AU
e ISSN-0976-6847
Agriculture Update
Volume **12** | TECHSEAR-10 | 2017 | 2681-2685
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RESEARCH ARTICLE :

Economics of profitable rice cultivation: a study acrossfarm sizes in Kurnool district of Andhra Pradesh

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ARTICLE CHRONICLE :
Received :
11.07.2017;
Accepted :
25.08.2017

SUMMARY : The present study was carried out in Kurnool district of Andhra Pradesh to investigate the cost of cultivation and profitability of rice particularly across different farm sizes. Multistage stratified random sampling technique was adopted for selection of the sample where rice cultivators were stratified into five groups based on the size of operational holding. The cost of cultivation for all the farms was found to be Rs.62135.31ha^{-1} with lowest on marginal farms (Rs.56873.89ha^{-1}) and highest on large farms (Rs.65390.17 ha^{-1}) implying that cost of cultivation increased with increase in farm size. Human labour constituted the major component (29.08%) of the total cost of cultivation. The cost incurred on hired labour was found to increase with farm size whereas the cost incurred on family labour decreased with increase in farm size. The amount spent on fertilizers and plant protection chemicals was least on marginal farms. Marginal farms in the study area were found to be more profitable in rice cultivation than large farms. Hence large farms can emulate the practices followed by marginal farms in order to improve profitability.

KEY WORDS :
Cost of cultivation, Farm sizes, Kurnool, Profitability, Rice

How to cite this article : Samarpitha, A., Vasudev, N. and Suhasini, K. (2017). Economics of profitable rice cultivation: a study acrossfarm sizes in Kurnool district of Andhra Pradesh. *Agric. Update*, **12** (TECHSEAR-10): 2681-2685.

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BACKGROUND AND OBJECTIVES

Rice is the most important and extensively grown tropical food crop in the world. Because of its importance in providing national food security and generating employment and incomes for the low-income sectors of society, most Asian governments regard rice as a strategic commodity (Hossain and Narciso, 2004).

Rice cultivation requires large quantities of inputs, particularly water, fertilizer and pesticides, contributing to high cost of cultivation. The management practices adopted in rice cultivation and costs incurred towards these practices have been on the rise over the years due to high cost of inputs. A general idea of cost of cultivation per hectare of various operations would help in estimating the returns and to find out the disparities, if any across the farm sizes. Returns from crop cultivation are essential not only for the

survival of farmers but also facilitate reinvestment in agriculture (Narayanamoorthy, 2013). Hence the present study was taken up with the aim of investigating cost of cultivation and returns per hectare of rice according to farm size.

Rice is of key importance to the economy of the state of Andhra Pradesh and its people wherein a large percentage of labour force earns a living from agriculture by cultivating rice. Considering the importance of rice cultivation in promoting agricultural development in the country in general, in the state of Andhra Pradesh in particular and Kurnool district in specific, an attempt has been made in this study to estimate the costs and returns from rice cultivation across farm sizes and to find out the most profitable farm size.

Fig. A : Mandal map of Kurnool district

RESOURCES AND METHODS

Multistage stratified random sampling technique was adopted for selection of the sample with district as the first stage unit, mandals/tehsils as the second stage units, villages as the third stage units and farm holdings as the final and ultimate stage units.

In the first stage, a district with highest production of rice was selected from Rayalaseema region of Andhra Pradesh state based on the average rice production of five years' *i.e.*, from 2008-09 to 2012-13. Accordingly Kurnool district was chosen for the study (Fig.1). Kurnool is known as the Gateway to Rayalaseema. The climate of Kurnool district is tropical with an average annual rainfall of about 705 mm. It lies on the banks of the Tungabhadra river. The Hundri and Neeva rivers also flow through the district. The K. C. Canal (Kurnool-Cuddapah) is a major source of irrigation. Two mandals namely Bandi Atmakur and Mahanandi were selected from the district based on three years' average rice production *i.e.*, from 2010-11 to 2012-13. From each mandal three villages were selected randomly. Thus a total of six villages were selected for the study.

In each selected village, rice cultivators were stratified into five groups based on the size of operational holding *viz.*, marginal (<1 ha), small (1-1.99 ha), semi-medium (2-3.99 ha), medium (4-9.99 ha) and large (>10 ha) following the classification given by Agriculture Land use census, Ministry of Agriculture. From each farm-size group, four rice farmers were selected randomly making a total of twenty farmers from each selected village. Thus the sample consisted of 1 district, two mandals, six villages (three villages from each mandal) and 120 rice farmers (twenty from each village).

The data of the selected rice farmers were obtained through personal interview method with the help of pre-tested comprehensive interview schedule. The district level and mandal level data were collected from Directorate of Economics and Statistics, Hyderabad. Costs and returns from rice cultivation were generated following the cost of cultivation scheme (CCS) under the Government of India.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads :

Cost of cultivation :

The cost of cultivation for all the farms was found to be '.62135.31 ha^{-1} with 81.28% and 18.72% of the total cost contributed by variable and fixed costs, respectively. The lowest cost of cultivation was reported on marginal farms ('.56873.89 ha^{-1}) and highest on large farms ('.65390.17 ha^{-1}) implying that cost of cultivation increased with increase in farm size.

Human labour constituted the major component (29.08%) of the total cost of cultivation which confirms the labour-intensive nature of paddy cultivation followed by machine labour (23.16%), fertilizers (13.98%), plant protection chemicals (8.63%), seed (3.52%) and bullock labour (2.03%).

The total operational costs were found to be highest

on large farms (‘.53243.25 ha^{-1}) and least on marginal farms (‘.46404.60 ha^{-1}). The total variable cost for all farms was ‘.50506.06 ha^{-1}.

Among the variable costs the expenditure on hired human labour per hectare was found to be highest on large farms (‘.19158.37 ha^{-1}) and least on marginal farms (‘.11710.42 ha^{-1}) while the contribution of family labour was highest on marginal farms (‘.5070.40 ha^{-1}) and least on medium farms (‘.1500.00 ha^{-1}). The use of family labour was not reported on large farms. The cost incurred on hired labour increased with increase in farm size while the cost incurred on family labour decreased with increase in farm size.

The expenditure on bullock labour was highest on semi-medium farms (‘.1562.50 ha^{-1}) and least on small farms (‘.1093.75 ha^{-1}). The use of bullock labour was not reported on large farms. The cost of machine labour was noted to be highest on large farms (‘.16206.25 ha^{-1}) and least on marginal farms (‘.12913.02 ha^{-1}).

The amount spent on seed ranged between ‘.2015.63 ha^{-1} on large farms and ‘.2270.83 ha^{-1} on marginal and small farms. The variation in the price of seed might have been due to the variation in the sources of seed that farmers in the study area of Kurnool district purchased. The sources of seed included own seed, seed from private dealers in respective villages or Babanagar or Nandyal town, agriclinic centres in Nandyal, college farm at Mahanandi, market yard at Nandyal, Agriculture department of the state government, National Seeds Corporation Limited. Subsidized seed was available from National Seeds Corporation Limited located at Noonepalle, Nandyal under the scheme of “Grameena

Table 1 : Farm-size wise cost of cultivation in Kurnool district **(Rs./ha)**

Item	Marginal	Small	Semi-medium	Medium	Large	All Farms
Seeds	2270.83 (3.99)	2270.83 (3.56)	2193.75 (3.54)	2182.29 (3.48)	2015.63 (3.08)	2186.67 (3.52)
Fertilizers	7860.68 (13.82)	9495.83 (14.90)	9428.91 (15.22)	8473.18 (13.51)	8159.90 (12.48)	8683.70 (13.98)
Human Labour	16780.82 (29.51)	17662.24 (27.71)	16653.43 (26.88)	20088.45 (32.02)	19158.37 (29.30)	18068.66 (29.08)
– Hired labour	11710.42 (20.59)	15298.96 (24.00)	15042.91 (24.28)	18588.45 (29.63)	19158.37 (29.30)	15959.82 (25.69)
– Family labour	5070.40 (8.92)	2363.28 (3.71)	1610.53 (2.60)	1500.00 (2.39)	-	2636.05 (4.24)
Bullock	1166.67 (2.05)	1093.75 (1.72)	1562.50 (2.52)	1230.77 (1.96)	-	1263.42 (2.03)
Machine	12913.02 (22.70)	14880.73 (23.35)	13762.50 (22.22)	14190.10 (22.62)	16206.25 (24.78)	14390.52 (23.16)
Pesticides	4271.32 (7.51)	5550.94 (8.71)	4851.49 (7.83)	5778.52 (9.21)	6373.69 (9.75)	5365.19 (8.63)
Interest on working capital	1141.27 (2.01)	1250.21 (1.96)	1246.43 (2.01)	1310.22 (2.09)	1329.42 (2.03)	1255.51 (2.02)
Operational Costs	46404.60 (81.59)	52204.53 (81.91)	49363.48 (79.69)	51314.43 (81.79)	53243.25 (81.42)	50506.06 (81.28)
Depreciation on implements & buildings	98.28 (0.17)	115.50 (0.18)	231.95 (0.37)	149.08 (0.24)	470.50 (0.72)	213.06 (0.34)
Land revenue, cess, taxes	693.75 (1.22)	653.13 (1.02)	709.38 (1.15)	646.88 (1.03)	642.71 (0.98)	669.17 (1.08)
Rental value of own land	9303.41 (16.36)	9877.06 (15.50)	9583.00 (15.47)	9920.00 (15.81)	9945.00 (15.21)	9725.69 (15.65)
Rent paid for leased-in land	12462.50 (21.91)	9948.21 (15.61)	11008.33 (17.77)	9791.50 (15.61)	9607.50 (14.69)	10563.61 (17.00)
Interest on fixed capital excluding land	447.78 (0.79)	1542.86 (2.42)	2986.67 (4.82)	1245.00 (1.98)	3195.45 (4.89)	1883.55 (3.03)
Fixed Costs	10469.28 (18.41)	11527.94 (18.09)	12579.95 (20.31)	11422.16 (18.21)	12146.92 (18.58)	11629.25 (18.72)
Total Costs	56873.89 (100.00)	63732.47 (100.00)	61943.44 (100.00)	62736.60 (100.00)	65390.17 (100.00)	62135.31 (100.00)

Note: Figures in parentheses indicate the percent to respective column total.

Table 2 : Cost of cultivation according to farm sizes **(Rs./ha)**

Farm size	Cost A1	Cost A2	Cost B1	Cost B2	Cost C1	Cost C2	Cost C3
Marginal	42068.90	43107.45	42236.82	51803.49	47307.22	56873.89	62561.27
Small	50571.38	53472.94	51471.38	61369.19	53834.66	63732.47	70105.72
Semi-medium	48933.16	53061.29	50550.94	60668.44	51825.94	61943.44	68137.78
Medium	51941.91	58061.60	52771.91	62611.60	52896.91	62736.60	69010.25
Large	54121.21	58124.33	55585.79	65390.17	55585.79	65390.17	71929.18
All farms	49527.31	53165.52	50523.37	60368.58	52290.10	62135.31	68348.84

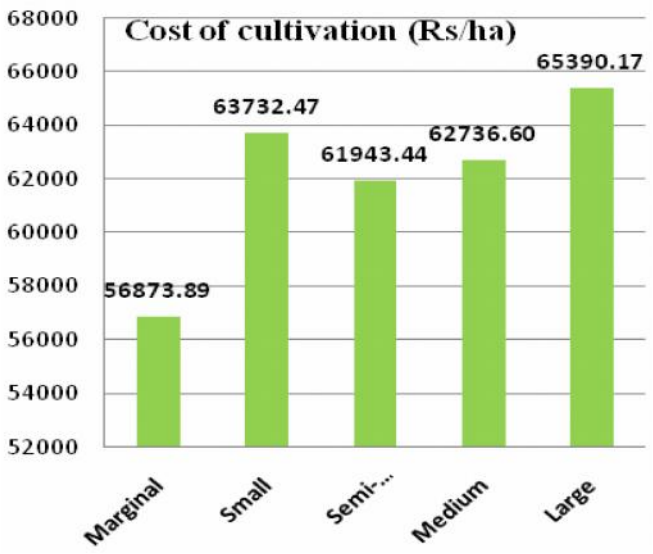

Fig. 1 : Cost of cultivation of rice farms

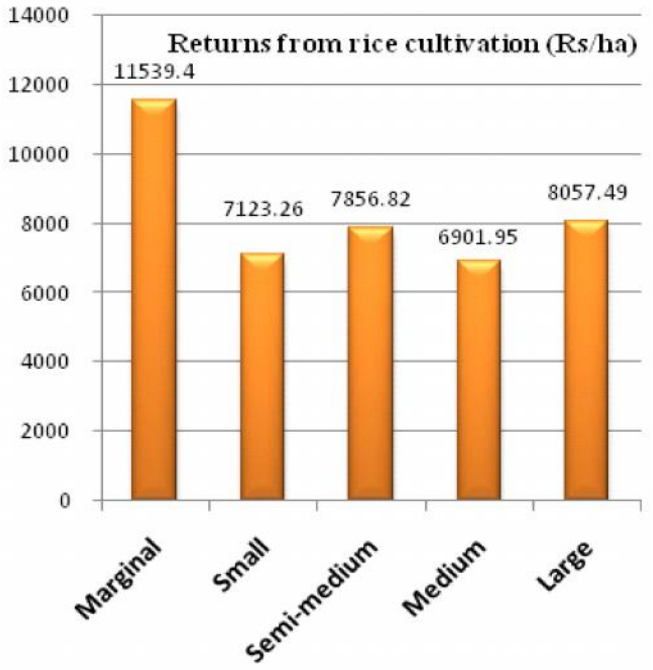

Fig. 2 : Returns from rice cultivation

Vithanothpatthi Pathakam" and from the Department of Agriculture. The remaining sources offered only unsubsidized seed.

The amount spent on fertilizers was highest on small farms (‘.9495.83 ha^{-1}) and lowest on marginal farms (‘.7860.68 ha^{-1}). The cost of plant protection chemicals was found to be highest on large farms (‘.6373.69 ha^{-1}) and least on marginal farms (‘.4271.32 ha^{-1}) indicating a direct relationship between the costs and farm size.

The total fixed cost for all the farms was ‘.11629.25 ha^{-1}. Rent paid for leased-in land and rental value of owned land contributed to 17.00% and 15.65% of the total cost while interest on fixed capital and land revenue, cess or taxes constituted 3.03% and 1.08% of the total cost. Highest fixed cost was observed on semi-medium farms (‘.12579.95 ha^{-1}) and least on marginal farms (‘.10469.28 ha^{-1}).

The cost incurred on hired human labour was positively related to farm size whereas participation of own farm labour was negatively related to farm size. Anantaramverma (1981) and Ninan (1984) also reported that family labour was negatively related to farm size whereas hired labour was positively related to farm size.

These results are in conformity with those of Neelappa (2002), Basavaraja *et al*. (2008), Vinaykumar *et al*. (2008), Sita and Ponnarasi (2009), Raj and Azeez (2011), Santha (1993), Rama Rao (2011) and Shende and Bagde (2013) who also observed that variable costs constituted the major portion of the total cost of cultivation of which the expenditure on human labour was found to be the major item.

As the cost of human labour is very high and found to be a major component of cost of cultivation low cost machines may be included in the government programs and extension activities. Research on the development and fine tuning of the existing machinery also must be encouraged.

The information regarding the cost of cultivation according to cost concepts is presented in Table 2. The lowest values of cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3 were observed on marginal farms and highest on large farms. Thus a direct relationship was noticed between the costs and farm size. These results are in line with those of Yadav and Sinha (2004), Kumar *et al*. (2013) and Rahman *et al*. (2012) who also showed that costs were lowest on marginal farms and increased with increase in farm size.

Returns from rice cultivation according to farm-size

To find the profitability of farm business, gross income, net income, family labour income, farm business income and farm investment income were worked out and presented in Table 3. Net income, family labour income, farm business income, farm investment income and returns per rupee investment were found to be highest for marginal farms indicating that marginal farms were profitable in rice cultivation compared to large farms. These results are in conformity with those of

Kumar *et al.* (2013) and Rahman *et al.* (2012) who also found that net returns and benefit-cost ratio were highest for marginal farms and declined with increase in farm size.

The study revealed that cost of cultivation of rice increased with increase in farm size. Human labour constituted the major component of the total cost of cultivation which confirms the labour-intensive nature of paddy cultivation. Hence low cost machines may be included in the government programmes, extension activities in addition to encouraging research on development and fine tuning of the existing machinery.

The cost incurred on hired labour was found to increase with farm size whereas the cost incurred on family labour decreased with increase in farm size. The amount spent on fertilizers and plant protection chemicals was least on marginal farms and higher on the remaining farm sizes. Farmers should be encouraged to use organic pesticides which can be made at the farmers' home thus simultaneously making use of the livestock instead of costly plant protection chemicals. Marginal farms were found to be more profitable in rice cultivation than large farms. Hence large farms can emulate the practices followed by marginal farms in order to improve profitability.

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