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Intensification of Cropping Patterns and Labor Use in Sankhu Village, Central Nepal

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Summary

Agriculture forms the foundation of Nepal's economy by contributing about 40 percent to the GDP, and 80 percent to employment (HMG, 1998). However, the statistics also show a food deficit almost every year since 1991. Crop intensification serves as one alternative to increase food self-sufficiency. Farmers are switching from the traditional double crop paddy-wheat cultivation to the modern triple crop farming including two cash crops and paddy cultivation.

This paper analyzes the labor force used on an intensified farm within the Sankhu village, located within the Kathmandu Valley, based on the daily records kept over two years. It was made clear that crop intensification demands a significantly larger labor force, which is a problem as both younger people and women from sub-urban areas are turning away from agriculture. This situation provides an opportunity for people living outside the region to work as hired labor, which accounts for half of the total labor used over the year. Women also played an important role in crop production as they contributed 61 percent of the total hired labor; performing the important activities of transplantation, weeding and harvesting. The study also showed that intensification of crops utilized the family labor force more efficiently as well as providing an opportunity for hired labor during peak seasons.

1. Introduction

Agriculture forms the foundation of Nepal's economy by contributing to about 40 percent of GDP in 1997 and 80 percent of employment (HMG, 1998). In order to modernize and to uplift the economic condition of the people, improvement in agriculture was a must since it supported the livelihood of people. The food balance in Table 1 shows the continued deficit in food supply in the 1990's except for the year 1990/91. To sustain the economy, it is quite important to increase agricultural productivity. The intensification of cropping pattern is one of

the alternatives for fulfilling the demand given the scarcity of farmland.

According to the Central Bureau of Statistics (1994), cropping intensity, which is measured by the ratio of the total cropped area to the total operational area, increased from 1.45 in 1981/82 to 1.75 in 1991/92. The hill and mountain areas were more affected by crop intensification. Over the same ten year period, the cropping intensity increased substantially from 1.23 to 1.77 in the Hill region; while in Tarai, the plain area in the south, it increased only from 1.62 to 1.75. Cropping intensity is higher

Table 1. Major Cereal Crops production and requirement in Nepal, 1990 to 1996 In million metric ton

		1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Production	(a)	3.62	3.37	3.29	3.59	3.4	3.91	3.97
Requirement	(b)	3.49	3.56	3.63	3.72	3.88	3.95	4.08
Balance	(a) - (b)	0.13	-0.19	-0.34	-0.13	-0.48	-0.04	-0.11

Source: C. B. S. 1999

Note: Major crops include Paddy, Wheat, Maize and Millet.

(a) production of major crops for the year; (b) estimated requirement of major crops for the year.

among the small farmers than in the large farmers. Farmers holding less than 0.5 ha in size had 1.88 cropping intensity, while it was 1.79 in the farms with sizes ranging from 0.5 to 2.0 ha, and 1.66 for farms of size 2 ha or more.

The typical traditional cropping pattern in Nepal is paddy-wheat in irrigated land and maize-millet in non-irrigated land. It has been expected that the availability of irrigation water during winter make crop intensification possible; thus, international economic assistance for many irrigation projects implemented. However, the cropping intensity has not improved as much as expected since the irrigation systems were designed mainly for paddy-wheat. Although the statistical information on the recent change of cropping intensity is not available, more intensive crops, such as potato, cauliflower, and onion, have become important as cash crops, which are accessible to irrigation facility and market; and they make a contribution in increasing cropping intensity.

Despite the fact that crop intensification requires more labor, more people diverted from agriculture to opportunities of non-farm work in nearby cities. The possibility of farm mechanization is low in hill area due to its rugged topography. Thus, the labor force is allocated in a competitive manner or in a complementary manner in order to increase crop production. Only a few studies were found on labor requirement for various crop productions. The study conducted by APROSC (1983) focused on the labor requirement for typical double cropping pattern¹⁾ under traditional as well as new system by using high yielding seeds and fertilizer. The objective of the study was to find the strategies for labor intensive farming in Nepal to increase farm employment. Similarly, another study from the western region focused on labor use for all the crops grown by farmers including upland and lowland farms compared to that of labor used for livestock raising (Amatya, 1997)²⁾. The

role of women in farming and other activities has also been a popular subject among the researchers but their role in agriculture based on labor use has been sporadic. There were no studies found so far on the labor requirements for intensified farming with more than double cash crops.

This paper aims to make clear the actual labor requirement for annual crop production in a highly intensified farm, which grows two crops and paddy, and analyzes the effect of cropping pattern changes on the labor use pattern³⁾. The availability of labor from hired and exchange labor in the village and the role of females are also analyzed from the daily record of an advanced farmer in Sankhu village of Kathmandu valley, Nepal. The study based on the record of a farmer for nearly two years is expected to provide the actual situation of the period of labor requirement for such intensification in the farm.

2. Study area and selected farmer

The study was conducted in Sankhu village located at 17km northeast of Kathmandu, the capital city of Nepal. It is a cluster of about 1,000 households, and it has been an important trade center with Tibet in the past until the road to the Chinese border was constructed by-passing Sankhu. In the 1960's, during the restructuring of the administrative divisions, Sankhu was divided into three parts and included in three separate Village Development Committees (VDCs), namely Bajrayogini, Pukhulachhi and Suntol. The total population⁴⁾ of the three VDCs is 12,803, spreading over 1,642 households of which about 50 percent are concentrated in the Sankhu clustered area. The major occupation of people is agriculture, which is gradually changing from subsistence to commercial farming.

People started cultivating three crops including two cash crops, summer potato and win-

ter potato after paddy where irrigation was available. Osanami et al, (1997) made clear that there is about 42 percent of land utilized for growing three crops with two potato crops, summer and winter potato. The remaining 20 percent are utilized in cultivating paddy and one potato crop and 22 percent have no potato cultivation due to water scarcity in winter, mainly towards the tail end of the canal.

For the study of detailed labor use pattern, one progressive farmer who is able to write and record was selected and requested to keep the daily records of family labor as well as hired and exchange labor including the types of work performed on the respective days. This is a typical study as it focused on the daily record instead of questionnaire survey using recall method on the farmer side. The record contains the number of male and female laborers from within and outside the family, hours and type of work performed. This farmer holds farms around the middle portion of canal where irrigation is available all season. The record was collected each season since July 1998 by a research assistant who lives in the same village. Interview with the farmer was conducted by the authors to correct the record every year.

The family of the selected farmer, Rajendra, consists of nine members comprised of two principal laborers (Rajendra and his father) who work fulltime in farm and two complementary

laborers (mother and wife) who are also responsible for household chores (Table 2). Two brothers of the respondent also support the farm work in peak seasons as supplementary laborers. Like the common joint family system, Rajendra, the eldest son and his family also live together in the same house and take up the farming work to support the younger brothers and sisters to continue their study.

The family cultivates a total land of 1.12 ha, of which 0.78 ha are self owned. The rest has been rented-in from others (Table 3). The farmer belongs to a large farmer category since a majority of farmers hold less than 0.25 ha of land in Sankhu. The farmer also represents the owner-cum-tenant category⁵⁾ as he cultivates rented-in farmland from others besides being a big farmer. Being an enthusiastic farmer, he managed to purchase a part of the rented-in land (one third of the plot 99) using a few years' savings. Although the fragmentation process goes on in Sankhu, the family tries to cultivate closely located land by renting-in. Due to the rent-in and purchase of land, the cultivated land of the family is located at 6 separate places in 9 plots within the village. As shown in Figure 1, the plots 234 and 99 adjoining his 46 and 52 plots, have been rented-in making the farm a bigger plot. The other plots 156 and 256 were also rented-in because of being close from his house.

Table 2. Family labor force of Rajendra, the selected farmer, as of year 2000

	Sex	Age	Occupation	Education
Father	M	65	Farmer (principal labor)	Illiterate
Mother	F	64	Complementary labor)	Illiterate
Rajendra (Respondent)	M	33	Farmer (principal labor)	10th grade
Wife	F	32	Complementary labor)	Illiterate
Daughter	F	10	Middle school	Student
Daughter	F	8	Primary school	Student
Daughter	F	5	—	—
Brother	M	21	Service (supplementary labor)	High school teacher
Brother	M	16	College (supplementary labor)	Student

Note : From Farm survey, 2000

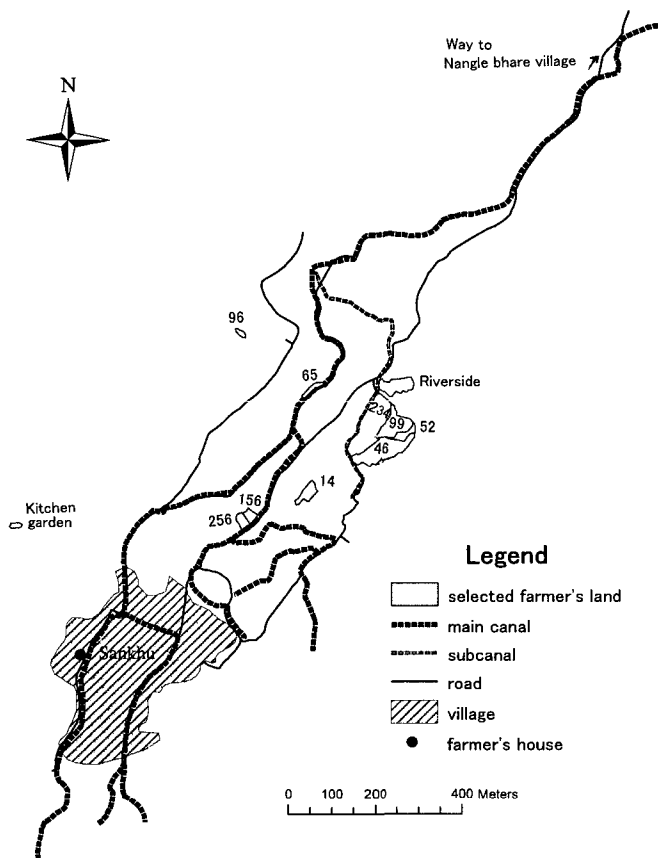


Figure 1 Location of surveyed farmer Rajendra's land

Table 3. Cultivated land of Rajendra and his family

Plot/Kitta no.	Own/rented-in	Area, in ha
46 *	Own	0.17
52 *	Rent-in (seasonal)	0.05
99 *	Own (1 / 3 only)	0.09
234 *	Rent-in (seasonal)	0.12
14	Own	0.05
65	Own	0.32
96	Own	0.09
156	Rent-in (seasonal)	0.14
Riverside	Own	0.09
Total		1.12

Note : Plots marked * are located at the same place adjoining each other.
 : A separate plot of 0.02 ha land is used as kitchen garden.

All the plots, except plot 96, have easy access to irrigation water even in the dry period, as they are located at the upstream of the main irrigation canal. The source of this Shalinadi ir-

rigation canal (also called Rajkulo, meaning a historic traditional canal of which the exact period of construction was not known) is the Shalinadi River flowing from the northeast towards

the south, joining the Manahara River. The characteristic of the canal is that it is divided into two and enters the settlement area so that water can also be used for daily purposes like washing utensils and clothes besides irrigation. A part of the upstream canal runs parallel with the road going up to Nangle bhare village. The plot 96, which is located at a higher altitude than the canal, requires the pumping up of water in the dry season when water from other sources is scarce.

Usually, the farmers maintain a small plot of land beside the house as a kitchen garden to produce vegetables for their own consumption. With Sankhu being a clustered settlement with most of the houses adjoining each other, there is no space for a homestead farm, the farmer maintains a plot of about 0.02ha as kitchen garden separately from the house to grow vegetables like garlic, ginger, pumpkin, green vegetable, etc. for home consumption.

3. Cropping intensification and labor use

3.1 Seasonal labor allocation

Figure 2 shows the 1999/2000 cropping calendar of Rajendra. It is representative of a cropping calendar for three crops, which shows that the farmer carefully plans the cultivation of different plots of land at different times to avoid labor scarcity during the peak period. There is a difference of about a month for plantation or harvest from start to finish for all the plots. The cropping season overlaps each other not only due to the work undertaken at different plots at different times but also due to the preparation for the next crop, such as seed nursery bed for paddy and compost making or the purchase of chicken manure and chemical fertilizer for potato outside the village.

Compared to the previous cropping pattern till the early 1990's for paddy and winter potato, the season for labor requirement has changed

considerably with the introduction of summer potato cultivation. (Figure 2) Potato cultivation in Sankhu is not new since the farmers have been cultivating winter potato for a long time although not for commercial purposes. Cultivation of potato for commercial purposes started only recently. The addition of one more crop demands labor, which is not sufficient when relying on family labor alone, especially when family labor is in a decline due to the involvement of women and the younger generation in non-farm works. Thus, it becomes important to hire labor providing work opportunity for people from within or outside the village. Labor supply was found to be in two different forms, such as exchange labor and hired labor with wages.

The farmer's record shows that there are four distinct labor use peaks (Figure 3) as against two peaks during June/July for paddy transplantation and October/November for harvesting in the traditional cropping pattern as shown by Amatya (1997) for collective labor used in both paddy-wheat and maize-millet farms. In case of the advanced farmer, the highest peak is found during September/October when the harvesting of paddy follows potato (summer) seed sowing. The peak in June is due to the harvest of winter potato and paddy transplantation while the other peak during December is due to the sowing of winter potato seed soon after the harvest of summer potato. A smaller peak in March is due to the preparation of land for making grooves to retain irrigation water for winter potato. During the period when labor requirement rises high to more than 1,000 hours per month, allowing the family to provide on average about 340 hours per month, labor is supplied by the hired workers as well as some labor exchange by neighbors. September and October are the months when labor is required at a maximum for harvest of paddy followed by potato plantation. The farmers have less work in

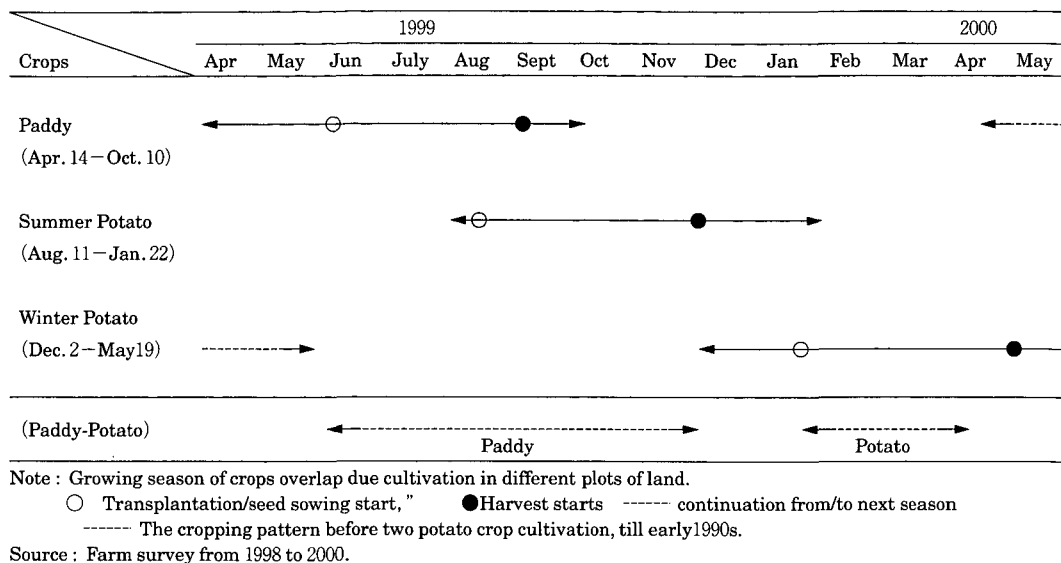


Figure 2. Cropping calendar of the farmer in Sankhu village

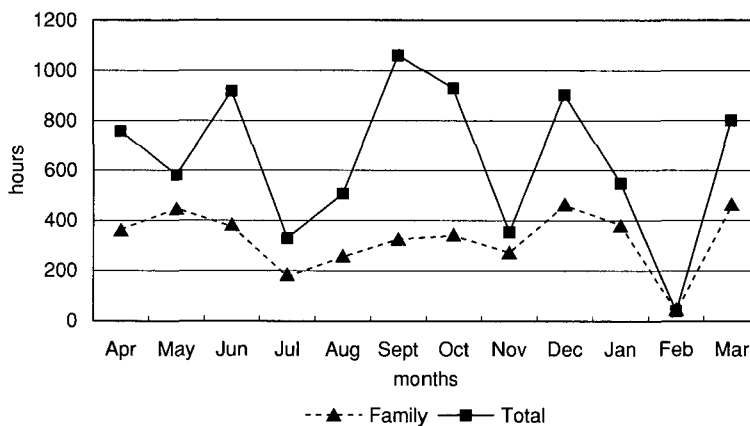


Figure 3. Monthly labor use per hectare of land for one crop cycle

(Data from selected farmer of Sankhu, April 1999 to March 2000.)

the farm in the months of May, July and November when hired labor requirements are at a minimum.

The record of the farmer for two years from July 1998 to October 2000 shows that the peaks shift about a month from September to October in 1999 and January through June in 2000 due to the climatic condition and arrangement with market prices. Since potato is the major cash crop, income from potato sales is of great con-

cern for farmers. The selected farmer effectively manages the harvest of potatoes looking carefully at the market price. In 1999, the harvest of summer potato was done gradually together with sowing winter potato seeds because of the low market price for potato. The market price for potato in the year 1999 remained almost similar for winter potato (Rs. 8.51 to Rs. 10.06 per kg)⁶⁾; whereas, the price in the previous year went up from Rs. 7.6 to Rs. 17.8 per kg of

potato as shown from the record of whole sale market of Kathmandu (Agricultural Marketing Information Bulletin, 1990–2000). This is the rationale behind the farmer's response to delay the harvest deliberately since there is no storage facility in the farm and in the village. The harvest of paddy in the year 2000 was delayed due to rain at the time of harvest season. In this way, there is a shift of labor requirement for a period of about one month as shown in the data.

3.2 Labor requirement by crops

In traditional subsistence agriculture, labor is required for growing paddy-wheat in places like Kathmandu valley or Tarai plains while in the hilly areas it is maize-millet. While in the modern farming system, more importance is given on commercial farming with cash crops along with crop intensification. The labor requirement largely depends on the number of crops cultivated. Labor required for a year with double crop, paddy and wheat was found to be at 351 person days per ha in the valley region according to the study conducted by APROSC (1983). Compared to that, labor used by the selected farmer is three times more, 1,257 person days/ha (8,799 hours, average working hours per day is 7 hours) for three crops (paddy-potato-potato) in a year.

Farming, either for subsistence or for commercial purpose, keeps farmers constantly busy depending upon the type and intensity of production. The recorded data included the number of persons worked for the day including male and female from family as well as hired workers. It also included the work performed, which was grouped into the major categories as shown in Table 4. Working hours were calculated on the basis of 7 hours a day when there were hired laborers and 8 hours when only the family members worked unless the record specified the exact hours of work for the day. The total working hours for one crop cycle starting from sowing

paddy seeds in nursery bed to the harvest of winter potato extended from mid April till mid May of the next year as shown in the Figures 2 and 3. The calculation, however, does not include the labor used for the harvest of previous winter potato, equivalent to 1,035 hours overlapped with paddy sowing. The data also excluded the labor equivalent to 294 hours for vegetable cultivation in the kitchen garden. Table 4 shows winter potato required almost an equal amount of labor 3,572 hours as that of paddy 2,663 hours while summer potato required less, 2,565 hours only. Activities like land preparation, fertilizer application, and harvest for winter potato require more labor than summer potato or paddy. The data shows that labor used for fertilizer application in winter potato, 730 hours/ha, was higher than summer potato, 188 hours/ha, because of the preparation of compost fertilizer from paddy straw and plant remains of summer potato after harvest. Although summer potato is grown mainly for cash income, farmers treat winter potato as main potato cultivation for separating seed potato to be used for the next cultivation. They also have a higher production of about 1.5 times more than summer potato. To avoid the risk of damage due to climate or other circumstances, the farmer keeps nearly double the amount, about 2,100 kg of his actual requirement of seed potato. The excess is sold after sowing for his fields.

Labor required for land preparation and management for potatoes is high. A total of 1,397 hours/ha for winter potato and 1,394 hours/ha for summer potato are needed while only 144 hours/ha is needed for paddy. Compared to double crop farming, paddy in summer and potatoes in winter, the labor needed for summer potato cultivation is extra labor required in intensive agriculture. This is due to the need to make grooves needed to retain water for irrigating potato, which are needed to

Table 4. Total hours of labor use per hectare by crops of the selected farmer in Sankhu

	1999										2000				Total ¹	
	Paddy					Summer Potato					Winter Potato ²					
	Family labor		Hired labor		Sub-total	Family labor		Hired labor		Sub-total	Family labor		Hired labor			Sub-total
	Male	Female	Male	Female		Male	Female	Male	Female		Male	Female	Male	Female		
Seed sowing	38	25	13	19	94	70	44	0	114	228	85	95	9	18	206	528
Transplantation	125	50	106	406	688	0	0	0	0	0	0	0	0	0	0	688
Irrigation ³	119	6	19	31	175	15	0	0	0	15	138	0	0	0	138	328
Land preparation	81	0	63	0	144	300	140	359	595	1394	403	368	364	263	1397	2934
Fertilizer application ⁴	0	0	0	0	0	88	0	100	0	188	166	160	273	131	730	918
Pesticide application	25	0	0	0	25	108	19	18	0	144	165	26	0	0	191	360
Weeding	131	113	0	338	581	0	0	0	0	0	0	0	0	0	0	581
Field checking ⁵	102	0	0	0	102	0	0	0	0	0	15	0	0	0	15	117
Harvest	75	56	256	281	669	169	166	35	228	598	298	279	68	251	895	2161
Post-harvest	68	37	44	38	186	0	0	0	0	0	0	0	0	0	0	186
Total	763	287	500	1113	2663	749	369	511	936	2565	1269	928	713	663	3572	8799

Source : Farmer's records from April 1999 to June 2000.

The total figures do not match due to rounding up of the numbers.

Notes :

¹Total does not include family labor hours gone out for exchange labor. The exchange labor received is included in hired labor, estimated to be 6.4 percent of total hired labor. Labor for harvest of summer potato include transport to market, and for winter potato include transport to cold store to keep seed. The data includes one crop cycle from April 1999 to May 2000, although there is overlapping with crop from other cycle. Labor used for vegetable and wheat is also excluded from this cycle.

²Winter Potato cropping period extend from December 1999 to May 2000

³Labor also includes draining out of water in paddy.

⁴Includes preparation of compost and going out to purchase fertilizer

⁵The farmer go around all the fields when there is no specific work

be maintained at all times. The use of the hand tractor for plowing land is limited to a few hours during winter for potato plantation. The farmer spends 2 – 3 days to purchase chicken compost directly from the poultry farms in Kathmandu in order to get good quality compost needed during that period.

Labor requirement for summer potato cultivation is mainly concentrated on land preparation consuming about 54 percent of the total labor used and 23 percent for harvest. Due to the moist remains from monsoon rain, labor for irrigation is considerably low while labor for weeding is almost zero.

Fertilizer is not applied for paddy as cultivation follows soon after winter potato wherein fertilizer is sufficiently applied. Labor used for paddy cultivation is also seen mainly during transplantation and harvest. This is about 40 percent of the total labor (2,663 hours/ha) required. Weeding is another labor-intensive activity for paddy production since about 22 percent of the total labor has been used as shown in Table 4.

4. Traditional agricultural practice and demand for hired labor in family farm

4.1 Hired labor and exchange labor

Labor is supplied mainly from three sources, family, exchange and hired. Although farming is a family business, family labor alone is not sufficient in multiple crop farming as well as during the peak seasons. Full time farmers are busy in their own farming, while the younger generation of the family are diverting to non-farm works, resulting in a decreased family labor force. Figure 3 shows that about 50 percent of required labor is supplied by hired labor. The family supplies labor regularly, on an average of 375 total hours/month, ranging from as low as 46 hours in February to more than 600 hours in May. The peak seasons for labor as

seen from the figure are during September-October, December and March, when the hired labor becomes important.

The major activities requiring hired labor are land preparation, transplantation, weeding, and harvesting. Since about 51 percent of the total labor is supplied by hired labor during the peak season, labor becomes scarce within the village and people from nearby hills supply labor. The cropping pattern in the hill villages like Ghamarchowk, Nangle Bhare is mainly maize and millet requiring labor at different times, thus enabling them to supply labor to Sankhu. Ghamarchowk and Nangle Bhare villages are located within 30 minutes to 1 hour walking distance. It is comprised of different ethnic group from Newars of Sankhu like the Tamangs and Brahmin or Chhetri who supply labor for Sankhu. Besides the peak season of paddy harvest, people from as far as Dhad khola, located on the way to Melamchi of Sindhupalchowk district, also supply labor to Sankhu. Dhad khola is situated along the Indrawati River at an altitude of about 1,000m, lower than Sankhu. Thus, people need to walk over a hill for about 4 hours to come to work. Due to the distance, people mainly the Danuwar Rai stay in Sankhu until paddy harvest is over in the village. As they manage their own food and shelter, it is not necessary for a particular farmer of Sankhu to arrange the facility for them. These people from Dhad khola are hired mainly during paddy harvest to perform the work, which require strength such as carrying and threshing of paddy. Since the cropping pattern is different, people from Dhad khola have no experience of potato cultivation and thus are not hired during potato plantation or harvest.

The continued requirement of labor in Sankhu from outside villages has developed a contract arrangement system where some people act as contractors to arrange the required

number of people needed for the farmer on a particular day. Hence, the farmer informs the contact person and places about his demand. The hired labor involves not only the payment of wage but also provision for food with drink during the afternoon break, particularly in the Newar community. The food consists of a plate of beaten rice and meat or vegetables along with home brewed drinks. The wage rate is determined according to the ethnic group that the Newars pay a little less, Rs. 50 as against Rs. 60 paid to other ethnic groups without food. Although the cost of the food was not calculated, it was estimated to be around Rs. 25–30 per person.

The major activities in the crop production can be divided into following categories such as, land preparation, plantation, crop management and harvest. Although present day modern paddy cultivation is similar to that of traditional in terms of the work involved, due to multiple crops farming, they use the improved variety for quicker harvest, which allows the land to be used for the summer and winter potatoes. In paddy production, the highest amount of labor is required during transplantation and harvesting. Transplantation consumes about 688 hours of total labor and as shown in Table 4, 59 percent of the work has been done by hired female laborers because transplantation is considered as women's work. Although transplantation of paddy requires land preparation and plowing of land, they are considered as heavy work done mainly by men. Once the transplantation of paddy is over, the farmer has no particular work except for one person from the family to go around to check all the fields one time in the morning and again in the evening. This field checking is done by the male of the family such as Rajendra himself in his case.

Pesticides application is quite less in case of paddy but in turn, it requires labor for weeding. The weeding part of the work is categorized

as women's work and about 78 percent of the work out of 581 hours was from women. The weeded plants are a source of animal feeding as well as compost fertilizer. Since people from Sankhu have less livestock holding they use the weeded plants for compost-making instead of animal feeding. They collect all the weeded plants at a place in the same field and let it decompose. However, in the case of Rajendra, the weeds gathered after weeding is given to the cow, which in consequence is used to give milk for the family. Its dung is also used for compost making.

During paddy harvest, more women were hired as this still involves manual and labor-intensive work, while threshing is considered as hard work for the men. Only a part of the threshing (of Taichung variety of paddy only) is done with the help of a thresher while threshing of other rice varieties such as Mansuli and Basmati, is done manually since the thresher breaks the straw instead of separating the paddy grains. The family contributes only 131 hours of labor during harvest and 537 hours from the outside. The proportion of male and female hired laborer for harvest is almost similar with 48 percent being female and 52 percent being male. Most of the women come from the hill village near Sankhu like Ghamarchowk, Nangle bhare while the male, who perform the hard work of threshing and carrying the heavy loads of harvested paddy, come from Dhad khola.

Paddy harvest is followed by summer potato cultivation for which land preparation requires a maximum amount of labor, 1,394 hours. Land preparation for potato cultivation involves the creation of grooves needed to retain irrigation water. Almost 68 percent of the work is contributed by hired labor of which about 62 percent is provided by women. Due to the moist soil, it requires light work in order to manage the grooves and cover up the potatoes. This is considered as land preparation even after planta-

tion.

The distribution of labor needed for land preparation for winter potato is also remarkable. This is done soon after the harvest of summer potato. Although the family supplies maximum labor for this season, it is only up to 44 percent of the total requirement thus the insufficient labor has to be fulfilled by hired labor.

Exchange labor is more popular in traditional subsistence agriculture. Exchange labor is usually done in a one to one basis, however, 2 females are required to substitute one male considering the type and amount of work. Female labor is valued half to that of male also in the case of wage rate. In the hills where traditional farming is still continued with only two crops, farmers depend much on exchange labor than hired labor as the works are carried out at a slower pace due to time in between the crops. The practice of exchange labor is gradually decreasing due to the shift to commercial farming with intensive cropping system. It provided only about 6.4 percent⁷⁾ of the total hired labor in case of Rajendra, and exchange labor is limited within only 4 – 5 households. In the valley, there is no continuous relationship with specific families since the exchange of labor depends on mutual exchange. The number of full time farmers in the family restricts the family to participate in the labor exchange. Crop intensification and commercial farming keep the farmers busy most of the time in their own farm. Hence, the use of hired labor is deemed to be easier when compared to labor exchange systems. In the case of Rajendra, the exchange of labor is still practiced only during transplantation of paddy and potato harvest.

This case gives a quite different picture to the information gathered previously in interviews when people assumed that almost half of the labor is provided by exchange. It is true only in the hills where the opportunity for commercial farming is still low. The system of hired la-

bor during the peak seasons provides opportunity for people in the hills where intensive farming is still not possible. Hand tractor for plowing land has been introduced mainly for winter potato cultivation to shorten the preparation time after rice or summer crops.

4.2 The role of female labor

Women play an important role in hired labor as they account for 61 percent of total hired labor. Traditionally, women carried out certain works such as, weeding, transplanting, and transporting compost manure and until now, hardly any men share in these activities. Bajracharya (2000) argues that it is just the cultural norm that separates some works exclusively for women in farming, since they are physically weak to carry out heavy works such as plowing and irrigation. However, looking at the type of works performed by women, most of them are labor intensive. Although women and men equally contribute to land preparation for potato in terms of labor hours, women are specialized in pulverization and land grading while men are specialized in plowing. Activities like paddy transplantation, weeding and harvest of the crops require more women as these activities are categorized as women's work and also due to fewer women in the family hired labor becomes more important. According to the data, hired women provided almost 58 percent during paddy transplantation and weeding as against 15 percent men for paddy transplantation. Although women are not involved in going to other places for the purpose of purchasing fertilizer, either chicken manure or chemical fertilizer, they are responsible for the transportation of compost fertilizer and for spreading it on the field⁸⁾. Men solely do the purchase and transportation of chicken manure and chemical fertilizer from outside the village on vehicles, since these activities require more than one day. The purchase of good quality chicken manure requires

the farmer to go up to Ranipauwa in the Nuwakot district on the way to Trishuli, which is around about 2 hours drive on bus from Kathmandu. According to the selected farmer, the chicken manure from the layers type is good quality than that of the broiler type chicken. The low quality manure costs nearly half to that of the good quality; however, the total cost becomes similar, as a larger quantity of the low quality is required in order to obtain the same effect.

Female hired laborers were more compared to male hired laborers at a proportion of 1 : 1.6. The main reasons for hiring more women are firstly due to certain activities that are considered as women's work and secondly, due to relatively cheap labor charges. The charge for a woman is Rs. 50.00 per day, fifty percent less than which is paid to a man. Although more women were hired for the agricultural works, only fewer women members of the family are involved in the farm works. The ratio of male and female labor supplied from the family of the selected farmer is found to be 1 : 0.5. It is due to the shifting of women from farm to self-employment in non-farm work in Sankhu (Manandhar, 1997). The younger woman from the surveyed family could not work full time in farm because she has to take care of her small child as well as household chores including preparation of food for the hired laborers. In other families of Sankhu, women of the younger generation are involved more on non-farm activities than farm works. The common non-farm activity getting popular among the women in urban and sub-urban areas is the hand knitting of sweaters, popular among the foreigners visiting Nepal. This is due to the fact that this is considered to be a self-earning job separate from farm work, which enables the individual to earn extra income for herself unlike farm work, which earns income for the entire family. The changed context of women's role in income gen-

eration and the lower social value for working in the farm among the Newar ethnic group also contribute in the shift from farm work to non-farm work provided by market opportunities. The status of farm work has been gradually changing among the women, especially in the younger generation within the community, which has led to more and more Sankhu women to get involved in knitting. This helps them to become partly independent in terms of earning for their own expenses. The shifting of Sankhu women to non-farm income generation work provides greater opportunity for women in the hill region to work as hired laborers. Since then, about 65 to 69 percent of the total hired labor are women to work in summer potato and paddy farms, most of whom come from the hill villages.

5. Conclusion

It was found that the increasing demand for vegetables led farmers to intensify cropping patterns from two crops to more crops in a year. The change of crops in the dry season from wheat to potato is prevalent in the suburbs of Kathmandu City. Potato being a popular cash crop is planted one after another (summer and winter potato) leaving no fallow period between the crops.

The labor use pattern of the selected farmer shows that the labor requirement largely depends on the number of crops cultivated. The total labor use by the selected farmer is 8,799 hours/ha for three crops (paddy-potato-potato) with 2,663 hours/ha for paddy, 2,565 hours/ha for summer potato and 3,572 hours/ha for winter potato. This proves that crop intensification demands nearly 29 percent more labor than that used only for the two crops paddy and winter potato. The introduction of summer potato could utilize the labor of the farmers and also provide labor opportunities for other farmers from nearby villages. The data shows that

peak labor use periods are in June, September, December and March. These are the periods for the harvest and planting of crops that need to be done one after other immediately.

It is clear from the study that for crop intensification using three crops, the total labor used was 8,799 hours in a year. When the total hours is divided by 7 hours a day, 1,257 person days is required which is equivalent to about 4.2 full time farmers, considering 300 days work in a year. Although the detail record for the traditional double crop farming is not available, it can be estimated to be similar to labor used for paddy and winter potato (6,235 hours) of the selected farmer. This means that the traditional farming system had under utilized the existing labor supply from the family. With the crop intensification, it helps in utilizing not only the under utilized family labor but also provide opportunity for others during the peak seasons.

The study shows that in farm with multiple crops, labor supply from outside the family becomes quite important since only about 50 percent of the total labor can be supplied from the family. Although exchange labor is important in the hills, hired labor is more valued because of timely completion of the work. It was also made clear that women contribute to a substantial amount of the work (49 percent). It was also found that women contribute more during the plantation, weeding and harvesting which are similar to that of traditional practice. Hired women also play an important role in the activities mentioned although women from the same village are less available due to their shift to non-farm activities.

Labor has become scarce from the same village, but due to the availability of labor from the hills, the shortage was not felt to be severe. An increasing number of younger generation people from valley or sub-urban areas diverting into non-farm activities leaves less people in the farm sector. This provides increasing opportu-

nity for the people as hired labor from hills where they cannot increase the cropping intensity.

This study shows the possibility of utilizing more labor during winter by introducing winter potato crop in the rest of the farm and summer potato where possible upon the improvement of the irrigation systems. Crop intensification with the improvement of irrigation systems can contribute in increasing the employment of rural people and help to improve the economic condition of rural people.

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Notes

- 1) Agricultural Projects Services Centre (APROSC) conducted the survey in representative areas of plain, valley and hill areas of the country. They focused on the traditional cropping pattern with double crops like paddy-wheat or paddy-maize/pulses and triple crops like paddy-wheat-bean, paddy-maize-mustard but no new cash crops was covered in the study.
- 2) The study of L. K. Amatya (1997) was a case study of 8 selected households from Syangja district in the western region of Nepal and focused on the traditional cropping system. The labor requirement was a collective of the lowland and upland, which the farmers own.
- 3) Regarding labor use in crop production, Agricultural Projects Services Centre (1983) reported that there are different sources of labor in different regions of the country. Family labor with exchange labor is used in the hill region, while hired labor is used more in the Tarai, and Valley. Two distinct labor use peaks in July-August and March-April (1992/93) are shown in case of paddy and millet cultivation in the Western region of Nepal (Amatya1997). The study is attributed to traditional farming systems with cropping intensities lower than 1.77.

- 4) It is still difficult to get the latest population statistics in VDC level. See CBS (1990). The Census of population has been conducted in 2001 and is still not available.
- 5) Renting-in and-renting out of land are common practices in Nepal and they become complicated in Sankhu, since one farmer rents-out own farmland to other farmers and rents-in land from others at the same time. The lack of written documents of rent-in or rent-out from the previous generation makes it more complicated to eliminate land tenancy in Sankhu. There is no pure landlord in Sankhu. The land tenure in Sankhu can be classified into five categories according to Sasaki (1997). Tenants account for 31percent of the total farms surveyed and owner-cultivators account for only 6 percent. Major part of the farmers is owner-cum-tenant who usually cultivate own and rent-in others farmland. Renting for only summer has also become common. This is because of the shifts to a commercial farming economy, and not all farmers owning irrigated land.
- 6) US \$ 1 is equivalent to Nepalese Rs. 72. 0.
- 7) The total hours obtained from the neighbors in exchange is estimated from the amount used by the family as exchange labor for others. The male 184 and female 88 hours per ha of labor that have been used for others is the equivalent amount received which is included as the hired labor.
- 8) Per tradition, women are not directly involved in handling cash and major decision-making in agricultural work.

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