

Farming Systems in the Mid-Hills of Nepal (A Case of Pumdi-Bhumdi in Kaski District)

T. C. Delobel*

INTRODUCTION

Pumdi Bhumdi (Kaski district) was one of the 6 Cropping Systems Research sites in Nepal lying 208 km. west of Kathmandu along the pokhara – Bhairahwa road. Since 1977, cropping systems trials were carried out on the south facing slope of a hill varying from 900 to 1400 meters above sea level. An average of 400 mm of rainfall occurs each year and 4 consecutive months receive more than 600 mm (monsoon period from June to September).

In order to strengthen the knowledge about the different components which intervene in the farms and which influence the farmers' decision making process in regard to the adoption of new agricultural technologies, the cropping systems program (CSP) was decided to develop farming systems research with special focus on both crop and livestock activities in the farms. This research started in Pumdi Bhumdi during the winter season addresses the development of appropriate methodologies for the new farming systems sites which will be established in Nepal in the near future.

This paper aims at both presenting the objectives and the methodology of the farming systems research in Pumdi Bhumdi and summarizing briefly the main results of the socio-economic components for the initial period of the farm monitoring.

OBJECTIVES OF FARMING SYSTEMS RESEARCH IN PUMDI BHUMDI

As that is reported in a previous document the main objectives of the farming systems research at Pumdi Bhumdi are as follows:

- To develop a better understanding about farming systems in the mid-hill areas with a special focus on the relationships between crop and livestock activities in the farms.
- To identify the mechanism of adoption of new agricultural technologies tested with farmers and to observe their effect at the whole farm level.

* *Mr. Delobel is a Socio-Economist, French Technical Assistance to Cropping Systems Program (CSP), Franco-Nepalese Cooperation Program (FNCP). This Paper was Presented at the 2nd Crop-Livestock Systems Research Monitoring Tour, Nepal and Indonesia; August 18-31, 1985.*

- To understand how farmers manage their farm resources in facing environmental constraints and external factors which influence the process of production and also to understand the inter-relationships among the farms at the community level.
- To define an operational methodology for farming systems research and development for Nepal. This methodology having to be reliable and appropriate in other areas.

MEHTODOLOGY

The farming systems research in Pumdi Bhumdi rests on a *farms monitoring* which was started in November 1984.

Selection of the Monitored Farmers

In order to develop our research with an optimal efficiency, a small sample of 12 farmers has been selected for the farms monitoring. Those farmers have been divided into two groups:

- One control group of 6 farmers in which the researchers' involvement is limited to a regular monitoring of the farming activities and,
- One intervention group of 6 farmers with whom research interventions or trials are undertaken.
- These two groups have also been divided in two categories according to the landholdings. According to the different categories the sample of monitored farmers is composed as follows:
 - 0.5 - 1 ha : 3 farmers in each group
 - 1 - 1.5 ha : 2 farmers in each group
 - 1.5 - 2 ha : 1 farmer in each group
- The smallest farms (< 0.5 ha) and the largest (> 2.5 ha) have been excluded in order to have more representative cases of farmers; conditions at Pumdi Bhumdi. However, the diversity of the farming systems has been neglected. The main criteria which have been used for farmer selection in each group are as follows:
 - Cultivated area according to the 3 categories in order to make comparisons as relevant as possible between the farms of each group. An exhaustive land measurement has been carried out in each monitored farm, especially in order to conduct more appropriate "On-Farm" trials and interventions through a better knowledge about the land structure in the farms.
 - Percentage of lowland and upland fields in order to select farms with mixed land type (at least 20% each of lowland and upland).

- Presence of "Kharbari" (for planting fodder trees).
- Number of dairy animals (buffaloes and cows) in order to ensure that milk production plays a sufficient role in the farm (at least 2 milking animals).
- Representative number of family members involved full time in agriculture and,
- Good relationship with the staff working in the field and especially with the field assistants involved in the information recording in order to make sure of the monitoring "Perennity".

Tools Used in the Farm Monitoring

Different tools were used to attempt to understand the farming conditions at Pumdi Bhumdi and the inter-relations between crop and livestock activities in the monitored farms :

Baseline survey questionnaire - To examine the "structure of production" in the farms (land - labor - capital).

Periodical monitoring forms - To approach the 'process of production' through the year for the selected farms and especially concerning the following aspects.

- Crop - cultural practices
- Milk production
- Livestock feeding
- Draft power use
- Economic transactions
- Livestock balance
- Allotment of the agricultural tasks

Focused interviews - To develop understanding about specific subjects:

- Labor and power exchange systems (Parma and Pareli)
- Informal credit cooperatives (Dhukuti)
- Use of "on field" temporary sheds for livestock

The detailed information concerning all these aspects for the initial 6 months of the farm monitoring - From Nov./Dec. to April/May are discussed separately in different "subject papers" (see selected references). Although, those subject papers are basically needed to deepen our knowledge of the farming systems at Pumdi Bhumdi, the present paper focuses on a discussion of the links between the main components of the farm rather than on a separate discussion of each of those components. We also attempt to show the links between the farms and the local socio-economic environment. The figure in Appendix 1 summarizes the farming systems approach at Pumdi Bhumdi. In this approach, there are 3 essential questions that we try to keep in mind. The farming activities consist of what are carried out, how and are performed why.

INITIAL FINDINGS OF THE FARM MONITORING AT PUMDI BHUMDI

The Communities of Pumdi Bhumdi

Pumdi Bhumdi village is composed of two ethnic groups :

- Aryan ethnic group which include 2 groups of people : The Brahmins and the members of the occupational castes
- Gurung ethnic group (origin Tibeto-Burman) which is mainly settled in the upper areas of the village.

As a result of the importance of non-farm revenues for the members of the Gurung community (mainly from military salaries and allowances), the Gurung farmers are generally less involved in farming activities than the Brahmin farmers who still get their main revenues from agriculture. So the standard of living of Brahmin households is more dependent on the increase of agricultural productivity.

The members of occupational castes (namely blacksmiths, goldsmiths, cobblers and tailors) generally live in poor conditions. They have little land and most of the time do not own rice fields (lowland) and draft power. Traditionally, they perform the tasks that both Brahmins and Gurungs are not allowed or not willing to do. The relationship between occupational caste members and the other farmers is not really a reciprocal one especially not on the level of the farming activities. Indeed, the study of the current organization of exchange labor and power (Pareli) (Delobel;1985 c) shows that the members of occupational castes are more often than not exploited by the members of the "Pareli" cooperatives whose fields they plow and plank. Although, Brahmin and Gurung farmers usually perform the agricultural tasks in very similar ways, they have very few contacts between them in the farming activities. The inter-farm relations occur only within homogenous ethnic group or caste. Thus, we cannot see Brahmin and Gurung farmers working together in a same Pareli cooperative. It is important to take this fact into consideration for eventual development purposes: Thus, form of inter-mixed cooperative might not be realistic in the case of Pumdi Bhumdi society.

Crop-Livestock Activities in the Farms

Livestock production is an integral part of the Farming Systems at Pumdi Bhumdi and crop and livestock enterprises are very closely related. Animals are kept for 3 main farming purposes:

- Making compost to fertilize the fields
- Providing draft power (bullock) for land preparation
- Milk production (namely from buffaloes) to get cash income

Application of the compost

As farmers do not use so much chemical fertilizer (schroeder; 1980) organic manure in the form of compost is the most important source of plant nutrient. But a shortage of compost was identified as one of the main constraints for more intensive

cultivation in the lowland fields (Van Der Veen; 1983). As a matter of fact, farmer usually prefer to apply compost in upland fields which are more intensively cultivated and especially to maize crops which seem to require more plant nutrient than other crops. But because of the constraint of labor available during the periods of land preparation, the compost is not incorporated into fields quickly enough, which constitutes the main problem regarding compost application.

In Pumdi Bhumdi, numerous farmers erect temporary sheds in the fallow fields during the winter season (Delobel; 1985 b). There are two main reasons for keeping animals in such temporary sheds:

- To fertilize the surrounding fields, directly with the dung when the animals graze the fallow fields or indirectly after the compost is accumulated in those temporary sheds.
- To keep the livestock in close proximity of the grazing grounds (fallow fields or common pasture) or/and close by the sources of spontaneous forage (grass and tree fodder)

The use of temporary sheds which aims at reducing the time devoted to both compost supplying and animal feeding, can be viewed as an example of how farmers try to optimize the labor productivity in the farms.

Use of Draft Power

In Pumdi Bhumdi, most of the farmers own only 1 ox. Those farmers who own 2 oxen have more cultivable land. Accordingly for land preparation farmers are often forced to manage the power supply between them. They do so mainly within the framework of labor and power exchange systems (Parma and Pareli organizations), which are needed to overcome the power requirement during certain periods of the agricultural year.

The results of the draft power use in the selected farms during the initial six months (Shrestha; 1985 a), show that as an average oxen remained idle for 127 out of 183 days from Mangsir (Nov./Dec.) to Baisakh (Apr./May). Otherwise, the peak months for draft power use were, Mangsir (Nov.-Dec.) for rice threshing, Chaitra (Mar./Apr.) and Baisakh (Apr./May) for land preparation and planting of the spring crops (maize and early rice). Until now, as a result of labor and power exchange systems which lead to create a balance between advantaged farms and disadvantaged ones in term of power (labor) availability, we can not state that there is a lack of draft power in Pumdi Bhumdi. However, in future, if the land use intensity is increased, a shortage of oxen might occur which may require a re-organization of the power force exchange practices.

Milk Production

Owing dairy animals has two important roles in the farms of Pumdi Bhumdi; a nutritional role for providing calories to the people and an economical role by generating cash income to households. The milk can be consumed fresh or in the form of ghee and curd. Otherwise, it is also used to feed the young calves. The level of milk

production in the selected farms is being studied especially in relation with the number of lactation and the calving rate of the dairy animals. In Pumdi Bhumdi, it has been found two categories of buffaloes according to the calving rate: the first category has a calving rate of 80 - 90 percent and the second one has a calving rate of 50-55 percent. So that, the latter is far less productive than the former. Certainly, many factors influence the calving rate (age, health, feeding etc.). We are trying now to focus on those factors. Generally the period of calving occurs during the monsoon season when the feed is abundant; of course, at the time when animals give birth an adequate nutrition is necessary (Singh and Joshi; 1985)

The feed deficit during the dry season is more crucial for production requirements when high quality green fodder gradually decrease resulting in lower milk production. At this period, green fodder (namely tree fodder leaves) is given in preference to lactating buffaloes while crop residues (namely rice straw) fingermillet straw is also given in Nov./Dec. wheat straw in limited quantity from Feb./Mar. to Apr./May and maize plant (from first weeding) and stalks (after harvesting) are given fairly equally to both productive and non-productive animals. On the other hand, concentrates (namely fingermillet and maize flour and rice bran) are virtually kept for productive animals only. Regarding the preliminary results of milk production and animal feed monitoring, it already appears that adequate nutrition is of fundamental importance for optimum milk production. That is why trials of oats as green fodder for livestock feed are being carried out in Pumdi Bhumdi (Singh and Gautam; 1985). We have also been studying the livestock balance inside the sample of selected farms (Shrestha; 1985 b). For the initial 6 months of the monitoring no real change in the number of owned livestock has been noticed. Indeed we must await the completion of the entire monitoring year previous to drawing any definite conclusions on livestock balance in the farms. However, it has already appeared that the main constraint which prevents higher livestock population in Pumdi Bhumdi is the lack of forage especially during the dry season (winter). The farmers might be willing to increase the magnitude of livestock if more forage were available as a result of either more intensive cropping with appropriate crops (eg.: introduction of oat) and varieties (eg. with high straw) or a better utilization of uncultivated and marginal lands in which improved species of fodder trees and grass can be planted.

A higher livestock population is also prevented by the lack of labor to collect forage and take care of the livestock which during certain periods of the year seriously compete with the operation to be carried on in the fields.

Another constraint may be the non-availability of cash to purchase extra livestock. As a result of the difficulties for the farmers to obtain appropriate credits from the Agricultural Bank. Numerous farmers of Pumdi Bhumdi are involved in informal credit associations (Dhukuti) managed by themselves (Delobel; 1985). It is shown that a substantial part of the credits which come from these associations is devoted to livestock purchasing, especially of dairy animals. Finally, even if the magnitude of the livestock population might not be increased at all the farms, there remains the possibility to act upon the animals; performance and make them more productive (eg. : with better breeds, nutrition and health control). This could certainly be combined with a more careful livestock management by the farmers themselves.

Labor Involvement in the Farming Activities

A previous study (Schroeder; 1980) has shown a positive relation between size of family labor force and adoption of new technologies in the Pumdi Bhumdi's farms. A more productive agriculture is obtained by intervening on crops and cropping patterns which requires a more labor intensive agriculture. Thus, previous to acting upon agricultural productivity in a given area, it is quite necessary to know how the labor force is currently managed. In Pumdi Bhumdi, three types of traditional systems of labor force organization predominate, family labor, hired labor and exchanged labor (Parma and Pareli systems). The study of labor organization shows in the farming activities either the presence of a clear division of the work or the importance of the inter-farm relations.

In the Pumdi Bhumdi, the division of the work is quite similar from one household to another (K.C., 1985 a) it depends on either the age or the sex of the worker. Generally, women spend more time caring for livestock, carrying materials (fire-wood, compost, forage etc.) and in cultural practices like crops establishment and weeding while men are more involved in land preparation and economic activities (buying/selling goods and farm products). In fact, women are by far more involved in farming activities than men. Also, they have to perform the domestic tasks of the household. However, men always make the decisions on the farm.

The inter-farm relations play a major role in the cultural practices at Pumdi Bhumdi. Those relations function mainly within the 2 systems of labor and power exchange organizations (Parma and Pareli systems) (Delobel; 1985 c.) The shortage of labor during certain phases of the farming cycle (especially for maize and rice planting operations) can be quite easily overcome. Usually, these two systems of labor and power exchange do not function for the winter crops (namely mustard and wheat) either because they require less labor force involvement (little land preparation and no weeding) than spring and summer crops or because only few areas are devoted to them at present. Thus, the cultural practices of winter crops are mainly carried out by the family labor force (except for plowing and planking which are usually carried on by occupational caste members.) Yet, the increase of intensity in cultivation during the dry season could go along with an expansion of labor and power exchange systems so as also to cover the winter crops. On the other hand, because all the fields in Pumdi Bhumdi are rain-fed, to grow winter crops is quite risky for the farmer. For example, due to the serious drought of winter 1984/85 (50.5 mm rainfall only from October to March) the production of wheat and mustard was very poor. The production of wheat grains for the monitored farmers was almost 3 times less than the production of the previous year: generally did not exceed 0.5 t/ha this year. Some farmers even left the wheat fields to be grazed by their livestock. As we know that a crop like wheat requires approximately 600 labor working hours per hectare, needs compost application and employs draft power during the period of shortage of animal feed, we can easily understand why farmers hesitate to grow such crops during the dry season. Maybe, more drought resistant varieties of wheat (if available) could be tested in Pumdi Bhumde.

Economic Aspects of the Pumdi Bhumdi's Farms

In comparison to other hill areas, more remote from market centers, the farms of Pumdi Bhumdi show a substantial level of marketed output especially from livestock activities. Fresh milk sale is an important source of income generating activity among many farmers in the area, within the sample of selected farmers about 60 percent of the milk is sold. Farmers can sell the milk at a "Milk Collection Center" located in Pumdi Bhumdi or directly at the hotels in Pokhara city (8 km by the road). In fact, numerous farmers prefer to bring their milk to Pokhara because they mix it with 50 - 100 percent of water and thus, obtain a better price for this adulterated milk. Rice and fingermillet are the usual crops sold by the farmers which own enough land to meet the subsistence needs. Although, it is generally quite difficult to collect relevant information concerning economic transactions in the farm we have been studying those transactions with the 12 farmers concerned. During the initial 6 months of crop-livestock monitoring, the production barely represented fifty percent of the total cash income while agricultural investments especially for cultivation inputs (seed-chemical fertilizer) seem very low (less than ten percent) (K.C; 1985 b). The study of informal credit associations (Dhukuti) also shows that the farming investment concern mainly the purpose of dairy animals. In fact, farmers are more interested to invest in such items which give quite rapid returns. Otherwise, for the majority of farmers in Pumdi Bhumdi, agriculture is still fairly subsistence-oriented and the increase of agriculture monetization is relatively low as we can see for example in labor and power force transactions (See above). By comparison, a trend of speedier increase is noticeable in the monetization of the global economy of the community. That is mainly true within the Gurung community whose people are more involved in non-farming activities. Finally, it is obvious that the farmers of Pumdi Bhumdi are moving fast ahead in the general process of monetization of Nepalese society.

In coming years we will be able to estimate in the monitored farms the ratio of the subsistence sector compared to the marketed sector and thus, to assert the stage reached in the direction of a monetary economy by the farms at Pumdi Bhumdi.

CONCLUSION

The findings presented in this paper are mainly the result of the initial 6 months of the monitoring in Pumdi Bhumdi. The objective was not to provide an in-depth study of each component of the farming systems but to show how these components interrelate. Farmers manage their farm as a global system. Generally, they are rational in how they use their resources. The main concern for agricultural researchers is to understand which constraints prevent better use of these resources. The main concern for agricultural researchers is to understand which constraints prevent better use of these resources and to try to figure out how to overcome these constraints in collaboration with the farmers.

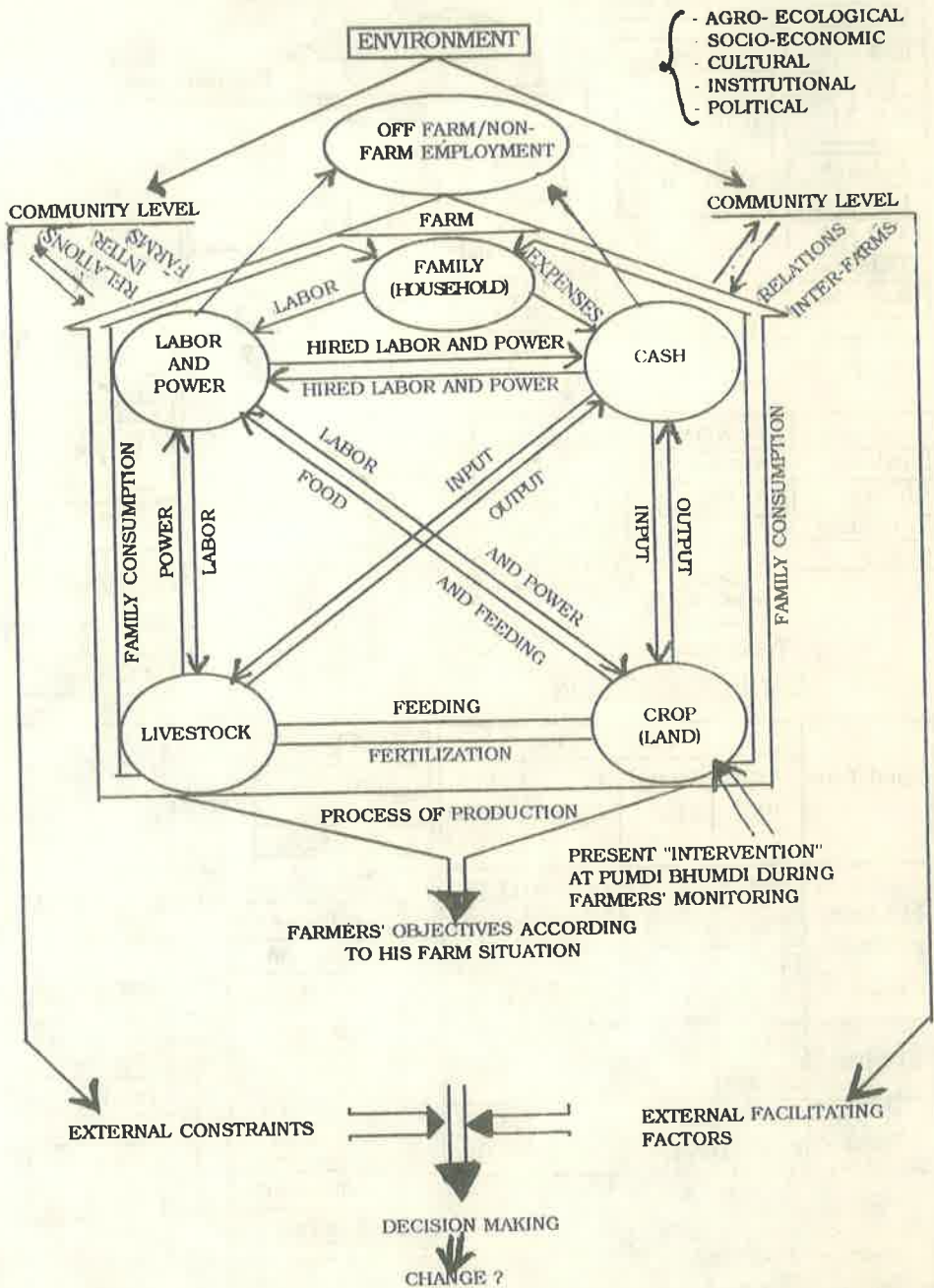
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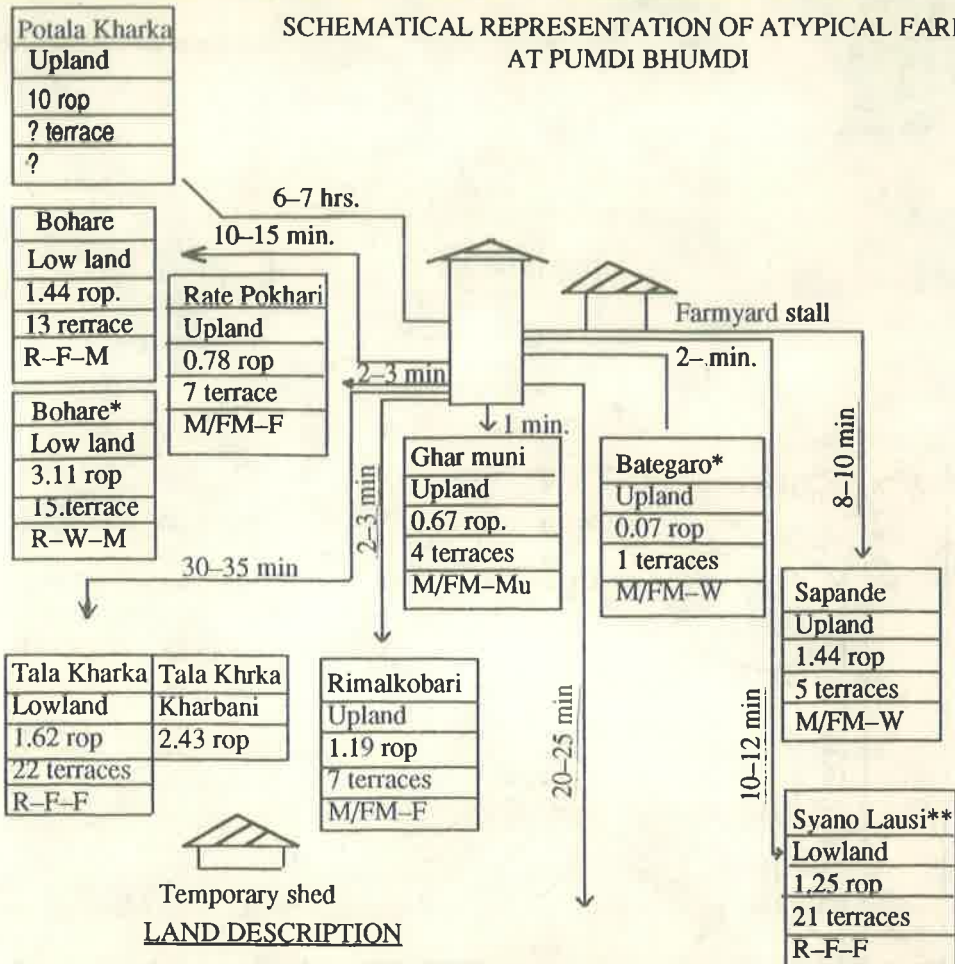
ANNEX

TABLE 1

RESOURCE FLOW IN THE FARMING SYSTEMS



**SCHEMATICAL REPRESENTATION OF ATYPICAL FARM
AT PUMDI BHUMDI**



LAND DESCRIPTION

Land Type	Land structure			
	owned (rop)	Mortgaged (rop)	* (rop)	Total farmed (rop)
Lowland	12.67 (39.3%)	4.42 (100%)	3.11 (97.8%)	13.98 (49.8%)
Upland	14.15 (43.9%)		0.07 (2.2%)	14.08 (50.2%)
Kharbari	5.43 (16.8%)			5.43
Total	32.25 (100%)	4.42 (100%)	3.18 (100%)	28.06 (100%)

Amalchaur **
Lowland
3.17 rop.
35 terraces
R-F-F

Amalchaur **
Lowland
5.15 rop.
34 terraces
R-W-M (25%)
R-Oat (13%)
R-F-F (62%)

Amalchaur
Kharbari
3 rop

Permanent shed



Amalchaur
Lowland
1.35 rop.
8 terraces
R-F-F

* Mortgaged out land

** Mortgaged in land

R= Ric -W= Wheat-FM = Finger Millet-M= Maize

Mu= Mustard and F= Fallow

1 ropani= 500 square meters.