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A study of input-output and determinates of yield status of selected chilli growers with reference to Tirunelveli district of Tamilnadu

[1]P. Shenbagaraj and [2]S. Sasikumar

1,2Department of Economics, St. Xavier's College (Autonomous),
Palayamkottai - 627002 (India)
Affiliated to Manonmaniam Sundaranar University, Abishekapatti,
Tirunelveli – 627012 (India)

Abstract

An essential ingredient in any kitchen is chilli. Vegetables, spices, condiments, sauces, and pickles are all grown in different types. One of the most lucrative crops, chilli is cultivated all around the nation. Tamil Nadu is one of the states in India that produces the most chillies. Tamil Nadu has the largest acreage, productivity, and output of chillies. Among the most significant spices, chilli is largely utilised in processed powder form in daily diets and has limited usage as a vegetable.

Based on the input-output structure, marginal and small farmers yield an average of 4.827 and 5.283 tonnes of chilli per acre, respectively. Small farmers outperform marginal farmers in terms of yield, as the yield difference is found to be statistically significant at the 5% level. Other than the use of manure and mechanical power, there is no variation in the labour force and other inputs used in the production of chillies between marginal and small farmers. Compared to labour from people and bullocks, input costs like seed are fixed. The amount of manure and mechanical power applied by small farmers in comparison to larger producers differs statistically significantly at the 5% level. The input-output structure reveals a considerable difference in the amount of chilli produced per acre between marginal and small farmers. This difference can be attributed to the small farmers' use of more manure and mechanical power. Regression analysis results indicate that the sole area of difference between marginal and small farmers is in their utilisation of mechanical power. Marginal farmers rely on labour from people, while small farms use machinery. Small and marginal farms' yields are dependent on all five variable inputs; changes in the five independent variables account for more than 81% of the yield variation.

Key words : chilli cultivation, indispensable spice, marginal and small farmers, mechanical power, input-output structure.

[1,2]Assistant Professors

One of India's most precious spice harvests is chilli (*Capsicum annuum* L.). Fruit is the primary reason for growing the crop. Because of its pungency, spice, aroma, and outward appearance of scent and flavour, it is a necessary ingredient in almost all Indian dishes. Vitamins A, C, and E can be found in abundance in chilli fruits[13]. With an average output of 1611 kg/ha, India grows around 1.298 million metric tonnes of chiles on 0.806 ha of land. Approximately one-third of India's total spice exports are made up of chillies, which also account for about sixteen percent of the global spice trade[9].

One of the most popular spices, chilli, is grown for commercial purposes[10]. Known as the "wonder spice," it is the most popular all-purpose spice. Various kinds are grown for a range of purposes, including pickles, vegetables, spices, and condiments[1]. In daily life, chillies are the most essential component of a wide variety of international cuisines since they provide the food with a kick, flavour, and colour. The colour and degree of spiciness of Indian chillies are two significant commercial attributes that have made them famous around the world. Other quality characteristics of chilli include length, width, and skin thickness. Some types are well-known for their red colour due to pigment[2].

Not only is chilli utilised as a food additive, but it also has several medical uses. Pharmaceutical preparations and medications for cardiac conditions use the capsaicin that is taken out of ripe, dried fruits. Using chillies on a regular basis increases saliva. India generates between 1.3 and 1.5 million tonnes of red chillies each year on average. In every Indian state, chillies are grown. The nation also produces the most chillies in the world, with 13.76 million tonnes produced there each year[6]. In India, domestic output accounts for only 15–20% of total production, with the remaining 80% being consumed domestically. India grows 309 thousand hectares of chillies, yielding 3592 thousand metric tonnes of chillies annually[12]. In 2015–16, India's production of spices surged, and its exports reached a level of over 12 percent[11]. To minimise expenses and achieve satisfactory returns, farmers need minimum support prices and subsidies[3].

The production of chillies would be decreased by extreme weather, precipitation, and summer droughts[7]. Drought and high heat can cause a 70% yield loss in chillies when grown commercially[4]. Given this context, the research aims to investigate the input-output status of a subset of chilli growers as well as the factors influencing the yield of chilli production in Tamilnadu's Tirunelveli district. Farmers in the Tirunelveli district are primarily focussing on hybrids and native varieties for their farming methods. The bulk of farmers in this block do not adhere to any scientific farming principles, and only a small percentage of them use high-yielding cultivars in their operations.

The current study's goals are as follows:

1. To research the input-output structure of small and marginal farmers in the Tirunelveli district's chilli cultivation per acre.
2. To determine the manpower needs per acre for small and marginal farmers growing chilli.
3. To calculate the factors that influence

yield in small-scale and marginal farming of chillies.

Based on the criterion of highest chilli production and sale, five villages in the Tirunelveli district—Sankarankoil, Cheranmahadevi, Pattamadai, Melacheval, and Manur—were specifically chosen for the study. One hundred and twenty farmers who grew chillies in the district were listed, and they were selected at random. To collect primary data, a series of pretested schedules specifically designed for this purpose were used for in-person interviews with a chosen group of farmers. The secondary data came from a variety of publications and reports, among other secondary sources. Considerations included the National Horticulture Board, the Government of Tamilnadu, the Directorate of Economics and Statistics, and other published and unpublished study-related materials. From December 2023 to May 2024, the field investigation was conducted.

Review of literature :

The identification of the fundamental supply chain model and the issue in the chilli sector were investigated by Ridwan *et al.*[15] To understand how the system behaves in the chilli sector, it is also examined using a simulation and system dynamics technique. According to the study, the supply chain system for chillies will continue to behave in the same way until 2025, but the price margin will also rise. They recommended that the government ascertain the profit value of the supply chain for chillies.

According to Somashekhar *et al.*,[17], one of the most valued, little-grown, and widely traded commercial crops in India is dry chilli. They employed factor analysis to highlight the various informational aspects of agribusiness supply chain management, such as government initiatives and the horticulture department's role; the frequency of market information searches, sources of market information; sources of information about crop diseases and how to sell them at a premium; sources of weather and market information; sources of information about cold storage and crop disease solutions; and sources of market information obtained through landline and mobile phone usage.

The financing of the chilli supply chain was examined by Karyani *et al.*[8]. The study focused on trade financing for cooperatives and pre-harvest financing for producers of red chillies. The findings indicated that other parties and stakeholders would need to support this finance model for it to be successful.

Based on the largest area under chilli production, G S Biradar and D M Chandrgi[5] concentrated on the technological gap in the adoption of chilli cultivation practices in the Raichur and Yadgir districts of Northeastern Karnataka during 2011–12. For this study, the exposit factor research design was employed.

According to Prabhavathi *et al.*[14], an effective supply chain guarantees producers fair rates for their goods and gives final customers the most satisfaction possible for the money they spend. The farmers encountered several challenges, including nonpayment following sales, issues with the fare price evolution process, collecting excessive commissions, and the availability of bank loans for produce.

Schipmann *et al*.[16] investigated the value chain of paprika and bird's eye chillies in Malawi. The study discovered that increasing productivity and output, forming farmer organisations, and promoting value-adding initiatives and procedures would all help to strengthen vertical links between paprika and chilli buyers as well as the timeliness, quality, and application of market information.

Input – Output Structure :

The input-output structure of small and marginal farmers' chilli cultivation per acre is provided in Table-1.

Table-1. Input-Output structure of chilli cultivation per acre between marginal and small farmers

Particulars	Farmers		t
	Marginal	Small	
Human labour (in mandays)	17	12	0.52
Bullock labour (in pairs)	5	3	0.21
Manure (in Rs.)	694.31	8324.75	3.52*
Seed cost (in Rs.)	105.73	97.51	1.01
Mechanical power (in hours)	1.04	2.18	2.23*
Yield (in tonnes)	4.827	5.283	2.11*

Source: Computed from Survey Data.

According to the input-output structure, small farmers yield 5.283 tonnes annually from chilli growing, compared to marginal producers' 4.827 tonnes. Small farmers are in a better position than marginal farmers in terms of yield since the difference in yield is determined to be statistically significant at the five percent level.

Except for the application of manure and mechanical power, there is little difference identified between marginal and small farmers with regard to human labour and other inputs required in chilli farming. There is little difference in the cost of inputs like seed and labour from bullocks or humans. The statistical significance of the difference in the application of manure and mechanical power at the 5% level indicates that small farmers consistently apply higher amounts of both manure and power. The input-output structure shows that there is a notable variation in the yield per acre of chilli production between marginal and small farmers. The small farmers' use of greater manure and mechanical power is responsible for this discrepancy.

Labour Requirement :

A significant portion of the total cost of cultivation goes towards paying for manpower, which is a valuable input in agriculture. Farm activities are categorised under seven headings: preparatory cultivation, ploughing, seeds and sowing, weeding, manuring, harvesting, and bundling. This allows for a better understanding of the pattern of male and female labour employment and the

Table-2. Labour requirements per acre for marginal and small farmers in chilli cultivation

Farm activities	Marginal Farmers		Small Farmers	
	Male	Female	Male	Female
Preparatory cultivation	1	4	1	2
Ploughing	1	-	1	-
Seeding and sowing	1	-	1	-
Weeding	-	2	-	3
Manuring	1	-	1	-
Harvesting	-	3	-	3
Bundling	1	-	1	-
Total	5	9	5	8

Source: Computed from Survey Data.

costs paid to them. Table-2 provides the labour requirement for marginal and small farmers to carry out these different farm tasks in order to cultivate chilli per acre.

According to Table-2, a total of 5 males and 9 females for marginal farms and 5 males and 8 females for small farms are needed for each acre of chilli cultivation for different farm operations. There aren't many women working on harvesting, weeding, and preparatory cultivation. Female labour is chosen over male labour because, despite the fact that more women work on marginal and small farms, their average pay is significantly less than that of men. The table indicates that small farms will require more manpower to cultivate chillies than marginal farms will and that small farms will incur greater labour costs.

Determinants of Yield :

The parameters impacting marginal and small farmers' yield from chilli growing were assessed using a log-linear regression model. The yield was the dependent variable, and the variable inputs were the independent variables in the regression equation. Manure (x_4), mechanical power (x_3), capital input (x_5), human work (x_1), and labour from bullocks (x_2) are the independent variables considered in the equation.

Table-3 displays marginal and small farmers' estimated regression findings.

All of the variable inputs had a favourable effect on yield for small farmers, according to the regression analysis results. Regression coefficients show that factors like mechanical power, manures, and capital input have a positive and significant effect on the yield of chilli cultivation. A one percent increase in these variables could result in a 0.1725, 0.1634, and 0.2319 percent increase in yield, respectively. The variance in the five variable inputs may account for 84% of the variation yield, according to the R^2 value.

Table-3. Estimated regression results of marginal and small farmers

Variables	Parameters estimates	
	Marginal Farmers	Small Farmers
Intercept	1.1384	2.7524
Log x_1	0.2108* (2.5761)	0.1385 (1.0147)
Log x_2	0.0437 (0.0124)	0.0077 (1.0031)
Log x_3	0.0631 (0.1021)	0.1725* (2.6142)
Log x_4	0.1384* (1.9452)	0.1634* (1.1509)
Log x_5	0.1247* (1.0574)	0.2319* (1.0853)
R^2	0.8121	0.8374
F-value	27.94	20.13
Residual sum of squares	0.1382	0.1108
Number of Observations	122	99

Note: Figures in parentheses represent t-values.

*shows that, at the 5% level, the coefficients are statistically significant.

Manure, capital, and human labour are found to have a positive and considerable impact on output for marginal farmers. Other inputs also have a beneficial effect on yield. The yield will vary by 0.2108 percent, 0.1384 percent, and 0.1247 percent, respectively, for every 1% increase in the variable inputs such as labour from human labour, manure, and capital. The five independent factors account for about 81.21 percent of the variation in yield. Only in the application of mechanical power does variance exist between marginal and small farmers, according to the regression study. The small farmers employ machinery, whilst the marginal farmers rely on work from people. All five variable inputs affect production for marginal and small farms alike, with variations in the five independent variables accounting for more than 81% of yield variation.

The input structure shows that small and marginal farmers may grow chillies on an acre for 5.283 and 4.827 tonnes, respectively. It is discovered that small farmers' increased usage of manure and mechanical power is what causes the production discrepancy. Compared to marginal producers, small farmers require more labour. In comparison to small farms, marginal farms use child labour and have a higher percentage of female workers. According to the regression analysis, the only area where marginal and small farmers differ is in how they employ mechanical power. Marginal farmers employ machines, in contrast to small farmers who depend on human labour. Variations in the five independent variables account for almost 81% of the yield variation, and each of the five variable inputs influences the output for both marginal and small farms. The agricultural chilli production cost and return structure per hectare aid in the farmer's mapping of organisational adjustments, ensuring the highest possible level of output and income.

Conflicts of Interest

The author does not have any conflict of interest.

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