



## ECONOMICS OF RICE BASED CROPPING SYSTEM

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### ABSTRACT

The study was conducted in Pellakur mandal of Nellore district of Andhra Pradesh during 2014-2015. The cost of cultivation was highest in the case of groundnut (₹ 68,874.71/ha) followed by *rabi* paddy (₹ 65,370.80/ha) and *kharif* paddy (₹ 63,999.44/ha). Among the three crops, groundnut (₹ 1.77) recorded the highest returns per rupee of expenditure followed by *rabi* paddy (₹ 1.59) and *kharif* paddy (₹ 1.42). For the system as a whole returns per rupee of expenditure was ₹ 1.60.

**KEYWORDS:** Paddy, Groundnut, costs and returns, input use pattern.

### INTRODUCTION

The objective of any cropping system is efficient utilization of all resources viz. land, labour, water, and solar radiation maintaining stability in production and obtaining higher net returns. The cropping system should provide enough food for the family, fodder for cattle and generate sufficient cash income for domestic and cultivation expenses. Paddy is the most important cereal crop grown all over the world and is a staple food for a large part of the world human population. In Andhra Pradesh paddy is grown over an area of 4.75 million hectares with production and productivity of 14.42 million tonnes and 3.04 tonnes per hectare respectively (Directorate of Economics and Statistics, 2013). In Nellore district paddy is the major crop which is grown in all the seasons. The major cropping system identified in the study area was paddy-paddy-groundnut. The present study was under taken to study the economics of the said cropping system.

### METHODOLOGY

Nellore district was purposively selected for the present study as it is one of the important districts of Rayalaseema region of Andhra Pradesh in cultivation of rice based cropping systems. From the district, Pellakur mandal which had similar cropping pattern of district was purposively selected for the study. From the selected mandal, a list of villages under rice based cropping systems was arranged and two villages namely Eguva chavalli, Chembedupalem were selected at random. From each of the selected village, 15 farmers were selected at

random. The total number of respondents selected for the purpose of the study was 30. Primary data were collected by the survey method through well designed schedule for the agricultural year 2014-15. The study was conducted to examine costs and returns, input use pattern in the cultivation of rice- based cropping system.

### RESULTS AND DISCUSSION

#### Labour utilization pattern of three crops under the cropping system

Human labour is one of the most important factors of production and also a major item of cost structure influencing the cultivation of any crop. The total human labour requirement for *kharif* paddy, *rabi* paddy and groundnut was 105.97, 109.82 and 106.82 mandays respectively. Total human labour requirement for the three crops was 322.61 mandays.

The cattle labour was used only in groundnut cultivation in the cropping system. The total cattle labour used by the groundnut farmers was 3.48 cattle pair days per hectare for sowing operation. Land preparation was the major machine labour absorbing operation in cultivation of any crop. Machinery power for *kharif* paddy, *rabi* paddy and groundnut was 10.85, 10.85 and 5.98 hours respectively. Machine power utilization was highest in groundnut when compared to paddy. This is because, in paddy cultivation machine power was also used for puddling and harvesting.

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### Material inputs utilization pattern in rice-based cropping system

It is seen from Table 2 that seed rate for *kharif* paddy was 77.60 kg per hectare. On an average, 4.82 tonnes of farm yard manure was used. The application of N, P and K through chemical fertilizer was of the order of 107.94 kg, 61.98 kg and 71.89 kg per hectare respectively, and zinc was applied 64.38 kg per hectare. The per hectare use of plant protection chemicals was 0.81 kg of Beem, 0.91 kg of Keldon, 2.38 kg of Fire and 1.50 liter of Monocrotophos. Herbicides were also applied as preventive and remedial measure against the attack of weeds. The per hectare use of herbicides was 3.80 liter of Pendimetholin.

In the case of *rabi* paddy seed rate was 77.59 kg per hectare. On an average, 4.82 tonnes of farm yard manure was used. The application of N, P and K through chemical fertilizer was of the order of 209.20, 68.65 and 80.05 kg per hectare respectively, and zinc was applied to an extent of 64.38 kg per hectare. Plant protection chemicals were applied as preventive and remedial measure against the attack of pest and disease. The per hectare use of plant protection chemicals was 1.04 kg of Keldon, 2.50 kg of Fire, 1.75 liters of Monocrotophos and 0.81 kg of Beem.

The seed rate was 175.65 kg per hectare in the cultivation of summer groundnut. The application of N, P, Ca and S through chemical fertilizers was of the order

**Table 1. Labour utilization pattern in three crops under cropping system**

| Particulars             | Human labour<br>(man days per hectare) | Cattle labour<br>(cattle pair day per hectare) | Machine labour<br>(hour per hectare) |
|-------------------------|--|--|--------------------------------------|
| Paddy ( <i>Kharif</i> ) | 105.97<br>(32.85)                      | -  | 10.85<br>(39.20)                     |
| Paddy( <i>Rabi</i> )    | 109.82<br>(34.04)                      | -  | 10.85<br>(39.20)                     |
| Groundnut               | 106.82<br>(33.11)                      | 3.48<br>(100)                                  | 5.98<br>(21.60)                      |
| Total cropping system   | 322.61<br>(100)                        | 3.48<br>(100)                                  | 26.70<br>(100)                       |

Note: Figures in parentheses indicate percentages to the total

of 162.37 kg, 95.52 kg, 53.32 kg and 27.91 kg per hectare respectively. The per hectare use of plant protection chemicals was 0.85 liters of monocrotophos, 0.25 kg of Mancozeb and 8.8 kg of Phorate granules.

### Costs and returns of different crops under the rice-based cropping system

On an average, the total cost of cultivation per hectare of *kharif* paddy in the cropping system was ₹ 63,999.44. The breakup of total costs into operational and fixed costs indicated that the operational costs were ₹ 53,655.46 and fixed costs were ₹ 10,343.98 (Table 3). Expenditure on human labour, seeds, fertiliser and manure, and plant protection chemicals were the important components of operational cost. Similarly rental value of owned land, interest on fixed capital and depreciation charges were the major components of fixed cost. On an average, the per hectare cost of cultivation of *rabi* paddy in the cropping system worked out to ₹ 65,370.80. Out of the

total costs, ₹ 55,026.82 were operational costs and ₹ 10,343.98 fixed costs (Table 4). The per hectare cost of cultivation of groundnut in the cropping system worked out to be ₹ 68,874.71. Out of the total costs, ₹ 58,530.73 were operational costs and ₹ 10,343.98 fixed costs (Table 5).

The total cost of cultivation of all crops in the cropping system as a whole was ₹ 1,98,244.95. Among the crops highest share in total cost was from groundnut (34.74%) followed by *rabi* paddy (32.98%) and *kharif* paddy (32.28%) (Table 6).

The gross income realized from the cropping system as a whole was ₹ 3,17,500.00 and the net income was ₹ 1,19,255.05. Among the crops, highest share in gross income was from groundnut (38.50%) followed by *rabi* paddy (32.75%) and *kharif* paddy (28.67%). Net income was also from groundnut (44.96 %) followed by *rabi* paddy (32.40%) and *kharif* paddy (22.64%).

**Table 2. Material inputs used in the rice-based cropping system**

| S. No. | Particulars                | Units  | Paddy<br>(Kharif) | Paddy<br>(Rabi) | Groundnut |
|--------|----------------------------|--------|-------------------|-----------------|-----------|
| 1      | Seeds                      | Kgs    | 77.60             | 77.59           | 175.65    |
| 2      | FYM                        | Tonnes | 4.82              | 4.82            | -         |
| 3      | Fertilizers.               |        |                   |                 |           |
| i      | N                          | Kgs    | 107.94            | 209.20          | 162.37    |
| ii     | P                          | Kgs    | 61.98             | 68.65           | 95.52     |
| iii    | K                          | Kgs    | 71.89             | 80.05           | -         |
| iv     | Zn                         | Kgs    | 64.38             | 64.38           | -         |
| v      | Ca                         | Kgs    | -                 | -               | 53.32     |
| vi     | S                          | Kgs    | -                 | -               | 27.91     |
| 4      | Plant protection chemicals |        |                   |                 |           |
| i      | Beem                       | Kgs    | 0.81              | 0.81            | -         |
| ii     | Keldon                     | Kgs    | 0.91              | 1.04            | -         |
| iii    | Fire                       | Kgs    | 2.38              | 2.50            | -         |
| iv     | Monocrotophos              | Lit    | 1.50              | 1.75            | 0.85      |
| vi     | Pendimetholin              | Lit    | 3.80              | -               | 3.78      |
| vii    | Mancozeb                   | Kgs    | -                 | -               | 0.25      |
| viii   | Phorate                    | Kgs    | -                 | -               | 8.8       |

**Table 3. Cost of cultivation of *kharif* paddy (Rupees per hectare)**

| S. No.    | Particulars.                | Per hectare |
|-----------|-----------------------------|-------------|
| <b>I</b>  | <b>VARIABLE COSTS</b>       |             |
| 1         | Human labour                | 18,544.75   |
| 2         | Tractor power               | 8,260.00    |
| 3         | Combined harvester          | 3,885.00    |
| 4         | Seeds                       | 1,939.77    |
| 5         | Manures and fertilizers     | 14616.11    |
| a)        | Manures                     | 4,820.00    |
| b)        | Fertilizers                 | 9,796.11    |
| 6         | Plant protection chemicals  | 4,847.05    |
| 7         | Interest on working capital | 1,562.78    |
|           | Total variable costs        | 53,655.46   |
| <b>II</b> | <b>FIXED COSTS</b>          |             |
| 1         | Land revenue                | 166.66      |
| 2         | Rental value of owned land  | 8,333.00    |
| 3         | Depreciation                | 799.00      |
| 4         | Interest on fixed capital   | 1,045.32    |
|           | Total fixed costs           | 10,343.98   |
|           | Total costs                 | 63,999.44   |

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**Table 4. Cost of cultivation of *rabi* paddy (Rupees per hectare)**

| <b>S. No.</b> | <b>Particulars.</b>         | <b>Per hectare</b> |
|---------------|-----------------------------|--------------------|
| <b>I</b>      | <b>VARIABLE COSTS</b>       |                    |
| 1             | Human labour                | 19,218.50          |
| 2             | Tractor power               | 8,250.00           |
| 3             | Combined harvester          | 3,900.00           |
| 4             | Seeds                       | 2,327.72           |
| 5             | Manures and fertilizers.    | 15988.12           |
| a)            | Manures                     | 4,820.00           |
| b)            | Fertilizers.                | 11,168.12          |
| 6             | Plant protection chemicals  | 3,739.76           |
| 7             | Interest on working capital | 1,602.72           |
|               | Total variable costs        | 55,026.82          |
| <b>II</b>     | <b>FIXED COSTS</b>          |                    |
| 1             | Land revenue                | 166.66             |
| 2             | Rental value of owned land  | 8,333.00           |
| 3             | Depreciation                | 799.00             |
| 4             | Interest on fixed capital   | 1,045.32           |
|               | Total fixed costs           | 10,343.98          |
|               | Total costs                 | 65,370.80          |

**Table 5. Cost of cultivation of groundnut (Rupees per hectare)**

| <b>S. No</b> | <b>Particulars.</b>         | <b>Per hectare</b> |
|--------------|-----------------------------|--------------------|
| <b>I</b>     | <b>VARIABLE COSTS</b>       |                    |
| 1            | Human labour                | 18,693.50          |
| 2            | Tractor power               | 5,980.00           |
| 3            | Cattle pair (sowing)        | 1,392.00           |
| 4            | Seeds                       | 16,440.62          |
| 5            | Fertilizers.                | 11,655.38          |
| 6            | Plant protection chemicals  | 2,664.45           |
| 7            | Interest on working capital | 1,704.78           |
|              | Total variable costs        | 58,530.73          |
| <b>II</b>    | <b>FIXED COSTS</b>          |                    |
| 1            | Land revenue                | 166.66             |
| 2            | Rental value of owned land  | 8,333.00           |
| 3            | Depreciation                | 799.00             |
| 4            | Interest on fixed capital   | 1,045.32           |
|              | Total fixed costs           | 10,343.98          |
|              | Total costs                 | 68,874.71          |

**Table 6. Costs and returns structure of different crops under rice-based cropping system (Rupees per hectare)**

| S. No | Particulars                  | Paddy<br>(Kharif)    | Paddy<br>(Rabi)        | Groundnut              | ₹ / Cropping<br>system |
|-------|------------------------------|----------------------|------------------------|------------------------|------------------------|
| I     | Costs                        |                      |                        |                        |                        |
| i     | TVC                          | 53,655.46<br>(32.09) | 55,026.82<br>(32.91)   | 58,530.73<br>(35.00)   | 1,67,213.01<br>(100)   |
| ii    | TFC                          | 10,343.98<br>(33.33) | 10,343.98<br>(33.33)   | 10,343.99<br>(33.34)   | 31,031.94<br>(100)     |
| iii   | TC                           | 63,999.44<br>(32.28) | 65,370.80<br>(32.98)   | 68,874.71<br>(34.74)   | 1,98,244.95<br>(100)   |
| II    | Returns                      |                      |                        |                        |                        |
| i     | Yield (tonnes)               | 7.28                 | 8                      | 3.5                    |                        |
| ii    | Gross income                 | 91,000.00<br>(28.70) | 1,04,000.00<br>(32.80) | 1,22,500.00<br>(38.50) | 3,17,500.00<br>(100)   |
| iii   | Net income                   | 27,000.56<br>(22.64) | 38,629.20<br>(32.40)   | 53,625.29<br>(44.96)   | 1,19,255.05<br>(100)   |
| iv    | Gross margin                 | 37,344.54<br>(24.85) | 48,973.18<br>(32.59)   | 63,969.27<br>(42.56)   | 1,50,286.99<br>(100)   |
| v     | Return per rupee expenditure | 1.42                 | 1.59                   | 1.77                   | 1.60                   |

The returns per rupee of expenditure was observed to be the highest in groundnut (1.77) followed by *rabi* paddy (1.59) and *kharif* paddy (1.42) and for the system as a whole it was found to be 1.60 (Table 6).

## CONCLUSIONS

The total cost of cultivation for the cropping system as a whole was ₹ 1,98,244.95 per hectare. Out of the total costs, ₹ 31,031.94 were fixed costs and ₹ 1,67,213.01 variable costs. The gross income, net income realized from the cropping system as a whole was ₹ 3,17,500 and ₹ 1,19,255.05 per gross hectare respectively. The return per rupee of expenditure for the cropping system as a whole was 1.60.

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