https://doi.org/10.29321/MAJ.10.A03369

Madras agric. J. 61 (1 & 2): 35—41 Jan. & Feb., 1974

Changes in Farming - A Case of Differing Response of Technology

By

C. RAMASAMY[1], V. RAJAGOPALAN[2] and P. K. AIYASAMY[3]

ABSTRACT

The study is an attempt to investigate the technological impact on farm income levels among three specified groups of the farmers. The farmers were identified as progressive and less progressive under three size groups in relation to income and resource-use by employing discriminant function. The analysis of the results showed statistically significant differences in the sharing of the benefits as among the three size groups and between the progressives and less progressives.

INTRODUCTION

There is differential response to technological impact manifest in perceptible variations in income patterns, savings dimension and investment decisions among the different categories of farming community. It is necessary, therefore, to identify and estimate the determinants of differential response and resultant changes. Such information would help to formulate needed research programmes and extension strategies to accelerate the adoption of improved technology by larger segment of farming community. In this study an attempt has been made to identify progressive and less progressive farmers with reference to size of farms and resource-use.

Herdt (1962) studied the impact of new technology in Thanjavur District and concluded that the cultivators who received higher income spent more per acre by adoption of new technology and also got higher net returns. Misra *et al.* (1965) concluded that one of the main reasons for considerable difference in income between the farmers could be the difference in the adoption of new technology. Dhondyal (1968) reported, in his study on changes in the levels of farm input, output and farm earnings in Kalyanpur Block, that the levels of production and net income per hectare had been pushed up by the use of high yielding varieties of crops in conjunction with increased complementary inputs of water and fertilizers. Kahlon (1970) reported that the gains of new technology had been unevenly distributed in the rural Punjab. Shah and Agarwal (1970) concluded that with the introduction of the new technology, difference in the income levels of

1. Instructor, 2. Professor and Head 3. Associate Professor, Department of Agricultural Economics, Tami Nadu Agricultural University, Coimbatore 641003.

progressive and less progressive farmers in the different size groups of the holdings become very significant. Prakashi (1971) indicated that new technology in agriculture had led to the widening of regional disparities in personal incomes in India.

MATERIALS AND METHODS

New technology, as defined in this study, is the use of hybrid seeds coupled with the use of chemical fertilizers, plant protection chemicals, improved implements and machinery in production. Progressive farmer is defined as one who has raised high yielding varieties of crops in at least 20 per cent of his total cropped area. Five villages were selected at random in Palani Taluk of Madurai District, Tamil Nadu. For classifying the farms into size groups, all the farms in five villages were enumerated and their area was cumulated after arranging the farms in ascending order of their size. The cumulated total was divided into three equal areas for fixing the class intervals. Thus, the specified classes are: Small farms 0.01 - 4.25 acres; Medium farms 4.26 - 9.00 acres; Large farm Above 9.00 acres.

From each size group, 20 progressive farms and 20 less progressive farms were selected by random sampling. In all, there were 60 progressive farmers and 60 less progressive farmers in the sample.

The sample data were used to test the criterian setforth in defining the farmers into progressive and less progressive. For this, the discriminant function was used. Discriminant function is a multivariate technique for studying the extent to which different population overlap one another or diverge from one another. The linear discriminant function $\sum_{i}^{n} \lambda_i x_i$ may be defined as the linear function of the x_i that gives the smallest probability of misclassification The characters considered for the problem of classification in the present study are farm net crop income (x_1), cost of manures, fertilizers and plant protection chemicals (x_2), human labour (x_3) and bullock labour (x_4) in units per acre.

To study the income levels, the 'disposable crop income' and the 'net crop income' were taken as two significant indicators. Disposable crop income referred to the actual income realised by the farmer for further investment and other expenses, and calculated by substracting the out-of-pocket expenses incurred in the crop production from the gross crop income. The out-of-pocket expenses included values of hired human and bullock labour, purchased seeds, fertilizers, plant protection chemicals, purchased cattle feeds, irrigation charges, interest on crop loans, land revenues, cess and other taxes and other charges related to crop enterprise of the farm. The net crop income was defined as the difference between disposable crop income and indirect costs. The latter included interest on working capital other than loans borrowed, interest on fixed capital, depreciation on dead-stock, depreciation on buildings and miscellaneous charges and levies.

TABLE 1. Mean value of variation per acre

Variables	Small size group		Medium size group		Large size group		Size groups pooled together	
	Progressive	Less progressive	Progressive	Less progressive	Progressive	Less progressive	Progressive	Less progressive
Net crop income in rupees [x_1]	835.35	263.65	765.20	497.70	1453.95	789.25	1,018.17	516.87
Fertilizers, manures and plant protection chemicals in rupees [x_2]	287.75	93.80	236.45	101.10	326.40	138.60	283.53	111.17
Human labour in mandays [x_3]	69.10	62.25	81.60	61.75	91.95	73.30	80.88	65.77
Bullock labour in bullock labour days [x_4]	16.20	14.70	18.85	15.50	15.50	16.05	16.85	15.42

RESULTS AND DISCUSSION

In all, four functions were fitted separately for progressive and less progressive for each of the three size groups and one for the pooled data of all farm sizes.

The mean values of all the variables were higher in almost all size groups of the progressive class than in the less progressive class (Table 1). The same trend is evident in the pooled data also. This indicates that the progressive farmers were getting higher net crop income, by investing more on critical inputs like fertilizers, plant protection chemicals and others. Progressive farmers of even the small size group were applying more than thrice of these inputs used by the less progressive farmers. Medium and large farms also showed the same trend though with different magnitudes. The rate of use of human labour and bullock labour, as among the progressives and less-progressives of the three size groups, revealed variation of a smaller degree than the previous case. However, in the case of large size group, the use of bullock labour was slightly higher in the less progressive group, revealing the less progressive class was investing more on bullock labour. In

sum, the net crop income realised by the progressive class was nearly twice that of the less progressive class and the overall impact of the technology on increasing the farm income significantly becomes evident.

The estimated discriminant functions (a), and final functions (b), are presented below:

[i] Small size group :

[a] $Z=0.000101\ x_1 + 0.000435\ x_2 - 0.000364\ x_3 - 0.019527\ x_4$;

[b] $Z=X_1 + 4.29\ X_2 - 3.59\ X_3 - 192.57\ X_4$; D^2 Statistic = 0.003264; F = 49.93**

[ii] Medium size group :

[a] $Z=0.000064\ x_1 + 0.000666\ x_2 - 0.000908\ x_3 + 0.000558\ x_4$;

[b] $Z=X_1 + 10.41\ X_2 - 14.19\ x_3 + 8.72\ X_4$; D^2 = Statistic = 0.008325; F = 7.97**

[iii] Large size group :

[a] $Z= - 0.000002\ x_1 + 0.000448\ x_2 - 0.000767\ x_3 + 0.001878\ x_4$;

[b] $Z= - x_1 + 224\ x_2 - 383.50\ x_3 + 939\ x_4$; D^2 Statistic = 0.004796; F = 6.05**

[iv] Pooled analysis :

[a] $Z=0.000007\ x_1 + 0.000134\ x_2 - 0.000618\ x_3 + 0.000241\ x_4$;

[b] $Z= x_1 + 19.14\ x_2 - 88.29\ x_3 + 34.43\ x_4$; D^2 Statistic = 0.000319; F = 14.93 **

** Significant at one per cent level

The D^2 statistics in all of the four sets of functions were statistically significant implying that the factors included in the functions possessed the power of discrimination or differentiation of the progressive farmers from the less progressive farmers. It may be noted from the derived functions that certain of the variables have negative signs and this does not mean that the variables had no value in forecasting Z (Murugesan, 1971). To classify the farmers in each size group under the progressive and lessprogressive classes, the discriminant index ($\bar{z}$ value) was computed. The calcula-

TABLE 2. Disposable crop income per farm, per acre and per capita [Size groupwise]

Size groups	Per farm		Per acre		Per capita	
	Progres-sive	Less progres-sive	Progressive	Less Progressive	Progressive	Less progressi
Small	3,323	981	1,230	604	1,085	299
Medium	7,961	5,400	1,258	839	1,866	1,216
Large	35,930	12,812	1,968	1,150	7,581	2,242
Overall	15,738	6,397	1,485	864	3,510	1,253

TABLE 3. Net crop income per farm, per acre and per capita [size groupwise]

Size of group	Per farm		Per acre		Per capita	
	Progre-ssive	Less progres-sive	Progressive	Less Progressive	Progressive	Less progressive
Small	2,193	713	835	264	735	230
Medium	4,669	3,180	765	498	1,167	795
Large	26,616	8,816	1,454	789	6,132	1,571
Overall	11,159	4,236	1,018	517	2,678	865

ted $\bar{z}$ being 4107.37, 1521.12 and 34091.05 for small, medium and large size groups respectively, the $\hat{z}$ values for 120 farmers were worked out individually, in all the three size groups. The results indicate that 55 farmers were to be included in the progressive class and 65 farmers in the less progressive class as against sixty farmers in progressive and sixty farmers in less progressive classes classified *a priori* on the basis of one factor viz., 20 per cent area sown to high yielding varieties. In the same way $\bar{z}$ value and $\hat{z}$ values for 120 farmers were calculated for pooled data. The $\bar{z}$ value is 4749.77. Here also, out of 120 farmers, 55 farmers were falling under the progressive class and the remaining 65 farmers under the less

progressive class. This result also agreed with the preliminary tentative categorisation of the farmers into progressive and less progressive on the basis of area sown to high yielding varieties. Thus while applying the $\bar{z}$ value in classifying the farmers, six farmers from the progressive class belonged to the less progressive class and one farmer in latter to the former. In other words, the percentage of misclassification is 5.83 which seems to be within reasonable limits.

Income levels :

After the farmers were classified as progressives and less progressives, their income levels were analysed. The estimated disposable crop income and net crop income, size groupwise and classwise, are given in Tables II and III.

It may be seen from the above Tables, the disposable crop income and net crop income per farm, per acre and per capita are higher for the progressive than the less progressive farmers in all size groups. Similarly, variations are evident across the tables indicating intra-size group variations which may perhaps be attributed to the level of resource-use and the degree of adoption.

The data were subject to statistical scrutiny using 't' tests. The comparision was made between progressive and less progressive farmers with respect to (i) the farm disposable crop income, (ii) the farm net crop income, (iii) fertilizers, manures and plant protection chemicals, (iv) human labour, (v) bullock labour and (vi) input-output ratios. The results showed statistically significant differences between progressive and less progressive farmers except for bullock labour

It could be concluded from the above tests that the progressive farmers had adopted new technology consisting of seeds of high yielding varieties, recommended doses of fertilizers and plant protection materials including employment of more human labour. Consequently, they realised higher levels of incomes than the less progressive farmers.

Policy implications :

While science and technology in agriculture have opened a new vista of opportunities for increasing farm income, farmers' response to new technologies is constrained by resource bottlenecks and information gap. This has resulted in differential benefits and income generation. Disparities in income between size groups and between irrigated and unirrigated farms are also visible attracting political attention.

How this inequitable distribution of resources, income and motivation could be corrected seems to be pivotal for rural development. The projects of Small Farmers Development Agency and Crash Programme may generate additional income which can gainfully be employed in agriculture. Nevertheless, bold and imaginative policies are necessary to tackle this problem. Rationalization of input, markets to ensure orderly marketing and planned distribution of critical inputs at differential pricing, the difference being absorbed by Government, are some of the strategies to be examined. This

may perhaps be an alternative to direct investment which, as some could observe, may be less efficient due to built in leaks and constraints in administrative and institutional set up.

ACKNOWLEDGEMENT

The senior author is thankful to the Tamil Nadu Agricultural University for having permitted to publish the dissertation material and also records his thanks to the Government of Tamil Nadu for the award of Merit Scholarship to support the study.

REFERENCES

DHONDYAL, S. P. 1968. Cost and effectiveness of modern technology on farm production and farm income. *Indian J. agric. Econ.* **23** : 58–62.

HERDT, W. ROBERT. 1962. The effect of purchased inputs on paddy fields of selected cultivators in Thanjavur District. *Indian J. agric. Econ.* **19** : 210–2.

KAHLON, A. S. 1970. New farm technology-its implications in Agricultural Economics. *Indian J. agric. Econ.*, **25** : 1–14.

MISRA, B., H. K. DAS GUPTA and B. MISRA. 1965. Possibilities of capital formation in agriculture. *Indian J. agric. Econ.* **20** : 209.

MURUGESAN, M. 1971. *A study on wastage and prediction of student achievement in an agricultural college - A discriminant function approach.* M. Sc. (Ag.) Thesis, Sardar Patel University.

PRAKASHI. 1971. New agricultural strategy - An appraisal. *South Econst.* **5** : 49–54.

SHAH, S. L. and R. C. AGARWAL. 1970. Impact of new technology on the levels of income, pattern of income distribution and savings of farmers in central Uttar Pradesh. *Indian J. aric. Econ.* **25** : 129.