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Input-Output Structure of Marginal and Small Farmers - An Analysis

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Abstract
Agriculture is the mainstay of the Indian economy. Agriculture and allied sectors, contribute nearly 22 per cent of Gross Domestic Product (GDP of India). About 65-70 per cent of the population is dependent on agriculture for their livelihood. An attempt had been made to study the characteristics of sample agricultural farmers, labour utilisation and input and output structure for marginal and small farmers cultivating cereals and pulses in Tuticorin District of Tamilnadu. Multistage stratified random sampling technique has been adopted for the study. Out of 300 sample farmer's cultivations cereals and pulses, 150 sample farms are under the category of cereals and remaining 150 sample farms come under pulses. The data relates to the month of November 2011. It may be concluded from the analysis that as in the case of cereals, the marginal farmers were efficient in the use of inputs like fertilizers and pesticides and marginal farmers have produced more yields per acre than small farmers and farmer groups of pulses.
Key words: agriculture, cereals and pulses, small and marginal farmers, labour utilisation, Z-test.

1. Introduction

Agriculture is the mainstay of the Indian economy. Agriculture and allied sectors, contribute nearly 22 per cent of Gross Domestic Product (GDP of India). About 65-70 per cent of the population is dependent on agriculture for their livelihood. The agricultural development is a precondition not only to provide food and nutrition security for the growing population but also inevitable for overall economic development of the state. It is essential, not only to achieve self reliance at state level but also to get household food security and to bring equity in distribution of income and wealth thereby reducing the poverty and no parity in living standard. The Indian government is keen to transform agriculture into a viable avocation in order to improve the standard of living of the farming community. India is the largest producer and consumer of cereals and pulses in the world accounting for 33 per cent of the world area and 22 per cent of world production of cereals and pulses. (Maheswari. R 1996) About 90% of the global pigeonpea, 65% of chickpea and 37% of lentil area falls in India, corresponding to 93%, 68% and 32% of the global production, respectively. (FAOSTAT 2009) The growth rate of area under cereals and pulse crops is just 0.04 per cent during the period 1967-68 to 2009; as a result cereals and pulses' share in the total food grain production has reduced from 17 per cent in 1961 to 7 per cent in 2009.

Tamil Nadu has done extremely well in irrigated agriculture particularly in paddy, cholam, pulses, cumbu, maize, sugarcane, ragi and groundnut, which are the major crops of the state. All these achievements were possible only with the importance given by the government of Tamil Nadu to agriculture. Over the recent past decade, the agricultural production in districts of Tamil Nadu had faced increased yields in almost all crops, especially in cereals and pulses. The state government has taken several efforts in order to increase the yield and production in the case of the major crops by mechanization of production by wide utilization of farm machinery in agriculture at subsidized prices and granted loans investment in agricultural infrastructure, supplying inputs such as fertilizers, pesticides and seed and pricing policy for several main crops, in particular cereal crops. This makes Tamil Nadu as one among the leading state that records the huge agricultural productions in cereals and pulses every year. An attempt had been made to study the characteristics of sample agricultural farmers, labour utilisation and input and output structure for marginal and small farmers cultivating cereals and pulses in Tuticorin District of Tamilnadu.

1.1 Objectives

The Objectives of the present study are:

- To collect data on the socio-economic structure of cereals and pulses cultivators in Tuticorin district.
- To estimate the distribution of size of operational holding and farming experience of marginal and small farmers.

- To analyse the labour utilisation and input-output structure for cereals and pulses in the study area.

1.2 Methodology

Multistage stratified random sampling technique has been adopted for the study, taking Tuticorin district as the universe, the block as the stratum, the village as the primary unit and cereals and pulses cultivators as the ultimate unit. Tuticorin district comprises 12 blocks. Cereals and pulses are mainly cultivated in Kovilpatti, Vilathikulam and Oottapidaram which show more than 70 per cent of area under cereals and pulses in this district and hence the selection of sample villages restricted to these three blocks. Five villages in each block, which account for the highest area under cereals and pulses cultivation in the descending order of magnitude, were selected as the study unit for primary data collection. A list of cereals and pulses cultivators in the selected villages was obtained from the records of the Joint Director of Agriculture, Tuticorin. The proportionate random sampling technique has been adopted to select 150 each of cereals and pulses cultivating farmers from these 15 villages. The data relates to the month of November 2011.

2. Discussion and analysis

In the study area,out of 300 sample farmer's cultivations cereals and pulses, 150 sample farms are under the category of cereals and remaining 150 sample farms come under pulses. In each crop, the sample farm can be divided into two group's namely small and marginal farmer based on area under cereals and pulses. For that, frequency tables were formed in each crop on the basis of area and its cumulative total was also worked out. The farms of less than 2 acres were grouped on marginal size and farms of more than or equal to 2-5 acres are grouped as small size. In the cereals, out of 150 sample farmers, 52 (34.67%) belong to marginal size and remaining 98 (65.33%) belong to small size. In the pulses, out of 150 sample farmers, 47 belong to marginal size and remaining 103 belong to small size.

2.1 Age

Age is one of the demographic factors that is helpful to illustrate households' personal situation and give indication about the age structure of the sample, along with the population. It is generally assumed that elder people have more farming experience which enables them to easily adopt new technologies and also because they have better involvement in different formal and informal groups, which helps them to easily access services and resources.

Table 1 Age-Wise Distribution of Sample Farmers

Age (in years)	**Cereals**			**Pulses**		
	Marginal	**Small**	**Overall**	**Marginal**	**Small**	**Overall**
Below 30	9 (6.00)	5 (3.33)	14 (9.33)	5 (3.33)	3 (2.00)	8 (5.33)
30-40	60 (40.00)	24 (16.00)	84 (56.00)	60 (40.00)	25 (16.67)	85 (56.67)
40-50	22 (14.67)	12 (8.00)	34 (22.67)	24 (16.00)	12 (8.00)	36 (24.00)
Above 50	7 (4.66)	11 (7.34)	18 (12.0)	14 (9.33)	7 (4.67)	21 (14.0)
Total	98 (65.33)	52 (34.67)	150 (100)	103(68.66)	47 (32.34)	150 (100)

Source: Survey Data.

Figures in brackets represent percentages to total.

The table 1 shows that in cereals, 78.67 per cent of the farmers were in the age group of 30 to 50 years. The age group of 40-50 years was relatively lower in the case of small farmers (8.00 per cent) while it was 14.67 per cent in the case of marginal farmers to their respective totals. The farmers below 30 years constitute only 9.33 per cent to the total. There above 50 years from 12.00 per cent only. In case of pulses, the farmers below 30 years constitute only 5.33 per cent to the total, those above 50 years from 14.00 per cent only. The respondents between the age group 30 to 50 years constitute 80.67 per cent. The age group of 30-40 years was relatively higher in the case of marginal farmer (40.00 per cent) while it was only 16.67 per cent in the case of small farmers. Comparing these two crops, it is

found that the farmers between age group of 30 to 50 years were found high in pulses (80.67 per cent) while it was 78.67 per cent in the case of cereals.

2.2 Education

Behavioural change is vital in making decisions to take up new technologies. In order to make a right decision, adequate information is needed. Education increases the likelihood of participating in formal organizations and thus acquiring information from formal sources, and it can lower the likelihood of relying on informal mechanisms of information exchange. In this study, education was expected to have positive relationship with decision of farmers to grow cereals and pulses.

Table 2 Literacy Levels of Sample Farmers

Literacy Level	**Cereals**			**Pulses**		
	Marginal	**Small**	**Overall**	**Marginal**	**Small**	**Overall**
Illiterate	3 (2.00)	3 (2.00)	6 (4.00)	2 (1.33)	3 (2.00)	5 (3.34)
School	78 (52.00)	36 (24.00)	114(76.00)	82 (54.67)	23 (15.33)	105 (70.00)
College	4 (9.33)	12 (8.00)	26 (17.33)	14 (9.33)	18 (12.0)	32 (21.33)
Professional	3 (2.00)	1 (0.67)	4 (2.67)	5 (3.33)	3 (2.00)	8 (5.33)
Total	98 (65.33)	52 (34.67)	150 (100)	103 (68.66)	47 (31.34)	150 (100)

Source: Survey data.

Figures in bracket represent percentages to total.

The table 2 reveals that in cereals 76.00 per cent of the farmers in the study area had only school education, followed by those with college level education (17.33 per cent). The illiterates form 3.33 per cent of the total. The school level education percentage was higher among marginal farmers (52.00 per cent) than among small farmers (24.00 per cent), while in the case of college level education, the marginal farmers (9.33 per cent) was considered to be higher than the small farmers (8.00 per cent). In pulses, farmers having the college level education form 21.33 per cent to the total. It was found that 70.00 per cent of the farmers are the study area had only school education, followed by illiterates (3.34 per cent). The school level education percentage was higher among marginal farmers (54.67 per cent) than among small farmers (15.33 per cent) respectively. Cereals were found to be high in school level educated farmer (76.00 per cent) when compared with pulses (70.00 per cent). And illiterates are high in pulses (3.34 per cent) when compared with cereals.

2.3 Farm Holdings

Land is one of the most important resources for any economic activity mainly in rural areas for agricultural production since their livelihood is reliant on it. Farm size influences households' decision on choice of crops. The land which is on the hand of farmer could be of different types, of which total land owned is the major one.

Table 3 Size of Operational Holdings of the Sample Farmers

Size of Holdings (in acres)	Cereals			Pulses		
	Marginal	Small	Overall	Marginal	Small	Overall
Less than 1	15 (10.00)	-	15 (10.00)	13 (8.66)	-	13 (8.66)
1-2	25 (16.67)	-	25 (16.67)	22 (14.67)	-	22 (14.67)
2-5	58 (38.66)	-	58 (38.67)	68 (45.33)	-	68 (45.33)
5-8	-	42 (28.00)	42 (28.00)	-	41(27.33)	41 (27.34)
Above 8	-	10 (6.67)	10 (6.66)	-	6 (4.00)	6 (4.00)
Total	98 (65.33)	57 (34.67)	150 (100)	103(68.66)	47(31.33)	150 (100)

Source: Survey data.

Figures in bracket represent percentages to total.

The table 3 reveals that in cereals, nearly 65.34 per cent of the operational holding was below 5 acres and remaining 34.66 per cent were above 5 acres. Among marginal farmers, the dominant operational holding was between 2-5 acres (38.67 per cent) while in the small farm, it was 5-8 acres (28.00 per cent) to the total. In the case of pulses, nearly 68.66 per cent of the operational holding was below 5 acres. The remaining 31.34 per cent belong was above 5 acres. Among marginal farmers, the dominant operational holding was between 2-5 acres (45.33 per cent) while in the small farms, it was 5-8 acres (27.34 per cent) to the total. Comparing the two crops, cereals is low in operational holdings below 5 acres (65.34 per cent) while pulses are high in operational holding below 5 acres (68.66 per cent) respectively.

2.4 Experience

Experience will improve the farmer's skill at production. A more experienced farmer may have a lower level of uncertainty about the innovation's performance. Farmers with higher experience appear to have often full information and better knowledge and are able to evaluate the advantage of the technology considered.

Table 4 Experience of Sample Farmers in Cereals and Pulses Cultivation

Experience in Years	Cereals			Pulses		
	Marginal	Small	Overall	Marginal	Small	Overall
Less than 5	8 (6.67)	4 (2.67)	14 (9.33)	4 (2.66)	5 (3.33)	9 (6.00)
5-10	26 (17.33)	10 (6.67)	36 (24.00)	27 (18.00)	15 (10.00)	42 (28.00)
10-15	57 (38.00)	36 (24.00)	93 (62.00)	64 (42.67)	23 (15.33)	87(58.00)
15-20	5 (3.33)	2 (1.33)	7 (4.67)	8 (5.33)	4 (2.67)	12 (8.00)
Total	98 (65.33)	52 (34.67)	150 (100)	103(68.66)	47 (31.33)	150 (100)

Source: Survey Data.

Figures in bracket represent percentages to total.

It is observed from the table 4 that in cereals 24.00 and 62.00 per cent of the farmers have had the experience of 5-10 years and 10-15 years respectively. While 9.33 per cent of farmers had the experience of less than 5 years and only 4.67 per cent of farmers have experience of 15-20 years. In pulses 28.00 and 58.00 per cent of the farmers had experience of 5-10 years and 10-15 years. While 8.00 per cent of the farmers had experience between 15-20 years and only 6.00 per cent had

experienced less than 5 years. Comparatively, pulses have 58.00 per cent of farmers with experience of 10-15 years, whereas in cereals only 62.00 per cent of farmers had experience between 10 to 15 years.

2.5 Labour Utilisation

Labour is one of the major constituents of the total cost incurred in farm business and therefore it has a direct impact on farm earnings. Labour utilisation is influenced by the size of the farm, cropping patterns and the intensity of cropping. Availability of labour decides the crop combinations to be selected as some are labour intensive and others are less so. Farmers are reluctant to grow pigeon pea because of pod borers' damage which can be managed with integrated pest management practices. (Ali, M.1998) In order to understand the labour absorption in cereals and pulses, labour utilisation for both cereals and pulses of agricultural crops is presented in the table.

Table 5 Labour Utilisation in the Cultivation of Cereals and Pulses (Rs. /acre)

Particulars	Cereals			Pulses		
	Marginal	Small	Overall	Marginal	Small	Overall
Human labour	996.25 (78.99)	1001.68 (79.49)	998.13 (79.16)	1141.07 (83.48)	1060.37 (82.55)	1115.75 (83.20)
Bullock labour	264.99 (21.01)	258.40 (20.51)	262.71 (20.84)	225.84 (16.52)	224.18 (17.45)	225.32 (16.80)
Total labour cost	1261.24 (100)	1260.08 (100)	1260.84 (100)	1366.91 (100)	1284.55 (100)	1341.07 (100)

Source: Survey data.

Figures in brackets represent percentages to total.

The table 5 reveals that there was a direct proportion between the size of the farm and the human labour and total labour cost in the case of cereals. The total labour cost increased with the increase in size of the farm. The total labour cost per acre was Rs.1261.24 for marginal farmers and Rs.1260.08 for small farmers. In the total labour cost, the cost of human labour constituted 78.99 per cent for marginal farmer, 79.49 per cent for small farmers and 79.16 per cent for overall farmers. Bullock labour constituted for 21.01 per cent on marginal farmers, 20.51 per cent on small farmers and 20.84 per cent on overall farmers. In the case of pulses, the total labour cost per acre was from Rs.1366.91 for marginal farmers and Rs.1284.55 for small farmers. In the total labour cost, the cost of human labour constituted 83.48 per cent, 82.55 per cent and 83.20 per cent for marginal, small and overall farmers respectively. Bullock labour accounted for 16.52 per cent for marginal farmers, 17.45 per cent for small farmers and 16.80 per cent for overall farmers.

2.6 Input-Output Structure

A study by Reddy compared cost-benefits from pulse based cropping systems with rice-wheat cropping systems in UP on farmers' fields under irrigated conditions. (Reddy, A A 2006) There was response from blackgram to P application up to 40 kg / ha in a study conducted at NPRC, Vamban especially in lateritic soils and single year response to sulphur (applied through gypsum) up to 40 kg / ha. (Ramamoorthy,K. and A.Arokia Raj. 1997) Integrated management strategies involves use of resistant varieties, use of disease free seeds, manipulation of cultural practices, management of vectors, and biological and chemical control methods. (Raguchander, T. Rajappan, K. and Prabakar, K. 1995) Patrick Jasper studied the effect of pre-harvest sanitation spray on seed yield and quality in pea. (Patrick Jasper 1998). The input-output structure of cereals and pulses cultivation for marginal and small farmers is shown in the table.

In order to test the difference between mean input-output structure of farmers cultivating cereals and pulses crops, the following form of Z-test was carried out.

$$\text{Z-test} = \frac{\text{Difference}}{\text{SE difference}}$$

Since the computed Z-value is greater than table value of Z at 5 per cent level (1.96) the difference is significant, otherwise it is not significant.

Table 6 Input-Output Structure per Acre for Marginal and Small Farmers Cultivating Cereals and Pulses

Particulars	Cereals			Pulses		
	Marginal	Small	Z-test	Marginal	Small	Z-test
Human Labour (in man days)	8.30	8.47	1.65	9.37	9.01	1.13
Bullock labour (in pairs)	2.21	2.19	1.09	2.18	2.88	1.54
Fertilizers (in Rs)	331.30	315.21	3.24*	395.88	356.27	3.31*
Pesticides (in Rs)	162.12	152.03	5.15*	206.36	196.87	4.21*
Seeds (in Rs.)	141.24	146.84	1.06	126.65	132.09	1.01
Yield (in kg)	181.61	194.12	3.99*	182.31	196.12	5.43*
Sample size	98	52		103	47	

Source: Survey data.
* Indicates significance at 5 per cent level.

It is revealed from the table 6 that the yield per acre of cereals crops was 181.61 kgs for marginal farmers and 194.12 kgs for small farmers. This shows that there is a significant difference in the yield between marginal and small farmers. The difference in yield works out to 12.51 kgs. In the case of human labour, the amount of labour required was 8.30 man days for the marginal farmers and 8.47 man days for small farmers. The marginal farmers applied 331.30 kgs of fertilizer whereas the small farmers used 315.21 kgs of fertilizer. In the case of pesticides, marginal farmers used 162.12 kgs and small farmers used 152.33 kgs respectively.

Apart from yield, the differences in the utilisation of other input variables like, fertilisers and pesticides were also found to be significant between the marginal and small farmers in the study area. With regard to the use of other variables like human labour, bullock labour and seeds, the differences between marginal and small farmers were not found to be significant. Thus, it may be inferred from the above analysis that the marginal farmers were efficient in the use of inputs like fertilizers and pesticides and they produced more yield than the small farmers, whereas in the case of pulses, the yield per acre was 182.31 kgs for marginal farmers and 196.12 kgs for small farmers.

It is observed that difference in the yield is significant between marginal and small farmers cultivating pulses also. The difference in yield works out 13.81 kgs. The human labour required was 9.37 man days and 9.01 man days for marginal and small farmers respectively. The marginal farmers used 395.88 kgs of fertilizer whereas the small farmers applied 356.27 kgs of fertilizer. In the case of pesticides, 206.32 kgs and 196.87 kgs were used by marginal and small farmer respectively. Thus, it may be concluded from the above analysis that as in the case of cereals, the marginal farmers were efficient in the use of inputs like fertilizers and pesticides and marginal farmers have produced more yields per acre than small farmers and farmer groups of pulses.

3. Conclusion

To sum up, a long term arrangement should be worked out by the Government of Tamil Nadu, to protect the interest of both producers and consumers and also to improve the production and marketing of cereals and pulses in the study area. The Government should initiate action to improve market information system and market intelligence. Existing techniques disseminating marketing information should be reviewed. Visual media like television can be used for providing market information to farmers of rural areas. Modern devices such as computers may be employed wherever necessary to make a meaningful estimate of marketable surplus and daily average prices.

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