced people from Kathmandu and bring them to Salija.[45] On the contrary, this decision was based on a belief in the value of participatory research, and the recognition that people generally accept new and unfamiliar experiences more quickly if they are personally and meaningfully involved.

Using educated outsiders may have facilitated communication with the principal investigator making the research easier to accomplish. Of much greater concern was the awareness that research assistants hired from outside the community would have been less capable and less successful working and communicating with research consultants than resident assistants.

There were obvious logistic advantages of hiring local women and men as research assistants, but, critical factor was that the participation and cooperation of residents contributed greatly to the fidelity of this research and is largely responsible for the character of the results. By sharing in this research effort, villagers not only learned more about their own village area, but their natural distrust of the research process and the researcher was quickly dispelled. The

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[44] These included: 1)two village men who helped in the general logistics of the research and in the improvement of research tools; 2)three men and three women who carried out the survey; and 3) eight men who carried out the private inventory.

[45] Salija is a 3 day walk from Pokhara, and Pokhara is a one day (200 kilometer) bus ride from Kathmandu. Living conditions in Salija are much more rustic than in Kathmandu.

research did not just happen **TO** them, but it happened with them, and it was successful because of them. These people were not "simply" nameless and faceless respondents, disconnected from the research purpose and process -- they were **participants.**

4.3 Research Methods

To accomplish this research and to address the hypotheses stated above a multi-method research approach, consisting of five distinct methods, was used to gather different, but related, types of data and information for this research. This approach helped overcome many of the problems endemic to cross-cultural research, and it helped create a holistic view of a tree fodder knowledge system within the context of the community under study. Each of these research methods is discussed individually in the following sections of this chapter. However, it should be emphasized that even though each method was applied individually they were selected and developed to function in an integrated fashion. Data from each method provided important pieces to this research puzzle.

4.3.1 Participant Observation

This method involved the observation of community and household activities. It provided the context within which all other methods were developed, and it functioned as the initial medium for learning about the social and biophysical environments of Salija. According to Whyte's (1977) classification of styles of observation, the form of observation used in this research can be characterized as unstructured. The advantage of this approach over more structured observation techniques is that it tends to preserve the holistic nature of what is observed: "the stream of human behavior and its complex interaction with the environment." This enabled the researcher to learn about the research site as a functioning system consisting of social and environmental interrelationships.

Within the context of unstructured observation, a blend of activities occurred: 1) discussions were held with residents; 2) questions were asked about specific aspects of village life; 3) time was spent listening to farmers talk among themselves; and 4) the principal investigator personally participated in some activities of farm life. This process also rapidly familiarized the researcher with the Nepalese "lingua franca" used by the people of Salija to talk about farm life, tree fodder, and resource management. Another advantage of participating in village and household activities is that it allowed the researcher to disguise the process of observation. A disadvantage is that since the observer is often involved in what is being observed, the "purity" of the observation is diminished.

This disadvantage was not a major concern for this research because the process of participant observation was primarily used to tie together the more discrete elements of data gathered by the other methods. Thus, an iterative process between participant observation and the other research methods evolved. The other methods allowed aspects of life in Salija to be isolated and studied out of the context of community life. Participant observation permitted these elements to be examined within the context of the social system. At times, this resulted in a more complete understanding of both the individual elements and the whole. In other situations, new questions about life in Salija emerged.

4.3.2 Household Level Survey:

4.3.2.1 **Survey Rationale & Questionnaire Development:** A formal household survey questionnaire was developed and used to gather information on socio-economic variables from households in Salija. (Appendix B) Under this broad category of information, nine specific classes of quantitative and qualitative data were gathered:

1) household composition;
2) household commerce;
3) land holding by size and composition;
4) livestock composition;
5) *Ghiu* (clarified butter) production (fodder/livestock interaction);
6) tree planting and management practices;
7) tree fodder collection practices;
8) tree species preference by type (fuelwood, fodder, timber, utility & tools, and other types); and
9) livestock feeding programs (i.e., what fodder types were fed to livestock in different months).

These question areas, and the entire survey, focused on the importance of trees, specifically fodder trees, within the farming system. Information gathered from this survey was also used with data gathered from the private tree inventory and other methods, to evaluate the formal hypotheses.

Problems associated with cross cultural survey research are well documented, and the accuracy and validity of data collected using surveys with rural populations in low income countries is open to debate (Whyte, 1977; Hill, 1984; Fisher, 1987; Campbell, *et al.*, 1979). One major problem with formal surveys is that the meanings ascribed to terms and concepts in survey questions often differ widely between researchers and informants. Additionally, questions are usually framed within the researcher's world view, and this may diverge significantly from that of members of the research population.

In recognition of these potential problems, great care was taken to use terms and concepts throughout the survey that were thought to be appropriate for this community. In addition, a rigorous preparation process was used in the development of this survey instrument. Questions were first written in English (with some Nepalese) based on what had been learned from participant observation during initial visits to Salija and from experiences in other parts of Nepal. These were then translated into Nepalese by an instructor at the Institute of Forestry in Pokhara, Nepal. This Nepalese translation was then back-translated into English by two different people, one into written English and the other orally. Variations in language were then corrected, and a second English-to-Nepalese-to-English translation series was carried out as a second level check. The second version of the survey was then pre-tested in two locations, one outside Pokhara and the other near Salija. Results of these pre-tests were then incorporated into a third version of the survey. This version was then read and edited by two long-term residents of Salija who worked as the primary research assistants. Final changes were also made to the final version of the survey by the people hired to administer the survey.

Even though a significant effort was expended in the development of the survey instrument, problems with concept equivalence and different frames of reference persisted. A good example of this problem is provided by question 13, which asks about household livestock composition. One part of this question asks about the number of different adult and juvenile animals that are kept by the household. Juvenile animals were defined as those animals one-year old or less. After the survey was carried out, it was learned that for some farmers cows and buffaloes are considered as juveniles until they are at least two years old. This problem surfaced even though the questionnaire had been pre-tested and reviewed by several Salija residents.

Other questions in this survey were developed with the intent of overcoming anticipated problems. For example, question 12 asks about land holding composition and size. This type of question is notorious for generating questionable responses. In an effort to deal with this, consultants were permitted to use any units of measure they wanted. The burden of understanding land area measurements then rested with the researcher, not with the consultants.[46] This question was also asked in the private tree inventory, and thus the two sets of values could be compared for consistency. Values reported by consultants were also compared to official *panchayat* records of land size holdings. Finally, the names of land types used in the survey came from the residents of Salija.

The open nature of questions 19.0 - 19.5 offers another example of how anticipated problems of concept equivalence and different world views were handled. Consultants were asked to provide the names of trees that they preferred under four main categories of use. They were also asked their reasons for this preference, and whether the tree was commonly found on farm and/or forest land. After tree names and information had been recorded, the consultants were then asked to rate their preference. Finally, consultants were provided with an "any-other-type-of-tree" category so they could mention preferred tree species that didn't fit well within the four use categories defined in the questionnaire.

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[46] As can be expected, a variety of units of measure for land area were provided by consultants. Estimates of equivalent units of measure for these local units were determined with the help of knowledgeable villagers (see Section 5.2.2 for a more detailed discussion of this topic).

These questions provided information that was rich in detail, and this not only generated new questions to investigate, but it also contributed to an improved understanding of the community as a whole.

4.3.2.2 **Selection & Training of Interviewers**: To overcome problems inherent in surveys involving interviewers, six local residents were hired to administer the survey. Half were male teachers from the Salija middle school, the others were the three most formally educated women in Salija. Of these women, one had recently graduated from high school, one was in her 10^{th} and final year of high school, and one was in the 9^{th} grade.

Local residents were hired to carry out the household survey in an attempt to lessen consultant fear of the survey, and of the interview process. It was also believed that the accent and form of Nepalese spoken by local interviewers would be closer to that used by consultants, than that used by outsiders. Using local interviewers also made it easier for interviewers to locate a consultant's home since households in the three sample wards are scattered throughout each ward, not within concentrated nuclear villages.

The interviewers underwent two training sessions. In the first session, the purpose and aims of the research project and survey were discussed. This was followed by reading the questionnaire and discussing each question in detail. During this session a few editorial changes were made to the forms. Next, interviewers interviewed each other in role-playing practice sessions. These were interrupted as needed to comment on interview style and to correct problems in filling in the survey form. Group discussions were held after each role playing session so that everyone could learn from each other. These training sessions also provided an opportunity for the interviewers to comment on the survey language and initiate changes in the survey form.

4.3.2.3 **Survey Procedure:** Before interviewers went into the field, the principal investigator, along with his two research assistants met with each ward chairman to discuss the survey. Then, each sample household was visited and each consultant was spoken with regarding the purpose of the research, who would be visiting them, and what sort of questions would be asked. This process contributed to a reduction in consultant fear of the survey and interview, and allowed the researcher to observe the household and surrounding land.

This introduction process may have contributed to survey leakage and stimulated thought and conversation about the survey before the interview. However, such losses in survey quality were likely offset by gains brought about by consultants being more relaxed and less fearful during the interview. The introduction process, coupled with the knowledge that community leaders supported the research project, contributed to the fidelity of research results.[47]

An early introduction of the researcher and the project was specifically important because half of the consultants were women. Women in rural areas of Nepal are often very shy, and they are rarely offered opportunities to be involved in activities such as surveys or discussions with foreign visitors, especially male visitors. In fact, none of the women involved in this survey had ever been interviewed before, while some of the men had taken part in earlier surveys. Thus, great pains were taken to explain what the survey procedure entailed to

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[47] It is not uncommon for local leaders of rural communities to be distrusted by community residents. Experience in Salija led to the belief that the communities of this panchayat are an exception to this general rule. Leaders in Salija were active in bettering the living conditions of their community, and caring for less fortunate community members. Thus, this research effort was able to make use of their support without fearing a negative effect on research results.

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make these woman as relaxed as possible about this very foreign experience. This is also the reason for hiring three women as interviewers.

Discussions with interviewers and selected consultants after the survey had been completed leads to the conclusion that the introduction process was appropriate and very successful. It is recommended that other researchers consider using similar techniques. This recommendation holds for expatriate and Nepalese researchers alike, as both groups can be considered as outsiders in the context of rural villages.

By design, each interviewer completed only one survey per day, usually conducted in the evening. On Saturday, it was possible to carry out two interviews, one in the morning and one in the evening.[48] This was done to limit interviewer fatigue and to encourage interviewers to take their time while conducting the survey.

After each interview, the principal researcher met with each interviewer to go over the survey and discuss the questions and responses. This allowed for the immediate translation of survey answers and interviewer comments. It also permitted the extraction of additional information about the survey situation and written comments, the correction of mistakes, and the interpretation of local word usage.[49]

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[48] Saturday is the only day when the teachers and students did not have to attend school.

[49] This last point proved very important; for example, the Nepalese word *chiso* is generally used to mean damp cold or to refer to a liquid as being cold. However, it is also used by the people of Salija to discuss the character of fodder. This point will be discussed in greater detail in Chapter 5.

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4.3.3 Procedure for Private Tree Inventory:

4.3.3.1 **Inventory Rationale & Instrument Description:** In addition to the household survey, an inventory of trees growing on each sample household's property was carried out. (Appendix C) Much of a person's and community's indigenous knowledge is tacit, not easily verbalized and often not obvious to outside observers, and verbal statements often differ from behavior. Therefore, it is necessary for researchers to seek out indicators of behavior important to research goals.

Getting at an understanding of indigenous management practices of fodder trees proved very difficult.[50] One option for overcoming such difficulties would have been to carry out an intensive, long-term observational study, where all behavior associated with fodder trees would have been recorded. The demands of such an approach would have quickly exhausted the resources of this research project without meeting the research goals. Therefore, a less time consuming and more cost efficient method was devised to capture some behavioral aspects of tree fodder management.

It was reasoned that the general shortage of arable land in Salija and elsewhere in the mid-hill region of Nepal is reflected in the small size of land holdings. The relative scarcity of arable land is also reflected in the intensity of land use. As a result of these two factors, it was reasoned that most, if not all,

[50] The term management was used initially to describe the focus of this research. However, from the perspective of the Nepalese farmers in the research area, this term proved to be inappropriate. There is no single word for the "management" of fodder trees or other natural resources that is commonly used and understood by residents of Salija. Discussions with farmers about their "management" of fodder trees in their farming systems, lead to the use of a more appropriate term, the Nepalese equivalent of "to cultivate" *umamu* or *launu*, in place of the relatively modern and uncommon term *byawasthaa gamu* (to manage). This is an excellent example of how difficult it is to carry out cross cultural research, and why it is so important to do so.

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trees, bushes, shrubs, and vines growing on household land were purposely cultivated and managed. The terms cultivation and management are not being used here in the same way as they are used in reference to crops. Because of the longer time horizon associated with growing trees, management of trees is often less intense than it is with crops. Thus, the term management is used here to convey the idea of woody vegetation being maintained on household land with varying degrees of farmer involvement.

Based on this reasoning, and the general research goals, an extensive inventory of private trees cultivated by each sample household was carried out. For each inventory, a research assistant was taken around the household's land by a member of the household, usually the selected consultant. At the start of an inventory, the consultant was asked about their household's land composition and their species preferences for different use categories of trees (as was done in the survey). During the "guided tour" five pieces of data were recorded on the inventory form.

1) Each tree[51], from seedling to mature tree, was named by the consultant and recorded by the surveyor on the inventory form.

2) The consultant was asked to identify the tree's first, second, and third major use (a tree-use-code card was used in assigning codes, see Appendix C).

3) The consultant was also asked to estimate the age class of the tree, i.e., older or younger than 10 years of age. A counting mark (/) was then recorded in the appropriate age column.

4) The consultant then identified the planting site of the tree (see the record form in Appendix C for a list of planting sites), and again a counting mark was recorded in the appropriate column.

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51 It is important to note the concept of what a tree is (especially in terms of "tree fodder") was not defined by the researcher. Each consultant was free to identify which plants growing on their land were considered to be trees. This was done to help limit the imposition of the researcher's own conceptualization of environmental attributes, and to thus enhance the chance of grasping the native's point of view.

5) If the tree was growing adjacent to agricultural land, the consultant was asked to name the crops that were commonly grown on that land, and crop codes (see Appendix C) were written in the appropriate column.

4.3.3.2 **Selection & Training of Inventory Assistants:** Eight young men from the three wards (two from Ward 2, three from Ward 6, and three from Ward 7) were hired to administer the inventory. Each of these men was either a recent graduate from the local high school or in their last year of school. They were given one day's training. The first part involved a discussion of the purpose of the research project, specifically the private tree inventory. Then each part of the inventory record form was read and discussed in detail.

Subsequently, the eight men were divided into three groups and sent off with research assistants to practice administering an inventory on land owned by people who were not part of the sample. Afterwards, problems encountered during the practice sessions were discussed. The training ended with a review of the proper inventory procedure.

4.3.3.3 **Inventory Procedure:** One day before a private tree inventory was scheduled, each man was given the name of the household they were to visit. The household head was then contacted to arrange an appointment with the consultant.

As with the survey, only one inventory was carried out per day. This was done because some landholdings took between 6 to 9 hours to inventory. When each person finished with that day's inventory they met with the principal investigator to discuss their results. These discussions provided opportunities to learn more about each household's land and tree cultivation practices, and to exar

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examine and press leaf and twig samples collected by these men from uncommon trees they had encountered during the inventory.

As inventories were administered, spot checks were made by the principal investigator and the two principal research assistants to ensure that the inventory was being carried out properly. In all cases, it was learned that the workers in the inventory and the survey had taken great care and pride in all aspects of their work. This high degree of quality was, to a great extent, the result of them being residents of Salija. It is strongly felt that an equivalent degree of quality could not have been achieved by using outsiders, i.e., people brought into Salija from Pokhara or Kathmandu.

Some households in Salija have established and/or intensively manage small private forests (*nigi bun*). These private forests are usually found along stream channels and on marginal land, and consist of a select variety of highly valued species. Some private forests were intensively grown as small plantations, with only a few species. Nearly all private forests and plantations were very small, and thus all trees were inventoried. For the few large private forests, a comprehensive inventory was not carried out. Instead, their dimensions were measured by pacing, and the dominant species where recorded on the back of the inventory record form.

4.3.4 <u>Tree Fodder Knowledge Discussion Guide</u>:

4.3.4.1 Development and Rationale for the Guide: Throughout the research, informal interviews were carried out in an opportunistic manner. These interviews often focused on specific tree species, and a great deal was learned from them. However, recording information during these interviews tended to disrupt the flow of c

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of conversation, and consultants would often grow impatient while waiting for notes to be written. Additionally, after reviewing interview notes important gaps in information regarding different fodder trees would often be discovered. The combination of these two problems led to the progressive development of a tree fodder knowledge interview/discussion guide. (Appendix D)

This guide was not used to conduct a formal interview, it was only used to make recording information easier and less intrusive, so that the flow of conversation was not disrupted. It helped to ensure that important points were not overlooked during a discussion, and helped maintain some consistency in data that was collected from each consultant. Most of the questions contained within this guide came from earlier discussions with farmers in Salija. During the first visit to Salija, most of the time was spent informally talking with villagers, observing community life, and learning the local names of trees, shrubs, and woody vines. As information was collected on different fodder trees, management practices, and use of different fodder trees, consistent themes emerged. These themes were eventually formalized into the discussion guide. In addition, village consultants and the research assistants contributed to the content of this guide.

4.3.4.2 Use of the Discussion Guide: Because of the great variety of trees, vines[52], grasses, and agricultural residue used as animal fodder, these detailed discussions focused on a limited number of trees that were identified as major sources of fodder in Salija. This permitted the collection of data on the same group of trees from several consultants.

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[52] See Appendix G for a list of trees and vines that were identified by consultants while in Salija. This list contains both Nepalese and Latin names, and the primary uses of each species.

Most of the people who participated in these detailed informal interviews were purposively selected, and usually provided information on several species of trees. Some discussions occurred in an opportunistic manner. For example, during the research introduction process some consultants would spontaneously start to talk about one or more specific fodder species. Many of these situations provided excellent opportunities to use the discussion guide to record information and to gently direct these talks so that important question areas were not neglected.

Information gathered through these informal interviews was especially useful in clarifying information collected by other methods. In a more general sense, it provided insights into the depth of knowledge that residents have about different species of trees, shrubs, and vines.

During some of these discussions, the subject would switch from tree fodder to a conversation about different medicinal grass and herbs that are found in the forests above Salija. Some of these grasses were used to treat human disease and sickness, and others were used to treat sickness in livestock. This is just one example, among many, of other important areas of potential research.

4.3.5 The Repertory Grid and Triad Tests:

4.3.5.1 **Rationale for using the Repertory Grid**: This research method was used to help identify and develop an understanding of a system of classification and evaluation used by villagers to evaluate the quality of different types of fodder[53].

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[53] Residents make an explicit distinction between tree fodders (*Dhali Gass*, which literally translates as branch grass), grass fodder (*Bhuie Gass*, which literally translates as ground grass), and the many types of agricultural residue and weeds. However, when villagers discussed tree fodders they also included fodders collected from shrubs, vines, and climbers. Therefore, the term fodder type includes vine, shrub, and tree fodders.

This method helped achieve a more accurate image of the natives' view of tree fodder, and it helped avoid imposing the researcher's own exogenous views and perceptions on this research.

The importance of suppressing exogenous perceptions and views of tree fodder is exemplified by the original focus on the term **tree** fodder, that was initially used in conversations with villagers. At the start of this research, tree fodder was defined in an exclusive manner, i.e., it excluded all potential fodder except for green leafy matter, fruit, and succulent bark from trees and shrubs.

This perception persisted for some time after entry into the field, as demonstrated by the continued use of the Nepalese phrase -- *"rook ko gass"* or grass of trees. Even though this phrase is used occasionally and understood by local farmers, it is not understood in the same way as it was by the principal investigator. As used by the researcher, *"rook ko gass"* excluded all types of fodder except that harvested from trees and shrubs. Villagers, on the other hand, seem to prefer the more commonly used synonym, *"dale gass"* or branch grasses. This is a more inclusive term that describes several types fodders, excluding ground grasses *"bhuin gass"*, and the variety of agricultural residue fed to livestock. It may be that villagers categorize all non-farm-residue fodders into two groups, monocotyledonous fodders or *bhuin gass*, and dicotyledonous fodders or *dale gass*.[54] Thus, the villagers' conception of "tree fodder" includes fodders from shrubs, bushes, woody vines, and herbaceous climbers (i.e., all fodders that come from branching plants).[55] This view of "tree fodder" appears, especially from the

[54] This hypothesis was developed after the field research was completed, and therefore it could not be tested.

[55] A notable exception to this is "tree" fodder from different bamboos.

perspective of farmers in Salija, to be more rational and useful than the view commonly used by outsiders.

The utility of this method is also reflected in the way that it has been used by other researchers. Bannister and Fransella (1971) used it to research political construct systems associated with British elections, while Stringer (1974) applied to a study on how people interpret land use planning maps. Leiker (1976) used the repertory grid technique to investigate spatial images and out-migration from the great plains in the United States. Berlin *et al.*, (1968) used this method, along with others to investigate "covert" taxonomic categories (i.e., labels for domains of items rather than for specific items). Richards (1980) describes two cases where the repertory grid technique was used. One involved a investigation of an indigenous knowledge system surrounding varieties of grain legume seeds. The other was concerned with research on differences in classification of local rice varieties between men and women in one community in Sierra Leone. Hudson (1974), concisely summarizes the utility of this method as:

> "a flexible method of allowing people to structure their images of reality in their own terms (within the assumptions of the method itself) rather than forcing people to reply in terms of concepts supplied by the researcher." (as quoted in Barker (1977), p.8)

The repertory grid technique, as used in this research, was adapted to the unique conditions of the research population and customized to address the specific goals of this research. This flexibility is one of the major strengths of this research technique.

The chief purposes of using the repertory grid method in this research were to: (1) elicit verbal labels that might represent elements of a person's construct system, and (2) to evaluate each person's construct labels against those of a larger sample. Besides being a very flexible research method, the repertory grid has several other advantages for investigating indigenous knowledge systems:

1) The repertory grid method is a direct extension of the PCT. Therefore, both the administration of the test and analysis of results are strengthened by this theoretical grounding.

2) The grid can deal with what is unique about individual people and what is common to a social group (Shortter, 1970). In much social science research and specifically with indigenous knowledge research, there is a need and a desire to account for the uniqueness of individuals and to generalize across members of a population.

3) The repertory grid technique is not influenced by the intelligence of the consultants (Kear-Colwell, 1973; Warren, 1966).

4.3.5.2 **Format of the Repertory Grid Method:** There are two general ways in which the repertory grid method is used. First, it is used to elicit unknown categories of discrimination and classification for a group of things. Second, it is used to determine how a person classifies or categorizes a group of things given a set of predetermined terms of classification. In this research, and the following example, the repertory grid method was used in this first way.

As seen in the hypothetical repertory grid in Figure 4, a grid consists of a matrix, that when completed, represents a consultant's system of personal constructs for a specific domain of elements (objects, phenomena, or concepts). The columns of the grid list the elements to be tested, and the rows are where verbal labels (representations of personal constructs) used to discriminate between elements are written. The elements in a grid can either be actual items in the environment that are pointed out to the consultant, names on cards, or photographs. Elements are presented to a consultant in groups of three, a triad sort (shown in the example as X's and O's). These triad sorts can either be predetermined by the researcher or left to the consultants to select from a group

Key:
X, X & O - TRIAD
X - SIMILAR
O - DISSIMILAR
A - AGREE
D - DISAGREE

VERBAL LABELS		ELEMENTS					
		HILL	ROAD	WELL	FARM	FOREST	STREAM
(X) DRY	WET (O)	X	X	D	A	O	D
OURS	NOT OURS	D	O	X	X	A	D
GIVES FOOD	DOES NOT	A	D	D	X	X	O

Figure 4

Sample Repertory Grid

of elements. Consultants are then asked to discriminate between these elements by selecting two that are most similar leaving one that is different from the grouped pair. This grouping is recorded on the grid form (e.g., X's for similar elements, and O's for the dissimilar element). Then, consultants are asked to explain the reason or reasons for their groupings, and these reasons are written in the appropriate row. These verbal labels are generally adjectival opposites, and thus they may be used to formulate an idea of the consultants bipolar constructs.[56] After being presented with a triad sort, consultants are then asked to evaluate the remaining elements against the verbal discriminators used in the original groupings, and identify those that agree or disagree with the similar pair. These data were then recorded.

[56] Bipolar verbal labels refers to the way that consultants explained their grouping of each triad leaf sort, e.g., the group with two of the three leaves may have been grouped together because they were considered as winter fodders, while the remaining leaf was excluded because it was considered a summer fodder. This dichotomous label, winter fodder/non-winter fodder is thus bipolar.

There are different ways to analyze grid data depending on the purpose of the research, the size of the sample, and the character of the data collected. At the simplest level, one can gain a sense for the main criteria used in categorizing a domain of elements by "eye-balling" the data (Whyte, 1977). If complete grids are obtained from large sample populations, and specific hypotheses are being tested, grid data can be analyzed using factor analysis or multidimensional scaling (Barker, 1977; Fransella and Bannister, 1977; Harrison and Sarre, 1974). The nature and purpose of the research problem and character of the data are important in determining if more sophisticated methods of analysis are appropriate. As Harrison and Sarre (1974) warn:

> "practical experience has tended to show that increasing mathematical sophistication often leads to uninterpretable results." (p.370)

4.3.5.3 **Repertory Grid Administration:**

To administer this technique 15 different fodder samples, listed in Table 6, were used as grid elements.[57] These 15 fodder samples were randomly selected (with repeats being excluded) from fodder samples that were collected from the surrounding area by three local farmers. To avoid consultant fatigue, only nine different triad leaf sorts, shown in Table 7, were used. Each of these triad leaf sorts were randomly determined (with repeat groups being excluded).

Consultants for this activity were purposively selected from the adult population of the three wards. This selection was based on two primary criteria:

1) that the person was knowledgeable about tree and vine fodders; and

2) that the person would be able to participate effectively in this activity.

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[57] Twelve of these leaves came from major fodder trees, and three leaf samples were from important fodder vines.

Table 6

Leaf Samples Used with the Repertory Grid

NEPALI NAMES	LATIN NAMES	TREE/VINE
1. *PHULTISO*	*?Colquhounia cocciea*	TREE
2. *MAYA*	*Eriobotrya elliptica*	TREE
3. *BHOKRE*	*Ilex doniana*	TREE
4. *HALAURE*	*Hedera nepalensis*	VINE
5. *BHANGO*	*Quercus incana*	TREE
6. *SETO CHULETRO*	*Brassaiopsis hainla*	TREE
7. *PAIYU*	*Prunus cerasoides*	TREE
8. *SHIRMOO*	*Michelia spp.*	TREE
9. *JHYANU*	*Eurya acuminata*	TREE
10. *KHARSU*	*Quercus semecarpifolia*	TREE
11. *BHAINS*	*Salix babylonica*	TREE
12. *DUDHILO*	*Ficus nemoralis*	TREE
13. *RAJELI*	?____________	VINE
14. *PANI LAHARA*	*Vitis repanda*	VINE
15. *DHURSE*	*Buddlija asiatica*	TREE

? - The Latin name is in question.

Not surprisingly, older consultants were found to be much more knowledgeable about tree and vine fodders and less shy in dealing with outsiders. The original goal of involving 15 male and 15 female consultants in this activity had to be reduced to 7 men and 6 women. There were two main reasons for this reduction in the number of people participating in this research activity:

1) some prospective consultants either found this research activity too difficult, or they did not want to participate;

2) some women participants were overly shy in dealing with the principal investigator and refused to talk and/or carry out the grouping activity.

Thus, finding 30 suitable consultants was not possible. Due to this low number of consultants, analysis of resultant data was necessarily limited to inspection and content analysis.

Table 7

List of Triad Sorts Used in Reparatory Grid

TRIAD LEAF SORTS	
Sort 1: *Ilex doniana* *Prunus cerasoides* *Ficus nemoralis*	Sort 2: *Ilex doniana* *Quercus incana* *Ficus nemoralis*
Sort 3: *Colquhounia cocciea* *Brassaiopsis hainla* *RAJELI*	Sort 4: *Quercus semecarpifolia* *Salix babylonica* *Buddlija asiatica*
Sort 5: *Colquhounia cocciea* *Eurya acuminata* *Quercus semecarpifolia*	Sort 6: *Hedera nepalensis* *RAJELI* *Vitis repanda*
Sort 7: *Prunus cerasoides* *Michelia spp.* *Quercus semecarpifolia*	Sort 8: *Eurya acuminata* *Ficus nemoralis* *Buddlija asiatica*
Sort 9: *Eriobotrya elliptica* *Hedera nepalensis* *Vitis repanda*	

Some authors suggest that consultants should be limited to using only one bipolar verbal classification label for each triad sort they are presented with (Kelly, 1955; Fransella & Bannister, 1977). Also, once a verbal label is used consultants are generally not allowed to use the same label again for other sort groupings. However, because of the goals of this research, it was not considered essential to restrict consultants to a single grouping rationale. Consultants were also permitted to repeat verbal labels for other sort groupings.

This deviation from standard research method was also based on pre-test results.[58] During pre-tests, attempts were made to restrict consultants to strict procedural requirements suggested by some researchers. However, this rigid application of research procedure had a negative effect on the performance of consultants. Pre-test consultants exhibited great reluctance to verbalize their rationale for their arrangements of leaves within a triad leaf sort when restricted to only one exclusive statement. These consultants also appeared to be uncomfortable and tense under these conditions, and this caused some to stop participating in the activity. Additionally, the information gathered through the strict application of this technique lacked the richness of detail that was common during more open discussions. These and other difficulties lead to the use of this more flexible procedure, which resulted in a more relaxed and open interchange between the consultants and researcher. In exchange for effective consultant participation and the collection of data rich in detail, the level of analysis that is possible with the resultant data is limited to qualitative content analysis of the verbal labels through inspection.

Before consultants were presented with triad leaf sorts, they were first told what the purpose of this activity was, and what procedures would occur. To introduce them to the procedure, an example of the research activity using three different ink pens was carried out between the principal investigator and his assistant. One of the major aims of this demonstration was to show consultants that there were no correct responses for this activity. Great care was also taken

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[58] Before administering this method it was pre-tested with people in Pokhara and in Salija. These pre-tests alerted the principal investigator to potential problems.

to assure consultants that only their personal responses were wanted, not their neighbor's, their husband's, or their mother's. This demonstration also helped consultants relax, since it was important that they did not feel that they were being tested. It was also important that they enjoy the research experience.

After the introduction, consultants were presented with a triad leaf sort, and then asked to name each leaf. They were then asked to arrange the leaves into two groups, one consisting of two leaves considered most similar to each other, and the other consisting of the remaining dissimilar leaf. Once this grouping activity was accomplished, consultants were asked to explain their reasons for their groupings.

After groupings and associated verbal labels were recorded (Appendix E), consultants were presented with another triad leaf sort and again asked to group them and provide their reasons for the resultant groups. When all nine triad leaf sorts had been presented, the consultants were reminded, one at a time, of each of their verbal labels and leaf groups, then they were asked to place the remaining 12 leaves in one of the two groups of each leaf sort. The record form was marked to indicate whether a specific leaf agreed or disagreed with a specific verbal label. This procedure, repeated for all verbal classification labels mentioned by the consultant, made it possible to test each leaf sample against one verbal classification label. This made it possible to construct a repertory grid composed of all fodder types involved in this test and the various verbal classification labels that were elicited. In some situations, this also led to new classification labels.[59]

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[59] An copy of the repertory grid record form is presented in Appendix E.

After these tests were completed, consultants were presented with one predetermined verbal label:

> "Some trees, if grown near agricultural crops, may cause these crops some harm. Please examine the 15 leaves and place them in two piles, one pile for trees that cause crop problems and one for trees that do not cause crop problems."

The consultants' responses and comments to this question were recorded. Again, to avoid consultant fatigue, only one preformulated construct label was used. Even with these limits, each triad test took between one to two hours to complete.

Chapter 5

RESEARCH FINDINGS AND RESULTS

5.1 Introduction:

This chapter presents results and findings from the research carried out in Salija. It is organized as follows:

1) Presentation and discussion of descriptive findings based on data from the household survey and private tree inventory;

2) Assessment and discussion of the hypotheses based primarily on data from the survey and inventory, with supporting information from the fodder knowledge discussion guide and participant observation; and

3) Presentation and discussion of a system of classification used by farmers in Salija to evaluate the qualitative character of tree fodder.

One of the major outcomes of this research was the formulation of the multi-method research strategy discussed earlier. During field work and data analysis the value of using this strategy became apparent. The goals of this research could not have been accomplished as well if only a subset of methods had been used. As anomalies and problems in the data from one method surfaced, clarifications were often made possible by cross checking with data and information collected by other methods. Cross checking data among the different sources also proved critical to the formulation and interpretation of results.

5.2 Descriptive Findings from Survey and Inventory Data

5.2.1 Demographic Characteristics of Salija:

From the sample of 54 households a total resident population of 318 people was recorded, or approximately 5.9 people per household. Five major demographic categories were defined in the survey: 1)Elders, people sixty five years and older; 2)Adults, people between 18 and 65 years of age; 3)Youth, people between 5 and 18 years of age (school age); 4)Children, people younger than 5 years of age, and 5)Labor, all people above 5 years of age. Within the youth category, information on those attending school and those not attending school was also gathered. Table 8 presents data on the composition of the sample population according to these demographic categories. These data also show the distribution of males and females within each category by ward. The percentage distribution of males and females in each demographic category for the total sample are also summarized in Table 9.

The 5 percent difference between the number of adult males and females is likely attributable to the fact that these data do not include household members who live outside the community for most of the year.[60] The 38 percent difference between the number of male and female youth, however, is not so easily explained. This difference may in part be the result of women marrying at younger ages then men (Banister and Thapa, 1981).[61] It may also be partially due to the fact that women are often married to households outside their native communities, and finally, this may be related to out-migration of young people from rural areas.

The data in Table 10 show that there is a greater percentage of school age males attending school, 87 percent, than females, 67 percent, and that only 32.5

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[60] Most of those who reside outside of the village area are men who are in the Indian, Nepalese, or British armies,

[61] Banister and Thapa (1981) report that the mean age of marriage for men and women is 20.8 and 16.7 years respectively. Thus, with women marrying outside the community, the number of female youth (5 - 18 years) living in Salija could be expected to be less than that of males of that same category.

Table 8

Population Data by Demographic Category

	WARD	ELDERS 65 >	ADULTS 18-65	YOUTH 5-18	NO SCH 5-18	SCHOOL 5-18	CHILD > 5	TOTAL LABOR	TOTAL PEOPLE	AVG / HH
MALES	#6	7	29	29	4	25	12	65	77	2.9
	#7	3	17	14	4	10	6	34	40	3.3
	#2	4	17	19	0	19	7	40	47	3.1
	TOTAL	14	63	62	8	54	25	139	164	3.0
FEMALES	#6	10	37	16	6	10	14	63	77	2.9
	#7	3	18	10	5	5	3	31	34	2.8
	#2	2	22	13	2	11	6	37	43	2.9
	TOTAL	15	77	39	13	26	23	131	154	2.9
TOTALS	#6	17	6	45	10	35	26	128	154	5.7
	#7	6	35	24	9	15	9	61	74	6.2
	#2	6	39	32	2	30	13	77	90	6.0
	TOTALS	29	140	101	21	80	50	270	318	5.9

percent of all young people in school are female. Shrestha (1987) provides a discussion of the many reasons for this disparity between the attendance of male and females in school in Nepal.

The number of children in a household who attend school effects the household labor pool, and in turn land-use strategies. For example, children who attend formal school cannot go to the forest to collect fodder or fuelwood. Thus, if tree fodder and fuelwood demand remains constant,

Table 9

Percent of Males & Females in each Demographic Category

	Elders	Adults	Youth	Child	Labor	Total
Total% Males	4% (48%)	19% (45%)	19% (61%)	8% (52%)	44% (52%)	52% (52%)
Total% Females	5% (52%)	24 (55%)	12% (39%)	7% (48%)	41% (48%)	48% (48%)
Total% People	9% (100%)	43% (100%)	32% (100%)	15% (100%)	85% (100%)	100% (100%)

(Percent within each category in parentheses)

this condition can act as an incentive to plant more fodder and fuelwood trees on private land. In other words, bring fodder and fuelwood resources to the household rather than send the household to gather these resources. This assumption is supported by results (discussed later, page 165) on fodder collection responsibilities within households, and from research evidence on recent increases in the number of trees being planted on private land in Salija.

Table 10

Percent School Age Males & Females Who Attend School

	Total No.	% In School	% Not In School	Total
Male Youth	62	87% (67.5%)	13%	100%
Female Youth	39	67% (32.5%)	33%	100%
Total Youth	101	79% (100%)	21%	100%

(Percent within category in parentheses)

Another important variable concerning household labor and land-use strategies is the relative size of households and whether the household is nuclear or extended. Table 11 presents data on the distribution of three household size categories in the study area. This data suggests that a majority of households have more than four resident members. Most of the families in Ward 6 range between four and six resident members. This is different from the household composition in Wards 2 and 7, where the majority of households have more than seven members. This apparent difference in household composition between the three wards may be related to the efforts of the dominant political leader in Salija to promote family planning in Ward 6, his home ward.

Of these households, 54 percent can be considered as extended.[62] Larger families and extended households may have a labor advantage over smaller, nuclear households, especially with respect to agricultural activities such as tree fodder and fuelwood collection.

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[62] An extended family is defined as a family that consists of the nuclear family, and one or more grandparent, uncle, aunt, or other relative, that live together in the households' dwellings and work household land.

Table 11

Number & Percentage of Households in Each Household Size Category

No. of People per Household	Ward 6 #	Ward 6 %	Ward 7 #	Ward 7 %	Ward 2 #	Ward 2 %	Totals #	Totals %
1 to 3	7	26%	3	25%	3	20%	13	24%
4 to 6	13	48%	3	25%	5	33%	21	39%
7 & >	7	26%	6	50%	7	47%	20	37%
Totals	27	100%	12	100%	15	100%	54	100%

- number of households in category;
% - % of households by Ward.

5.2.2 Land Distribution Characteristics in Salija:

As mentioned earlier, each ward chairman had provided a list of households in their wards that included an official estimate of landholdings in *Ropani*, the official measurement unit for land area in Nepal (1 hectare = 19.66 *ropani* = 2.47 acres).[63] Both the inventory and survey asked about land holdings by size and character, a type of question that is notorious for generating data of debatable reliability. In an effort to increase the reliability of this data, consultants were encouraged to use units of measure they were most familiar with. They were not required to answer this question in terms of *ropani* units. The most common unit of measure for cultivated land used by consultants was *haul*. This unit of measure describes the number of days it takes a man and a team of oxen to plow a piece

[63] Units of measure are presented in both Western and Nepali units where possible. This is done out of respect for Nepalese culture, and to make data more usable and relevant within the context of the mid-hill area of Nepal.

of land. One *haul* of land requires one day to plow, and in the Salija area this is approximately equal to two *ropani* (0.102 ha & .26 acres) of land. For uncultivated grass land, land along stream banks, and gully land, the most common unit of measure used by consultants was *"din"* (day) or *"jina"* (person). These units of measure describe the number of days or *"din"* it takes one person to cut the grass growing on a piece of land, or the number of people or *"jina"* it takes to cut the same amount of grass in one day. In the Salija area, one *"din"* of land is approximately equal to 0.5 *ropani* (0.025 ha & 0.065 acres) of land. The *ropani* values for land area presented below were calculated using these conversion units on the reported sizes of land holdings.

Because of the subjective nature of local units of measure and of the estimated conversion units, it is possible that individual *ropani* estimates are inaccurate. However, because of the orderly character of agricultural land and the consistency with which it is cultivated, it is conceivable that reported area measurements for cultivated land are fairly accurate. The same cannot be said for non-agricultural land. This category of land consists of stream banks, steep grassy slopes, gullied and degraded land, and other types of marginal land, often irregular in shape, and worked less frequently than agricultural land. Therefore, it is likely that estimates for the amount of land in this category may be less accurate than for agricultural land. It is assumed in this research that the degree of error in these estimates is fairly equivalent across the population, and the relative sizes of landholdings are assumed to be accurate within this study area.[64]

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[64] This assumption cannot be extended beyond the study area and therefore, generalizations based in part on land holding data cannot be made for larger populations.

Additionally, it is possible that these land area values are more accurate than values derived by asking consultants to report their land holdings in unfamiliar *ropani* units.

Values of reported land area were compared with the *ropani* estimates provided by the ward chairmen in an effort to evaluate the relative accuracy of reported values. The resultant data are presented below in Tables 12 and 13. The ratio of *Panchayat* estimates of land holdings to the values reported by consultants (EST/REP) shows a high degree of concurrence. This suggests that reported area estimates for total landholdings are fairly accurate. There are several possible explanations for this:

1) since consultants were allowed to use units of measure they were familiar with, reporting accuracy was enhanced[65];

2) consultants were willing to report their landholdings as accurately as they could because they did not fear the researcher or research project.

This same evaluation, however, cannot be made for the estimates for arable and non-arable fractions.

From Tables 12 and 13 it can be seen that the average size landholding is 0.67 ha or 13.1 *ropani*, with approximately 70 percent of this classed as agricultural land. The remaining 30 percent, or non-agricultural land, is where most of the private trees, except for fruit and many fodder trees, are cultivated. This 70

[65] During the introduction phase of the research, many of the consultants asked if they would be asked how many *ropani* of land they owned. Consultants asked this question because most of them do not know the size of their land holding in ropani units. Some also seemed fearful of being asked this questions since they would not be able to answer it. When they were told that they could use any units of measure they wanted many consultants showed great relief.

Table 12

Land Holding Data From Inventory (in *ropani*)

WARDS & (#HH)	AGRICULTURAL LAND AREA		OTHER LAND AREA		TOTAL LAND AREA		ESTIMATED LAND AREA (ward list)		RATIO EST/REP
	Total	Avg.	Total	Avg.	Total	Avg.	Total	Avg.	
#6 (27)	235.0	8.7	99.3	3.7	346.3	12.8	333.0	12.3	0.96
#7 (12)	101.0	8.4	42.0	3.5	143.0	11.9	156.0	13.0	1.37
#2 (15)	161.0	10.7	58.5	3.9	219.5	14.6	208.0	13.9	1.19
Tot(54)	497.0	9.3	199.8	3.7	708.8	13.1	697.0	13.1	1.01

* See Table 13 for definitions of terms used in this table.

Table 13

Land Holding Data From Inventory (in hectares)

WARDS & (#HH)	AGRICULTURAL LAND AREA		OTHER LAND AREA		TOTAL LAND AREA		ESTIMATE LAND AREA (ward list)		RATIO EST/REP
	Total	Avg.	Total	Avg.	Total	Avg.	Total	Avg.	
#6 (27)	12.0	.44	5.1	.19	17.6	.65	16.9	.63	0.96
#7 (12)	5.14	.43	2.14	.18	7.3	.61	7.9	.66	1.37
#2 (15)	8.2	.55	2.98	.20	11.2	.74	10.6	.71	1.19
Tot(54)	25.34	.47	10.22	.19	36.1	.67	35.4	.67	1.01

(#HH) - The number of households in each sample.
EST/REP - A ratio between estimated land size and consultant reported land size. This is used as a rough indicator for accuracy, a value of 1 indicates that the reported average is equal to the estimated average. Agricultural Land - irrigated land (khet) & non-irrigated land (baari).
Other Land - grassland (khar baari), stream channels (khola kolsi).
Estimated - this data came from Panchayat records.

percent figure for agricultural land is likely an over-estimate, since measurement estimates for non-agricultural land are probably less accurate than for agricultural land. Tables 14 and 15 show that the distribution of land among land size categories for the sample population is similar to that reported for Nepal as a whole. This feature, along with the ratio of estimated:reported landholdings suggests that landholding data gathered for this research are reliable and relatively accurate.

Table 14

Land Distribution Patterns in Salija

	Land size categories (ha)				
	0-0.49	0.5-0.99	1.0-1.49	1.5 >	TOTAL
WARD - 6					
# OF HH	13	8	4	2	27
% OF HH	48.15%	29.63%	14.81%	7.41%	100.00%
WARD - 7					
# OF HH	8	2	-	2	12
% OF HH	66.66%	16.67%	-	16.67%	100.00%
WARD - 2					
# OF HH	9	3	1	2	15
% OF HH	60.00%	20.00%	6.67%	13.33%	100.00%
TOTAL					
# OF HH	30	13	5	6	54
% OF HH	55.56%	24.07%	9.26%	11.11%	100.00%

All three wards show a similar distribution of land with nearly 50 percent of households in each ward owning less than one-half hectare. Even though there were no landless people in the sample population or research area, near-landlessness was evident. The smallest farms were reported to be 0.05 ha or 1

Table 15

Agricultural Land Distribution in Nepal, 1981-82 (ha)

Land Size (ha)	0	.01-.49	.50-.99	1-1.99	2 >
% of Population	15.4	42.5	13.7	14.7	13.6

Source: Wallace, 1987

ropani in area. For the near-landless farmers there is little space on their land that can be spared to plant trees. Consequently they usually cannot participate in private tree planting efforts. For these households, public lands and forests are critically important sources for tree and forest-based resources that are essential for survival. Even though these farmers have a limited capacity to participate in such development efforts, there should be some effort to help owners of small farms to incorporate valuable multi-purpose trees and shrubs into their farming systems to as great extent as possible.

5.2.3 Distribution of Trees in the Study Area:

In this section, general introductory information on the distribution of trees by tree categories, land area, household, and species are presented. Data presented below will be discussed in greater detail in later sections of this chapter.

5.2.3.1 **Tree Categories:** The inventory of trees and shrubs cultivated on private land resulted in a cataloging of 129 different species. During the inventory farmers were also asked to state their primary, secondary, and tertiary uses for each species by usage category (Appendix C).[66] These reports by consultants on

[66] Farmers were allowed to give as many uses by category as they wished. They were not required to give three or restricted to just three.

the major uses of each species were used to group different trees into the following 15 usage categories:

<u>D-Fodder</u> or dedicated fodder - trees maintained on private land primarily as sources of animal fodder. This and other categories of trees may also provide additional benefits, but such benefits are viewed here as positive externalities.

<u>D-Fuelwood</u> or dedicated fuelwood - trees maintained on private land primarily as sources of fuelwood.

<u>D-Timber</u> or dedicated timber - trees maintained on private land primarily as sources of timber.

<u>D-Utility</u> or dedicated utility - trees maintained on private land primarily for tool handles, household implements, livestock stakes, temporary shelters, roofing stakes, etc.

<u>Fruit</u> - trees cultivated for their fruit.

<u>Fod-Fuel-Tim</u> or fodder-fuelwood-timber - multipurpose trees maintained as sources of three primary goods, fodder, fuelwood, and timber.

<u>Fod-Fuel</u> or fodder-fuelwood - multipurpose trees cultivate primarily as sources of both fodder and fuelwood, with neither use predominating.

<u>Fod-Tim</u> or fodder-timber - multipurpose trees maintained as sources of both fodder and timber, with no other use predominating..

<u>Fod-Utility</u> or fodder-utility - multipurpose trees maintained as sources of both fodder and utility wood.

<u>Tim-Fuel</u> or timber-fuelwood - multipurpose trees maintained as sources of both timber and fuelwood.

<u>Util-Fuel</u> or utility-fuelwood - multipurpose trees maintained as sources of fuelwood and utility wood.

<u>Med-Spice</u> or medicinal-spices - multipurpose trees maintained as both sources of medicine and spices.

<u>S-Conserve-Fod</u> or soil-conservation-fodder - trees maintained primarily for their soil conservation value, but with fodder being an important secondary product.

<u>L-Fences</u> or living-fences - trees maintained primarily as living fences.

Religious or trees maintained primarily for ceremonial purposes.

Other or trees with no primary dominating use, some were cultivated for decorative reasons, others as browse for grazing livestock.

It should be emphasized that these categories were developed by the principal investigator by averaging reports of tree use provided by consultants on the inventory. These categories are not necessarily used by residents of Salija to classify or evaluate trees, they were created to help in the analysis of inventory data.

Table 16 shows the number of different species, the total number of trees, and the percentage of trees in each category to the total number recorded. These data show that some of these categories are represented by either only a few species or only a few trees. Because of this, some of the categories were grouped together to form composite categories ("#" and "@" indicate subgroups used to form composite groups). For example, all multi-use categories that included fodder as a major use were combined to form a "MULTI-FODDER" category (@) with 28 species and 21 percent of the total recorded trees. The remaining categories with fewer than 400 trees were combined to form the "OTHER" (#) category, with 16 species and four percent of the total recorded trees maintained on private land. This resulted in a total of seven final categories.

Figure 5 shows the distribution of these seven composite categories of trees as a percentage of the total number of trees recorded in the research area. This figure shows that an average of 54 percent of all trees grown on private land are potential sources of animal fodder, and 33 percent are primarily cultivated to supply animal fodder. It is important to note that the number of "utility trees,"

Table 16

Number of Species and Trees by Tree-Use Category

USAGE CATEGORY	NUMBER OF SPECIES	TOTAL NO. OF TREES	% OF TOTAL TREES
* D-FODDER	28	4519	33.0
* D-FUELWOOD	16	3070	22.4
@ FOD-FUEL-TIM	7	1819	13.3
* D-TIMBER	9	1564	11.4
* FRUIT	20	743	5.4
@ FOD-FUEL	18	742	5.4
* MED-SPICE	11	411	3.0
# D-UTILITY	3	175	1.3
# UTIL-FUEL	3	162	1.2
# TIM-FUEL	3	146	1.2
@ S-CONSERVE	2	116	0.8
@ FOD-TIM	1	88	0.6
# L-FENCES	3	54	0.4
@ FOD-UTIL	1	46	0.3
# OTHER	3	36	0.3
# RELIGIOUS	1	7	0.1
TOTALS	129	13,698	100 %

* Categories that remained members of the final 7 categories.
@ Members of the composite MULTI-FODDER category.
# Members of the composite OTHER category.

which is part of the "other trees" category, do not accurately reflect the importance of these trees to farming systems in Salija. Many of the trees in this category are never felled, instead, specific branches are cut as needed. Because of this pattern of utilization, each household does not need to cultivate a great number of these species. Several important species from other categories also have important utility value. For example, wood from *Phalant* or *Quercus lamellosa*, an important fodder, fuelwood, and timber species, is used to make plows, while wood from

PERCENTAGE OF TREES BY USAGE CATEGORY
TREES GROWN ON PRIVATE LAND IN SALIJA
(From wards 6, 7, & 2 only.)

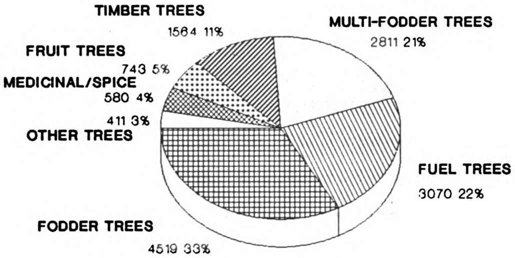

Figure 5

Percentage of Trees by Usage Category

Guraas or *Rhododendron spp.*, an important fuelwood species, is used to carve wooden containers used in making *Ghiu* and yogurt.

Figure 6 shows that the distribution of these tree type categories is not uniform across the three wards. Species in the fuelwood category account for a greater percentage of total trees in Ward 7, 33 percent, than they do in Wards 6 and 2, 21 and 17 percent respectively. Species in the dedicated fodder category account for a greater percentage of total trees in Ward 2, 46 percent, than they do in Ward 6 and 7, 29 and 30 percent respectively. Some of this variation may be related to the relatively small sample size from Wards 2 and 7. However, other data suggest that the higher percentage concentration of dedicated fodder species in Ward 2 is attributable to a relatively higher demand for tree fodder in this ward. Farmers in Ward 2 have a greater average number of large livestock than do farmers in the other two wards. Therefore, their demand for fodder of all types is greater, and during fodder deficit seasons, the demand for tree fodder increases. Also, Ward 2 is farther from the three forests of Salija *Panchayat* than the other two wards. As the distance from public sources of tree fodder increases, the time required to gather fodder from these forests also increases.

5.2.3.2 **Distribution/Density of Trees by Farm Size**: Another way to analyze the distribution of trees on farms in Nepal is to compare the numbers of trees to farm size. Figure 5 shows the distribution of the average number of trees per hectare on private land over the whole study area (the data for this figure is presented in Table 17 on page 132). By examining the "all wards" bar in each land size category it can be seen that this distribution, or the density of trees, is

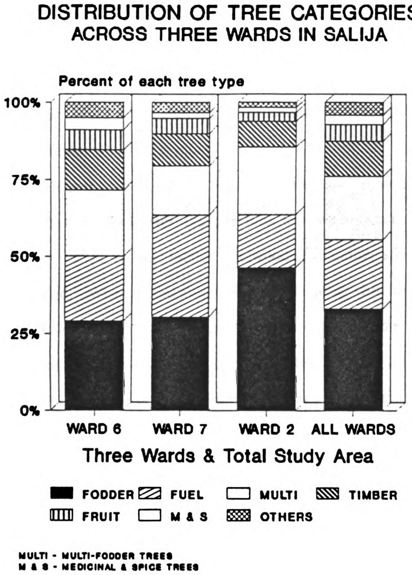

Figure 6

Distribution of Tree Categories Across the Research Area relatively uniform across all land sizes. However, within land size categories and between wards, there is greater variation. This individual ward variation may be attributed to the small sample sizes within each ward, the relative influence of a few individuals on the total average, and the fact that the inventory counted trees of all age classes.

For example, the large number of trees per hectare at the smallest land size category for Ward 6 was strongly influenced by two specific households. One of these households reported owning 0.46 ha of land with 722 recorded trees. The other household reported owning 0.13 ha of land with 669 recorded trees. In both cases, these farmers had, over the previous five years, been establishing small "micro-plantations" of various fodder, fuelwood and timber species on their non-agricultural land. When asked their reasons for doing this, they said that much of their land was too poor for good agricultural production, but that it would grow trees that could eventually be sold or traded for food and other household necessities. One of these farmers commented that growing trees also required less labor over the years than the cultivation of crops.

The relative uniformity of tree densities across land size categories contrast with conventional assumptions about tree densities per hectare of land in Nepal (Karki, 1989). According to this, as land size decreases the density of trees per hectare increases. There are several problems with this assumption:

1) Much of the data that supports this assumption comes from surveys that collected verbally reported information on size of land holdings in units of measure unfamiliar to the farmers, and on the number of trees being grown, with the concept of "tree" not being defined.

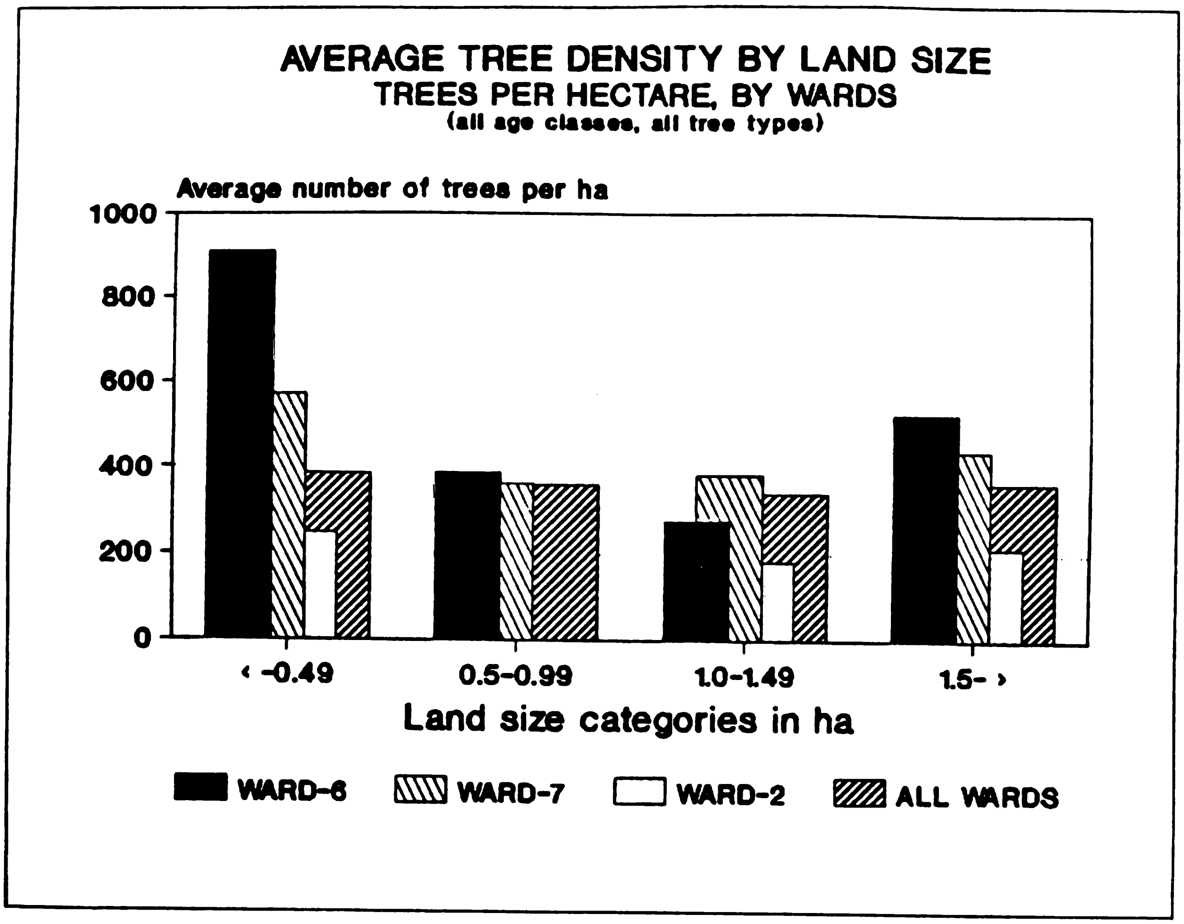

Figure 7

<u>Average Number of Trees per Hectare by Land Size Categories</u>

2) Farmers generally do not cultivate trees evenly across all their land, much tree planting is reserved for non-agricultural land. Therefore, it is necessary to examine the density of trees with respect to land-use types not simply land area.

3) Since a majority of farmers in Nepal own less than a hectare of land it seems inappropriate to take the number of trees growing on very small units of land and multiply this number by hectare units to arrive at a per hectare value. This is the reason for the extreme value of over 900 trees per hectare for Ward 6 farms in the 0.49 hectare and less category.

4) Finally, this measurement does not effectively address the issue of the supply of tree-based resources at the household level, and it provides little insight into the important roles that trees play within the farming system.

The contrast between the data presented in Figure 7 and this conventional assumption may be attributed to several factors.

1) The number of trees recorded within each land size category were individually counted, not based on reports, and therefore they may be more accurate.

2) The determination of what constitutes a tree was left to farmers, and thus a wide variety of woody vegetation, shrubs, bushes, and trees were counted. Also, all age classes of trees were counted.

3) Land area reports were made in the farmers' own units, and this again may have improved accuracy.

4) The small sample size may have allowed individual households to have a disproportionate effect on the averages values so they may appear to be more uniform across land size categories than they actually are.

Based on these and other data, and general knowledge about the Salija area, it is felt that this uniformity in trees/ha. in the different land size classes is valid. These data may demonstrate that the conventional assumption about tree planting density is not valid for all areas of Nepal. Thus, it is important for researchers to carefully question the use and application of this and other assumptions, and work to develop better mechanisms to evaluate tree planting on private land.

One possible way to evaluate differences in land size and tree planting is to compare the composition of different tree types on different land size groups. Since trees are maintained on land for different purposes, it may be possible to identify and understand possible relationships between the size of land holdings, and the distribution of different categories of trees. Figure 8 shows how the average composition of private trees changes as the size of land holdings changes. On land holdings of less than 0.5 ha, nearly 65 percent of all trees can potentially supply fodder, and of this, 45 percent are recognized as dedicated fodder species. These percentages decline to 60 and 36, and 47 and 30 percent in the next two land size categories, while the percentage of other types of trees tend to increase. This data suggests that as land size decreases, farmers focus their tree planting on fodder producing species. For land sizes greater than 1.5 ha, this apparent trend changes, i.e., as land become less of a constraint valuable species, especially fodder species, become a greater percentage of total trees planted. This change in percentage distribution of tree types may be partly the result of the increasing number of livestock that farmers with larger land holdings generally own. Another factor is related to the desire voiced by several consultants in this study to become independent of public sources of tree fodder. This and other data suggests that as land size increases above 1.5 ha. the opportunity to become tree fodder independent increases, and farmers cultivate an increasing number of fodder trees to realize this independence. The benefit from achieving independence from public tree fodder sources is easily understandable since it can contribute to a substantial savings in household labor, and this savings can either be spent in

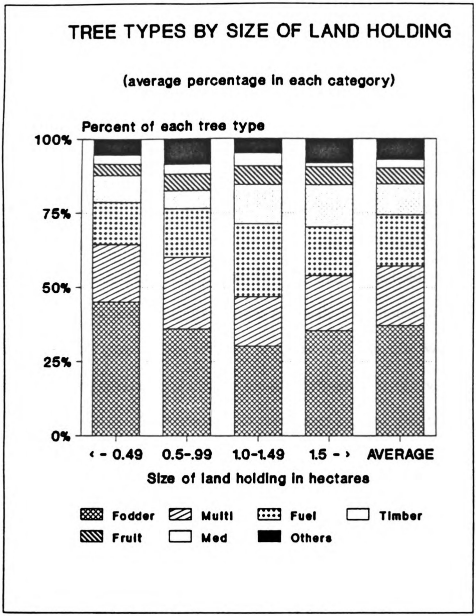

Figure 8

<u>Tree Types by Size of Land Holding</u>

recreational activities, other household work, or it can allow both male and female children to attend school.

5.2.3.3 **Distribution of Trees by Household:** It is also appropriate to examine planting densities at the household level rather than only in terms of land area. Data from Table 17, as presented in Figures 9 and 10, shows two perspectives on the average number of trees per household with respect to land size categories in the research area. Figure 9 illustrates the positive influence that land size has on tree planting at the household level, especially with farms of 1.5 ha and larger. The strength of this association is examined in section 5.3.3 (page 167).

Figure 10, presents another view of these data, with land size categories grouped by ward. Both Figures 9 and 10 indicate that households within the 0.5 to .99 ha category are cultivating trees more intensely than household in the next higher land size category. However, the small sample size for Wards 2 and 7 preclude formulating a clear explanation for the difference in cultivation intensity between the three wards. Nevertheless, all these data suggest that tree cultivation on private land is complex and influenced by more variables than land size. Understanding the complexities of these indigenous agroforesty systems requires a determination of what variables might be important, how they interrelate, and what data are needed to formulate these variables. At present, an understanding of these three elements is only in its infancy.

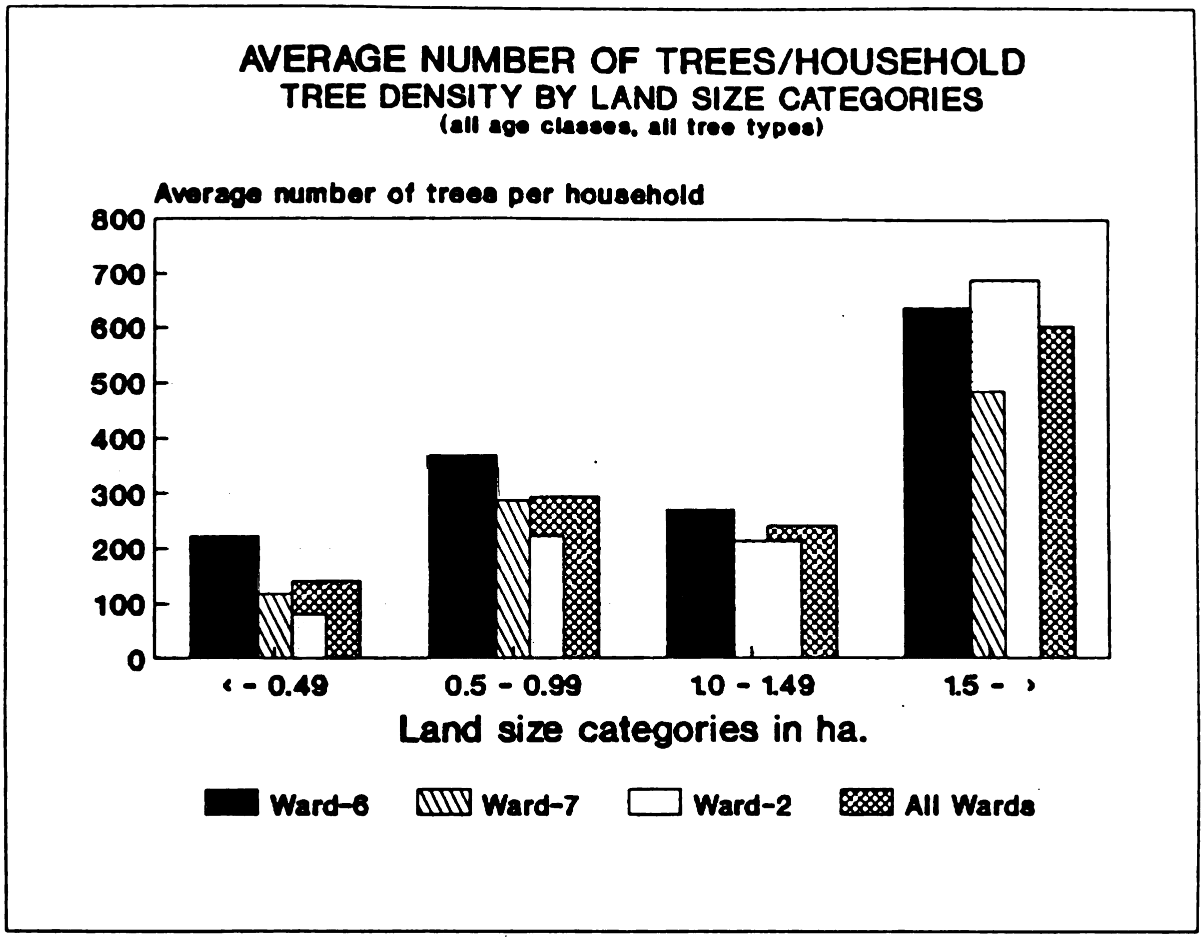

Figure 9

Average Number of Trees per Household by Land Size Category

Table 17

Average Tree Density by Size of Landholding (ha)*

Land Size	Ward 6 Trees/ha	Ward 6 #Trees/hh	Ward 7 Trees/ha	Ward 7 #Trees/hh	Ward 2 Trees/ha	Ward 2 #Trees/hh	All Wards Trees/ha	All Wards #Trees/hh
0-0.49	911	223 (13)	389	117 (8)	278	82 (9)	526	141 (30)
.5-0.99	572	369 (8)	363	287 (2)	385	223 (3)	440	293 (13)
1-1.49	248	272 (4)	-	-	182	213 (1)	215	242 (5)
1.5 >	386	640 (2)	362	487 (2)	340	689 (2)	363	605 (6)

* The numbers of households for each category are in parentheses.

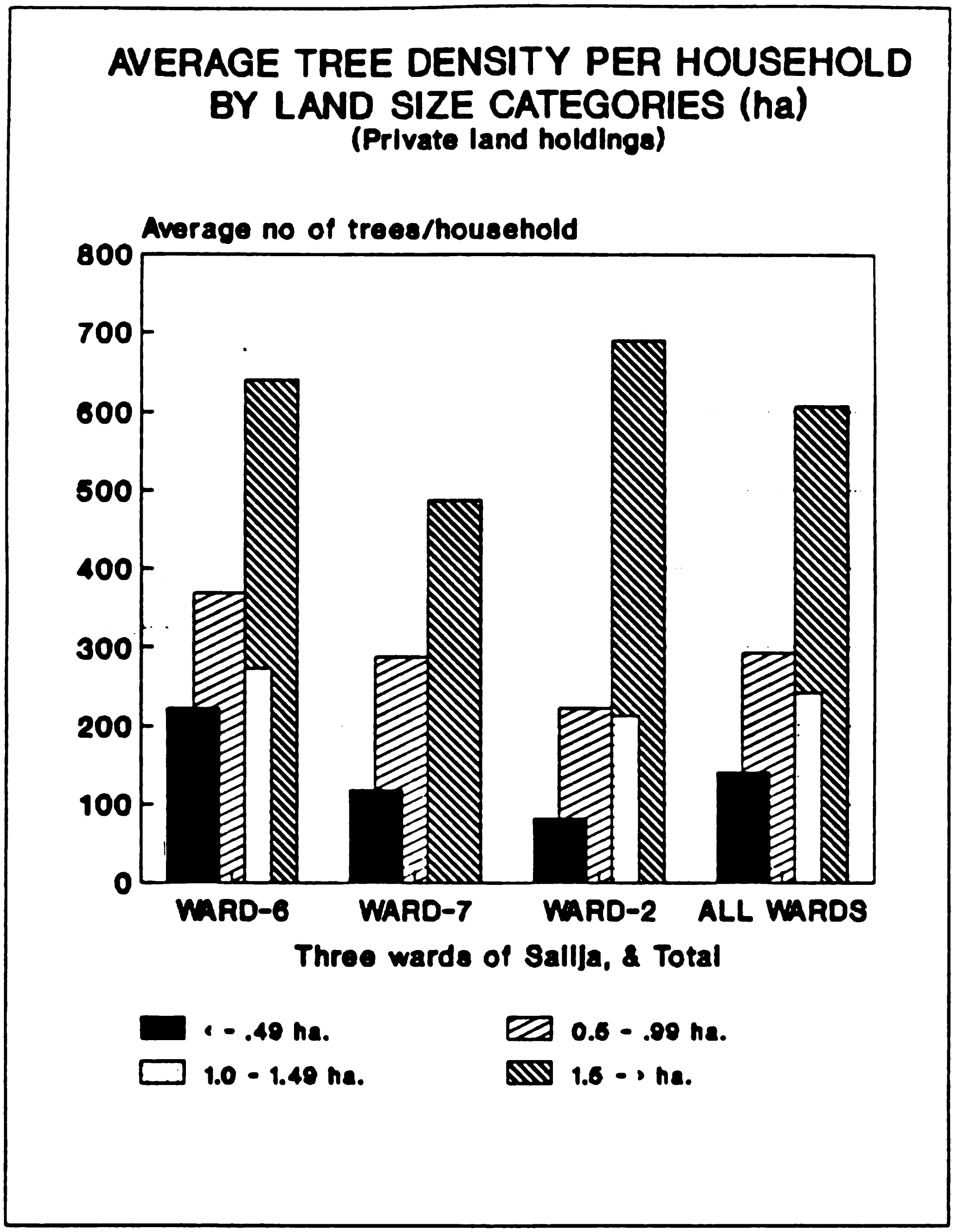

Figure 10

Average Tree Density Per Household by Land Size Categories (ha.)

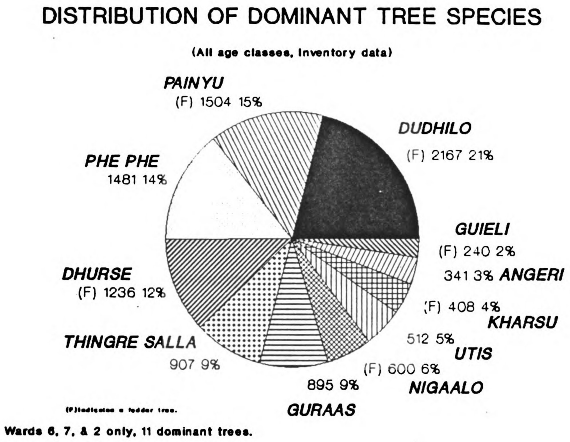

Figure 11

<u>Distribution of Dominant Tree Species on Private Land</u>

<u>Species Key</u>:

Nepali	Latin	Nepali	Latin
DUDHILO	*Ficus nemoralis*	*PAINYU*	*Prunus cerasoides*
PHE PHE	*Neolitsea umbrosa*	*DHURSE*	*Buddlija asiatica*
THINGRE SALLA	*Pinus wallichiana*	*GURAAS*	*Rhododendron spp.*
NIGAALO	*Arundinaria spp.*	*UTIS*	*Alnus nepalensis*
KHARSU	*Quercus semecarpifolia*	*ANGERI*	*Pieris ovalifolia*
GUIELI	*Elaeagnus parvifolia*		

5.2.3.4 **Distribution of Tree Species:** In addition to examining the distribution of trees by type, by ha, and by household, it is useful to examine the distribution of the dominant species cultivated on private land. Figure 11 shows the distribution of the 11 dominant species of trees (on average for all age categories) cultivated on private land in the study area. When these data are compared with data discussed previously, a further appreciation of the complexity of these agroforestry systems is attained. From this data it can be seen that, on average, 60 percent of the dominant tree species cultivated on private land are potential sources of fodder.[67] It is interesting to note that of the species in Figure 11 only *Ficus nemoralis* may be considered as a dedicated fodder tree. Other major fodder producing trees, *Quercus semecarpifolia, Prunus cerasoides, Buddlija asiatica*, and *Arundinaria spp.*, also supply other very important products to the household. It is also interesting to note that even though two of the dominant species, *Neolitsea umbrosa* and *Buddlija asiatica*, are very important to local agroforestry systems, they are seemingly unknown to forestry related research, extension, and development efforts.

5.2.4 Distribution of Livestock and Fodder Trees:

5.2.4.1 **Distribution of Livestock:** Livestock are a major component of farming systems in Nepal. Livestock in the study area consists of buffalo, cattle, goats and sheep.[68] It is convenient, within the context of Nepalese farming systems, to think of these livestock as the primary energy conversion systems on farms. They

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[67] Since many of these trees are less than 10 years of age, they have not yet reached a "harvestable" age, and therefore do not currently provide households with leaf fodder.

[68] Most households also maintained some chickens and a few household raised rabbits, but these animals were not included in the survey.

consume a variety of feeds including grasses, agricultural residue, tree fodder, and other freely browsed vegetation and convert this into products and services essential to many farm households in the research area and elsewhere in Nepal.

An awareness of some aspects of the livestock component of these complex farming systems can help develop an understanding of private tree fodder planting practices, and of indigenous knowledge systems surrounding tree fodder. This section presents general information on the distribution of livestock in the study area, and relates this to the distribution of fodder trees on private land. Some of the data presented here will be discussed in greater detail in later sections of this chapter.

Two very products from livestock are dung and urine, for without animal dung the fertility of fields could not be maintained and agricultural yields would diminish.[69] The importance of dung to household economies is demonstrated by the existence of "dung" trading in Salija. One example comes from the three households in the sample population that did not own any livestock. Even in the absence of livestock, these households still cultivated fodder trees, and were planning to plant more. These households allow their neighbors who own livestock (i.e., dung factories) to collect fodder from their trees in exchange for dung. In other cases, farm labor is also exchanged for dung. There is no evidence that dung is sold as a cash commodity in Salija. The importance of dung in the farming system is also strongly related to the knowledge systems surrounding tree fodder (page 187).

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[69] Transporting commercial inorganic fertilizers on the backs of porters or donkeys from the nearest road to Salija makes them too costly for the farmers of this community. A small amount of commercial fertilizer is used by some farmers on their fruit trees, but some farmers reported that they had little faith in this product, believing that it would damage the long term productivity of their soil.

Another important product of this energy conversion are the animals themselves and their offspring. In some cases, these products may be consumed directly or sold for consumption (these include only male buffaloes, old female buffaloes, goats and sheep).[70] Closely associated with this use, is the importance of goats and sheep, and to a lesser extent buffaloes, as beasts for sacrifices during some religious ceremonies.

Another important product from both cows and female buffalo (*Bhainsi*) is milk. Milk is consumed directly or used to brew tea. Possibly more important, is the conversion of milk to *Ghiu* or clarified butter, an important cooking oil, spice, and cash income earning commodity. The by-product of *ghiu production*, butter milk, is also prized as a refreshing drink. Oxen are used to convert chemical energy to mechanical energy that is used in the plowing and cultivation of fields. In general, the value of livestock to these farming systems is reflected in the amount of time and effort expended by households to feed and care for their animals in exchange for their flesh, milk, labor, and their dung.

Table 18 presents data on the numbers of livestock units (LSU) per household and per hectare. This data is compared to the number of dedicated fodder trees of all age classes (see Table 20) being cultivated, and the number of all fodder producing trees (the sum of dedicated and multipurpose fodder trees) grown on private land. The number of LSU per household in the Salija study is comparable to data reported by Hawkins and Malla (1983), and Panday (1982), as shown in Table 19. However, data on the number of fodder trees per

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[70] Because Nepal is a Hindu Kingdom, cows and oxen cannot killed for consumption and their flesh is not eaten by a majority of Nepalese.

Table 18

Number of Livestock Units by Household, Hectare, and Fodder Trees

	TOTAL L.S.U.@	L.S.U. PER HH	L.S.U. PER HA	D-FODDER * PER L.S.U.	ALL FODDER # PER L.S.U.
WARD 6	135.10	5.00	7.95	13.66	22.89
WARD 7	70.40	5.87	9.68	7.63	10.78
WARD 2	94.50	6.30	8.46	10.23	14.99
TOTAL	300.00	5.56	8.47	11.16	17.56

@ - L.S.U. - Livestock units. A buffalo is = 1.5 LSU, a cow is = 1.0 LSU, a buffalo or cow calf is = 0.5 LSU, a sheep or goat is = 0.2 LSU, and a kid is = 0.1 LSU. (Dutt, 1979)

* - D-FODDER - Dedicated fodder trees are trees reported to be primarily used for animal fodder with only minimal secondary uses (Table 20).

- ALL FODDER - Dedicated fodder trees and multipurpose fodder trees, i.e., trees reported as being used for animal fodder (Table 20).

household and per LSU reported by these studies are noticeably different from data on all age classes of fodder trees cultivated on private land in the Salija area.

When the data from this research is broken down in different ways, a level of comparability with the Hawkins and Malla data can be attained. As data in Table 18 shows, there are 11.2 dedicated fodder trees per LSU, and 17.6 total fodder trees per LSU. For trees reported to be over 10 years of age, the figures are 3.9 and 8.9 respectively. The value of 3.9 dedicated fodder trees (that are 10 years or older) per LSU is very similar to the average value of 4.1 fodder trees per LSU reported by Hawkins and Malla (1982).

These differences may be partly due to the use of a survey to collect the Hawkins and Malla data. Nepalese farmers have little problem knowing how many cows, buffaloes, and goats they own, and the names of these animals are likely equivalent in meaning to both researchers and farmers. This is not necessarily true for fodder trees. Terms used to describe categories of trees, and what constitutes a tree, may not share equivalent meanings for researchers and farmers, and thus interpretation of questions and responses may differ. Additionally, many farmers can be expected to have some difficulty recalling the number of specific categories of trees being cultivated on their land.

Table 19

LSU and Fodder Tree Data From Other Studies

Study:	LSU/HH	Fodder Trees/HH	Fodder Trees/ LSU
Hawkins & Malla:			
Rahi panchayat	7.2	28.7	4.0
Narayansthan pan.	4.1	13.3	3.2
Dehimando pan.	5.9	29.7	5.0
Panday(national avg.)	4.1	xx	> 2

This suggests that when farmers are asked to report on the number of fodder trees they own they may count only mature trees that are primarily used to supply fodder. This assumption has important implications for farming systems research, extension efforts, and development projects, but before it can be accepted more research is needed.

Figure 12 shows the average composition of household livestock in terms of LSU of each type of livestock per household in the study area. For Wards 6 and 2, adult buffalo are the dominant animal, while in Ward 7 adult cattle are dominant. The reason for the relatively large number of LSU represented by cattle and buffalo (C&B) less than a year old in Ward 2 is not known. It may be related to the fact that Lumle's livestock extension agent lives in this ward, or it could be related to the proximity of this ward to the major market town of Beni (map 2 page 25). Figure 13 presents this same data in terms of percentage composition of LSU by each type of livestock. Again, the dominance of cattle in Ward 7 is clear. Both of these figures clearly demonstrates the overall dominance of large livestock over the small sheep and goats. Even though goats and sheep eat less and can be fed a greater variety of fodders than buffaloes and cattle, they are not as common a component of farming systems as cattle and buffalo. There are four possible explanations for this:

1) dung produced by cattle and buffalo is reported by farmers to be a better fertilizer than that produced by goats and sheep (with buffalo dung being considered superior to cow dung);
2) there is no tradition for the consumption of goats' milk;
3) goats cannot be used to plow fields; and
4) people need to accompany goats and sheep when they are sent to graze on common land or in forests, while cattle and buffalo are generally sent out to graze on their own.

Finally, data presented in Figure 14, on the frequency of LSU by ward, shows that for the study area as a whole, the frequency distribution appears normal. It also shows that the mix of 6 to 7 LSU per household is most common,

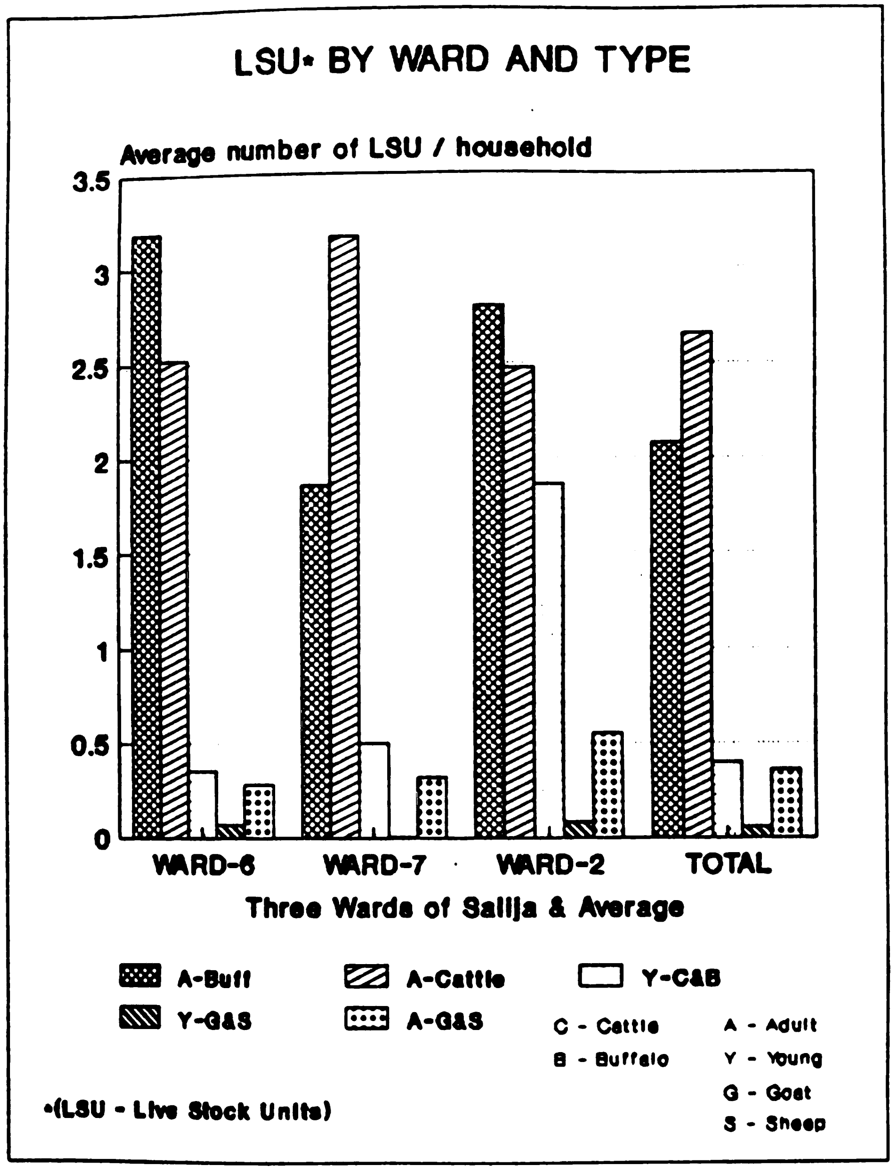

Figure 12

<u>LSU By Ward and Type</u>

and that it is relatively uncommon for households to have more than 10 LSU. This may be a reflection of what some residents of Salija recognized as the gradual specialization of farming households into specific areas of agricultural production. According to one consultant: "Years ago everyone had five to seven *bhainsi* (buffalo), but now some people don't have any, while others have ten. Some families are concentrating on livestock and paying less attention to crops, while others are finding it too difficult to raise more than one *bhainsi* and a pair of oxen." It may be that as private planting of fodder trees increases, and the large number of recently planted fodder trees mature (see section 5.3.4 page 172), farmers may start to increase the number of buffaloes and cows in their farming systems.

5.2.4.2 **Distribution of Fodder Trees**: Table 20 and Figure 15 present general data on the distribution of privately owned fodder trees in three categories. These data show that an average of 135 trees/household (53 percent of all trees cultivated on private land) can provide some animal fodder. It is important to note that this data includes trees of all age classes. When only trees in the 10 year or older age class are considered, the average number of fodder trees per household (of all categories) decreases. For the all-fodder category, i.e., both dedicated and multipurpose fodder trees, the average number of trees per household decreases from 135 trees/household (for trees of all age classes) to 67 trees/household for trees in the 10 years or older age class.

Before conclusions can be drawn regarding relationships between the distribution of fodder trees and livestock, several other important factors need mentioning. One major problem with evaluating information on the number of

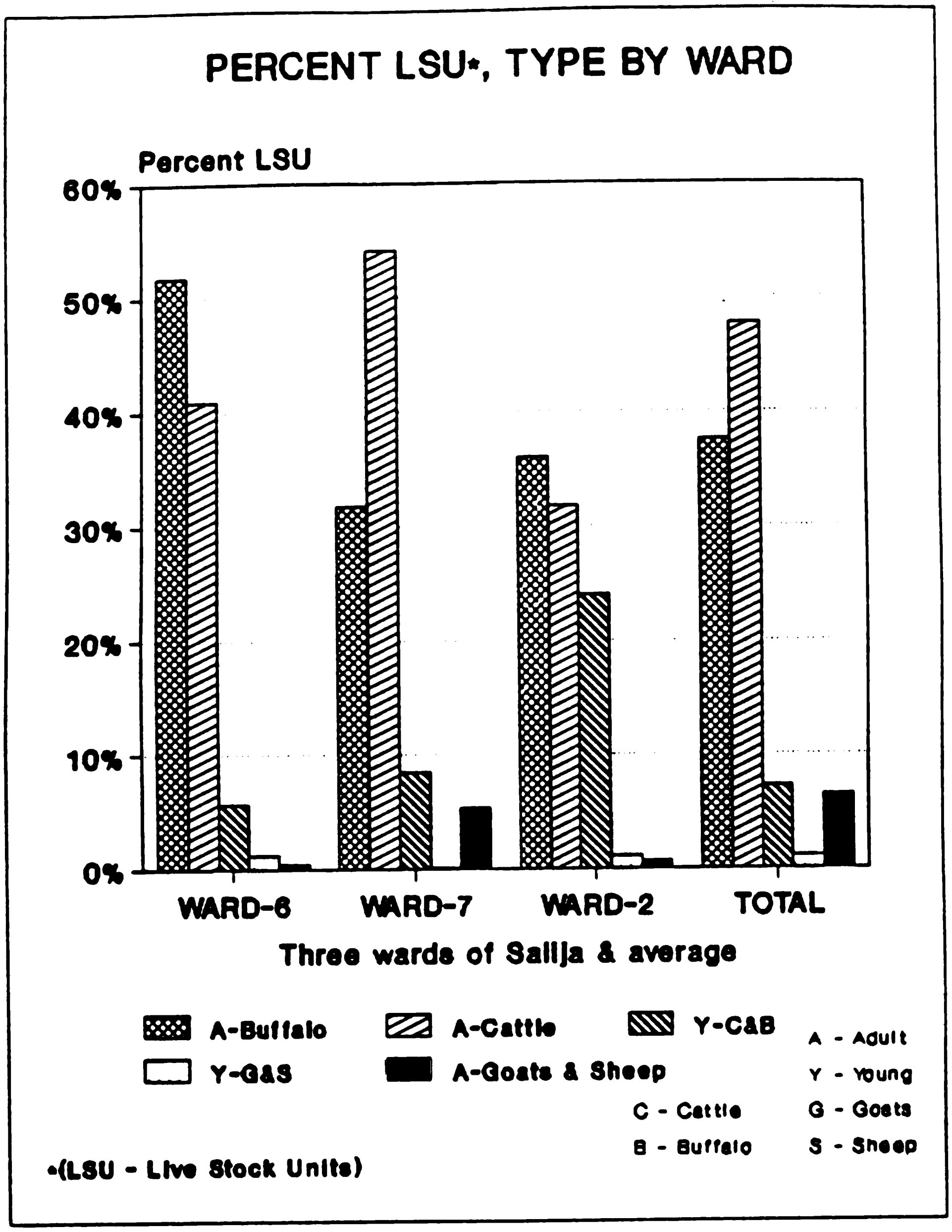

Figure 13.

Percent LSU, Type by Ward

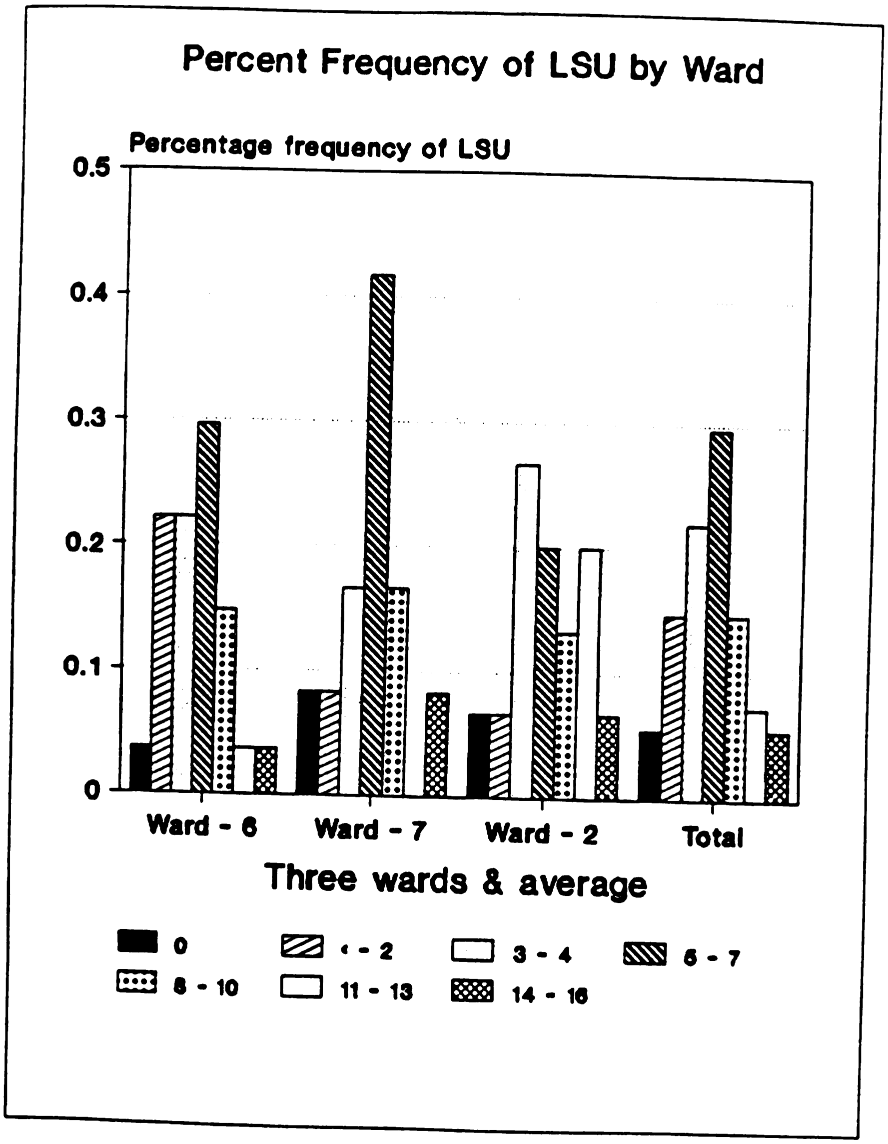

Figure 14

<u>Percent Frequency of LSU by Ward</u>

trees (both general types and fodder) per household, hectare, or LSU, is that data on the productivity of each species in terms appropriate to different farming

Table 20

Distribution of Private Fodder Trees in Salija (all age classes)

	TOTAL ALL TREES	DEDICATED FODDER TREES			MULTIPURPOSE FODDER TREES			ALL FODDER # TREES		
		Total	/hh	%*	Total	/hh	%*	Total	/hh	%@
WARD 6	8218	2375	87	57	1756	65	43	4131	153	50
WARD 7	2479	753	63	67	397	31	33	1120	96	45
WARD 2	3001	1391	93	68	658	44	32	2049	137	68
TOTAL	13698	4519	84	62	2881	52	38	7300	135	53

All Fodder = Dedicated Fodder + Multipurpose Fodder
* Percent of total fodder trees.
@ Percent of total trees.

systems in Nepal and for different age classes is not available. This problem is compounded by the lack of data on the nutritional contribution that different species of fodder trees make to the growth and productivity of different livestock. Without such data, formulating reliable conclusions about these aggregate data are very difficult. Additionally, data for many other important variables related to the productivity of different tree fodder species and the effect that different management regimes have on tree fodder production are both poorly understood and lacking. In the absence of these data, reliable generalizations about what the data presented above mean, in terms of farming system productivity and decision making cannot reliably be made.

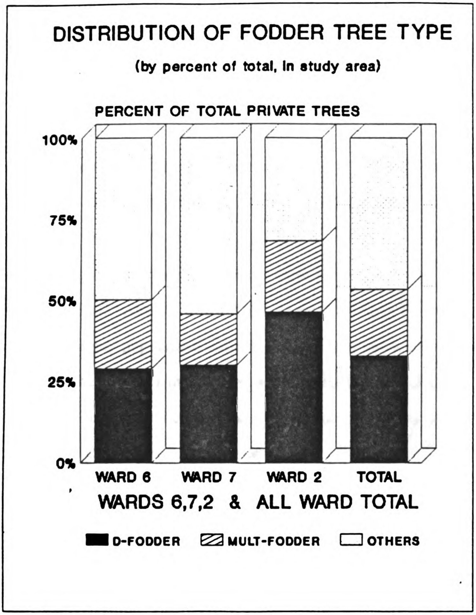

Figure 15

Percent of Fodder Trees by Category

However, one very important thing can be learned from the above data: farming systems in the middle hills of Nepal are complex heterogenous systems. The image of traditional simplicity presented by the many seemingly similar and unpretentious farming households in Nepal hides incredible complexity and diversity. The data present above provide only a partial glimpse of this.

5.3 Evaluation of The Research Hypotheses

This section deals with the evaluation of the research hypotheses that were presented in section 4.2.1. The primary purpose for formulating these hypotheses was to help focus the investigation. They were not constructed prior to entry into the field with the purpose of being formally tested. Because of this, and because of the very localized nature of this research, these hypotheses were not definitively proved or disproved. Also, it is felt that generalizations, with respect to these hypotheses, for larger populations beyond the research area cannot reliably be made. Rather, the research hypotheses are *evaluated* against available data and information, and judged as being either acceptable or unacceptable statements about the reality that exists in the research area. This should help refine an understanding of the relationships that may exist between the cultivation of fodder trees on private land and other aspects of household and community life in the Salija area. It should also help other researchers formulate hypotheses and research questions for other rural agrarian communities in Nepal.

5.3.1 Hypothesis Set #1:

It was reasoned (in section 4.2.1.1) that farmers in the Salija area would not cultivate fodder trees in a random manner on their land. On the contrary, it was believed that specific species of trees and categories of trees would be found to be cultivated more intensely on certain land types than on others. This presumption was formally stated in the following research hypothesis:

1)$H_{(r)}$ = The cultivation of fodder trees (i.e., where they are grown) on private land is not random.

Data used in the evaluation of this hypothesis was gathered with the household survey and the private tree inventory. As part of the inventory, the total number of different tree species found on a household's land were recorded. This total number of trees was categorized according to the following categories of land where trees were found growing: 1)the face and bund of terraces of irrigated agricultural land (*Khet Kangla*); 2)the face and bund of terraces of non-irrigated agricultural land (*Baari Kangla*); 3)grass land and marginal land (*Khar Baari* and *Banjho*); 4)land surrounding both seasonal and annual streams and rivers (*Khola Kosi*); 5)land surrounding the homestead (*Kharesa Baari*); and 6)land along the sides of farm paths and major trails (*Bato ma*). On the inventory form there were no specific categories for cultivated fields since trees are rarely found growing within terraces. If trees were found growing on terraced agricultural land (not on the bund or terrace face) these were recorded in a remarks column on the inventory form.

As part of the survey, consultants were asked where on their land (within six planting areas listed above) they had planted different categories of trees in the previous year. (See survey question #16 Appendix B.) In response, consultants reported the numbers of different tree types that they had planted on these different categories of land.

Because this question only asked about trees planted in the previous year, and because it was dependent on consultant recall, the data presented in Table 21 can only be used to demonstrate general trends in planting practices. If different categories of trees are being cultivated randomly across the different land types in Salija, one would not expect the distribution of tree types as depicted in Table 21. A Chi-square statistic (1737.5076 with 24 degrees of freedom) was calculated for the entire table (excluding the "*bato*" column) and this proved significant to the 0.001 level of significance (beyond the preselected α of 0.05). Based on these data, and observations made in the field, it can be concluded that the cultivation of trees on private land is not random, which supports research hypothesis #1. In contrast to being random, there are a few general associations between some specific tree types and species, and different planting areas that are evident, as discussed below.

One prominent feature of Table 21 concerns the "*Bato*" column. As the survey and inventory were being carried out it became clear that something was wrong with this question because no responses were being recorded in the "*bato*" column. Even though terms used in describe planting sites had been carefully selected to match locally used categories, and then pretested, the roadside site "*bato*" was never selected, either on the survey or the inventory, by consultants as an area for planting or cultivating trees. The explanation for this anomaly is found through understanding the differences between how the principal investigator and consultants interpreted the term "*bato*" as it was used to describe an area for planting and cultivating trees.

When this survey question and the inventory sheet were first formulated, *bato* was selected as a planting area based on field observations made by the principal investigator and on conversations with villagers. Throughout the Salija area, and in other areas in Nepal, trees are found being cultivated along

Table 21

The Reported Number of Trees Planted in Previous Year

	PLANTING SITES						
TREE TYPE	BANJHO	BAARI K	KHET K	KARESA B.	KHOLA	BATO	TOTAL
FODDER	675	180	35	121	262	0	1273
FUELWOOD	530	0	0	0	119	0	649
TIMBER	319	10	0	0	10	0	339
FRUIT	39	122	19	262	3	0	445
BAMBOO	240	0	0	0	61	0	301
UTILITY	7	0	0	0	2	0	9
OTHER	60	13	0	0	9	0	82
TOTALS	1870	325	54	383	466	0	3098

Definitions: Banjho : Non-agricultural land, usually grassy land (*khar baari*), or degraded and gullied land.
Baari K. : The terrace face and bund of non-irrigated agricultural land (majority of agricultural land in Salija is of this type).
Khet K. : The terrace face and bund of irrigated agricultural land.
Karesa B. : Land surrounding the household.
Kola : Steep or degraded land around streams and seasonal water flow channels.
Bato : Land surrounding trails and paths on private and public land.

farmstead paths and major trails. At the time, it seemed logical for *bato* to be designated on the survey and inventory form as a place where trees were planted and cultivated since trees, shrubs, and woody vines were observed growing along road sides and paths. However, the data in Table 21 suggests that this assumption about *"bato"* as an appropriate option on the survey and inventory was incorrect.

After investigating this problem it became clear that the "*bato*" option made no real sense to local people. It was beyond their range of convenience for defining an appropriate tree planting and cultivation area. As one farmer explained: "If I planted trees on the road people would trample them, and if they grew, people would not be able to use the road! We don't plant trees on the road!" The planting and cultivation areas that had been identified by the principal investigator as being roadside areas were in reality classified by consultants as other types of areas. These generally included *baari kangla* (terrace bund), *banjho* (marginal land), or *khar baari* (grass land).

Even with this problem, data in Table 21 shows that all tree types, except for fodder and fruit trees, are reported being planted on only two categories of land, one, recognized as *banjho* and *khar baari* land (marginal, degraded land, and grass land), and the other classed as *kola* land (land along streams and rivers).[71] These two areas also appear to be the preferred planting and cultivation areas for fodder trees, with 74 percent of all fodder trees are reported as planted in these two areas.

The next most common area for planting fodder trees is on the *baari kangla* (the terrace face and bund of non-irrigated agricultural land), and nearly all the

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[71] The 13 trees in the "other" category that were reported planted on *baari kangla* were all trees in the medicinal and spice category.

trees being planted in this area are of one species, *Buddlija asiatic* (*Dhurse*).[72] This species is also one of the most common ones planted on *khet kangla* (the terrace face and bund of irrigated agricultural land), and around homesteads.

The few number of trees reported as being planted on *khet kangla* is partially a reflection of the small amount of *khet* land owned by residents of Salija. Only 17 households reported owning a total of 3.23 ha of *khet* land, which accounts for only 9 percent of total land reported owned by consultants. Also, because all this *khet* land is located in Lower Salija, about 500 meters lower in altitude below the study area, farmers in Upper Salija are reluctant to plant fodder trees and other valuable trees on private property that is so distant from their homesteads. As one farmer explained, "If I plant fruit and fodder trees on my *khet kangla* someone in the lower community will benefit, and besides its too difficult to carry a load of fodder up to my home from down where my *khet* land is."

5.3.2 Hypothesis Set #2:

The second set of hypotheses (discussed in section 4.2.1.2) presumes that gender might be an important variable with respect to knowledge systems and perception of tree fodder resources. Identification of such gender related differences in perception and knowledge can help in the design of extension activities and other development project. This is especially important for

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[72] This species is commonly found evenly spaced along *baari kangla*. This valuable fodder species can withstand heavy lopping, which helps keep this small to medium sized tree from growing very large. This in turn makes it easy for young children and older people to collect fodder from this tree without the need of climbing. This species also has ragged open crown so that the shading effect on adjacent crops is limited. Farmers report that they can cut fodder from this species 12 months of the year without killing the tree. This is not only important for fodder, but it enables farmers to reduce the shading effect on crops when it becomes most critical. Wood from this tree is also reported to be very hard and durable and it is used for tool handles, fuelwood and to make charcoal. Finally, this species is propagated vegetatively.

development efforts that may effect resource use among different segments of populations.

Three specific research hypotheses were formulated within this general question.

2)$H_{(r)}$ = There are difference and similarities between the domains of knowledge of men and women regarding tree fodder use, cultivation and management.

3)$H_{(r)}$ = Some of the verbal labels used by and men and women to evaluate and differentiate between tree fodder types are equivalent, and others are different.

4)$H_{(r)}$ = There are differences and similarities between tree species preference within classes of tree types between men and women.

To evaluate these three hypotheses, data from the repertory grid and triad tests are used. Data from the survey and inventory are also used in this evaluation and to help develop a clearer understanding of this issue.

5.3.2.1 **Triad Test Results**: The triad tests and the repertory grid elicited a series of verbal labels from each consultant as they explained their reasons for their groupings of each set of three leaves. All of these verbal labels were sorted according to similarities among labels and organized into 16 different categories as presented in Table 22 (see Appendix F for the complete list of translated verbal labels).

Next, as show in Table 23, the degree of difference between the frequencies of responses for each category provided by women and men were determined. From these tables it can be seen that five categories, those printed in **bold and underlined**, exhibit a noticeable difference in the number of men and women

TABLE 22

Frequency of Construct Labels by Gender *

CATEGORY	TOTAL LABELS	% of total	MALE	FEMALE
1. **WINTER FODDER**	**28**	**18.3**	**22**	**6**
2. GOOD FOR MILK PRODUCTION	24	15.7	13	11
3. NUTRITIOUS, HEALTHY	19	12.4	10	9
4. EATEN WELL	12	7.8	8	4
5. **HEALTH PROBLEMS**	**11**	**7.2**	**9**	**2**
6. **GOOD FOR MILK & GHIU**	**9**	**5.9**	**7**	**2**
7. AVAILABLE ALL SEASONS	9	5.9	5	4
8. **SOURCE OF FODDER & FUEL**	**7**	**4.6**	**1**	**6**
9. OBANO FODDERS	7	4.6	4	3
10. **CHISO FODDERS**	**7**	**4.6**	**7**	**0**
11. EASILY OBTAINABLE	6	3.9	2	4
12. GENERALLY GOOD	5	3.3	2	3
13. MANURE PRODUCTION	5	3.3	2	3
14. AVAILABLE IN SAME SEASON	2	1.3	2	0
15. SATISFYING FODDER	1	0.6	1	0
16. HOT SEASON FODDER	1	0.6	0	1
TOTAL	153	100	95	58

-- Seven men and six women provided data.
-- GHIU is the Nepalese word for clarified butter. This product is made primarily form buffalo milk and it serves as an important cooking oil, seasoning, and source of cash in Dhali Gaun households.
-- OBANO is the Nepalese word for dry.
-- CHISO is the Nepalese word for cold and wet. See footnote #11 and pages 187 for more information on this term relative to fodder.

who used these labels to differentiate between fodder types. The remaining categories did not display such a difference, and in some cases the differences between the responses provided by men and women were negligible.

As discussed earlier, it was hypothesized that men and women would share common domains of knowledge and perception about tree fodder use, cultivation and management, as well as have unique gender related domains of knowledge and perception. The data presented in Tables 22 and 23 provides some support for this belief. Four of the five categories highlighted above indicate that men

Table 23

High & Low Frequencies for Label Categories By Men and Women*

LABELS	MEN H	MEN L	WOMEN H	WOMEN L
1. **WINTER FODDER**	X			X
2. GOOD FOR MILK PRODUCTION	N		N	
3. NUTRITIOUS, HEALTHY	N		N	
4. EATEN WELL	N		N	
5. **HEALTH PROBLEMS**	X			X
6. **GOOD FOR MILK & GHIU**	X			X
7. AVAILABLE ALL SEASONS	N		N	
8. **SOURCE OF FODDER & FUEL**		X	X	
9. OBANO FODDERS	N		N	
10. **CHISO FODDERS**	X			X
11. EASILY OBTAINABLE	O		O	
12. GENERALLY GOOD	O		O	
13. MANURE PRODUCTION	O		O	
14. AVAILABLE IN SAME SEASON	O		O	
15. SATISFYING FODDER	O		O	
16. HOT SEASON FODDER	O		O	

* The determination of H (high) and L (low) depends on whether or not the frequency of responses from male or female consultant groups for a category is 50 percent higher or lower than the frequency of responses from the other group for the same category.
The letter "N" indicates that the differences between women and men were not greater or less than 50 percent within that category.
The letter "O" indicates that there were too few comments to make this computation meaningful.
GHIU, is the Nepalese word for clarified butter, an important cooking oil and source of cash in Dhali Gaun.
OBANO, is the Nepalese word for warm and dry. CHISO, is the Nepalese word for cold and wet. Women and men use these terms to distinguish between fodder types, as discussed in the third section of this chapter.

have particular interest in, and possibly more knowledge about, aspects of tree fodder related to: 1) fodders available during the winter season; 2) animal health related to tree fodder; 3) fodders that are good for both milk and *ghiu* production; and 4) fodders that have *chiso* attributes (see section 5.4, page 182).

Alternatively, the data indicate that women have specific interest in, and possibly more knowledge about, trees that are both good sources of fodder and fuelwood. The remaining data show that interest in, and possibly knowledge about, other aspects of tree fodder embodied within the other categories is shared relatively evenly between women and men.

In summary, the data presented in Tables 22 and 23 support the belief that there are both common and unique domains of knowledge and perception between women and men surrounding tree fodder. Also, this data provides insight into what these different domains may consist of. Furthermore, results from a Chi-Square statistic, 15.1874 with 4 degrees of freedom, calculated for the five most distinct categories of data in Table 22, proved significant at 0.0043 level (below the preselected $\alpha = 0.05$). This permits the statistical verification of the research hypotheses stated above.

These results indicate that for some domains of knowledge the research hypothesis can be rejected, while for other ares of knowledge and perception it cannot. This conclusion supports the original assumptions about relationships between gender and tree fodder knowledge and perception. Other research, based on this initial work, may be able to test the significance of these identified differences against a larger population and to learn more about these common and unique domains of knowledge and perception.

5.3.2.2 **Survey & Inventory Data:** Understanding differences between domains of knowledge and perception between women and men and tree fodder resources can be furthered by examining differences in tree fodder preference. It is reasoned that people formulate preferences for different species of fodder trees based on their knowledge about different fodders, what they learn from other people, personal experience, and their needs and household situation. Therefore, by investigating aspects of tree fodder preference in the population of Salija, and specifically between men and women, it is possible to gain insights into aspects of the indigenous knowledge systems surrounding tree fodder.

Tree fodder preference data was gathered from the survey and inventory. Based on analysis of this data, a strong argument can be made to support the arguments presented in the previous section. Tables 24, 25 and 26 present data on fodder tree preference by tree category, species, and gender. These data originated from two similar questions: 1) data in Tables 24 and 25 came from an open question about tree fodder preference with no specific reference to how the fodder would be used; and 2) data in Table 26 came from a question that asked about fodder preference specific to the production of *ghiu*.

Table 24 shows that a clear majority of women consultants (85.6 percent) selected *Ficus nemoralis* (*Dudhilo*) as their first choice for the best tree fodder. In contrast, Table 25 shows that only 27 percent of the men consultants selected this species as their first preference, while 35.7 percent of the men selected *Quercus semecarpifolia* (*Kharsu*) as their most preferred fodder tree.

Table 26 presents data on tree fodder preference for the production of *ghiu* (clarified butter). *Ghiu* was selected as an indicator of fodder productivity in this question because of its importance as a food, spice, and as a cash income earning commodity. Milk, on the other hand, is rarely sold, and there seems to be less discussion and distinction made about the quality of milk than there is about the quality of *ghiu*.

Data in Table 26 are organized according to male and female preferences, where the specific species are commonly found (according to consultant reports

Table 24

Frequency of 1st Preference Tree Fodder Species by Women

Species	Where Common	All Wards	% of Total
Ficus nemoralis	farm	24	85.6
Quercus semecarpifolia	forest	1	3.6
Ilex doniana	forest	0	0.0
Colquhounia coccinea	forest	1	3.6
Brassaiopsis hainla	farm	0	0.0
Salix babylonica	farm	1	3.6
No Answer		1	3.6
Total		28	100.0

Table 25

Frequency of 1st Preference Tree Fodder Species by Men

Species	Where Common	All Wards	% of Total
Ficus nemoralis	farm	7	27.0
Quercus semecarpifolia	forest	9	34.7
Ilex doniana	forest	2	7.7
Colquhounia coccinea	farm	0	0.0
Brassaiopsis hainla	farm	1	3.6
Salix babylonica	farm	0	0.0
No Answer		7	27.0
Total		26	100.0

on the survey), and by the frequency of responses in each category. It is clearly evident that female preference is most strongly associated with "domestic" fodder species, while male preference is most strongly associated with forest or "non-domestic" species. This difference in preference is less evident in Tables 24 and 25 which deal with "general" fodder preference.

domestic" species. This difference in preference is less evident in Tables 24 and 25 which deal with "general" fodder preference.

To test the significance of this difference, a Chi-Square statistic was calculated on the summary data presented in Table 26, the result of 14.02 (with 3 degrees of freedom) proved significant at the 0.001 confidence level (exceeding the preselected α of 0.01). Therefore, it is concluded that there is a significant difference in the first level preference for tree fodder species with respect to *ghiu* production between men and women. This is additional support for the research hypotheses stated earlier.

This data also helps to explain some of the differences between categories favored by women and men in the triad test data discussed earlier. For example, The male dominated label "winter fodder" is partially explained by the fact that one of the most common winter fodder species is *Quercus semecarpifolia* (*Kharsu*)[73], a species that is more commonly found in the forests above Salija than growing on private land. This species is also reported as being one of the best fodders for improving and maintaining the health of large livestock, another male dominated label.

For the female dominated label of "fuel & fodder", this relationship is not maintained. Two of the species identified as first preferences by women in Table 26, *Brassaiopsis hainla* (*Chuletro*) and *Ficus nemoralis* (*Dudhilo*), are not reported

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[73] Even though *Quercus semecarpifolia (Kharsu)* is much more common in forests than on private land, a fair number of these trees are maintained on private land (see Figure 9 page 131). However, these are generally not grown near crop land because of the negative effect of shading and the deleterious effect of leaf litter on agricultural soils. Many of the consultants reported that most of the *Kharsu* growing on there land were remnants of the forest that was cleared by their fathers when this area was settled. A few older consultants also reported that they had planted some of their *Kharsu* many years earlier.

Table 26

Best Species for Ghiu Production, Preference by Men and Women

Nepali &	Latin Names	Common Habitat	Males	Females
Kharsu -	Quercus semecarpifolia	(Forest species)	9	1
Bhokre -	Ilex doniana	(Forest species)	2	0
Phultiso -	Colquhounia coccinea	(Forest species)	0	1
TOTAL FOR FOREST SPECIES			11	2
Bhains -	Salix babylonica	(Farm species)	0	1
Chuletro -	Brassaiopsis hainla	(Farm species)	1	0
Dudhilo -	Ficus nemoralis	(Farm species)	7	24
TOTAL FOR DOMESTIC SPECIES			8	25

burned. If it is burned before being sufficiently dry, it will smoke profusely, and even after drying it is reported to burn quickly without producing much heat.[74]

These differences in preference between men and women for forest and domestic fodder species are only evident in the first level of preference. When data on second and third levels of preference are examined the difference between women and men diminishes drastically and cannot be considered as significant. One of the most noticeable changes is that the mix of species preferred by men becomes dominated by "domestic" species, and the preference for species recognized as more common in forest areas dwindle. As might be expected, the number of women mentioning forest species also increases slightly, but this is essentially limited to *Quercus semecarpifolia* (*Kharsu*).

It appears that first level preference is more strongly related to personal association with fodder species, i.e., how it relates to an individual's general household and agricultural responsibilities and need. In contrast, lower levels of preference seem to be more strongly associated with judgments about the quality and availability of specific fodder species, and these individual judgments appear to be somewhat similar throughout the population.

An additional question about fodder preference was also asked as part of the private tree inventory. Aggregate data from this question is presented in Figure 16, which shows the frequencies of responses for the eight most popular tree fodder species. The top two choices, as might be expected, are *Ficus nemoralis* (*Dudhilo*) and *Quercus semecarpifolia* (*Kharsu*). The four next species

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[74] The most commonly reported features of high quality fuelwood are: burns for a long time; gives off much heat; produces good hot coals that will still be hot in the morning; produces little smoke and does not give off spark; is easy to ignite; and is light and easy to cut.

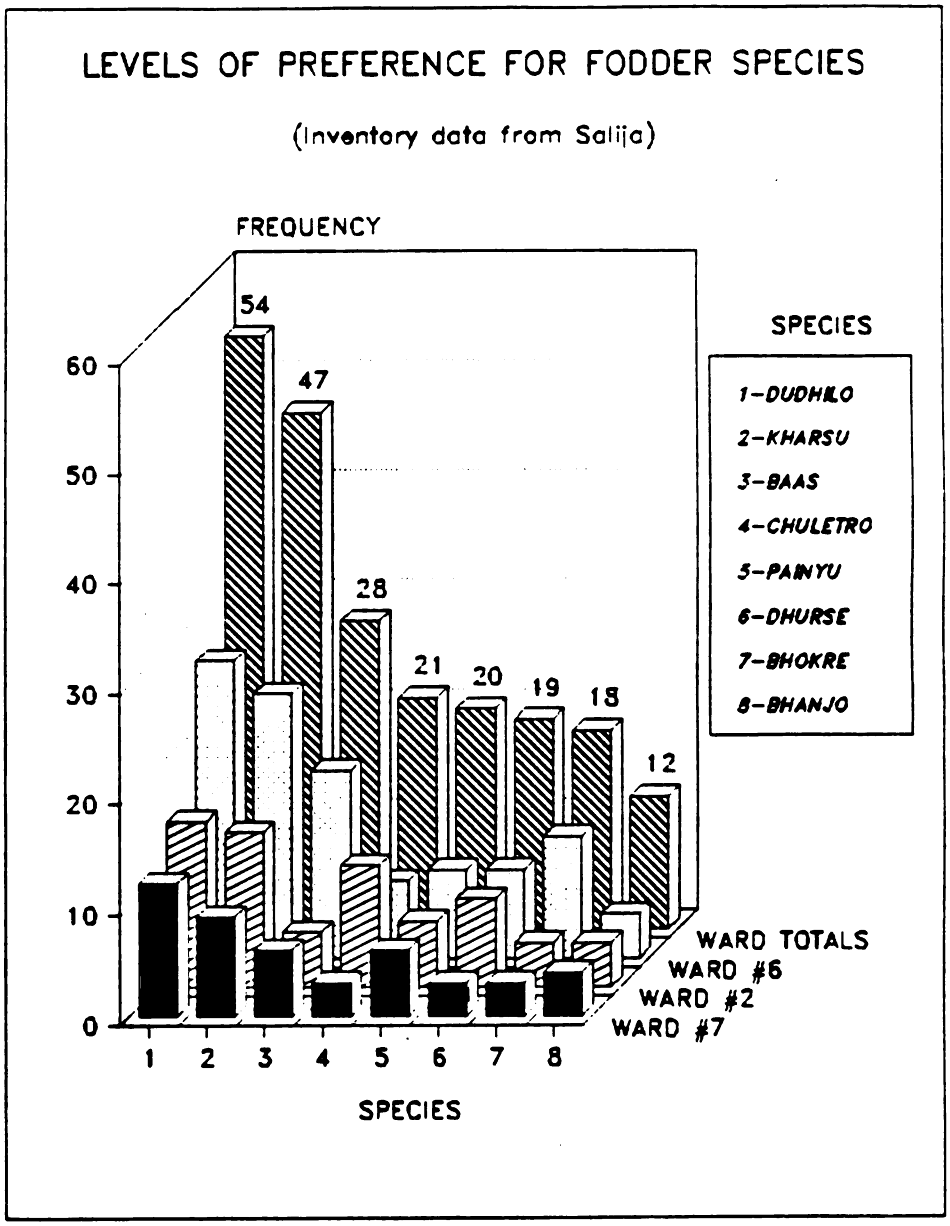

Figure 16

Levels of Preference for Tree Fodder Species

Latin Names for Species

1. *Dudhilo - Ficus nemoralis* 2. *Kharsu - Quercus semecarpifolia*
3. *Nigaalo - Arundinaria spp.* 4. *Chuletro (Putre) - Brassaiopsis hainla*
5. *Painyu - Prunus cerasoides*
6. *Dhruse - Buddlija asiatica* 7. *Bhokre (Lise) - Ilex doniana ?*
8. *Bhanjo - Quercus incana* (The Nepali names in ( ) were commonly used in Salija, but not well known outside of this area)

are all common domestic fodder trees. Even though *Arundinaria spp.* is a grass (bamboo) in the *Graminae* family and not a "real" tree, residents of Salija, and of other areas in Nepal, speak of this and the other bamboos as "fodder trees." The final two species in this figure are most commonly found in forests, and they are recognized as providing excellent fodder for both milk and *ghiu* production, and for maintaining healthy animals. It is useful to compare the data in Figure 16 with that presented in Figure 11 on the distribution of dominant species planted on private land in Salija. From this comparison it can be seen that five of these preferred species are also some of the most common trees being cultivated on private land in the research area. This strong association begs the question: Are they preferred because they are common, or are they common because they are preferred? It is likely that these questions are both partially correct.

Interpretation of the differences in preference discussed above can be enhanced when characteristics specific to two of these species are examined in greater detail:[75]

Ficus nemoralis

1) This species is almost exclusively cultivated on private land. The private tree inventory recorded 2,167 trees of this species being cultivated. Women appear to be more concerned with fodder collection from private land than from forests (see Table 27 page 165).

2) A majority of consultants reported that this is the best species for milk production, and milk is not commonly sold in Salija. Women appear less involved with the selling of *ghiu*, but more involved with the production and processing of milk.

Quercus semecarpifolia

[75] Information presented in this discussion was gathered from informal interviews using the fodder knowledge discussion guide, open questions on the survey, and from participant observation.

1) This species is almost exclusively found in forests and is not commonly cultivated on private land, only 408 trees of this species was recorded being cultivated on private land. Men appear to be primarily responsible for fodder collection from forests (see Table 27 page 165)

2) A majority of consultants reported that this is the best species for the production of *ghiu* (clarified butter). *Ghiu* is an important cash commodity in Salija, with about 50 percent of those household who reported making *ghiu* also reporting that they sell it. Men appear to be more involved with selling *ghiu* than women.

Most women consultants reported that they preferred *Ficus nemoralis* over *Quercus semecarpifolia* for three reasons:

1) *Ficus nemoralis* was readily available near their homes while women report that to cut *Quercus semecarpifolia* they have to travel to the forests;

2) *Ficus nemoralis* was an easier tree to climb than *Quercus semecarpifolia*. One women said, "*Kharsu* in the forest are very big trees and I am a small woman,climbing them is difficult and dangerous for women, only men collect fodder from this tree."; and

3) *Ficus nemoralis* does not have thorns on its leaves, and women report that this is therefore an easier fodder to collect.

In contrast, many men consultants reported that they preferred *Quercus semecarpifolia* over *Ficus nemoralis* because:

1) *Quercus semecarpifolia* is available during the winter season when other animal fodders are scarce. The winter season is a period of time when labor requirements for men are low and therefore men can collect fodder at this time of year;

2) *Quercus semecarpifolia* is reported to be good for livestock health, it is reported to make buffalo, cows, and oxen fat and healthy; and

3) feeding *Quercus semecarpifolia* produces more *ghiu* than other fodders, i.e., it increases the butter fat content of the milk and thus *ghiu*. *Ghiu* is also an important cash income earning commodity.

When these data are considered along with what was presented earlier, it can reasonably be concluded that gender related differences exist concerning male/female fodder perception and evaluation.

Finally, data in Table 27, on reports of fodder collecting responsibility in the household, provides further support for the differences identified above. These data show who in the household is responsible for collecting different fractions of tree fodder from public forests and private land.[76]

Table 27

Responsibility For Collecting Tree Fodder From Private & Forest Trees

	HOUSEHOLD MEMBER AND TREE FODDER SOURCE							
AMOUNT GATHERED	ADULT MALE		ADULT FEMALE		MALE YOUTH		FEMALE YOUTH	
	PVL	FOR	PVL	FOR	PVL	FOR	PVL	FOR
MOST	16	12	12	7	5	2	1	1
HALF	15	8	10	4	4	1	5	2
LITTLE	5	11	12	7	8	7	8	6
SUBTOTAL	36	31	34	18	17	10	14	9
NONE	18	23	20	36	37	44	40	45
TOTALS	54	54	54	54	54	54	54	54

PVL - Trees on private land; For - Public forest.

From these data it can be seen that there were 31 reports (out of 54) that men collected at least some fodder from public forests while 36 reports (out of 54)

[76] The terms used to define these fractions are terms that are commonly used by villagers to discuss time use and quantity estimates.

stated that adult women in the households collected no fodder from the public forests.[77] The number of reports about adult men and women collecting fodder from private land are nearly equal. This reported difference in fodder collecting responsibility between forest and private land may be related to the differences in tree fodder preference discussed earlier.

These data also show that male and female youth (household residents between 5 and 18 years of age) share little of the responsibility for collecting animal fodder, especially with respect to tree fodder from public forests. It is possible that school attendance affects the involvement of youth in this agricultural activity. As enrollment increases (a trend being promoted by community leaders) this effect can be expected to become more prominent. Additionally, government programs that encourage parents to have only two children (programs also supported by community leaders) may also contribute to increasing the labor burden of adult members of households. This in turn can be expected to influence evolving attitudes toward land use, one aspect of which may involved an increased emphasis on incorporating trees into the farming system. As one consultant reported, "I have only three children and poor land, I want my two sons and daughter to attend school, and so I must plant more trees to give them a better life."

These results indicate that there are strong differences between first levels of tree species preference within classes of tree types between men and women.

[77] It is important to note that these reports on fodder collecting responsibility do not correlate with the gender of the consultants.

This is especially true when specific productive uses, i.e., *ghiu* production, are considered. Thus, hypothesis #4 cannot be rejected.

The differences and similarities in preference and evaluation evidenced in the data presented above indicate that there may also be basic differences and similarities in male and female knowledge systems related to tree fodder. This complex mix of unique and common domains of knowledge makes it very important for outsiders involved in research, extension, or development initiatives to carefully evaluate personal and institutional assumptions concerning differences between women and men with respect to perception and knowledge systems of the environment. It may be specifically important to stop articulating gender related issues in terms restricted to women's issues, and take a broader and more holistic perspective of gender related issues. There are without a doubt important gender defined differences in household labor allocation and decision making. However, as these data demonstrate, the realization of these differences are often modified by the realities of daily farm life.

5.3.3 Hypothesis Set #3:

As discussed in section 4.2.1.3 (page 77), it was presumed that variables such as: demand for fodder (based on the number of livestock units owned by a household); size and character (i.e., amount of agricultural and non-agricultural land); access to public sources of fodder; and family size and composition, might be associated with, and influence the cultivation and management of fodder trees on private land. These presumptions were formally expressed in the following research hypotheses:

5)$H_{(r)}$ = The number of fodder trees per household is correlated with the number of livestock units per household.

6)$H_{(r)}$ = The number of fodder trees per household is correlated with the composition of household land.

7)$H_{(r)}$ = The number of fodder trees per household is correlated with household size.

To determine if the associations between these variables were significant, the non-parametric Spearman's rank correlation statistic and a calculation for the student-t were used.[78] Aggregate data for all wards for the following variables were compared against each other using Spearman's rank correlation test.[79]

1: Total LSU per household;

2: Total land per household in hectares;

3: Total hectares agricultural land per household;

4: Total hectares non-agricultural land per household;

5: Total resident members in each household;

6: Total trees per household all age classes; and

7: Total fodder trees (dedicated plus multipurpose fodder trees) per household.

The results of individual correlations specific to the hypotheses stated above, and the levels of significance are presented below in Table 28. A value of 0.05 was selected as the significance level.

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[78] This correlation test was selected because it has less rigid requirements than the product moment correlation test, while its power-efficiency is about 91 percent of the product moment test. Also, according to Hammond and McCullagh (1982), this method can be used on data "where the margins of error are sufficiently great to make the use of an interval scale unrealistic." As discussed earlier, the land area data used in this research are based on reported values of non-linear area measurements that were transformed to linear area measurements with estimated conversion units. Because of this, it was felt that the margins of error were likely too great to use the product moment correlation statistic. Spearman's rank correlation statistic uses rank order to determine association and was thus considered to be more appropriate for the data gathered in this research.

[79] Pearson's product moment correlation coefficients were also calculated for this data as a back-up, and they were found to be comparable with the coefficients from Spearman's test.

These data indicate that the total number of fodder trees per household is significantly associated with LSU per household, and land area per household (for all categories) at the preselected α of 0.05. Therefore, hypotheses #5 and #6 cannot be rejected, and we can conclude that there is a strong correlation between these variables. This conclusion also supports the judgment arrived at in section 5.2.3.3 (page 130). It should be emphasized that this correlation does not suggest a causal relationship between these variables. The rather weak association

Table 28

Correlation Matrix for Hypotheses 5 to 7

Variables	Total Fodder Trees / HH		Total Trees per HH	
	r	p	r	p
LSU / household	0.306820	.990	0.279157	.975
Total land / household	0.610019	.999	0.687826	.999
Agricultural land / household (ha)	0.655479	.999	0.698448	.999
Non-agricultural land/ household (ha)	0.357828	.990	0.456519	.999
Household size (residents only)	0.189361	.900	0.158096	.900

HH - Household
r - Spearman's rank correlation coefficient.
p - One-tail probability level.
N = 54, df = 52.

between household size and the total number of fodder trees per household did not prove significant at the $\alpha = 0.05$, and therefore research hypothesis #7 is not supported by these data.

Even though total LSU per household is shown to be significantly correlated with total fodder trees per household, this correlation is not as strong as that for total land area. One possible explanation for this is that households in Salija cultivate trees on their land usually for a variety of reasons, not solely to produce fodder for livestock. Thus, a tree categorized as a "fodder tree" may be planted by a farmer for purposes other than the production of fodder for his or her livestock.

For example, *Arundinaria spp.* (*Nigaalo*) is considered by many consultants in Salija as an important fodder species. Yet it is also a very important source of raw material used in weaving different kinds of baskets that are essential to maintaining households in Nepal. One consultant, who had planted many stands (too many to be easily counted) of this species, said that he was cultivating *Arundinaria spp.* in great numbers because he was selling the woody branches from this bamboo to his neighbors. He also commented that because he had a sufficient supply of superior tree fodder, he rarely used the leaves from *Arundinaria spp.* as fodder.

In another example, it is common for households in Salija to cultivate *Salix babylonica* (*Bainsh*) on eroded land or land threatened by landslides in the hope that this tree will stabilize the land. It is believed by consultants that the roots of this species spread out wide and deep in the soil, and thus hold on to soil and stabilize land. This species is also recognized by villagers and outsiders as an important and preferred fodder species.

Households without livestock also cultivate fodder trees. In some cases these households allow neighbors to cut fodder from trees growing on their land to feed to their livestock and in return receive dung and other forms of remuneration for this raw material.

These three examples illustrate that trees categorized as fodder trees may be planted and cultivated for reasons other than feeding livestock, and thus a correlation between LSU and the number of fodder trees can be expected to be weaker than one might initially assume.

The correlation coefficients in Table 28 for the two different categories of land and the number of fodder and total trees are counter intuitive. Based on reports from the survey, and on data from the inventory, a stronger correlation was anticipated between the amount of non-agricultural land and the number of trees, than for agricultural land. The increase in the strength of the correlations from fodder trees to total trees, for non-agricultural land (0.358 and 0.457) is greater than the increase in strength of association for the same variables correlated with agricultural land (0.655 and 0.698). This may suggest that non-agricultural land is more important for the cultivation of non-fodder species than for fodder species. This suggestion is also supported by data presented in Table 21 (page 150).

Other variables would likely show strong associations with the number of fodder trees, the number of total trees, and the diversity of species being cultivated on private land in Salija. Examples are: 1) the presence of a well run nursery in Ward 6 where residents have access to seedlings they want; 2) different rates of precipitation in the three wards; 3) different mean annual temperatures and different soils in each ward and homestead; 4) the strength of local leadership; 5) the presence of active forestry and horticulture extension agents in the *panchayat* who live in Ward 6; 6) the new national forestry laws that theoretically permit local people at the panchayat level to exercise control over their local forest resources[80]; 7) the changing structure and function of households (fewer children and children attending school); 8) the influence of Lumle Agricultural Center; 9) relative access to off-farm fodder sources; and 10) future access to timber markets by a motorable road to Beni that will be built in the near future.[81]

5.3.4 Hypothesis Set #4:

This final hypothesis (presented in section 4.2.1.4 page 77), presumes that the planting of trees, specifically fodder trees, has, on average, intensified over the past ten years. The research hypothesis is as follows:

8)$H_{(r)}$ = The number of fodder trees that are "planted" each year per household has increased in recent years.

Evaluating this hypothesis is problematic since there are no written records for the number of trees planted by each household, the types of trees planted, or the rate of seedling survival. Therefore, data for this hypothesis must be gathered via two general methods. One, data can be gathered from verbal reports by consultants concerning their planting practices over time, and their estimates of seedling survival rates. Two, data can also be gathered indirectly by evaluating the difference in the numbers of trees in the two age classes (0 - 10 years, and 10 or greater years) that are cultivated on private land. This approach uses the

80 The forests in Salija have not yet been demarcated under these forestry laws, and therefore national and regional forestry officials have not yet changed the local system of public forest management that have been in effect for the past 15 years. Because of this, the residents of Salija still exercise complete control over their forests, and they would like to keep it that way.

81 Several consultants commented that they were starting to plant an increasing number of valuable timber species in anticipation of a motorable road that will connect Beni (the nearest major market town) to Pokhara, Kathmandu, and other timber markets.

presence of trees on private land as an indicator of historical tree cultivating activities. Such data may show that there are more young trees being cultivated than older ones, and on this basis the research hypothesis is supported by these data.

Each one of these approaches suffers from several short comings. Gathering historical information on quantitative variables via verbal reports suffers from problems of recall error. Even though one might expect a lower rate of recall error in societies that rely on memory and oral mechanisms for passing knowledge from one generation to another, recall error will still exist. Additionally, there may be little reason for many farmers to invest much effort in remembering the exact numbers of trees they have cultivated over the years, when these trees were planted, what species they were, or their rate of survival.

There is anecdotal evidence from this research that suggest that some farmers have strong memories of planting and cultivating specific trees over their life times. In one case, Paisari Pun, an 88 year old woman living in Ward 6 of Salija, pointed out over 15 trees in the immediate area surrounding her home during an interview.[82] As she pointed out each tree she called out its name saying, "I also planted that one, that *Kharsu* over there." After this she would recount how many years ago she had planted the tree, the time of day and month she had planted it, which forest and where in the forest she had collected the

[82] Narmati Pun was too feeble to walk with the principal investigator around her land (which had recently be divided among her sons), so the only trees she referred to were ones growing near her home.

seedling,[83] and what she was doing when she had collected it. There was no hesitancy as she discussed her tree planting activities. She also explained one of her reasons for planting these trees, saying that her husband had been away for long periods of time in the British Gurkha Army, and she had to raise her family on her own. Thus, she found going to the forest for fodder and fuelwood too time consuming and difficult, and therefore she gradually planted trees on her private land.

In another case, Jum Bahadu Pun, a 74 year old man also living in Ward 6, provided an extensive report of his own, his father's, and his grandfather's tree planting and cultivation history. He explained that he had learned the value of planting trees from his father, who in turn had learned it from his own father. During a tour of his land, he pointed out numerous very large trees of different species, some of the largest trees seen growing on private land in Salija, that his father and grandfather had planted. At times he would recall how old he was when his father or grandfather had planted a specific tree, and how it had been his responsibility to cut the weeds around the young seedlings. He also explained that some of these older trees were now the primary source of seed for the community nursery and for his own tree planting work.

Jum Bahadu also took us through his two small private forests (*niji bun*). These private forests, or more appropriately, these well kept arboretums, were very impressive. The grass and weeds around all of the seedlings that were seen had

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[83] She was very specific about the name of the forest and a description of the location where she collected the seedling. When she spoke about this she would often speak directly with the principal research assistant, who knew where she was talking about. At times they would get involved in rather animated conversations about specific places in the forest and tell stories about experiences they had each had in this place. It was obvious that much, if not all, of their forest was as familiar to them as a college campus is to a student.

been cut to ground level, and in some cases the ground had been cultivated around the base of seedlings and young trees, and dung was evident in the turned soil. As we walked through these forests Jum Bahadu recounted the year he had planted specific trees or group of trees, and where he had collected the seedlings. His affection and affinity for his trees was apparent in the way that he would stroke and caress the bark and leaves of individuals that we passed.

It is possible that Paisari Pun and Jum Bahadu Pun are exceptions in this community, and it is also possible that they have forgotten the many trees that never survived or the ones that had been harvested in the past.[84] However, these examples indicate that some community members have vivid memories of the history of their land and their trees. Grasping this rich pool of information and quantifying it, however, is not easy.

Consultants report that many of their trees were planted from seedlings that they collected from three main sources: 1)the local nursery, which now provides a vast majority of seedlings people plant; 2) seedlings they find in the forest and transplant to their land; and 3) seedlings they find growing on their own land and transplant to preferred planting sites. Some farmers reported that they had even collected seedlings from distant areas and tried to grow them on their land experimentally.

There are also problems with gathering data via the indirect method of inventorying trees by age class. One problem with this approach is that it does not account for trees that have been harvested as they grow older. A more

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[84] Since most of the members of the Magar cast in this community used the name Pun as a last name, one cannot assume that people are closely related just because they have the same last name.

serious source of error originates from inaccurately estimating the age class of specific trees and shrubs. For many observations there is no problem with this, but for slow growing trees that may have suffered under repeated lopping for fodder, accurate age estimation is difficult. Most of the estimates of tree age were provided by consultants who were asked when trees were first planted or allowed to grow where they had germinated on their own.

In an effort to mitigate problems associated with both of the approaches discussed above, a composite data gathering strategy was used. Some information was gathered via the household survey, and other data was gathered from the inventory. It is believed that using data from both these sources provides sufficient accuracy to evaluate this hypothesis.

5.3.4.1 **Data From the Inventory:** Figures 17 and 18 present summary data from the inventory on 13 of the most common species being cultivated on private land in Salija. Data in Figure 17 presents the total numbers of trees of each species in each estimated age class (less than ten years old, and greater than ten years old). These two age classes are also compared to the total number of trees in both age classes. This same data is presented in Figure 18, showing the percent of total trees in each age class for each species, starting with the most dominant species and progressing to less dominant ones.

Evaluating these figures together shows that there is a significant difference (α = .01) between the two age class groups.[85] Thus we can conclude that there

[85] A Student-t statistic was calculated for the means of the two populations, this proved significant at a preselected α of 0.01 (0.99 probability level).

is a significant difference between the two populations.[86] Several interesting features of these two figures deserve further discussion. Three of these species, *Pinus wallichiana*, *Alnus nepalensis*, and *Prunus persica*, appear to be relatively new to this community, while *Quercus semecarpifolia* and *Elaeagnus pravifolia* are species that were more prevalent in the older age class than in the younger age class. One other species, *Buddlija asiatica*, was reported as being cultivated in the Salija area for many years, appears to have become increasingly popular in recent years. This assumption is also supported by reports from the nursery manager who explained that more farmers are requesting a greater number of this species then in years past.

Another way to evaluate possible changes in tree cultivation practices over time is to examine the species composition of the two age classes. Table 29 presents aggregate data on the number of different species, present in each age class, out of a total of 127 different species that were recorded by the inventory. For all the wards, 112 of the total 127 species were found in the younger age class (88.2 percent), while only 93 (77.3 percent) of this total number of species were represented in the older age class. (See Appendix G for a list of tree and plant species recorded in Salija.) Conversely, 26.8 percent of the total number of species recorded by the inventory are not present in the older age class. This indicates that approximately 34 species, or 26.8 percent of the total

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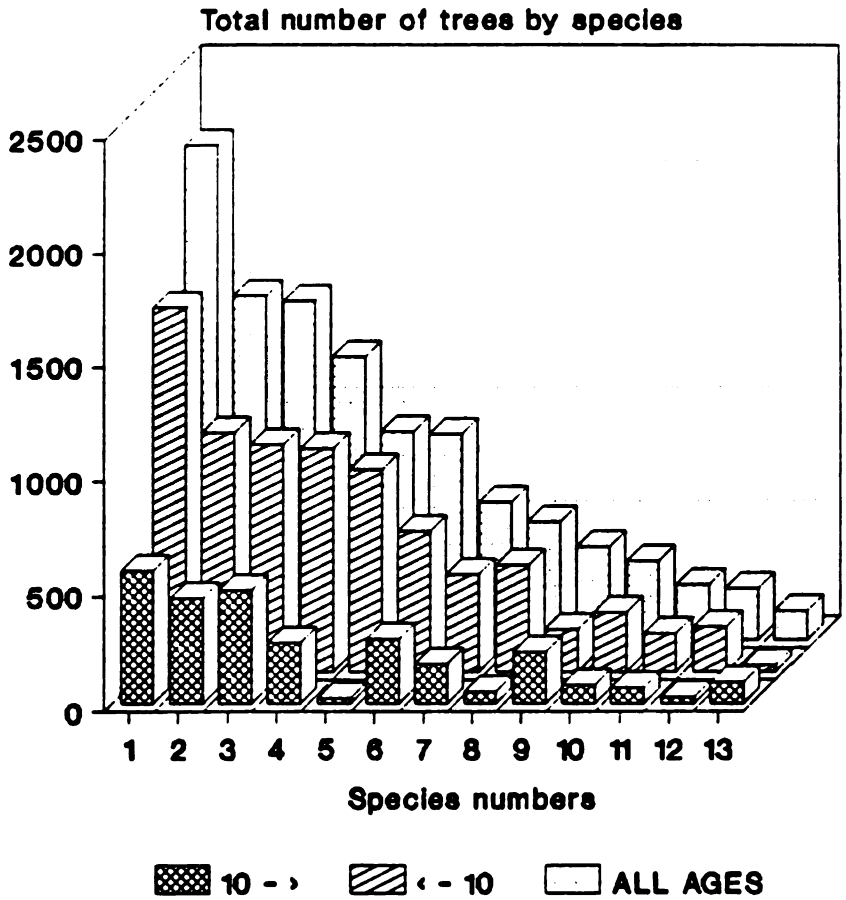
[86] It is important to remember that the age classes were developed from visual and memory estimates and not measured values, and therefore there is probably a high degree of experimental error.

DOMINANT SPECIES BY AGE CLASS

(from inventory data, Sallja)



SPECIES KEY

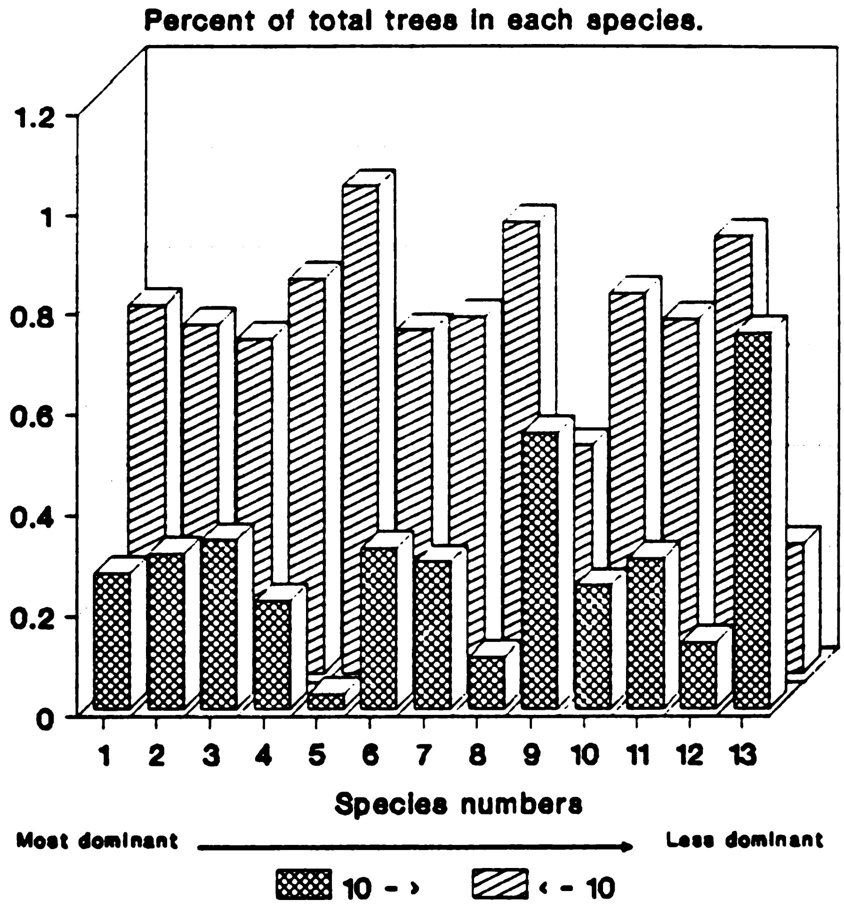
#1: Ficus nemoralis	*#7: Arundinaria spp.*
#2: Prunus cerasoides	*#8: Alnus nepalensis*
#3: Neolitsea umbrosa	*#9: Quercus semecarpifolia*
#4: Buddlija asiatica	*#10: Pieris ovalifolia*
#5: Pinus wallichiana	*#11: Elaeagnus latifolia*
#6: Rhododendron spp.	*#12: Prunus persica*
	#13: Pinus roxburghii

Figure 17

Distribution of Dominant Species by Age Class

PERCENT DOMINANT SPECIES BY AGE CLASS

(from inventory data, Salija)



SPECIES KEY

#1: Ficus nemoralis
#2: Prunus cerasoides
#3: Neolitsea umbrosa
#4: Buddlija asiatica
#5: Pinus wallichiana
#6: Rhododendron spp.
#7: Arundinaria spp.
#8: Alnus nepalensis
#9: Quercus semecarpifolia
#10: Pieris ovalifolia
#11: Elaeagnus latifolia
#12: Prunus persica
#13: Pinus roxburghii

Figure 18

Percent Dominant Species by Age Class

Table 29

The Number of Different Species by Age Class

Present or Absent	< - 10 Years old		10 - > Years old		All Age Classes	
	#'s	%	#'s	%	#'s	%
All Wards						
# Present *	112	88.2	93	77.3	127	100
# Absent	15	11.8	34	26.8	0	0
Ward 6						
# Present	102	80.3	79	62.2	112	88.2
# Absent	25	19.7	48	37.8	15	11.8
Ward 7						
# Present	58	45.7	42	33.1	61	48.0
# Absent	69	54.3	85	66.9	66	52.0
Ward 2						
# Present	49	38.6	43	33.9	56	44.1
# Absent	78	61.4	84	66.1	71	55.9

* Presence and Absence values are in comparison to the

number, are recent additions to household tree collections. Similarly, 15 species, or 11.8 percent of the total, are not represented in the younger age class, and this suggests that these species may be considered as not as useful to plant and cultivate by residents of Salija as other species.[87] This may also be the result of management practices specific to certain species, where trees are harvested prior to age ten.[88] Part of this difference may also be caused by errors in not

[87] This may be due to several factors: propagation difficulties; lack of seed; low valued species; slow growing species; species may be considered as being harmful to some elements of the farming systems, etc.

[88] Even though no such management practices was identified during the research, such a practice may exist.

accurately estimating the age of species that are small in size and/or those that grow slowly.

The number of species in all age classes that are present in individual wards diminishes from Ward 6 to Ward 2. As mentioned earlier, these three wards lie adjacent to each other along the ridge that composes most of Salija *Panchayat*, with ward 2 being most distant from the major forests of Salija, the nursery, and the forestry extension agent. Based on personal observations, it may be that Ward 2 has lower levels of relative humidity and soil moisture than both Wards 6 and 7, with Ward 6 being the wettest. This likely variance in humidity and soil moisture may be an important factor influencing the lower level of species diversity in Wards 2 and 7, thus enhancing the ability of farmers in Ward 6 to cultivate a greater diversity of species.

The individual ward data in Table 29 also indicate that there is greater species diversity in the younger age class than in the older one. These data again suggest that this apparent increase in species diversity is related to an overall increase in tree cultivation over the last ten years.

5.3.4.2 **Data From The Survey:** Data in Table 30, collected via the household survey, shows the frequencies of people who reported planting trees over the last 12 years.[89] As shown, 87 percent of the consultants reported that their household had planted trees some time over the last 12 years. The *panchayat* forester and nursery manager reported that demand for seedlings from all the wards, especially in Ward 6, had steadily increased since the nursery was established.

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[89] The question on the survey used to gather this data did not refer to the number of years. The date that the community nursery was established was used as a reference data (1976, 12 years before this research was carried out), rather that name a year. It was thought that by using a reference to an important occurrence in Salija would make it easier for householders to recall information, than if only a date was used.

Table 30

Frequency of Responses to Planting Trees Over Last 12 Years

	WARD-6	WARD-7	WARD-2	TOTAL	% OF TOTAL
YES	26	10	11	47	87%
NO	1	2	4	7	13%

The level of tree planting on private land over the last 12 years is highest in Ward 6 (96 percent), this decreases to 83 percent in Ward 7, and to 79 percent in Ward 2. This apparent trend in tree cultivation appears to be associated with the following variables:

1) the tree nursery is situated in Ward 6, and is most distant from Ward 2;

2) Ward 6 appears to be the wettest Ward and Ward 2 the driest;

3) Ward 6 is closest to the major forests of Salija, and Ward 2 is most distant; and

4) both the forestry and horticultural extension agents live in Ward 6.

Before definitive conclusions about the possible relationships between these and other variables and historical planting trends can be made, further research is needed.

Table 31 presents data on the frequency of responses to different reasons for planting trees over the past 12 years.

It is important to note that data in Table 31 was derived from an open question about consultant's reason(s) for planting trees on their own land. A typical response to this question was: "I planted trees for more fuelwood and fodder." Thus, the categories in this table came from consultant responses.

Table 31

Frequency of Responses to Reasons for Planting Trees

(Consultants could provide multiple reasons.)

REASONS	WARD-6	WARD-7	WARD-2	TOTAL
FODDER	23	8	9	40
FUELWOOD	25	7	7	39
CONSERVE SOIL	11	3	1	15
FRUIT TREES	5	3	3	11
TIMBER	4	2	3	9
UTILITY TREES	1	0	0	1
MISC.	0	1	1	2

These data provide insight into the rationale behind the tree planting and cultivation practices of residents of Salija. Eighty percent of the responses to this question mentioned the reasons of fodder, fuelwood, and soil conservation. Fruit trees were the fourth most frequent reason provided for planting trees, less than might be expected.[90] This data not only helps understand tree planting practices, but it could also facilitate extension efforts that involve the introduction of exotic species or new management practices. For example, forestry extension programs may be more effective if the trees being offered by nurseries were ones that local people were interested in planting, and not ones selected on the basis of outsiders' assumptions.

[90] Campbell and Bhattarai (1980) report that fruit trees are the preferred tree type for 29 hill districts in Nepal.

Table 32 presents data on the reported number of trees that were planted in the previous year, reported number of seedlings that survived, and the reported number of trees consultants feel they will plant in the coming year.[91] The total number of trees reported as planted and surviving in the previous year, 3,361 and 2,883 respectively, can be cross-checked against the total number of trees reported being planted in Table 21 (page 150). The differences between the values in Table 32 (3,361 and 2,883), and that in Table 21 (3,098), is only 8.5 and 6.9 percent respectively. This suggests that the data is relatively accurate. Based on this, the average reported seedling survival rate of 86 percent can also be assumed to be fairly accurate. This high survival rate is further supported by observations made in Salija. Again, these data in Table 32 supports research hypothesis number 8.

Table 32

Tree Planting and Survival Data

WARD	NO. PLANTED TOTAL	/HH	NO. SURVIVED TOTAL	/HH	% SURVIVAL	TO PLANT TOTAL	/HH
#6	2545	94.3	2247	83.0	88%	710	26
#7	322	26.8	254	21.0	79%	155	13
#2	494	32.9	382	25.5	77%	328	22
TOTAL	3361	62.0	2883	53.4	86%	1193	22

91 Since the survey was carried out just before the end of the Nepalese calendar year, April 14th, in the year 2045 (1987-88), the phrasing of this question was felt to be appropriate.

5.4 Evaluation and Classification of Tree Fodder

5.4.1 Introduction:

As discussed in Chapter 2, one major goal of this research was to learn about an indigenous system of knowledge surrounding tree fodder resources. Embodied in this goal was the belief that a knowledge system for the evaluation and classification of tree fodders existed and could be identified. There was little indication that such a system of classification or evaluation existed until late in the field work phase of the research. What eventually evolved is proposed as a knowledge system that used by residents of Salija for the classification and evaluation of different types of tree fodder. In part, this system is used to determine if leaves from different trees, shrubs, or vines are suitable as animal fodder. It is also part of a decision making process used in the formulation of daily and seasonal feeding regimes for livestock. This proposed knowledge system appears to be only one of three major elements of this decision making process surrounding tree fodder harvesting and livestock feeding. The other two include: 1) an individual's knowledge about and preference for different types of tree fodder; and 2) the availability of alternatives to tree fodders and different feeding regimes.[92]

5.4.2 Underlying Data:

The following tree fodder classification and evaluation system was formulated primarily from repertory grid data. As discussed in section 4.3.5 (see page 96) this research method allowed consultants to express their own perceptions

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[92] Tree fodders are harvested and fed to livestock that are maintained in stalls. Livestock may also be staked in private fields where they graze on crop residue, or allowed to graze freely in public forests and on public grass land.

about different tree fodders with limited external influence from the researcher or research method. Statements made by consultants explaining their rationale for their groupings of the triad leaf sorts provided insight into how people of Salija classify and evaluate tree fodder. It also permitted the identification of some aspects of tree fodders that residents perceive as valuable, dangerous, and curious.

As explained earlier, this research used a less rigorous form of the repertory grid method than some authors promote. This allowed for more effective consultant participation and facilitated the elicitation of information. However, in exchange for more effective consultant participation and data rich in detail, analysis was limited to qualitative content analysis of the verbal labels through inspection. Also, because consultants were permitted to use more than one verbal label to describe their grouping rationale, many statements contained reference to several tree fodder attributes. Table 33 shows the differences in the number of different verbal labels provided by consultants according to gender. Nearly twice as many comments were provide by men that contained two or more attributes than those provide by women. This difference in the number of comments made by women and men are probably due to the shyness of women consultants in talking directly with a foreign man. The fewer number of tree fodder attributes provided by women should not be attributed to any lack of knowledge about or interest in tree fodder resources. This variation in responses per consultant is another reason that analysis was limited.

TABLE 33

Frequency Verbal Labels by Gender

	NUMBER OF ATTRIBUTES PER GROUPING RATIONAL			
	3	2	1	0
WOMEN	5	10	32	9
MEN	11	18	33	0
TOTAL	16	28	65	9

3, 2, 1, OR 0 Attributes per Grouping Category

Verbal labels were compiled and then grouped into major categories based on similarities among labels. (Appendix F lists all elicited verbal labels.) This resulted in the formulation of sixteen label categories. Table 22 show these categories and their associated frequencies (see page 154). These different label categories then formed the basis of further analysis.

5.4.3 Extraction of Categories of Evaluation & Formulation of the Proposed Knowledge System:

One of the goals of the repertory grid technique is to elicit an array of categories of classification for a domain of knowledge. Data presented in Tables 22 and 23 show that this goal was successfully achieved.

Another major goal of this method involves the identification of an underlying system of classification embodied within the elicited categories. Thus, through analysis of resultant label categories a classification or knowledge system may be revealed within grid data. According to PCT, analysis of grid data may reveal that some categories of classification, or representations of personal constructs, will be subordinate "constructs." These subordinated "constructs" will in turn be subsumed by broader more inclusive superordinate "constructs." Thus, by identifying relationships between subordinate and superordinate "constructs" an indigenous knowledge system for the classification and evaluation for the elements of a domain of knowledge may be revealed. The analysis of the structure and content of grid data elicited in this research did not reveal any obvious ordered classification system into which different verbal categories could be arranged.

This problem of an apparent lack of a underlying classification structure was solved by associating repertory grid data with data and information derived from the other research methods. From this, a plausible classification scheme was developed. This proposed scheme is based, to a great extent, on three assumption of the Personal Construct Theory (see section 3.5, page 55). The first assumption involves the basic tenets of bipolar constructs. The second major assumption concerns Kelly's idea of how constructs are organized into subordinate and superordinate systems (see page 65). According to this idea, major, or superordinate categories of a classification scheme are broad in character, and encompass more specific subordinate categories. The final assumption uses Kelly's "Communality Corollary" that helps to explain how individual knowledge or construct systems can form a community knowledge or construct system (see page 66). Based on these assumptions, and information gathered from informal interviews, the inventory, and household survey, it is proposed that a system of classification and evaluation of tree fodder is embodied within the bipolar scale depicted in Figure 17.

CHISO SPECIES THAT MOVE ALONG THE SCALE *OBANO*

------> <------ | ------> <------

Vitis repanda	*Ficus nemoralis*	*Quercus semecarpifolia*
CHHEROTE	*Ilex doniana*	*Quercus incana*
Chonemorpha	*Brassaiopes hainla*	*Buddlija asiatica*
macrophylla	*Prunus cerasoides*	*Vibrurm coriaceum*
Machilus spp.	*Eurya acuminata*	*Betula spp.*
Hedera nepalensis	*Dendrocalamus spp.*	*Quercus glauca*
Salix babylonica	*Prunus cerasoides*	*Ilex dipyrenia?*
Michelia spp.	*Eurya acuminata*	RAJELI

FIGURE 17

Bipolar Scale of Evaluation for Tree Fodder

This figure shows that the proposed model for tree fodder evaluation and classification[93] consists of a bipolar scale with the two poles defined as *Chiso* or *Obano*.[94] It appears that all tree and vine fodders, and possibly grass fodders and agricultural residue, can be classified according to this bipolar scale as being either more or less *chiso* or *obano*. Only a few species are shown in Figure 17 to demonstrate how some tree and vine fodders are arranged along this scale for the Nepali month of *Magh* (January-February).[95]

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[93] At the start of this research, vines were not thought to be even remotely important in terms of a tree fodder resource. However, consultants reported on the survey, inventory, and through informal interviews that woody vines and herbaceous climbers are very important sources of fodder in Salija. Additionally, many vines and climbers are spoken of as being "tree fodders," i.e., *dhali gass*. In contrast to their importance as a tree fodder, the principal investigator did not find any reference to vine fodders in the literature. However, their importance to farmers in Salija is reflected in their inclusion in the repertory grid method.

[94] *Obano* is the most common term used by residents of Salija to define this pole of the scale. Another common term *Garimi*, which means warm or hot, is occasionally used along with or in place of *obano*.

[95] This arrangement will likely be different for different seasons.

The Nepalese word *chiso* is generally used to describe something that is cold and damp, and *obano* is used to describe something that is dry and possibly warm. When these terms are used to describe the character of fodder there meanings are expanded to include attributes of fodder character and quality. These terms are also used to explain what may result from feeding an excessive amount of *chiso* or *obano* fodders to livestock.

Consultants reported that the best quality fodders often have *obano* attributes, which not only describe the physical character of leaves, i.e., being relatively dry, stiff, and leathery, but it also infers that when animals are fed *obano* fodder it will:

1) lead to the production of good firm relatively dry dung without causing constipation;[96]
2) improve the generally health of livestock;[97]
3) cause the livestock to gain weight;
4) be eaten well and satisfy the animal's appetite;[98] and
5) contribute to the production of milk and *ghiu*.[99]

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[96] The production of firm relatively dry dung makes it easier for family members to collect dung and use it to fertilize their fields. Loose watery dung is much more difficulty to collect and transport to compost pits and fields. Thus, fodders that are perceived as producing dry firm dung are preferred.

[97] There are a variety of other terms used to describe a fodder the contributes to an animal's health, including *pashilo* (nutritious) and *nirogi* (healthful).

[98] This attribute proved to be important to farmers. Some *obano* fodders were prized because farmers said that only a little of the fodder needed to be fed to livestock to satisfy their appetites. Other fodder, generally *chiso* fodders were said to never satisfy a cow or buffalo's appetite. As one farmer remarked, "You can cut and feed some *chiso* fodders all day long and the animals still cry as if they haven't eaten for a week."

[99] These attributes of fodder were extracted from the repertory grid results, and information provided from other research methods.

Conversely, chiso fodders are often considered as poorer quality fodders that usually need to be mixed with other more *obano* fodders before being fed to livestock. As with the term *obano*, the term *chiso* describes both physical attributes of the fodder, i.e., being relatively succulent, supple, and smooth, but possibly more important, it describe the physiological effects that fodders of this type commonly have on livestock. Consultants report that if *chiso* fodders are fed to livestock in excess they:

1) will cause animals to produce watery dung;
2) will, sometimes cause the lose of weight;
3) will weaken animals and cause them to lose their appetite, and possibly causing a blockage in the stomachs or throats of the livestock;
4) will not satisfy the animals' appetite; and
5) will not increase the production of *ghiu*.

It should be emphasized that *chiso* fodders are not necessary thought of as "bad" fodders. For example, *Vitis repanda* (*Pani Lahara*) which is considered as one of the most *chiso* fodders used in the Salija area, is also considered as one of the best fodders for milk and *ghiu* production. Because of this fodder's high *chiso* quality, it is generally only fed to livestock in limited quantities, and it is often mixed with more *obano* fodders. For example, consultants were observed feeding small quantities of *Vitis repanda* along with larger quantities of *Quercus semecarpifolia* (an *obano* fodder). On one occasion, the principal investigator, while "helping" a consultant feed here livestock with these two fodders, was scolded for feeding to much of the chiso fodder to one of her animals. As this woman explained, "Do you want to make my buffalo sick? You should only feed a little of the *Pani Lahara* along with the *Kharsu*."

Similarly, all *obano* fodders cannot be considered as simply "good" fodder, free from problems. For example, one consultant explained that during the Nepali month of *Asar* (June-July) fodder from *Prunus cerasoides* (*Painyu*), which is relatively *obano*, can be fed as the sole fodder because there is sufficient water around for animals to drink. According to this woman, at other times of the year, if this "garimi" (obano) fodder is the only fodder fed to cows and buffalos, the udder to dry up and the teats will develop pimples." Other consultants reported that if very *obano* fodders were fed in excess livestock may develope severe constipation, and this could even result in the death of the animal.

It appears that only a few fodder species are classified as purely *obano* and *chiso*, most fodders fall between these two extremes of classification, forming three groups: two relatively static groups adjacent to the polar groups; and a more dynamic middle group that changes state over time. Most fodders appears to fall within this dynamic middle group, and these tend to move along the scale becoming more or less chiso or *obano* at different times of the year and as leaves mature. This process can be considered as similar to the ripening of fruit. Many fodder leaves, like fruit, must "ripen" before they are considered suitable for consumption.

For example, *Ficus nemoralis* (*Dudhilo*), one of the most popular fodders in Salija, can be classified as very *chiso* when there is a new flush of leaves, but as the leaves mature they become progressively more *obano* and the fodder quality of this species gradually improves. Since not all leaves on a tree mature at the same time many trees will generally have leaves that are relatively *obano* and *chiso*. Therefore, fodder collection often requires the selective lopping of the more *obano* leaves from a tree, leaving the more *chiso* leaves to mature (or ripen) for later use. This practice of selectively harvesting fodder leaves from trees was observed in Salija. In one case, a women was observed selectively cutting leaves from five privately owned *Ficus nemoralis* trees. When asker her reason for not just cutting all the fodder she needed from one tree she explained that, "not all the leaves were yet ripe (*pakeko*)." As she explained, many of the leaves on these trees were still too chiso to be fed to her livestock.

It appears that farmers in Salija use two basic techniques to determine the relative *chiso* or *obano* condition of tree fodders. The first involves associating the species to a season of the year, this method seems to be used most commonly with those fodders that are more or less fixed at either pole. For most fodders, those that lie between the two extremes, farmers need to apply a second technique, the qualitative analysis of the leaves of trees or vines using their senses. Table 34 presents techniques of qualitative analysis that many consultants in Salija were observed using in the evaluation of different tree and vine fodders. Once a judgement is made about the quality of a specific fodder, farmers may then make a series of other decisions about the quantity of different *chiso* and *obano* fodders that will be collected and fed to their livestock. It is suggested that farmers use this *chiso-obano* evaluatory system for more than just determining what tree fodders should be harvested. Farmers also appear to use their qualitative understanding of *chiso* and *obano* attributes of fodders, along with their knowledge about other aspects of specific fodders, to formulate feed for their livestock that consists of a variety of fodder types to achieve personal production goals.

Table 34

General Methods of Qualitative Analysis of Tree Fodders

Sense	Analytic Technique
SIGHT	Both surfaces of the leaves were closely inspected by holding the leaves to take best advantage of natural lighting.
TOUCH	Both surfaces of the leaves were gently fondled between the thumb and fingers. The leaves were tugged, bent, and crumpled. Leaf margins were caressed and thorns teased. Leaf petioles were also rolled between the thumb and forefinger.
SMELL	Leaves were smelled in both crumpled and uncrumped states.
TASTE	Some consultants placed some leaves or parts of leaves in their mouths and chewed.

As might be expected, this *chiso-obano* systems of classification appears to be flexible in application and rather tacit. More specific elements of fodder classification and evaluation, e.g., those listed in Table 22 and Appendix E, are more frequently used in discussing tree fodders than the terms *chiso* or *obano*. An explanation for this is that most other fodder attributes can be classified or subsumed within the superordinate "construct" *chiso-obano*. Additionally, the more specific subordinate "constructs" are thus more functional for describing characteristics of specific tree fodders and decision making rules surrounding the management and use of tree fodder at specific points in time.

5.4.4 Conclusions:

The existence of this sophisticated knowledge systems used by residents of Salija to classify and evaluate tree fodders supports Kelly's thesis of "man-the-scientists." That all people function in a "scientific" manner by using perceived regularity in the environment to make predictions about future actions (see page 55). Some of these perceptions of regularity and order, and their associated predictions, develop into formal systems of classification that are shared by members of a community. This *chiso-obano* system thus allows residents of Salija to transform the apparent randomness and chaos reflected in the many varieties of fodder and multipurpose trees, each with their dynamic individual qualitative characteristics, into an order system of knowledge. A system that enables farmers to evaluate different fodders and make predictions about the management and use of their tree fodder resources.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

6.1 Summary of Major Findings

This research has demonstrated that there is much more to the collection, management, and use of tree fodders than may meet the eyes of outsiders. Furthermore, the research has shown that knowledgeable villagers can efficiently evaluate the relative quality of different fodders and provide good feed to their livestock by using three main tools: 1)their extensive knowledge about individual fodder species; 2)the indigenous system of classification and evaluation depicted in Figure 17 (page 178); and 3)their skillful qualitative analysis of available tree fodder species (Table 34, page 194). This research has provided another example of how people develop and use complex cognitive systems that impresses order on the apparent disorder of nature.

At a more specific level, much was learned about the relationships between trees, tree fodder and farming systems in this middle hill community. The following list, in no order of priority, summarizes some of the key findings:

1) An average of 33 percent of all trees cultivated on private land are classed as dedicated fodder trees (page 121). While an average of 54 percent of all privately cultivated trees are potential sources of animal fodder.

2) Contrary to a common assumption, average tree density per unit land area (trees/ha) was shown to be relatively uniform across all land size categories (page 126).

3) For farms smaller than 1.5 hectares in size, the percentage of fodder trees (to total trees) cultivated per unit of land increased as land area decreased. Conversely, the percentage of fuelwood trees diminished, as farm size decreased (page 133).

4) The effect of land size on tree cultivation was most obvious on farms larger than 1.5 hectares in size. Household with large land holdings have intensified tree planting with the intent of becoming independent of public sources of fodder and fuelwood (page 130).

5) Tree cultivation strategies vary between households and are influenced by people's perceptions about how best to use their land. As such, it is important to test assumptions and generalization before using them to make planning and research decisions.

6) On average, 70 percent of all trees cultivated on private land consist of 5 major species: *Ficus nemoralis* 21% (*Dudhilo*); *Prunus cerasoides* 15% (*Painyu*); *Neolitsea umbrosa* 14% (*Phe Phe*); *Buddleja asiatica* 12% (*Dhurse*); and *Pinus wallichiana* 9% (*Thingre Salla*) (page 135).

7) Cows and Buffalos are the dominant livestock in Salija with an average of 5.6 LSU per household (page 135).

8) Trees are not cultivated randomly around household land. Excepting fodder and fruit trees, most tree types are almost exclusively planted on marginal land, grass land, and along side streams and rivers. Fodder trees are also most often cultivated on these types of land, but they are also cultivated along the terraces of non-irrigated agricultural land and on land surrounding household dwellings. Fruit trees are most commonly cultivated around household dwellings and along terraces of non-irrigated agricultural land (page 147).

9) Within the domain of tree and tree fodder knowledge, there were both unique and common elements of knowledge characteristic of men and women. Women appear to have specific interest in "domestic" fodder trees and trees that provide good quality fodder and fuelwood. Men appear to have specific interest in "forest" trees, and trees that produce winter fodder, fodder that effect the health of livestock, and fodders that improve the production of *ghiu*. Alternatively, both men and women appear to share knowledge and perceptions about other aspects of tree fodder relatively equally (page 152).

10) Men appear to have greater responsibility for collecting tree fodder from public forests, while women appear to concentrate their fodder gathering efforts from trees cultivated on private land (page 165).

11) There is a significant correlation between the number of fodder trees and the number of LSU per household. However, this correlation was not as strong as was anticipated, and therefore, it is suggested that other variables are also important in explaining private fodder tree cultivation (page 167).

12) There is a significant correlation between the number of fodder trees per household and the size of land holding. This correlation is much stronger than that for fodder trees by LSU. However the correlation between the number of fodder trees and non-agricultural land is less strong than for fodder trees to agricultural land (page 167).

13) Household size is not significantly correlated to the number of fodder trees cultivated per household. This suggests that household labor is not a very important variable in terms of the number of fodder and other trees cultivated on private land. However, this same relationship probably does not exist with respect to collecting tree fodder from public lands (page 167).

14) Households that do not have livestock still cultivate fodder trees. One reasons for this is the trading of tree fodder for dung.

15) It appears that the planting of fodder and other types of trees has increased over the last 12 years as compared to earlier years. This increase in planting appears to be associated with changes in the availability of forest resources, changes in household labor, presence of village oriented nursery, and strong local leadership that promotes private tree planting (page 172).

16) There is a tradition that supports the cultivation of trees on private land (87 percent of the consultants reported that their household's have engaged in tree planting on their land over the last 12 years). It appears that this tradition has been strengthened by environmental, social, economic and political changes occurring in Salija and in Nepal (page 181).

17) The most commonly reported reasons for planting trees on private land are: for: fodder; fuelwood; and soil conservation. Contrary to other research, the planting of trees for fruit is not a very important reason (page 183).

18) For the study area as a whole, consultants report that 86 percent of the seedlings planted the previous year survived. The distribution of survival rates across the three wards suggests that environmental and biophysical variables are important for seedling survival (page 184).

19) Before there was a local nursery, tree seedlings were collected from the forest and/or from private land. Now, however, the nursery is the dominant supplying of tree seedlings. This is primarily due to the fact that seedlings grown by the nursery are trees requested by residents of Salija.

20) A total of 127 different species of trees were recorded as being cultivated on private land. The diversity of species varied between wards, with 112 species recorded in Ward 6, and 61 and 56 species recorded in Wards 7 and 2 respectively (page 180).

21) Evidence suggests that approximately 34 species have recently been added (over that last 10 to 12 years) to the planting stock of trees cultivated on private land in Salija. While approximately 15 species present in the older age class were not recorded in the younger age class (page 176).

22) The two previous findings (#20 & 21) indicate that farmers are adapting their tree planting strategies in response to the availability of new species, to changes in supply and demand for different tree based resources, and to changes in social, economic, and political environments in Salija and in Nepal.

23) Residents of Salija have developed a sophisticated knowledge system for the classification and evaluation of tree fodders (page 187). This system is broader than a taxonomic system for tree species. It is used to help residents determine which fodder trees to harvest, and how to formulate feed for their livestock from a changing stock of fodders to best achieve desired production goals.

24) Woody vines were found to be an important source of "tree" fodder for the residents of Salija. Also, the concept of "tree fodder" as commonly used by both Nepalese and expatriate outsiders was found to be much narrower and exclusive than that used by residents of Salija. Data suggests that the local used of the term *dale gass* ("branch grass" or tree fodder) defines all dicotyledonous fodders (and bamboos), while the term *bhuin gass* ("ground grass") defines all monocotyledonous fodders.

25) Field observations indicate that residents experiment with different methods of tree establishment. For example, a very effective indigenous technique for propagating *Ficus nemoralis*, an important and dominant tree fodder species in Salija and other areas of the middle hills of Nepal, is used by farmers in Salija. Because of the palatability of this species, grazing animals make it very difficult to propagate, especially on public lands. To overcome this problem, farmers in Salija use *Neolitsea umbrosa*, a small bushy tree that grazing animals ignore, as a nurse plant for *F. nemoralis*. From field observations and according to farmers who use this technique, companion planted *F. nemoralis* grows more quickly than trees grown without *N. umbrosa*.

6.2 Lessons Learned

This research has also demonstrated that conducting this type of investigation is viable and feasible within a reasonable time frame and with limited financial resources. Extensive participation of villagers as research consultants and assistants was also shown to be highly effective because they (Chapter 4 page 71):

1) lessened the cost of obtaining reliable and appropriate information;
2) reduced the time required to carry out this research;
3) helped to quickly dispel the fear villagers had of the research and the researcher;
4) refined research methods that more appropriately reflect the needs and character of this community; and
5) provided very important insights to the indigenous knowledge systems and environmental cognition of this village area.

Research of this type requires that researchers establish a good working rapport with the residents of the community being studied. Of the many techniques used to establish a good rapport in this research, three standout as most significant. First, was to approach this research from the humble perspective of a learner, to shed, as Mao Tse-Tung (1971) said, "the ugly mantle of pretentiousness and become a willing pupil." Second, in accordance with being a student of the village, it was essential that the residents of Salija be treated with the respect deserving of teachers. Thus, throughout this dissertation villagers are referred to as consultants, a term that accurately reflects the respect owed to people who possess unique and valuable knowledge. During field work, consultants were addressed as *guru* (teacher), *baje* (grandfather), or *bajyai* (grandmother), all terms that confer respect on people with wisdom. Finally, as an outsider, it proved effective to behave as a guest might behave when visiting someone's home. This behavior coupled respect for individual consultants and their households, with respect for the culture of the community.

The value of this approach in conducting field research of this type cannot be emphasized enough. All researchers, expatriate or nationals alike, should make a sincere effort to apply them in other field research efforts.

Finally, this research demonstrated the importance of taking a interdisciplinary perspective in formulating the research strategy and developing research methods. This perspective provided the flexibility necessary to devise the multi-method research strategy described in Chapter 4 (page 71). Both during field work and data analysis, the value of using this strategy for this type of research became apparent. The major goal of developing a more complete understanding of the use, cultivation, and knowledge about fodder trees in a Nepalese village could probably not have been accomplished if only a subset of the methods had been used. One of the key advantages of this approach was that when data obtained from each method was inspected and analyzed, anomalies and problems that came to light could be cross checked with information provided from other methods. In many cases, what were at first problems of understanding, became insights into the workings of this complex rural system.

Closely associated with this methodological approach was the emphasis on allowing consultants to report quantifiable data in units of measure they are familiar with. This not only contributed to the accuracy of data collected, but it also provided further insight on the structure and function of the research community. Furthermore, this approach lessened the anxiety of some consultants who participated in this research.

6.3 Recommendations for Further Research & Possible Applications

This research, as with most other field work, led to the formulation of more questions than it answered, and there is an abundance of research "fodder" for years to come. One major area for further research is to learn more about the character of the fodder evaluation and classification model discussed in Section 5.4 (page 185). Now that the *chiso-obano* construct has been identified it can be used in a repertory grid to test a greater number of tree fodder species against this attribute. Additionally, other types of fodder could be tested against this construct to determine the extent of its "range of convenience." In a similar manner, exotic species of fodder producing trees could be evaluated by villagers against the *chiso-obano* construct to see how unfamiliar species are evaluated.

Furthermore, research could be carried out to determine if this fodder evaluation model is used by other population groups across Nepal and South Asia. By testing this model across a larger population one might learn of variations, extensions, and limits of it's applicability. It would also be interesting to learn if there are variations in its use across different age groups within populations. It could also be used to refine our understanding of gender related differences and tree fodder evaluation. At a broader level, the repertory grid method could be used across a larger population sample with the hope of clarifying relationships between other verbal categories identified in this study.

It might also prove fruitful to test a set of valuable tree species using repertory grid method with groups of forestry professionals and village farmers. From this, one might learn how these two populations differ with respect to ways that they evaluate and classify different fodder tree species. This might also indicate how different terms used to discuss trees and fodder are interpreted and used by the two groups. Results from such research could then be used to improve forestry and agricultural education programs.

Research using this construct and the repertory grid method could also be used to evaluate changes in *chiso-obano* characteristics of a select number of tree fodder species across time. This research could then be matched against biochemical analysis of evaluated samples in an effort to determine any chemical or biological basis for fodder being evaluated as *chiso* or *obano*. For example, consultants reported that a common problem attributed to *chiso* fodder is that it can cause a blockage in the throats or stomachs of the animals. It could be useful to determine if this problem is the result of a chemical reaction that either causes the leaf matter to congeal or causes throat tissues to swell. Such research may also help identify properties of different fodders that positively and/or negatively effect milk and butter fat production, and the health of livestock.

Researchers and planners around the world have shown keen interest in developing models to help explain current and changing land use strategies and farmer decision making systems, and then to plan development and extension efforts to alter these strategies. It appears that much of this model building effort is premature for many areas of the world. Before such macro level models are constructed is seems appropriate for more basic research to be carried out at a more micro level. To this end, there appear to be three major interrelated gaps in the knowledge base needed to formulate such models: 1) many of the important in the knowledge base needed to formulate such models: 1) many of the important variables required for model development have not yet been well defined; 2) as such, there is not a clear understanding of the data required to formulate these variables; and 3) research methods designed to efficiently and accurately gather this data are also still poorly developed.[100]

To remedy this problem requires research to: determine what variables need to be measured; develop appropriate scales of measurement; and formulate creative methods to apply these scales.

Not all communities in the middle hills of Nepal cultivate trees on private land as intensely as households in Salija. A comparative study between two communities, one that intensely cultivates private trees, and one that does not, might further our understanding of the reasons behind the presence and absence of private tree cultivation. Such a study would need to consider socio-economic, geographic, biophysical, political (local and national), historical, and cognitive variables. It is also likely that an interdisciplinary research strategy would also need to be applied.

6.4 Conclusion

One of the immediate applications of this research is to contribute to the enlightenment of western trained professionals, "experts," planners, extension agents, and development practitioners about the extent, sophistication, and value of indigenous knowledge systems. As Richards (1985) concludes,

> "peasant-focused ... research and development .. is an option worth serious consideration because it is appropriate ... 'People's science' is worth

[100] There seems to be an over reliance on the "cookbook" style of survey research, and less attention paid to the creative development of locally appropriate research tools.

> pursuing ... not out of 'spontaneous admiration' for the peasantry ... but on the grounds that it is good science." (p.162)

This is not to imply that indigenous knowledge systems or "people's science" are perfect. Indigenous systems of knowledge, like Western international science, have their weaknesses and imperfections, and it is just because of this that both are worth exploring. Also, since all knowledge systems are incomplete, and to some extent inaccurate representations of "reality," it seems appropriate and prudent to employ the resources of a variety of knowledge systems when dealing with development problems, especially problems related to diverse biophysical and socio-political environments. As Hatley and Thompson (1985) summarize:

> "(Since) there are many different systems of knowledge, and (since) each of them is incomplete, then the more of them we can make use of the better. The only trouble is that, to do this, (we) have to concede that (our) truth is not the only truth: something that does not come easily to those who see development as a kind of mission."

Research on indigenous knowledge systems has the potential to both help improve our understanding of the complexities of rural farming systems, and to improve development and extension efforts. This research has demonstrated that the people of Salija have developed and use a complex cognitive system to help them cope with the management of tree fodder. It is likely that similar cognitive systems are used by other social groups to assist in the management of natural resources that are critical to survival. As such, this research may stimulate other research designed to refine our understanding of knowledge systems and natural resource management. Closely associated with this, is the realization that such research can also further our understanding of the social ecological nature of human kind, and our interactional relationship with our environment.

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APPENDICIES

APPENDIX A

Outline of Personal Construct Theory

APPENDIX A

Outline of Personal Construct Theory

A. Formal Content of Personal Construct Theory:

Fundamental Postulate. A person's processes are psychologically channelized by the ways in which he {sic} anticipates events.

Construction Corollary. A person anticipates events by construing their replications.

Individuality Corollary. Persons differ from each other in their constructions of events.

Organization Corollary. Each person characteristically evolves, for his convenience in anticipating events, a construction system embracing ordinal relationships between constructs.

Dichotomy Corollary. A person's construction system is composed of a finite number of dichotomous constructs.
1
Choice Corollary. A person chooses for himself that alternative in a dichotomized construct 1through which he anticipates the greater possibility for the elaboration of his system.

Range Corollary. A construct is convenient for the anticipation of a finite range of events only.

Experience Corollary. A person's constructions system varies as he {sic} successively construes the replications of events.

Modulation Corollary. The variation in a person's construction system is limited by the 1permeability of the constructs within whose ranges of convenience the variants lie.

1Fragmentation Corollary. A person may successively employ a variety of construction subsystems which are inferentially incompatible with each other.

Commonality Corollary. To the extent that one person employs a construction of experience which is similar to that employed by another, his {sic} processes are psychologically similar to those of the other person.

Sociality Corollary. To the extent that one person construes the construction processes of another he {sic} may play a role in a social process involving the other person.

B. Formal Aspects of Constructs:

Range of Convenience. A construct's range of convenience comprises all those things to which the user would find its application useful.

Focus of Convenience. A construct's focus of convenience comprises those particular things to which the user would find its application maximally useful. These are the elements upon which the construct is likely to have been formed originally.

Elements. The things or events which are abstracted by a person's sue of a construct are elements. In some systems these are called objects.

Context. The context of a construct comprises those elements among which the user ordinarily discriminates by means of the construct. It is somewhat more restricted than the range of convenience, since it refers to the circumstances in which the construct emerges for practical use, and not necessarily to all the circumstances in which a person might eventually use the construct. It is somewhat more extensive than the focus of convenience, since the construct may often appear in circumstances where its application is not optimal.

Pole. Each construct discriminates between two poles, one at each end of its dichotomy. The elements abstracted are like each other at each pole with respect to the construct and are unlike the elements at the other pole.

Contrast. The relationship between the two poles of a construct is one of contrast.

Likeness End. When referring specifically to elements at one pole of a construct, one may use the term "likeness end" to designate that pole.

Contrast End. When referring specifically to elements at one pole of a construct, one may use the term "contrast end" to designate the opposite pole.

Constriction. Constriction occurs when a person narrows his {sic} perceptual field in order to minimize apparent incompatibilities.

Comprehensive Constructs. A comprehensive construct is one which subsumes a wide variety of events.

Incidental Construct. An incidental construct is one which subsumes a narrow variety of events.

Superordinate Constructs. A superordinate construct is one which includes another as one of the element in the context of another.

Subordinate Constructs. A subordinate construct is one which is included as an element in the context of another.

Regnant Constructs. A regnant construct is a kind of superordinate construct which assigns each of its elements to a category on an all-or-none basis, as in classical logic. It tends to be nonabstractive.

Core Constructs. A core construct is one which governs the client's maintenance processes.

Peripheral Constructs. A peripheral construct is one which can be altered without serious modification of the core structure.

Tight Constructs. A tight construct is one which leads to unvarying predictions.

Emergence. The emergent pole of a construct is that one which embraces most of the immediately perceived context.

Implicitness. The implicit pole of a construct is that one which embraces contrasting context. It contrasts with the emergent pole. Frequently the person has no available symbol or name for it; it is symbolized only implicitly by the emergent term.

Symbol. An element in the context of a construct which represents not only itself but also the construct by which it is abstracted by the user is called the construct's symbol.

C. Constructs Classified According to the Nature of Their Control Over Their Elements:

Preemptive Construct. A construct which preempts its elements for membership in its own realm exclusively is called a preemptive construct. This is the "nothing but" type of construction --"If this is a ball it is nothing but a ball."

Constellatory Construct. A construct which fixes the other realm membership of its elements is called a constellatory construct. This is a stereotyped or typological thinking.

Propositional Construct. A construct which carries no implication regarding the other realm membership of its elements is a propositional construct. This is uncontaminated construction.

D. General Diagnostic Constructs:

Preverbal Constructs. A preverbal construct is one which continues to be used, even though it has no consistent word symbol. It may or may not have been devised before the client had command of speech symbolism.

Submergence. The submerged pole of a construct is the one which is less available for application to events.

Suspension. A suspended element is one which is omitted from the context of a construct as a result of revision of the client's construct system.

Level of Cognitive Awareness. The level of cognitive awareness ranges from high to low. A high-level construct is one which is readily expressed in socially effective symbols; whose alternatives are both readily accessible; which falls well within the range of convenience of the client's major constructions; and which is not suspended by its superordinating constructs.

Dilation. Dilation occurs when a person broadens his perceptual field in order to reorganize it on a more comprehensive level. It does not, in itself, include the comprehensive reconstruction of those elements.

Loose Constructs. A loose Construct is one leading to varying predictions, but which retains its identity.

E. Constructs Relating to Transition:

Threat. Threat is the awareness of a imminent comprehensive change in one's core structures.

Fear. Fear is the awareness of an imminent incidental change in one's core structures.

Anxiety. Anxiety is the awareness that the events with which one is confronted lie mostly outside the range of convenience of his construct system.

Guilt. Guilt is the awareness of dislodgment of the self from one's core role structure.

Aggressiveness. Aggressiveness is the active elaboration of one's perceptual field.

Hostility. Hostility is the continued effort to extort validational evidence in favor of a type of social prediction which has already been recognized as a failure.

C-P-C Cycle. The C-P-C cycle is a sequence of construction involving, in succession, circumspection, preemption, and control, and leading to a choice precipitating the person into a particular situation.

Creativity Cycle. The creativity cycle is one which starts with loosened construction and terminates with tightened and construction.

Source: D. Bannister and J.M.M. Mair, The Evaluation of Personal Constructs. London: Academic Press, 1968.

APPENDIX B

Part 1

HOUSEHOLD LEVEL SURVEY

(English Translation)

APPENDIX B

Part 1

HOUSEHOLD LEVEL SURVEY
(English Translation)

DATE: ___/___/ 88___ SURVEYOR: __________________

1. WARD NUMBER: __________ 2. VILLAGE NAME: ______________________________

3. ALTITUDE: _____________ 4. HOUSEHOLD ASPECT: _________________________

5. CASTE: __P___C___D__ 6: SEX: __M___F__ 7: NAME & AGE: ___________
P-Pun; C-Cami; D-Damai

9. HOUSEHOLD COMPOSITION:

	60 YEARS OR OLDER	15 - 60 YEARS WORKING ON FARM	OUTSIDE	IN ARMY N	I	B	5 to 15 YEARS SCHOOL	NOT SCHOOL	< 5 YEARS
MALE*									
FEMALE									
TOTAL									

*IF OLDER MALES ARE RETIRED FROM AN ARMY NOTE DOWN P IF THEY RECEIVE A PENSION. N-Nepalese; I-Indian; B-British

9.1. DID YOUR MOTHER AND FATHER HAVE MORE CHILDREN THAN YOU AND YOUR HUSBAND/WIFE HAVE OR ARE PLANNING TO HAVE?

PARENTS HAD MORE CHILDREN ______________

PARENTS HAD FEWER CHILDREN ______________

FAMILY SIZE IS THE SAME ______________

10. WERE MEMBERS OF YOUR HOUSEHOLD ENGAGED IN WAGE EARNING ACTIVITIES THIS LAST YEAR? NO [ ]; YES [ ]

10.1. IF YES:	NUMBER MALE	FEMALE	PLACE OF WORK
FULL TIME: PART TIME: LESS THAN 1 MONTH:			

CODES FOR ACTIVITY: A - AGRICULTURAL LABOR; T - TRADE
B - BUSINESS; S - SALARIED JOB
CODES FOR PLACE: 1 - LOCAL PANCHAYAT; 2 - OUTSIDE PANCHAYAT;
3 - OUTSIDE DISTRICT; 4 - OUTSIDE NEPAL.

11. WHAT THINGS (INCLUDING YOUR OWN PRODUCTION) DOES YOUR HOUSEHOLD SELL? 1-CEREAL GRAIN, 2-VEGETABLES, 3-FRUITS, 4-MILK, 5-CURD, 7-GHIU, 8-LIVESTOCK, 9-CHICKENS, 10-EGGS, 11-FUELWOOD, 12-FODDER, 13-TIMBER, 14-MAL, 15-CLOTH, 16-DHOKOS & BAMBOO GOODS, 17-MEDICAL PLANTS, 18-PHE PHE SEEDS/OIL, 19-SPICES, 20-ALCOHOL, 21-SEEDS.

IF LIVESTOCK OR OTHER GENERAL ITEM, WRITE IN NAME. WRITE IN OTHER THINGS NOT IN THIS LIST & GIVE DETAIL WHERE NEEDED.

ITEMS SOLD CODE #	SOLD LAST YEAR UNITS	QUANTITY	COMMENTS	CHANGE SINCE LUMLE I OR D

12. LAND OWNERSHIP COMPOSITION: HOW MUCH OF THE DIFFERENT TYPES OF LAND DOES YOU HOUSEHOLD OWN? (LET FARMER USE THEIR OWN UNITS OF MEASURE)

KHET ______________________________ BAARI ______________________________
KHAR BAARI ______________________ KOLAKO JUGGA ______________________
(BANJHO) (KHAKARE)
TOTAL ______________________________

12.1. HAS THIS LAND INCREASED, DECREASED, OR REMAINED THE SAME IN QUANTITY SINCE LUMLE? (LAST 10-12 YEARS)

INCREASED ________, DECREASED _________, SAME ________

13. LIVESTOCK COMPOSITION: HOW MANY OF THESE DIFFERENT ANIMALS DOES YOUR HOUSEHOLD OWN?

TYPE	ONE YEAR OLD NOW	OLDER THAN ONE YEAR NOW	10 YEARS AGO	USUALLY STALL FED	NOT USUALLY STALL FED
BHAISI					
RANGA					
GAAI					
GORU					
BAAKHOR					
BHERAA					

13. (continued) IF NOT USUALLY STALL FED ASK WHERE USUALLY FED, FOREST OR FIELD, AND WRITE IN PLACE, ALSO WRITE IN NIGHT OR DAY.

14. DOES YOUR HOUSEHOLD MAKE GHIU? NO [ ] YES [ ]

14.1. IF YES,ABOUT HOW MUCH GHIU DID YOU MAKE LAST YEAR? ____________
(USE FARMER'S UNITS OF MEASURE)

14.2. IF YES, DOES YOUR HOUSEHOLD SELL GHIU? NO [ ] YES [ ]

14.3. WHICH TYPES OF TREE FODDER MAKES THE MOST/BEST GHIU? (BE SURE TO WRITE ANY COMMENTS MADE BY THE FARMER ABOUT THESE TREES, USE EITHER THE SPACE HERE OR IN YOUR NOTE BOOK.)

TREE NAME	FROM YOUR OWN LAND COMMON TREE	SCARCE	FROM THE FOREST COMMON TREE	SCARCE
1.				
2.				
3.				
4.				
5.				

14.3.1. AFTER FARMER HAS GIVEN YOU HIS/HER LIST, REREAD THE LIST AND ASK THE FARMER TO RATE THESE TREES, FIRST, SECOND, ETC.

14.3.2. IF A TREE IS REPORTED TO BE REAR IN FOREST OR FIELD, ASK FARMER TO EXPLAIN WHY.

15. HAS ANYONE IN YOUR HOUSEHOLD PLANTED TREES ON YOUR LAND IN LAST 15 YEARS? YES [ ], NO [ ]

15.1. IF YES, WHAT ARE YOUR REASONS FOR PLANTING TREES ON YOUR LAND?

15.2. IF NO, WHAT ARE YOUR REASONS FOR NOT PLANTING TREES ON YOUR LAND?

15.3. WHO IN YOUR HOUSEHOLD IS INVOLVED IN THE PLANTING OF TREES ON YOUR OWN LAND?

	MOST OF THE PLANTING	HALF OF THE TREE PLANTING	ONLY A LITTLE TREE PLANTING	NONE
MEN				
WOMEN				
SONS				
DAUGHTER				
[ ] EVERYONE IN HOUSEHOLD SHARES EQUALLY IN TREE PLANTING WORK.				

15.4 HOW MANY OF THE DIFFERENT TYPES OF TREES HAVE MEMBERS OF YOUR HOUSEHOLD PLANTED ON YOUR LAND?
[USE THE FOLLOWING SEEDLING SOURCE CODES: 1-VILLAGE NURSERY; 2-GROWN PERSONALLY; 3-TRANSPLANTED FROM OWN LAND; 4-TRANSPLANTED FROM THE FOREST.

NUMBER OF TREES PLANTED & TO BE PLANTED

TYPE	LAST YEAR			THIS YEAR	
	PLANTED	SURVIVED	SOURCE	NO. TO PLANT	SOURCE
FODDER					
FUELWOOD					
TIMBER					
TOOL WOOD					
FRUIT					
BAMBOO					
GENERAL					

5.5. IF IT IS REPORTED THAT THE NUMBER OF TREES PLANTED LAST YEAR IS DIFFERENT THAN WHAT HE/SHE PLANS TO PLANT THIS YEAR, ASK:

"THE NUMBER OF TREES THAT YOUR HOUSEHOLD PLANS TO PLANT THIS YEAR IS GREATER/LESS THAN WHAT YOUR HOUSEHOLD PLANTED LAST YEAR? WHAT ARE YOUR REASONS FOR THIS DIFFERENCE?"

____

____

16. IF TREES WERE PLANTED ON YOUR LAND LAST YEAR, ABOUT HOW MANY OF THE FOLLOWING TYPES OF TREE SEEDLINGS (FROM ANY SOURCE) WERE PLANTED IN THE FOLLOWING PLACES?

NUMBER OF SEEDLINGS PLANTED

	BAARI K.	KHET K.	BANJHO	KARESA B.	KOLA	BATO
FODDER						
FUELWOOD						
TIMBER						
FRUIT						
BAMBOO						
GENERAL						

K. - KANGLA B. - BAARI

17. IF TREE SEEDLINGS WERE PLANTED, WHICH OF THE FOLLOWING TREATMENTS ON THE DIFFERENT TYPES OF SEEDLING WERE USED?

SEEDLING	PROTECTION	MUL	WATER	WEEDING	REMARKS
FODDER					
FUELWOOD					
TIMBER					
FRUIT					
BAMBOO					
GENERAL					

17.1. IF TREATMENTS WERE USED, ASK THE RESPONDENT O DESCRIBE THEIR METHODS. [TRY AND GET AS MUCH INFORMATION ON THIS AS POSSIBLE. IF IT IS CONVENIENT, ASK THE FARMER TO SHOW YOU HIS/HER SYSTEM OF PROTECTION. TO MAKE IT EASIER, DRAW A PICTURE IF YOU WANT.

TYPES OF PROTECTION USED: ______________________________

TYPES OF MAL USED & HOW OFTEN: ______________________________

HOW OFTEN WATERED: ______________________________

HOW OFTEN WEEDED: ______________________________

18. HOW MUCH FODDER COLLECTING IS DONE BY DIFFERENT FAMILY MEMBERS?

	FROM OWN TREES			FROM THE FOREST		
	MOST	HALF	LITTLE	MOST	HALF	LITTLE
ADULT MALES						
ADULT FEMALES						
MALE CHILDREN						
FEMALE CHILDREN						

18.1. WHO IN YOUR HOUSEHOLD DECIDES TO GO TO THE FOREST OR TO YOUR OWN TREES TO COLLECT TREE FODDER? (HHH - head of household)

MALE HHH [__], FEMALE HHH [__], OLD M/F [__], SONS [__],

DAUGHTERS [__], WORKERS [__]. (HHH - Head of Household)

18.2. WHICH FORESTS DO YOU GO TO MOST OFTEN FOR COLLECTING TREE FODDER?
FOREST NAMES: ______________________________

18.3. HOW MUCH TIME DOES IT TAKE TO REACH THESE FOREST FROM YOUR HOUSE? (WRITE THE UNITS OF TIME THE FARMER USES.)

______________________________.

18.4. FOR YOUR HOUSEHOLD TREE FODDER NEEDS, HOW MUCH DO YOU COLLECT FROM PUBLIC FORESTS? AND HOW MUCH FROM TREES ON YOUR OWN LAND? (Write an "X" in the appropriate spaces)

FROM PUBLIC FORESTS					FROM PRIVATE TREES				
ALL	75%	50%	25%	0%	ALL	75%	50%	25%	0%

[NOTE: the values for ALL and 0% should be seen as "nearly all," and "nearly none", respectively, not as absolutes. The percentage values were worded as three-quarters; one-half; and one-quarter respectively, these are commonly used measurement estimates in rural communities in Nepal.]

19. THERE ARE MANY TYPES OF TREES THAT GROW IN THIS AREA, SOME ARE FOUND GROWING IN THE FOREST, SOME ARE FOUND GROWING IN FARM AREAS. WE WOULD LIKE TO LEARN ABOUT THE TREES THAT YOU BELIEVE ARE THE BEST TREES FOR FUELWOOD, TIMBER, FODDER, AND FOR MAKING TOOLS. IF YOUR DON'T KNOW ANY TREES THAT ARE GOOD FOR THESE REASONS JUST TELL ME YOU DON'T KNOW.

19.1. BEST FOR FUELWOOD	REASON	WHERE GROWN FARM	FOREST
1.			
2.			
3.			
4.			
5.			

AFTER THE FARMER HAS LISTED HIS/HER TREES, READ HIS/HER LIST AND ASK THE FARMER TO RATE THEM, #1, #2, ETC.

IF A TREE IS FOUND ONLY IN THE FOREST OR THE FIELD, ASK THE FARMER TO EXPLAIN WHY.

____

19.2. BEST FOR TIMBER	REASON	WHERE GROWN FARM	FOREST
1.			
2.			
3.			
4.			
5.			

- AFTER THE FARMER HAS LISTED HIS/HER TREES, READ HIS/HER LIST AND ASK THE FARMER TO RATE THEM, #1, #2, ETC.
- IF A TREE IS FOUND ONLY IN THE FOREST OR THE FIELD, ASK THE FARMER TO EXPLAIN WHY. ______________________________

19.3. BEST FOR FODDER

	REASONS	WHERE GROWN FARM	FOREST
1.			
2.			
3.			
4.			
5.			

AFTER THE FARMER HAS LISTED HIS/HER TREES, READ HIS/HER LIST AND ASK THE FARMER TO RATE THEM, #1, #2, ETC.

IF A TREE IS FOUND ONLY IN THE FOREST OR THE FIELD, ASK THE FARMER TO EXPLAIN WHY.

___

___

19.4. BEST FOR TOOLS & HOUSEHOLD IMPLEMENTS

	REASON	WHERE GROWN FARM	FOREST
1.			
2.			
3.			
4.			
5.			

AFTER THE FARMER HAS LISTED HIS/HER TREES, READ HIS/HER LIST AND ASK THE FARMER TO RATE THEM, #1, #2, ETC.

IF A TREE IS FOUND ONLY IN THE FOREST OR THE FIELD, ASK THE FARMER TO EXPLAIN WHY.

___

___

19.5.ANY OTHER IMPORTANT TREES:

	REASON	WHERE GROWN FARM	FOREST
1.			
2.			
3.			
4.			
5.			

AFTER THE FARMER HAS LISTED HIS/HER TREES, READ HIS/HER LIST AND ASK THE FARMER TO RATE THEM, #1, #2, ETC.

IF A TREE IS FOUND ONLY IN THE FOREST OR THE FIELD, ASK THE FARMER TO EXPLAIN WHY.

____

____

20. DOES YOUR HOUSEHOLD MAINTAIN A GOTH IN THE FOREST? NO [ ] YES [ ]

20.1.IF YES, HOW MANY OF THE FOLLOWING ANIMALS AND FOR WHICH MONTHS DO YOU KEEP ANIMALS AT YOUR GOTH?

TYPE	NUMBER	MONTHS KEPT AT GOTH
BHAISI		
RANGO		
GAAI		
GORU		

21. WHICH FEEDS DO YOU USE TO FEED YOUR LIVESTOCK FOR THE DIFFERENT MONTH OF THIS LAST YEAR. (READ THE LIST OF FEEDS FOR EACH MONTH AND WRITE IN THE QUANTITY CODE.)

QUANTITY CODES: 1=ALL, 2=TIN CHOUTHAI, 3=ADHA, 4=EK CHOUTHAI, 5=ALIKATI

MONTH	BUN KO GHANS	APHNU RUKH	NAL PARAL	BUI GHANS	KUDO BUSA	GRAZING BARI/KHET	BUN MA GRAZING	COM-MENT
1. BAISAKH								
2. JETH								
3. ASAD								
4. SAUN								
5. BHADAU								
6. ASOJ								
7. KATTIK								
8. MANGSIR								
9. PUS								
10. MAGH								
11. PHAGUN								
12. CHAIT								

22. NAME THOSE MONTHS IN WHICH YOU DO NOT HAVE A NORMAL (GOOD) SUPPLY OF FODDER.
1)__________________, 2)__________________, 3)__________________.

IF MORE THAN ONE MONTH WAS NAME ASK FARMER TO RATE MONTHS, #1 BEING THE WORST MONTH OF THE ONES NAMED.

22.1 DO YOU THINK YOU COULD GROW ENOUGH FODDER TREES ON YOUR OWN LAND SO THAT YOU WOULD NOT NEED TO GO TO THE FOREST FOR TREE FODDER?

YES [__] NO [__].

22.1.1. IF YES, ABOUT HOW MANY TOTAL TREES WOULD YOU NEED TO GROW?

NUMBER OF TREES ______________.

22.1.2. IF NO, WHY CAN'T YOU GROW ENOUGH TREES? ____________

23. WE HAVE TALKED TOGETHER FOR A LONG TIME, AND I AM VERY PLEASED WITH YOUR HELP. THANK YOU VERY MUCH FOR YOUR HELP AND I DIDN'T MEAN TO GIVE YOU ANY PROBLEMS. BEFORE I LEAVE, IS THERE ANYTHING THAT YOU WOULD LIKE TO TELL ME ABOUT TREE PLANTING, TREE FODDER, YOUR FOREST, OR DIFFICULTIES YOU HAVE ON YOUR FARM, ETC? PLEASE SPEAK SLOWLY SO THAT I CAN REMEMBER WHAT YOU TELL ME.

____

____

INTERVIEWER'S COMMENTS

NOTE THE FOLLOWING BY OBSERVING THE RESPONDENT'S HOUSEHOLD:

1. RELATIVE SIZE OF THE MAIN HOUSE:

   [1][ ]SMALL [2][ ]MEDIUM [3][ ]LARGE

2. ROOF OF DWELLING:

   [1][ ]KATCHA [2][ ]SLATE [3][ ]TIN

3. ECONOMIC STATUS OF THE FAMILY:

   [1][ ]LOW [2][ ]MEDIUM [3][ ]HIGH

4. WRITE DOWN ANY COMMENTS YOU MAY HAVE ABOUT THE INTERVIEW, THE FARMER, OR THE HOUSEHOLD. WAS THE INTERVIEW CARRIED OUT IN PRIVATE, OR WERE OTHER PEOPLE PRESENT? DESCRIBE THE INTERVIEW SITUATION FOR ME.

   ____

   ____

   ____

   ____

APPENDIX B

Part 2

HOUSEHOLD LEVEL SURVEY

(Nepalese language edition)

This is a photo-reduced copy of the actual survey questionnaire.

APPENDIX B

Part 2

HOUSEHOLD LEVEL SURVEY

(Nepalese language edition)

घरेलु ऊर्जा तथा दाउरा बारे सर्वेक्षण

घर गृहस्थी बारे लिइने नमूना सर्वेक्षण :

सर्वेक्षक :- ____________ मिती:- ____________

१. नाम :- ____________ २. वार्ड नं. :- ________ ३. गाउँ टोलको नाम :- ____________
४. उचाई :- ____________ ५. घरको मोहडा :- ______ ६. धर्म :- ____________ ७. लिंग :-(पुरुष) (स्त्री)
८. उमेर :- ____________

९. पारिवारिक विवरण :- Total number of household numbers:

विवरण	६० वर्ष माथिका	१५ देखी ६० वर्ष सम्मका					५-१५ वर्ष सम्मका		५ वर्ष मुनीका	कैफियत
		घरमा काम गर्ने	बाहीर काम गर्ने	शैक्षिक सेवामा			स्कूल जाने	स्कूल नजाने		
				[illegible]	[illegible]	[illegible]				
पुरुष										
स्त्री										
जम्मा										

यदी शैक्षिक सेवा बाट अवकाश पाएर पेन्सन खाएर बसेको भए त्यस्ता व्यक्तीको संख्या अगाडी "प" लगाएर देखाउनु पर्छ:- १"प" वा २"प"

(२)

९. १. तपाईं कति दाजु,भाई तथा दिदी बहिनी हुनु हुन्छ ? ________________

९. २. के तपाईंको परिवार संख्या तपाईंको बाबुको परिवार संख्या भन्दा सानो । ठूलो छ ? छ   छैन   एउटै छ

१०. तपाईंको परिवारका कुनै सदस्यले गत वर्ष ज्यालामा काम गरेका थिए ?

थिए ☐   थिएनन् ☐

यदि थिए भने तलको तालिका भर्नु होस् । (कामको किसिम तथा ठाउँ प्रत्येक व्यक्तिको लागि छुट्टै, आवश्यक परे कोड प्रयोग गर्नु)

कामको किसिमको कोड :-   क - कृषि मजदुरी   ख - व्यापार   ग - उद्योग   घ - जागिर

१ - स्थानीय पंचायत   २ - बाहिर का पंचायत   ३ - अन्य जिल्ला   ४ - नेपाल बाहिर

विवरण	कामको किसिम तथा काम गर्ने ठाउँ	
	पुरुष संख्या	स्त्री संख्या
वर्ष भरी		
छ महिना भन्दा बढी		
१ महिना भन्दा कम		

(३)

११. तपाईंको घरायसी उत्पादन तथा वाहृय श्रोत बाट अन्य परिवार बीच बीजक सहित गरेको तपाईंको परिवारले के के वेच बिखन गर्नु ?

तालिक :- १. अन्न २. तरकारी ३. फलफुल ४ दूध ५. दही ६. घिउ ७. फुलक ८. फेतोलक

९. मसला १०. दाउरा ११. घाँसपात १२. काठ १३. मह १४. पशुपंछी लुगा १५. डोको, डाली, नाम्लो

१६. डोकुटो १७. पकेको घिउ १८. तेल 19 बीउ 20 मसिस

(यदो पशु तथा पैतो पनि भने नाम समेत लेख्नु होस् । यदि अन्न जस्तो धेरै बीजक समावेश भएको वस्तु लेखिएमा त्यस अन्तर्गत पर्ने खास किसिम समेत लेख्ने । जस्तै :- १. धान, १. मकै, १. गहुँ २. घुम्सा इत्यादो

उपरोक्त लिष्टमा उल्लेख भएका वस्तुहरू भएमा उल्लेख गर्नु होस् ।

<u>तालिका</u>

बीजक वस्तु कोड नं.	गत वर्ष बेचिएका			हाल बिक्रि पछिको परिवर्तन		
	स्थाई	परिमाण	टिप्पणी	स्थाई	परिमाण	टिप्पणी

(४)

१२. जग्गा सम्बन्धी विवरण :-

विभिन्न किसिमको जग्गा मध्ये तपाईंको परिवार सँग कुन कुन जग्गा कति छ ? (कृषक स्वयंले आफ्नै स्थानीय माप भन्नुहोस् ।)

(क) खेत ______ (ख) बारी ______ (ग) खरबारी (बाँझो) ______

(घ) खोला, खोल्सी (पखेरा गल्ली जग्गा) ______ (ङ) जम्मा ______

१२.१ कहिले विकास (तुम्के) शुरु भएको वर्ष पछि तपाईंको जग्गा घटेको छ कि बढेको छ ?

घटेको   बढेको   फरक छैन

१२.१.१. यदि फरक छैन भने कारण बताउनु होस् ।

१३. पशु सम्बन्धी विवरण तपाईंको परिवार सँग विभिन्न किसिम का पशु कति कति छन् ।

किसिम	एक वर्ष भन्दा मुनिका	एक वर्ष भन्दा माथीका		धेरै जसो घरमा बाँधेर खुवाउने		घरमा बाँधेर खुवाउने बाहेक कहाँ	
		आफ्नो	१० वर्ष पाल्ने	दिन day	रात Night	खर्कमा/चरनमा चराउने	जंगलमा चराउने
भैंसी							
राँगा							
गाई							
गोरु							
बाख्रा							
भेडा							
घोडा							
बंगुर							
चौंरी							

(५)

१७. के तपाईंको घरमा घिउ बनाउनुहुन्छ ? बनाउँछ [ ] बनाउँदैन [ ]

एक वर्षमा कति घिउ बनाउनुहुन्छ ? ____________ (किलाग्राम वा मानामा भन्ने) ____________

१७.१ के तपाईंको घरबाट घिउ बेच्नुहुन्छ ? बेच्छ [ ] बेच्दैन [ ]

१७.२ कुन डालेघाँस खुवाउँदा भने घिउ धेरै हुन्छ ? (द्रष्टव्य :- पुछ्दा कुनै टिप्पणी भए त्यो लेख्ने)

१७.२.१. यदि गोठ तथा बथानमा दुध कम मिल्ने पाइने भए, कारण साध्ने ?

डाले घाँसका रुखको नाम	पिरो बनाउने				बढ मौल्ने			
	पाउने पाइने	टिप्पणी	मिल्ने पाइने	टिप्पणी	पाउने पाइने	टिप्पणी	मिल्ने पाइने	टिप्पणी
१.								
२.								
३.								
४.								
५.								

(९)

२५. के तपाईं वा परिवारका कुनै सदस्य ले गएको १५ वर्षमा आफ्नो जग्गा मा रुख रोपेका छन् । रोपे ☐ रोपेनन् ☐

यदि रोपेका छन् भने आफ्नो जग्गा मा रुख रोप्नाको कारण के के हुन् ? ________________

____

____

~~यदि किसान ले कारण भन्न नसकेमा, आफ्नो निजी जग्गामा रुख रोप्नु वा नरोप्नुका विचार सोध्नु होस् ।~~ ________________

____

२५.२ यदि रोपेका छैनन् भने, नरोपेको कारण के के हुन् ? ________________

____

२५.३ तपाईं परिवारमा आफ्नो जग्गामा रुख रोप्ने काम कसले गर्छ ? ((तल्का तालिकामा ठीक् हाल्नु)

	सबै जसो जिम्मा रोप्ने	आधा जसो जिम्मा रोप्ने	अलि अलि रुख रोप्ने	कुनै रुख नरोप्ने
लोग्ने मानिस				
स्वास्नी मानिस				
केटा				
केटी				

( ) घरका सबै सदस्यले रुख रोप्ने कामा बराबर गर्दछन् ।

(७)

१५.४ विभिन्न जातका कुन- कुन रुखहरु तपाईंको परिवारका सदस्यहरुले तपाईंको जग्गामा रोपेका छन् ?

रुखको किसिम	गत वर्ष (०४४ साल)			यो वर्ष (०४५ साल)	
	रुखको संख्या र नाम	जिवित संख्या	बिरुवा ल्याएको ठाउँ	रुखको संख्या र नाम	बिरुवा ल्याउने ठाउँ
घाँस					
डाले घाँस					
दाउरा					
काठ					
हतियार बनाउने					
फलफुल					
भाडा तथा आंगार					
अन्य					

बिरुवा प्राप्ति (पाउने ठाउँ) संकेत :- १. गाउँको नर्सरी २. आफ्नै जग्गामा उम्रेको ३. आफ्नो जग्गा मा त्यसै उम्रेको बिरुवा सारेको ४. जंगलमा त्यसै उम्रेको बिरुवा सारेको

(८)

१५.५ (द्रष्टव्य :- यदि तपाईले गत वर्ष रोपिएका बिरुवाको संख्या भन्दा यो वर्ष रोपिएका वा रोपिने बिरुवा कम अथवा बढी देख्नु भयो भने, तलको प्रश्न सोध्नु होस्)

तपाईको परिवारले यस वर्ष रोपेको वा रोप्ने योजना गरेको बिरुवा संख्या गत वर्षको रोपेको भन्दा कम । बढी छ । यसको कारण मलाई दिन सक्नु हुन्छ ? ______________________________

____

१६. यदि गएको वर्ष तपाईको निजी जग्गामा कुनै बिरुवा रोपिएका भए तल उल्लेख गरिएका ठाउँहरुमा के कति कुन बिरुवा रोपिए होलान् त ?

किसिम	रोपिएका बिरुवाको संख्या					
	बारी कान्ला	खेत, डील	बाँझो	करेसा बारी	घाँसो	बाटो
दाउरा						
काठ						
फलफूल						
घाँस						
डाले घाँस						
पाढ़ा तथा अजिरा						
अन्य						

(६)

१७. यदि बिरुवा हरू रोपिएका भए तल लेखिएका मध्ये कुन- कुन बिरुवा संरक्षण तालिम तपाईंले अपनाउनु भयो ?

बिरुवा किसिम	तार बार घेरा	अग्निरेखा हाल्ने	मल	पानी हाल्ने	झार उखेल्ने	कैफियत
डाले घाँसका रुख						
दाउराको रुख						
काठका रुख						
फलफूलका रुख						
बाँसका रुख						
भाडा तथा बगार						
अन्य						

१७.१ यदि बिरुवा रोपण वा संरक्षण का तालिम अपनाइएका भए, किसान लाई ती बारे अति विस्तृत जानकारी दिन अनुरोध गर्नु होला ।
(किसान ले अति कुरा भन्न चाहनु हुन्छ भने त्यो लेख्नुहोस्, आवश्यक परे किसानलाई आफ्नो प्रविधि तपाईंलाई देखाउन अनुरोध गर्नुहोस् , चित्र बनाउनु होला ।)

रोपण को किसिमहरु:-

(क) तार बार, घेरा बेरा के कस्तो

(ख) मलको किसिम मात्रा र कति पटक

(ग) पानी कति पटक लगाउनु भयो

(घ) झार कति पटक गोड्यो

(१०)

१७.२ परिवारका विभिन्न सदस्यहरु ले कै कति डाले घाँस काटेर ल्याउनु ?

सदस्यहरु	निजी जग्गाको हरु घाँस			वनमा पाइने हरु घाँस		
	सबै जसो	आधा	थोरै	सबै जसो	आधा	थोरै
उमेर पुगेका लोग्ने मानिस						
उमेर पुगेका स्वास्नी ,,						
बालक (छोराहरु)						
बालिकाहरु (छोरीहरु)						

१७.३. तपाईंको परिवारमा डाले घाँस काट्न वनमा जाने हो कि घर बारी या खेतको ल्याउने भनेर कसले निर्णय गर्छ ?

१. वयस्क (लोग्ने मानिस) ☐ २. वयस्क (स्वास्नी मानिस) ☐

३. बूढा, बूढी मान्छे ☐ ४. बुहारी ☐ ५. छोरा ☐ ६. छोरी ☐

७. काम गर्ने मानिस ☐

१७.४ तपाईंको गाउँको वन क्षेत्रमा तुन बाटो वनमा घाँस काट्न तपाईं वा तपाईंका परिवार का सदस्यहरु सब भन्दा बढी जाने गर्नुहुन्छ । वनको नाम भन्नु होस् ______________________________

____

१७.४.१. माथि उल्लेखित वनमा पुग्न तपाईंको घर बाट कति समय लाग्छ ? (द्रष्टव्य :- समय भन्न गाह्रो मानेमा के मा जाँदा पुग्ने त्यसैको आधारमा समय नोट गर्नु) ______________________________

(११)

१७.५ तपाईंको घरमा ल्याउने दाउरा वार्षिक मध्ये कति वन जंगलबाट ल्याउनुहुन्छ ? अनि कति निजी जग्गा बाट ल्याउनुहुन्छ ?

(क) वन जंगल बाट

सबै	तीन चौथाई	आधा	एक चौथाई	थोरै,थोरै

(ख) निजी जग्गा बाट

सबै	तीन चौथाई	आधा	एक चौथाई	थोरै थोरै

१८. हामीले यो गाउँ बस्तिको धेरै [illegible] एक देख्यौं कति वन जंगलमा छन् तथा कति [illegible] छन्। हामीलाई तपाईंको विचारमा यति काठ, दाउरा, घाँस, औषधी एक प्रत्येक को लागि सब भन्दा उत्तम व्यक्ति बताई दिनु हुन्छ कि ? यदि यस्तो कुरा थाहा भए थाहा छैन भन्नु हुन्छ ।

(उक्त तलको तालिकामा लेख्नु होला)

१८.१. दाउराको लागि उत्तम व्यक्ति:-

सि. नं.	नाम	कारण तथा यस बारे विशेषज्ञ टिप्पणी	पाउने ठाउँ	
			खेतबारी	जंगल
१.				
२.				
३.				
४.				
५.				

द्रष्टव्य:- क) यदि दुवै ठाउँमा पाउने भए दुवै ठाउँमा चिन्ह लगाउनु होला)

ख) [illegible] नाम, [illegible] सबभन्दा राम्रो [illegible] अनुसार [illegible], [illegible]

१८.१.१ यदि तुमी हब सब गौंल वा बजारोमा मात्र पाउन्छ भनि भविष्यमा किसान की त्यस्को कारण बताउनु होऊ ।

१८.२ यसको लागि उक्त हरू

सि.नं.	नाम	कारण	पाउने ठाउँ	
			बजारो	गौंल
१.				
२.				
३.				
४.				
५.				

१८.२.१ द्रष्टव्य :- यदि तुमी हब सब गौंल वा बजारोमा मात्र पाउन्छ भनी भविष्यमा किसान की त्यस्को कारण बताउनु होऊ ।

(२३)

२८.३ ठाले वाक्सी ठागो उत्म क्रमक:-

सि. नं.	नाम	ठेगाना	पाइने ठाउँ	
			खेतवारी	जंगल
१.				
२.				
३.				
४.				
५.				

२८.३.१. द्रष्टव्य:- यदि कुनै हरु जन जंगल वा खेतवारी मा मात्र पाइन्छ भनी मानिसमा विश्वास छ भने त्यसको कारण लेख्नु होस् ।

१८.४ भाँडा कुँडा तथा औजार हरू बनाउन उपयोग हुने रुखहरू:-

क्र. सं.	रुखको नाम	हातहतियार वा भाँडा कुँडा को नाम	कारण । टिप्पणी	पाइने ठाउँ	
				खेतबारी	जंगल
१.					
२.					
३.					
४.					
५.					

१८.४.१. द्रष्टव्य:- यदि रुख हरू वन जंगल वा खेतबारीमा मात्र पाइन्छ भने भविष्यमा त्यसका कारण खोज्नु होला ।

(२५)

क.५ अन्य प्रजातिका रूखहरु :-

सि.नं.	रूखको नाम	प्रयोग वा काम	कारण / टिप्पणी	पाइने ठाउँ	
				किनारी	भित्र
१.					
२.					
३.					
४.					
५.					

क.५.१. द्रष्टव्य :- यदि रूखहरु वन भित्र वा किनारामा मात्र पाइन्छन् भनि भनिएमा त्यसको कारण लेख्नु होस् ।

१८. के तपाईं भविष्यमा आफुलाई चाहिने भन्दा बढी माछा आफ्नो खेतबारी बाँधामा उत्पादन गर्न सक्नु हुन्छ भन्ने गर्दा तपाईंको परिवारलाई यस कोष्ठमा राख्नु भयोहो ।

सकिन्छ ☐ सकिंदैन ☐

१८.१ यदि सकिन्छ भने जम्मा कति पाँजा हजार तपाईंले आफ्नो खेतबारीमा लगाउनु हुन्छ ?

संख्या ____________________

१८.२ यदि सकिंदैन भने कारण दिनु होस् । ____________________

(२६)

२९. के तपाईंको परिवारले भैंसी गाई गोठ राख्ने गर्छ ? गर्छ [ ] गर्दैन [ ]

२९.१ यदि गर्छ भने तलका मध्ये कुन जातको पशु कुन कुन महिनामा गोठ राख्ने गर्नुहुन्छ ?

किसिम	संख्या	गोठ मा राख्ने महिना	कारण
भैंसी			
गाई			
गोरु			
बाख्रा			

३०. अब हामी तपाईंले गत वर्ष आफ्ना गाईवस्तुलाई खाने पानी कुन कुन ठाउँ । दाना कुँडो भन्दा त्यस बारे कुरा गरौं ?
(द्रष्टव्य :- तलका स्केलमा ठीक्क होइन र ठाउँ प्रयोग गर्ने)
(परिमाण स्केल ठाउँ :- १. धेरै ज्यादा २. तीन चौथाई ३. आधा ४. एक चौथाई ५. अति थोरै)

(अर्को पन्ना मा हेर्नु होस्)

(ञ)

सि.नं.	महिना	बन्की यतिपात	अतवारीका छ	अतवारोका घाटको भर्ई वालि	मछ,पाल	बाल अतवारोगा	बाल अन मा	लुड्डी, लुटी
१.	बैशाख							
२.	जेष्ठ							
३.	असार							
४.	श्रावण							
५.	भाद्रै							
६.	असोज							
७.	कार्तिक							
८.	मंसिर							
९.	पुष							
१०.	माघ							
११.	फागुन							
१२.	चैत्र							

२१. त्यस्ता कुनै महिना छन् जो नाम भन्नु होस् जसमा गाई वस्तु लाई आवश्यक घाँस पात पटक्कै पाउन सकिंदैन ।
(द्रष्टव्य :- एक भन्दा बढी महिना भए सब भन्दा बढी कमी भएको महिना लाई पहिले लेख्नु होस् ।)

महिनाको नाम:-

१. ____________________

२. ____________________

३. ____________________

२२. हामीले धेरै बेर तपाईं सँग कुराकानी गर्यौं र तपाईंले भन्नु भएका कुरा हरु हाम्रो धेरै काम लाग्दछन् । यदि तपाईंको मनमा लागेका कुराहरू बाहेक यदि तथा तपाईंको मन मा अरु केहि अरु कुरा भए भन्नु होस् । यदि भए तपाईंलाई सहयोगको लागि धेरै धेरै धन्यवाद ।

लेखिएका आफ्ना कुराहरू:- ____________________

(प्रश्नकर्ताको लागि मात्र) निरीक्षण गरी घरको प्राप्त जानकारीको आधारमा तलका कुरा लेख्नु होस् ।

१. गाउँका अरू घरहरूको दाँजोमा निजको घरको आकार

१.१ सानो □ १.२ मध्यम □ १.३ ठूलो □ छ ।

२. घरको छानाको किसिम

२.१ कच्ची □ २.२ स्लेट □ २.३ टीन, कंक्रीट □ छ ।

३. परिवारको आर्थिक स्थिति

३.१ कमजोर □ ३.२ मध्यम □ ३.३ धनी □ छ ।

४. अब यो गाउँको शिक्षाका बारे तपाईंको आफ्नो स्पष्ट टिप्पणी । विचार । सुझाव लेख्नुहोस् ।

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APPENDIX C

Part 1

TREE FODDER INVENTORY SHEET

(English Translation)

APPENDIX C

Part 1

TREE FODDER INVENTORY SHEET

Household # ____ Name ________________ Date ______ Inventory # ___

		Age Estimate		Place of Planting		
USE	TREE NAME	< 10 YRS	> 10 YRS	<u>KHAR BAARI</u>	<u>BARRI</u>	<u>KHET</u>
A B	<u>Dudhilo</u>	\\\\\ \\\\	\\\	\\\\		
code		This total = the rest of the row.				

This is a continuation of the above form.
The actual inventory the sheets were
printed in landscap form.

STREAM	MARGINAL	HOUSEHOLD	TRAIL
\\\\		\\\\	

<u>TRANSLATION KEY</u>:

BARRI - Non-irrigated agricultural land.
KHET - Irrigated agricultural land.
KHAR BARRI - Land where thatch grass is grown (marginal land).

<u>INVENTORY FORM KEY</u>:

Codes: Use or utility codes, A,B,C, etc. were written in order of importance based on comments made by farmers.

Age Estimates: These were made by the consultant farmers.

APPENDIX C

Part 2

Tree Use & Crop Codes

APPENDIX C

Part 2

Tree Use & Crop Codes

TREE USE CODES / RUKH UPYOG SANCHO

A -	ANIMAL FODDER /	GAI BASTU KO GHANS / गाई वस्तु को घास
B -	FUELWOOD /	DAURA / दाउरा
C -	TIMBER /	KAATH / काठ
D -	TOOL WOOD /	HATIYAR WA AUJAR KO KATH /(हतियार वा औजार को काठ)
E -	FRUIT /	PHAL PHUL / फलफुल
F -	BEDDING /	GAI BASTU KO SOTTAR / गाई वस्तु को सोतर
G -	POLE WOOD /	KHAMBA KO KATH / खम्बाको काठ
H -	LIVE FENCES /	BAAR LAUNE BIRUWA / बार लाउने बिरुवा
I -	MEDICINE /	AUSHADHI / औषधी
J -	RELIGIOUS TREE/	DHARMIK RUKH / धार्मिक रुख
K -	OTHER USE TREES/	ARU KAAM KO RUKH / अरु कामको रुख

CROP CODES / BAALI SAMBANDHI SANCHO

1.	RICE	DHAAN	धान
2.	MAIZE	MAKAI	मकै
3.	WHEAT	GAHU	गहुँ
4.	MILLET	KODO	कोदो
5.	OATS	UA	उवा
6.	BUCKWHEAT	PHAPAR	फापर
7.	BARLEY	JAU	जौं
8.	MUSTARD	TORI	तोरी
9.	POTATO	AALU	आलु
10.	LENTIL	MASURO	मसुरो
11.	LEGUME	GEDAGUDI	गेडागुडी
12.	VEGETABLES	TARKARI	तरकारी
13.	GREENS	HARI SAAGPAAT	हरियो सागपात
14.	FALLOW LAND	BANJHO JAGGA	बाँझो जग्गा
15.	GRASS LAND	KHARBAARI	खरबारी
16.	RANGE LAND	KHARKA	खर्क
17.	HORSE GRAM	GAHAT	गहत
18.	SESAME	TEEL	तिल
19.	GREEN GRAM	MAAS	मास
20.	YELLOW MUSTARD	SARSUE (N)	सर्स्यूँ
21.	GINGER	ADUA	अदुवा
22.	GRAM	CHANA	चना
23.	MUNG BEAN	MUNG	मुंग
24.	RICE BEAN	MASYANG	मस्याङ
25.	TURMERIC	BESAR	बेसार
26.	COW PEA	BODI	बोडी
27.	PEAS	KERAU	केराउ
28.	SOYABEAN	BHATMAAS	भटमास

APPENDIX C

Part 3

TREE FODDER INVENTORY SHEET

(Nepalese Language Edition)

This is a photo-reduced copy of the actual inventory form.

APPENDIX C

Part 3

TREE FODDER INVENTORY SHEET

(Nepalese Language Edition)

१. तल उल्लेखित रुख का किसिम मध्ये आफ्नो निजी जग्गा मा लगाउन तपाईं कुन चाहिं रुख भन्दा बढी मन पराउनु हुन्छ ?

(द्रष्टव्य :- एउटै रुख एक भन्दा बढी हुन सक्छ)

(मन पराएका ५ वटा रुख लाई क्रमानुसार लेख्नु होस्)

१.१ डाले घाँस का रुख

१. ____________
२. ____________
३. ____________
४. ____________
५. ____________

१.२ दाउरा का रुख

१. ____________
२. ____________
३. ____________
४. ____________
५. ____________

१.३ काठका रुख

१. ____________
२. ____________
३. ____________
४. ____________
५. ____________

१.४ अन्य रुख

१. ____________ २. ____________ ३. ____________
४. ____________ ५. ____________

२) तपाईं को परिवार को निम्न किसिम का जग्गा कति छन्? सो सम्म रोपनी मा भरि दिनु होस् ।

२.१ खेत ____________ २.२ बारी ____________ २.३ खर्बारी ____________
(घाँस पर्ने)

२.४ पाखो / भीरालो ____________ २.५ जम्मा जग्गा ____________
(पखेरा लेख्ने)

[illegible]

पृष्ठ नं. ________

[illegible] :- ______________________

[illegible] :- __________

[illegible] नं. :- __________

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
१. २. ३.												
१. २. ३.												
१. २. ३.												
१. २. ३.												
१. २. ३.												
१. २. ३.												
१. २. ३.												
१. २. ३.												

सर्वेक्षण को टिप्पणी

यसै पछि, तपाईं आफै ले एक छिन विचार गरेर तलका प्रश्न हरूको उत्तर दिनु होस् ।

१. यो परिवारको जग्गा मा भएका रूखहरू अध्ययन गर्दा तपाईंको विचार मा घर नाट प्रति हेक्टर टाढा गएको रूखको संख्या

(क) बढेछ ☐ (ख) घटेछ ☐ वा (ग) उस्तै रहेछ ☐

(मिल्दो मा चिनो लगाउनु होस्)

२. माथि प्राप्त गरिएको सूचना को आधार मा सम्पूर्ण रूख हरू लाई निम्नलिखित उमेर को हिसाब ले कसरी बाँडन सकिन्छ ।

(क) १० वर्ष भन्दा पुराना ______________________ प्र.श.

(ख) ५ देखि १० वर्ष पुराना ______________________ प्र.श.

(ग) ५ वर्ष भन्दा कम उमेर का ______________________ प्र.श.

३. यस घर परिवारको चाल चलन रीति रिवाज । रहन सहन बारे तपाईं लाई कुनै कुरा अत्यन्त महत्वपूर्ण वा अति चाखलाग्दो लागेको भए संक्षेप मा लेख्नु होस् ।

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APPENDIX D

TREE FODDER KNOWLEDGE DISCUSSION GUIDE

[English translation]

APPENDIX D

TREE FODDER KNOWLEDGE DISCUSSION GUIDE

1.SPECIES: (NEPALI)_______________ 2.(LATIN)______________________________.

3.SITE/LOCATION:______________________________________. SAMPLE No.________.

4.ELEVATION:________________ 5.ASPECT:__________________ 6.DATE:___/___/88.

5.CONSULTANT(S):_[M],[F]_____________________________________ 6.AGE:_____.

7.BIO-DATA:____.

8.PLANT IS A: TREE☐, SHRUB☐, VINE☐, GRASS☐, OTHER ____________.

9.FODDER QUALITY: E☐, G☐, F☐, P☐, NOT FODDER ☐.

9.1.COMMENTS:____

____.

10. ARE THERE MONTHS WHEN THIS FODDER CANNOT BE USED? [Y], [N]

10.1.EXPLAIN/COMMENTS: ____

____.

11.FODDER FOR:BUFFALO☐☐ COW☐☐ GOATS☐☐ SHEEP☐☐ ALL☐

12.FODDER FOR: OLDER ANIMALS ☐, YOUNGER ☐, BOTH ☐;

PREGNANT ANIMALS: [Y], [N], MILKING ANIMALS [Y], [N].

13.OTHER USES WITH RATING [E, G, F, P]:

FUEL☐ TIMBER☐ TOOLS☐ MEDICAL☐ FIBER ☐ FRUIT ☐

BED/FERT.☐

OTHER:____.

14.DOES FODDER CAUSE HEALTH PROBLEMS?: [Y], [N], DETAILS:________________

____.

15. CAN BOTH OLD AND YOUNG(NEW) LEAVES BE FED TO ANIMALS? [Y], [N]

EXPLAIN:____.

16.HOW ARE OTHER PARTS OF THE TREE USED?

SAP		LEAVES		FLOWERS		SEEDS		ROOTS		BARK		FRUIT	

IF HUMAN FOOD OR OTHER [MEDICINE/RELIGIOUS] EXPLAIN:____________________

17.HOW OFTEN SHOULD FODDER BE HARVESTED? WHY? ____________________

____________________.

18. HOW HEAVILY SHOULD THIS TREE BE LOPPED? ALL LEAVES [ ],

ONLY A FRACTION OF THE LEAVES [ ] ______%, ONLY NEW LEAVES [ ],
ONLY OLD LEAVES [ ]. EXPLAIN REASONS FOR THIS LOPPING INTENSITY:

____

____________________.

19. HOW OLD SHOULD TREE BE BEFORE IT IS FIRST LOPPED? ____________.

20. CAN LOPPING BE USED TO CONTROL THE SHAPE OF THE ADULT TREE? [Y], [N].

20.1. HOW IS THIS LOPPING DONE: ____________________

____________________.

21. CAN THIS TREE BE COPPICED (TUSAAUNU)? [Y], [N], [DK].

22. HOW OFTEN DO YOU HARVEST THIS FODDER? WHY? ____________________

____________________.

23. PRIMARY MONTHS FOR LOPPING AND COLLECTION OF FODDER:

BAISAKH	JETH	ASAD	SAUN	BHADAU	ASOJ	KATTIK	MANGSIR	PUS	MAGH	PHAGUN	CHAIT
1	2	3	4	5	6	7	8	9	10	11	12

24.WHICH MONTH(S) IS FODDER QUALITY BEST? (USE NOs.) ____________.

25.MONTHS FODDER IS MOST AVAILABLE:(USE NOs.)____________.

26.TREE GROWS: MAINLY IN FARM [ ], MAINLY IN FOREST [ ], BOTH [ ].

26.1. IF GROWN IN FARM AREA, GROWN IN KHET? [ ] &/OR BAARI? [ ]

27.BEST SITE/LOCATION FOR GROWTH: ______________________________
____.

28.HOW FAST DOES THIS TREE GROW? FAST ☐, MEDIUM ☐, SLOW ☐.

28.1.EXPLAIN: ____
____.

29.IS IT GROWN NEAR CROPS? [Y], [N], WHICH CROPS:__________________

29.1.IF NOT, WHY NOT? ______________________________________
____.

30.WHAT EFFECT DOES THIS TREE HAVE ON CROPS? ____________________
____.

31. HOW IS THIS TREE GENERALLY PROPAGATED (GROWN)?

SEED☐, CUTTING☐, TRANSPLANTING☐, NURSERY SEEDLING☐
OTHER [ ]

31.1.DESCRIPTION OF PROCEDURE: ______________________________
____.

32. DOES THIS TREE HARBOR PESTS: [Y], [N]. EXPLAIN:_______________
____.

33. DO EPIPHITES GROW ON THIS TREE? [Y] [N] DETAILS:______________
____.

34. IS THERE ANYTHING ELSE THAT YOU CAN TELL ME ABOUT THIS TREE?
____
____
____

APPENDIX E

TRIAD TEST RECORD FORM

APPENDIX E

TRIAD TEST RECORD FORM

Consultant: ________________ **Date:** __________ **Time:** ________

CONSTRUCTS LABELS	NAME OF LEAF SAMPLES															NOTES
	PHULTISO	MAYA	BHOKRE	HALAURE	BANJO	CHULERO	PAIYU	SHIRMOO	JHYANU	KHASRU	BAINS	DUDHILO	RAJELI	PANI LAHARA	DHURSE	
			X				X					X				
			X		X							X				
	X					X							X			
										X	X				X	
	X								X	X						
				X									X	X		
							X	X		X						
								X				X			X	
NEW CONSTRUCT																X = TRIAD MEMBER $\boxed{X}$ = TRIAD PAIR
NEW CONSTRUCT																+ = CONSTRUCT AGREEMENT
PROBLEMS W/ CROPS																- = NO AGREEMENT

APPENDIX F

LIST OF VERBAL LABELS ELICITED FROM TRIAD TEST

APPENDIX F

LIST OF VERBAL LABELS ELICITED FROM TRIAD TEST

TRIAD 1: *BHOKRE ----- PAIYU ----- DUDHILO*

SORT GROUPINGS		CONSULTANT NO. & COMMENT
BHOKRE & DUDHILO *VS* *PAIYU*		
1a- M	1:	LEAVES SPROUT & SHED IN SAME SEASONS.
1a- F	2:	GOOD FODDER WHEN OLD ALSO A GOOD FUELWOOD.
1a- M	3:	GOOD FOR MILK (*DUDHILO*) AND *GHIU* (*BHOKRE*) PRODUCTION.
1a- F	4:	NUTRITIOUS, GOOD FOR MILK PRODUCTION (*PAIYU* ONLY USED WHEN OTHER GRASS NOT AVAILABLE).
1a- M	5:	GOOD FOR MILK PRODUCTION, A WINTER FODDER.
1a- M	6:	A GOOD FODDER FOR MILK (*DUDHILO*) AND *GHIU* (*BHOKRE*) PRODUCTION. *BHOKRE* IS WINTER FODDER. PAIYU GIVE RED URINE, BUT WHEN MIXED WITH DRY FODDERS THIS MAKES A GOOD FEED.
1a- M	8:	A GOOD FODDER FOR MILK PRODUCTION. *PAIYU* IS OKAY DURING *ASARD* WITH WATER IN THE WET SEASON, THIS IS A "*GARIMI GASS*" IF EATEN IN QUANTITY THE UDDER WILL DRY UP AND PIMPLES WILL DEVELOP ON THE TITS.
1a- F	9:	NO REASONS -- TOO SHY.
1a- M	10:	GOOD FODDER, ANIMALS LIKE IT, CAN BE FOUND AT SAME SEASON. *PAIYU* IS ONLY FED WHEN OTHER FODDERS ARE NOT FOUND.
1a- F	11:	GOOD FOR MILK PRODUCTION.
1a- F	12:	GOOD FOR MILK (*DUDHILO*) AND *GHIU* (*BHOKRE*) PRODUCTION.
1a- M	13:	GOOD FOR MILK AND *GHIU* PRODUCTION.

PAIYU & DUDHILO
VS
BHOKRE

1b- F 7: EASY TO GET, CLOSE TO HOME.

TRIAD 2: *BHOKRE ----- BANJO ----- DUDHILO*

SORT GROUPINGS — CONSULTANT NO. & COMMENT

BHOKRE & BANJO
VS
DUDHILO

	2a- M	1: THESE ARE WINTER FODDERS.
FODDER	2a- F	2: THESE PRODUCE BOTH GOOD FUELWOOD.
	2a- M	3: THESE ARE GOOD FOR ANIMAL HEALTH, THEY PROTECT AGAINST SICKNESS. (ANIMALS DON'T EAT *BANJO* VERY WELL)
	2a- M	5: THESE ARE WINTER FODDERS. *DUDHILO* IS NOT.
	2a- M	6: THESE ARE WINTER FODDERS. *DUDHILO* IS NOT.
	2a- M	8: THESE ARE ALL SEASONS GRASS. *DUDHILO* IS NOT AVAILABLE IN WINTER.
	2a- F	9: NO REASONS PROVIDED.
	2a- M	10: THESE ARE WINTER FODDERS, *DUDHILO* NOT AVAILABLE IN THE WINTER.
	2a- F	12: THESE ARE *PASHILO* (nutritious) FODDERS.

BANJO & DUDHILO
VS
BHOKRE

	2b- F	4: THESE ARE NUTRITIOUS (*PASHILO*) FODDERS,ANIMALS GET FAT AND STRONG FROM EATING THEM. *BHOKRE* IS A WINTER FODDER.
	2b- F	11: THESE ARE *OBANO* FODDERS, *BHOKRE* IS A LITTLE *CHISO*.

BHOKRE & DUDHILO
VS
BANJO

	2c- F	7:	AVAILABLE ON OWN LAND, GOOD FOR MILK PRODUCTION. (SHE DOES NOT KNOW ABOUT *BANJO*.)
	2c- M	13:	*BHOKRE & DUDHILO* ARE GOOD FOR BOTH MILK AND *GHIU* PRODUCTION. *BANJO* IS GOOD ONLY FOR *GHIU* PRODUCTION.

TRIAD 3: *PHULTISO ----- CHULETRO -----RAJELI*

SORT GROUPINGS CONSULTANT NO. & COMMENT

PHULTISO & CHULETRO
VS
RAJELI

	3a- M	1:	THESE ARE *CHISO* FODDERS, *RAJELI* IS NOT.
	3a- M	8:	THESE FODDERS ARE GROWN ON THEIR OWN LAND.
	3a- M	13:	THESE ARE NOT WINTER FODDERS, THEY ARE ALSO NOT FOUND IN THE FOREST.

CHULETRO & RAJELI
VS
PHULTISO

	3b- F	2:	GOOD FOR MILK PRODUCTION.
	3b- F	4:	GOOD FOR MILK PRODUCTION. WHEN THERE IS NOT ENOUGH WATER FOR ANIMALS THIS IS NOT GOOD FOR MILK PRODUCTION, BUT *PHULTISO* IS GOOD FOR OXEN.
	3b- M	5:	ANIMALS LIKE THESE FODDERS (*MITO* tasty), THEY DON'T EAT *PHULTISO* AS WELL.
	3b- M	6:	ANIMALS EAT THESE FODDERS WELL (*MITO*) (*ASILO*), AND THEY ARE ALSO GOOD FOR MILK PRODUCTION. (*RAJELI* IS AVAILABLE ALL THE TIME, *PHULTISO* IS A WINTER FODDER, AND *CHULETRO* IS A SUMMER & FALL FODDER.)

3b- F	7:	THESE ARE GOOD FODDERS. (*CHULETRO* IS EASY TO GROW, *RAJELI* IS AVAILABLE IN THE WINTER, SHE DOESN'T KNOW *PHULTISO* WELL.)
3b- F	9:	NO COMMENT.
3b- M	10:	THESE ARE WINTER FODDERS.
3b- F	11:	THESE ARE GOOD FOR MILK PRODUCTION.
3b- F	12:	THESE ARE *PASHILO* (NUTRITIOUS) FODDERS

PHULTISO & RAJELI
VS
CHULETRO

3c- M	3:	ONLY A LITTLE OF THESE FODDERS IS NEEDED TO SATISFY THE ANIMALS. (*PHULTISO* IS DIFFICULT TO CUT BECAUSE THE LEAVES FALL FROM THE TREE QUICKLY WHEN "RIPE".) (*RAJELI* IS A TASTY FODDER THAT PRODUCES GOOD MILK.) (EVEN WHEN THE ANIMALS EAT MUCH OF THE *CHULETRO* THEY DON'T GET SATISFIED.)

TRIAD 4: *KHARSU ----- BAINS ----- DHURSE*

SORT GROUPINTS CONSULTANT NO. & COMMENT

KHARSU & BAINS
VS
DHURSE

4a- F	2:	THESE ARE CUT ONLY ONCE EACH YEAR (i.e. cut from an individual tree.) THESE ARE ALSO GOOD FOR FUELWOOD. *DHURSE* CAN BE CUT 12 MONTHS OF THE YEAR FROM INDIVIDUAL TREES.
4a- F	4:	THESE FODDERS ARE GOOD FOR GENERAL HEALTH (THIS WAS A WEAK ASSOCIATION). THESE ARE CUT REGULARLY -- 12 MONTHS A YEAR. (*DHRUSE* IS A NUTRITIOUS FODDER AND IS GOOD FOR *GHIU* PRODUCTION.)

KHARSU & DHURSE
VS
BAINS

4b- M	1:	THESE ARE WINTER FODDERS, *PASHILO* (NUTRITIOUS) FODDERS.
4b- M	3:	AVAILABLE 12 MONTHS A YEAR, WINTER FODDER. WHEN *KHARSU* IS FED SICKNESS DOES NOT COME.
4b- M	5:	WINTER FODDER, AVAILABLE 12 MONTHS A YEAR.
4b- M	6:	"*NIROGI*" (HEALTHY) FODDER, IF FED, SICKNESS WILL NOT COME. BAINS IS A *CHISO* FODDER.
4b- F	7:	WINTER FODDER, AVAILABLE 12 MONTHS A YEAR.
4b- M	8:	"*PASHILO*" (NUTRITIOUS) FODDER, GOOD FOR MILK PRODUCTION. "*KHARSU* IS THE BEST FODDER FOR LIVESTOCK."
4b- M	10:	THESE ARE A WINTER FODDER.
4b- F	11:	THESE ARE ALL AROUND GOOD FODDERS.
4b- F	12:	THESE ARE GENERALLY GOOD FODDERS.

BAINS & DHURSE
VS
KHARSU

4c- F	9:	NO COMMENT WAS GIVEN
4c- M	13:	GOOD FOR ONLY MILK PRODUCTION. KHARSU IS BEST FOR *GHIU*).

TRIAD 5: *PHULTISO ----- JHAYNU ----- KHARSU*

SORT GROUPINGS CONSULTANT NO. & COMMENT

JHAYNU & KHARSU
VS
PHULTISO

5a- M	1:	WINTER FODDER.
5a- F	2:	PRODUCES GOOD FODDER AND FUELWOOD. *PHULTISO* IS A POOR FUELWOOD.
5a- M	3:	WINTER FODDER.
5a- F	4:	WINTER FODDER.
5a- M	5:	WINTER FODDER.

5a- M	6:	GOOD FOR LIVESTOCK HEALTH, "ALMOST JUST LIKE A MEDICINE". *KHARSU* GIVES ANIMALS RELIEF FROM THE HOT SEASON. ANIMALS DON'T EAT *PHULTISO* WELL.
5a- F	7:	WINTER FODDER. THIS CONSULTANT SAID THAT SHE DIDN'T KNOW ABOUT *JHAYNU* WELL.
5a- M	8:	THIS IS A WINTER FODDER.
5a- F	9:	NO COMMENT.
5a- M	10:	WINTER FODDER, GOOD FOR MILK PRODUCTION.
5a- F	11:	ANIMALS EAT THIS FODDER WELL. THEY DON'T EAT *PHULTISO* WELL.
5a- F	12:	GOOD FOR MANURE PRODUCTION AND MILK PRODUCTION, MAKES THE ANIMALS FAT.
5a- M	13:	IF THESE ARE FED TOGETHER, THEY ARE EATEN WELL.

TRIAD 6: *HALAURE ----- RAJELI ----- PANI LAHARA*

SORT GROUPINGS — CONSULTANT NO. & COMMENT:

HALAURE & RAJELI
VS
PANI LAHARA

6a- M	1:	AVAILABLE 12 MONTHS A YEAR.
6a- M	3:	THESE ARE A *CHISO* FODDER, IF TOO MUCH IS EATEN MANURE WILL BE WATERY. *PANI LAHARA* DOES NOT LEAD TO SICKNESS, IT MAKES THE ANIMALS HEALTHY AND THEY PRODUCE MUCH MILK. (*PAIYU* PRODUCES DRY HARD MANURE AND THE ANIMALS LOOSE WEIGHT.
6a- F	4:	AVAILABLE ALL YEAR LONG, THESE ARE A *PASHILO* (nutritious) FODDER THAT IS GOOD FOR MILK PRODUCTION. *PANI LAHARA* IS GOOD FOR *CHAIT* AND *BAISAKH*.
6a- M	5:	THESE ARE *PASHILO* FODDERS, GOOD FOR THE HEALTH OF THE LIVESTOCK, NOT A *CHISO* FODDER. *PANI LAHARA* IS A *CHISO* FODDER.

6a- M	6:	THESE ARE NOT *CHISO* FODDERS, THEY DO NOT PRODUCE WATERY MANURE. THE ANIMALS EAT THEM WELL AND THEY PRODUCE GOOD *GHIU*.
6a- F	7:	GOOD FOR MILK PRODUCTION, NOT A *CHISO* FODDER.
6a- F	9:	NO COMMENT
6a- F	11:	DOES NOT PRODUCE WATERY MANURE (NOT A *CHISO* FODDER)
6a- F	12:	THESE ARE TASTY FODDERS, ANIMALS EAT THEM WELL.
6a- M	13:	DOES NOT PRODUCE WATERY MANURE.

RAJELI & PANI LAHARA
VS
HALAURE

6b-M	8:	THESE ARE GOOD FOR MILK PRODUCTION. ALL OF THESE ARE NOT TREES.
6b- M	10:	GOOD FOR MILK PRODUCTION. ALL ARE NOT TREES, AND THEY ARE ALL GOOD IF FED IN SMALL QUANTITIES.

HALAURE & RAJELI
VS
PANI LAHARA

6c- F	2:	THESE ARE ALL EXCELLENT FOR MILK PRODUCTION AND THEY ARE ALL VINES.
6c- M	13:	THEY DO NOT PRODUCE STOMACH PROBLEMS.

TRIAD 7: *PAIYU ----- SHIRMOO ----- KHARSU*

SORT GROUPINGS — CONSULTANT NO. & COMMENT

SHIRMOO & KHARSU
VS
PAIYU

7a- M	1:	THESE ARE WINTER FODDERS.
7a- M	5:	THESE ARE WINTER FODDERS. *PAIYU* WILL CAUSE BLOOD TO COME IN THE URINE.
7a- M	6:	THESE ARE GOOD WHEN MIXED TOGETHER, THEY WILL NOT CAUSE

		RED URINE.
7a- M	8:	THESE ARE GOOD FOR FUELWOOD. *KHARSU* IS A GOOD FODDER, *SHIRMOO* IS *CHISO*.
7a- M	10:	THESE ARE *PASHILO* FODDERS, BUT IF *SHIRMOO* IS FED TOO MUCH THE ANIMALS WILL GET SICK. *PAIYU* IS ONLY FED WHEN OTHER FODDER IN NOT AVAILABLE.
7a- F	11:	THESE ARE *PASHILO* FODDERS, *PAIYU* CAUSES RED URINE.
7a- F	12:	THESE ARE BETTER THAN *PAIYU*.

PAIYU & KHARSU
VS
SHIRMOO

7b- F	2:	THESE FODDERS PROVIDE BOTH MILK FUELWOOD.
7b- F	7:	THESE ARE WINTER FODDERS.
7b- M	13:	*PAIYU* CAUSE RED URINE, ALSO IF EATEN TOO MUCH THE ANIMAL WILL LOSE WEIGHT.

PAIYU & SHIRMOO
VS
KHARSU

7c- M	3:	THESE FODDERS WILL PRODUCE RED URINE IF FED IN QUANTITY.
7c- F	4:	THESE FODDERS WILL PRODUCE HEALTH PROBLEMS. "IF EATEN IN QUANTITY OR IF DURING PLOWING IF OXEN EAT THIS FODDER BLOOD WILL COME IN THEIR URINE AND THE ANIMAL WILL GET SICK, IT CAN EVEN DIE.
7c- F	9:	NO COMMENT.

TRIAD 8: *JHAYNU ----- DUDHILO ----- DHURSE*

SORT GROUPINGS — CONSULTANT NO. & COMMENT

DUDHILO & DHURSE
VS
JHAYNU

8a- M	1:	THESE ARE *OBANO OR TATO* (hot) FODDERS.

8a- M 3: THESE ARE NOT *CHISO* FODDERS, THEY ARE WINTER FODDERS.

8a- F 4: NOT A GOOD FODDER FOR HOT SEASON, BUT DOES PROVIDE GOOD MILK AND *DHURSE* PRODUCES GOOD *GHIU*. *JHAYNU* IS GOOD FOR THE HOT SEASON IT GIVES "*SITAL*", i.e. cools the animals down.

8a- M 6: GOOD FOR MILK AND *GHIU* PRODUCTION. *JHAYNU* AND *DUDHILO* ARE *CHISO*, *DHURSE* IS *GARAMI* (*OBANO*). *DHURSE* IS ALSO *CHORO* - gives off much heat when burned).

8a- F 7: THESE ARE FOUND ON MY OWN LAND, THEY ARE EASY TO GET. *JHAYNU* IS A FOREST TREE.

8a- M 8: THESE ARE GOOD FOR MILK AND *GHIU* PRODUCTION, BUT YOU NEED TO FEED ALLOT OF THESE FODDERS.

8a- F 9: NO COMMENT

8a- M 10: VERY GOOD FOR MILK AND *GHIU* PRODUCTION

8a- F 11: *PASHILO* AND GOOD FOR MILK PRODUCTION, ANIMALS EAT THEM WELL. ANIMALS DON'T EAT *JHAYNU* VERY WELL.

8a- F 12: THESE ARE VERY AVAILABLE, YOU CAN GET MUCH OF IT.

8a- M 13: GOOD FODDERS FOR GENERAL REASONS, *JHAYNU* IS ONLY A WINTER FODDER.

JHAYNU & DUDHILO
VS
DHURSE

8b- F 2: PRODUCES BOTH MILK AND FUELWOOD.

8b- M 5: THESE ARE CHISO FODDERS. *DUDHILO* PRODUCES GOOD MILK. *DHURSE* IS *ASILO* (THE ANIMALS EAT IT WELL).

TRIAD 9: *MAYA ----- HALAURE ----- PANI LAHARA*

SORT GROUPING			CONSULTANT NO. & COMMENT
MAYA & PANI LAHARA VS *HALAURE*			
	9a- M	8:	NOT AS GOOD A FODDER AS THE OTHER.
	9a- F	12:	THESE ARE GOOD FOR MANURE PRODUCTION.
HALAURE & PANI LAHARA VS *MAYA*			
	9b-M	1:	COMMON AND AVAILABLE.
	9b-F	2:	GOOD FODDER BUT PROVIDES NO FUELWOOD. *MAYA* IS A CEREMONIAL TREE, AND PROVIDES FUELWOOD.
	9b-M	3:	THESE ARE A WINTER FODDER, PROVIDES MUCH MILK.
	9b-F	4:	THESE ARE NOT CEREMONIAL, BUT THEY DO PRODUCE GOOD MILK. *HALAURE* WILL PRODUCE DRY MANURE, WHILE *PANI LAHARA* PRODUCES WATERY MANURE AND IF FED IN QUANTITY IT WILL CAUSE WEIGH LOSS.
	9b-M	5:	THESE FODDERS ARE EATEN WELL AND PRODUCE MUCH MILK.
	9b-M	6:	THESE FODDERS ARE EATEN WELL.
	9b-F	7:	THESE FODDERS ARE EATEN WELL.
	9b-F	9:	NO COMMENT.
	9b-M	10:	CAN BE FOUND 12 MONTHS OF THE YEAR AND THEY ARE FOUND TOGETHER. IF TOO MUCH OF *PANI LAHARA* IS FED IT WILL CAUSE SICKNESS AND WATERY MANURE, BUT IN SMALL QUANTITIES IT IS EXCELLENT FOR MILK PRODUCTION.
	9b-M	13:	GOOD FOR MILK PRODUCTION, BUT IF TOO MUCH OF *PANI LAHARA* IS FED IT WILL PRODUCE STOMACH PROBLEMS.
MAYA & HALAURE VS *PANI LAHARA*			
	9c-F	11:	*PASHILO* FODDER, MAKES ANIMALS FAT.

APPENDIX G

LIST OF TREES AND VINES FOR SALIJA

APPENDIX G

LIST OF TREES AND VINES FOR SALIJA

The trees with code numbers are those that were recorded either in the survey or inventory sheets. The trees with 0 code numbers are those that were encountered while in and around Salija, but did were not listed on either the survey or inventory forms. This list primarily uses the Nepalese name for the trees that are used in Salija. Alternate pronunciations or alternate names are occasionally listed in parentheses. It is possible that some of these names refer to the same species, and that other name are specific to the Salija area. Where possible, the Latin name has been provided, but is several cases the accuracy of this is in doubt (this is indicated by a question mark).

The following use codes were derived from consultant comments during interviews and from the survey and inventory sheets.

USE CODES:
bk - bark used for light; ch - charcoal; fd - fodder; ft - fruit;
fu - fuelwood; lf - live fences; md - medicine; po - pole wood;
ps - poison; rg - religious & ceremonial; rp - rope & binding;
rt - root; sc - soil conservation; so - bedding; sp - spice;
tm - timber; to - tool & utensils; fo - fruit/food; fb - fiber;
cp - child play (seeds & flowers); fn - cut wood fences;

	NEPALESE NAME	LATIN NAME	USE CODE
2	*Aarupaate*	*Prunus napaulensis*	fu,fd,tm
3	*Aisalu (Ainselu)*	*Rubus ellipticus*	ft,fu
4	*Akha Thep (Jam Jame Timure)*	____________	cp
5	*Ambaa*	*Psidium gaujava*	fo
6	*Amilso* (tree)	*Hippophae solicifolia*	tm,to
7	*Angeri*[1]	*Pieris ovalifolia* (*Lyonia*)	fu,me
8	*Aru Bhokre*[2]	*Prunus domestica*	ft,fu
9	*Aru*	*Prunus persica*	ft,fu

10	*Auchur*	________________	fo
11	*Aule Salla*	*Pinus roxburghii*	tm,fu
12	*Baas*	*Dendrocalamus spp.*	fd,fu,to
13	*Bhanjo (Banjh)*	*Quercus incana*	fd,fu
14	*Bhaduwa (Baruwa)*	*Daphne bholua*	paper
15	*Bhaira*	________________	fd,to
16	*Bhaisi Timor*	________________	md,fu
17	*Bhakiamilo*	*Rhus javanica*	fd,ft,md
18	*Bhalayo (Thulo)*	*Rhus succedana*	so,fu,tm,fd
19	*Bhokraule (Kiun Kaphal)*	________________	fu,ft,fd
20	*Bhokre (Lise)*	*Ilex doniana(?)or dipyrena*	fd,fu
21	*Bilaune*	*Maesa chisia*	fd,fu,(md)
22	*Chajan (Chadan)*	*Daphniphyllum himalayense*	fu,so
23	*Chia Patti*	*Camellia kissi*	sp
24	*Chilaune*	*Schima wallichii*	fd,tm,fu,to
25	*Chutro*	*Berberis asiatica*	lf,ft,fu
26	*Dabdabe*	*?Garuga pinnata* or *Symplocos ramosissima*	tm,fu
27	*Dalchini*	*Cinnamomum zeylanchium*	sp,fd,fu,md
28	*Demur (Dumare)*	*?Ficus spp.*	ft,md,fd
29	*Dhurse*	*Buddlija asiatica*	fd,fu
30	*Dudhilo*	*Ficus nemoralis*	fd,fu
31	*Ghunggus*	________________	fd(shrub)
32	*Ghangaru (Changaru)*	*Pyracantha crenulata*	fu,to,lf
33	*Ginderi (Gil Darne)*	*Premna barbata or latifolia*	fd,fu

34	*Githa (Ban Tarul)*	(climber)__________	md
35	*Goffola(climber)*[3]	*?Chonemorpha macrophylla*	ft,fd,rp
36	*Gogan*	*Saurauria nepalensis*	fd,fu
37	*Gopi Baas*	*Dendrocalamus spp.*	fd,fu,to
38	*Guai khat*	??__________	tm,to
39	*Guieli (Giewelo,Gunyali)*	*Elacagnus latifolia* or *Laeagnus parvifolia*	fd,fu,to
40	*Guraas*	*Rhododendron spp.*	fu,to
41	*Haledo*	__________	fu,fd
42	*Kompain (Jamani mandro)*	*Mahonia nepaulensis*	ft,fu,lf
43	*Jhyanu*	*Eurya acuminata*	fd,fu
45	*Kali Khat (Bhewul?)*	*?Myrsine semiserata*	fd,fu
46	*Kalo Dhurse*	__________	fd,fu
47	*Kalo Chuletro*	*Brassaiopsis glomerulata*	fd
48	*Kalo Kharsu*	*Quercus semecarpifloia*	fd,fu
49	*Kaphel*[4]	*Myrica esculenta*	fu,so
50	*Kaulo (Kopile)*	*Machilus spp.*	fd,fu,to,tm
51	*Kera*	*Banna spp.*	fo,fb
52	*Ketuki*	__________	to
53	*Khannim*	*Ficus semicordata*	fd,fu
54	*Khari*	*Celtis australis*	fd,to
55	*Kharse*	*Ficus hispidia*	to
56	*Khatus*[5]	*Castanopsis indica*	fd,fu,ft
57	*Khirra*	*Holarrhena antidysenterica*	to,fu
58	*Khirjwan* (climber)	__________	fd

59	*Khutti*	*Polyalthia simiarum*	fd
60	*Kimbu Kaphal*	*Morus spp. or Myrica spp.*	fd,fu,ft,
61	*Luise Khath*	________________	fd
62	*Kutmiro*	*Litsea monopetala*	fd,fu
63	*Lankuri*	*Fraxinus floribunda* (Wall.)	fd,fu
64	*Lapsi*	*Choerospondias axillaris*	ft,fu
65	*Malatto*	*Macaranga pustulata*	fu,tm
66	*Malkaunu*	____________climber	fd
67	*Mauwa (Maguwa)*	*Madhuca latifolia??* or *Engelhardintia spicata* ?? or *Madhuca indica*??	fu,ps
68	*Maya*	*Eriobotrya elliptica*	fd,fu,tm,rg
69	*Musure Phlant*[6]	*Quercus lanuginosa*	fd,tm,fu
70	*Nal Siri*	________________	fd,fu
71	*Narga (Ganaune)*	*Viburnum erubescens*	to,fu,tm,so,ch
72	*Naspati*	*Pyrus communis*	ft,fu
73	*Nibuwa*	________________	fo
74	*Nigaalo (Nigaalo Arsu)*	*Arundinaria spp.*	fd,to,fu
75	*Nigaalo Tite*[7]	*Drepanostachyum intermedium* *D. khasianum*	fd
76	*Nimmaro(Timila)*	*Ficus roxburghii*	fd,fu
76	*Timilo (Nimaro)*	*??Ficus auriculata*	fd,fu
77	*Nundhiki*	*Osyris wightiana*	fd
78	*Okhar (Dante Okhar 116)*	*Juglans regia*	tm,to,ft,so
79	*Painyu*	*Prunus cerasoides*	fd,fu,tm,to
80	*Pangro (Kandar)*	*Aesculus indica ??*	fd,fu,to,ft

81	*Pankhe (Pangkhe)*	________________	fd
82	*Pare*	________________	fu,so
83	*Phalam kath*	*Carallia brachiata*	fu,to
84	*Phaledo*	*Erythrina spp. ???*	fu
85	*Pharse*	________________	so,fu,to
86	*Phe Phe*	*Neolitsea umbrosa*	fu,to,me
87	*Phir Phire (Fer Fera)*	*Acer oblongum*	
88	*Phitho Swor*[8]	*Vibrurm coriaceum*	fd,fu
89	*Phultiso*[9]	*?Colquhounia coccinea*	tm,fu,fd
90	*Raksan (Chadan)*	*Daphniphyllum himalense*	fu,so
91	*Rangkuli*	________________	fu,fd
92	*Rato Kange*	________________	fd,fu
93	*Ritha*	*Sapindus mukorossi*	fu
94	*Sada(sandhan pipli)*	*Ougeinia dalbergiodes*	fd,fu
95	*Seto Chuletro(Putre)*	*Brassaiopsis hainla*	fd,fu
96	*Shete Kath*	*Myrsine spp.*	fu
97	*Shimolta (climber)*[10]	________________	fd,ft
98	*SilTirmu*	*Litsea cubeba*	md,fd,fu,sp
99	*Sirmoo*[11]	*Michelia spp.*	fu,tm,to
100	*Syaau*	*Pyrus malus*	ft,fu
101	*Tapse (Takse)*	________________	ft,fu,so
102	*Tata Shiri*	________________	so,fu
103	*Theule*	________________	fu
104	*Thulo Gari*	________________	lf,fu,fn

105 *Timur (Bokhe timur)*	*??Zanthoxylum armatur*	md
106 *Tingre Salla*	*Pinus wallichiana*	tm,fu,to,po,so
107 *Tooni*	*Cedrela spp.*	fu
108 *TooSare*	________________	fd
109 *Umba (Beloiti)*	________________	ft,fu
110 *Utis*	*Alnus nepalensis*	tm,fu
111 *Bainsh*	*Salix babylonica*	fd,fu,sc
112 *Phalant*	*Quercus glauca*	fd,fu,tm,to
113 *Bunge Salla*	*Abies spectabilis*	tm,to,fu
114 *Gobre Salla*	*Tsuga dumosa*	tm,to,fu
115 *Silinge*	*Ilex (dipyrenia?)*	fd,fu,to
116 *Dante Okhar*	*Juglans regia*	tm,to,ft,so
117 *Bhalayo (Sano)*	*Semicarpus anacardium*	so,fu,fd
118 *Ghari (Seto Gari)*	________________	lf,fd
119 *Champho*	________________	tm
120 *Kageti*(lemon)	*Citrus spp.*	fo
121 *Seto Kharsu*	*Xylosma latifolium*	fd,fu
122 *Thulo Phalant*	*Quercus lamellosa*	fd,fu,tm,to
123 *Bhate Kaulo*	*Machilus odorotissima*	fd,fu
124 *Rajeli* (climber)	________________	fd
125 *Jhaphre*	________________	
126 *Sew Dona*	________________	
127 *Swor (Sauer)*	*?Betula spp.(alnoides)*	fd,fu,md, tm,bk,po
129 *Bhate Kaphal*	________________	ft,fd,fu

130 *Hade Kaphel*	______________	ft,fd,fu
131 *Aulo Tushare*	______________	
132 *Thulo Phultiso*	______________	
134 *Chamre PhePhe*	*Lindera pulcherrima (?)*	to,fu
135 *Khamari*	*Ficus roxburghi Wall*	fd,
136 *Shimal*	*Bombox ceiba*	
137 *Chyuri*	*Bassia butyraceae*	
138 *Kakchuchcha*	______________	fd,to
139 *Sano Dhurse*	______________	fd,fu
140 *Dar (Githa Dar)*	*Boehmeria rugulosa*	to
141 *Narga Ko Baba* (*Bhawami Kath*)	______________	
142 *Akha Timur*	______________	ft
143 *Dhobi Salla (Dhupi)*	*Cryptomeria japonica*	tm
144 *Jam Jame Timur*	______________	
145 *Katungje* (low Alt.)		
146 *Bainsh Ko Baba*	______________	fd,fu,sc
147 *Sano Phlant*	*Quercus lanuginosa or lanata*	fd,fu,to
148 *Nura* (5-7)		
150 *Seto Champ*	*Michelia champaco*	tm
151 *Halaure (Pipal Pate)*	*Hedera nepalensis (climber)*	fd
152 *Kimu*	______________	
152 *Pani Lahara*	*Vitis repanda*	fd
153 *Khumilo??*	______________	to

0	*Ruru*	________________	fd,fu
0	*Musure Katus*	*Castanopsis tribuloides*	fd,fu,tm,to
0	*Bhawlo (Bhayow)*	________________	fu
0	*Bimure*	*Citrus medica*	ft,
0	*Guylo*	________________	
0	*Bajhar*	*Sorbus spp.*	fd,fu
0	*Siris*	*Albissia mollis*	fd,fu
0	*Pakhure*	*Ficus glaberrima*	fd,fu
0	*Charchare* (vine)	________________	fd,md
0	*Thulo Bhalayo*	*Rhus wallichii*	so,fu
0	*Chiple*	*?Villegrunnea frutescens*	*rt(sel-roti)*[12]
0	*Lodh*	*Symplesos panicalata*	fd,fu,gh
0	*Phangaru*	*Acer spp.*	
0	*Madani Lahare*	__________climber	fd
0	*Kau Chuchhe*	__________climber	fd
0	*Lahari(Batule pat)*	*Cissampeols pareira* (climber)	fd

1. May have male & female trees or represent two different species.

2. This is also spelled: "AalubakhaRaa" (Forestry Word-List, NAFP & UMN)

3. Also called, "Gothale Phul".

4. This may be the same as "Kimbu Kaphel, Hade kaphel, or Rukh Kaphal".

5. Also called, "Dhale Katus".

6. Also called: "Sano Phlant."

7. Also called: "Gore (Gure) Nigaalo", it only grows near water and is excellent for making dhokos.

8. May also include: "Sungar Swor".

9. Also called: "Sano Tusare".

10. This may also be: Simalata, Hajero, or Hadjore Une.

11. Also called: "Champ".

12. Sel roti is a bread like food made from rice flour dough that is deep fried in the shape of a doughnut (with an extra large hole). The root from this plant is used as the leavening agent for this bread.