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## Mechanized rice cultivation in west Godavari district of Andhra Pradesh: An economic analysis

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### Abstract

Costs and returns of fully and partially mechanized rice production in the West Godavari district of Andhra Pradesh were estimated using the cost concepts approach. The primary data was collected from 122 (63 fully and 59 partially mechanized) rice farmers during 2017-18. The results revealed that the cost of cultivation ( $C_3$ ) per hectare in fully mechanized farms (Rs.92842.29/ha) was less than partially mechanized farms (Rs.104022.74/ha), whereas, it was Rs.98361.64/ha for the combined sample. The share of human labour in total cost in fully mechanized farms (16.26 per cent) was less than that of partially mechanized farms (31.07 per cent). The yield, net income over operational cost, and the input-output ratio were higher in fully mechanized farms than the partially mechanized farms.

**Keywords:** rice, mechanization, cost concepts approach, West Godavari

### Introduction

India is the second largest rice-growing country after China. In India, rice is grown in 43.76 million ha, with a production of 110.18 million tonnes and with a productivity of 2518 kg/ha (TE, 2017-18). It was estimated that the demand for rice will be 121.2 million tonnes by the year 2030, 129.6 million tonnes by the year 2040, and 137.3 million tonnes by the year 2050 for internal consumption. In order to achieve this, the productivity of rice should be increased to 3.3 tonnes per ha from 2.4 tonnes at present (Vision 2050). To increase the production of rice, technology and machines will be key solutions because the cost of human labour constituted almost half of the cost of cultivation of major crops. The adoption of mechanization saves time, cost resulting in increased yield. But, the overall level of farm mechanization in India is less than 40-45 per cent, as compared to 90 per cent in most of the developed countries.

In India, Andhra Pradesh ranked the third position in rice with 21.61 lakh hectares of area, 8.52 million tonnes of production, and 5541 kg/ha productivity (TE, 2017-18). As in the rest of India, there has been a steady shift from animal power to electro-mechanical sources of power in Andhra Pradesh but, at slow rate compared to other leading agricultural states. The availability of power is estimated at 1.38 kW/ha, of which about 90 per cent comes from tractors, engines, and motors. There is a great scope of mechanization in the state as machines play a vital role in sustainable development of agriculture and also enhancing the crop productivity (AP-farmech). Andhra Pradesh Government is providing machinery on subsidy basis to the rice farmers to encourage large scale production and some of the farmers employing machinery for the operations like puddling, transplanting, harvesting, etc. The Government is supplying machinery to the rice farmers of West Godavari district on subsidy basis through the schemes viz., Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation (RKVY-RAFTAAR), National Food Security Mission, Sub Mission on Agricultural Mechanisation and RythuRadham. Hence, an attempt was made to estimate the costs and returns in fully and partially mechanized rice farms in the West Godavari district of Andhra Pradesh.

### Materials and Methods

West Godavari district was purposively selected for the present study as it is the highest rice producing district in Andhra Pradesh with an area of 3.99 L ha during the year 2017-18. Four mandals and two villages from each mandal were selected purposively based on the adoption of high mechanization making a total sample of 122 (63 fully and 59 partially mechanized) rice farmers.

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Fully mechanized farmers are those who would employ machinery for ploughing, transplanting, and harvesting operations, and partially mechanized farmers are those who would employ machinery only for ploughing. The selected respondents were interviewed personally with the help of a well-structured interview schedule and the information collected pertaining to the year 2017-18 was analyzed using the cost concepts approach.

### Cost concepts approach

The cost concepts approach recommended by Directorate of Economics and Statistics, Ministry of Agriculture, Government of India were used for the study.

#### Cost A<sub>1</sub>

##### Cost A<sub>1</sub> includes

1. Value of hired human labour
2. Value of owned and hired bullock power
3. Value of owned and hired machine power
4. Value of owned and purchased seed
5. Value of owned and purchased manures
6. Value of fertilisers and pesticides
7. Depreciation
8. Irrigation charges
9. Interest on total variable capital
10. Land revenue

**Cost A<sub>2</sub>:** Cost A<sub>1</sub> + Rent paid for the leased-in land

**Cost B<sub>1</sub>:** Cost A<sub>2</sub> + Interest on fixed assets (excluding land)

**Cost B<sub>2</sub>:** Cost B<sub>1</sub> + Rental value of the owned land

**Cost C<sub>1</sub>:** Cost B<sub>2</sub> + 'imputed value' of family labour

**Cost C<sub>2</sub>:** Cost B<sub>2</sub> + 'imputed value' of family labour

**Cost C<sub>3</sub>:** Cost C<sub>2</sub> + 10% of Cost C<sub>2</sub>

**Gross income:** Value of output (both main and by-product)

**Net income:** Gross income – Cost C<sub>3</sub>

**Farm investment income**=Farm business income - 'imputed value' of family labour

**Farm business income**=Gross income - 'Cost A<sub>1</sub>'

**Farm labour income:** Gross income – Cost B<sub>2</sub>

### Results and Discussion

The cost of cultivation was estimated by using the cost concepts approach and the results were presented in Table 1. The results showed that the total cost of cultivation (C<sub>3</sub>) in the case of fully mechanized farms (Rs.92842.29/ha) was less than that of partially mechanized farms (Rs.104022.74/ha) whereas; it was Rs.98361.64/ha for the combined sample. The yield was higher in fully mechanized farms (68.07q/ha) than the partially mechanized farms (58.35q/ha) as machine transplanting ensures timely planting, uniform spacing, plant density, and vigorous tillering. In addition to this, the mechanized harvesting of rice eliminates grain loss which is common in case of manual cutting of the crop, requires less labour, spread straw back in the field. The cost of production per quintal based on the operational cost in fully mechanized farms was Rs.571.11, which is less than partially mechanized farms (Rs.899.39/q). It was Rs.695.97/q for the combined sample. The gross income realized was Rs.126156.17/ha in fully mechanized farms, which is higher than the partially mechanized farms (Rs.117641.81/ha). The input-output ratio of fully mechanized farms (1.36) was higher than partially mechanized farms (1.13). Farm business income (Rs.85745.27) was higher in fully mechanized farms than the partially mechanized farms (Rs.65064.43). The share of the cost of human labour was the highest with 16.26 per cent followed by machine power with 12.11 per cent in fully mechanized farms. The share of the cost of human labour was the highest with 31.07 per cent in partially mechanized farms.

**Table 1:** Cost of cultivation of Rice (Rs/ha)

S. No.	Particulars	Fully mechanized farms (n=63)	Partially mechanized farms (n=59)	Combined (n=122)
1	Seed	1577.5 (1.70)	2210 (2.12)	1893.75 (1.89)
2	Human labour	15100 (16.26)	32318 (31.07)	23709 (23.65)
3	Animal power	-	-	-
4	Machine power	11244 (12.11)	5200 (5.00)	8222 (8.20)
5	Manures and fertilizers	5370 (5.78)	5771 (5.55)	5570 (5.56)
6	Plant protection chemicals	4875 (5.25)	5500 (5.29)	5187 (5.18)
7	Irrigation	260.41 (0.28)	875 (0.84)	567.7 (0.57)
8	Rent paid for leased in land	-	-	-
9	Interest on working capital	448.31 (0.48)	605.20 (0.58)	526.74 (0.53)
	Total operational cost	38875.22 (41.87)	52479.20 (50.45)	45676.19 (45.57)
10	Rental value of owned land	40100 (43.19)	40625 (39.05)	40363 (40.27)
11	Depreciation	2671.10 (2.88)	733.60 (0.71)	1702 (1.70)
12	Interest on fixed capital	2391.18 (2.58)	363.75 (0.35)	1313.9 (1.34)
13	Land revenue	364.58 (0.39)	364.58 (0.35)	364.58 (0.37)
	Total fixed cost	45526.86 (49.04)	42086.93 (40.46)	43743.48 (44.47)
	Grand Total	84402.08 (90.90)	94566.13 (90.90)	89419.67 (90.90)
14	Cost A <sub>1</sub>	40410.90 (43.53)	52577.38 (50.54)	46492.77 (47.27)
15	Cost A <sub>2</sub>	40410.90 (43.53)	52577.38 (50.54)	46492.77 (47.27)
16	Cost B <sub>1</sub>	42802.08 (46.10)	52941.13 (50.89)	47806.67 (48.60)
17	Cost B <sub>2</sub>	82902.08 (89.29)	93566.13 (89.95)	88169.67 (89.64)
18	Cost C <sub>1</sub>	44302.08 (47.72)	53941.13 (51.86)	49056.67 (49.87)
19	Cost C <sub>2</sub>	84402.08 (90.90)	94566.13 (90.90)	89419.67 (90.90)
20	Cost C <sub>3</sub>	92842.29 (100)	104022.74 (100)	98361.64 (100)
	Yield (q)	68.07	58.35	65.63
	Price per quintal	1853.33	1853.33	1853.33
	Value of main product	126156.17	108141.81	121634.05

Value of by-product	0	9,500	4594
Gross income	126156.17	117641.81	126228.05
Input-output ratio	1.36	1.13	1.28
Net income over operational cost	87280.95	65162.61	80551.85
Net income over total cost	33313.88	13619.07	27866.41
Cost of production per quintal over operational cost	571.11	899.39	695.97
Cost of production per quintal over total cost	1363.92	1782.74	1498.73
Farm business income (Gross income - Cost A <sub>1</sub> )	85745.27	65064.43	79735.27
Farm labour income (Gross income – Cost B <sub>2</sub> )	43254.09	24075.68	38058.37
Farm investment income (Farm business income – Imputed value of family labour)	84245.27	64064.43	78485.27

(Figures in parenthesis indicate per cent to the total)

### Conclusion

The total cost of cultivation and cost of production over the operational cost of fully mechanized farms were less than the partially mechanized farms. The yield, net income over operational cost, net income over total cost, input-output ratio were higher in fully mechanized farms compared to partially mechanized farms as these farms employed machinery during puddling, transplanting, and harvesting operations by reducing the human labour. However, human labour was employed for bunding, weeding, carting and manure spreading, fertilizer application, plant protection, irrigation operations etc. Hence, Government should provide subsidy on rice transplanter and harvester, besides making the machinery available through custom hiring centres and Agricultural Research Stations to reduce the drudgery in rice cultivation and cost of production as well.

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