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the concentration of nutrients on smaller area of a particular crop should be deferred in favour of the smaller doses spread over the larger crop areas.

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A NOTE ON EFFICIENCY IN TRANSITIONAL AGRICULTURE : A STUDY OF FARMS IN RURAL DELHI

Most of the developing countries today are in the throes of a technological revolution in agriculture. Farmers are being increasingly confronted with new alternatives and problems which do not fit their experience-based decision frame. This implies, and it has been shown empirically by Huang,[1] that a degree of inefficiency in resource allocation is characteristic as a traditional agriculture is transformed into a modern one.

The forces of transformation do not affect all farmers in the same way; a few are innovators who gain substantial benefits by adopting the new techniques ahead of others, some are laggards and most of the others lie in between in the adoption continuum. Consequently, one encounters large variations in the output levels of farmers and would expect a similar variability in resource use efficiency. Another way of looking at it may be, and this would be more acceptable to the adherents of the "rational farmer's" view, that differences in resource endowments and farm structure may cause farmers to respond differently to technical innovations and other economic stimuli, resulting in differences in the adoption levels.

The conventional efficiency yardsticks used in farm management are based generally on returns to certain inputs—land, labour, etc. This ignores the fact that a farmer may be put in the inefficient class not because his deployment of resources is faulty but because, for example, of acute capital scarcity which precludes the possibility of a high score on the efficiency chart. It is, therefore, possible that a farmer who is defined as a laggard in the 'adoption' sense and has a low efficiency index relative to others, may be an "efficient" allocator of resources.

This note reports the results of a study which examines resource use efficiency in relation to resource endowments for a sample of farms in rural Delhi where farming systems are evolving rapidly under the stimulus of technological innovation. It seeks to examine, firstly, the efficiency of resource

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1. Yukon Huang, "Allocation Efficiency in a Developing Agricultural Economy in Malaya," *American Journal of Agricultural Economics*, Vol. 53, No. 3, August, 1971, pp. 514-516.

allocation for farmers who fall at the extremes of the "net income per acre" range in two villages,[2] and secondly, to analyse the significance of the working capital constraint on the income possibilities of these farms. The first objective will enable testing the hypothesis that farmers with low incomes per acre are inefficient allocators of resources. The second will provide evidence on the impact of capital scarcity on farm incomes.

Methodology

The stratified random sampling technique was employed to select a sample covering ten per cent of the farm population in each of the two villages. Comprehensive data on different aspects of farm organization were collected for the agricultural year 1967-68. These farms were then arranged in an ascending array according to net income per acre[3] and divided into two groups, designated high income and low income groups. Two farmers, representing the extreme per acre net income values (column 3, Table I), were selected from both the income groups for detailed analysis, along with the average farm situation in each case.

Linear programming was used to derive optimal farm plans. Two sets of technological matrices, one each for the two income group situations, were prepared for each village. The activities comprised crop rotations with a number of processes to indicate varietal and inputs use differences. Appropriate human and bullock labour hiring activities and a capital borrowing activity also figured in the matrices. The constraints considered were : (*a*) Land, classified according to irrigation, soil type and use suitability; (*b*) Human and bullock labour in six periods of heavy work-load for human labour and five for bullock labour; (*c*) Working capital available to meet the variable costs; (*d*) Restrictions on minimum cereals and fodder which the farmer must produce to cover the basic consumption needs of the farm family and livestock; and (*e*) Maximum area restriction for sugarcane crop.[4]

Three programming situations were developed for each farm. In the first (situation I), optimal plans were developed under the existing technological and capital availability situation with a view to know the gap between the existing and feasible incomes. In situation II, the high-yielding variety crop activities of one income group were allowed as alternatives in the matrix for the other group of the same village. This aimed at giving an idea as to whether the alternatives available to the high income group in respect of high-yielding varieties were relatively superior and could be adopted on the low income group farms. The third situation provided for borrowing of working capital.

2. Dichaon Kalan and Nangal Thakran in Najafgarh and Kanjhawala development blocks of the Union Territory of Delhi.
3. Defined as gross income less variable costs for farm business as a whole.
4. The acreage under sugarcane in Delhi has been declining over past years because of high incidence of pests and diseases. Farmers are unwilling to expand sugarcane acreage.

Results

The overall impact of changes brought about by optimization of existing resource use has been discussed in terms of changes in net farm incomes. A comparison of the existing and feasible incomes provides an idea of deviation from optimality or the extent of resource use "inefficiency." These figures for different farms in the two villages have been presented in columns 5 through 8 in Table I.

TABLE I—EXISTING AND OPTIMAL INCOMES ON FARMS IN LOW AND HIGH INCOME GROUPS IN SAMPLE VILLAGES

Income group	Rank of the farm in the income group	Existing net income per acre (Rs.)	Farm size (acres)	Existing net income on the farm (Rs.)	Optimal net incomes (Rs.) in		
					Situation I	Situation II	Situation III
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Village Dichaon Kalan				
Low income group	Lowest	635	27.0	17,150 (100)	18,746 (109)	19,019 (111)	27,837 (162)
	Highest	692	14.5	10,035 (100)	11,427 (114)	12,527 (125)	18,184 (181)
	Average	656	12.6	8,267 (100)	9,644 (117)	10,047 (122)	14,781 (179)
High income group	Lowest	730	9.5	6,933 (100)	7,771 (112)	—	11,104 (160)
	Highest	1,028	7.0	7,197 (100)	7,515 (104)	—	10,159 (141)
	Average	832	8.6	7,154 (100)	7,539 (105)	—	8,946 (125)
			Village Nangal Thakran				
Low income group	Lowest	507	5.0	2,536 (100)	2,740 (108)	2,785 (110)	2,785 (110)
	Highest	593	8.4	4,981 (100)	6,223 (125)	6,356 (128)	8,182 (164)
	Average	549	10.0	5,495 (100)	7,085 (129)	7,384 (134)	7,670 (140)
High income group	Lowest	686	4.5	3,085 (100)	3,725 (121)	—	4,587 (149)
	Highest	1,131	11.0	12,446 (100)	15,147 (114)	—	15,575 (125)
	Average	803	8.8	7,068 (100)	8,644 (122)	—	9,705 (137)

Note : Figures in parentheses indicate percentages.

A look at the income indices for the *average* farm situations indicates that, in general, the high income group farms are more efficient in the sense that the gap between existing and optimal incomes is smaller as compared to the low income group farms (situation I). Corresponding figures for individual farms, however, give more information and indicate that the farmers at the extremes, that is, the lowest and highest income farms in the village, operate almost at the optimal levels. The optimum incomes for these farms are only 4 to 9 per cent higher than the existing incomes in Dichaon Kalan. The corresponding figures for Nangal Thakran are 8 to 14 per cent. For farms in the intermediate range, the optimal incomes are higher by 5 to 17 per cent in Dichaon Kalan and by 21 to 29 per cent in Nangal Thakran. The lowest income farmer in the low income group thus proves as efficient as the highest income farmer in the high income group. Obviously, the information provided by "net income per acre" proves misleading in judging the efficiency of resource use on these farms.

Figures presented for situation II throw some more light on this issue. The resultant income increases over situation I on low income group farms are small in almost all cases while in the high income group, incomes do not change at all. The latter finding suggests that the high-yielding variety crop activities of the high income group are technically more efficient. Yet the small magnitude of income increments in the low income group implies that this superiority is only marginal. Hence, lower technical efficiency with respect to the high-yielding variety crop activities cannot be attributed as a significant factor responsible for low incomes per acre.

It could be argued that the lowest income farmer is an efficient 'traditional' farmer in the Schultzian sense and operates at a low output equilibrium. Low productivity on his farm is not due to inefficient techniques of production. Given his resources, he could barely do better. The highest income farmer has succeeded not only in taking to the new technology recently offered but also in optimizing. The latter fact provides an idea of the duration of the adoption lag. The data for this study relate to the year 1967-68 and the new technology, centred round high-yielding varieties of wheat and bajra, was made available only around 1965-66. Thus, for some farmers at least, it took only about three years to adjust fully to the change in technology and pass beyond the stage of transition to a new equilibrium. Most of the farmers, however, are still in the transitory phase characterized by 'inefficiency' in resource use. The results for situation III, where the increase in the range of alternatives is associated with provision for borrowing working capital, clearly establish that it is the severity of the working capital constraint which holds productivity at low levels. Net farm incomes show a sharp increase on almost all farms under this situation. On the low income group farms particularly, with the exception of the lowest income farmer in Nangal Thakran, the additions in income are substantial. This lends very strong support to the hypothesis regarding the crucial role of capital rationing which does not

permit farmers to benefit from the new technology. However, owing to the fact that only a one-row capital constraint was included in the model which did not permit a sequential flow of working capital through seasons, the conclusion drawn regarding the role of working capital is rather tentative. Also only working capital was considered as a constraint in this study and a more detailed analysis would have to reckon for the long-term capital needs also.

These findings, therefore, suggest two important points. Firstly, the view expressed earlier regarding the hiatus between efficiency as defined by indices commonly used in farm management literature and efficiency in resource allocation for the farm as a whole, seems to be established. It was indicated that all farms having low per acre incomes do not show inefficiency in resource allocation when the real alternatives available to the farmers and their resource limitations are carefully incorporated in the analysis, though many of them do. Secondly, acute scarcity of working capital is the most important factor responsible for low incomes per acre, and this does not permit the adoption of more remunerative production alternatives.

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TREND IN AGRICULTURAL WAGES IN GUJARAT†

Empirical studies conducted in the field of the trend in agricultural wages in India give different results.[1] This has made it difficult to make any generalization regarding the behaviour of agricultural wages in India in the post-Independence period, and has created a controversy on the subject. But one major limitation of most of these studies is that they do not consider the extent of unreliability of the data used. And consequently, their results should not be accepted at their face values. As agricultural wage statistics have not yet acquired a reasonable standard of accuracy, we feel that it is difficult to arrive at any conclusion regarding the trend without examining the reliability of the wage data used. Our main objective in this paper is to study the behaviour of agricultural wage rate in some selected districts of Gujarat, giving due consideration to the reliability aspect of the data.

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1. These studies are as follows : Nilakantha Rath and R. V. Joshi, "Relative Movements of Agricultural Wage-Rates and Cereal Prices : Some Indian Evidence," *Artha Vijnana*, Vol. 8, No. 2, June, 1966 ; Pranab Bardhan, 'Green Revolution' and Agricultural Labourers," *Economic and Political Weekly*, Vol. V, Nos. 29, 30 and 31, Special Number, 1970; N. Krishnaji, "Wages of Agricultural Labour," *Economic and Political Weekly*, Vol. VI, No. 39, September 25, 1971; Robert W. Herdt and Edward A. Baker, "Agricultural Wages, Production and the High Yielding Varieties," *Economic and Political Weekly*, Vol. VII, No. 13, March 25, 1972.