Vol XXXIV
No. 4

ISSN 0019-5014

OCTOBER-
DECEMBER
1979

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS

INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

The study points out that before the implementation of the T & V system, most of the cultivable area was under traditional crop varieties. The introduction of the T & V system has resulted in increasing the cultivated area under HYVs of crops. The new knowledge of farming, disseminated by the T & V system, has the potential to increase the cropping intensity, employment of family labour, marginal value productivities of all inputs and the extent of adoption of recommended practices on both the categories of farms. However, the impact of this system is found to be more on the small holdings as compared to the large. Thus the study clearly indicates that the T & V system has a considerably positive impact on the farming economy of Hoogly district. Similar results[2] were obtained by a number of studies conducted on the T & V system at Chambal Command Area (Rajasthan). Further, there is no reason why promising results should not be ensured in other areas within a brief period of time.

AN ECONOMIC EVALUATION STUDY OF 'OPERATIONAL RESEARCH PROJECT' IN RURAL DELHI

G. S. Ram and A. S. Sirohi*

A recapitulation of the history of agricultural extension strategies in India starting with 'Grow More Food Campaign', 'Community Development and National Extension Service', 'Intensive Agricultural District Programme', 'High-Yielding Varieties Programme', 'Multiple Cropping Programme', 'Small Farmers' Development Agency and Marginal Farmers and Agricultural Labourers Development Agency', 'Dry Land Farming,' 'Integrated Rural Development Programme', etc., would help to drive home the point that most of the programmes have lacked a totality of approach. They have generally been concerned with one or at the most two aspects of a given agricultural situation. Besides, these programmes have been essentially developmental in character and have suffered for want of strong research base. Taking cognizance of these limitations, the Indian Council of Agricultural Research initiated around mid-seventies what is called as 'Operational Research Project' (ORP). Twenty-five such projects were launched throughout the country in which a number of villages were adopted by agricultural universities/research institutes for overall agricultural development by considering the aggregate picture of farming. By now we have had some experience of the functioning of these projects. It would be advisable to make precise estimates of the impacts of these projects

2. Crop Estimation Study under Agricultural Extension Programme in Chambal Command Area, Project Director (Extension), Kota (Rajasthan), 1976-77 and 1977-78.

* Extension Agricultural Economist and Head, respectively, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi-12.

so that further policy decisions about the continuance, intensification and expansion of these programmes could be considered in the right perspective. It is with this idea in mind that the present study has been undertaken to evaluate the impact of one such ORP being carried out by the Indian Agricultural Research Institute (IARI) in rural Delhi. The specific objectives of the study were (*i*) to determine the effects of ORP on the cropping pattern, fertilizer consumption, crop yields, production costs and returns of crops; and (*ii*) to assess the return per unit of investment in agricultural extension activities of ORP.

METHODOLOGY

IARI under ORP adopted four villages having specific problems for total agricultural transformation. Thus village Sanoth (Alipur block) was selected for the salinity problems of soil and water; Holumbi Kalan (Alipur block) for intensive cultivation of vegetables; Ghoga (Alipur block) for extremely limited supply of water and also for large number of marginal and small holdings; and Bawana (Kanjhawala block) for its potential for dairy development. The project was operated by a multi-disciplinary team of scientists. The co-operation of other organizations, *viz.*, block development offices, banks, input supplying agencies, and minor irrigation department, etc., was also sought.

A comprehensive survey of all the 1,440 households in four villages was conducted in 1974-75 on all aspects of farming. A control village, namely, Holumbi Khurd where ORP was not being conducted and which was within the cluster of ORP villages, was surveyed on sampling basis to obtain controlled data.

The analysis of the bench mark data brought out a large number of problems. Consequently, sixteen distinct programmes were drawn. The important among these programmes were economic development of marginal holdings, reclamation and management of saline soils, utilization of brackish water, saturation of villages with high-yielding varieties of crops, land use planning, survey and surveillance of diseases, and maximization of crop and dairy yields.

Concerted efforts were made on each of the above programmes except dairy where the Institute did not have much technical expertise. The project was implemented in three years' period ending 1977-78 agricultural year. All the monetary figures for all the years were worked out at constant prices prevailing in the year 1976-77 and these values were converted to their present worth in the period 1976-77 by using the conventional methods of compounding and discounting as given below. The achievements of the three years were then averaged to have an idea of the annual performance.

Compounding formula

$$V = P_J \left(1 + \frac{r}{100}\right)^J$$

Discounting formula

$$V = \frac{P_J}{\left(1 + \frac{r}{100}\right)^J}$$

where V = present value at a given period,
P_J = principal amount in jth year,
r = rate of interest and
n = number of time period.

The bench mark income data of 1974-75 and the data for 1978-79 pertaining to the control village were used to analyse the general growth of agricultural income. This analysis was used to compare the returns in the control village with those of ORP villages to determine the explicit effects of ORP.

RESULTS

Impact on Area, Yields, Fertilizer Use and Production

The execution of the project brought out a lot of changes in the cropping pattern, use of seeds and fertilizers, yields, production, costs and returns in the four villages selected under the project. The impact of ORP in various villages differed from each other because of the differences in the programmes. The summarised picture of achievements emerging in respect of these villages is presented in Table I.

Table I amply demonstrates the significant impact brought out by the project in terms of increased use of fertilizers and enlarged production and income. The area under most of the crops increased except maize and miscellaneous crops. Pulses and oilseeds recorded substantial increases. In rice and vegetables, the rise was moderate. The increase in acreage was comparatively much lower in barley, wheat and bajra. The overall annual increase in the gross cultivated area was 14 per cent during the project period.

The increase in yield was more spectacular than the change in the cropping pattern. The yield of oilseeds exhibited the highest increase of nearly 130 per cent. The yield of bajra almost doubled in the three years of project operation. Maize recorded a yield rise of 80 per cent. In wheat and rice, the rise in yield was around 60 per cent; whereas pulses showed an increase of 50 per cent. The overall increase in the yields of all crops was to the tune of 63 per cent.

The yield increase was mostly made possible by increased consumption of fertilizers (N, P, K) in most of the crops. The fertilizer consumption displayed the largest percentage increase (more than 180 per cent) in wheat followed by 80 per cent in rice. In pulses, the use of fertilizers doubled although the absolute quantities used were extremely low. Bajra raised its fertilizer consumption by more than 65 per cent. The overall increase of fertilizer application in all crops was about 140 per cent which jumped from 13 kg./hectare in 1974-75 to 31 kg./hectare during the project period.

TABLE I—IMPACT OF 'OPERATIONAL RESEARCH PROJECT' ON AREA, YIELD, FERTILIZER USE, COST AND RETURN IN DELHI

Sr. No.	Particulars	Year	Bajra	Rice	Maize	Wheat	Barley	Pulses	Oil-seeds	Vege-tables	Others	All crops
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1.	Area (hectares)	1974-75	432	269	22	1,343	55	181	103	224	195	2,830
	Annual average	1975-76 to 1977-78	440	334	18	1,467	60	303	181	258	150	3,211
	Per cent increase		(1·8)	(24·2)	(—18·2)	(8·7)	(9·1)	(67·0)	(75·7)	(15·2)	(—30·0)	(13·5)
2.	Yield (quintals/hectare)	1974-75	8·1	20·2	9·0	19·2	7·3	7·0	4·5	170·0	10·2	27·3
	Annual average	1975-76 to 1977-78	16·0	31·8	16·2	31·0	16·3	10·5	10·3	180·0	12·3	36·7
	Per cent increase		(97·5)	(57·4)	(80·0)	(61·5)	(23·3)	(50·0)	(128·9)	(5·9)	(20·6)	(34·5)
3.	Fertilizer (N+P+K) use (kg./hectare)	1974-75	17	12	17	17	15	2	—	7	2	13
	Annual average	1975-76 to 1977-78	28	34	24	48	20	4	—	10	3	31
	Per cent increase		(64·7)	(83·3)	(41·2)	(182·3)	(33·3)	(200·0)	—	(42·9)	(50·0)	(138·5)
4.	Total production (quintals)	1974-75	3,499	5,434	198	25,901	402	1,267	464	38,080	1,898	77,234
	Annual average	1975-76 to 1977-78	7,040	10,621	292	45,477	978	3,182	1,864	46,640	1,845	119,939
	Per cent increase		(101·2)	(95·5)	(47·5)	(75·6)	(143·3)	(151·1)	(301·7)	(22·4)	(—7·2)	(52·7)
5.	Gross return (Rs./hectare)	1974-75	599	1,535	681	2,016	727	1,269	923	6,800	969	1,418
	Annual average	1975-76 to 1977-78	1,216	2,545	1,222	3,409	1,716	2,310	2,779	9,038	1,233	2,500
	Per cent increase		(103·0)	(65·8)	(79·4)	(69·1)	(136·0)	(82·0)	(201·1)	(32·9)	(27·2)	(76·3)
6.	Total cost (Rs./hectare)	1974-75	449	1,078	500	1,163	527	524	504	3,086	487	835
	Annual average	1975-76 to 1977-78	602	1,518	611	1,432	650	633	619	4,576	633	1,185
	Per cent increase		(34·1)	(40·8)	(22·2)	(23·1)	(23·3)	(20·8)	(22·8)	(48·3)	(30·0)	(42·3)
7.	Net return (Rs./hectare)	1974-75	150	457	181	853	200	745	519	3,714	482	583
	Annual average	1975-76 to 1977-78	614	1,027	611	1,977	1,066	1,677	2,160	4,462	600	1,311
	Per cent increase		(309·3)	(124·7)	(237·6)	(131·8)	(433·0)	(125·1)	(316·2)	(20·1)	(24·5)	(124·9)
8.	Total net return (Rs./thousand)	1974-75	65	123	4	1,151	11	133	43	832	94	2,456
	Annual average	1975-76 to 1977-78	270	343	11	2,901	4	508	391	1,151	90	5,729
	Per cent increase		(315·4)	(178·9)	(175·0)	(152·0)	(481·8)	(281·9)	(809·3)	(38·3)	(—4·2)	(133·3)

As a result of larger area and fertilizer use, the production of most of the crops rose considerably. The aggregate production of oilseeds increased three-fold during the project period. There was about one and half-fold rise in pulse and barley production. The production of bajra and rice was about doubled. Wheat output increased by 75 per cent. The production of vegetables showed the lowest rise of 22 per cent. The increase in the total production of all crops was to the tune of 53 per cent.

Impact on Cost of Production and Income

Since the enlarged yields and production were largely due to larger use of inputs, the costs of production also increased accordingly. Rise in input prices also contributed to increased cost of crop production which inflated by more than 40 per cent during the period of the project. The highest increase of 48 per cent in per hectare cost was realised in vegetables. This was followed by rice where the rise in cost was about 40 per cent. The higher increase in the production costs of vegetables and rice was mainly due to the labour intensive character of these crops. The labour wages have been escalating in and around Delhi metropolis. The cost of production of bajra increased by one-third. In maize, wheat, barley, pulses and oilseeds, the cost rise ranged between 20 and 25 per cent. The overall increase in the production cost was a little more than 40 per cent.

The increase in the cost of production was, however, outpaced by the rise in yield and price of output. The net result was, therefore, an increased amount of net returns per unit area. The net return per hectare in barley increased four-fold, while in the case of bajra and oilseeds, there was a three-fold increase in their net earnings per hectare. There was an increase of about 125 per cent in the net earnings of rice, wheat and pulses and also all crops. In vegetables the percentage per hectare net return was the lowest but in absolute terms, it was the highest.

The total net income from the entire area under all crops increased by 133 per cent during the project period. The highest rise of eight-fold in the total net earnings was obtained in oilseeds. The percentage increase in the total net returns was also quite substantial in bajra, barely and pulses. Rice, maize and wheat exhibited a rise in total net income varying from 150 to 180 per cent.

Compared to the above growth rates in ORP villages, the average growth rate of net income of the farmers in the control village was only to the extent of 5 per cent. This clearly indicates the striking effect of ORP on the net income of farmers.

Returns to Extension Expenditure

The comparative elucidation of economic returns as done above is not explicit because of the difference of time period, non-consideration of general secular growth in agriculture and changes in the pricing units of inputs and outputs. As indicated earlier, the returns in 1974-75 were converted to their present value in 1976-77 to make the analysis comparable. A rate of

10 per cent interest was used in compounding and discounting formula. Further, a 5 per cent annual increase in return was considered to accrue due to secular agricultural growth on the basis of analysis done in the control village—Holumbi Khurd. Thus the net return of Rs. 2.46 million in 1974-75 would be equivalent to Rs. 3.25 million in 1976-77. The difference of the two incomes which came to Rs. 2.48 million was thus pure return to extension expenditure.

Aftermath Effect of Extension on Agricultural Earnings

Extension work has, however, a prolonged effect on the knowledge, skill and earnings of the farmers. Apart from improving the income during the period of extension activities, there is a generation of stream of incomes in successive years after the project has been completed. There is no specific scientific work on the exclusive aftermath effects of an extension programme. Even if there were any, the experience of the same could not be utilized intrinsically in the present study because of the specificity of that programme in time, space and sincerity. The best method of evaluating the effects *post facto* is to keep maintaining the statistics for the post-project periods so that changes in production, costs and returns can be gauged. Since the present project was withdrawn after 1977-78, there was only one year (1978-79) to study the post-effects. The analysis of the records maintained for 1978-79 year in respect of 75 selected farmers reveals the realisation of only 80 per cent of the increased income (at constant price of 1976-77) generated by the project during the period 1975-76 to 1977-78. In other words, there has been an annual decline of 20 per cent in the additional earnings brought out by the project. Assuming this decline to operate at 20 per cent in future years also, the effects of the project would cease after four years.

Hence the increased net return of Rs. 2.48 million at constant price accruing due to the project during its operation would decline at 20 per cent annually in subsequent periods. Thus, the incomes available at future dates have to be discounted to the base year 1976-77 of the project evaluation.

Assuming 10 per cent annual rate of interest and 20 per cent yearly fall in the net earnings, the expected returns to the ORP work would be as presented in Table II.

TABLE II—DETAILS OF EXPECTED NET RETURNS ACCRUING DUE TO THE PROJECT

(*thousand rupees*)

Year	Net return accruing due to the project	Net return accruing due to the project in 1976-77
1976-77	2,481	2,481
1978-79	1,965	1,640
1979-80	1,489	1,119
1980-81	992	678
1981-82	496	308

Expenditure Details of the Project

The ORP work which was carried out for three years starting in 1975-76 was made successful with the involvement of a big team of scientists and field staff. The average annual expenditure over the three-year period of the project worked out to be as shown in Table III.

TABLE III—DETAILS OF AVERAGE ANNUAL EXPENDITURE INCURRED ON THE ORP WORK

	Items	Annual expenditure (Rs.)
1.	Survey work	10,000
2.	Pay of 12 scientist devoting 33% time in the project @ Rs. 650 p.m. per scientist	93,600
3.	Full time 4 field staff posted in the villages @ Rs. 400 p.m. per staff	19,200
4.	P.O.L. for 120 trips per annum @ Rs. 60 per trip	7,200
5.	Wages of drivers for 120 days @ Rs. 16 per day	1,920
6.	Stationery	5,000
7.	Miscellaneous	10,000
	Total	1,46,320

The above table indicates that a total amount of Rs. 1,46,320 was spent annually on the extension activities of ORP in the four villages.

Cost-Benefit Account of the Project

As has been discussed above, the investment of Rs. 1,46,320 in the project in the central period (1976-77) accrued a net return of Rs. 2.48 million. This, thus, provided a ratio of 1: 16.95 between expenditure and net return. In other words, a rupee spent on extension work of the type of present ORP would give a net return of Rs. 17 in the same year. But if the long run view of the project were to be taken, the return would be still higher. Even if the impacts of the project are moderately sustained, the project will, within a short period of four years after project completion, generate a total net return as high as Rs. 6.23 million at constant prices. With this return, the ratio of cost-benefit would, therefore, become 1 : 42.55, implying thereby the realisation of a profit of Rs. 42.55 for each rupee spent on ORP type extension work.

The foregoing analysis thus strongly suggests the extension, expansion and intensification of the programmes of the type of ORP, which carry out the extension work with strong research backing.