

Costs and returns of rice cultivation under different levels of mechanization in cauvery delta zone of Tamil Nadu state

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ABSTRACT

The study has examined the cost and returns of rice cultivation in Cauvery Delta Zone (CDZ) of Tamil Nadu state under different levels of mechanization. The levels were partially mechanized and fully mechanized. Fully mechanized farms were defined as the farms with all operations except weeding which was mechanized. The farms with all operations mechanized except weeding and transplanting were defined as partially mechanized farms. The total cost of cultivation worked out to Rs.55,420 per ha for fully mechanized farms and Rs.56,547 per ha for partially mechanized farms. The cost of production per quintal of rice worked out to Rs.766 per ha for fully mechanized farms and Rs.872 per ha for partially mechanized farms. The net income per ha of fully mechanized farms was Rs.22,113 whereas it was Rs.18,793 for partially mechanized farms. The BCR (1.57) was obtained for fully mechanized farms and (1.45) obtained for partially mechanized farms indicated clearly that the fully mechanized farms were cost effective and more profitable than the partially mechanized farms.

KEY WORDS : Rice cultivation, Cost, Returns, Partially mechanized, Fully mechanized

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The study of cost and returns is a major economic analysis so as to find out the financial viability of any crop enterprise. Rice crop has been cultivated in the Cauvery Delta Zone (CDZ) for several decades. The farming practices have been changing with the introduction of technologies either in the form of variety, cultivation methods and mechanization. Of late, the zone has been experiencing severe scarcity of labour and the operations are being mechanized with varying levels. Therefore, it is of prime importance to analyze the components of cost and returns of rice cultivation with the different levels of

mechanization and hence, the study was conducted.

METHODOLOGY

The present study was carried out in Cauvery Delta Zone (CDZ) of Tamil Nadu state in 2013. A multi-stage random sampling procedure was adopted for the selection of taluks, villages and farmers. In the first stage, six taluks were selected in the major three districts of CDZ namely, Thanjavur, Thiruvarur and Nagapattinam districts based on the highest area under rice cultivation. In the second stage, twelve villages (two villages per taluk) were selected and in the third stage twenty farmers per village were selected, based on the proportion of area under rice. The total sample size constituted 240 farmers. Simple statistical analyses were performed to estimate the cost and returns. Farms with operations like ploughing, transplanting, manures and manuring, irrigation, harvesting, threshing and cleaning mechanized were treated as fully mechanized farms while the farms with the above operations mechanized except transplanting were treated as partially mechanized farms.

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Weeding has been excluded in both the farms as this operation is not yet mechanized.

ANALYSIS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Partially mechanized farms:

Partially mechanized farms were those farms where all the operations except transplanting were mechanized. While comparing the partially mechanized farms, the total variable cost had worked out to Rs.46,174 per hectare for small farms and Rs.42,843 per hectare for large farms, proving that higher the farm size, lesser the cost of cultivation (Table 1). While the cost of inputs remained more or less the same for both the farms but there was a significant difference in the cost structure towards the cost of three types of labour *viz.*, human, animal and machine labour. The cost of human labour was Rs.23,395 per hectare (40.51%) for small farms and Rs.19,894 per hectare (35.93%) for large farms, while the

reverse in trend was true with regard to the use of machineries. The cost of machine labour was Rs.9,240 per hectare (16.0 %) for small farms and Rs.10,432 per hectare (18.84 %) for large farms.

Similarly, the use of animal labour was also declining as the farm size increases which was worked out to Rs.1,582 per hectare for small farms and Rs.769 per hectare for large farms. The fixed cost structure between the two size of farms was also significant. While the share of fixed cost for the small farms was Rs.6,315 per hectare (10.93%) the same for the large farms was Rs.7,482 per hectare (13.51 %). The total cost of cultivation had worked out to Rs. 57,737 per hectare for small farms and Rs. 55,357 per hectare for large farms (Table 1).

While the per hectare cost of production was able to be decreased with increased farm size and increased use of machineries, the impact of these factors had also reflected in the output of the crop. The yield obtained was 45.64 qtl per hectare for small farms and 48.21 qtl per hectare for large farms, resulting in a significant performance on net farm income and the cost of production per unit of output. The net income over variable cost was Rs.15,506 per hectare for small farms and Rs.19,530 per hectare for large farms and the cost of production worked out to Rs.949 per qtl and Rs.822 per qtl for small and large farms, respectively. The benefit-cost ratio was worked out to 1.35 for small farms and 1.49 for large farms. The results of the cost and return analysis have revealed that higher the farm size and higher the use of machineries higher will be the impact on the overall performance of rice production (Table 1).

Table 1: Cost of cultivation / production of rice per ha			
Sr. No	Particulars	Partially mechanized	
		Small farms	Large farms
	Variable cost		
1.	Human labour	23,395 (40.51)	19,894 (35.93)
2.	Animal labour	1,582 (2.74)	769 (1.38)
3.	Machine labour	9,240 (16.0)	10,432 (18.84)
	Total labour	34,217 (59.26)	31,095 (56.17)
4.	Seeds/seedlings	1,482 (2.56)	1,876 (3.38)
5.	Manures and fertilizer	5,182 (8.97)	4,335 (7.83)
6.	Plant protection	932 (1.61)	1,235 (2.23)
7.	Irrigation	1,645 (2.84)	1,782 (3.22)
	Working capital	9,241 (16.0)	9,228 (16.66)
8.	Interest on working capital @ 12.5%	2,716 (4.70)	2,520 (4.55)
9.	Total variable cost	46,174 (99.97)	42,843 (77.39)
	Fixed cost	6,315 (10.93)	7,482 (13.51)
	Sub- total I + II	52,439 (90.91)	50,325 (90.90)
10.	Managerial cost @ 10 per cent	5,248 (9.08)	5,032 (9.09)
	Total cost	57,737 (100.0)	55,357 (100.0)
11.	Main product (quintal)	45.64	48.21
12.	Value of main product	58,840	59,168
13.	Value of by product	2,840	3,205
14.	Gross income	61,680	62,373
15.	Net income over variable cost	15,506	19,530
16.	Cost of production per quintal	949	822
17.	BCR	1.35	1.49

Note: Figures in parentheses indicate percentage

Fully mechanized farms:

The analysis of costs and returns for fully mechanized small and large farms had shown almost similar comparative performance as that of the partially mechanized small and large farms (Table 2). However, the per hectare cost of cultivation and cost of production had significantly reduced in fully mechanized farms. The cost of cultivation of rice had worked out to Rs.43,333 per hectare for small farms and Rs.40,028 for large farms. The significant difference in cost structure was the component of human labour. The small farms have incurred Rs.14,430 per hectare towards the cost of human labour and it was only Rs.7,565 per hectare for large farms. Conversely, large farms had more of machine labour replacing human labour substantially.

The cost of machine labour for large farms worked out to Rs.19,396 per hectare while it was Rs.16,342 per hectare for the small farms. The share of total labour cost accounted for 56 per cent for small farms and 50 per cent for large farms, which made the main difference in the cost of cultivation of the two size groups. The next major component, namely the cost of inputs worked out to Rs.9,167

Table 2: Cost of cultivation / production of rice (Rs./ha)

Sr. No.	Particulars	Fully mechanized	
		Small farms	Large farms
Variable cost			
1.	Human labour	14,430 (25.57)	7,565 (13.90)
2.	Animal labour	845 (1.5)	534 (0.98)
3.	Machine labour	16,342 (28.95)	19,396 (35.64)
Total labour		31,617 (56.02)	27,495 (50.53)
4.	Seeds/seedlings	1,235 (2.18)	1,185 (2.18)
5.	Manures and fertilizer	5,361 (9.5)	5,963 (10.95)
6.	Plant protection	1,140 (2.02)	1,365 (2.51)
7.	Irrigation	1,431 (2.53)	1,666 (3.06)
Working capital		9,167 (16.24)	10,179 (18.70)
8.	Interest on working capital @ 12.5%	2,544 (4.51)	2,354 (4.32)
9.	Total variable cost	43,333 (76.78)	40,028 (73.56)
Fixed cost		7,968 (14.11)	9,435 (17.34)
Sub- total I + II		51,301 (90.90)	49,463 (90.90)
10.	Managerial cost @ 10 %	5,130 (9.09)	4,946 (9.09)
Total cost		56,431 (100.0)	54,409 (100.0)
11.	Main product (quintal)	51.18	53.36
12.	Value of main product	62,799	62,615
13.	Value of by product	2,615	2,110
14.	Gross income	65,414	64,725
15.	Net income over variable	22,081	24,697
16.	Cost of production per	846.60	750.15
17.	BCR	1.51	1.62

Note: Figures in parentheses indicate percentage

per hectare for small farms and Rs.10,179 per hectare for large farms. The share of fixed cost was higher for fully mechanized large farms which stood at Rs.9,435 per hectare, whereas, the fixed cost for small farms worked out to Rs.7968 per hectare. The total cost of cultivation worked out to Rs.54,409 per hectare for large farms and Rs.56,431 per hectare for small farms.

As regards the returns, the production of rice for the small farms was 51.18 qtl per hectare and 53.36 qtl per hectare for large farms, revealing the efficiency of large farms. The net income realized by the small and large farms was of the order of Rs.22,081 per hectare and Rs.24,697 per hectare, respectively.

The overall analysis of the cost structure has revealed that large sized farms had the cost advantage over the small farms. The average cost of cultivation per hectare of paddy was Rs.41,435 for large farms, while the small farms had incurred the average cost of cultivation at Rs.44,751 per hectare (Table 4). Similarly, the average cost of cultivation for fully mechanized farms was Rs.41,680 per hectare, while

it was Rs.44,508 per hectare for partially mechanized farms, revealing that the cost of cultivation will decrease as the level of mechanization increases (Table 3).

Table 3: Cost of cultivation / production of rice (Rs./ha)

Sr. No.	Particulars	Partially	Fully
		mechanized	mechanized
Variable cost			
1.	Human labour	21,644.0 (38.27)	10,997.5 (19.84)
2.	Animal labour	1,175.5 (2.07)	689.0 (1.24)
3.	Machine labour	9,836.0 (17.39)	17,869.0 (32.24)
Total labour		32,656.0 (57.73)	29,556.0 (53.33)
4.	Seeds/seedlings	1,679.0 (2.96)	1,210.0 (2.18)
5.	Manures and fertilizer	4,758.5 (8.41)	5,662.0 (10.22)
6.	Plant protection	1,083.5 (1.92)	1,252.5 (2.26)
7.	Irrigation	1,713 (3.02)	1,548.5 (2.27)
Working capital		9,234.5 (16.32)	9,673.0 (17.45)
8.	Interest on working capital @ 12.5 %	2,618.0 (4.62)	2,449.0 (4.41)
9.	Total variable cost	44,508.0 (78.71)	41,680.5 (75.20)
Fixed cost		6,898.5 (12.19)	8,701.0 (15.70)
Sub-total I + II		51,382.0 (90.90)	50,382.0 (90.90)
10.	Managerial cost @ 10 %	5,140.0 (9.10)	5,038.0 (9.10)
Total cost		56,547.0 (100.0)	55,420.0 (100.0)
11.	Main product (quintal)	46.92	52.27
12.	Value of main product	59,004.00	62,707.00
13.	Value of by product	3,022.50	2,362.50
14.	Gross income	62,026.50	65,069.50
15.	Net income over variable cost	17,518.50	23,389.50
16.	Cost of production per	948.60	797.40
17.	BCR	1.39	1.56

Note: Figures in parentheses indicate percentages

On production front, the average productivity for small farms was 48.41 quintal per hectare, while it was 50.78 qtl for large farms (Table 4). Comparing the two levels of mechanization, it was apparent that mechanization would lead to increased productivity. The average productivity of fully mechanized farms was 52.27 quintal per hectare, while the partially mechanized farms were able to produce only 46.92 qtl per hectare. This factor might be mainly attributed to the advantage of mechanical transplanting which helps in uniform spacing, uniform number of seedlings per hill, shallow planting, profuse tillering and rooting anchorage (Table 3).

On the income side, the average net income of the small farms worked out to Rs.18,793 per hectare while the large farms realized an average net income of Rs.22,113 per hectare capturing the difference in the cost structure of the respective size of farms (Table 4). Similarly, the partially mechanized farms had a net income of Rs.17,518.50 per

hactare while the fully mechanized farms generated a net income of Rs. 23,389 per hactare (Table 3). The average cost of production of rice worked out to Rs.872 per quintal for small farms and Rs.766 per quintal for large farms, proving the efficiency of large sized farms (Table 4).

Table 4: Cost of cultivation / production of rice per ha			
Sr. No.	Particulars	Small farms	Large farms
Variable cost			
1.	Human labour	18,912.5(13.13)	13,729.5 (25.02)
2.	Animal labour	1,213.5 (2.12)	651.5 (11.86)
3.	Machine labour	12,791.0(22.40)	14,914.0 (27.17)
Total labour		32,917.0(57.66)	29,295.0 (53.37)
4.	Seeds/seedlings	1,358.5 (2.37)	1,530.5 (2.78)
5.	Manures and fertilizer	5,271.5 (9.23)	5,149.0 (9.38)
6.	Plant protection	1,036.0 (1.81)	1,300 (2.36)
7.	Irrigation	1,538.0 (2.69)	1,724.0 (3.14)
Working capital		9,204.0 (16.12)	9,703.5 (17.67)
8.	Interest on working capital @ 12.5 %	2,630.0 (4.60)	2,437.0 (4.44)
9.	Total variable cost	44,751.0(78.39)	41,435 (75.49)
Fixed cost		7,141.5 (12.5)	8,458.5 (15.41)
Sub-total I + II		51,870.0(90.86)	49,894.0(90.90)
10.	Managerial cost @ 10 %	5,189.0 (9.14)	4,989.0 (9.10)
Total cost		57,084.0(100.0)	54,883.0 (100.0)
11.	Main product (quintal)	48.41	50.78
12.	Value of main product	60,819.5	60,891.5
13.	Value of by product	2,727.5	2,657.5
14.	Gross income	63,547.0	63,549.0
15.	Net income over variable cost	18,793.5	22,113.5
16.	Cost of production per quintal	872.0	766.0
17.	BCR	1.45	1.57

Note: Figures in parentheses indicate percentages

Similarly, the average cost of production for partially mechanized farms was Rs.948.60 per qtl, while the same worked out to Rs.797.40 per quintal for fully mechanized farms (Table 3). From the analysis of cost and returns of rice production it could be concluded that the large sized and fully mechanized farms were comparatively more efficient than the other category of size and level.

Rama Rao (2011) had worked out the costs and returns of paddy as Rs.28,525 per hactare in North coastal Andhra Pradesh during 2011. Karunakaran (2011) had worked out the BCR for rice cultivation as 1.48 and 1.56 for the partially mechanized and fully mechanized rice farms of CDZ during 2011. He had also estimated the cost of production of rice as Rs.787 and Rs.841 per quintal for the above two types of farms, respectively. The CCPC scheme of the Department of Agricultural Economics, TNAU, Coimbatore had estimated the per hactare cost of cultivation of paddy for Tamil Nadu at Rs.57,063 and the cost of production per quintal of paddy at Rs.981 for the year 2010-11. The results of the last two studies are in conformity with the present result.

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