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Economic Analysis and Production Constraints of Rice Fallow Maize in Guntur District of Andhra Pradesh

H Srinivasa Rao, G Raghunadha Reddy, D V S Rao and V Srinivasa Rao
Department of Agricultural Economics, Agricultural College, Bapatla 522 101

ABSTRACT

Maize, the queen of the course cereals, cultivation has been steadily increasing in many parts of Andhra Pradesh, particularly as a rice fallow crop. The study reveals that human labour cost followed by fertilizers and irrigation are the major cost in maize production. The farm income measures proved that the medium and large farms are more viable than small farms. The Kendall's coefficient showed that high cost of fertilizers and pesticides, non-abailability of credit in time and the forced sales for debt payment were the major constraints.

Key words : Constraints, Cost-return profile, Maize.

Maize, 'queen of coarse cereals' (Pant and Shyoraj Hada, 2004) is the only crop with highest productivity with its world average yield of 27.8 q ha^{-1} followed by rice, wheat and millets (Handbook of Agriculture). It is grown over an area of 1,45,142 thousand hectares with a production of 7,05,293 thousand tons. About 65 per cent of maize produced in the world is used as animal feed, 27 per cent as human food and rest of 8 per cent as non-food industrial products and seed. India's share in world's area is only 4.69 per cent with 6800 thousand tons next to USA, China, Brazil and Mexico. Among the coarse cereals, it has the highest average national productivity (1.7-1.8 t ha^{-1}), followed by sorghum and bajra (Verma, 2007). About 55 per cent of the maize produced in the country is used in poultry/ cattle feed, 38 per cent is used for human consumption, 6 per cent in the manufacture of starch and allied products and remaining one per cent as seed.

In the recent past, its cultivation has been increased in many parts of Andhra Pradesh as a rice fallow crop replacing the traditional crops like black gram, sumhemp etc. So, the present research article is aimed at analyzing the cost-return profile of the rice fallow maize crop as well as identifying its production constraints.

MATERIAL AND METHODOLOGY

A three stage sampling procedure *i.e.,* mandal, village and farmer level was followed for the purpose of selection of primary sampling units. The Guntur district was purposively selected for the study as the rice fallows experienced a rapid shift towards maize during the period 2006 to 2009. Two representative mandals namely, Vemuru and Duggirala were selected from the district having highest area under rice fallow maize. Three villages from each mandal were selected finally for this study. A sample of 120 farmers of rice fallow maize were randomly selected covering 60 farmers from each group *i.e.,* small farms (less than 2 ha) and other farms (above 2 ha). Other farmers include both medium (82 per cent having 2-4 ha) and large farmers (18 per cent having more than 4 ha).

The study pertains to the rabi season of 2009-10. The data regarding to the working costs, fixed costs, prices of products, output obtained, returns realized, production problems etc., were collected using a structured pre-tested schedule. Operational/variable costs including value of human labour, machinery power, seeds, fertilizers, plant protection chemicals, herbicides, irrigation charges and interest on working capital. Fixed costs including rental value of owned land, rent paid for leased in land, land revenue/cess and taxes, depreciation amount of implements and interest on fixed capital (Raju and Rao, 2006). The cost concepts classification and calculations adopted by CACP, New Delhi was used in the present study for estimating cost of cultivation.

Kendall's coefficient of concordance was adopted for ranking the various constraints identified in the maize production (Kothari, 2008).

Table 1. Cost of cultivation of rice fallow maize according to farm size (Rs ha^{-1})

S No.	Particulars	Size of the farm					
		Small farms	% age to total	Other farms	%age to total	Pooled	% age to total
I	**Operational costs**						
1	Human labour	10924.54	24.68	11762.26	24.80	11522.23	24.78
	a) Family labour	2364.54	5.34	497.40	1.05	1000.09	2.15
	b) Hired labour	8560	19.34	11264.86	23.75	10522.14	22.62
2.	Machine labour	1969.20	4.45	2020.47	4.26	2006.39	4.31
3.	Seed	3161.60	7.14	3360.05	7.08	3305.56	7.11
4.	Fertilizer	6501.37	14.68	7073.03	14.91	6916.05	14.87
5.	Plan protection chemicals	2370.88	5.35	2774.33	5.85	2645.70	5.69
6.	Herbicides	1567.57	3.54	1825.83	3.85	1754.94	3.77
7.	Irrigation*	5271.16	11.91	5739.13	12.10	5565.55	11.97
8.	Interest on working capital	338.78	0.88	362.82	0.76	356.22	0.76
9.	Total operational costs	32105.10	72.52	34917.92	73.63	34072.64	73.27
II	**Fixed costs**						
1.	Land revenue	494.00	1.11	494.00	1.04	494.00	1.06
2.	Depreciation	588.67	1.33	798.89	1.68	756.47	1.63
3.	Rental value land	10374.00	23.43	10374	21.87	10374	22.31
4.	Interest on fixed capital	705.41	1.59	840.72	1.77	803.90	1.78
5.	Total fixed costs	12162.08	27.47	12507.61	26.37	12428.37	26.72
Total cost		44267.18	100.00	47425.53	100.00	46501.01	100.00

*Cost including human and machine labour engaged

$$Kc = \frac{\sum Rj^2 - \frac{(\sum \mathrm{Rj})^2}{n}}{\frac{1}{12}k^2(n^3 - n)}$$

Where, K_C = Kendall's Coefficient
K = No. of respondents assigning ranks.
n = No. of constraints ranked.
R_j = Rank total of columns j.
j = Ranks assigned 1 to n.

χ^2_{cal} =K (n-1) K_c

RESULTS AND DISCUSSIONS

The cost of cultivation details of maize grown as rice fallow crop is presented in the table 1. The major component in cost of cultivation was human labour accounting to 24.68 per cent, 24.80 per cent and 24.78 per cent respectively at small, other and pooled farms because most of the operations in maize crop were performed manually (Hanumanthaiah *et al.*, 2004). Next to human labour, fertilizer cost accounted for 14.68 percent and 14.91 per cent of total cost respectively on small farms and other farms. Due to lack of technical know how, most of the farmers applied more quantities of fertilizers than recommended (Chahal and Kataria, 2005). The third important cost incurred was irrigation charges. Even though, the crop was grown as rice fallow, it was given on an average with three

Table 2. Various cost concepts of rice fallow maize

(Rs ha^{-1})

S No.	Particulars	Size of the farm					
		Small farms	% age to total	Other farms	%age to total	Pooled	% age to total
1	Cost A_1	30823.23	63.30	35713.41	68.46	34323.02	67.10
2	Cost A_2	35389.56	72.67	39550.21	75.81	38351.02	74.97
3	Cost B_1	36094.97	74.13	40390.93	77.42	39154.92	76.55
4	Cost B_2	41902.63	86.05	46928.93	89.96	45500.92	88.95
5	Cost C_1	38459.51	78.98	40888.33	78.38	40155.01	78.50
6	Cost C_2	44267.17	90.91	47425.52	90.91	46501.01	90.91
7	Cost C_3	48693.88	100.00	52168.07	100.00	51151.11	100.00

Table 3. Productivity, unit cost of production and gross returns in rice fallow maize

S No.	Particular	Small farms	Other farms	Pooled farms
1	Physical yield (qtl ha^{-1})	80.29	85.78	84.59
2	Avg. price qtl^{-1} (Rs ha^{-1})	772.80	780.90	764.07
3	Total cost of cultivation (Rs ha^{-1})	48693.88	52168.07	51151.11
4	Cost of production (Rs qtl^{-1})	606.47	608.16	604.69
5	Gross returns (Rs ha^{-1})	62048.20	66985.78	64633.08

Table 4. Farm business analysis of rice fallow maize

(Rs ha^{-1})

Particulars	Small farms	Other farms	Pooled farms
A. Gross margin	29943.31	32067.86	30560.44
B. Farm business income	31224.97	31272.37	30310.06
C. Owned Farm business income	26658.64	27435.57	26282.06
D. Family labour income	20145.57	20057.66	19132.16
E. Farm investment income	28860.43	30774.97	29309.97
F. Net income	13354.32	14817.71	13481.97

Table 5. Benefit-cost ratios over various cost concepts in rice fallow maize

S.No.	Benefit-cost ratios	Small farms	Other farms	Pooled farms
1	Over cost A_1	0.433	0.415	0.392
2	Over cost A_2	0.377	0.375	0.351
3	Over cost B_1	0.369	0.366	0.344
4	Over cost B_2	0.318	0.315	0.296
5	Over cost C_1	0.347	0.362	0.335
6	Over cost C_2	0.301	0.312	0.289
7	Over cost C_3	0.274	0.284	0.263

Table 6. Ranks assigned to the constraints faced by farmers in maize production

S. No.	Constraint	$\sum Rj$	Mean rank	% age to total
1	Non availability of good quality seed	516	4.3	8.33
2	High cost of fertilizers and pesticides	247	2.06	37.5
3	High wage rate of labour	416	3.47	12.5
4	Non availability of credit	303	2.52	29.16
5	Forced sales for debt payment	399	3.32	20.83

k_C = Kendall's Coefficient= 0.025

$\chi^2_{cal} = K (n-1) K_c = 12.14$

χ^2_{tab} 4 d.f. =9.488

surface irrigations using diesel pump sets. The charges towards irrigation were shared almost equally between human and machine labour.

From the Table 2 it is clear that all the cost concepts analyzed have shown direct relationship with the farm size. The range of difference between the cost concepts indicates that various hidden operational and management functions of the sample farmers over and above the total cost components shown in the Table 1.

The difference between cost A_1 and A_2 reveals that some of the sample farmers (38 per cent) are tenants, who has paid rent for leased-in land. The difference between the cost A_2 and B_2 indicates the rental value imputed for the owned land of the sample farmers. Similarly, the difference of cost B_2 and C_2 shows the imputed value of family labour employed in the cultivation. The cost C_3, the commercial indicator for cost of cultivation reveals all the physical and imputed costs including the management component/ input (10 per cent of cost C_2) of the sample farmers.

It was observed that the productivity of the rice fallow maize has a direct relationship with the farm size. The productivity per hectare was 80.29 qtls for small farms, 85.78 qtls for other farms and 84.59 qtls for pooled farms. The cost of production per quintal was worked out as Rs.606.47, Rs.608.16 and Rs.604.69 on small farm, other farm and pooled farms respectively. Table. 3 reveals that on an average the gross returns are 20 per cent above the total cost per ha and the break even output of the

crop is 66.94 qtls per ha according to cost C_3 concept (Raghunadha Reddy, 2007)

The farm business income, owned farm business income, farm investment income and net income showed direct relationship with farm size except family labour income. Family labour income was comparatively more in case of small farms because the farmers of small farms were directly engaged in field operations. However, the gross margin (satisfactory indicator with all the sample farmers) is Rs.30560.44 at pooled farms indicating money left with farmers after variable costs. All the income measures presented in Table. 3 indicates that the medium and large farms realized better returns compared to the small farmers revealing not only the material and labour intensive nature of the crop but also the managerial input by the sample farmers. (Raghunadha Reddy 2007).

The benefit-cost ratio was comparatively high over cost A_1 when compared with all cost concepts with 0.433 at small farms, 0.415 at other farms and 0.392 at pooled farms, which is generally considered as profits by the sample farmers. The benefit-cost ratio over cost C_3 was 0.274 on small farms, 0.284 on other farms and 0.263 on pooled farms, indicating overall profitability in maize cultivation (Table 5).

The χ^2 calculated value of Kendall's Coefficient of Concordance (12.14) was greater than the table value (9.488) at 5 per cent level of significance. The ranking given to the constraints like high cost of fertilizers and pesticides, non-availability of credit in time and farmers are forced to sell their produce for debt payment reveals that these were the major problems faced by the maize growers.

Conclusions

From the above study it was found that the, total cost of cultivation showed a direct relation with farm size. Hired human labour, fertilizers and irrigation charges are the major costs in maize cultivation and account for nearly 50% of the total cost. Human labour utilization and machine labour utilization increased with increase in farm size. Both gross returns and net returns were more at medium and large farms compared to small farms. The income measures and the benefit cost ratios indicated that the rice fallow maize cultivation is profitable with all the cost components. High cost of fertilizers and pesticides, non-availability of credit in time and forced sales for debt payment were major constraints in maize production.

Suggestions

The Department of Agriculture and other R&D institutions of Agriculture have to tackle the problem of low productivity by developing and disseminating the production technologies at the field level. The government may increase subsidy on fertilizers to reduce the cost of fertilizers and also ensure the quality of pesticides to reduce the cost of production. Proper credit facilities especially for *rabi* grown maize should be given to provide financial support thereby increasing risk bearing capacity of the sample farmers.

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