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Input use gap and technology adoption among female-headed and male-headed households in Bilaspur district of Himachal Pradesh

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Abstract

Hill and mountain agriculture is generally characterized by inaccessibility, small and scattered land holdings and poor infrastructural facilities. Under these circumstances the males migrate to the plains to seek employment, leaving the management of household affairs including agriculture for the females. The availability of inputs and other market information is likely to be restricted to these households. This has serious implications for agricultural development. Keeping this in view, the study was conducted in Bilaspur district of Himachal Pradesh to find out the gaps in input use, agricultural productivity and adoption pattern of new agricultural technologies among both types of households. The results showed that maize and paddy were the major crops grown in kharif season, whereas, wheat was the only crop grown in rabi season. The area allotted to vegetables in both the seasons, was very less. The productivity of all the major crops was found to be higher on MHH as compared to FHH. The expenditure on seed in all the crops was higher on MHH except maize, whereas, in case of fertilizer reverse trend was observed. The per hectare use of seed was higher than recommended in case of maize and paddy on both types of households, whereas, in case of wheat the seed rate was close to the recommended level. The gap in seed was found to be maximum in case of paddy followed by maize. Maximum number of cultivators used only nitrogenous fertilizers during kharif season. A significant gap was observed in use of fertilizers which was found to be higher on MHH than FHH. The use of HYVs and chemicals was very low on both the households. The use of fertilizers was not only low but imbalanced also. Adoption of line sowing method, which contributed significantly in enhancing yields, was almost negligible. In case of paddy, majority of the households used the local seed. This shows the low level of adoption of new technology in the study area. The low production on FHH was due to delayed operations, inability to visit the agency being female and low purchasing power. Thus the study suggests the need for imparting trainings and creating awareness about credit facilities in the area. The lending agencies should also advance loans to such households with less formalities and security.

Key words: Input use, technology adoption, female-headed households.

Introduction

Indian agriculture has grown rapidly enough in recent decades. More than two-thirds of the rural workforce continues to depend on agriculture for their livelihood, out of which about half of the population is of females. In the hilly and mountainous regions, because of low level of industrial development, the dependence of population on agriculture is higher than the national average and also that of other states. For example, in Himachal Pradesh in 1999-00, while 55.30 per cent of the male workers were employed in agriculture, the female percentage was much higher at 95.10 per cent (Sharma, 2001). Hill and mountain agriculture is generally characterized by inaccessibility, small and scattered land holding and poor infrastructural facilities. Under these circumstances the males migrate to the plains to seek employment, leaving the management of household affairs including agriculture for the women. In the hills of Himachal Pradesh, Uttaranchal, and North East, they are responsible for sowing, hoeing, crop maintenance, harvesting, food processing, seed selection and future planning, livestock management besides their regular duties in

household chores. In the absence of male heads, the female has to take on all these responsibilities. Such types of households are called female headed households. These emerge due to death of spouse, divorce, separation, migration of males to other places for long period of time, and/or non-functioning of male members for income generation due to many reasons (Lingam, 1994). There is a plethora of studies that have documented the contribution of females in the hilly/mountainous agriculture [Bala (1992), Tuteja (2000)]. But there is relative dearth of studies about the impact of male migration on agricultural productivity, input use and adoption of new agricultural technology. The availability of inputs and other market information is likely to be restricted to the female headed households due to illiteracy and many other factors. This would be reflected in lower productivity and thus lower income (Tuteja, 2000 op.cit.).

In a hilly and mountainous state, where the phenomenon of male migration is substantial, this has serious implications for agricultural development. Factors like supply of inputs, farmer's participation of benefits of new technology and limited knowledge of modern inputs are some of the important factors which determine adoption and spread of modern technology (Narlove, *et al,* 1996) and female are the most affected in this regard. It is, therefore, interesting to study what are the gaps in input use and agricultural productivity on Female-Headed Households (FHH) as compared to Male-Headed Households (MHH) and the adoption pattern of new agricultural technology in female headed households. Against this background, the present study proposes to compare the performance of agriculture in terms of productivity, input use and adoption between the female-headed households and the male-headed households. More specifically, the objectives of the study were:

1. To study the gap in input use and productivity level of major crops between the Female- Headed and Male- Headed Households.
2. To study the extent of adoption of new technology by the two categories of sample households.

Materials and Methods

The study was carried out in Ghumarwin block randomly selected from Bilaspur district of Himachal Pradesh. Two stage simple random sampling design was followed for the sample selection. Four per cent of total villages, twelve in all, were selected randomly. Finally, 60 Male-Headed Households (MHH) and 60 Female-Headed Households (FHH) were allocated by proportionate allocation in the respective villages. Tabular analysis was employed to study the general information regarding cropping pattern and average yield of crops, adoption of new technology etc. The t-test was used to work out the standard errors of mean values of inputs (both physical and value terms). The recommended levels of productivity and input use were taken from package of practices, CSK HPKV, Palampur.

Results and Discussion

Cropping pattern: The major crops grown in kharif season were maize and paddy whereas wheat was the only crop grown in rabi season. The area allotted to vegetables in both the seasons, was very less. (Table1) The total cultivated area was higher in MHH (1.08 hectare) than that in FHH (0.82 hectare) by 32 per cent.

In MHH 42 per cent of total cultivated area was under maize against 40 per cent in FHH. Out of the total area under maize nearly 75 per cent area is under high yielding varieties.

Table further indicated that about 47 per cent of the cropped area on both types of households was under wheat crop. The irrigated area in kharif season was allotted to paddy. In case of paddy, mostly local varieties were grown in the region as compared to the improved varieties. The area under vegetables in both the seasons was higher on FHH as compared to MHH. This can be attributed to the fact that vegetables were mostly labour intensive. In hill agriculture most of the agricultural operations are performed by females and thus FHH are able to take up vegetables for cultivation.

Gap in productivity levels of major crops: The productivity of the major crops was found to be higher on MHH as compared to FHH. (Table 2) It was higher by 32 per cent in maize, 25 per cent in paddy and 30 per cent in wheat in MHH as compared to FHH.

Table 1. Cropping pattern of sample households (Per cent)

Crops	MHH	FHH
I. Kharif crops		
Maize local	8.95	9.96
Maize HYV	33.06	30.66
Paddy local	4.44	4.39
Paddy HYV	1.11	0.68
Seasonal vegetables	3.03	4.69
II. Rabi crops		
Wheat local	7.47	7.62
Wheat HYV	39.72	38.09
Seasonal vegetables	2.22	3.91
Total area (hectare)	1.08	0.82
	(100.00)	(100.00)

Table 2. Gap in productivity of major crops (q/ha)

Crops	MHH			FHH			t_{cal}	% Change over recommended	
	E	P	G	E	P	G		MHH	FHH
Maize	21.93	30.00	8.07	18.78	30.00	11.22	225.0*	36.80	59.74
Paddy	15.00	30.00	15.00	11.78	30.00	18.22	41.3*	100.00	154.67
Wheat	18.36	28.00	9.64	16.64	28.00	11.36	143.3*	52.51	68.27

E – Existing, P – Potential, G – Gap

t_{cal} shows the differences in the respective mean values of MHH and FHH

* denotes significance at 5%

This may be due to better use of resources on MHH. The gap was found to be highest in case of paddy on FHH (18.22 q/ha) followed by paddy in MHH (15 q/ha). The minimum gap was found in case of maize in MHH that is 8.07 q/ha. The table also showed that the percent change over recommended was positive in all the crops. It was lowest for maize on MHH (36.80%) where as in for paddy in both types of household it was higher than 100 per cent. In others it vary between 50-70 per cent.

Expenditure on seed and fertilizer: The expenditure on seed and fertilizer was examined in value terms. It can be examined from the table that the expenditure on seed in all the crops was higher on MHH except maize whereas in case of fertilizer reverse trend was observed. The standard errors were found to be higher within the same category of households, thereby showing wide variability in the use of seed. In case of fertilizer standard error was minimum in case of paddy in both types of households. In general standard error was found to be higher on MHH than FHH. This may be because of the fact that some of the MHH had better accessibility towards various inputs.

Gaps in input use

A) Seed: Expenditure on seed forms an important part of total cash variable expenses. Although the farmers were using very less quantity of HYVs but the survey has shown that it was coming up fast. The cultivators had shown their inclination to adopt hybrid maize along with fresh seed from the market for paddy and wheat. This has led to increase in expenditure on seed.

Table 3. Expenditure on seed and fertilizer (Rs.)

Crops	MHH		FHH	
	Seed	Fertilizer	Seed	Fertilizer
Maize	495 (256.7)	787 (373.1)	513 (108.0)	795 (176.5)
Paddy	2107 (367.5)	425 (85.3)	2069 (120.0)	558 (73.0)
Wheat	2297 (960.7)	527 (366.0)	2415 (447.3)	904 (223.6)

Figures in the parentheses are SEs

Table 4. Level of input use of seed (kg/ha)

Crops	MHH			FHH			t_{cal}	% Change over commended	
	E	R	G	E	R	G		MHH	FHH
Maize	30.92	25.00	-5.92	32.06	25.00	-7.06	88.83*	-19.15	-22.02
Paddy	131.67	100.0	-31.67	129.33	100.0	-29.33	41.91*	-24.05	-22.68
Wheat	114.85	120.0	5.15	120.73	120.0	-0.73	91.33*	4.48	-0.60

E – Existing, R – Recommended, G – Gap

t_{cal} shows the differences in the respective mean values of MHH and FHH

* denotes significance at 5%

The table revealed that seed rate was higher than recommended dose in case of maize and paddy in both types of households whereas in case of wheat seed rate was close to the recommended level. The differences in seed rate were observed in these households with the help of 't' test which was found to be significant for all the crops. The gap in seed was found to be the maximum in case of paddy followed by maize and wheat. The gap was negative for all the crops except wheat on MHH. The per cent change over recommended was highest (24 per cent) in case of paddy in MHH followed by paddy and maize in FHH. The gap was lowest in wheat in FHH that is 0.73 per cent.

B) Fertilizer

Use of plant nutrients: Maximum cultivators used only nitrogenous fertilizers during kharif season. In maize, 88 per cent of MHH used only nitrogen against 97 per cent of FHH and rest of farmers used mixed fertilizers (Table 5). All the selected households who grew paddy used nitrogenous fertilizers. However, there was one out of 23 on FHH who used mixed fertilizer. It is important to note that all the households were using the fertilizers in both the seasons. The results further show that in wheat crop, 53 per cent of MHH used nitrogen only against 60 per cent of FHH. This indicated that more number of MHH used mixed fertilizer as compared to FHH, in case of wheat.

In maize crop, mixed fertilizers were used by both types of households but in small quantities. The table 6 clearly showed that in absolute terms the gap was the maximum in case of phosphorus on both types of households but in percentage terms the maximum gap was observed for potassium. The gap was 3.5 times higher on FHH than MHH. In case of nitrogen the gap is very less because the farmers were mainly using nitrogenous fertilizers. In paddy crop mixed fertilizers were used only in case of FHH. The per cent change was higher (30 per cent) in case of MHH for nitrogen than FHH (10 per cent). In phosphorus and potassium it was quite high. In wheat, mixed fertilizers were mainly used by FHH. The gap was higher on MHH than FHH but highest in case of K in both types of households. The per cent change over recommended was also higher in MHH than FHH by 20 per cent in N, 15 and 12 times higher for P and K respectively whereas in case of FYM reverse trend was observed.

Table 5. Distribution of sample households according to use of plant nutrients (Per cent)

Category	MHH			FHH		
	Maize	Paddy	Wheat	Maize	Paddy	Wheat
N only	88.33	100.00	53.33	96.67	95.65	60.00
Mixed fertilizer	11.67	-	46.67	3.33	4.35	40.00
Total number	60 (100.00)	19 (100.00)	60 (100.00)	60 (100.00)	23 (100.00)	60 (100.00)

Table 6. Gap in use of fertilizer (Per ha)

Crops	MHH			FHH			% Change over recommended	
	E	R	G	E	R	G	MHH	FHH
Maize								
FYM	21.71	15.00	-6.71	22.60	15.00	-7.6	-30.91	-33.63
N	61.58	90.00	28.42	65.56	90.00	24.44	46.15	37.28
P	4.07	45.00	40.93	1.20	45.00	43.8	1005.65	3650.00
K	2.04	30.00	27.96	0.60	30.00	29.4	1370.59	4900.00
Paddy								
FYM	12.50	10.00	-2.5	16.83	10.00	-6.83	-20.00	-40.58
N	38.55	50.00	11.45	45.21	50.00	4.79	29.70	10.60
P	-	25.00	25	3.23	25.00	21.77	-	673.99
K	-	25.00	25	1.62	25.00	23.38	-	1443.21
Wheat								
FYM	21.16	15.00	-6.16	21.58	15.00	-6.58	-29.11	-30.49
N	47.21	80.00	32.79	53.12	80.00	26.88	69.46	50.60
P	1.64	40.00	38.36	15.67	40.00	24.33	2339.02	155.26
K	0.82	40.00	39.18	7.83	40.00	32.17	4778.05	410.86

Level of adoption of technology

Technology has been changing at a rapid rate but the farmers, due to many reasons, have not been keeping pace with these technologies. The FHH and MHH were interviewed to know about the level of technology adoption for various operations in different crops. The results are presented in Table 7.

A. Maize: Results have shown that good seedbed was adopted by about 2/3rd of households, whereas, the adoption of HYVs was low. Adoption of line sowing method, which contributed significantly in enhancing yields, was almost negligible. Most of the farmers were using broadcasting method of sowing and this was one of the reasons for higher seed rate in the area. About 2/3rd of households, who used fertilizers, were using only single / basal dose of fertilizer. Use of chemicals for plant protection and irrigation was almost negligible. The use of chemical fertilizers was also very low in both types of households. Fifty per cent of households used less than 30 per cent of the recommended fertilizer dose.

B. Paddy: The farmers of the area were found to be conscious about good seedbed. 80 per cent of MHH and 61 per cent of FHH had adopted good seedbed for paddy cultivation. Majority of the households used the local seed. Line sowing, which is very important, was partially done by 50 per cent of MHH and 26 per cent of FHH on a

small scale. In about 2/3rd of households, only single / basal dose of nitrogen was given. Use of chemical fertilizers in paddy was also very less. About half of the households used chemical fertilizers and it was below 50. per cent of recommended doses. About 40 per cent and 50 per cent of households in MHH and FHH respectively felt the need for irrigation at critical stages.

C. Wheat: Results indicated that good seedbed had been adopted by 80 per cent and 70 per cent of MHH and FHH, respectively. The use of HYVs was also high in wheat as compared to maize and paddy. About 3/5th of the sample households used HYV. Line sowing had not been accepted yet in the area. In MHH about 3/5th of households gave split dose of nitrogen against 2/5th in FHH. Use of chemical fertilizers was very less. Maximum population used below 30 per cent of the recommended fertilizer dose.

In general, the use of HYVs was very low Line sowing was done at a very small scale due to paucity of labour at the proper time. Use of hired labour was very less which may be due to

Table 7. Distribution of household according to level of adoption of technology in different crops (Per cent)

Characteristics	Maize		Paddy		Wheat	
	MHH	FHH	MHH	FHH	MHH	FHH
I. Good seed bed	66.67	63.33	78.95	60.87	80.00	71.67
II. HYV						
a. Partial	16.67	23.33	-	-	16.67	-
b. Complete	33.33	26.67	5.26	-	61.67	68.33
III. Line sowing						
a. Partial	10.00	1.67	47.37	26.09	-	-
b. Complete	28.33	10.00	-	-	15.00	8.33
IV. Top dressing of N						
a. Single dose	66.67	75.00	73.68	73.91	23.33	63.33
b. Split dose	33.33	25.00	26.32	26.09	61.67	36.67
V. Use of chemical fertilizers						
< 30%	48.33	53.33	36.34	17.39	62.02	45.91
30-50%	23.33	16.67	21.05	13.04	20.37	31.33
50-80%	8.33	3.33	-	-	3.21	2.45
> 80%	-	-	-	-	-	-
VI. Irrigation at critical stages	-	-	42.11	47.83	-	-
Total number	60	60	19	23	60	60
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

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vailability of family labour, low requirements and low paying capacity of the households. A large proportion of farmers applied nitrogen as a basal dose due to lack of knowledge about the benefits of split dose of fertilizers. The use of chemicals was very less due to low purchasing power and declining productivity. Irrigation was not applied at critical stages due to non-availability of water at critical stages. The overall scenario showed that adoption of technology was very less in the area.

Reasons for low productivity in FHH

The main reasons as given by FHH for low production were that the operations were delayed due to non- availability of labour (66.67% households) followed by inability to visit the agency being female (46.67%) as these were located at far of places from there households and low purchasing power (45.00%). The other reasons for low productivity were more dependence on hired labour, late in approaching the society, low purchasing power and lack of timely information. Maximum female heads nearly 85 per cent could not complete the formalities being illiterate whereas others did not know about the availability of credit. Thus to improve the status of females there is a need of training to females in general and FHH in particular regarding latest agricultural technologies and credit accessibilities.

Conclusions

The total cultivated area was higher in MHH (1.08 hectare) than in FHH (0.82 hectare). The productivity was found to be higher in MHH as compared to FHH by 32 per cent in maize, 25 per cent in paddy and 30 per cent in wheat. The expenditure on seed in all the crops was higher in MHH except maize whereas in case of fertilizer reverse trend was observed. The gap in seed was found to be maximum in case of paddy followed by maize. Maximum cultivators used onlynitrogenous fertilizers during kharif season. But the use of fertilizers was more in FHH than MHH. A significant gap was observed in use of fertilizer which was found to be higher in MHH than FHH. The use of HYVs, line sowing and chemicals was very low by the farmers. The overall scenario showed that adoption of

Table 8. Reasons for low productivity in FHH (Per cent)

Problems	FHH	Problems	FHH
1. Operations are delayed	66.67	6. Late in approaching the society	30.00
2. More dependence on hired labour	43.33	7. Do not have sufficient funds	21.67
3. Low purchasing power	45.00	8. Lack of awareness about credit	71.67
4. Can't visit the agency	46.67	9. can't complete the formalities	85.00
5. Information received was late	13.33	Total number	60

technology was very less in the area. The low production in FHH was mainly because the operations were delayed due to non- availability of labour, inability to visit the agency being female etc. Thus the lending agencies should come forward to advance loans particularly to FHH with less formalities and security. There is also need of training to females in general and FHH in particular regarding latest agricultural technologies and credit facilities so that their status can be improved.

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