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A STUDY INTO ECONOMICS OF CULTIVATION OF TAICHUNG NATIVE I PADDY IN KOLABA DISTRICT OF MAHARASHTRA

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High-yielding varieties of crops have indeed added a new hope amongst scientists as well as administrators that the country can aspire to be not only self-sufficient but also surplus in foodgrains. The most outstanding feature of these varieties has been their response to high doses of fertilizers. The improved varieties so far were yielding only 10 per cent higher than the local ones whereas the newly introduced varieties are capable of producing double or even more than the local varieties.

Being aware of the potentialities of these high-yielding varieties, the State Government launched an ambitious programme in 1966-67 and since then the areas under these varieties have been increasing very fast. The area under these crops during 1968-69 is given below :

(*in lakh acres*)

	Taichung Native I and I.R.-8	Hybrid jowar	Mexican wheat	Hybrid bajri	Hybrid maize
1968-69	3.00	30.50	3.00*	7.50	3.50

* Target for 1968-69.

These high-yielding varieties like hybrid jowar, hybrid bajri have made possible extension of areas under double cropping since these varieties are of short duration.

All is not well with these varieties. Most of them are highly susceptible to diseases and pests. Plant protection measures can be ignored only at the cost of major losses. Further, these varieties respond well only under high doses of fertilizers. Thus, these high-yielding varieties entail more expenditure than the hitherto cultivated improved varieties.

To study the economics of high-yielding varieties vis-a-vis local varieties, a survey was conducted by selecting random samples in homogeneous areas.

SAMPLE AND THE RESULTS

Since the cultivation of Taichung Native I has not spread in all the villages, the villages having larger area under T.N. I were selected. In turn, from these 16 selected villages, 40 cultivators were finally selected randomly. The data from seven farmers were incomplete and hence rejected. For comparison, the data from the neighbouring fields in respect of local paddy were also collected.

The results are given in Table I.

TABLE I—COST OF CULTIVATION AND PROFIT PER ACRE

Type of cost*	Variety	
	Taichung Native I (Rs.)	Local (Rs.)
1. Cost A	303.53	195.61
2. Cost A_2	382.95	239.51
3. Cost B	352.51	239.51
4. Cost C	431.71	283.42
Yield in quintals	12.34	8.50
By-product	23.96	18.17
Value of yield (including by-product) ..	721.14	511.16
Profit at Cost C	289.43	227.74
Additional value of produce over local ..	209.98	
Additional cost over local	148.29	
Net gain over local	61.69	

Cost A = Total cash and kind expenditure.
Cost A_2 = Cost A + wages of unpaid family labour.
Cost B = Cost A + estimated value of rent + interest on current expenses.
Cost C = Cost B + wages of unpaid family labour.

Thus, Taichung Native I gave about 49 per cent higher yield over the local. Taichung Native I required Rs. 148.29 more expenditure than the local and produced Rs. 209.98 worth additional quantity of paddy giving a net gain of Rs. 61.69 per acre. It may be noted that the local variety of paddy *Bhadas* is also a high yielder as compared to other improved varieties.

PRODUCTIVITY ANALYSIS

To estimate the resource productivity due to the adoption of T. N. I, the Cobb-Douglas function was selected. The equation fitted to the data is

$$y = A x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4}$$

which is linear in logarithms and usually written as

$$\text{Log } y = \text{Log } a + b_1 \text{ Log } x_1 \ldots\ldots\ldots\ldots\ldots\ldots + b_4, \text{ Log } x_4$$

where b_1, b_2, b_3 and b_4 are the elasticities of production of inputs x_1, x_2, x_3 and x_4 respectively.

The five variables included in the function are

- y = Yield in kilograms.
- x_1 = Area under Taichung Native I in *gunthas*[1]
- x_2 = Human labour in man-days.
- x_3 = Bullock labour in days.
- x_4 = Working capital (excluding expenditure on human and bullock labour).

The production function derived is

$$y = 1.3578\ x_1^{.4939}\ x_2^{.2062}\ x_3^{.2536}\ x_4^{.1292}$$

$R = 0.88$ (significant at 5 per cent level)

$R^2 = 0.7744$

The value of R^2 indicates that about three-fourth of the variance of the output is associated with the independent variables selected in this study. The unexplained portion (23 per cent) of the variance in yield may be due to inter-farm differences in production technique, due to errors in reporting data or other casual factors.

The net regression coefficients—'elasticities', their standard errors and 't' values—are shown in Table II.

TABLE II

Inputs	Elasticities	S.E.	't' values
Acreage	0.4939	0.1778	2.78**
Human labour	0.2062	0.1756	1.17 N. S.
Bullock labour	0.2536	0.950	2.67**
Working capital	0.1292	0.1573	0.82 N. S.

** Significant at 5 per cent level. N. S. = Not significant.

Interpretation

Since individual elasticities are less than one, the diminishing marginal returns to individual input factors are indicated. The sum of elasticities is 1.0829. It means that where all the four factors are increased by 1 per cent the yield would increase by 1.0829. Thus, the function represents roughly increasing returns to scale.

1. 40 *gunthas* = one acre.

MARGINAL PRODUCTIVITY

The marginal productivities were derived from the elasticities of production using the geometric mean of inputs and outputs. Marginal products indicate the expected increase in total output resulting on an average from the use of one additional unit of that input.

The estimated marginal physical productivities of the various inputs are shown in Table III.

TABLE III

Sr. No.	Inputs	Average size of (geometric mean)	Marginal physical productivity (kg.)
1	Land (*gunthas*)	25.09	14.71
2	Human labour (days)	35.39	4.35
3	Bullock labour (days)	9.76	19.42
4	Working capital (Rs.)	92.58	1.04

Marginal returns to land and bullock labour seem to be higher than the marginal cost. The marginal productivity of human labour appears to compare favourably with the prevailing wage rates when converted into money value. The marginal return to capital seems to be lesser than the marginal cost. This is probably due to inadequacy of use of fertilizers and pesticides which should account for a larger part of working capital. The productivity of bullock labour appears to be quite high and suggest substitution of bullock labour in place of human labour, wherever feasible. But there are obvious limitations to it.

The estimated production function for the sample studied provides an approximate rather than very precise estimates of input-output relationship in the production of crop under study.

SUMMARY AND CONCLUSION

The study indicated that the newly introduced T. N. I yielded higher than the local varieties. Though it entails larger expenditure, it also yields higher income to the farmer. Production function analysis indicated larger marginal returns to land and bullock labour when compared with their respective marginal costs. The marginal return to working capital is less than the marginal cost. The marginal return to human labour just approximates the prevailing wage rate.

The yields obtained by the cultivators, though were higher than that of the local varieties, were considerably low when compared with high yields obtained by some of the progressive farmers and with the claims made on behalf of this variety.

Two important characteristics of this variety are that it responds to high doses of fertilizers and is susceptible to pests and diseases. So the raw data were examined to study the use of fertilizers and insecticides.

The recommended dose of fertilizers for this variety is 40 kgs. of nitrogen, 25 kgs. of phosphoric acid and 20 kgs. of potash. In the survey, it was observed that out of 33 farmers, 13 applied 20-25 kgs. of nitrogen per acre, 5 farmers applied 15-20 kgs. of nitrogen. Twelve Farmers applied 10-15 kgs. while 4 farmers did not use any fertilizer.

Only two out of 33 farmers adopted plant protection measures, that too, inadequately. The use of proper quantities of fertilizers and adequate plant protection measures are a 'must' for successful implementation of the programme of high-yielding varieties.

PRODUCTIVITY AND PROFITABILITY OF ADT-27 IN THANJAVUR DISTRICT*

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In Thiruvaiyaru, one of the progressive blocks in the Thanjavur district, two villages were selected for the field study on High-Yielding Varieties (HYV) Programme for the ADT-27 paddy crop in the *kharif* season 1967-68. Of the 50 cultivators contacted in the two villages, 43 of them were participants in the programme. The answers from 40 participants out of the 43 were noteworthy. They were enquired as to *what* they had known about the characteristics of this new high-yielding paddy strain, ADT-27, introduced in this area. They all knew that this new variety would give a higher yield than the varieties locally used. The salient qualities of this new strain, like non-lodging, high fertilizer response, less susceptibility to pest attack were not heard of by them. In general, cultivators of this area were enthusiastic to participate in the programme. In fact, seven non-participant cultivators were also willing to join in the programme in the coming years.

PARTICIPATION IN THE PROGRAMME

It was found difficult to select even this seven non-participants in this area, as almost all the cultivators were participants in the programme either wholly or partially. The increase of preference to this new strain can be seen from rapid

* This paper is based on the field study done by the author in the Thiruvaiyaru Block of Thanjavur district during 1967-68.