Impact of TAR-IVLP on Crop Cultivation

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ABSTRACT

Agriculture is the mainstay of the India's rural economy contributing significantly towards employment and income generation. The study was carried out at two IVLP centres namely; NDRI, Karnal representing Irrigated Agro Eco-system and IGFRI, Jhansi, representing Rainfed Agro Eco-system. A total of 150 farmers were randomly selected for the study. There was an increase of 15.18 and 25.26 percent in yield of PR and basmati rice, respectively, where as wheat yield has increased by 18.54 percent due to improved varieties. The average production of rice and wheat has significantly increased by 15.02 and 17.80 percent respectively under the irrigated agro-eco-system. Due to increase in the price of inputs, an increase of 73.24 percent and 70.67 percent in cost of cultivation of paddy and wheat respectively was recorded in the IVLP villages. The average yield gain was 1.55 q/acre due to zero tillage technology. The average cost saving was Rs. 878 per acre under zero tillage. The supply of quality seeds of improved varieties has assured 239.09, 122.52 and 92 percent increase in gram, barley and wheat production, respectively. An increase of 20.04 percent in gram and 56.59 percent in wheat cultivation was found in the IVLP villages.

Key Words : *Institute Village Linkage Programme (IVLP); Technology Assessment and Refinement (TAR); Agro eco-system; Varietal interventions*

Indian agriculture supports about 65 per cent of its total population and contributes about 22 per cent of GDP. It is the mainstay of India's rural economy and contributes significantly towards employment and income generation. The real and overall development of Indian economy will be possible only when the villages are self sufficient. There is a need to prioritise our research programmes as per the clientele preferences. Since independence, several technologies have been evolved for increasing the production, productivity of the crop as well as animals by improving the adoption behaviour of the farmers (Dwivedi *et al*., 2004). The technologies generated should be appropriate, profitable, environmentally sound and sustainable to improve the livelihood of the farming community. The technologies generated by the system need to be assessed and refined in order to suit the requirements of farmers with varying bio-physical and socio-economic environment. Client oriented research and technology development to improve productivity; sustainability and equity were the fundamentals of IVLP (Singh *et al*., 2005). This paper tries to assess the impact of IVLP interventions on crop cultivation.

METHODOLOGY

The study was carried out at two IVLP centres namely; NDRI, Karnal representing Irrigated Agro Eco-system situated in Karnal district of Haryana and IGFRI, Jhansi, representing Rainfed Agro Eco-system. These two centres were selected purposively to have more number of interventions on crops.

The ex-post facto research design was formulated for this study. In this design the participants were compared to themselves before and after the project interventions.Under irrigated agro eco-system all the five villages namely, Gaurgarh, Amargarh (Kala Majra), Sikri, Shekhpura and Gumto of district Karnal and all the three adopted villages of IGFRI, Jhansi namely, Algi, Sanora and Garera and their hamlets of district Datia/Shivpuri of MP were selected purposively.

From Irrigated Agro Eco-system a total of 75 farmers i.e. 15 farmers from each village were selected by adopting random sampling technique. Similarly, 75 farmers were selected from the Rainfed Agro Eco-system i.e. 25 farmers from each village. A total of 150 respondents formed the sample size for the present study.

RESULTS AND DISCUSSION

Socio personal traits of the farmers :

Age : It is evident from Table 1 that majority (64.67%) of the IVLP farmers belonged to middle age group and 20 per cent of them were of younger age i.e. less than 28 years. Only 15.33 per cent of the respondents were old

aged (above 51 years). The findings are in line with the findings of Singh (2003), Nachimuthu (2002) and Gadgil *et al.* (2005) who reported a large percentage of respondents as middle aged.

Table 1. Socio-personal profile of respondents

Variables	Categories (Score)	Frequency		
		Irrigated (n=75)	Rainfed (n=75)	Pooled (N=150)
Age (years)	Young (below 28)	15 (20.00)	15 (20.00)	30 (20.00)
	Middle (28-51)	45 (60.00)	52 (69.33)	97 (64.67)
	Old (Above 51)	15 (20.00)	08 (10.67)	23 (15.33)
Education	Illiterate	10 (13.33)	09 (12.00)	19 (12.67)
	Read only	00 (00.00)	11(14.67)	11 (07.33)
	Read and write	00 (00.00)	14 (37.50)	14 (09.33)
	Primary	05 (06.67)	22 (12.50)	27 (18.00)
	Middle	18 (24.00)	19 (25.33)	37 (24.67)
	Matric	35 (46.67)	00 (00.00)	35 (23.33)
	Graduate and above	07 (09.33)	00 (00.00)	07 (04.67)
Land	Landless	00 (00.00)	03 (04.00)	03 (02.00)
holding (acres)	Marginal (< 2.5)	08 (10.67)	13 (17.33)	21 (14.00)
	Small (< 2.50 to 5.0)	21 (28.00)	30 (40.00)	51 (34.00)
	Medium (< 5.0 to 10.0)	22 (29.33)	15 (20.00)	37 (24.67)
	Large (> 10.0)	24 (32.00)	14 (18.67)	38 (25.33)
Main occupation	Agriculture	74 (98.67)	72 (96.00)	146 (97.33)
	Dairying	01 (00.00)	03 (04.00	04 (02.66)
Other occupation	Service	04 (05.33)	06 (08.00)	10 (06.67)
	Business	07 (09.33)	02 (02.67)	09 (06.00)
	Others	03 (04.00)	04 (05.33)	07 (0.67)

Figures in parentheses indicate percentage.

Education : The overall picture showed that 47.33 per cent of the farmers had education below primary level while 48 per cent had upto middle and high school education. None of the farmers under rainfed agro eco-system had education above matric, while under irrigated agro eco-system 28% of the farmers had education above matric, still about 13% of the farmers were illiterate in the study area. Findings of the present study are well supported by Singh (2003) and Gadgil *et al.* (2005). Education status is an important personal trait for better adoption of scientific agriculture.

Land holding : Half of the farmers had less than or equal to 5 acres of land. It clearly reflected that the representation of small farmers under TAR-IVLP was more emphasized. However, 24.67 and 25.33 per cent of the beneficiaries were categorized as medium and large farmers, respectively. The involvement of small farmers (61%) was more in rainfed agro eco-system than irrigated agro eco-system (38.67%).

Occupation : Agriculture was the main occupation of majority (97.33%) of the farmers. Most of them had agriculture as their primary occupation and dairying as the secondary occupation. Only 13.34 per cent of the IVLP farmers were engaged in other vocations such as service, business and other activities. It could be interpreted that still most of the farmers depend on agriculture and dairying for their livelihood in the villages.

Impact of IVLP on agriculture :

Input utilization in agriculture

Area under HYV seeds : Results in Table 2 indicated significant increase in acreage under HYV seeds. This reflected the increased requirement of quality HYV seeds in IVLP villages. Due to the technological interventions, knowledge and awareness of the beneficiary farmers had increased and they have realized the importance of growing recent varieties of crops. There was overall significant increase in area under HYV (110.62%) in both the systems. It could be interpreted from the above findings that the increase in area under HYV had increased the crop productivity and production in the project area. There was an increase in quantity of improved seed of fodder crops too. Further, it could also be interpreted that average area under HYV seeds was quite high (10.43 acres) in irrigated agro eco-system due to effective seed supply services.

Table 2. Impact of TAR-IVLP on area under HYV seeds

Agro eco-system	Mean		Mean difference	Per cent change	t-value
	Pre	Post			
Irrigated	5.379	10.435	5.056	94.00	09.941**
Rain fed	1.400	3.847	2.447	174.79	08.482**
Over all	3.39	7.14	3.750	110.62	12.112**

** Significant at (P < 0.01)

Use of farm power : It was found that most of the farmers of irrigated agro eco-system were using the tractor operated implements while majority of the farmers under rainfed agro eco-system still rely on bullock drawn implements. However, changes have been observed in the later system too, as many farmers have purchased tractors. But the number of farm machineries was quite high in irrigated agro eco-system as compared to rainfed agro eco-system. Hence the change was observed more in rainfed agro eco-system.

Labour use : Due to increased mechanization there was a reduction in use of labour per acre in both the agro eco-systems. More mechanization has happened in irrigated agro eco-system as compared to rainfed particularly with respect to zero tillage technology for wheat sowing and use of combine harvester for harvesting of wheat and paddy has led to decrease in labour use per acre. In rainfed agro eco-system, the farmers had few agricultural implements/machinery, hence the change in labour use was not that much evident.

Agro-chemicals : There was an increase in expenditure on agro-chemicals in both the systems. Due to increased incidence of weeds, insects, pests and diseases farmers had to spend more on chemicals for plant protection. This was in addition to increased expenses on fertilizers. The increase was observed more in irrigated agro eco-system due to input intensive nature of agriculture.

It was also observed in the study area that irrigation frequency of most of the crops was same. The quantity of weedicides increased in both the systems but it was quite high in irrigated agro eco-system. The farmers of irrigated agro eco-system used Butachlor in paddy and Isoproturan, 2,4-D, Leader, Topik, Puma Super, Fateh, SF 10 and Algrip in wheat crop. In irrigated agro eco-system farmers were not adhering to the recommended doses of weedicides. They were applying right quantity of insecticides and pesticides in their crops.

Impact of agricultural interventions :

Irrigated agro eco-system : Most of the technological interventions under TAR-IVLP were targeted at increased productivity and production of various crops in the villages. Under irrigated agro eco-system, rice-wheat system was the most dominant and prevailing system in the Indo-Gangetic Plain. The impact of the project was observed on the following parameters.

Area : It was observed that there was a slight decrease in area under wheat as well as paddy crop under irrigated agro eco-system. Though it was difficult to explain this on the basis of present study, inclination of farmers towards diversification towards rice-wheat system may be one of the reasons. Although most of the research endeavours are directly or indirectly directed toward the diversification of rice-wheat system, results are yet to be seen.

Table 3. Impact on paddy cultivation in irrigated agro eco-system

Parameters		Mean		Mean difference	Per cent change	t-value
		Pre	Post			
Area		8.684	8.676	0.008	0.012	1.00
Yield (q/acre)	PR	23.437	27.000	3.563	15.20	18.737**
	Basmati	11.141	13.844	2.703	24.26	19.772**
Production (q/household)		202.305	232.691	30.387	15.02	7.782**
Cost of cultivation (Rs/acre)		2581.25	4471.875	1890.625	73.24	35.817**

** Significant at (P < 0.01)

Productivity : There was an increase of 15.18 and 25.26 per cent in yield of PR and basmati rice respectively under the project. Varieties like PR-114, Pusa 44, Pusa 1121 etc. were assessed and had recorded increased productivity. Wheat registered significant increase (18.54%) in yield. This way, the project was successful in increasing the overall yield of rice-wheat system. The wheat varieties such as PBW 343, HD 2687 and PBW 373 were assessed. Zero tillage technology of wheat had also increased the yield by 1.55q/acre. The present findings get consolidated when compared with the findings of Mann *et al*. (2003), Pandey *et al*. (2004) who reported 20-25 per cent more yield by cultivating improved varieties of wheat.

*Production :*The average production of rice and wheat had significantly increased by 15.02 and 17.80 per cent, respectively under the irrigated agro eco-system. It is evident from the above findings that TAR-IVLP has been successful in increasing the production of rice wheat system.

Table 4. Impact on wheat cultivation in irrigated agro eco-system

Particulars	Mean		Mean difference	Percent change	t-value
	Pre	Post			
Area (acres)	8.445	8.441	0.004	0.05	1.00
Yield (q/acre)	19.844	23.523	3.680	18.54	21.818**
Production (q)	167.688	197.543	29.855	17.80	8.085**
Cost of cultivation (Rs./acre)	2301.56	3928.125	1626.562	70.67	42.504**

** Significant at (P < 0.01)

Cost of cultivation : Due to increase in the price of inputs, an increase of 73.24 per cent and 70.67 per cent in cost of cultivation of paddy and wheat respectively was recorded in the IVLP villages.

Copping intensity (CI) : In irrigated agro eco-system a reduction of 1.74 per cent was observed while in the rainfed agro eco-system a significant increase of 11.42% in CI was registered. In irrigated agro eco-system farmers were growing two successive paddy crops immediately after wheat harvesting. During calendar year 2004, one crop of paddy i.e. Sathi (short duration paddy crop which matures within 90 days) had been banned in Haryana due to over exploitation of ground water. Inspite of this, few farmers managed to take *Sathi* hence the CI was above 200 percent in both the situations.

Rainfed Agro Eco-system : Farmers were growing a large number of crops to cover the risk under rainfed system. The major crops were wheat, barley, soybean, mustard, gram, groundnut and sorghum. The impact was studied on the following parameters.

Area : Except barley and sorghum, all the crops had shown increase in acreage. Maximum increase of 209.29 per cent was observed under mustard crop followed by gram (28.55%), groundnut (21.39%), soybean (18.06%), wheat (13%). It is evident from the findings that farmers are slowly reducing the area under cultivation of traditional crops like barley (6.25%) and sorghum (32.64%) for food grain purpose.

Table 5. Impact on area (acres) under major crops in rain fed agro eco-system

Crops	Mean		Mean	Per cent	t-value
	Pre	Post	difference	change	
Wheat	2.767	3.127	0.360	13.00	4.08**
Barley	1.600	1.500	0.100	6.25	1.048
Soybean	1.700	2.007	0.307	18.06	1.715
Mustard	0.226	0.699	0.473	209.29	5.755**
Gram	1.359	1.747	0.388	28.55	5.814**
Ground nut	3.273	3.973	0.70	21.39	5.830**
Sorghum	0.573	0.387	0.187	32.46	2.188**

** Significant at (P < 0.01)

Productivity : All the crops recorded a significant increase in yield due to the technological interventions. The maximum yield gain of 161.42% was recorded in gram, followed by barley (140.86%) and sorghum (132.7%). The maximum yield gain was in crops having less water requirement which proved their suitability in the rainfed agro eco-system (table 6). Most of the recent varieties assessed under TAR-IVLP had shown superiority in yield over the existing traditional varieties. Introduction of new varieties was the most contributing intervention towards yield gain in all the crops.

Table 6. Impact on productivity (q/acre)of major crops in rain fed agro eco-system

Crops	Mean		Mean	Per cent	t-value
	Pre	Post	difference	change	
Wheat	9.573	16.360	06.787	70.90	35.522**
Barley	7.440	17.920	10.480	140.86	41.929**
Soybean	6.187	8.613	02.427	39.23	24.084**
Mustard	3.133	5.633	02.500	79.80	25.704**
Gram	3.467	9.067	05.600	161.52	38.406**
Ground nut	4.300	7.133	02.833	65.88	26.879**
Sorghum	3.713	8.640	04.927	132.70	57.079**

** Significant at (P < 0.01)

Production : Increase in the average production of most of the crops was due to productivity as well as their increased acreage. More than four folds increase in production of mustard was recorded in the villages. Earlier, farmers were growing mustard along with wheat crop. Now due to interventions under TAR-IVLP, farmers have realized the importance of growing mustard as sole crop and were able to harvest better yield. The varieties like Vaibhav, Pusa Bold, Pusa Barani outperformed the local varieties. The supply of quality seeds of improved varieties has ensured 414.66, 240.06, 122.52 and 92 per cent increase in mustard, gram, barley and wheat production, respectively.

Table 8. Impact on average production (q) of major crops in rain fed agro eco-system

Crops	Mean Score		Mean	Per cent	t-value
	Pre	Post	difference	change	
Wheat	26.433	50.773	24.340	92.08	7.581**
Barley	11.887	26.467	14.580	122.65	7.666**
Soybean	10.640	17.427	6.787	63.78	4.519**
Mustard	0.730	3.757	3.027	414.66	5.886**
Gram	4.669	15.907	11.237	240.6	8.079**
Groundnut	3.273	3.973	0.700	21.39	5.830**
Sorghum	3.320	2.140	1.180	35.54	2.585**

** Significant at (P < 0.01)

Table 9. Impact on cost of cultivation (Rs/acre) of major crops in rain fed agro eco-system

Crops	Mean		Mean	Per cent	t-value
	Pre	Post	difference	change	
Wheat	1733.333	2716.000	982.667	56.69	33.319**
Barley	1408.000	1789.333	381.333	27.08	25.785**
Soybean	1650.667	2120.000	469.333	28.43	27.821**
Mustard	1429.333	1758.667	329.333	23.04	28.228**
Gram	1912.000	2294.667	382.667	20.04	27.592**
Groundnut	2256.00	2782.667	526.667	23.35	30.211**
Sorghum	1634.667	1988.000	353.333	21.61	24.318**

** Significant at (P < 0.01)

Cost of Cultivation : The cost of cultivation of most of the crops has increased mainly due to high cost of inputs.

There was an increase of 56.59, 20.04 percent in wheat and gram cultivation, respectively in the IVLP villages (table 9). The increase was statistically significant in all the crops.

Cropping Intensity : It is an important aspect which indicates the number of crops grown on a piece of land in a year. It also gives an idea about the optimum utilization of land. In rainfed agro eco-system, the non-availability of water during summer, farmers could take only two crops. Due to the construction of ponds and water harvesting tank few farmers managed to take three crops that led to increased crop intensity (226%) in the IVLP villages.

Table 10. Impact of TAR-IVLP on cropping intensity (in percent)

Agro eco-system	Mean		Mean difference	Per cent change	t-value
	Pre	Post			
Irrigated	230.7	234.7	4	-1.74	-0.725
Rain fed	198.7	221.3	22.6	11.37	4.339**
Over all	216.7	226.0	9.3	4.29	2.369*

** Significant at (P < 0.01)* Significant at (P < 0.05)

Cropping pattern : There wasn't much change in cropping pattern under both the systems. In irrigated system, Rice-Wheat system is dominant and followed by majority of the farmers. Efforts should be made towards diversification of rice-wheat system by incorporating other crops like maize, sugarcane and vegetables in crop rotation. In Rainfed agro eco-system, a number of crops were grown depending on the availability of water. Due to the IVLP interventions, improved varieties of soybean, gram and groundnut were introduced and cultivation of these traditional crops intensified.

In fodder crop the IVLP has introduced new fodder crops in both the systems and farmers were in a position to take three crops in order to ensure round the year supply of green fodder.

CONCLUSION

It was observed that the area under HYV seeds had increased in the IVLP villages. Due to mechanization there was a reduction in labour use per acre under both the agro-ecosystems. The average production of rice and wheat has significantly increased under the irrigated agro-eco-system. In rainfed agro ecosystem there was an increase in area and production of mustard, gram, soybean and wheat. The varietal intervention under IVLP has ensured the supply of quality seeds of improved varieties could be one of the major reasons for better production of all the major crops grown in the villages. Due to increase in the price of inputs an increase in cost of cultivation of paddy and wheat respectively was recorded in the IVLP villages. Hence, a project of this nature should be emphasized for the overall agricultural development of the country.

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