Vol. 6 No. 2 March 2018 ISSN: 2319-961X UGC Approval No: 44192 Impact Factor: 3.104

IMPACT OF HIGH YIELDING VARIETY OF PADDY ON FACTOR SHARES IN SIVAGANGAI DISTRICT

Article Particulars

Received: 30.01.2018 Accepted: 17.02.2018 Published: 27.03.2018

K.MEENAKSHI SUNDARAM

Full-time Research Scholar, Department of Economics

Raja Dorai Singam Government Arts College, Sivagangai, Tamil Nadu, India

Dr.A.MARIMUTHU

Assistant Professor, PG & Research Department of Economics

Government Arts College, Melur, Madurai, Tamil Nadu, India

Abstract

In this paper an attempt is made to study the estimate input demand elasticities and supply responsiveness for small and large farmers producing High Yielding Variety (HYV) and Traditional Variety (TV) of paddy. In recent years, technological change has brought about a substantial increase in agricultural output and income in India. The following objectives was farmed to study the impact of new technology on factor shares and to measure the nature of factor biases in technical change. The profit function is inherently a cross-sectional approach. The application of profit function approach is warranted only under conditions of price variations between farms at a point of time. The indirect estimates of production elasticities derived from the Cobb-Douglas production function by using the results. The HYV of paddy cultivation reduces the problem of unemployment in the agricultural sector, particularly in sivagangai district. The present study that the share of land is found to be the maximum for both the varieties. The human labour share in output is observed to be higher for HYV than TV of paddy.

Keywords: *high yielding variety, traditional variety, paddy cultivation, human labour, profit function, cobb-douglas production function*

Introduction

In recent years, technological change has brought about a substantial increase in agricultural output and income in India, such a technological break through in production is mainly due to the introduction of high yielding varieties, besides the other factor inputs in Indian agriculture. As a result, the adoption of high yielding variety production technology may affect in total income. In this paper an attempt is made to study the estimate input demand elasticities and supply responsiveness for small and large farmers producing High Yielding Variety (HYV) and Traditional Variety (TV) of paddy.

Objectives

1. To study the impact of new technology on factor shares and
2. To measure the nature of factor biases in technical change.

Analytical Framework

The profit function is inherently a cross-sectional approach. The application of profit function approach is warranted only under conditions of price variations between farms at a point of time. Hence, special efforts were made during the survey to collect the details of price paid and received by the farmers.

The Normalised Profit Function derived from Cobb-Douglas Production Function was jointly estimated along with input demand functions with random disturbances. It was of the form,

$$\log \pi^* = \alpha_0 + \beta^*_1 \log W + \beta^*_2 \log B + \beta^*_3 \log F + \beta^*_4 \log F + \alpha_1^* \log A + \alpha_2^* \log c + U \quad \ldots\ldots\ldots\ldots (1)$$

$$\left.\begin{aligned} \frac{-WX_1}{\pi^*} &= \beta_1^* + U_1 \\ \frac{-BX_2}{\pi^*} &= \beta_1^* + U_2 \\ \frac{-FX_3}{\pi^*} &= \beta_3^* + U_3 \\ \frac{-PX_4}{\pi^*} &= \beta_4^* + U_4 \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots (2)$$

where

π^* = Real profit in rupees (that is total revenue minus total variable cost normalised by the price of output)

W = Real wages for labour

B = Real bullock pair day price

F = Real fertilizer price

P = Real pesticides price

A = Total area cultivated

C = Capital flows (calculated as the sum of depreciation, maintenance and opportunity cost of capital stock)

X_1 = Total labour man-days utilised

X_2 = Total bullock pair days

X_3 = Total quantity of fertilizer used and

X_4 = Total quantity of pesticides used.

The above equations (1) and (2) were jointly estimated by Zellner's Seemingly Unrelated Regressions which gives asymptotically more efficient estimates than the production function estimated by ordinary least squares method. Since β_i^* appears in

both profit and demand functions, they were estimated jointly by imposing the conditions that β_i^* is equal in two sets of equations.

Analysis and Interpretation

This section discusses the impact of high yielding variety on factor shares, nature of factor bias and factor shares in total income, through profit function analysis. Factor combination and factor shares in agriculture depend on a number of factors such as the resource endowments of the region, cropping pattern, level of technology used, factor prices and government policy. Distribution of factor shares and their changes over time and space are important in the context of economic growth and social justice. Technical change in terms of introducing High Yielding Variety seeds is one of the major forces leading to changes in output, employment and functional income distribution. Technical change is labour saving, labour-neutral or labour-using depending on whether the labour share in total cost decrease, remaining constant or increases at constant factor prices. Most researchers have concentrated on the effect of farm size on efficiency as measured by absolute productivity differences in gross returns in irrigated agriculture. Efficiency of agricultural operation can be deduced from the combinations of factors of production in farm operations. Technological change has led to considerable increase in agricultural output and income.

The paper would help in understanding the impact of cropping pattern, on the changes in factor shares. The researcher seeks to examine in detail, the estimation of factor shares in Indian agriculture with particular reference to shift from Traditional Variety (TV) to High Yielding Variety (HYV).

Measurement of Production Elasticities

The Unit Output Price (UOP) profit function developed by L.J. Lau and P.A. Yotopoulos has been used here to identify the important factors of production which influence productivity. The technical bias is measured as changes in output elasticities. The production elasticities measured on the basis of production function are found to be biased and inconsistent. The profit function helps to overcome the problem of simultaneous equation bias in the estimation of production elasticities of production function. The estimated parameters of profit functions may be used to derive elasticities of production function indirectly. The estimated results of equation (1) and (2) for HYV and TV of paddy cultivating farmers are given in Table 1.

Table 1 Estimated results of profit and input demand function for HYV and TV of paddy producting farmers

Variables	Parameters	Estimates	
		HYV	TV
Intercept	α_0	4.6361	3.9966
Log W	β_1*	-0.3363* (-4.5022)	-0.3118* (-4.1671)
Log B	β_2*	-0.0794* (-5.1617)	-0.0959* (-2.6166)

Log F	β_3*	-0.1933* (-3.6721)	-0.2166* (-3.6519)
Log P	β_4*	-0.1012* (-2.9216)	-0.0864* (-2.8616)
Log A	α_1	0.7943* (6.1249)	0.7529* (4.3213)
Log C	α_2	0.2117* (3.6622)	0.2517* (6.1812)
Labour Demand	β_1*	-0.3363* (-4.5022)	-0.3118* (-4.1671)
Bullock Labour Demand	β_2*	-0.0794* (-5.1617)	-0.0959* (-2.6166)
Fertilizer Demand	β_3*	-0.1933* (-3.6721)	-0.2166* (-3.6519)
Pesticides Demand	β_4*	-0.1012* (-2.9216)	-0.0864* (-2.8616)

The indirect estimates of production elasticities derived from the Cobb-Douglas production function by using the results in Table 1 are furnished in Table 2.

Table 2 Indirect estimate of production elasticities from the cobb-douglas profit function

Inputs	Parameters	Estimates of Production Elasticities	
		HYV	TV
Human Labour	a_1	0.1867	0.1761
Bullock Labour	a_2	0.0566	0.0666
Fertilizer	a_3	0.1133	0.1341
Pesticides	a_4	0.0693	0.0507
Land	a_5	0.5541	0.4601
Capital	a_6	0.1341	0.1531

From Table 2, it is observed that the partial elasticities of production function a_1 to a_6 with constant returns to scale are the factor shares in output. The share of land is found to be the maximum for both the varieties. There is a slight difference between two varieties regarding share of land in output. The human labour share in output is found to be higher for HYV than TV of paddy. Therefore, the share of human labour has increased substantially as one moves from TV to HYV cultivation. It indicates the efficiency gain regarding labour found in HYV cultivation, that is, a given amount of output can be produced with less amount of human labourers under HYV cultivation. In the case of capital, HYV cultivation requires less of capital inputs than TV cultivation. Therefore, the share of capital in HYV is less compared to TV of paddy.

Nature of Factors Bias and Factor Shares in Total Income

This section attempts to analyse the nature of factor bias due to change in cultivating HYV of paddy which may be labour-using or capital-using accordingly as the marginal rate of substitution of capital for labour increases or decreases.

Binswanger in his study, "The Management of Technical Change Biases with many Factors of Production", reveals a slightly modified version and defines factors bias in terms of factor shares in total cost. In the present article, Binswanger's modified version has been used to examine the nature of factor biases due to change in the introduction of HYV, that is due to the shift from Traditional and New Technology in the study area. The shifting of area from TV and HYV is labour saving, labour neutral or labour using, as the labour share in total cost decreases remains constant or increases

respectively. The biases of factors of production are measured using the Binswanger's of the following empirical model.

$$B_i = \frac{(a_i)_{HYV} - (a_i)_{TV}}{(a_i)_{TV}}$$

where,

a_i = Output elasticity of ith factor,

HYV = High Yielding Variety and

TV = Traditional Variety.

As per definition of the concept, that is, ith input saving neutral or input using, if the value $B_i < 0$, $B_i = 0$, $B_i > 0$, accordingly.

Nature of Bias:

The nature of technical bias in HYV and TV of paddy cultivation is measured with the help of the production elasticities and the result is furnished in Table 3.

Table 3 Nature of technical bias in high yielding variety (hyv) of paddy cultivation

Cultivation	Factor	Proportionate Change in Output Elasticity	Nature of Technical Bias
HYV Versus TV	Human labour	0.0140	Human Labour using
	Bullock Labour	-0.0097	Fertilizer saving
	Fertilizer	-0.0137	Pesticides saving
	Pesticides	0.0087	Bullock Pair using
	Land	0.0245	Land Using
	Capital	-0.0234	Capital Saving

Table 3 reveals that HYV of paddy cultivation is biased in favour of human labour, pesticides and land and it against for bullock labour, fertilizer and capital. This shows the need for intensive use of human labour, pesticides and land rather than fertilizer and other variable inputs in the HYV of paddy cultivation. Thus, the cultivation of HYV of paddy leads to a considerable using a labour in the study area. The HYV of paddy cultivation reduces the problem of unemployment in the agricultural sector, particularly in sivagangai district.

Absolute Factor Shares in Total Income

The absolute factor shares rather than relative factor shares provide a better perspective on functional distribution problem. The change in absolute factor shares in total income could be measured by multiplying total incomes by production elasticities. The calculated value of percentage change in absolute factor shares is presented in Table 4.

Table 4 Percentage Change in Absolute Factor Shares

Cultivation	Factor of Production	Absolute Factor Share per Acre (in Rupees)		Percentage Change in Absolute Factor Share
		HYV	TV	
HYV Versus TV of Paddy	Human labour	2797.23	2416.46	13.61
	Bullock Labour	684.15	606.46	11.36

	Fertilizer	1776.21	1766.21	0.56
	Pesticides	883.15	665.16	24.60
	Land	6919.15	5963.15	13.82
	Capital	1968.26	1946.23	1.12

This percentage change in absolute factor shares in Table 4 reveals that all the factors of production except capital stand to gain absolute terms due to the shift to HYV cultivation. This may be main reason for shifting the area to HYV from TV cultivation in the study area. The percentage gain is maximum for pesticides under HYV of paddy cultivation.

Factor Shares:

The share of land is found to be maximum for HYV than for TV in the study area.

The share of human labour had increased from 0.1761 to 0.1867 indicating efficiency gain in production with respect to labour under banana cultivation. HYV of paddy cultivation requires more capital for a given output as compared to TV cultivation. HYV of paddy cultivation is biased in favour of human labour, pesticides and land is against, for fertilizers, bullock pair and capital. The adoption of HYV of paddy cultivation had increased employment opportunities in the agricultural sector.

The absolute share of all factors except capital had increased with the adoption of HYV of paddy cultivation. The farmers in the study who had to change their paddy cultivation of HYV stood to gain. The absolute share was maximum for pesticides under HYV of the cultivation.

Conclusion

Thus, it is concluded from the analysis of the present study that the share of land is found to be the maximum for both the varieties. The human labour share in output is observed to be higher for HYV than TV of paddy. Therefore, the share of human labour has increased substantially as one moves from TV to HYV of paddy cultivation. It indicates the efficiency gain regarding labour found in HYV of paddy cultivation, that is, a given amount of output can be produced with less amount of human labourers under HYV of paddy cultivation. In the case of capital, HYV of paddy cultivation requires less of capital inputs than TV of paddy cultivation. Hence, the share of capital in HYV is less compared to TV of paddy in Sivagangai district.

References

1. John Quiggin and Anh Bui-Lau, 'The use of Cross Sectional Estimates of Profit Functions for Tests of Relative Efficiency: A Critical Review", *Australian Journal of Agricultural Economics*, Vol.28, No.1, April 1984.
2. Arnold Zellner. "An Efficient Method of Estimating Seemingly Unrelated Regression and Test of Aggregation Bias", *Journal of American Statistical Association*, Vol. 57, No.2, June 1962.

3. M.V. George, N.J. Kurien and C. Chandra Mohan, "Factor Shares in Indian Agriculture: Temporal and Spatial Variations and Their Implications", *Indian Journal of Agricultural Economics*, Vol. XXXVIII, No. 3, July-September, 1983.
4. M.R. Alshi, P. Kumar and V.C. Mathur, "Technological Change and Factor Shares in Cotton Production: A Case Study of Ashola Cotton Farms", *Indian Journal of Agricultural Economics*, Vol. XXXVIII, No. 3, July-September, 1983.
5. F.S. Bagi, "Economics of Irrigation Crop Production in Haryana", *Indian Journal of Agricultural Economics*, Vol. XXXVI, No. 3, July-September, 1981.
6. K.C. Borach, "Factor Shares in Traditional Farming in Assam – A Case Study in Majuli – A River Island", *Indian Journal of Agricultural Economics*, Vol. XXXVIII, No. 3, July-September, 1983.
7. P.S. Lalitha, "Technological Improvement – Labour Contribution and Its Share", *Indian Journal of Agricultural Economics*, Vol. XXXVIII, No. 3, July-September, 1983.
8. L.J. Lau and P.A. Yotopoulos, "Profit Supply and Factor Demand Functions", *American Journal of Agricultural Economics*, Vol. 54, No. 1, February, 1972.
9. A.A. Walters, "Production and Cost Functions: An Econometric Survey", *Econometrica*, Vol. 31, Nos. 1-2, January-April, 1963.
10. P. Binswanger, "The Measurement of Technical Change Biases with Many Factors of Production", *The American Economic Review*, Vol. LXIV, No. 5, December 1974.