WOMEN IN LAND MANAGEMENT AND CONSERVATION: A CASE STUDY FROM THE MIDDLE HILLS OF NEPAL

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Introduction

There are various categories of agricultural land use such as cereal crops, vegetables, cash crops, fruit orchards, agroforestry, and commercial farming or subsistence farming; the land-use choice depends on farmers' preferences, market demand, and resources at the farmers' disposal. In Nepal, both men and women are involved in resource management and conservation. Women participate actively in soil management and conservation and watershed management activities (APO, 2000). Often men conduct tasks such as clearing the fields, terracing, and tilling the soil while women are involved in manure transportation and spreading, weeding, and hoeing with light tools (Ekop, 2001; Hjorth, 2000; Pandey, 1992). Women collect, process, transport, and apply all organic material for soil-fertility management. Caste, age, education, family size, position in the family, and family support are some of the socio-cultural factors that influence women's involvement in resource management (UNDPA, 2001; Bajracharya, 1994).

Women play a dominant role in the livelihood systems of the mountains of Nepal. Traditionally, mountain women have greater independence in decision making and more freedom of movement than women in the lowlands (Gurung, 1998). As they take an active part in resource management, it is imperative to understand their roles, their indigenous knowledge on resource management, their perceptions of land management, their constraints, their involvement in planning and implementation of watershed management programmes, and the opportunities linked to these factors. The level and quality of land husbandry determines land resource conservation and hence the productivity of the soil. The management of the land depends on cultural values, knowledge of the quality and limitations of the land, awareness of the consequences of improper land use, and perceptions of different land-use practices and their effects.

Selection of the study area

The Galaundu Phokhare Khola (GPK) sub-watershed of Dhading District was selected as the study area (Figure 1). Women comprise almost 47 percent of the total population. The area suffers from soil erosion and loss of soil fertility. A study conducted by the Nepal Agroforestry Foundation (NAF) in 1999 has identified ignorance of soil-erosion problems and suitable conservation measures as two major problems in the area. Improper farming practices, low quality of manure and compost, and improper land use are other important problems leading to low agricultural production and food insufficiency.

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General background of the study area

The GPK sub-watershed is located in Dhading District in the central development region of Nepal. The district represents the typical mid-hills of the country and is located approximately 62 km to the west of Kathmandu.

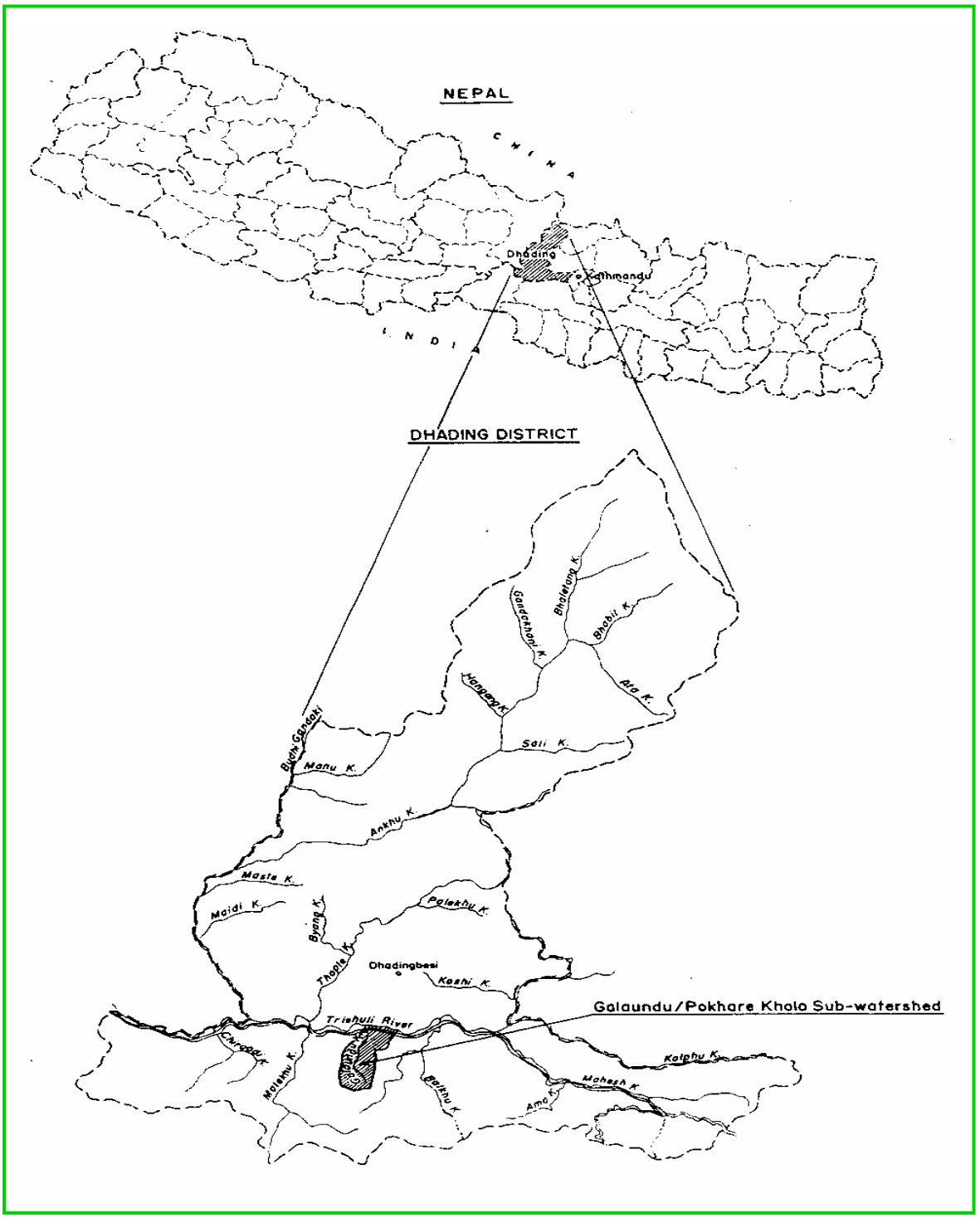

Figure 1 Galaundu-Pokhare Khola Sub-watershed

Geographical and biophysical setting of the area

The total area of the watershed is 28.73 km^2 (2 873 ha). It lies between latitude 27^O 14'N to 28^{O}14' N and longitude 84^{O}0' to 85^{O}1'E (NAF, 1999). It consists of two main streams — the Galaundu Khola and Pokhare Khola. Based on the boundaries of these two streams and altitude, the watershed encompasses the wards of two village development committees (VDCs) namely Gajuri and Pida. The climate of the area is dominantly sub-tropical. Based on altitude and climatic parameters, the area can be classified into four agroclimatic zones. The average annual rainfall is 1 370 mm occurring over 104 rainfall days (NAF, 1999). Based on the NAF classification and reconnaissance surveys, the study area was divided into two zones to understand the general difference between the two zones, such as cropping patterns, crop productivity, livestock rearing, and soil-fertility management.

Infrastructure

Only the northern part of the watershed is connected with a paved road (about 4 km of the Prithvi highway) while the other parts of watershed have only foot trails. The construction of a road navigable by vehicles is underway in some parts of the watershed. The watershed stretches from north to south and it takes almost eight hours of walking to reach the southern ridge of the watershed. A number of small irrigation channels exist. Most of them are managed by farmers. Only one is government managed. There are altogether eight schools (two secondary and six primary), four in each VDC.

Socio-economic characteristics of the population

The watershed has approximately 890 households. The total population of the area is 5 305, of which 52 percent are men and 48 percent are women. The population growth rate for the district is 1.97 percent (CBS, 2001).

Caste composition

Nepalese society is divided into several social strata according to the caste system. There are four castes namely, Brahmins, Chhetris, Baishyas, and Shudras. Brahmins and Chhetris (B/C), occupy the higher strata in the social hierarchical system (38 percent of the total population). Baishyas occupy the third strata. Besides agriculture, the Shudras have occupational castes such as blacksmiths (Kami), tailors (Damai), and cobblers (Sarki).

Because of social norms, marriage between the B/C is still not easy, but the two castes share many things in common, for example language, customs, festivals, family structure, and gender roles. Variation is found among ethnic groups as well. The B/C mainly live in the lower parts of the watershed. The Chepang, which are one of the most disadvantaged ethnic groups, mostly inhabit the upper zone of the Galaundu Watershed. The Rai are found exclusively in Pokhare Khola microwatershed (bottom of the lower zone) whereas the Mijar or Sarki mostly inhabit the upper part of the same microwatershed.

Household size and population structure

The mean household size for the watershed is 6.86, which is higher than the district mean household size of 5.4 (CBS, 2001). The highest mean household size was among the ethnic groups: the Chepang, Magar, and Rai had mean household sizes of 8.59, 8.0, and 7.9 respectively.

Occupational structure

All the households had agriculture as their main occupation. Among the service sector (n = 20), 60 percent were Brahmins and Chhetris followed by ethnic groups (30 percent) and Newars (10 percent). None of the lower castes were in service. In contrast, waged labour occurred more among ethnic groups (52.8 percent, n = 21) followed by upper castes (19.04 percent) and Newars and lower castes (14.29 percent). Occupational work was limited only to lower castes.

Educational status

The total population of the surveyed household was 926 persons; 50.65 percent (469) of the total population was female and the rest 49.35 percent (457) was male. The usual age for starting school was 6 years. Thus for the total population, the literacy status was computed only for the population older than 6 years. Excluding the children below 6 years of age, the literacy status for the rest of the population (n = 790) is given in Table 1.

Table 1. Literacy status of the respondents

Literacy status	Male (%)	Female (%)	Total (%)
Illiterate	13.42	20.51	33.93
Literate (no formal school attendance)	7.47	7.59	15.06
Primary school level	19.24	15.32	34.56
Secondary school level	8.61	4.43	13.04
Higher education (after secondary school)	2.66	0.75	3.41

Source: Field Survey (2002) n = 790 (406 male; 384 female)

Out of this population, 300 men (37.97 percent) were educated whereas only 222 (28.1 percent) women were educated. More men were involved in higher education than women. The lower figure for women in secondary and higher education can be attributed to male dominance in society. Most of the children, both male and female, attend schools. A higher percentage of people are illiterate in the upper agroclimatic zone than in the lower zone. The number of both illiterate men and women was significantly higher ($p < 0.01$) in the upper zone than in the lower zone. Even among the literate category, the number of women in the lower zone is significantly lower than in the upper zone ($p < 0.01$).

Income and food sufficiency

Agriculture is the primary occupation of the households and it is mainly subsistence oriented. Commercial vegetable cultivation was only found in the lower zone, which has access to irrigation and markets like Chabise, Dhodeni, Dharapani as well as in Gangrang and Hatiya. The majority of households in the lower zone and a high proportion of households in the upper zone earn less than NR10 000/year[2] (45.1 percent and 79.1 percent respectively) (Lobre, 2002). Between the two agroclimatic zones, food deficit for longer periods was more prevalent in the upper zone. Surplus production for sale was very high in the lower zone (21 percent, n = 105) compared to the upper zone (3.3 percent, n = 30). In the upper zone, maize is the dominant crop followed by millet. Most of the fields are sloping terraces, which are more prone to erosion than level terraces.

[2] US$1.00 = NR72 (June 2004)

Table 2. Food sufficiency of the households in the upper and lower zones

Agroclimatic zones	Months of food sufficiency per year (% of households)				
	Less than 3 months	3 to 6 months	6 to 9 months	Whole year	Surplus for sale
Upper zones (n = 30)	0.00	43.3	30.0	23.3	3.3
Lower zone (n = 100)	0.00	14.3	17.1	47.6	21.0
Total (n = 135)	**0.00**	**20.7**	**20.0**	**42.2**	**17.0**

Source: Field Survey (2002)

Various reasons were given by the respondents for food sufficiency and food deficit (Table 2). Low yield (14 percent) and small land-holdings (13 percent) are the key reasons for food deficit given by the farmers. The households having surplus production for sale cited good yield (7.4 percent) or small family (3.0 percent) as reasons. Almost 52 percent of the households did not respond to this variable.

Land use and agricultural systems

Two types of agricultural land exist in the study area: *Khet* (irrigated land) used for paddy cultivation and *Bari* (non-irrigated) used for mostly maize and millet cultivation. The other *Bari* lands are known as *Pakho Bari* (sloping terraces, steeper, and drier) and the *Kharbari* (marginal land used to grow thatch grass and other agroforestry species).

The type of agricultural land determines not only the cropping pattern but also cropping intensity and crop diversification. The total area of agricultural land for the surveyed households was 2 339.50 *ropani* (117 ha), which included *Khet* (level terraces), *Gharbari*, *Pakho*, and *Kharbari Bari* (including *Gharbari* and *Pakho Bari*); this accounted for 57.5 percent of the total area. *Khet* land accounted for 37 percent of the total area while *Kharbari* accounted for approximately 5.5 percent of the total agricultural land. The dominant annual cropping patterns found in *Khet* and *Bari* land were:

- Irrigated *Khet* (*Tari*): rice-wheat, winter maize, mustard, potato, vegetable-rice
- Rain-fed *Khet* (*Phant*) : rice-fallow-maize, legumes
- *Bari*: maize-millet-fallow

Land use

The main types of land in the watershed are sloping terraces, level terraces, forest land, shrubland, fans, and river courses. Forests are mixed and dominated by sal (*Shorea rubusta*) in the lower zone and *kattus* (*Castanopsis* sp.) in the upper zone (Lobre, 2002; Field Observation, 2002). *Bari* land, fans, and irrigated land occupy approximately 32, 8, and 5.9 percent respectively of the total land area. The watershed has moderate to steep slopes ranging from 3 to more than 60 percent. Over 60 percent of the area has slopes ranging from 30-60 percent. Approximately 20 percent of the land has steep slopes exceeding 60 percent. About 11 percent of the area has slopes ranging from 15-30 percent (NAF, 1999).

Land-holdings and ownership

Land-holding is higher in the upper zone (0.96 ha) than in the lower zone (0.84 ha). Per capita land-holding in the upper zone and lower zone was 0.15 and 0.13 ha respectively. The majority of the households (40 percent) had three parcels, 28.1 percent had four parcels, 17 percent had two parcels, 8.1 percent had five parcels, and very few (< 3 percent) had more than six. The usual cropping /land-use pattern is *Gharbari* (the *Bari* adjoining the household area), *Bari*, and *Khet*. Ownership of *Bari* land was lower; more than 80 percent of the surveyed households owned *Khet* land.

Main crops and their productivity

Maize is grown in both the upper and lower zones. Rice is the second crop occupying 32.64 percent of the total cropped area. Oil crops and legumes are grown mostly in the lower zone. Mustard is grown as an oil crop. It needs irrigation and is therefore grown in the lower zone, where irrigation water is available especially in Chabise, Bhadaure, and Keureni villages. Potato is grown in both the upper zone and lower zones. For millet and wheat, average yields were higher. Average potato yields were lower than the national average. Potatoes have a high moisture requirement and farmers grow them mostly as a rain-fed crop on *Bari* land in the upper zone (but also on *Khet* land in the lower zone). The average productivity of rice in the lower zone is significantly higher than in the upper zone.

Livestock rearing

Livestock rearing is one of the most important enterprises in the Nepalese farming system. Cattle, buffalo, goats, and poultry are the most common farm animals. The culture prohibits many castes from keeping pigs. Therefore pigs are mostly reared by Chepang, Magar, and Rai among the ethnic groups. The average number of cattle and buffalo per household was higher in the upper zone than in the lower zone while the average number of goats and poultry was higher in the lower zone. Farmers usually graze cattle and goats in the nearby forest if they have open access to it. If it is community forest, free grazing is not permitted. Buffaloes are always stall-fed. Most of the households (78.7 percent) collect fodder from the forest during winter.

Institutions working in the area

Local institutions comprise: Livestock and Agriculture service centres, Women's Development Division, Unit Forest Office, Nepal Water for Health (NEWA), and Support Activities for Poor Producers Nepal (SAPROSC/N); they operate in other VDCs, including Gajuri and Pida.

Also, various community-based organizations are found in the study area, which include forest user groups, farmers' groups, savings and credit groups, and women's groups. Most of the farmers' groups, savings and credit groups, and women's groups are formed by NAF and SAPROSC/N. Women's groups were also formed by the Women Development Division (WDD) under the Ministry of Local Development, giving more emphasis to women's empowerment through savings and credit mobilization among women.

Indigenous land management practices

Terracing

Terraces are embankments of earth or stone built across the slope to check erosion (Ojha, 1997). Farmers use terraces mainly to dispose of excess water from cultivated lands safely, to prevent erosion from runoff. Level bench terraces are constructed and maintained where water control is of paramount importance to grow paddy. The vertical interval for terraces on *Khet* land was lower (3 to 4 feet). This practice began in 1992 after the area experienced extremely heavy floods and a landslide that caused heavy loss of both *Khet* land along the riverside and *Bari* land in the upper regions. In these places, stone terraces replaced the ordinary level terraces, especially along the riverside where the floods deposited heavy stones and pebbles.

Growing plants on the terrace risers and bunds

On the ricefield bunds, there is a tendency to grow legume crops, especially black gram and soybean. On the terrace risers in the uplands, different fodder trees and forage grasses are grown. The most common indigenous species are *khanayo* (*Ficus nemoralis*), *pakhuri* (*Ficus glaberima*), *gayo* (*Bridelia retulosa*), *tanki* (*Bauhinia pupurea*), *kabhro* (*Ficus lacor*), *dumri* (*Ficus racemosa*), *pipal* (*Ficus religiosa*), and *dabdabe* (*Garuga pinnata*). The most commonly promoted forage species are Napier also known as elephant grass (Pennisetum purpureum), NB 21 (Pennisetum spp.), *jai*, and *gajuma*. Common exotic fodder species are mulberry (*Morus alba*) and ipil ipil (Leucaena leucocephala). The indigenous species most commonly found on terrace risers are *tanki*, *khanayo*, and *gideri*.

Cutting or scraping of terrace risers

Terrace riser cutting before rice transplanting on the lowlands and before planting of maize in the uplands is a regular practice. During the year, weeds grow on the terrace risers that harbour rats, squirrels, and insects. Farmers spread the scraped soil and weeds on the field. The terrace embankments are rich in plant nutrients. Because of the weed growth on the embankments, the washed out manure from the terraces collects on the terrace risers. Upon drying, farmers incorporate the weeds as green manure.

Constructing stone walls

Construction of stonewalls on the terrace risers in the uplands is done to control soil erosion. After every rainy season or monsoon, the farmers repair the bunds and the terrace risers, and build stone walls. Farmers consider this more important to protect their soil than maintaining waterways.

Maintaining waterways or spillways and canals

Maintenance of waterways and canals is also done regularly. Especially during the rainy season, men are involved in the management of spillways in *Khet* and *Bari* land for the safe disposal of water flow so that it does not damage the terraces. Runoff management and diverting surface runoff from the forest after the first monsoon is also common among the farmers.

Crop rotation

Maize and millet are the dominant crops in the uplands while in the lowlands rice is the main crop. Farmers keep the land fallow during the winter due to lack of irrigation water. Very few households with access to water grow vegetables on the *Bari* land. Potatoes are grown mostly on *Bari* land. In the lowlands, however, different cropping patterns are observed. In the *Khet* lands of the lower zones, farmers usually grow winter maize after the rice.

Use of farmyard manure, compost, green manure, and inorganic fertilizers

Farmyard manure (FYM) and compost are the main sources of plant nutrients for most of the hill farmers. Compost is thus loosely synonymous with FYM. In the lower hills, where access to forest resources is often severely constrained, animals are dependent more on crop by-products as a source of feed (Balogun et al.; 1988 cited by Suwal et al.; 1991). Of the plant species traditionally used by farmers for green-leaf manuring, *asuro* is among the species with the highest nutrient contents (Subedi, 2002). Farmers use manure to increase production. They also know that manure application helps in conserving moisture, makes the soil friable, and facilitates ploughing, But the added fertilizers do not give added benefits anymore.

Residue management

Straw and stover are used as animal feed, as roofing materials, as fuelwood, and for other household purposes. Wheat straw is more commonly used as roofing material. Farmers use rice straw, maize, and millet stalks as animal feed during the dry season when forage and fodder are not easily available. Burning makes the fields appear cleaner. Oil crops such as mustard are uprooted and the dried plant parts are either burned or fed to the livestock. Very few crop residues and crop by-products are returned directly to the soil.

Soil-fertility management

Soil-fertility management is one of the most common land management practices. Before chemical fertilizers were introduced to Nepal, farmers practised indigenous soil-fertility management using local resources like FYM, oil cake, compost, and crop residues as the sources of plant nutrients. Slight differences between men and women's applications were noticed (Table 3).

Table 3. Fertilizer preferences/ranking by gender

Type of fertilizer	Preferences of men (n = 89)	Preferences of women (n = 46)	Preferences of both men and women (n = 135)
Goat manure	1	2	1
Cattle manure	2	3	2
Buffalo manure	4	5	4
Poultry manure	3	1	3
Mustard oilcake	6	6	6
Compost	7	7	7
Chemical fertilizer	5	4	5

Source: Field Survey (2002)

Note: n = number of responses

The reasons for the preference for a particular manure/fertilizer were discussed with the women. Goat manure was given the second priority and cattle manure, the third. As experienced by farmers, goat manure, being relatively dry and "granular", decomposes slowly. *Bari* land has limited soil moisture availability, and this leads to slow nutrient release of the manure. Cattle manure is also slow in nutrient release but it is considered to be of higher quality than buffalo manure. Buffaloes are mostly stall-fed whereas cattle are grazed. Farmers perceive the difference in manure quality because of the different feeding practices and materials used in stall feeding and grazing. Trained farmers found compost manure to be of very good quality.

Fertilizer use in Khet *land and* Bari *land*

The amount of manure applied to the fields varies depending on the priority of the crop species grown, the distance of fields from the homesteads, the availability of organic matter and labour, the fertility status of the soil, and the availability of chemical fertilizers (Balogun et al., 1988 cited in Suwal et al.; 1991). Not all the households (77 percent) use inorganic fertilizer on *Khet* and *Bari* land in the upper region. Although significant difference in the use of inorganic fertilizer used in *Khet* and *Bari* land was not found, chemical fertilizer use on *Khet* land in uplands and lowlands was significant. In the upper zone, which is remote from the market where chemical fertilizers can be bought, farmers use less chemical fertilizer than in the lower zone.

Fertilizer use and distance to the parcel of land

In the study area, the average number of parcels of land per household is three, with a minimum of one and a maximum of eight. Farmers had generally more parcels of *Bari* land than *Khet* land. *Khet* land is usually located at a greater distance from the homestead than *Bari* land. The time required to reach *Khet* land varies from one minute to a maximum of five hours. *Gharbari* is usually the small piece of land adjacent to the homestead. The maximum time to reach *Bari* land ranged from one hour (to the nearer *Bari*) to two hours (for the *Bari* located at a distance, parcel 2) when farmers had more than one parcel of *Bari* land. *Bari* land is usually located nearer to the homesteads than *Khet* land (in most of the cases); farmers use more manure on *Bari* land (Table 4).

Table 4. Fertilizers used on *Khet* and *Bari* land

Parameters	Inorganic fertilizer		Organic fertilizer	
	***Khet* land**	***Bari* land**	***Khet* land**	***Bari* land**
% of households using fertilizer	93	99	93	100
Average (kg/ha)	375 kg/ha	220 kg/ha	5.5 t/ha (29)	14.5 t/ha (11)
Minimum (kg/ha)	0 kg/ha	0 kg/ha	0 t/ha (0)	0 t/ha (0)
Maximum (kg/ha)	1700 kg/ha	1000 kg/ha	30 t/ha (60)	100 t/ha (200)

Source: Field Survey (2002) n = 135; figures in parentheses indicate manure used, *doko* per *ropani* (1 *ropani* = 0.05 ha).
Note: *Doko* is a local basket made of bamboo for carrying manure and other items. One *doko* is equivalent to approximately 25 kg of manure.

In a study by Balogun et al. (1988, cited by Suwal et al., 1991), in the western hills of Nepal, an average application rate of 20-28 t/ha FYM or compost was common in maize- millet systems (*Bari* land), and 0-23 t/ha in a rice-based cropping pattern (*Khet* land).

Fertilizer use, livestock numbers, and land size per household

Cattle, buffalo, and goats are tended by most of the households. Statistically, no correlation was found between livestock number and total manure kept on the *Khet* and *Bari* land. However, with increasing numbers of livestock, more manure is being used on *Bari* land than *Khet* land.

Fertilizer use and land-holding

The mean land-holding size is 0.87 ha. The average size of *Khet* land is 0.32 ha and 0.5 ha for *Bari* land. The average use of inorganic fertilizer per *ropani* is 30 kg (0.6 MT/ha); the average use of organic manure is 41 *doko* per *ropani* (20.5 MT/ha). The values differ between *Khet* and *Bari* land. The correlation between the use of manure/fertilizer and land size is not statistically significant. A negative trend was also found for the use of inorganic fertilizer on *Khet* land and *Bari* land. Farmers use more chemical fertilizer on *Khet* land. Also, manure promotes weed growth. The use of manure per unit of *Bari* land also shows non-significant, weak negative correlation.

Indigenous soil classification

Farmers have distinct and systematic criteria for soil classification (Table 5). Soil is differentiated on the basis of colour, topsoil texture, soil depth, and consistency (Regmi, 2001; Tamang, 1992; Shah, 1991). Several studies have identified indigenous soil-classification systems used by farmers, especially the men.

Table 5. Soil classification based on soil colour

Soil class	Colour	Texture	Moisture retention	Ploughing	Manure needs	Fertilizer needs	Production	Remarks
Kalo	Black	Loamy	High	Easy	Low	Low	Very high	Best for the crop
Rato	Red	Clayey	Low	Difficult when dry	Medium	Medium (lowest)*	High	Good with sufficient moisture
Phushre or Phasphase	Grey	Sandy loam	Very low	Very easy	Very high	Very high	Lower	Problem of white grubs, susceptible to erosion
Pahelo	Yellow	Clayey	--	Difficult when dry	Medium			
Seto	White							

Source: Field Survey (group discussion) (2002) * Tamang (1992) found it is lowest in red soil.

According to Shah (1991), the colour categories noted by the farmers are a partial indication of organic matter content in the soil. At higher carbon content, the soil colours are usually darker, the moisture content and cation-holding capacity are higher, and the structural stability of soil aggregates is greater. In addition, the very old soils in Nepal are deeply weathered and contain significant portions of iron (Fe) and aluminium (Al).

Soil texture involves the size of individual particles and arrangement of soil particles into groups or aggregates. The farmers' textural classifications are used primarily for crop selection and soil management. Heavy-textured (*Chimte*) soils require higher labour inputs than light-textured (*Domat*)

soils for ploughing and other agronomic activities. The soil classification used by women based on colour and texture has close consistency with the scientific classification as well (Table 6).

Table 6. Soil classification based on soil texture

Soil class	Moisture retention	Texture	Ploughing ease	Manure needs	Fertilizer needs	Production	Remarks
Chimtey	High, hard when dry	Clayey (fine)	Very difficult	Very high	Medium	Medium to high	
Dumath	Adequate	Loam		High	Very high	Good	Good for many crops
Balaute	Very low	Sandy	Very easy	Very high	Higher	Medium	Good for root crops
Dhunge	Least	Gravel	Difficult	Highest	Highest	Very low	Marginal land
Pangaya mato		Sandy loam				Low	High erosion

Source: Field Survey (group discussion) (2002)

Farming activities and gender

The roles and responsibilities of men and women and their decision making in various activities are guided by many different factors such as caste, culture, educational level of the household members, and type of family (whether nuclear or joint).

Gender-wise distribution of farming activities and their implications on land management

Although men and women do a lot of farm work together, there are differences in some activities. Ploughing, terrace construction and maintenance, construction, repair and maintenance of irrigation canals and waterways are the domain of men. Women mostly carry out bedding-material management such as spreading bedding materials and cleaning the shed. Bedding-material management by men is common in households with small families, in households with few women or when the women have small babies. Women mostly collect fuelwood.

Seasonal distribution of farming activities according to gender

Seasonal distribution of farming activities according to gender reflects the relative workload between men and women and their free periods during the season (Table 7). The periods when women are less occupied are important for the designing of extension activities that target women. Women mentioned that while men are busy during the peak seasons of farming activities, women are busy throughout the year. Land preparation includes activities such as ploughing, shaping the land, terrace-riser cutting, and repairing the terraces and bunds. Exchange of labour is practised for land preparation during maize planting and rice planting. In areas where no winter crops are grown, the women are relatively free during the winter (mid-January to mid-February).

Table 7. Seasonal distributions of farming activities for men and women in different agroclimatic regions

Season	Farming activities	
	Upper zone	**Lower zone**
Mid-May to mid-June (*Jestha*)	Maize weeding: *f* Rice nursery bed establishment, land preparation for main season rice: *m*	Maize and upland rice weeding: *f* Rice nursery bed establishment, land preparation and irrigation management for main season rice: *m*. Fuelwood collection: *f*
Mid-June to mid-July (*Ashar*)	Main season rice transplanting, seed bed preparation of finger millet, harvesting of spring paddy: *f*	Harvesting of spring paddy, maize weeding: *f* Land preparation and irrigation management for main season paddy: *m* Transplanting of main season rice: *f* Threshing of spring paddy and transporting of the harvest: *m*
Mid-July to mid-August (*Shrawan*)	Finger millet transplanting, rice weeding: *f* Maize harvesting begins: *m, f*	Transplanting of main season rice (late transplanting), millet transplanting: *f* Vegetable planting: *m, f* Threshing of spring paddy and transporting of the harvest: *m*
Mid-August to mid-September (*Bhadra*)	Maize harvesting, rice weeding: *f* Buckwheat, black gram planting: *m, f*	Maize harvesting, vegetable weeding, vegetable sowing (bean), fuelwood collection: *f* Marketing of french beans, egg plant, ball pepper, gourds etc: *m, f*
Mid-September to mid-October (*Ashwin*)	Millet weeding, rice weeding: *f* Fuelwood collection: *f*	Harvesting and marketing of vegetables: *m, f* Fuelwood collection: *f*
Mid-October to mid-November (*Kartik*)	Early rice and millet harvesting, vegetable planting on *Bari* land, fuelwood collection: *f* Rice threshing, transporting the harvest: *m*; land preparation for vegetables: *m, f*	Early rice harvest: *f* Fuelwood collection: *f*
Mid-November to mid-December (*Mangshir*)	Rice and millet harvesting and threshing: *f* Transporting the harvest: *m* Fuelwood collection: *f*	Harvesting of rice: *f*; transporting harvest, threshing of rice: *m*; wheat and vegetable planting: *f*; marketing of paddy: *m, f* Fuelwood collection: *f*
Mid-December to Mid-January (*Poush*)	Collecting thatch grass, millet threshing: *f* Fuelwood collection: *f*	Threshing, processing of rice: *m, f* Fuelwood, thatch grass collection: *f*
Mid-January to mid- February (*Magh*)	*Bari* land ploughing, terrace riser cutting: *m*; manure carrying: *f* Fuelwood collection: *f*	Manure carrying: *f* Fuelwood collection: *f*
Mid February to Mid-March (*Falgun*)	Land preparation for maize, terrace riser cutting: *m*; manure carrying: *f* Maize planting: *m, f;* Fuelwood collection: *f*	Land preparation for winter maize: *m* Winter maize planting: *m, f* Manure carrying: *f* Fuelwood collection: *f*
Mid-March to mid-April (*Chaitra*)	Land preparation for spring paddy: *m* Maize planting, maize weeding, manure carrying, spring paddy transplanting, fuelwood collection: *f*	Land preparation for spring paddy and maize: *m*; manure carrying: *f* Fuelwood collection: *f*

Source: Field survey (2002) Note: Months in parentheses are months according to the Nepali calendar.
m: activities mostly done by men; *f*: activities mostly done by women; *m, f*: activities done by both men and women; shaded cells indicate periods when women have less work on the land.

As the winter is a relatively free period for most of the women, any extension activities targeting women's groups can be organized during this period to encourage their increased participation and improve the effectiveness of the extension programme.

Access to resources and decision making related to resource use

Access to means of production is important to determine whether women receive a fair share of the various inputs necessary for agricultural production. These include land, water, and irrigation; drainage facilities; agricultural credit; agricultural inputs; extension services; and transport. Decisions regarding the management of the household along with farm and livestock production are affected by control over the resources. Analysis of resource control indicates the degree of decision making concerning particular aspects of agriculture. The division of labour between genders thus affects the way households and local resources are allocated (Bajracharya, 1993 cited by Bajracharya, 1994).

Land

In Nepal, agricultural land titles are mostly awarded to the male members unless there is a female-headed household. The allocation of land ownership to male family members restrains the women from free access to and use of the land and limits their decisions regarding land management, such as the crops to plant or which agroforestry species to grow. Approximately 86 percent of the men and 85 percent of the women feel that access to land is either exclusively or predominantly reserved for the men. Almost 94 percent of the men and 93 percent of the women feel that decisions are either exclusively or predominantly made by men.

Irrigation

Women have better access to irrigation water as 62 percent of women said both men and women have access to irrigation water. However, the majority of the men (60 percent) said that men either exclusively or predominantly have access to irrigation resources and only 37 percent of the men felt that both sexes have equal access. For reasons embedded in the local culture, activities related to irrigation are men's responsibilities, with some exceptions in vegetable-growing areas, where women are also involved in irrigation. Activities include canal repair and maintenance, maintaining the waterways and spillways, draining excess water, and distribution of water. Men monitor adequate distribution of water in the fields and between the different plots.

Livestock

Livestock is the resource to which both sexes have access. This was agreed by both men (80.5 percent) and women (75.6 percent). Many references have cited that the involvement of women is greater than men in livestock management. Men take the major decisions such as selling or buying of livestock, administering medicines, or taking livestock for medical treatment. Whereas decisions related to feeding management, cleaning the shed, bedding management, and selling livestock produce, such as ghee, are made by women. Often women recommend medical treatment of animals when needed.

Cash/income

Access to cash is important because it determines many decisions related to farm and household activities. About 60 percent of the men stated that access to cash income is either exclusively or predominantly with men, and this is why they make decisions on the use and expenditure of the cash. The women respondents in the household survey were either women who headed households or women whose male counterparts were working outside the village. These women were responsible for many farming activities, including marketing. Because of this, these women had more access to cash income than women in male-led households. In Raigaun, Dharapani, Pokhare Khola, Kotgaun, and Dhodeni women had more access to cash than women in other villages.

Production inputs

Men have more access to production inputs such as seeds, fertilizers, and pesticides compared to women. However, 40 percent of the men and 44 percent of the women stated that both the sexes have access to the inputs. Farmers usually do not buy seeds. Since most of them use the seed from the previous year's harvest, both men and women can use it. The case is different for fertilizers and pesticides. It is usually the men who buy and apply chemical fertilizers and pesticides. Also, men have more access to training. Thus they have more knowledge on the doses, type, and application time of fertilizers and pesticides; therefore mostly men make decisions regarding input use.

Marketing

This has implications, as men tend to spend less of their income on household affairs than women (SEAGA, 1997). Although 70 percent of the women responded that both men and women have access to the market, 71.8 percent of the women also responded that men make the decisions related to marketing activities exclusively or predominantly. In Dhodeni, Chabise, and Kotgaun, where farmers grow vegetables for sale, the involvement of women in marketing is higher, especially in harvesting and carrying the produce to the market. In Raigaun, it is mostly the women who are engaged in selling livestock produce, especially milk.

Extension and training

Bajracharya (1994) noted that women are seldom targets of agricultural training and extension services. Extension services include programmes on the radio, group meetings with extension agents, demonstrations, field trips and tours, and training courses. In the study area, both men (55 percent) and women (58 percent) stated that both men and women have access to extension activities. Almost 50 percent of the men and women said both sexes have access to training; 41 percent of the men and 46 percent of the women said this applies mostly to men.

The WDD works exclusively for women's groups and the NAF and other organizations also ensure women's participation in their programmes and activities. The decision making on extension services such as participation in certain extension activities of the development organizations is made jointly by men and women. Women complained that they have access to training only when it is meant for "women only". If the duration of the training is longer (for example more than a week) and if the location of the training demands an overnight stay (at headquarters for example), men are reluctant to send their female counterparts for training. In the lower region, women have more access to extension and training compared to women in the upper region.

Membership in local organizations

About 80 percent of the women and 72 percent of the men were members in organizations such as savings and credit, community forestry, mother's groups (ama samuha), and women's development groups (mahila bikas samuja). The higher percentage of women respondents is not same for all regions. Women also confirmed that they have equal access to membership in any organization.

The majority of the respondents preferred mixed groups. Almost 80 percent of the men preferred mixed groups. Although 63 percent of the women also preferred mixed groups, about 26 percent preferred women's groups. Women farmers preferring mixed groups indicated that in a mixed group, men or women can substitute each other during regular group meetings when one of them is busy. Very few women, who preferred specific caste groups, were from ethnic groups (Magars).

Decision making on various farming activities

Decision making varies between households. Usually, in a small, nuclear family, women have more decision-making roles than in a joint family with many men. Even within joint families, the decision-making role of older women is higher as they are more experienced in many farming activities. The decisions for activities such as crops to grow, planting and harvesting time, buying of production inputs, and selling of agricultural produce are made by both men and women. Women are, however, involved in the selling of agricultural produce, even in commercial farming.

Labour management and wages

Agriculture in Nepal is labour intensive and therefore labour is a major component of land management. Water, soil fertility, and labour are interdependent, interactive, and inseparable components of land management (Tamang, 1992). Farmers use family labour and exchange labour for farming activities, including activities related to land management. This is only common in villages in the lower zones where male farmers from the upper zones, such as Newarbas, Chilaunekharka, and Tarke migrate seasonally to work as hired labour.

Exchange labour management is more common during the peak seasons of rice planting (June/July) and harvesting (November/December). Where the farmers grow winter paddy and maize, exchange labour starts in March/April for planting rice and maize and continues until June/July for planting main season paddy and finger millet, and also for harvesting winter paddy and maize. Men substitute women and vice versa during the exchange of labour. Seventy-nine percent of the women accepted that men could accomplish more during a given period of time when the same task is assigned to both men and women. In some discussions, the women disagreed with the statement that women can accomplish less. Sometimes, men actually accomplish less than women but still receive higher wages.

Table 8. Reasons for lower wages for women for similar jobs

Reasons for difference in male/female wages	Percentage of respondents saying "yes"		
	Men (n = 10)	Women (n = 29)	Total (n = 39)
Women work less than men when it requires greater physical strength	50	79	72
Both have similar efficiency but traditional influence	50	14	23
Women can't do work requiring greater skills than men	0	7	5

Source: Field Survey (2002)

Wage discrimination between men and women has always been a debated issue (Table 8). Lower wage rates can be a disincentive for women to value their land and manage it accordingly. Bridging the gap in the wage rate for similar jobs could be an incentive for women to work as hired labour, as men do. If women are treated equally for similar tasks, not only will they have better access to cash income as hired labour but this will also stimulate more enthusiastic land management.

Perceptions and awareness of women on land management and conservation

Social characteristics of women farmers

Observations and discussions with women revealed that the working age for girls on the land begins at 13 or 14 years of age. Most of the women were either illiterate (40 percent) or literate (30 percent). Only 8 percent of women had achieved higher education. The highest illiteracy rate (25 percent) was among ethnic groups and the highest percentage of respondents extending from primary education was for the upper caste (13 percent).

Based on field observations and group discussions, women respondents were categorized into three age groups to study the relationship of age with other characteristics such as perceptions and priorities. With further increase in age, their participation in land management decreases and they are more involved in work requiring less physical strength such as seed selection and post-harvest operations such as corn shelling and seed screening.

Age-wise farming activities

Farming activities varied between the sexes and between different age groups within the same sex. Farming activities start at the early age of 8 to 9 years. But involvement in land management starts from 13 to 14 years onwards. In this sub-section, the age group is categorized, based on involvement in activities related to land management. Usually children below 15 years are less involved in such activities because of limited physical strength. The enrollment of children at school limits children above 15 years from working in the fields.

Every day, before going to the school, small girls of seven or older collect forage in most of the areas and fetch water in some areas.

Boys are not involved in forage collection. They collect fodder grasses. In addition, small children are also involved in livestock management to some extent, for example in herding livestock, providing the animals with the collected fodder, and transferring the livestock as routine work. Very few boys were observed carrying manure. Boys older than 14 years help with terrace riser cutting, terrace

repairs, ploughing, roofing, and a few transport manure; girls are mostly involved in weeding, cultivating, manure transportation, and transplanting. Older men and women are also involved in other livestock management activities such as feed management and milking.

Significance of farming activities for land management

In most cases, women are not always aware of the significance of their activities on the land. For example, a women farmer was found spreading rice husks on the field, as instructed by the landowner, but without understanding the significance of this activity.

Reasons for tillage

Farmers use animal power to plough the soil. Even tillage with hand tools can result in pulverization of topsoil and compaction of underlying layers. Most women mentioned the positive effect of tillage on land. The women said that tillage makes the soil loose, friable, and light. Loose and friable soils are easy to work with. When the soils are tilled, this increases aeration, facilitates infiltration, and promotes root growth.

Reasons for harrowing and breaking clods

While all women over the age of 45 said harrowing makes the soil friable and is therefore good for crops, younger groups also mentioned the ease of working on harrowed plots, good germination of the crops, and that harrowing conserves moisture and makes the field easy to irrigate.

Reasons for making ridges (earthing up)

Ridge making is common for crops such as potato and maize. Potato tubers under sunlight develop a green pigment known as solanin that makes them less edible. For maize, farmers usually make ridges to prevent the crop from lodging. This also conserves moisture and therefore indirectly leads to increased production. Respondents gave increased production as the reason for earthing up and indicated moisture conservation as the reason for making ridges.

Reasons for irrigation

Water management is also part of land management. Plants require water to meet different physiological requirements such as transpiration, photosynthesis, the translocation of nutrients within the plants, etc. Timely irrigation therefore helps meet these requirements and will increase production. Plants require irrigation water to absorb the nutrients from the soil and adequate irrigation also helps in decomposition of organic matter when the soil is dry. Good irrigation ensures good crops, better plant canopy and therefore less soil is exposed to the impact of rainfall. This reduces soil erosion to some extent. The main reason for irrigation, given by the women, was to moisten the soil or prevent it from drying.

Reasons for canal/waterways repair and maintenance

Although canal repair and maintenance and irrigation is predominantly men's work, women indicated that the regular maintenance of canals and waterways facilitates irrigation flow. Only a few (6.2

percent) mentioned that maintenance of spillways and waterways checks erosion. Water flows at high speed through spillways and waterways. If they are not repaired regularly, spillways might develop into bigger rills, which induce soil erosion. Maintenance and draining of waterways reduces the speed of flowing water.

Reasons for FYM application

FYM improves the soil structure and increases the water-holding capacity. Soils rich in organic matter are very fertile, are easy to work on, and facilitate plant growth. Fertile soils are not always productive. When the plants cannot utilize plant nutrients in the soil, the soil, although fertile, is not productive. FYM enhances soil productivity by improving general soil quality. FYM helps moisture conservation and soils with more than 2 percent organic matter are less erodible (Shaxson et al., 1989). Use of FYM is widely practiced. Increasing soil fertility and production were the main reasons for application.

Significance of livestock grazing

Excessive grazing compacts the soil surface and exposes it to rain-drop impact. Women mentioned the negative effects of livestock movement on soil. Women believed that larger livestock compress the soil more because of their body weight and that they damage terraces and bunds while foraging. Smaller farm animals were considered less damaging in terms of compressing the land but farmers explained that when they graze, they severely damage the fodder/forage and endanger regeneration.

Conservation from the women's perspectives

Several conservation practices can be used to prevent land degradation. Planting trees, fodder species, and forage grasses such as mulberry (*Morus alba*), ipil ipil (*Leucaena leucocephala*), Napier (*Pennisitum purpureum*), NB 21 (*Pennisitum* sp.) on the land; construction of stone walls to repair the terraces; and growing pulse crops such as soybean, black gram, and mungbean on rice bunds were the most common responses given by the women. Many women gave somewhat vague answers, such as any measures taken to prevent soil erosion served as land conservation. Women in Gangrang, Raigaun, and Chisapani put more emphasis on growing of plants on the bunds, growing trees and grasses on the land, and also on construction of stone walls to check erosion. Women in Tarke mentioned using leaf litter and banana stumps to check erosion from spillways and to prevent the development of gullies from rills and spillways.

Perceptions of land conservation

During the household surveys, both men and women were asked whether or not they supported certain statements related to soil conservation. Women were also asked to give the reasons for supporting or not supporting the statements. For most of the statements, men and women gave similar responses. For Statement 5, 64 percent of the men strongly agreed while almost 62 percent of the women disagreed (that grasses are more effective in reducing the impact of rain drops and soil erosion). Men usually have better access to extension agents and extension programmes.

Statement 1: Vegetation cover is important to reduce the impact of rainfall

Rain drops compact and seal the soil surface when the rain drops are large and their kinetic energy is high. Vegetation cover therefore helps to dissipate the energy of falling rain drops by breaking them up into smaller droplets, the energy of which is insufficient to splash the soil and to compact it (Shaxson et al., 1989). Ethnic women, living mostly in the upper region, were unaware that the canopy offsets negative effects. Almost 31 percent of women in the literate group and 40 percent women with secondary education disagreed with the statement.

Statement 2: Removal of soil by erosion reduces soil fertility

Erosion of topsoil also washes away the manure and nutrients applied to the soil. Almost all of the women seemed to agree with this statement.

Statement 3: Legume crops (such as pulse crops) are good for the soil

Legume crops are good for improving soil characteristics as they act as green manure. The deep roots of legume crops help to bind the soil and minimize erosion. Most of the women mentioned that they grow pulse crops on the rice terrace bunds to utilize the free space. Very few (23 percent) mentioned nitrogen-fixing ability. Only women who had been trained were aware of this characteristic. The responses clearly show that with more education, more women will realize the nitrogen-fixing benefit of legume crops.

Statement 4: Crop rotation is important for soil fertility and pest management

Different crops have different rooting depths and nutrient requirements. Crop rotation also plays a significant role in erosion control. Most of the women did not relate crop rotation to erosion control. The majority (32 percent) said that pests are found in any crop rotation.

Statement 5: Grasses are better than trees in reducing the impact of rain drops and in reducing soil erosion

The same plant species can provide a varying amount of cover (Shaxson et al., 1989). When grasses are planted continuously, this is more effective in controlling erosion than when trees are planted at a distance. But most women believed that as grasses have smaller roots, which do not extend to the same extent as trees, they are not effective in controlling soil erosion.

Statement 6: Manure can offset the negative effects of chemical fertilizers (such as soil acidity)

Organic materials are of great importance in the formation, improvement, and maintenance of soil structure, which is essential for providing optimum conditions for root growth (Shaxson et al., 1989). Chemical fertilizers do not help to improve the soil physical characteristics; either improper doses or the use of only urea, degrade the soil's chemical as well as physical properties. When chemical fertilizers and manures are added together, the negative effects of chemical fertilizers are reduced. Few women believed that fertilizer absorbs the nutrients from soil itself.

Statement 7: Engineering methods are less durable than vegetative conservation measures in the long run

Most of the women were aware that vegetative conservation methods are more effective than engineering methods. However, almost one-third suggested engineering methods such as gabion wires to prevent soil erosion are more effective. Women stated that none of the methods is effective when excess rainfall occurs, referring to the heavy rainfall and flooding of 1992.

Statement 8: Grazing animals impact on the land

Eighty percent said that livestock movements have a negative impact on soil characteristics.

Women's perceptions of priorities and constraints to land management

Priority factors determining land value

Steepness of the land

Slope has the highest priority in determining land value. Steeper slopes increase runoff velocity and the movement of soil carried in the runoff. Severe or prolonged erosion from such land can decrease yields and soil productivity, depending on the topsoil thickness and subsoil properties. Most of women gave slope first priority except those living in the lower region where the land is relatively flat.

Irrigation water availability

The study by Tamang (1992) found that the availability of water for irrigation had the most influence on land value. The availability of water is essential for plant growth. Soil fertility is vital to a productive soil, but a fertile soil may not necessarily be productive if there is not enough moisture for the plants. The water sources could be temporary, only during the rainy season, or permanent. The women stressed that even if the land has access to irrigation water, the land near the head-end of the water source has a higher value than the land at the tail-end of an irrigation system. Women's perspectives on land value priorities are shown in Table 9.

Table 9. Priority factors affecting land value from women's perspectives

Attributes (land value)	Priority by women (n = 60)
Slope steepness	1
Markets (low price, distance)	3
Water availability)	2
Soil type	4
Management point of view	7
Soil fertility	5
Having trees	8
Land type (and shape)	6

Source: Field Survey (2002)

Access to the market

The market plays a crucial role in defining land value. Also stated by Tamang (1992), the land closer to the market will have easy access to inputs like seeds, fertilizers, and pesticides and it is also easier to sell agricultural produce. Access to market also helps in crop diversification.

Soil type

Even for land with similar slopes, access to irrigation water, and proximity to the market, the land value may differ depending on the soil type. Both men and women gave soil type the fourth priority.

Land management aspects

Farmers also mentioned that land value is determined not only by soil quality but also by location. Land adjacent to the house is the most valuable. Land located at a distance usually requires more labour to carry inputs and to bring back the harvest. The severity of damage by monkeys is usually higher for land located at a distance.

Soil fertility

Water, fertility, and labour are viewed as interdependent, interactive, and inseparable components of soil management. Fertile soil becomes productive only when the soil has enough moisture. In the case of *Khet* land, land that has access to irrigation water throughout the year is more fertile. Farmers usually apply chemical fertilizers to *Khet* land and therefore it requires adequate moisture for the plants to absorb the nutrients.

Land with trees

Compared to the plains (Terai) where the land is flat and plots are large, flat lands and large plot sizes in the hills are rare. In the Terai, lands with trees, especially *sissoo* (*Dalbergia sissoo*) and *sal* (*Shorea robusta*) will have higher land value. The shade effects of trees on cereal crops and plant nutrient absorption by large trees have negative effects on production.

Distance from district headquarters

The district headquarters (administrative centre) in general has better facilities for education, communication, transportation, marketing, and other needs. Although only a few men mentioned this factor, they related it with land for residential purpose. The land nearer to the district headquarters may have higher value.

Land type (including size and shape of the plot)

By "land type", farmers meant the four classes of the traditional land classification system of the Nepalese government, which divided the land into *Abbal, Doyam, Sim,* and *Chahar* based on *inter alia* water availability, slope, and soil type basically with the objective of levying land tax. *Khet* land falls in this category. *Doyam* land is either *Khet* land with seasonal irrigation or *Bari* land with access to irrigation during the rainy seasons. Farmers also mentioned land shape as part of the land type

factor. Narrow, irregular shaped land (often called *surka/surki*) is of lower value and is difficult to plough with animal power.

Aspect

Vaidya et al. (cited by Khanal, 1998) also mentioned that there is higher productivity on southern aspects due to more solar energy obtained than on northern aspects. The overall index of land value shows that farmers do not usually consider aspect as an important factor for land value.

Priority factors influencing land productivity

Land productivity is defined as the inherent capacity of the land to contribute to yield (Regmi, 2001). The women identified several factors affecting land productivity (Table 10).

Table 10. Priority factors affecting land productivity from women's perspectives

Attributes of land value	Priority by women
Crop yields	1
Land type (*Khet, Bari*, type of *Khet* etc)	2
Soil type	3
Slope of the land	4
Walking distance to the land	5
Land shape	6
Depth of the soil or stoniness	7

Source: Field Survey (2002)

Productivity or yield of the crop

The productivity of any crop determines the land productivity. The higher the production per unit of the area, the higher the land productivity. Women accorded the production of crops highest priority, irrespective of age groups, castes, and educational levels.

Land type

Land type relates to the availability of irrigation water. Moisture content is positively related with land productivity. Thus, a fertile soil becomes productive only when it has adequate moisture. Plants cannot absorb the nutrients in the soil in the absence of moisture. Because of this, *Khet* lands are more productive than *Bari* lands.

Soil type

Black soil is considered the most productive as it is more fertile requiring less additional fertilizer and has a good moisture retention capacity, thus making it more productive.

Slope or steepness of the land

Steepness of the land is associated with its moisture and nutrient retention capacity. This makes the steep land less productive, despite its inherent fertility. Women stressed removal of plant nutrients along with the topsoil as an additional constraint.

Walking distance to the land parcel

Women mentioned that if the land parcel is located nearby, it gets more manure per unit of land. The fields located near the homestead get frequent irrigation and manure application. This makes such lands more productive.

Soil depth or stoniness of the land

Younger women, who are usually more educated, have given this higher priority than the women who are illiterate and older.

Problems and constraints faced by men and women

Recent trends related to land management

Increases in population and household numbers have led to higher encroachment on forest land as well as settlement on the grazing land, decreasing the grazing area. The total population of livestock in the watershed area is still increasing although the average number of livestock per household has decreased. Agricultural productivity is on the rise, which can be attributed mostly to use of chemical fertilizers and pesticides. The farmers, however, mentioned that although production is increasing, overall soil fertility is decreasing. The use of chemical fertilizers has degraded the soil quality. Farmers are using many indigenous land management practices.

General problems related to farming

Farmers were asked about the most pressing problems related to farming in general. They were asked to prioritize these problems into major, moderate, and minor problems (Table 11).

Table 11. Priorities of the problems related to farming in general

Problems outlined by men and women	Women (n = 60)	Total (n = 149)
Lack of irrigation water	1	1
Road/transportation	4	6
Problem of inputs (availability, high price etc)	7	2
Market (low price, distance)	2	4
Problems related to pests and diseases	3	3
Lack of awareness of technology	5	7
Others (e.g. labour shortage, open grazing, low capital)	6	5

Source: Field Survey (2002)

Training needs

None of the women from the upper region had received training. Upper caste women received more training (Table 12). Of the women who had benefited, 25.9 percent had received training on sewing, health, and sanitation; 18.5 percent on afforestation; 14.8 percent on kitchen gardens and horticulture; 11.1 percent on savings and credit; 11.1 percent on livestock raising; 7.4 percent on fodder-related training; 7.4 percent on crop-related training; and 3.7 percent had received training on group mobilization.

Table 12. Training received by the women

Have they received training	Caste				Agroclimatic zone	
	Upper caste	Ethnic group	Newar	Lower caste	Upper	Lower
Yes (% within caste)	43.5	22.7	20.0	37.5	0.0	36.5
No (% within caste)	52.6	77.3	80.0	62.5	100.0	63.5

Source: Field Survey (2002)

When women were asked about the ideal situation they desired, most indicated improvement of irrigation water availability and good erosion control.

Conclusion

The study conducted in GPK sub-watershed was conducted to understand the role of women in land management and conservation. The agricultural productivity of the lower zone (with a sub-tropical climate) is higher than in the upper zone (with a warm temperate climate). Income levels in the upper zone are significantly lower than in the lower zone. The use of manure on *Khet* land in the lower zone is significantly higher than in the upper zone because the average time required to reach the *Khet* lands in the lower zone is less than in the upper zone. Farmers use more inorganic fertilizers on *Khet* land while manure is used more on *Bari* land.

Farmers have developed indigenous practices for land management. Terracing, repair and maintenance of terraces; soil-fertility management using FYM, green manure, and compost; maintenance of waterways and spillways; crop rotation; and residue management are some of the indigenous land management practices in the area. Farmers use both family labour and exchange labour for these activities. The farming activities vary not only between men and women but also between different age groups of men and women. A marked difference in the activities between women of different castes was not found, but was observed for women with different educational levels. Awareness on land conservation and perceptions on the significance of farming activities were different between women of different age groups, castes, and educational levels. For some activities like harrowing, tillage, FYM application, canal repair and maintenance, impact of grazing livestock on land, the perceptions between younger (13-45 years) and older women (> 45 years) differed.

The general perception of different conservation measures did not vary much among the women's groups. Women's preferred conservation practice was growing trees and grasses on rice-field bunds and terrace risers. No general pattern was found for priorities associated with land productivity, land value, and soil fertility. Usually, educated women are perceived to be more aware of land degradation and possible measures of conservation.

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