

## Socio-economic Study on Current Farmer's Practices on Wheat and Mustard Production Systems in Surkhet, Salyan and Doti Districts

Naresh S Thakur\* and Ramji Khadka

Outreach Research Division, NARC, Khumaltar, Lalitpur

### ABSTRACT

Wheat is one of the major cereal crops grown as a mono crop or mixed with mustard/lentil or pea in the Mid and Far Western Development Regions. The main objective of the study was to explore the existing cropping practices of wheat and mustard production systems and to establish a benchmark for further impact evaluation. Three representative districts Surkhet, Salyan and Doti were selected for the socio-economic study in wheat and mustard production system. A total of 92 households were surveyed (using two stage purposive random sampling method) in the districts and information was also collected through RRA techniques. The total population of the surveyed households was 744 with an average family size of 7.8, 8.3 and 8.3 persons in Surkhet, Salyan and Doti, respectively. Brahmin/Chhetri (66%) and Gurung/Newar (1%) were the major and minor groups, respectively. The total area of the surveyed households was 79.96 hectares with an average farm size of 0.91, 1.02 and 0.60 hectare for Surkhet, Salyan and Doti respectively. Recommendation was made to identify the technology on mixed cropping of wheat and mustard for appropriate time of planting to maximize productivity of wheat and mustard crops without disturbing the existing farmer's practices.

**Key words:** Farmer's practice, impact evaluation, mixed crops, socio-economic study

### INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the major cereal crops mostly grown as a mono crop in Nepal. Being a component of various cropping patterns, wheat crop is also mixed with mustard (*Brassica juncea*), lentil (*Lens culinaris* M) and pea (*Pisum sativum*) in the lower hills of Mid and Far Western Development Regions with altitudes ranging from 300-800 masl. Productivity was higher in mix cropping of wheat, lentil and mustard than sole crop so the gross benefit from seed and grain was higher in wheat, lentil or mustard intercrop than sole (Neupane et al 1997). Intercropping of wheat and pea was profitable in terms of overall grain yield, land advantage, economic return and dietary requirements of the subsistent farmers, though the sole crop of pea gave the highest net benefit (Subedi 1996). There are several reports which suggest intercropping is advantageous in many ways such as yield stability, soil fertility improvement, human and animal nutrition (Willey 1979, cited by Subedi 1996). Similarly on the fertility trial of Wheat +

Mustard mixed crop in maize based systems at Kotjhari, with 60:30:0 NPK kg ha<sup>-1</sup> gave the highest gross return of Rs 13111 ha<sup>-1</sup> as against the other treatments (Yadav and Thapa 1990). The improved cropping pattern of Rice + Maize-Wheat + Mustard produced higher yield (9.39 t ha<sup>-1</sup>) than the farmer's practice (7.96 t ha<sup>-1</sup>) in the same upland situation (Joshi and Adhikari 1986). Food security and high intensity production systems have been perceived as priority areas by the Agricultural Perspective Plan (APROSC and JMA 1995) and also the ongoing 10<sup>th</sup> Five Year Plan. Wheat is one of the priority crops for food security, whereas mustard is a cash crop and both have direct impact on poverty reduction.

The objective of the present study was to identify the existing socio-economic status of the farmers, explore the existing cropping practices, identify and prioritize bio-physical and socio-economic constraints and establish benchmark of present socio-economic status of the farmers for future impact evaluation.

## MATERIALS AND METHODS

The survey covered the socio-economic status of the farmers and their mixed cropping practices of wheat + mustard/lentil/pea. A total of 92 households of Surkhet, Salyan and Doti districts were purposively selected at random from different Village Development Committees (VDCs). The survey was carried out in October 2000. Primary data were collected through household survey and rapid rural appraisal (RRA) techniques. Checklists and structured questionnaires were developed and filled up by interacting with persons and households, the owners of socio-economic conditions and farming practices. A multidisciplinary team of experts of Nepal Agricultural Research Council (NARC) and concerned District Agricultural Development Offices (Surkhet, Salyan and Doti) were involved in the study. Data sets obtained through the household survey were analyzed using SPSS software. The information obtained was based on memory recall. Secondary information was collected from the respective Agricultural Offices at Surkhet, Salyan, and Doti districts as well as NARC library.

### Surkhet

Melkuna, Maintada, Chhinchhu and Uttarganga VDCs of Surkhet were the sites surveyed. Settlement in these areas started after deforestation in the year 1965. The major farming ethnic groups at present are Magar (Bhudha), Brahmin, Chhetri/Thakuri, and Gurung. These groups had migrated from Salyan, Musikot, Rukum, Rolpa and Jajarkot districts. Melkuna, Chhinchhu and Utterganga VDCs are about 26, 20 and 0.5 miles away from the district headquarters respectively. The sites of Melkuna, Chhinchhu and Uttarganga VDCs have an area of about 2543, 5434 and 4986 hectares respectively. The elevations range from 198 to 2367 masl. There are about 1404, 1436 and 1260 households in the VDCs mentioned above with a population of 7649, 8319 and 6704 respectively. The total cultivable land in Melkuna, Chhinchhu and Utterganga VDCs are about 636, 498 and 1057 hectares respectively (DADO 1999).

### Salyan

The study areas are located at Chhayachhetra, and Khalanga VDCs in ward numbers 8, 9 and 4, 5 respectively. These VDCs have 678 and 999 households with the population of 3850 and 5313 respectively. The total cultivable areas in these VDCs are 2613 and 2199 hectares of which 807 ha and 715 ha is cultivated respectively. The elevations range from 326 to 1500 masl. The average annual rainfall is about 2039 mm of which 80 % is received between June to September. The average maximum and minimum temperatures are recorded 25°C and 15°C respectively (DADO 1999). The major ethnic groups are Brahmin, Chhetri/Thakuri, Magar, Gurung and Schedule Castes (blacksmith, shoemaker and tailor).

### Doti

The study areas are ward numbers 9 and 10 of Dipayal Municipality and 8 and 9 of Latamandu VDC. These survey sites are located physiographically in low hills of Dipayal Municipality and Latamandu VDC at a distance of 0 and 10 km respectively from Dipayal, the regional headquarter of Far Western Development Region. Dipayal and Latamandu VDCs have cultivable areas of 908 and 100 hectares respectively with 1962 and 868 households and a population of about 12360 and 4858. The elevations range from 305 to 1300 masl. The temperatures are rather extreme and fall down to 5°C in the coldest month and rise up to 42°C during the hottest month (DADO 2000). The major ethnic groups are Brahmin, Chhetri/Thakuri, Newar, Gurung, Magar and Schedule Casts (blacksmith, shoemaker and tailor).

## RESULTS AND DISCUSSION

### Socio-economic attributes

The total population of the 92 households was 744 with an average family size of 8.1 persons. The average family sizes were 7.8, 8.3 and 8.3 respectively in Surkhet, Salyan and Doti districts. The average family size of Surkhet was observed comparatively smaller than that of Salyan and Doti. Among the surveyed VDCs, the highest

average family size was observed for Maintada VDC (9.6) and the lowest for Utterganga VDC (6.1) of Surkhet district (Table 1). The male (49.6%) and female (50.4%) population virtually were in equal proportion. Population of age group between 15 to 60 years was engaged in different type of production activities including field crops, livestock raising and other income generating activities. The percentage of major ethnic composition of the Surkhet, Salyan and Doti sites comprises of 47, 74 and 82 percent of Brahmin/Chhetri and 34, 6 and 9 percent of schedule caste respectively (Figure 1).

**Table 1. Distribution of households (HH), population and family size in different Village Development Committees of Surkhet, Salyan and Doti districts**

District/VDC	HH†	HH, %	Population			Family size
			Male	Female	Total	
<b>Surkhet</b>	38	41	146	152	298	7.8
Utterganga	10	11	33	28	61	6.1
Maintada	10	11	45	51	96	9.6
Chhinchhu	9	10	29	30	59	6.5
Melkuna	9	10	39	43	82	9.1
<b>Salyan</b>	31	34	128	128	256	8.3
Chhayachhetra	16	17	70	68	138	8.6
Khalanga	15	16	58	60	118	7.9
<b>Doti</b>	23	25	95	95	190	8.3
Dipayal	15	16	35	27	62	7.7
Latomandu	8	9	60	68	128	8.5
Total	92	100	369	375	744	8.1

† HH, Household.

### Agricultural land

The total cultivated area of the surveyed households was 79.96 ha with an average farm size of 0.87 ha. A detail of land holding is given in Table 2. The average farm size of Salyan was comparatively bigger (1.02 ha). Doti had the smaller farm size (0.6 ha) than the overall average (0.87 ha). The highest average farm size (1.61 ha) was observed in Utterganga VDC, Surkhet and the lowest (0.42 ha) in Dipayal, Doti because the land is located in the river basin area, which is comparatively fertile. In the same way, Chhinchhu of Surkhet is close to the market and limited area located nearby.

About 48% of the total households categorized as small farm size (0.5 - 1.0 ha) occupied 39% of the total farm area. The percentage of big holders was very much limited (5%). Only large farmers had enough food production for their home consumption. A few of them had some surplus to sale in the local market. About 39% of the total

households categorized as marginal farm size (< 0.5 ha) and the food availability is for less than eight months (Figure 2).

### Land utilization

Out of the total cultivated area of 126.5 ha about 87% of the land was used for production of cereal crops and 10% for cash crops and 1% for fruits and 2% for own forest (Figure 3). In lowland area, paddy crop was grown in summer followed by wheat + mustard or wheat/potato as mono crop in winter. The other crops grown in upland were maize, finger millet and legumes in summer and mustard in winter. Despite these crops, maize has also been started to grow as a spring crop especially in the lowland area.

### Area and production of major crops

The major cereal and cash crops grown in the surveyed area were paddy, wheat, maize, finger millet and mustard. Farmers gave top priority to paddy, wheat and maize. Farmers' opinion showed that bio-physical condition was most suitable for these crops. The main products of these crops were utilized for human and the crop residues for livestock.

### Wheat

Wheat was the major cereal crop grown in both upland and lowland area in the winter season. About 96% of the total households grew wheat. The total area under wheat was 41.0 ha with an average land of 0.44 ha per household. The average area under wheat in Surkhet, Salyan and Doti districts were 0.38, 0.51 and 0.46 ha per household respectively. The average yield of wheat + mustard mixed crops was estimated to be 846 kg ha<sup>-1</sup> that is about half of the national average of sole wheat. The highest average yield (1242 kg ha<sup>-1</sup>) of wheat was observed at Melkuna VDC whereas the lowest yield (520 kg ha<sup>-1</sup>) was at Maintada VDC in rainfed eco-system (Table 3). It was nearly half of the national average (1806 t ha<sup>-1</sup>) because the farmers grew degenerated cultivars like Vaskar in poor management condition.

### Mustard

Mustard was the main cash crop grown in the low land as well as upland in the winter season. About 42% of the total households grew mustard.

The total area under mustard was 6.5 ha with an average land of 0.18 ha per household. The average area under mustard was 0.27, 0.13 and 0.20 ha per household in Surkhet, Salyan and Doti districts respectively. The average yield of mustard in wheat plus mustard pattern was estimated to be 286 kg ha<sup>-1</sup>. The highest average yield (414 kg ha<sup>-1</sup>) of mustard in wheat mustard mixed crops was observed at Utterganga VDC whereas the lowest (144 kg ha<sup>-1</sup>) at Maintada VDC (Table 3). It is about half of the national sole mustard crop (702 t ha<sup>-1</sup>).

**Cropping patterns**

Rice - wheat + mustard - fallow and upland rice - wheat + mustard - fallow were the dominant cropping patterns of irrigated lowland as well as fertile upland of river basin areas of all three districts, among which, Doti occupied the maximum area (90%) (Table 4).

Apart from the above patterns, specially in the hills of Doti the farmer also adopted slightly different cropping patterns in the marginal upland condition and where they grew triple crops in two years rotation (upland rice - wheat + mustard - finger millet - fallow) against the double crops in other districts. In such case, farmers had been experiencing that the finger millet depletes substantially higher amount of plant nutrients from soil than any other cereal crops. Hence, they left their lands fallow in the succeeding season after finger millet (Figure 4). In recent years, a few number of small farmers have initiated triple cropping patterns ie rice - wheat + mustard - maize in limited irrigated area where transportation and market facilities for green cobs were available.

Land/month	J	F	M	A	M	J	J	A	S	O	N	D
Lowland									Rice			
												Wheat
			Wheat+ mustard									Mustard
			Mustard									
									Maize			
Upland									Maize			
			Lentil									Lentil
			Mustard									Mustard
								Upland rice				
									Finger millet			

**Figure 4. Existing major crops calendar**

**Cropping practices**

Unavailability of irrigation is the primary limitation to improve the productivity of winter crops like wheat and mustard. About 28% of the

total cultivated land is covered by irrigation in the surveyed districts. About 1-3 times irrigation is the usual practice in irrigated lowland

condition whereas rests of others entirely depend upon natural precipitation.

For planting wheat, seed broadcasting followed by one or two plowings was the usual farmer's practice. 90% of the farmers applied compost (FYM) @ 5-15 t ha<sup>-1</sup> before planting. Although some farmers used chemical fertilizers along with compost as a basal application or top dress during late tillering stage (Table 5).

**Table 5. Average seed rate, fertilizers and FYM used in wheat and mustard crops**

VDC	Wheat, kg ha <sup>-1</sup>				Mustard,
	Seed	Urea	DAP	FYM	kg ha <sup>-1</sup>
<b>Surkhet</b>					
Utterganga	120	60	62	35000	7.20
Maintada	140	56	100	42500	5.60
Chhinchhu	90	40	68	33760	5.6
Melkuna	110	140	140	18760	5.4
<b>Salyan</b>					
Chhayachhetra	126	100	60	36340	5.3
Khalanga	130	80	40	15000	4.0
<b>Doti</b>					
Dipayal	106	80	100	22800	7.6
Latamandu	100	160	180	34820	5.8
Average	115	90	94	29872	6.00

While seeding was usually done by broadcasting (by 96%), some people (4%) also planted wheat behind the plow in moisture stress condition. Normal planting time was from November to mid-December. However, rarely the planting goes even beyond this period if moisture is not enough. Farmers reported that the seed rate of wheat and mustard for mixed cropping was 100 kg and 4 kg ha<sup>-1</sup> respectively while for sole crops 115 and 6 kg ha<sup>-1</sup> respectively. The seed rate used by the farmers found slightly higher than NARC recommended dose in wheat and mustard sole crop situation. Another factor of high seed rate used by the farmers was poor quality seed. Besides the mixed crop of wheat plus mustard, in some cases, people also grew wheat mixed with winter legumes like pea in low land and lentil in upland eco systems.

The average use of urea in wheat was 90 kg ha<sup>-1</sup>. It was observed that the highest urea (160 kg ha<sup>-1</sup>) was used in wheat crop at Latamandu VDC. The average amount of FYM used for wheat was too high 29872 kg ha<sup>-1</sup> (Table 5) because of small land holding. The application of FYM depends

upon the livestock herds holding by households. The improved varieties of seed were used for the last 20 years. Over the time farmers are using the same seed.

Rice, wheat, maize, legumes and mustard were the popular crops grown in the surveyed areas. Farmers usually grow rice, wheat, mustard, potato in lowland and maize, wheat, rapeseed and winter legumes in upland ecosystems. Among the cropping practices, wheat and mustard mixed cropping was popular pattern in the river basin areas of Surkhet, Salyan and Doti districts. The most popular varieties of mustard for mixed crops (wheat + mustard) were *Barsali*, local and *Vikash* improved. The varieties used for mixed crop were phenotypically different from that of the sole crop. It is taller and fruiting branches were always above the wheat crop. Wheat and mustard varieties grown in the survey sites are given in Table 6.

**Table 6. Crops and varieties adopted in the districts**

Crop	Districts		
	Surkhet	Salyan	Doti
Wheat	1. BL 1022	1. BL 1022	1. RR 21
	2. Nepal 297	2. Bhrikuti	2. Kalyansona
	3. Annapurna 1	3. Nepal 297	3. BL 1135
	4. Bhrikuti	4. RR 21	4. BL 1022
	5. Vaskar		5. Dabdekhani
Mustard	1. Surkhet local	1. Vikash	1. Kalo local
	2. Barsali	2. Local	2. PT 30
	3. Vikash		
	4. Pusa bold		
	5. Pragati		

Farmers were very much choosy in selecting wheat and mustard crops for mix cropping. Generally, they did mix mustard or rape seeds with wheat in lowland and fertile upland conditions to get extra yield over the sole crop of wheat. More than 80% growers of Surkhet and Doti plant tall type of mustard (*Rai*), which would not affect the wheat crop. During wheat heading, mustard started shedding their leaves. It allowed for better solar radiation that resulted into better yield of wheat. Besides this, it was also desirable from standpoint of utilizing plant nutrients from different soil depths because of their different root systems. Hence, it could be said that the crops were compatible for mix cropping.

In mixed crop of wheat plus mustard, maturity period of crops did not coincide, though the planting was done at the same time. Normally, mustard matures about a month earlier than wheat. Only harvesting of fruiting branches or uprooting whole plants were practiced for mustard harvest in all the districts. For wheat in Doti heads were picked whereas in Salyan and Surkhet, the whole plants were harvested. Threshing was done by stick beating in Doti while treading by bullock around the centrally fixed wooden pole was practiced for threshing in Salyan and Surkhet.

#### **Utilization of wheat, mustard and by-products**

Wheat is the staple food of hilly areas of Mid and Far Western Development Region. It is used for making different food items like bread, *Puri*, *Paratha*, *Bhat*, *Haluwa* and even liquor (alcohol and local beer). Among these, use of wheat flour as bread and grains as liquor are common in all survey districts. Besides, grain by-products like wheat bran is used as a part of animal feed. Wheat straw was widely used for animal feed particularly in lean period as well as for roofing.

Mustard oil is quite commonly used as edible or cooking oil. It is also used for other purposes like body massage, hair care, health care item for eye and ear etc. Oil cake as a by-product is used as animal feed, manure as well as preservative of household bamboo crafts such as *Nanglo*, *Dalo*, *Kotha*, etc.

#### **Food sufficiency situation**

About 45, 51 and 75 percent of the total households in Surkhet, Salyan and Doti respectively reported that their agricultural produce is enough for less than 8 months of their annual food requirements and 26, 24 and 8 percent respectively had surplus (Figure 5). Only 3% farmers in the Maintada VDC and 8% in Dipayal Municipality reported that their agricultural produce is enough only for 4 months. Farmers reported that off-farm income contributes towards fulfilling their food requirements during deficit period.

#### **Bio-physical and socio-economic constraints**

Different types of bio-physical and socio-economic problems were reported and recorded

during the field survey. In the study area, frequent drought and decline in soil fertility were the major constraints for crop production. Furthermore, pests, hailstone and weeds were also identified as the major bio-physical problems during the cropping season (Table 7).

Similarly, small land holding, lack of labor, unavailability of credit and lack of technical information were the important prevailing socio-economic constraints. Besides these, low market price of products and unavailability of fertilizers were also reported as the frequent problems during cropping season (Table 7).

#### **Gender roles in farm activities**

Both male and female members were actively involved in carrying out the farm activities. Land preparation, seeding, weeding, harvesting, threshing and marketing were major farm activities where gender involvement was reported in different crop activities. It was observed that male farmers were involved exclusively in plowing activity and females for cleaning and weeding activities. Both male and female farmers carried out harvesting and threshing activities.

Wheat is one of the major cereal crops grown as a mono crop or mixed with mustard/lentil/pea in the Mid and Far Western Development Regions. About 87% of the total land was used for cereal crops and 10% for cash crops in the surveyed sites. Rice - wheat + mustard - fallow and upland rice - wheat + mustard - fallow were the dominant cropping patterns in irrigated lowland as well as in fertile upland of river basin areas of all three districts among which Doti occupied the maximum area (90%) and Salyan the lowest (40%). The popular cultivars of wheat are BL 1022, NL 297, Bhrikuti and RR 21 and for mustard they are Barsali local and Vikash improved. Productivity of wheat and mustard is quite lower than that of district average. Subsequently about 52% of the total households reported that their agricultural produce is enough only for less than 9 months and during the deficit period, food requirement is met through off-farm income.

Hence, the present level of productivity of both the crops can be enhanced through varietal identification and crop management practices. A complete package of practices for mixed cropping of wheat and mustard needs to be developed for further dissemination of technology in river basin areas of Mid and Far Western Development Regions. These crops can contribute to improve food security and employment opportunity and have direct impact on poverty reduction through management of sustainable farming systems.

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