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FODDER SITUATION: AN ECOLOGICAL-ANTHROPOLOGICAL STUDY OF MACHHEGAON, NEPAL

Laya Prasad Uprety

HMG-USAID-GTZ-IDRC-FORD-WINROCK PROJECT

STRENGTHENING INSTITUTIONAL CAPACITY IN THE

FOOD AND AGRICULTURAL SECTOR IN NEPAL

FOREWORD

This Forestry Research Paper Series is funded through the project, "Strengthening Institutional Capacity in the Food and Agricultural Sector in Nepal," a cooperative effort by the Ministry of Agriculture (MOA) of His Majesty's Government of Nepal and the Winrock International Institute for Agricultural Development. This project has been made possible by substantial financial support from the U.S. Agency for International Development (USAID), the German Agency for Technical Cooperation (GTZ), the Canadian International Development Research Centre (IDRC), and the Ford Foundation.

One of the most important activities of this project is funding for problem oriented research by young professional staff of agricultural agencies of the MOA and related institutions, as well as for concerned individuals in the private sector. In particular, funding is provided by the Ford Foundation to support research activities related to the human aspects of natural resource management. This research is carried out with the active professional assistance of the Winrock staff.

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FODDER SITUATION: AN ECOLOGICAL-ANTHROPOLOGICAL STUDY OF MACHHEGAON, NEPAL

Laya Prasad Uprety*

INTRODUCTION

Background

The hill economy of Nepal is based on agriculture and livestock farming, both of which are dependent on the availability of natural resources. In Nepal, agriculture and livestock farming are inseparable. Agricultural productivity depends on the quantity and quality of organic manure, which is dependent on the availability of fodder resources. In recent decades, a number of factors have affected the fodder resources, of which the most important is the population growth. As the population increases, landholdings are increasingly fragmented and people encroach on private pasture lands to produce more food. Population growth also adversely affects public pastures because they are either cultivated to produce more crops or overgrazed by ruminants. Forest fodder resources are extensively exploited and the excessive ruminant population prevents regeneration of the forest fodder resources. Ultimately, this fodder shortage has a detrimental effect on the agrarian hill economy.

Nepal has a predominantly agrarian economy supported by livestock farming. Agriculture accounted for 58.9 percent of the GDP in 1976/77, and 57.4 percent in 1977/78. In those years, livestock production contributed 18.4 percent and 17.4 percent, respectively, to the GDP (Rajbhandary and Shah, 1981). Nepal has one of the world's highest livestock populations per unit of land.

In Nepal, farmers raise livestock for meat, milk, fertilizer, and cultural values. Manure is the primary contribution made by livestock. As Nepalese farmers are poor, they cannot afford chemical fertilizer and must depend on animal manure. Animal manure is also used as fuel in some rural and urban areas of the Tarai.

Livestock, as a source of meat and milk, helps meet the nutritional requirements of the rural population. Livestock farming is dependent on the availability of fodder. Meat production from the country's animal population is approximately 40-45,000 tons annually, the largest contribution coming from buffalo. The milk production from cows, she-buffalos, and yak-hybrids is about 450,000 tons annually (Pandey, 1982). Besides the family consumption of the milk, the rural people of Nepal sell milk in those areas where transportation is available. In inacces-

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sible areas, people produce refined butter and sell it for cash. By earning money in this way, rural people can buy basic necessities.

Male cattle and buffalo provide the draft power for plowing almost 75 percent of the 2.3 million ha. of cultivated land. Ninety percent of the work is done by the estimated 700,000 oxen pairs (Pandey, 1982).

In Nepal, livestock are considered objects of cultural value. Traditionally, it has been an integral part of Nepalese culture to raise livestock. Cows and oxen are revered religiously; this religious worshipping of cattle exists as an unconscious expression of ecological value in traditional Nepalese agriculture.

For ages, farmers of rural Nepal have used by-products of agriculture, grasses from terraces, hill and highland pasture, forest foliage and tree leaves as fodder sources. Fodder sources can be grouped into two types: private and public. Private sources of fodder include by-products of agriculture such as straw, stubble, weeds, undesired crops, plants, other agricultural residues, and fodder from privately owned trees. Fodder is also extracted from the cropland terraces, terrace banks, and terrace walls.

Farmers also obtain their fodder from public fodder sources, such as forest foliage and pasture. The forest produces fodder from two different strata of vegetation: trees and undergrowth. Forest fodder supply is variously estimated at from 40 to 60 percent of the total fodder consumption (Macfarlane, 1976).

Several studies indicate there is no longer a balance between the demand and supply of fodder because the livestock population is increasing and the forest biomass production is declining.

Fodder is declining from all of its sources which has had a negative impact on the economy of Nepalese villages. Forest fodder is exploited because a majority of farmers do not have alternative sources of fodder. The pressure of human and livestock populations on the forest ecosystem is fully responsible for causing this environmental plight. Trees on public lands are mercilessly exploited because they are regarded as common property. Private pastures have already been turned into arable land because of the population increase and public pastures are overgrazed. Besides the economic value of fodder trees in the forest and on private lands, and their ecological value; fodder trees work as checks on top soil erosion, soil restorers, moisture holders, and shade providers.

A reduction of forests and pastures means a reduction of livestock, and a consequent decrease in the quantity of manure. This results in the decline of agricultural productivity and a loss of income from livestock farming for villagers. Equally important is the fact that reduction in domestic animals gives rise to the malnutrition of the rural poor. Therefore, concerned authorities should encourage local farmers to plant fodder trees. The improvement of the fodder situation will help strengthen the collapsing village economy of Nepal.

Objectives

This study has the following objectives.

1. Assess the role of livestock in the local economy of Machhegaon.

2. Assess fodder availability and villager's participation in planting fodder trees on their farmlands in Machhegaon.

3. Focus on the present fodder crisis and its effect on the local economy of Machhegaon.

4. Suggest measures for improving Machhegaon's fodder situation.

Rationale and Limitations

There are few studies in Nepal that have highlighted the relationship between humans and the environment, which is the main concern of ecological anthropology. In Nepal, little attention is given to the problems surrounding this interaction, an urgent concern of the rural poor. This study considers fodder as an environmental factor and shows its economic and ecological value in the village subsistence economy.

This study does not claim to have fulfilled all of its objectives and has the following limitations.

1. This is basically a descriptive study as most of the data gathered from the field are qualitative.

2. It is confined to a small village in the Kathmandu Valley and thus generalizations made from this study may not be equally equally applicable to other remote villages.

3. This study is constrained by time. Three months was not enough time to assess all dimensions of the fodder situation.

Literature Review

The general finding of most research reports on natural resource management in Nepal are that the Nepalese agricultural economy is dependent on fodder and population growth; the encroachment on forests and pastures (overgrazing and careless lopping of the forest fodder trees) is the major cause for the decline of fodder in Nepal during the past few decades; and the acute shortage of fodder in the hills has had a negative impact on the local village economy (Field and Pandey, 1969; Pandey, 1976; Rieger, 1976; Bose and Ojha, 1968; Poffenberger, 1980; Rajbhandary and Shah, 1981).

In the middle hills of Nepal, the population is dependent on the forest, pasture, cropland terrace, by-products of agriculture, and private fodder trees for fodder which is an indispensable component of the livestock farming (Malla and Mahat, 1981; Pandey, 1982; Kayastha, 1977).

Although there are a few anthropological studies on the people of Nepal which show natural resource and livestock farming to be an integral part of the agrosystem, they do not emphasize people's participation in planting fodder trees which is an economic and ecological necessity. Therefore, this study highlights people's participation in fodder tree planting, analyzes the contribution made by livestock in local economy, fodder availability, and the impact of the fodder crisis on the local economy.

METHODOLOGY

This study adopts a microcosmic method of approach in an attempt to observe the local fodder situation. Field work was carried out from 15 August to 1 September 1985 to collect primary data. Relevant secondary information was also used, including reports published by the Ministry of Forestry, the Department of Forestry, Agricultural Development Council (now Winrock International), and various Forest Division Offices.

Sampling Procedure

Sixty out of 232 households were selected by purposive sampling. Domestication of livestock was a criterion of the selection process. The researcher attempted to pick a representative cross section of the village, including a broad range of sociocultural characteristics and the seven ethnic groups. Generally, village elders were selected as the key respondents because of their historical knowledge of the fodder availability in the forest and the public and private pastures.

Data Collection

Traditional methods of data collection frequently adopted by anthropologists were used such as participant observation, unstructured and structured interviews.

Participant Observation. The participant observation method was used to observe the village settlement pattern, dwellings, fodder collection methods, overgrazing of public pasture, decline of private pasture, ecological problems, and forest growth rate.

Unstructured Interview. Unstructured interviews were used to collect information on the availability of fodder from cropland, forest, private and public pastures, on people's participation in planting, the fodder crisis, and its impact on the local economy.

Structured Interview. Structured questionnaires were used to determine the role of livestock in the local economy.

Initially, local people were hesitant to answer questions because they thought that the researcher was a government official sent to elicit information about the cattle census and to arrest illegal tree cutters. Once the researcher assured locals he had neither the intention nor the authority to arrest them, they responded to the questions.

THE SETTING

Geographic Location

Machhegaon is about nine to ten km. south of Kathmandu, situated on top of Champadevi hill, at an elevation of 5200 ft. above sea level. Machhegaon is bordered by the Champadevi village panchayat to the east, the Takhal village panchayat to the west, the Baiheree village panchayat to the north, and Champadevi hill to the south. Machhegaon has a climate ranging from sub-tropical, temperate, to cool temperate. Average maximum temperature is 25.7 degrees Celsius during the warm season (April to September) and 11.4 degrees Celsius during the cold season. The monsoon rains leave an average annual rainfall of 1306.6 mm.

Ethnic Composition

Machhegaon has seven ethnic groups: Brahmin, Chhetri, Newar, Tamang, Damai, Kami, and Sarki. The ethnic distribution of Macchegaon is shown in Table 1.

Table 1. Village Ethnic Composition

Ethnicity/caste	Number of sample households	Total village population	Percentage of total
Chhetri	74	518	32.5
Brahmin	69	483	30.3
Newar	55	371	23.3
Tamang	19	123	8.0
Kami	7	43	2.7
Damai	5	32	2.0
Sarki	3	19	1.2

Brahmins and Chhetris have the top social standing in the caste hierarchy while Kami, Damai, and Sarki are at the bottom of the social hierarchy. The latter are the untouchables, the service caste. Brahmins and Chhetris migrated from the western part of Nepal during the unification campaign of Prithivi Narayan Shah, the founder of modern Nepal. Politically, economically, socially and in education, Brahmins and Chhetris dominate the entire village. Their population is larger than the other ethnic groups. The jajamani system, a patron-client relationship between the members of the high castes and the service castes, is prevalent in the village.

The Newar are said to be the oldest ethnic group of this village. Newars have a patrilineal society and can be either Hindu or Buddhist. These Newars are successful farmers, businessmen, and minor service holders. Newars in the study area have a socioeconomic organization called guthi, which means a common trust. Cultivated land is the asset of guthi. There are three types of guthi: religious guthi (for worshipping a deity), functional guthi (for cremation, conduct of funerals and maintenance of public places), and social guthi (for entertainment of the members of common locality).

The Tamangs are a Tibeto-Burmese speaking community who migrated from their original homeland east of Kathmandu Valley. They practice agriculture and animal husbandry. Poorer Tamangs are engaged in fuelwood portering. Tamangs maintain the tradition of cross-cousin marriage. They have their own language but they also speak Nepali as a second language. They maintain Buddhist traditions although they are slowly adopting Hindu traditions.

Natural Resources

Formerly, Machhegaon was rich in natural resources. Prior to the beginning of deforestation in 1933 it had 3000 ropanis of forested land area--this has decreased to only 1300 ropanis of thinly forested land. Local farmers used to hunt deer and black pheasant, which have declined because of the loss of their natural habitat. The area has been restricted for hunting. The village has scenic resources, which if developed properly, could help to promote the local tourist trade.

Village Economy

The people of Machhegaon have a peasant subsistence economy. Although the principal livelihood comes from agriculture, it is supplemented with animal husbandry, business, service, labor, cottage industries, fuelwood sale, tailoring, smithing, and shoe-making. The following table shows the occupational distribution of Machhegaon.

Table 2. Occupation

Occupation	Main		Allied	
	Number of households	Percentage	Number of households	Percentage
Agriculture	232	100.0	-	-
Business	-	-	17	7.3
Service	-	-	9	3.9
Labor	-	-	10	4.3
Cottage industry	-	-	4	1.7
Others*	-	-	12	5.2
Total	232	100.0	52	22.4

* Fuelwood sale, tailoring, smithing and shoe-making.

Education

Approximately 20 percent of the people in the 60 sample households are literate. Machhegaon has one middle school and one English nursery school. The former is run by the government and the latter is privately run. In both schools, girls' enrollment is less than boy's enrollment. Many of the orthodox people still do not send their daughters to school. Brahmins and Chhetris have the highest socioeconomic status and are more literate than other ethnic groups.

FINDINGS

Role of Livestock in the Local Economy

Anthropological studies have shown livestock to be of cultural and economic importance in many underdeveloped societies. For example, cows are esteemed for the social status their possession brings among east african pastoralists (Metting, 1977). The Isembaga People of New Guinea base their entire culture on the domestication of pigs (Rappaport, 1968). In India, the subsistence economy of the Toda Tribe is entirely dependent on the buffalo dairy farm (Majumdar and Mada, 1977).

Farmers of Machhegaon raise cattle, buffalos, sheep, goats, and pigs for milk products, manure, plowing, sale, meat, hides, hair, and other by-products. Cattle, buffalos, sheep, and goats are raised by high caste Hindus while pigs are raised by liquor-drinking people.

Table 3. Livestock Ownership

Ethnicity	Number of sampled households	Number of Livestock					
		Buffalos	Cattle	Sheep	Goats	Pigs	Total
Brahmin	18	26	28	25	47	-	126
Chhetri	21	36	49	39	54	-	178
Newar	12	3	15	13	30	10	71
Tamang	5	-	10	10	9	15	44
Kami	2	-	2	4	6	3	15
Damai	1	-	-	2	4	2	8
Sarki	1	-	-	2	3	1	6
Total	60	65	104	95	153	31	448

As in other villages of Nepal, cows are valuable assets and regarded as sacred. Cow milk and urine are essential ingredients for various Hindu rituals. Since most people of Machhegaon have small fragmented landholdings and still use oxen for plowing, households with larger landholdings rarely have tamed oxen. Many people hire oxen for plowing. Local farmers report unanimously that a pair of hired oxen costs 40-50 rupees per day while a male laborer used for digging costs 20-30 rupees per day. Small landholdings prevent the people from raising oxen for plowing.

Milk production in Machhegaon is used for family consumption and sale. All local cows are zebu cows. Local farmers reported that the quantity of milk produced by the zebu cows is relatively low. Most of the zebu cows provide approximately 500 pounds of milk annually. Female water buffalo are raised by farmers who want animals primarily for milking because they lactate more and yield more butter than zebu cows.

Table 4. Yearly Income from Milk Sales (average)

Category	Number of households	Yearly income from milk sale
A	7	NRs. 5040
B	3	NRs. 8640
C	2	NRs.14,400
Total	12	NRs.18,080

* One liter cow and buffalo milk locally costs NRs.8.
A: Households selling 1/2 liter of milk daily.
B: Households selling 2 liters of milk daily.
C: Households selling 5 liters of milk daily.

These households sell milk only six months of the year, and not during the dry season. Ghee sale has disappeared for two reasons--the number of milking animals has decreased due to fodder reduction; and there is adjoining small bazaar, Kirtipur Naya, where a few hotels and tea stalls are located to which villagers sell milk. Milk is much more lucrative than ghee. Early in the morning, the milk-selling households send their children (and sometimes adults) with milk to Kirtipur Naya Bazaar where they sell their milk to hotel owners, tea stall owners, and university students. Many prefer the pure cow and buffalo milk over the dairy milk which does not contain fat and is relatively thinner. The income earned from milk is spent on clothes, soap, cooking oil, salt, spices, and paying school fees.

Goat, sheep, and pigs are raised for meat. Traditional Brahmins and Chhetris eat both goat and sheep but not pigs because they are considered to be polluting animals. Goats, sheep, and pigs are sacrificed during the festivals of Dasain and other household rituals. Consumption of meat helps meet the protein requirements. If cash is needed, the household may sell these animals. Ten households sell their meat animals annually. Their income from the sale of these animals fluctuates yearly, between NRs.500 and NRs.1000. According to the respondents, meat and income from the sale of meat animals have decreased 50 percent during the last few decades due to fodder reduction.

Cattle, sheep, goat, and pigs produce organic manure, the most important constituent of the soil in promoting maximum biological activity. Most households of Machhegaon are very poor and cannot buy chemical fertilizer. Of the sample, 98 percent of the households use organic manure and two percent use both chemical fertilizer and organic manure. As in other villages of Nepal, cow dung is also mixed with water and soil and used for household flooring material.

Fodder Availability

Fodder from Agricultural By-Products. Large ruminant livestock are dependent on agricultural by-products and crop residues. Agricultural by-products include paddy straw, wheat straw, maize stalk, and stubble. Straw, bran, and husk are made from paddy and fed to the livestock. Farmers feed the livestock paddy straw from November to May which provides 20 percent of the livestock fodder. Wheat straw is fed to the

livestock after harvest while it is still green. It constitutes three percent of the total fodder. Sometimes local farmers leave wheat straw in the fields after harvest and later use it for roofing. Millet straw is fed just after harvest, from October to February, and provides ten percent of the total fodder. Some farmers dry it to feed their dry livestock in January and February.

From July through August, green maize stalk is used, providing 15 percent of the total fodder. Farmers also dry it and keep it for the winter. Maize stalk is also used as livestock bedding which helps increase the amount of manure. Farmers also collect the pulse residues and feed their livestock.

Fodder from Cropland Terrace. Cropland is also a major fodder resource. Local farmers extract 20 percent of their fodder from the terrace banks and walls. Terrace banks are mostly found on the paddy terraces. These terrace banks are used by the local farmers to grow pulses and fodder.

Fodder is also extracted from the terrace walls. Paddy, maize, and millet terraces have such walls which are mainly used to grow grass to feed livestock. During the summer, women and children cut the grass grown on the terraces banks and walls. The women and children make small bundle of grass known locally as mutha. One mutha weighs approximately four to five kg. On average, the grass-cutters make ten to twelve muthas per day which are bundled with rope for transport.

Grazing of the cropland after harvest is commonly practiced by the local farmers. Thus, the cropland terrace is a significant source of fodder for sustaining livestock in Machhegaon.

Fodder from Privately Owned Fodder Trees. In Machhegaon, the deciduous trees that grow around the houses are sources of fodder. Ninety-five percent of the sampled households own fodder trees. Green leaves, cut daily from October through June, contribute 15 percent of the total fodder. The fodder trees have considerable nutritive value. Leaf fodder is mainly fed to the milch animals. The productivity of the farmland fodder tree depends on the lopping pattern. The households which do not have private fodder trees depend on forest and public pasture.

Fodder from Pasture. Pasture provides ten percent of the feeding resources in Machhegaon. Two types of pasture are available in the study area: private and public. Four respondents had small plots of private pasture of 40 to 50 ropanis where they graze their ruminant livestock in the summer. Population growth during the past four decades has been responsible for the reduction of private pasture. Private pasture is reduced to feed the growing population. The earlier marginal private pastures have been converted into cultivable lands, leading to erosion of the farming land.

A public pasture of 1000 ropanis is close to the village. Small patches of public pasture of about 40-50 ropanis are found on both sides of the rivulets. In the pasture, livestock are driven for grazing by young children and old people. Grazing animals can also go up to the denuded hills where good grass in the thinning forest is available.

Fodder from Forest. Forest provides at least 17 percent of the total fodder. The economy of Machhegaon is predominantly based on biomass extraction from the neighboring forest. The significant use of animal manure is made possible through the extraction of fodder from the nearby forest.

Fodder trees, undergrowth, shrubs, bushes, and treelets are available in the forested area. From November through June, villagers used the following trees: falant (Quercus glauca Thunb.), gogan (Sauruja nepalensis D.C.), khasru (Quercus semi carpifolia), sano banjh (Quercus incana Roxb.), and musure katus (Castanopsis tribuloides A.D.C.).

Participation in Planting Fodder Trees

Almost all of the local farmers have shown a deep interest in planting fodder trees on their farmlands. Farmers are aware of the potentials of fodder trees for economic gain as well as for soil conservation, protection from erosion, retention of moisture, and provision of shade.

The farmers of Machhegaon have planted the following fodder trees: kutmiro (Litsea polyantha) lapsi (Chaerospondias axillaris Roxb.), bakaino (Melia azedarach Linn.), bans (Bambusa sp.), khanew (Ficus cunia Burch-Ham), paiyun (Prunus cerasoides D. Don.), nigalo (Arundinaria intermedia), musure katus (Castanopsis tribuloides), kabhro (Ficus infectoria Roxb.), chuletro (Brassiopsis hainla), khasreto (Ficus nispida Linn.), champ (Michelia Champaca Linn.), and hatipaile (Pterospermum acerifolium Will.).

Ninety-five percent of the local farmers have planted these trees for the last 20 years. All this clearly shows that farmers' interest in planting fodder tree is praiseworthy. Despite the people's eager interest in planting fodder trees, the Department of Forestry has not encouraged the people to plant fodder trees. A nursery was established in 1979 to distribute seedlings to the local farmers. Farmers told the researcher that it has distributed only nonfodder trees (except Lahare pipal). The researcher could not find out why the nursery is distributing nonfodder trees because the nursery guard is illiterate. Later, the researcher found out that local people are not consulted in nursery activities. Had the nursery provided new fodder tree seedlings to the farmers, their participation would certainly have increased.

Present Fodder Crisis in Machhegaon

Reduction of Private Pasture. Older respondents said that four decades ago the population of the village was only 500 and almost all of the households had private pastures. Most of the private pastures have been disappeared. One villager remarked:

> I was the only son of my father. But later when I was married, I was blessed with nine sons and two daughters. I had more than three hundred ropanis of land with enough private pasture lands. Later when my sons were married, they separated from the Mul Ghar (ancestral house) and now only the kanchho (the youngest son) is residing with me. As all my grown up sons separated, my land was fragmented into

smaller holdings. My sons converted the private pasture areas, into cultivable lands to feed their hungry children. Hence, today me and my sons are devoid of private pastures.

Overgrazing of Public Pasture. Overgrazing is adding to the fodder scarcity. Ruminant livestock are left to graze in the public pasture, which is too small to support the livestock population of the village. This overuse has a direct consequence on the pasture environment. When the public pasture is overgrazed, it loses the capacity to resist the flow of rain water. This results in the loss of alluvial soil of the pasture land and a reduction in its fertility. Consequently, the carrying capacity of the pasture is further reduced. In Machhegaon, stocking, ownership and agronomical measures have not been taken to ensure proper management of the public pasture. Hence, overgrazing of the public pasture has constituted another major factor in causing the present fodder crisis.

Deforestation and Fodder Problems. Respondents reported that Machhegaon had densely forested land until 1933. Prior to that year, various wild animals, such as tiger, leopard, deer, rabbit, and pheasant were abundant because of the dense forest. These are disappearing due to the rapid deforestation.

Before the regime of Chandra Shumshere, an ex-Rana Prime Minister of Nepal, the forest of Machhegaon was protected by the government, mainly for hunting purposes. Forest guards were appointed by the government. local people were strictly prohibited to enter into the forest to gather fuelwood, cut timber, or collect fodder. Nonetheless, local people secretly went, even at night, to gather fuelwood, timber, and fodder.

Deforestation in Machhegaon began after the earthquake of 1933, in which many houses in Kathmandu Valley collapsed. The demand of timber and firewood for the general public increased dramatically. Juddha Shumshere, then Rana Prime Minister of Nepal, allowed the general public to fell trees in an unrestricted manner. This led to the indiscriminate ravaging of the forest for timber.

There is a saying that one could then reach the top of Champadevi hill by walking on the branches of trees from Machhegaon. Although this massive deforestation took place some fifty years ago, this process continued until 1948. After 1933 forest guards were no longer appointed. Now the area is thinly forested with few species of trees.

Most of the forest has already been depleted because of heedless deforestation. Now the remaining undergrowth, shrubs, bushes and treelets are haphazardly lopped by the farmers for feeding their livestock. The remaining fodder treelets are not tended for future use. The villagers believe that fodder from the forest is common property.

Impact of Fodder Crisis on the Local Economy

Farmers of Machhegaon are now aware of the vicious cycle caused by the fodder crisis. Fodder from private pasture, public pasture, and the forest has declined considerably because of population growth, overgrazing, and uncontrolled lopping. Consequently, the number of live-

stock per household has also decreased, resulting in the decline of manure production, which adversely effects the agricultural yield of the village. The decline of agricultural productivity means less agricultural by-products to use for feeding.

Local farmers said their milk yield has declined by 50 percent in the past few decades because of fodder shortages. Ghee sale has been almost nonexistent, and milk sales are declining every year. At present, livestock are not fed enough to give the desired yield. Many households used to produce enough ghee for export to Kathmandu--this practice has all but disappeared. One older respondent remarked:

> Fifty years ago I had tamed 4 milch cows and 5 milch buffalos when there was the abundance of fodder resources. I used to produce enough ghee and export it to Kathmandu. Cash earning through ghee sale was very satisfactory and this cash was spent on household expenditure. But I have two dry cows and one milch buffalo and ghee sale has been a concept of day dream. Now sometimes I have to buy Dalda Ghee from Kathmandu city to meet my oil requirement.

The sources of income for many households have diminished dramatically. The practice of selling animals has declined. Previously, local farmers sold goats, sheep, and pigs but now they can no longer raise these animals and have lost potential income. The production of wool for cash is now insignificant. Although a few households are still selling milk, this practice has also declined. Many of respondents are buried deeper into debt every year. A few households report they are suffering from malnutrition. Their economy has been drastically weakened by the reduction of forest and pasture.

SUMMARY

Nepal has an agrarian economy supported by the livestock farming. Farmers of Nepal domesticate livestock for milk, meat, fertilizer, tillage, for its cash and cultural values. The agricultural economy of Nepal can survive only with the enrichment of livestock farming. However, livestock farming can continue only if fodder is abundant. Fodder is hence one of the most important components of livestock development and agricultural productivity in Nepal.

In Nepal, fodder sources are of two types, private and public. Fodder from agricultural residue, cropland terraces, terrace banks and walls, and privately owned fodder trees are private sources of fodder. Public sources include forest foliage and public pasture.

Uncontrolled population growth has been the primary cause for the reduction of private pasture. Reduction of private pasture has led to the overgrazing of public pasture and consequently aggravated many serious ecological problems. Fodder from the forest has declined through intense deforestation. Reduction of fodder means a reduction of livestock. When the number of livestock decreases, the quantity of manure also decreases. This results in the decline of agricultural

productivity--and people will have less to eat. The rural population also loses income from livestock farming and suffer from malnutrition. Thus the fodder scarcity affects the ecosystem and the survival of both humans and the livestock population to an alarming degree.

Since fodder from forest and private and public pasture is disappearing, local farmers have started to show interest in planting fodder trees on their farm lands. Nonetheless, there is still a lot to be done by the Department of Forestry to encourage local farmers' participation in planting fodder trees.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations have been made to improve the fodder situation:

1. The local nursery should distribute seedlings to farmers to encourage the planting of fodder trees on farmland. On a national level, the Department of Forestry should provide more incentives to farmers.

2. The local farmers should be given training for planting and producing improved hay.

3. Environmental education should be provided to rural people in order to reverse their fundamental ignorance of the value of the forest as a source of fodder. Local panchas, schoolteachers, and ecologists should organize village meetings on economic and ecological values of fodder trees.

4. Regulations should be strictly enforced by the Department of Forestry for the protection of the forest.

5. Population control measures should be introduced.

6. The Department of Livestock Development and Animal Health should introduce a pasture development program in the study area as early possible.

7. The Department of Livestock Development and Animal Health should provide cows of improved variety which may help local farmers to supplement their declining income and family consumption of milk.

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