



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Vol XXIX  
No. 2

ISSN 0019-5014

APRIL-  
JUNE  
1974

# INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF  
AGRICULTURAL ECONOMICS,  
BOMBAY

## RESEARCH NOTES

### FACTORS INFLUENCING THE PRICE OF BOVINE STOCK

The price of an animal depends on both the quantitative and qualitative characters. The quantitative characters like level of milk production, age, order of lactation, stage of lactation and stage of pregnancy in the case of milch stock and age in the case of male ones and the qualitative characters, such as condition of health, colour and other confirmation characteristics are the major factors which influence the pricing of an animal. The factors of qualitative nature are purely subjective and cannot be measured. When an animal is purchased from a livestock farm one can know the details about the performance of the animal or of its parents from the records maintained there. Such information is hardly available if an animal is purchased from outside a farm excepting actually seeing the animal on the spot and obtaining such information like milk yield which can be verified. The study aims at to see how far the factors of quantitative nature have influence on the pricing of an animal.

### NATURE AND EXTENT OF DATA

Large-scale sample surveys to estimate the cost of production of milk were carried out by the Institute of Agricultural Research Statistics in Madras city and rural areas of Tamil Nadu (1957-59.) Fifty-four randomly selected producer households in the urban area and 96 in the rural area were kept under observation for a period of two years, visiting each household regularly at weekly intervals. Similar surveys to estimate the availability and cost of production of milk were carried out in Krishna delta area of Andhra Pradesh (1967-69) and in Dhulia region of Maharashtra State (1969-71.) A random sample of 192 commercial milk producer households was selected in each region and the households were kept under observation for a period of two years visiting them regularly at fortnightly intervals. A more comprehensive survey to study the economics of raising cattle and buffaloes was carried out in Hissar district of Haryana State during 1963-66. A random sample of 408 households in 103 villages was selected for collection of necessary data at fortnightly intervals. In all these surveys data on milk yield and feed were recorded by actual weighment and other information like sale and purchase prices of animals, particulars of animals sold and purchased, etc., by careful observation and enquiry. The particulars of each milch animal regarding its breed, age, order of lactation, stage of lactation, stage of pregnancy, etc., were recorded along with the price at the time of transaction which took place during the period of enquiry in each of the selected households. Similarly for male stock, the age of the animal and price of sale and purchase were recorded. The relationship of the price of an animal with various quantitative characters has been studied utilizing the data pertaining to these animals.

## METHODOLOGY

Linear, quadratic and Cobb-Douglas functions were fitted taking age or order of lactation and milk yield as independent variables and price of animal as dependent variable. Age and order of lactation being highly correlated, only one of these two factors was utilized as one of the independent variables. Similarly, since the stage of running lactation and level of production were correlated, only the latter was considered for studying the relationship. The function which explained the maximum variation has been considered as the most appropriate relationship for knowing the extent of influence of various quantitative characters to determine the price of an animal. A situation is likely to arise when the milk yield of an animal remaining the same, the price of the animal changes due to a change in the prevailing market rates of milk. Under the situation the relationship fitted will undergo some change which has also been discussed.

## RESULTS AND DISCUSSION

(A) *Buffaloes in milk*: Utilizing the available data, functions were fitted to show the relationship of price ( $y$ ) of buffaloes in milk with age ( $X_1$ ) and milk yield ( $X_2$ ) as well as with the order of lactation ( $X_3$ ) and milk yield. The correlation coefficients between different characters are given in Table I. Linear relationship which explained maximum variation was considered to be the best fit and is given in Table II. The regression coefficients of age and order of lactation, though not significant, were negative indicating that an increase in either age or order of lactation would decrease the price of animal. The regression coefficient for milk yield was highly significant in all the cases indicating that it was the single largest factor accounting for the variation in price.

The average price of a buffalo in milk, age and milk yield on the day of transaction along with the prevailing market rates of milk in different areas at the time of survey are summarised as follows. The increase in price of animal due to one kg. increase in milk yield (obtained from fitted regression equations) has also been indicated.

Area			Average price of buffalo (Rs.)	Average age		Milk yield/day kg.	Rate/kg. of milk (paise)	$\frac{\Delta Y}{\Delta x_2}$
				Year	Month			
Madras city	(1957-59)	.. ..	225	9	— 10	3.26	82	68
Gudiyatham	(1957-59)	.. ..	102	7	— 7	1.81	34	44
Hissar	(1963-66)	.. ..	538	6	— 8	7.07	82	39
Krishna	(1967-69)	.. ..	274	8	— 7	2.18	92	81
Dhulia	(1969-71)	.. ..	773	9	— 3	4.53	125	91

TABLE I—CORRELATION COEFFICIENTS BETWEEN DIFFERENT CHARACTERS

Area	Breed	No. of observations	$r_{yx_1}$	$r_{yx_2}$	$r_{yx_3}$	$r_{yx_4}$	$r_{x_1x_2}$	$r_{x_1x_3}$	$r_{x_2x_3}$	$r_{x_2x_4}$
<i>Buffaloes</i>										
Madras city .. ..	ND	160	-0.164*	0.740**	-0.011	-0.649**	-0.184*	0.717**	-0.079	-0.503**
Gudiyatham taluk .. ..	ND	34	-0.365*	0.684**	-0.229	-0.408*	-0.392*	0.738**	-0.112	-0.301
Krishna delta area (Andhra Pradesh) .. ..	ND	98	-0.174	0.668**	-0.221*	-0.411**	-0.071	0.859**	-0.103	-0.437**
Dhulia region (Maharashtra) ..	ND	49	-0.167	0.655**	-0.141	-0.381*	-0.174	0.353**	0.125	-0.329*
Hissar district (Haryana) ..	M	46	-0.076	0.686**	-0.201	-0.452**	0.141	0.911**	0.260	-0.184
<i>Cows</i>										
Madras city .. ..	CB	39	-0.037	0.776**	0.036	-0.478**	0.123	0.893**	0.099	-0.481**
	O	32	0.093	0.764**	0.139	-0.445**	0.169	0.478**	-0.188	-0.453**
	ND	24	0.032	0.811**	0.304	-0.377	0.515**	0.786**	0.422*	-0.146

Y = Price in Rs.  
 X<sub>1</sub> = Age in months.  
 X<sub>2</sub> = Milk yield in kg.  
 X<sub>3</sub> = Order of lactation.  
 X<sub>4</sub> = Stage of lactation.  
 ND = Non-descript.  
 M = Murrah.  
 CB = Cross-bred  
 O = Ongole.

TABLE II—RELATIONSHIP OF PRICE WITH MILK YIELD AND AGE OR ORDER OF LACTATION

(a) *Buffaloes in Milk*

Area	Breed	No. of animals	Equation	R <sup>2</sup> × 100
Madras city .. ..	ND	160	$Y = 21.48 - 0.16^{**} X_1 + 68.32^{**} X_2$ (0.133) (7.97)	54.88
			$Y = 23.47 + 68.46^{**} X_2 - 6.24 X_3$ (9.97) (5.33)	55.02
			$Y = 0.96 + 68.80^{**} X_2$ (4.99)	54.81
Gudiyatham taluk (Tamil Nadu)	ND	34	$Y = 49.73 - 0.25 X_1 + 41.67^{**} X_2$ (0.183) (8.64)	47.90
			$Y = 38.89 + 43.47^{**} X_2 - 5.51 X_3$ (9.17) (3.02)	49.14
			$Y = 21.76 + 44.60^{**} X_2$ (7.67)	46.78
Krishna delta area (Andhra Pradesh)	ND	98	$Y = 173.43 - 0.74 X_1 + 81.30^{**} X_2$ (0.62) (17.98)	46.28
			$Y = 141.21 + 80.46^{**} X_2 - 12.57 X_3$ (14.57) (9.16)	46.88
			$Y = 95.00 - 82.42^{**} X_2$ (8.80)	44.56
Dhulia region (Maharashtra)	ND	49	$Y = 456.70 - 0.71 X_1 + 87.42^{**} X_2$ (1.46) (15.28)	43.20
			$Y = 494.60 + 91.15^{**} X_2 - 44.37 X_3$ (14.95) (33.8)	44.00
			$Y = 350.10 + 91.80^{**} X_2$ (10.05)	42.80

(Contd.)

TABLE II—(Concl'd.)

Area	Breed	No. of animals	Equation	R <sup>2</sup> ×100
(a) <i>Buffaloes in Milk</i>				
Hissar district (Haryana)	.. M	46	$Y = 373.87 - 1.35 X_1 + 38.59^{**} X_2$ (0.76) (6.07)	49.87
			$Y = 336.52 + 43.10^{**} X_2 - 23.40 X_3$ (5.80) (18.10)	48.13
			$Y = 230.16 + 43.37^{**} X_2$ (4.81)	46.92
(b) <i>Cows in Milk</i>				
Madras city	CB	39	$Y = 270.05 X_1 - 0.3078 X_2 + 1.1348^{**} X_3$ (0.1821) (0.1203)	71.28
			$Y = 72.02 X_2 + 1.1194^{**} X_3 - 0.0741$ (0.197) (0.057)	69.38
			$Y = 68.43 X_2 + 1.1125^{**}$ (0.1226)	69.01
	O	32	$Y = -6.19 - 0.28 X_1 + 71.80^{**} X_2$ (-0.31) (11.31)	58.52
			$Y = -36.67 + 71.36^{**} X_2 + 0.68 X_3$ (9.76) (0.38)	58.40
			$Y = -34.23 + 71.27^{**} X_2$ (10.98)	58.40
	ND	24	$Y = -23.34 - 0.73 X_1 + 73.01^{**} X_2$ (-0.81) (12.17)	67.10
			$Y = -72.62 + 68.98^{**} X_2 - 4.86 X_3$ (6.10) (2.55)	65.99
			$Y = -81.48 + 67.36^{**} X_2$ (10.35)	65.81

\*\* Significant at 1 per cent level of probability.

N.B. : Figures in brackets indicate the standard errors of regression coefficients.

It can be seen as a specific case that the average price of a buffalo giving about 4.5 kg. of milk in Dhulia region was Rs. 773 when the prevailing market rate of milk was Rs. 1.25 per kg. The price of the buffalo would increase by Rs. 91 for one kg. increase in milk yield.

In order to predict the price of a buffalo at a particular point of time, it would be essential to convert the daily milk yield into its value. The linear relationship will be between the price of an animal as dependent variable and the age/order of lactation and value of milk yield as independent variables. The regression coefficients of age/order of lactation and also the pure constant would remain unchanged. The regression coefficient of the variable "value of milk yield" could easily be obtained by dividing the regression coefficient of milk yield by the market rate of milk. As an illustration, consider the relationship

$$Y = 21.48 - 0.16 X_1 + 68.32 X_2$$

which was fitted for buffaloes in Madras city considering the age and milk yield. In place of milk yield, when its money equivalent was considered the relationship worked out to be

$$Y = 21.48 - 0.16 X_1 + 83.32 X_2^1$$

where  $X_2^1$  is the value of daily milk yield of a buffalo. The coefficient 83.32 can be obtained from the coefficient of  $X_2$  by dividing the prevailing market

rate of milk, i.e.,  $\frac{68.32}{0.82} = 83.32$ . This indicates that the increase in the

value of daily milk yield of an animal by one rupee would increase the price of the animal by about Rs. 83. Assuming the present enhanced market rate of milk as Rs. 1.75 per kg. (earlier it was 82 paise per kg.), the price of a buffalo giving 3.26 kg. of milk per day and of age 9 years 10 months would be Rs. 478 (earlier price was Rs. 225 for the same animal).

(B) *Cows in milk*: In Madras city the cows sold or purchased during the period of enquiry were classified according to different breeds in order to eliminate the breed effect.

Cobb-Douglas function in the case of cross-bred cows and linear function both for Ongole and non-descript cows were considered to be the appropriate ones to show the relationship of price of a cow with age and milk yield on the day of transaction. The coefficient of elasticity of milk yield was highly significant indicating that one per cent increase in milk yield would increase the price of a cross-bred cow by 1.13 per cent. The regression coefficients for milk yield were highly significant both for Ongole and non-descript cows. A cross-bred cow of eight and half years old and giving 4.85 kg. of milk per

day was sold for Rs. 422. The corresponding price of an Ongole and non-descript cow of about 9 years of age and giving 4 kg. milk per day was Rs. 259 and Rs. 191 respectively. The prevailing market rate of cow milk was 70 paise per kg.

(C) *Dry and pregnant buffaloes* : For studying the pricing of a dry animal the quantitative characters taken into consideration were age of the animal ( $X_1$ ) and the stage of pregnancy ( $X_5$ ) at the time of sale or purchase. For buffaloes in Krishna area, quadratic function which explained maximum variation amounting to 38.8 per cent was considered to be the appropriate fit and is as follows:

$$Y = 191.89 + 2.34 X_1 - 26.44 X_5 - 0.177^{**} X_1^2 + 3.58 X_5^2 - 0.0115 X_1 X_5$$

Under the situation prevailing, the maximum price would be fetched when the animal could attain 65 months of age and fourth month of pregnancy. This result is obtained by taking partial derivatives of the above function and solving for  $X_1$  and  $X_5$ .

(D) *Dry and pregnant cows* : Detailed data were available only for 15 dry cows which were either sold or purchased in the selected households in Gudiyatham taluk. Utilizing the data, functions were fitted and it was observed that the quadratic explained 43.1 per cent of variation when the independent variables considered were age ( $X_1$ ) and stage of pregnancy ( $X_5$ ) and 53.7 per cent variation when the independent variables were order of lactation completed ( $X_3$ ) and stage of pregnancy. These two functions are as follows:

$$Y = 43.05 + 0.228 X_1 + 14.79 X_5 - 0.0021 X_1^2 - 1.2220 X_5^2 + 0.0042 X_1 X_5$$

$$\text{and } Y = -45.24 + 47.69 X_3 + 41.42 X_5 - 6.015 X_3^2 - 2.72 X_5^2 - 5.62 X_3 X_5$$

As in the case of dry buffaloes, these functions can be utilized for getting particulars of an animal when it can fetch maximum price. These results are only indicative and detailed discussion on these may not be made due to the fact that the number of observations is few and none of the coefficients significant.

(E) *Bullocks* : Age was the only quantitative character which could be utilized to study the pricing of a bullock. Information on 24 bullocks which were sold in Hissar area during the period of enquiry was available. The quadratic function which explained 89 per cent variation was considered to be the appropriate one and is as follows:

$$Y = 237.34 + 8.54^* X_1 - 0.0952 X_1^2$$

Maximum price would be fetched when a bullock would attain about 45 months of age. The linear function which explained 80 per cent of the total variation is

$$Y = 696.70 - 5.26^{**} X_1.$$

This function can be considered as important for the purpose of working out depreciation. There would be depreciation of an order of Rs. 63 for every year of increase in the age of the bullock. It can further be interpreted that the active life of a bullock in the area was upto 11 years.

K. C. RAUT AND SHIVTAR SINGH\*

#### INPUT AND OUTPUT RELATIONS OF BANANA PLANTATION IN KANYAKUMARI DISTRICT (TAMIL NADU)

##### I

It is interesting to note that very often the paddy fields are being converted into banana plantations for a period of one year in Kanyakumari district of Tamil Nadu. After one year, again, the fields are reverted to paddy cultivation. This conversion can neither be called as rotation of crop nor as shift of cultivation. This is not either being done at regular intervals or permanently. Perhaps, the reason for conversion may be that the farmer may like to give rest to the soil from its routine of paddy cultivation. The farmer is forced by circumstances, mainly the financial strain, to allow a gap of one year in certain times, or the soil exhaustion caused by the continuous cultivation of the same crop, without any restoration, compels the farmer to give a gap in the routine of enterprise. The latter is more true today for, the new high-yielding varieties of paddy have high uptake of soil nutrients and the farmer fails to restore subsequently by spending a lot of resources on artificial manure.

This period of gap is being leased out by the landowner for the plantation of banana. Instances could be cited where the entire area of his field being planted by the landowner himself or a portion of it being planted by him or divided among his relatives also. But in major cases, if not all, the lease holder, locally called *Thalayal*, accepts the responsibility on contract basis and pays the rent in paddy on par with the average yield, locally called *Maeni*. The *Thalayal* divides the field, so obtained, into *Pinais*<sup>1</sup> and distri-

\* Institute of Agricultural Research Statistics, New Delhi-12.

The authors are extremely thankful to the Director, Institute of Agricultural Research Statistics for his keen interest and constant encouragement given in the study. Thanks are due to Shri R. L. Rastogi and Shri R. P. Jain for assisting in the compilation of the data considered for the study.

1. The local terra used to refer to the long strips of land usually intended for a row of banana plants. Width of a strip ranges from 1.75m to 2m.

butes them among his men<sup>2</sup> on the plant based contracted rent which is collected in paddy in two instalments. Most of the planters, grouped under the *Thalayal* contribute their labour throughout the year, the necessary capital resources and the personal care involved. Hired labour services are being utilized during the time of manuring. Purchased inputs in almost all cases are only young rhizomes,<sup>3</sup> artificial manure, pesticides, casual hired labour units and paddy.<sup>4</sup>

Banana has a good number of varieties. The particular variety which is referred in this study is natively called *Yettan*.<sup>5</sup> This is an annual crop found in Kanyakumari district and also in the adjoining districts of Kerala State. *Yettan* is mostly planted in paddy fields because of the watering and drainage conveniences and not because of the fertility of the soil of paddy fields. Its plantation is not influenced by the seasonal factors that prevail in this district. But, generally, the planting time is synchronised with the period of vacation of paddy crop from the field. Since double crop<sup>6</sup> in a year is the common practice in this district the planting and harvesting of banana are accordingly adjusted. As a result, the supply of it is in abundance twice a year. One plant yields only one bunch, containing 30 to 80 fruits arranged in four to seven clusters and will sell at Rs. 20 to Rs. 40 per hundred fruits, according to the size, in the wholesale market.

This special variety which is peculiar to Kanyakumari district and Kerala State is highly nutritious, more digestive and strengthening than that of arrowroot, and hence more suitable for children and invalids. The nutritive value of *Yettan* is even superior to that of potato. In its immature condition it contains much starch, which on ripening changes into sugar and contains every element of animal food mixed with fragrant elements. It is almost the only tropical fruit without stone or core of any sort, which can be eaten without inconvenience either dressed or raw. The local people also use in their dishes the extremities of the flower shoots and the heart of the stem

## II

### Objectives

An attempt has been made in this paper to analyse the input and output relations of *Yettan* plantation in Kanyakumari district. Speci-

2. His men are mostly youngsters between the age-group 18 to 35 who are wishing to be self-employed and in possession of some capital. This poor man's money crop is a field for investment of both labour and capital.

3. Young rhizomes are separated from the mother rhizomes. These suckers or offshoots are responsible for the multiplication of banana.

4. Paddy is being bought by the planters to pay off the rent. This rent forms a part of his total cost.

5. Old Kerala Government records refer banana to *Yettan* alone and plantain to other varieties both culinary and table bananas. But no distinction is being made between banana and plantain in the recent Tamil Nadu Government records on the ground that the distinction is neither universally accepted nor standardised.

6. Two crops are being raised from the paddy fields with a negligible exception of three crops that are being raised in a year.

fically, this paper seeks (1) to study the comparative economic relation of various inputs that go into the production of banana; (2) to construct an equation for the banana production in Kanyakumari district; (3) to determine the optimum allocation of resources in banana production; and (4) to suggest a way out for obtaining a high percentage of profit without increasing the prevailing average total expenditure.

### *Methodology*

In a season, 71,369 acres were being under the cultivation of paddy in this district. On an average, 3,849 acres of paddy fields were annually being converted into banana plantations. This area under banana plantation was being distributed unevenly in the four talukas of this district. One sample planter each was drawn for every 200 acres, approximately, for this particular study. A total of 20 random sample planters were drawn from all over the district and by choosing not more than one from a village.

The sample planters were personally interviewed. Most of them were personally known and co-operated well in the enumeration.

Cobb-Douglas model of production function has been used as analytical tool to estimate the productivities of various inputs used in the plantation of banana. The algebraic form of the function used in the analysis is as follows :

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3}$$

where :

- $Y$  = The total annual gross returns which include all monetary incomes accruing from banana plantation.
- $X_1$  = The total per day units of labour used for the preparation of the field, manuring, covering the bunch and fixing the support poles of plants, cutting or harvesting and loading on bullock cart which takes them to the market, watering the plant till the harvest and night watch over the plantation since its maturity to the period of harvest. In certain cases  $X_1$  units were measured with the help of the price per unit of labour ( $Px_1$ ). For example, the total monetary payment made for night watch was divided by  $Px_1$  in order to get the number of units of labour.
- $X_2$  = Total expenditure (in rupees) incurred for manuring.  $X_2$  contains many sub-variables—green manure, artificial manure, ash and pesticides—applied in various doses.
- $X_3$  = Total expenditure (in rupees) incurred on young rhizome of plants, transportation of banana to the market, support poles, baskets, marketing tax, commission to the *Thalayal* and rent.

The above classification of the variables was made on the basis of their behaviour in the total cost. Labour units had different characteristics which were also very distinct from others. Hence labour was treated as a separate variable  $X_1$  and the average price of  $X_1$  unit was equal to Rs. 4.50.  $X_2$ , referring to the different doses of manuring, differed widely from planter to planter. The planters unanimously opined that the yield and manuring expenditure had positive relation. To analyse the importance of manuring in banana plantation  $X_2$  was made to cover the different doses of manuring. The expenditure on the sub-variables of  $X_3$  moved more or less in proportion to the number of plants planted. Interest on capital and personal supervision charges were purposely omitted in the variables for, the planter invested his own labour to acquire many of the inputs used—green manure, pole basket, watering and watching—in large number of cases when the plantation of plants by one individual counted less than 200. Certain of those items were included with  $X_1$  variables and others were with  $X_2$  and  $X_3$  variables accordingly.

$a$  is the intercept on the production axis or the constant term in the equation.

$b_1, b_2, b_3$  are the regression coefficients or the production elasticities of the respective variables.

### Results and Discussion

The regression coefficients of variables, their standard errors and levels of significance are given in Table I. The estimated coefficients of the independent variables are the production elasticities of the respective factors. The percentage change in the product is shown by the coeffi-

TABLE I—REGRESSION COEFFICIENTS OF VARIABLES, THEIR STANDARD ERRORS AND LEVELS OF SIGNIFICANCE

Resources			Coefficients (bs)	Standard errors	Calculated t—values	Levels of significance
$X_1$	..	..	0.1948	0.1073	1.816	10 per cent
$X_2$	..	..	0.7058	0.1414	4.992	0.1 per cent
$X_3$	..	..	0.2605	0.1359	2.516	2 per cent
			1.1611 = $\Sigma b$		$R^2 = 0.9122$	

cients if the input of a factor of production is increased by one per cent at their geometric mean level, while other factors are kept constant. In the related equation,  $X_2$  is a significant variable indicating the different degrees of influence on the output of  $Y$ . All the three coefficients are positive, but one per cent increase of those factors will increase the gross

income Y, only on a diminishing scale. The returns to scale is calculated by summing up the elasticities or bs. Since  $\Sigma b = 1.1611$  or more than unity, it is concluded that banana plantation in the paddy fields of Kanyakumari district is operating on an increasing returns to scale.

The coefficient of determination or  $R^2 = 0.9122$  which shows that in Kanyakumari district in the plantation of banana 91 per cent of variation in the gross income is explained by the independent variables  $X_1$ ,  $X_2$  and  $X_3$  included in the equation. The calculated F value is 55.41 and, therefore R is significant at 1 per cent level.

The marginal value products (MVPs) of various inputs are worked out at the geometric mean levels of the variables and are compared with their respective prices (Table II).

TABLE II—MVP<sub>X<sub>s</sub></sub> AND P<sub>X<sub>s</sub></sub> IN RUPEES AND THEIR DIFFERENCES

Factors		Units	MVP <sub>X<sub>s</sub></sub> (Rs.)	P <sub>X<sub>s</sub></sub> (Rs.)	Difference (Rs.)
X <sub>1</sub>	.. ..	151	2.80	4.50	1.70
X <sub>2</sub>	.. ..	451	3.40	1.00	2.40
X <sub>3</sub>	.. ..	561	1.01	1.00	0.01

The MVP<sub>X<sub>s</sub></sub> indicate the returns in money terms, anticipated by the addition of one more unit of the particular resource input over and above the mean level while retaining the level of other inputs unchanged; or fall in the production by the withdrawal of one unit of the particular resource input at the mean level while retaining the level of other inputs unchanged. An efficient production requires the equation of

$$\frac{MVP_{X_1}}{P_{X_1}} \text{ and } \frac{MVP_{X_2}}{P_{X_2}} \text{ and } \frac{MVP_{X_3}}{P_{X_3}}$$

where  $P_{X_s}$  refer to the prices per unit of the respective variables. It is evident that  $MVP_{X_3}$  is more or less equal to  $P_{X_3}$ ,  $MVP_{X_1} < P_{X_1}$  and  $MVP_{X_2} > P_{X_2}$ . For an efficient combination of them, certain units of  $X_1$  will have to be withdrawn at the existing level until the  $MVP_{X_1} = P_{X_1}$  and certain units of  $X_2$  will have to be added to the existing level until the  $MVP_{X_2} = P_{X_2}$ . In the same way,  $X_3$  factor also deserves some addition.

Table III shows that a shift of resources from  $X_1$  input to  $X_2$  input is necessary to maximize the gross income at the existing level of expenditure.

TABLE III—EXISTING AND OPTIMUM LEVELS OF INPUT AND OUTPUT

Particulars		Existing level		Optimum level		
		Units	MVP (Rs.)	Units	MVP (Rs.)	
Factor	$\left\{ \begin{array}{l} X_1 \\ X_2 \\ X_3 \end{array} \right.$	..	151	2.80	94	4.50
		..	451	3.40	1597	1.00
		..	560	1.01	565	1.00
Yield	(Rs.)	..	2,170	—	4,842	—

Table IV shows that an increase in the total expenditure upto the optimum level can even double the net income of the planter. Even at the present level of expenditure more than 25 per cent of net income can be obtained, if not 47 per cent, provided a reallocation of resources is being made.

TABLE IV—EXISTING AND OPTIMUM LEVELS OF GROSS INCOME, TOTAL COST AND NET INCOME AT THEIR GEOMETRIC MEAN LEVELS AND RATIO OF NET INCOME TO COST AND PERCENTAGE OF NET INCOME TO COST

Particulars					Existing level (Rs.)	Optimum level (Rs.)
Gross income	..	..	..	..	2,770	4,842
Total cost	..	..	..	..	1,691	2,585
Net income	..	..	..	..	479	2,257
Ratio of net income to cost	..	..	..	..	0.25	0.47
Percentage of net income to cost	..	..	..	..	25	47

### Conclusions

There is a highly significant positive response in the gross income to the positive changes in the manuring expenses. Since the MVP of labour is less than the wage rate, a shift of resource to manuring, where the MVP is higher than the rupee expenditure on it, would assure more of net income as well as gross income with the existing level of expenditure. Therefore researches could be made on the lines of exploring the devices of resource shift from  $X_1$  variable to  $X_2$  and  $X_3$  variables.

D. PETER\*

\* Assistant Professor, Department of Economics, Scott Christian College, Nagercoil, Kanyakumari District, Tamil Nadu.