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Impact of Agricultural Technologies on Work Participation of Women in Sub Mountainous Region of Punjab

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Abstract

The agriculture in Punjab has been highly mechanized, but there is differential use of machinery in different regions. There are different regions in state i.e sub- mountain undulating region, undulating plain region, central plain region, western plain region, western region. In sub- mountainous region, there is less use of machinery. So, the present study was planned with specific objective to investigate the impact of technology on work participation of women in sub- mountainous region of Roopnagar and Hoshiarpur districts. Four parameters viz., drudgery reduction, work displacement, income generation/reduction and free time were analysed. The study found that due to mechanization, farm labourers got displaced from agriculture. As a result of displacement from agricultural and nearly no non- farm employment avenues, farm labourers income had been reduced. Majority of them disclosed that due to lack of gainful employment, they had enough free time at their disposal, but of what use was idle time when they can't even ensure basic sustenance level for themselves and their family. The total sample consisted of 120 respondents. The study suggested farm labourers who got displaced due to mechanization of agriculture may be provided with off farm employment avenues in order to assure basic sustenance level.

Keywords: Punjab, Agriculture, Sub- mountainous region, Agricultural technology, Farmwomen, Farm labourers

JEL Classification: H74, Q10, Q16, O18, J43, J14

Introduction

About 55 per cent of the total work force of India is dependent on the farm sector (GOI, 2011). Over the years, agriculture has developed and with the use of new technologies and methods it replaced almost all the manual and traditional type of farming. In Punjab there is differential use of machinery in agriculture in different regions. Studies have reported less use of machinery in sub-mountainous region of Punjab as compared to central plain, western plain and western region. Due to mechanization involvement of labour has decreased at excess rate. Only eight day per labour is required for one acre of wheat cultivation and 26 day per labour is required for one acre of paddy cultivation (Ramya and Muruganandham, 2016). It displaced many labourers from their work especially women (Mada and Mahai, 2013; Mehta, 2005; Godara, 2011)

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Rural women have great experience about agriculture and its related activities. They have great capacity of promoting agriculture in real sense, if opportunities are given to them. The participation of women are mainly found in various agricultural activities like seed sowing, weeding, harvesting, threshing, application of manure, seed storage, post harvesting. According to time allocations studies, Indian women spent around 25 hours in a week for doing domestic chores and 30 hours they spent for doing different operations of agriculture (The Times News Network, 2012; Satyavathi, *et al*, 2010). According to GOI, 2016 the operational land holdings of women had increased from12.79 per cent in 2011 to 13.87 per cent in 2015-16.

After green revolution, traditional operations of agriculture were replaced by machinery. Manual work has been changed into modern and mechanical work.

Due to mechanization in agriculture women's role has changed and impacted a lot (Sebby, 2010). Displaced women lost their cultural and social identity after displacement. They were forced to move and change their traditional and manual type of work or livelihood. The country needs new strategies to resolve the problems of these displaced women (Kaur and Sharma 2019; Kumar and Mishra, 2018; Mishra, 2014; Asthana, 2012). Punjab's sub-mountainous region extends along the eastern borders of the state and covers 9.5 per cent of the total geographical area of the state and concentrated in some areas of Ajitgarh, Roopnagar, Shaheed Bhagat Singh Nagar (S.B.S Nagar), Hoshiarpur and Pathankot districts. The present study was an attempt to investigate the impact of technology on work participation of women in sub- mountainous region of Punjab.

Data Sources and Methodology

The study was conducted in sub-mountainous region of Punjab state. Multi stage random sampling technique was used. At first stage, two districts viz. Roopnagar and Hoshiarpur were randomly selected. At second stage, two blocks were taken randomly from both the districts. Then from selected four blocks, three villages were chosen. At final stage ten women respondents (five marginal and small farmers and five farm labourers) were interviewed from the total 12 villages. Thus, a total sample of 120 respondents was selected for the study. The data were collected through self structured interview schedule. Three point scale i.e. extremely, rarely or less, which scored as 3, 2 and 1 was made to assess the impact. Impact of agricultural technology was assessed through four parameters viz. drudgery reduction, work displacement, income generation/ reduction and free time. Mean scores were calculated for all parameters. For assessing the difference of technological impact on work participation of farm women and farm labourer, t- test had been used. The data were collected in the year 2019-2020.

Results and Discussion

Study of socio-economic profile of women respondents from sub- mountainous region of Punjab which included age, caste, education and family income is pertinent to gauge the different impact of agricultural technologies on farm women and farm labour. Hence, the characteristics were studied and presented in Table 1.

Data given in Table 1 revealed that half of the respondents (48.33 % farm women and 50.00 % farm labourer) belonged to 26-50 years age group. Average age for farm women was 39 years and for farm labourers, it was 42 years. Overall average age was 41 years for both the categories. No significant difference was found between the age of respondents in both the categories. Half of the farm women belonged to general castes and 48.33 per cent farm labourer belonged to scheduled castes. All the farm women were able to read and write. On the other hand 40 per cent of farm labourers were unable to read or write. Twelve per cent of farm women and 31.67 per cent of farm labourers were educated up to primary level. Up to secondary level education was attained by 21.67 per cent farm women and only five per cent farm labourers. Only ten per cent of farm women were graduated and no one from farm labourers had obtained graduation degree. Study further divulged that annual family income of farm women varied from Rs. 50 thousands to three lakhs. Majority (91.67%) of farm labour earned up to one lakh and just 8.33 per cent earned upto 1.5 lakh per annum. Significant difference was found between the incomes of both categories.

Study further investigated the impact of agricultural implements (Disc harrow, Seed cum fertilizer drill, Potato planter, Zero till drill, Rotavator, Reaper, Tractor operated combine, Maize Sheller) on work participation of farm women and farm labour (Table 2). This Impact was measured in terms of drudgery reduction, work displacement, income generation and reduction and provision of free time.

Study divulged that disc harrow had reduced the most drudgery of tilling the soil and removing of weeds. Before the use of this implement lots of hard work and strength was needed by individual who till the soil with the help of bullock carts. Women were also equally involved in tilling operation, but after disc harrows came into operation, women's involvement became minimal. There were about 2.62 lakh disc harrows in Punjab state in 2018-19. Use of disc harrow had reduced drudgery to maximum level in both the cases but farm labourers (2.17 mean score) benefitted more as tilling of soil and weeding were majorly done by labourers. At the same time it had displaced farm labourers (2.40 mean score) and farm women (1.98 mean score) from major agricultural operations. With the use of disc harrow yield had increased & ultimately lead to more

Table 1. Socio- economic profile of the respondents

Particulars	Age (Years)			
	Farm women (n=60)	Farm labourer (n=60)	Overall (120)	Z-value
Age				
Up-to 25	12 (20.00)	8 (13.33)	20 (16.66)	0.9797^{ns}
26- 50	29 (48.33)	30 (50.00)	59 (49.16)	0.1826^{ns}
51-75	19 (31.67)	22 (36.67)	41 (34.16)	0.5774^{ns}
Average Age	39	42	41	
Caste				
General Castes	30 (50.00)	4 (6.67)	34 (28.33)	5.27**
Scheduled Castes (SCs)	9 (15.00)	29 (48.33)	38 (31.66)	3.92**
Backward Castes (BCs)	21 (35.00)	27 (45.00)	48 (40.00)	1.12^{ns}
Educational Qualification				
Can't read or write	-	24 (40.00)	24 (40.00)	5.47**
Primary	12 (20.00)	19 (31.67)	31 (25.83)	1.45^{ns}
Middle	13 (21.67)	14 (23.33)	27 (22.5)	0.21^{ns}
Secondary	13 (21.67)	3 (5.00)	16 (13.33)	2.68*
Senior Secondary	6 (10.00)	-	6 (10.00)	2.51*
Diploma	6 (10.00)	-	6 (10.00)	2.51*
Graduation	10 (16.66)	-	10 (16.66)	3.302**
Family Income (Rs in thousands)				
50 -100	7 (11.67)	55 (91.67)	62 (51.66)	8.76**
100-150	18 (30.00)	5 (8.33)	23 (19.16)	3.01**
150-200	10 (16.67)	-	10 (16.67)	3.30**
200-250	11 (18.33)	-	11 (18.33)	3.47**
250-300	8 (13.33)	-	8 (13.33)	2.92*
300 and above	6 (10.00)	-	6 (10.00)	2.51^{ns}
Average Annual family income(in Rupees/-)	Rs.95,000	Rs.66,422	Rs.69,243	

Note-Figures in the parentheses indicate percentage to total,
**, ** indicates significance level at 5% and 1% level respectively*

income for farm women (2.13 mean score). Due to this modern technology the involvement of women in pre-harvesting operation of land preparation had reduced significantly and was reported nil in the study area.

Seed cum fertilizer drill is used for sowing seeds of wheat, maize, paddy etc. at equal distances and in proper depth without any kind of wastage. There were 1.41 lakh seed cum fertilizer drills in Punjab in 2018-19 (Handbook of Agriculture, 2021). With the use of seed cum fertilizer drill drudgery had been reduced for both farm women (mean score 2.07) and farm laborers (mean score 2.53). In case of farm labourers drudgery had reduced more. Though the drill had spared farm labourers for strenuous activity of sowing etc but there is no denying the fact that they were displaced from their work. In the absence of alternative occupation a greater percentage of farm labourers were displaced and were out of work hence had enough time at their disposal. Majority of farm labour (mean score 1.80) and farm women (mean score 1.97) divulged that in absence of occupation and employment opportunities they were without work.

Potato planter is another, labour saving, easy to use equipment used to complete the process of sowing, ridge forming and potato planting. There were 8180 potato planters in Punjab in 2018-19(Ibid). Farm women helped their husbands in operating potato planter as a result this technology had less impact on their drudgery reduction (0.77 mean score) where as potato planter pushed farm labourers out of their work in operation of sowing potatoes hence more drudgery reduction (mean score 1.80) and resulted in greater work displacement for them (mean score 2.32). Due to price volatility of potatoes it did not impacted towards generating income (mean score 0.72).On the other hand farm labourers felt more displacement with the mean score 2.32, their drudgery had reduced (mean score 1.80) because there was no work for them. Due to no work, income had reduced more for farm labourer (mean score 1.00) compared to their counterparts (farm women mean score 0.72). Due to displacement from work farm labourer had more time (mean score 2.53) as compared to farmwomen (mean score 0.57) at their disposal which otherwise went absence of work opportunities in farm or off-farm sector.

Zero till drill was used to grow crops without tilling the land for retention of nutrients in the soil. This is used for sowing wheat after harvesting paddy crop. There were 41410 zero till drills in Punjab in 2018-19 (ibid). Zero till drill reduced the drudgery of farm women (mean score 1.35) as well asfarm labour (meanscore1.88) as tillage of land with traditional method was a very tough job. With this technology drudgery had reduced in real manner. At the same time both the categories got displaced from their work (mean score 2.62 for farm women and mean score 1.97 for farm labourers) as zero till drill pushed them out of their work in operation of land preparation. This implement is expensive, hence small and marginal farmers cannot afford to buy and take it on rent from others. Farm women had to provide food and tea to labourers working in the field resulting in increased burden of household chores on them, so they had less free time (mean score 1.20). On the other hand farm labourers got displaced and with displacement, income had decreased too (mean score 1.20) and got more time (mean score 1.58) as compared to farm women (mean score 1.30) at their disposal.

Rotavator is commonly used for leveling of land and sowing seeds. It saved 35 per cent time and 25 per cent cost of operation as compared to traditional tillage method. There were 40248 rotavators in Punjab in 2018-19 (ibid). Rotavator reduced the drudgery of farm women with mean score 1.38 as well as for farm labour with mean score 1.80. It displaced both categories (farm women mean score 2.70 and farm labourers mean score 2.03) from land preparation operations. Farm labourer had more unproductive time (mean score 2.53) and their source of income during land preparation operation had reduced at maximum level (mean score 1.00) compared to farm women (mean score 1.62). Farm labourer had no alternative opportunities and their income had been decreased.

Reaper is used for harvesting the crops. It is cost effective, saves time and suitable for many crops such as, wheat, paddy, soybean, mustard, bengal gram, black gram etc. There were 40750 reapers in Punjab in 2018-19 (ibid). Involvement of women was significant in post harvesting operations such as, threshing and winnowing etc but machines like reaper had reduced their work opportunities. Many families still believed in manual work, this gave them satisfaction and keep them engaged in work. Drudgery had reduced for both categories (farm women 1.33 and farm labourers1.88). Though, these technologies save time as well as energy but are not cost effective for all (income generation/

Table 2. Distribution of respondents on the basis of impact of farm technology on work participation

Agricultural implements	Impact	Mean score		t-value
		Farm women	Farm labourer	
Disc harrow/ Cultivators	Drudgery reduction	2.05	2.17	0.743
	Work Displacement	1.98	2.40	2.976**
	Income generation/ reduction	2.13	1.00	15.497**
	Free time	1.55	2.17	4.939**
Seed-cum fertilizer drill	Drudgery reduction	2.07	2.53	3.507**
	Work Displacement	2.18	2.43	2.029*
	Income generation/ reduction	1.92	1.00	16.765**
	Free time	1.97	1.80	1.172
Potato planter	Drudgery reduction	0.77	1.80	6.019**
	Work Displacement	0.90	2.32	7.813**
	Income generation/ reduction	0.72	1.00	2.173*
	Free time	0.57	2.53	14.665**
Zero till drill	Drudgery reduction	1.35	1.88	3.797**
	Work Displacement	2.62	1.97	5.959**
	Income generation/ reduction	1.80	1.20	6.845**
	Free time	1.30	1.58	2.627
Rotavator	Drudgery reduction	1.38	1.80	3.154**
	Work Displacement	2.70	2.03	5.275**
	Income generation/ reduction	1.62	1.00	7.461**
	Free time	1.22	2.53	13.613**
Reaper	Drudgery reduction	1.33	1.88	3.817**
	Work Displacement	2.77	2.13	5.983*
	Income generation/ reduction	1.93	1.20	9.033**
	Free time	1.37	1.58	1.779
Tractor operated combine	Drudgery reduction	1.43	1.80	2.639**
	Work Displacement	2.63	2.17	3.637**
	Income generation/ reduction	1.83	1.00	10.051**
	Free time	1.32	2.53	12.079**
Maize sheller	Drudgery reduction	1.22	2.32	6.444**
	Work Displacement	0.93	1.82	6.533**
	Income generation/ reduction	1.18	1.20	0.107
	Free time	1.18	1.58	2.316*

*Note: *, ** indicates significance at 5%and 1% level respectively*

reduction mean score for farm women 1.93 and for farm labourer mean score 1.20). For small and marginal farmers it is an expensive implement, so it burdened their pocket more. On the other hand women were more involved in the operations of harvesting. But due to reapers they also got displaced from this operation as well (farm labourer mean score 2.13 and farm women mean score 2.77). Due to displaced from this work they had more unproductive time (farm women mean score 1.37 and farm labourer mean score 1.58) to spend in different operation and in household chores.

Tractor operated combine is very common for harvesting of wheat, oats, maize, sorghum etc. There were 4200 tractor operated combines in Punjab in 2018-19 (ibid). With the mean score 1.80, drudgery had reduced more in farm labourers as compared to farm women (mean score 1.43). Both the categories displaced (farm women mean score 2.63 and farm labourer mean score 2.17) from their work due to extensive use of implement. Due to displacement income of farm labourers had reduced at maximum level with the mean score 1.00. Due to displacement from work farm labourer had more time (mean score 2.53) as compared to farm women (mean score 1.32) at their disposal which otherwise was absence of alternative employment avenues.

Maize sheller is used for separating maize kernels from cobs. Use of maize sheller was found more among large farmers. It has certainly reduced the drudgery more for labourers (2.32 mean score) than for farm women (1.22 mean score). Most of the farm women shelling the grains by own with traditional method. On the other hand farm labourer pushed out of their work in operation of shelling of grains (mean score 1.82) compared to farm women (mean score 0.93) and as a result due to displaced from this operation farm labourer had more unproductive time (mean score 1.58).

Conclusion and Policy Implications

The green revolution model of Punjab agriculture adopted capital intensive technologies which impacted the role of marginal and small farm women and farm laborers to a great extent. These technologies saved time, energy and hence found effective for drudgery reduction on farm. As a result some women were made free from various farm operations, but had they been provided with some off-farm employment avenues, they would have aptly utilized their time, energy and had successfully generated some income. The study found that capital intensive technologies had reduced work opportunities on the farm for farm women and farm labour and had displaced majority of them. In the absence of off- farm employment avenues income of majority had reduced. The study suggested that in the agrarian economy of Punjab where 57 per cent of the population is engaged in farming, labour intensive model cannot be replaced steadily as it is very important to keep people engaged in work. So unless we are able to engage people in off farm employment or service sector, agriculture technologies will impact small farmers and agricultural labour adversely. There is a need to involve them in other income generating activities to use their idle time and to maintain their certain living standards.

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