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PROSPECTS OF INCREASING INCOME AND EMPLOYMENT THROUGH ADOPTION OF IMPROVED TECHNOLOGY: A LINEAR PROGRAMMING APPROACH

S. RAJESWARI*, T.V. NEELAKANTA SASTRY AND P. RAGHU RAM

Department of Agricultural Economics, S.V. Agricultural College, Tirupati-517 502, Andhra Pradesh, India

ABSTRACT

The present study was undertaken in Kadapa district of Andhra Pradesh state, with the overall objective of enquiring into the economic aspects of the impact of modern technology on income and employment. The total sample comprised 60 randomly selected cultivators from four villages of Obulavaripalli mandal of Kadapa district. The findings indicated that the adoption of recommended technology had resulted in higher income even with the available funds. The returns and employment could be increased further and reach maximum attainable levels with the additional credit facilities for adopting recommended technology.

KEY WORDS: Employment. Farm returns, Improved technology, Linear programming technique, Optimum farm plans

INTRODUCTION

Indian agriculture is known for its ability of providing employment, livelihood, food, nutritional and ecological securities. Agriculture contributes 14.2 per cent to the gross domestic product of India. About 60 per cent of the country's population ekes out their livelihood from this sector of the economy. The importance of agriculture in India prevails amidst the fast growing secondary and tertiary sectors. To compete with these sectors, the income from the agriculture must be increased which can be possible by rational use of resources and by raising production on the farms through the adoption of new technology. The present study was undertaken with the overall objective of enquiring into the economic aspects of the impact of modern technology on income and employment.

MATERIAL AND METHODS

The present study was conducted in Obulavaripalli mandal of Kadapa district, Andhra Pradesh. From the mandal four villages were selected, which had highest gross cropped area. From each village, ten small and ten large farmers were selected. Thus the total number of farmers selected for the present study was 80. The data regarding existing farm resources and input output coefficients were collected through a schedule especially designed for this study.

Two types of crop production activities were included in the model. The first group of crop activities indicated the production technology that was followed currently by the farmers whereas the other group of crop activities represented recommended technology as suggested in improved cultivation practices for high yields. The information regarding the crop production activities with existing technology was obtained from the selected respondents, whereas the information regarding recommended technology for various crops was obtained from the Regional Agricultural Research Station, Tirupati.

The linear programming technique which maximizes farm returns from various crop activities subject to the various constraints has been used as an analytical tool. This technique was also used by Shareef and Murthy (2001), Prasad (2004) for developing optimum plans. The model used was

$$\text{Maximise } Z = \sum_{j=1}^{n} C_j X_j$$

j = 1 to n activities

Subject to following constraints

1. $\sum_{j=1}^{n} a_{ij} X_j \geq b_i$ (i = 1, …….K)
2. $\sum_{j=1}^{n} a_{ij} X_j \leq b_i$ (i = K+1,……. m)
3. $\sum_{j=1}^{n} a_{ij} X_j = b_i$ (i = m+1, ……. v)
4. X_j , $b_i \geq 0$ (non negativity constraint)

*Corresponding author, E-mail: rajeswari.svag@gmail.com

where,

Z = is the objective function to be maximized in the year.

C_j = is the value or price of jth activity during *kharif* and *rabi* seasons of the year.

X_j = is the unit of jth production activity during *kharif* and *rabi* seasons of the year.

a_{ij} = amount of ith resource required by j^{th} activity

b_i = quantity of ith resource

With the help of the above linear programming analysis, the following four optimum plans were developed for both small and large farms.

Model 1: The technology considered in this model was based on the practices followed by the sample farmers in production of crops. Cash availability of the farmers was restricted to owned funds.

Model 2: The technology consider in this model was existing technology. It is similar to model 1 but for the complete relaxation of the loan amount available to farmers.

Model 3: This model is similar to model 1 except that the recommended technology was incorporated in place of existing technology. Model 3 results indicate the income increasing possibilities by a switch over to the recommended technology even at the existing level of funds.

Model 4: It is similar to model 2, except that the recommended technology was incorporated in the place of existing technology. This model was designed to assess the effect of modern technology in conjunction with adequate capital on income and employment.

RESULTS AND DISCUSSION

A comparison of net farm returns between models designed at existing technology (Model 1) and at recommended technology (Model 3) with available funds shows impact of technology under restricted capital and a similar comparison of models with borrowed capital (Model 2 and Model 4) shows the impact of technology under unlimited capital. The results of these comparisons are presented in Table 1.

The programme designed at recommended technology with limited capital helped large farmers to realize an income of ₹ 1,67,611.60 as against ₹ 46,361 realized by small farmers. Due to the adoption of recommended technology small and large farmers realized an increased income of ₹ 927 (2.04%) and ₹ 33,038.10 (24.55%) respectively over the optimum plans developed at the current technology with owned funds and this reflects the impact of technology under capital constraint.

The existing technology with adequate capital helped small and large farmers to realize ₹ 50, 459 and ₹ 1, 50,480.40 respectively as net farm returns. The results of models developed at recommended technology with relaxed borrowing revealed that it was possible to get net farm returns of ₹ 64, 815 and ₹ 1, 92,515.70 for small and large farmers respectively. These returns were higher by ₹ 14, 356 (28.45%) and ₹ 42, 035.30 (27.93%) over the net farm returns obtained from model 2 for small and large farmers. This indicates the influence of technology on income under relaxed borrowing.

Impact of technology on employment of small and large farmers is presented in Table 2. The effect of technology under limited capital condition can be known by comparing models 1 and 3. The adoption of recommended technology with available funds led to decrease in the labour use by 3.47 man days, 33.51 womandays and 8.34 bullockdays over the labour use in the existing technology on small farms.

In the case of large farms, the adoption of recommended technology even under limited capital led to increase employment to the extent of 22.46 mandays, 40.51 woman days and 3.21 hours tractor use over the optimum model 1.

A comparison of models 2 and 4 indicates the impact of technology on employment under unlimited capital condition. In model 4 labour use was higher by 7.02 mandays, 44.05 womandays and 9.85 hours of tractor use over model 2 on small farms. Model 4 provided an additional employment of 18.46 mandays, 96.30 womandays and 8.94 hours of tractor use over model 2 on large farms.

CONCLUSION

From the above discussion, it may be inferred that the recommended technology had significant effect on net farm returns of both the categories of farmers under limited and unlimited capital conditions. However, the effect of technology was relatively more when it was associated with adequate capital. It is interesting to note that impact of technology was more on large farms compared to small farms under limited capital while the

Table 1. Impact of technology on net farm returns of small and large farms (in Rupees)

Category /Model	Limited capital			Unlimited capital		
	Model-1	Model-3	Change over Model-1	Model-2	Model-4	Change over Model - 2
Small farmers	45,434.00	46,361.00	927.00 (2.04)	50,459.00	64,815.00	14,356.00 (28.45)
Large farmers	1,34,573.50	1,67,611.60	33,038.10 (24.55)	1,50,480.40	1,92,515.70	42,035.30 (27.93)

Note: Figures in parentheses indicate percentages

Table 2. Impact of technology on employment of small and large farms

Category / Model	Limited capital				Unlimited capital			
	Model-1	Model-3	Change Over Model-1		Model-2	Model-4	Change Over Model-2	
			Absolute	Per cent			Absolute	Per cent
1. Small farmers								
Mandays	46.80	43.33	-3.47	-7.41	55.78	62.80	7.02	12.58
Womandays	171.33	137.82	-33.51	-19.55	190.33	234.38	44.05	23.14
Bullockdays	14.29	5.95	-8.34	-58.36	17.72	5.80	-11.92	-67.27
Tractor hours	4.76	8.34	3.58	75.21	5.69	15.54	9.85	173.11
2. Large farmers								
Mandays	141.80	164.26	22.46	15.84	160.83	179.29	18.46	11.47
Womandays	508.87	549.38	40.51	7.96	562.30	658.60	96.30	17.13
Bullockdays	26.61	17.99	-8.62	-32.39	33.28	23.72	-9.56	-28.73
Tractor hours	36.75	39.96	3.21	8.73	42.15	51.09	8.94	21.21

same was more on small farms under unlimited capital environment. The findings in this aspect were found in conformity with the findings of Deoghare (1997), Gajanana and Sharma (1990), Jagtar et.al. (1990), Sreelakshmi (1995). The results showed that the labour employment could be increased by introducing modern technology along with credit facilities.

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