Indian J. Applied & Pure Bio. Vol. 38(2), 815-821 (2023). **ISSN: 0970-2091**
A web of Science Journal

An analysis of profit and input efficiency of farmers producing cowpea in Thoothukudi District of Tamilnadu

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Abstract

The state's principal crops, paddy, cholam, pulses, cumbu, cowpea, maize, sugarcane, ragi, and groundnut, have done exceptionally well in irrigated agriculture in Tamil Nadu. Only because the Tamil Nadu government placed such a high value on agriculture were all these accomplishments possible. This study aims to investigate the profitability and input effectiveness for small and marginal farmers growing cowpea in Tamilnadu'sThoothukudi area. 120 cowpea farmers from 5 villages in the Thoothukudi district were chosen using the proportionate random selection technique. The secondary data were gathered from a range of publications, including books, journals, articles, newspapers, magazines, and websites. The data collected from the primary source was analysed using a variety of statistical techniques, including Cobb-Douglas Production Function and Regression analysis. From December 2022 to February 2023, the data were gathered. On the demand for labour in the study area, changes in the price of pulses for small and marginal farmers appeared to have a sizable impact. This suggests that one of the important elements affecting the employment of farmers who grow pulses, especially cowpeas, is the wage rate. Small and marginal farmers' demand for labour on the land had elasticities of 0.5872 and 0.6307 percent, respectively. The corresponding elasticities were 0.1351 and 0.2065 for capital. This suggests that the demand for small farmers, as opposed to marginal farmers, was more positively impacted by an increase in pulse growers. The study demonstrates that small farmers might absorb more labour than marginal farmers when growing pulses like cowpea. As a result, it can be inferred from the data that marginal farmers in the study area are economically more productive than small farmers when it comes to growing cowpeas. This might be because of the improved oversight and more effective farm management made possible by the small operational holdings. This showed that, in addition to the effective distribution of inputs, direct supervision and farm management are important factors in determining economic efficiency.

Key words : Agriculture, pulses, small and marginal farmers, Cowpea cultivation, economic efficiency.

The Indian economy is based primarily on agriculture. Nearly 22% of the Gross Domestic Product is made up of the agricultural and related sectors (GDP of India) Between 65 and 70 percent of people rely on agriculture for their livelihood[3]. Development of the agricultural sector is necessary for the state's overall economic growth as well as for ensuring the food and nutrition security of its expanding population.

It is crucial to establish household food security, justice in the distribution of income and wealth, and state self-reliance to reduce poverty and ensure that living standards are equal. To raise the standard of living for the farming population, the Indian government is eager to make agriculture a profitable profession[7]. Indian agriculture will be better, more effective, and stronger if small and marginal farmers are empowered via education, reforms, and development. [9]The development of the industry and, more crucially, the improvement of the economic circumstances of impoverished farmers will be aided by the motivation of new models in production and marketing, as well as by raising awareness and providing education to small and marginal farmers.[5]

In India, the production of commercial crops such as pulses, oilseeds, and cereal grains is constantly rising. But because of the government's unfavourable investment promotion strategy, capital formation is declining in the agriculture sector.[4] Compared to other grains and vegetables, pulses have a higher protein content. Because nitrogen is fixed during the cultivation of pulses, soil fertility is preserved. They are grown everywhere and eaten everywhere in the world.[8]

Maintaining food and nutritional security depends on the production and use of pulses. Compared to other grains and vegetables, pulses provide more protein.[2] One of the significant Indian kharif pulses is cowpea (Vigna unguiculata L.). It is a warm-season crop that may grow in a variety of humid tropical and subtropical climates. Cowpea is resistant to frost but tolerant of heat and drought. Cowpea benefits greatly from the usage of fertiliser, and the amount of fertiliser required is based on the initial soil quality and the availability of moisture.[6]

Cowpeas can withstand heat and dry circumstances but not frost.[10] The amount of fertiliser needed depends on the initial soil quality and moisture availability, and cowpea responds well to fertiliser treatment.[1] In the Thoothukudi district of Tamil Nadu, this study examines the profitability and input efficiency of small and marginal farmers growing cowpea.

Objectives of study :

The Objectives of the present study are:

1. To study profit and input efficiency for small and marginal farmers producing cowpea in the Thoothukudi district of Tamilnadu, and
2. To analyzethe price elasticities of demand for labour for small and marginal farmers cultivating cowpea.

Research methodology :

In the study, both primary and secondary data were employed. A previously tested

timetable was used to conduct the personal interview method. Primary data were gathered using the structured questionnaire. 120 cowpea farmers from 5 villages in the Thoothukudi district were chosen using the proportionate random selection technique. The secondary data were gathered from a range of publications, including books, journals, articles, newspapers, magazines, and websites. The data collected from the primary source was analysed using a variety of statistical techniques, including Cobb-Douglas Production Function and Regression analysis. From December 2022 to February 2023, the data were gathered.

According to Kumar *et al*.,[12] because of its distinctive nature, hill agriculture is practised in difficult circumstances. The distinct topographical characteristics and climate differences along the gradient contribute to the hill and mountain environment. Hill agriculture's primary characteristics include small, dispersed landholdings and sparse land use.

In a study conducted in the Peechi Command Area of the Thrissur district in Kerala, Suresh. A and T.R. Keshava Reddy[15] looked at resource productivity and allocation as well as the technical effectiveness of paddy production. The primary data for the study were gathered from 71 rice farmers in the command area through stratified random sampling.

According to Lau and Yotopoulas[11] production function approach is not suited to examine the allocative efficiency of farmers, because the prices are not incorporated as exogenous variables nor does the approach allow for different groups of farmers having different endowments of factor inputs[14].

Indian farmers' combination behaviour of profit-maximizing and competitive behaviour was put to the test by Junakar[13]. The study was based on cross-sections of data regarding paddy farmers in Tamil Nadu's Thanjavur district for 1969–1970. By using Zellner's Seemingly Unrelated Regression, he estimated Lau-profit Yotopoulas's function as well as that variable input demand equation, and then he evaluated the theoretical restriction. He discovered that Indian farmers were not profit maximizers, which is completely at odds with the past findings of other studies. Small and large farmers in India, he claimed, did not compete on the same loan or labour markets because they did not do business there.

Small farms, defined as those with 1 to 2 hectares of land, and marginal farms, defined as those with less than 1 hectare of land, were both put together. In the cowpea, out of the 120 sample farmers, 41 are small-scale farmers and the rest 79 are marginal-scale farmers.

Profit and input demand function for small and marginal farmers producing cowpea:

A cross-sectional method is necessarily included in a profit function. Only when there are price differences between farms at a given moment is the adoption of the profit function technique justified. To get information about the price the farmers received and paid, extra effort was made throughout the survey.

Together with input demand functions with random disturbances, the Normalized Profit Function derived from the Cobb-Douglas Production Function was computed. It was of the form,

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

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

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 the 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 the 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 of Cowpea :

The estimated results of equations (1) and (2) for small and marginal farmers cultivating Cowpea of pulses are given in Table-1.

Table-1. Estimated results of profit and input demand function for small and marginal farmers producing cowpea

Variables	Parameters	Estimates	
		Small farmers	Marginal farmers
Intercept	α_0	4.1364	4.7526
Log W	β_1^*	-0.2137* (-2.5134)	-0.3017* (-1.3802)
Log B	β_2^*	-0.0631* (-3.9521)	-0.0562* (-2.7231)
Log F	β_3^*	-0.1032* (-1.3754)	-0.2102* (-2.6427)
Log P	β_4^*	-0.1054* (-2.1105)	-0.1210* (-2.3649)
Log A	α_1^*	0.6254*	0.5287*

		(3.6754)	(2.6124)
Log C	$\propto_2^*$	0.1123* (1.8534)	0.2024* (1.5234)
Labour demand	β_1^*	-0.2794* (-2.5874)	-0.2318* (-1.374)
Bullock labour demand	β_2^*	-0.0536* (-3.4781)	-0.0624* (-2.9847)
Fertilizer demand	β_3^*	-0.1021* (-1.6748)	-0.2105* (-1.9845)
Pesticides demand	β_4^*	-0.1002* (-2.6475)	-0.1135* (-2.9425)

Figures in brackets represent t- value.
* Indicates significance at 5 per cent level.

Supply and demand elasticities :

The own and cross-price elasticities of demand for labour and elasticities concerningthe supply of pulses were computed by using the formula given in Table-2.

Table-2. Formula to estimate input demand and supply elasticities derived from cobb-douglas profit function

Description	Formula
a) Input Demand Elasticities) Own price elasticity of X_1	β_I^*-1
b) Cross-price elasticity for X_1concerningthe real price of X_1	β_J^*
c) Variable input X_1 concerning fixed factor, Z_j	$\propto_I^*$
d) Demand elasticity of X_1 concerning output price	$-\sum\beta_I^*+1$
b) Supply Elasticities: a) Supply elasticity concerning output price	$n-\sum\beta_J^*$ i=1
b) Supply elasticity concerningthe real price of the variable input X_I	β_J^*
c) Supply elasticity concerning fixed input Z_j	$\propto_I^*$

Source: Computed Data.

Table-3 shows the own and cross-price elasticities of demand for labour for small and marginal farmers cultivating Cowpea of pulses.

Table-3. Own and cross-price elasticities of demand for labour for small and marginal farmers cultivating cowpea

Si. No.	Variables	Labour Demand	
		Small farmers	Marginal farmers
1.	Pulses price	1.2157	1.1053
2.	Real Wage	-1.1687	-1.1021
3.	Real Bullock Pair price	-0.0584	-0.0692
4.	Real Fertilizer price	-0.1869	-0.1374
5.	Real Pesticide price	-0.0847	-0.0341
6.	Land	0.5872	0.6307
7.	Capital	0.1351	0.2065

Source: Computed Data.

From Table-3, the labour demand elasticities for small and marginal farmers of pulses (Cowpea) concerningtheir prices were 1.2157 and 1.1053 respectively. Changes in pulses prices for small and marginal farmers appeared to have a significant effect on the demand for labour in the study area. A 10 per cent increase in pulses (Cowpea) price of small and marginal farmers was found to ensure a more than 10 per cent rise in the demand for labour.

The elasticities indicated that a 10 per cent increase in the real wage would induce the farmers to reduce labour employment by 11.687 per cent in the case of small farmers and 11.021 per cent in the case of marginal farmers. This implies that wage rate is also one of the factors that significantly affect farm employment of pulses cultivators', particularly Cowpea cultivation.

The elasticities of small and marginal farmers' demand for labour onthe land were 0.5872 and 0.6307 per cent respectively. In the case of capital, the respective elasticities were 0.1351 and 0.2065. This indicates that an increase in the area of pulse farmers had a more favourable impact on the demand for small farmers than on marginal farmers.

The study shows that small farmers could absorb an increased amount of labour more than marginal farmers producing Cowpea of pulses.

As a result, it can be inferred from the data that marginal farmers in the study area are economically more productive than small farmers when it comes to growing cowpeas. This might be because of the improved oversight and more effective farm management made possible by the small operational holdings. This showed that, in addition to the effective distribution of inputs, direct supervision and farm management are important factors in determining economic efficiency.

For the materials used in the study and literature review, the author is grateful to the Joint Director of Agriculture and the cowpea farmers in the Thoothukudi district's Kovilpatti,

Vilathikulam, and Oottapidaramareas.

Conflicts of Interest :

There are no conflicts of interest among the author.

References :

1. Ahlawat, I. P. S., and G. B. Shivakumar, (2005). Kharif pulses. In Textbook of Field Crops Production. Dr R. Prasad (Ed.). New Delhi: Indian Council of Agricultural Research.
2. Amutha D., Constraints and Techniques for Improving Pulses Production in Tamil Nadu (2011), India, *International Journal of Bio-resource and Stress Management,* Print ISSN: 0976-3988. Online ISSN: 0976-4038, *2*(2): pp 159-162.
3. Amutha, D., (2012a). Agricultural Crisis in India: The Root Cause and Consequences. Available at SSRN: https://ssrn.com/abstract=2167261
4. Amutha, D. (2012b), *Journal of Natural Sciences Research, 2*(1): 19-25.
5. Amutha, D., (2013a). Present Status of Indian Agriculture. Available at SSRN: https://ssrn.com/abstract=2739231 or http://dx.doi.org/10.2139/ssrn.2739231
6. D. Amutha, (2013b), Analysis of cost and return structure of cowpea cultivation, *International Journal of Retailing & Rural Business Perspectives, 2*(3): pp 496-500.
7. Amutha, D. (2014a), *International Journal of Economics and Management Sciences, 3:* 203-207.
8. Amutha, D. (2014b), Technical Efficiency in Cultivation of Pulses, *Journal of Social Welfare and Management, 6*(1): 23-27.
9. Amutha, D., (2015) Food Security and Indian Agriculture. Available at SSRN: https://ssrn.com/abstract=2614265 or http://dx.doi.org/10.2139/ssrn.2614265
10. Davis, D. W., A. E. Oelke, S. E. Oplinger, D.J. Doll, V.C. Hanson and H.D. Putman (2000). Alternative field crops manual. Retrieved from http://www.hort.purdue.edu/newcrop/afcm/cowpea.html.
11. Lau L.J. and P.A. Yolopoulos, (1972), *American Journal of Agricultural Economics*, *54*(1): February 1972, pp.11-18.
12. Kumar, L.R., K. Srinivas and S.R.K. Singh (2005), *Indian Journal of Agricultural Economics*, *60*(3): 483-491.
13. P.N. Junankar, (1980), *The Journal of Development Studies*, *17*(1): 48-61.
14. R.K. Sampath, (1979), 'Nature and Measurement of Economic Efficiency in Indian Agriculture", *Indian Journal of Agricultural Economics*, *34*(2): 20.
15. Suresh. A and T.R. Keshava Reddy, (2006), *Agricultural Economics Research Review, 19:* 159-171.