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A Study on the Extent of Adoption of Various Recommended Technologies in Wheat Cultivation in Punjab

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Abstract

The extent of adoption of various recommended production technologies and returns from wheat crop in Punjab have been studied for the years 2006-07, 2007-08 and 2008-09. The results reveal that the area under recommended varieties of wheat has decreased from 95.29 per cent in 2006-07 to 90.63 per cent in 2008-09. At the same time, it has been observed that a majority of the sample farmers grow wheat at recommended time by using recommended quantity of seed per acre. Although the percentage of farmers who treat the seed before sowing wheat crop has increased from 27.81 per cent in 2006-07 to 39.00 per cent in 2008-09, still a majority of the farmers do not follow this technology. It has been advocated by the PAU that zero tillage of wheat can save up to Rs 1000 per acre but this technology was adopted by 13.94 per cent, 13.64 per cent and 14.22 per cent of the sample farmers respectively during the above said years. Despite various shortcomings, it has been found that about 31.82 per cent, 25.37 per cent and 29.14 per cent of the sample farmers had sown the crop through broadcasting method during 2006-07, 2007-08 and 2008-09, respectively. The study has concluded that nitrogen was being applied at more than the recommended level, phosphorus was being applied at the recommended level and potash was not being applied by the farmers in wheat crop in Punjab. It has been noticed that 55.95 per cent, 41.00 per cent and 71.58 per cent of the sample farmers applied herbicides in wheat crop after the recommended period. The study has brought out that there exists a number of gaps in the adoption of recommended production technology of wheat crop, which need to be plugged properly to enhance productivity as well as net returns to wheat producers in Punjab.

Introduction

A technology transfer programme would be considered effective if there is minimal or no gap between the potential and realized impacts of the technology. It means that monitoring of adoption or adaptation of technologies is an integral part of the technology transfer system. Therefore, transfer of technology must be preceded and succeeded by technology assessment, reasserting that technology transfer and assessment are complementary processes.

It has been observed during crop surveys that many farmers are still not following the recommended production technology for cultivation of wheat crop, resulting in higher cost of production without a commensurate increase in returns. During 2007-08, wheat was grown on 34.88 lakh hectares in Punjab with a total production of 157.20 lakh tonnes and average productivity of 4507 kg/ha. Although more than 80 per cent of the potential yield of wheat has been realized by the wheat growers in Punjab, there still exist some of the adoption gaps which need to be bridged properly in order to maximize the returns. The present study has examined the extent of adoption of various technological recommendations in wheat cultivation and has estimated the returns over variable costs for this crop in Punjab.

Methodology

The primary data were collected from 800 wheat growers for the years 2006-07, 2007-08 and 2008-09, in the districts of Amritsar, Gurdaspur, Jalandhar, Sangrur, Patiala, Bathinda, Ferozepur and Mukatsar

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by systematic random sampling technique. To study the extent of adoption of various recommended production technologies, the information on seed rate, seed treatment, varieties, sowing time, method of land preparation, method of sowing, fertilizer use, irrigation, and herbicide and insecticide application was collected through a well-administered schedule by personal interview method. Simple tabular analysis was carried out to bring forth the conclusions. The returns over variable costs were calculated by using the enterprise budgeting technique. The enterprise budget includes the level of inputs such as seeds, fertilizers, insecticides and pesticides, irrigation, human labour, machine labour, etc., used by the farmers in the production process, their cost and output, with gross returns per acre. The returns over variable costs were computed by deducting the total variable costs from the gross returns.

Results and Discussion

Land Preparation

The majority of sample farmers (>80 per cent) had sown the crop with conventional method using normal tillage during the study years (Table 1). It has been advocated by the PAU that zero tillage of wheat can save up to Rs 1000 per acre, besides having many other advantages.

Table 1. Land preparation followed by sample farmers in Punjab

(Per cent farmers)

Method of land preparation	2006-07	2007-08	2008-09
Normal tillage	81.55	85.50	80.00
Minimum tillage	4.52	5.63	5.77
Zero tillage	13.94	13.64	14.22
Total	100.00	104.75*	100.00

*Multiple responses

The present study has revealed that 13.94 per cent, 13.64 per cent and 14.22 per cent of the sample farmers used this technology for sowing of wheat crop respectively during 2006-07, 2007-08 and 2008-09. It was also noticed that 4.52 per cent, 5.63 per cent and 5.77 per cent of the sample farmers followed the minimum tillage technology for sowing of wheat crop respectively during the above said years.

Area under Wheat Varieties

The total area allocated by the sample farmers under early-sown varieties, as recommended by the PAU, was estimated to be around 91.75 per cent in 2006-07, which decreased slightly to 86.80 per cent in 2008-09 (Table 2). The area under late-sown recommended varieties was estimated to be 3.54 per cent in 2006-07 which marginally increased to 3.83 per cent in 2008-09. In this way, the area under PAU-recommended varieties of wheat accounted for 95.29 per cent and 90.63 per cent share in the total area under wheat in 2006-07 and 2008-09, respectively. Therefore, it can be safely concluded that a majority of the sample farmers were growing recommended varieties of wheat in Punjab. Although the area allocated under the un-recommended varieties of wheat had increased from 4.71 per cent in 2006-07 to 9.37 per cent in 2008-09, the farmers must be advised not to grow un-recommended varieties of wheat as it may invite several new problems in wheat cultivation in Punjab.

Recommended Varieties of Wheat

The most favourite recommended variety of wheat amongst the sample farmers was PBW-343, but its share in the total area under wheat in Punjab was found declining from 70.95 per cent in 2006-07 to 63.64 in 2008-09 (Table 3).

The other important variety grown by the sample farmers was PBW-502, but its use in the total wheat area had also declined from 19.54 per cent in 2006-07 to 14.06 per cent in 2008-09. The two newly-recommended varieties were DBW 17 and PBW 550, but their shares had yet to pick up. The share of late-sown varieties PBW 373 and PBW 509 continued to be small, 2.98 per cent and 0.56 per cent in 2006-07 and 3.39 per cent and 0.44 per cent, respectively in 2008-09.

Seed Rate

It was found that majority of sample farmers were using recommended quantity of seed (40 kg/acre) for sowing of wheat crop (Table 4). It was also observed that 16.04 per cent, 13.75 per cent and 16.14 per cent of the sample farmers used more than recommended seed rate, whereas 7.22 per cent, 10.88 per cent and 3.29 per cent used less than the recommended seed

Table 2. Area under wheat varieties in Punjab: 2006-07 to 2008-09

Year	Recommended varieties			Un-recommended varieties
	Early-sown	Late-sown	Sub-total	
2006-07	91.75	3.54	95.29	4.71
2007-08	89.72	3.42	93.14	6.86
2008-09	86.80	3.83	90.63	9.37

Table 3. Area under different recommended wheat varieties in Punjab: 2006-07 to 2008-09

Recommended varieties	2006-07	2007-08	2008-09
	Early-sown		
DBW 17	-	0.26	1.65
PBW 343	70.95	68.57	63.64
PBW 502	19.54	17.29	14.06
PBW 550	-	1.40	5.59
WH 542	1.26	2.20	1.86
	Late-sown		
PBW 373	2.98	3.00	3.39
PBW 509	0.56	0.42	0.44

Table 4. Seed rate of wheat used by the sample farmers in Punjab

(Per cent farmers)

Quantity of seed used	2006-07	2007-08	2008-09
Recommended rate	76.74	75.37	80.57
Above recommended rate	16.04	13.75	16.14
Below recommended rate	7.22	10.88	3.29

rate for sowing of wheat crop in 2006-07, 2007-08 and 2008-09, respectively. The farmers were suggested to use the recommended seed rate so that they could get potential yield without incurring excessive expenditure on seed.

Seed Treatment

It was observed during the study that nearly 28 per cent of the sample farmers treated the seed before sowing wheat in 2006-07; their number increased to 37 per cent in 2007-08 and further to 39 per cent in 2008-09. Thus, though the percentage of farmers treating the wheat seed had increased, a vast majority was still not following this important technology. Therefore, there exists a scope for filling the gap in the adoption of this technology in Punjab. It will not only go a long way to protect the crop from primary infestation of diseases and insects but will also augment the productivity of wheat crop in the state along with reduction in the cost of production.

Time of Sowing

It was found that a majority of the sample farmers were sowing wheat crop during the recommended period and their number had increased from 87.9 per cent in 2006-07 to 94.0 per cent in 2007-08 and further to 92.2 per cent in 2008-09. No farmer sowed the wheat crop before the recommended period and the remaining farmers sowed the crops after the recommended period in all the three years under study. Timely sowing of wheat in Punjab was a positive factor towards its good production in these years.

Method of Sowing

It has been found that the method of sowing has a significant effect on the productivity of a crop. The results presented in Table 5 show that a majority of the sample farmers followed single directional method of sowing; it was followed by the broadcasting method by about 30 per cent farmers in all the three years under study (Table 5).

It has been reported that if wheat crop is sown by following bi-directional method, the yield could enhance by two quintals per acre, without enhancing seed rate and other inputs. However, this method was being followed by about 1.00 per cent of the sample farmers only in the study area.

Fertilizer Application

Nitrogen: It was found that only a small percentage of the sample farmers used recommended dose of nitrogen (50 kg/acre) in wheat crop, it was 16.71 in 2006-07, 12.38 per cent in 2007-08 and 15.43 per cent in 2008-09. About 3 per cent of the sample farmers used lower than the recommended dose of nitrogenous

Table 5. Method of wheat crop sowing in Punjab: 2006-07 to 2008-09

(Per cent farmers)

Method of sowing	2006-07	2007-08	2008-09
Single directional	67.38	73.88	69.86
Bi-directional	0.80	0.75	1.00
Broadcasting	31.82	25.37	29.14

fertilizers in their crop during the above said years. On the other hand, more than 80 per cent of the sample farmers used higher than the recommended dose of nitrogen in their wheat crop (Table 6). The higher use of nitrogen increases the cost of cultivation and causes lodging of wheat crop. Therefore, wheat cultivators need to be educated regarding the benefits of using recommended dose of nitrogen, which will also bring down the cost of wheat production.

Table 6. Nitrogen application in wheat crop in Punjab

(Per cent farmers)

Particulars	2005-06	2006-07	2007-08
Recommended dose	16.71	12.38	15.43
Above recommended level	80.58	84.00	81.43
Below recommended level	2.81	3.62	3.14

Phosphorus

Most of the sample farmers applied recommended dose of phosphorus (25 kg/acre) to their crops in all the three years under study. It was noticed that 15-20 per cent of the sample farmers applied more than recommended and about 2 per cent of the farmers applied less than recommended dose of phosphorus to wheat crop during the above said years (Table 7). About one per cent of the sample farmers did not apply phosphorus at all in wheat crop in Punjab.

Potash

Potash application to wheat crop in Punjab was found missing, as a majority (96-97 per cent) farmers did not apply any potash during the years 2005-06, 2006-07 and 2007-08. Only 1-2 per cent of the sample farmers used recommended dose of potash (12 kg/acre) and about one per cent of the sample farmers used lower than the recommended dose of potash in their crop during these years.

Table 7. Phosphorus application in wheat crop in Punjab

(Per cent farmers)

Particulars	2005-06	2006-07	2007-08
Recommended dose	81.55	83.00	76.72
Above recommended level	15.91	14.87	19.86
Below recommended level	1.47	1.63	2.42
Nil	1.07	0.50	1.00

Table 8. Potash application in wheat crop in Punjab

(Per cent farmers)

Particulars	2005-06	2006-07	2007-08
Recommended dose	0.94	0.48	2.00
Above recommended level	1.34	2.76	1.72
Below recommended level	0.66	0.63	0.57
Nil	97.06	96.13	95.71

Thus, it can be concluded that nitrogen was being applied at more than the recommended level, phosphorus was being applied at the recommended level and potash was not being applied by farmers in wheat crop in Punjab.

Irrigation

The present study has found that about 50 per cent of the sample farmers applied recommended number of irrigations (4-5) to wheat crop in the years 2005-06, 2006-07 and 2007-08 (Table 9). About 30-40 per cent farmers applied less and 8-14 per cent applied more than the recommended number of irrigations.

Although the number of irrigations depends on weather conditions, the farmers should use irrigation water more rationally to enhance its efficiency per unit of output.

Herbicide Application

It was found that 94.60 per cent of the sample area was covered with application of herbicides in

Table 9. Number of irrigations applied to wheat crop in Punjab

(Per cent farmers)

No. of irrigations	2005-06	2006-07	2007-08
Recommended	54.81	47.13	56.14
Above recommended	8.43	12.00	14.43
Below recommended	36.76	40.87	29.43

Table 10. Time of herbicide application to wheat crop by the percent sample farmers in Punjab

Time of herbicide application	2005-06	2006-07	2007-08
Recommended period	40.64	56.75	26.14
After recommended period	56.15	41.00	71.58
Before recommended period	3.21	2.25	1.57
Not applied	-	-	0.71

Punjab during 2005-06, which slightly increased to 95.30 per cent in 2006-07 and further to 97.47 per cent in 2007-08.

Time of Herbicide Application: It was found that 40.64 per cent, 56.75 per cent and 26.14 per cent of the sample farmers applied herbicides on the recommended time (30-35 days after sowing of wheat crop) in wheat crop during 2005-06, 2006-07 and 2007-08, respectively. The percentage of farmers applying herbicides after the recommended period was quite high; it was about 56 per cent in 2005-06, 41 per cent in 2006-07 and 72 per cent in 2007-08. About 2-3 per cent farmers applied herbicides before the recommended period also.

Hence, it can be concluded that a majority of the sample farmers were applying herbicides after the recommended period. The farmers not following the recommended time of herbicide application, are likely to confront a number of problems in weeds management and may get lower output per unit of land.

Use of Herbicide Brands: It has been brought out that the *Phalaris minor* infestation in wheat can cause 20-40 per cent yield losses. The study has found that nearly 14 per cent of the farmers in Punjab use un-recommended herbicides and 27 per cent apply wrong brands of herbicides. It was also noticed that about 20 per cent of the farmers use wrong doses of herbicides. Therefore, the farmers must be educated on the use of recommended herbicide groups as well as their brands along with proper spraying techniques so as to augment wheat productivity in Punjab.

Pesticide Application

It was observed that the number of sample farmers who applied one spray of pesticides on wheat crop to check the attack of termites, aphid/ jassid and brown mites, had increased during the study years, from 20.6 per cent in 2005-06 to 30.4 per cent in 2006-07 and further to 37.7 per cent in 2007-08. However, it was comfortable to note that 79.4 per cent, 69.6 per cent and 60.5 per cent of the farmers did not use any pesticide on wheat crop, which showed that the wheat crop is quite resistance to the attack of various pests and diseases. About 2 per cent farmers made 2 sprays of these pesticides.

Economics of Wheat Cultivation

The productivity of wheat crop was estimated to be 17.88 q/acre in 2006-07, which increased to 18.46 q/acre in 2007-08 (Table 11). The gross returns, variable costs and returns over variable costs for the years 2006-07 and 2007-08 are also given in Table 11. A perusal of Table 11 clearly shows that both productivity and returns over variable costs are higher in 2007-08 than in 2006-07. This primarily happened due to favourable climatic conditions and secondly because of upward revision of minimum support price (MSP) to Rs 1000/q in 2007-08, which was higher by Rs 250/q as compared to 2006-07.

Conclusions

The study has revealed that there exists a number of gaps in the application of various recommended technologies in the cultivation of wheat crop in Punjab. The wheat growers would achieve remunerative returns from cultivation of wheat if the adoption gaps, especially

Table 11. Economics of wheat cultivation in Punjab, 2006-07 and 2007-08

(Rs/acre)

Year	Main product (q/acre)	By-product (q/acre)	Gross returns	Total variable cost	Returns over variable costs
2006-07	17.88	16.57	18387	6457	11930
2007-08	18.46	16.59	20968	6553	13919

higher seed rate, low seed treatment, higher use of nitrogen and phosphorus, use of herbicides after the recommended period, etc. are properly plugged. The agricultural scientists, extension scientists and state agricultural technocrats should re-launch awareness generation campaign to educate the wheat growers about the benefits of the use of the recommended dosages of various inputs in wheat cultivation in Punjab.

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