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Comparison of Cost And Returns of Major Food Crops Under Central Dry Zone of Karnataka

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Abstract: *A study was carried out for comparison of cost and returns of major food crops under rainfed condition and bore well situation in Central Dry Zone of Karnataka (CDZ) in 2014-15. In CDZ, paddy, ragi, maize and groundnut are the major crops. To analyse cost and returns, the techniques such as tabular method with percentage, numbers and market approach were used. Random sampling technique was employed in the selection of 90 farmers for the study, which comprises of 45 irrigated farmers and 45 rainfed farmers. The secondary data regarding area, production and productivity data of the madhugiri taluk of Tumakuru district were collected from the district website for the year 2013–14 for sample selection based on area dominance. The study showed that cost and net returns for borewell irrigated paddy were Rs. 56225 ha^{-1} and Rs. 34091 ha^{-1}, respectively. Among these crops, cost of cultivation was higher in rainfed and borewell irrigated groundnut (Rs.47274 ha^{-1} and Rs.51619 ha^{-1}), respectively. The net returns realised under rainfed and borewell irrigated maize was found to be more i.e., Rs.11570 ha^{-1} and Rs.31405 ha^{-1}, respectively. Whereas, in case of ragi, net returns under rainfed condition was Rs. -2440 ha^{-1} and in irrigated condition it was Rs.13552 ha^{-1}. Comparison reveals that, the cost and net returns of all crops in CDZ were more than the Cost of Cultivation Scheme (CCS) estimates for Karnataka due to higher productivity of crops in Tumakuru district (CDZ) except in rainfed ragi (Rs.-2440 ha^{-1}).*

Keywords: *Central Dry Zone, cost and net returns, rainfed situation, borewell*

I. Preamble

Agriculture continues to play an important role in the Indian economy. Around 53% of its population depends on this sector (Anonymous, 2015). Agriculture and allied sectors contributes 13.9% of the total gross domestic product and accounted for 263.2 million tonnes food grain production in 2013 (Anonymous, 2014). Agriculture in India is still predominantly dependents on the vagaries of monsoons as larger percentage of the cultivable land is under dry farming (Anonymous, 2013a).The total availability of land for cultivation is 142 mha, of this total cultivated area of 142 mha., 97 mha. is rainfed (68%). India's irrigation potential increased from 22.6 mha. to 90 mha., but water usage efficiency is to too little i.e. only 30% (Patil Ashish et al.,2013). The monsoon instability adds to the variability in crop yields, prices etc. and thus cause high degree of variability in the net farm returns.

The study of cost and returns is a major economic analysis because the estimation of product cost is useful in decision-making process at farm level. Knowing the profitability of the individual products can help in planning of future production. Fixed as well as variable costs are also used to evaluate the profitability of the product as well as, determine the optimal production process and also helps to take pricing decisions (Luca Cesaro et al., 2008). The Central dry zone of Karnataka which covers an area of 19.43 mha with an annual rainfall of 453–717 mm of which 55% is received in kharif season (Anonymous, 2013b). The major crops grown in central dry zone are paddy, ragi, maize, groundnut, pulses and minor millets. Water is a crucial natural resource and its increasing scarcity is affecting crop production, efficient use, management and sustainability.

In view of the importance of agriculture in the economy, accurate and latest information on cost of cultivation of crops is crucial for policy formulation. Crop-wise information on costs and returns is useful for farmers in efficient allocation of scarce resources which is also useful to organizations closely related to agricultural sector. This study is aimed at exploring comparison of cost and profitability of crops in general and in CDZ of Karnataka through market approach.

II. Methodology

The present experiment was carried out in Tumakuru district in CDZ of Karnataka during 2014-15, for comparison of cost and returns of major food crops under rainfed condition as well as bore well situation in Central Dry Zone of Karnataka (CDZ). For the purpose of the study the economic important crops were selected. The major crops grown in this district includes ragi, maize, groundnut, redgram and horsegram in rainfed situation and majorly paddy under irrigated condition. Groundnut is the important commercial crop in

the study area. Random sampling technique was employed in the selection of 90 farmers for the study, which comprises of 45 irrigated farmers and 45 rainfed farmers.
The secondary data regarding area, production and productivity of the Madhugiri taluk of Tumakuru district were collected from the district website (Anonymous, 2013c) for the year 2013–14 for sample selection based on area dominance.

2.1 Analytical tools employed

Costs and returns Analysis

To work out the cost of cultivation of different crops in Karnataka, data was collected for the year Triennium Ending (TE) 2010–11 from the cost of cultivation scheme, Karnataka. The time series and panel data from 450 farmers belonging to 45 taluks in Karnataka for the three years 2008-09, 2009-10, 2010-11 is the latest data base. Using the relevant codes, farmers were divided into rainfed, borewell irrigated, canal irrigated conditions. The data were provided by Directorate of Economics and Statistics through the Comprehensive Scheme for study of Cost of Cultivation (CCS), Karnataka. Hence the cost and net returns according to market prices have been worked out as under:

In the first step, the crop wise Cost A2 plus imputed value of family labour ha^{-1} which includes cost of seeds, fertilisers, manure, human labour (hired, attached and family), animal labour (hired and family), machine labour (hired and family), cost of canal irrigation (as water rate if any paid to Government), since in CDZ canal irrigated farmers not found in sample data therefore it is not considered in analysis part, plant protection chemicals, interest on working capital @12.5 % for the duration of crop, all these costs were categorized under variable costs. Fixed costs were defined to include land revenue, taxes, cesses, depreciation on implements and farm buildings. Since the farmers are not paying for electricity in the case of tube (bore) well irrigated crops, the pumping expenditure is estimated.

In the second step, crop wise gross returns hactare which includes value of main product and bi-product is considered. In the third step, the net returns according to market prices is worked out as gross returns minus cost A2 plus imputed value of family labour (Rohith, et al., 2015) In case of crops irrigated by borewell, the energy cost for each borewell irrigated crop was computed by using the following formula. Number of irrigation pumpset run hours for the crop area for one irrigation×number of irrigations $month^{-1}$×number of months of the crop×HP of the pumpset×0.75 (conversion factor)× Rs.3.5.

III. Results And Discussion

The above study reveals that per hectare cost of rainfed ragi cultivation was Rs. 38023 whereas, it was Rs. 46319 under borewell irrigated situation (Table 1).Out of the total cost , Variable cost forms the major portion in the total cost. It is observed that, in both the cases labour cost accounted for 35% of total cost of cultivation indicating that cultivation of ragi is labour intensive. Of the total variable cost, major cost was incurred on human labour (Jimjel et al., 2015) followed by cost on machine labour under both rainfed situation and borewell irrigated situation. Rainfed farmers realized negative net returns (Rs.-2400 ha^{-1}) because of high cost of cultivation and poor yield. The returns per rupee of expenditure in case of irrigated ragi was (1.29) and in case of rainfed groundnut was (0.94) (Ramarao, 2012), indicating that cultivation of ragi under rainfed condition is not profitable (Narayanamoorthy, 2013). However, Karnataka has more area under rainfed situation than irrigated situation (Ravi, 2015). Hence, there is a need to make ragi profitable by revising the minimum support price of ragi which helps in inducing farmers to cultivate more ragi and also helps to increase the productivity.

Groundnut is the major oilseed crop, grown under both rainfed and borewell irrigated conditions in Tumkur district of CDZ of Karnataka. The total cost of cultivation of groundnut was Rs. 47274 ha^{-1} and Rs.51619 ha^{-1} in case of rainfed and irrigated conditions, respectively (Table 2). Among the components of variable cost, the major cost was on human labour accounting for 27% and 29% in case of rainfed and irrigated conditions, followed by seed cost in both rainfed (16%) and irrigated conditions (14%), because of high price. There is intensive use of labour in both situations (Thennarasu and Banumathy ,2011). Farmers use higher seed rate in rainfed condition because of germination problem. The returns per rupee of expenditure was higher in case of irrigated groundnut (1.33) compared to rainfed groundnut (1.11) due to differences in cost of cultivation and yield under the two situations.

The details of per hactare cost and returns in maize cultivation indicated that, total cost of cultivation was worked out to be Rs. 41398 ha^{-1} and Rs.49577 $ha^{-1,}$ respectively under rainfed and borewell irrigated situations (Table 3). Maize cultivation under borewell irrigated condition was expensive compared to rainfed situation. Borewell irrigated maize cultivation fetched a higher net income of Rs. 31405 ha^{-1} whereas net returns from rainfed maize cultivation was Rs. 11570 ha^{-1}, because of the yield differential. Among the total variable cost items, proportion of labour and machine cost were found to be more to the extent of 30.71% and 14.10%, respectively in rainfed situation, In case of borewell irrigated condition proportion of labour and fertilizer cost were also found to be more to the extent of 27% and 14%, respectively. We can see the intensive use of labour

in both the situations. The findings of the study are in line with the results Vinaya kumar et al., (2008). In case of borewell irrigated maize, farmers go for hybrid varieties to get higher yield and hybrid varieties are more fertilizer responsive in irrigated condition (Chahal and Katariya, 2005).

The cost of cultivation of borewell irrigated paddy was given in the Table 4. Per hactare cost of borewell irrigated paddy was Rs. 56, 225. Out of the total cost, variable cost forms major proportion. The human labour cost (29%) also constituted the major cost followed by irrigation cost (14.10%) together accounting 43% of the total cost. These results are in conformity with the results of Devi and Ponnarasi (2009). Human labour is the most essential input in paddy cultivation (Lal and Sharma, 2006). Out of total cost, machine cost accounts 11% because of its usage for land preparation and threshing. The prominent cost associated with borewell irrigated paddy cultivation included the energy cost for pumping water which accounts for about 14% in total cost. Cultivation of paddy in borewell irrigated situation is found to be profitable with total gross return of Rs. 90316 ha^{-1} and net returns of Rs.34091 ha^{-1}. The returns per rupee of expenditure from paddy cultivation was found to be 1.61.

The comparison of cost of cultivation of various crops in Tumakuru district with cost of cultivation scheme (CCS) estimates of Karnataka state is given in the Table 5. The district level data was compared with State level cost of cultivation scheme (CCS) data. The results revealed that, net returns were found to be higher in case of borewell irrigated paddy, maize, groundnut, ragi and in case of rainfed maize at Rs. 34091 ha^{-1}, Rs. 31405 ha^{-1}, Rs. 17131 ha^{-1}, Rs. 13552 ha^{-1} and Rs. 11570 ha^{-1}, respectively. This comparison reveals that, the cost and net returns of all crops cultivated in Tumakuru district were more than CCS estimates for Karnataka due to higher productivity of crops in Tumakuru district except in rainfed ragi (Rs. -2440 ha^{-1}). The net returns of ragi farmers in Tumakuru district are 91% lower than that of the Karnataka state average. This shows that farmers cultivating ragi were losing Rs. 2440 ha^{-1}. Hence there is a need to revisit the methodological part of estimating MSP to appreciate whether all the costs are considered (Rohith et al.,). For other crops, difference in net returns between Tumakuru district and Karnataka state ranged from 3–59%. Thus, there is a great scope to cultivate ground nut under both borewell irrigated condition and rainfed situation, where farmers realized the higher net returns in both Tumakuru and Karnataka state (Figure 1).

IV. Conclusion And Policy Implications

The economic performance of crop cultivation by farmers is greatly influenced by input prices valued at market prices. It is uneconomical to cultivate rainfed ragi, at market prices in Central Dry Zone. Thus, rainfed ragi needs to be supported by input subsidy and output price support and CCS needs to substantially modify its methodology to appropriately and scientifically cost the resources.

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Table 1: Cost of cultivation of rainfed and borewell irrigated ragi in Tumakuru district (2014–15) (Rs. ha^{-1})

Sl. No.	Particulars	Rainfed	Percentage to total cost	Borewell iriigated	Percentage to total cost
I	**Variable costs (Rs.)**				
1	Human labour	13349	35.11	15631	33.75
2	Bullock labour	4460	11.73	6575	14.20
3	Machine labour	5500	14.46	6835	14.76
4	Seed	288	0.76	358	0.77
5	FYM	4526	11.90	4618	9.97
6	Fertilizer	5017	13.19	5008	10.81
7	Plant Protection Chemicals	112	0.29	536	1.16
8	Irrigation charges	0	0.00	940	2.03
9	Miscellaneous	2422	6.37	2314	5.00
10	Interest on working capital @12.5%	1486	3.91	1784	3.85
	Total variable cost	37160	97.73	44599	96.29
II	**Fixed costs (Rs.)**		0.00		0.00
1	Depreciation	848	2.23	1695	3.66
2	Land revenue	15	0.04	25	0.05
	Total fixed cost	863	2.27	1720	3.71
III	**Total cost of cultivation**	38023	100.00	46319	100.00
IV	**Returns**				
	Main product quantity (Qtl)	17.78		28	
	Main product value (Rs.)	28961		50759	
	By product (Rs.)	6623		9112	
	Gross returns (Rs.)	35583		59871	
	Net returns (Rs.)	-2440		13552	
	Cost of production (Rs. Qtl^{-1})	2138		1666	
V	**Returns $rupee^{-1}$ of expenditure**	0.94		1.29	

Table 2: Cost of cultivation of rainfed and borewell irrigated groundnut in Tumakuru district (2014–15) (Rs. ha^{-1})

Sl. No.	Particulars	Rainfed	Percentage to total cost	Borewell iriigated	Percentage to total cost
I	**Variable costs (Rs.)**				
1	Human labour	12951	27.40	15125	29.30
2	Bullock labour	5040	10.66	4857	9.41
3	Machine labour	6977	14.76	7107	13.77
4	Seed	7465	15.79	7214	13.98
5	FYM	4552	9.63	3661	7.09
6	Fertilizer	6138	12.98	6500	12.59
7	Plant Protection Chemicals	351	0.74	732	1.42
8	Irrigation charges	0	0.00	1103	2.14
9	Miscellaneous	1041	2.20	1865	3.61
10	Interest on working capital @12.5%	1636	3.46	2043	3.96
	Total variable cost	46151	97.62	50207	97.26
II	**Fixed costs (Rs.)**				
1	Depreciation	1108	2.34	1387	2.69
2	Land revenue	15	0.03	25	0.05
	Total fixed cost	1123	2.38	1412	2.74
III	**Total cost of cultivation**	47274	100.00	51619	100.00
IV	**Returns**				
	Main product quantity (Qtl)	13		22.5	
	Main product value (Rs.)	47264		61250	
	By product (Rs.)	5196		7500	
	Gross returns (Rs.)	52460		68750	
	Net returns (Rs.)	5186		17130	
	Cost of production (Rs. Qtl^{-1})	3769		2294	
V	**Returns $rupee^{-1}$ of expenditure**	1.11		1.33	

Table 3: Cost of cultivation of rainfed and borewell irrigated maize in Tumakuru district (2014–15) (Rs. ha^{-1})					
Sl. No	**Particulars**	**Rainfed**	**Percentage to total cost**	**Borewell iriigated**	**Percentage to total cost**
I	**Variable costs (Rs.)**				
1	Human labour	12713	30.71	13169	26.6
2	Bullock labour	3339	8.07	3328	6.7
3	Machine labour	5839	14.10	6003	12.1
4	Seed	2948	7.12	4332	8.7
5	FYM	5060	12.22	6106	12.3
6	Fertilizer	3884	9.38	6857	13.8
7	Plant Protection Chemicals	380	0.92	960	1.9
8	Irrigation charges	0	0.00	1470	3.0
9	Miscellaneous	2610	6.30	3577	7.2
10	Interest on working capital @12.5%	1683	4.07	1927	3.9
	Total variable cost	40253	97.23	47729	96.3
II	**Fixed costs (Rs.)**				
1	Depreciation	1130	2.73	1848	3.7
2	Land revenue	15	0.04	25	0.1
	Total fixed cost	1145	2.77	1873	3.8
III	**Total cost of cultivation**	41398	100	49577	100.0
IV	**Returns**				
	Main product quantity (Qtl)	38.83		55.78	
	Main product value (Rs.)	47116		73572	
	By product (Rs.)	4706		7410	
	Gross returns (Rs.)	51822		80982	
	Net returns (Rs.)	11570		31405	
	Cost of production (Rs. Qtl^{-1})	1066		889	
V	**Returns rupee^{-1} of expenditure**	1.25		1.63	

Table 4: Cost of cultivation of borewell irrigated paddy in Tumakuru district (2014–15) (Rs. ha^{-1})			
Sl. No	**Particulars**	**Borewell irrigated**	**Percentage to total cost**
I	**Variable costs (Rs.)**		
1	Human labour	16356	29.09
2	Bullock labour	4315	7.67
3	Machine labour	6260	11.13
4	Seed	2373	4.22
5	FYM	4539	8.07
6	Fertilizer	6116	10.88
7	Plant Protection Chemicals	615	1.09
8	Irrigation charges	7930	14.10
9	Miscellaneous	3320	5.90
10	Interest on working capital @12.5%	2159	3.84
	Total variable cost	53983	96.01
II	**Fixed costs (Rs.)**		
1	Depreciation	2217	3.94
2	Land revenue	25	0.04
	Total fixed cost	2242	3.99
III	**Total cost of cultivation**	56225	100.00
IV	**Returns**		
	Main product quantity (Qtl)	55	
	Main product value (Rs.)	81939	
	By product (Rs.)	8377	
	Gross returns (Rs.)	90316	
	Net returns (Rs.)	34091	
	Cost of production (Rs. Qtl^{-1})	1022	
V	**Returns rupee^{-1} of expenditure**	1.61	

Table 5: Comparison of cost of cultivation and net returns of sample data with the CCS estimates for the year 2014– 15 (Rs. ha^{-1})

Crops	Tumakuru District			Karnataka State			Percentage change for Tumukuru district over Karnataka State		
	Total cost (Rs.)	Gross returns (Rs.)	Net returns (Rs.)	Total cost (Rs.)	Gross returns (Rs.)	Net returns (Rs.)	Total cost (%)	Gross returns (%)	Net returns (%)
Rainfed crops									
Maize	41398	51822	11570	15671	26921	11250	62	48	3
Ragi	38023	35583	-2440	18008	17800	-208	53	50	91
Groundnut	47274	52460	5186	15006	18595	3589	68	65	31
Borewell irrigated crops									
Paddy	56225	90316	34091	29819	60150	30331	47	33	11
Maize	49577	80982	31405	18022	36061	18039	64	55	43
Ragi	46319	59871	13552	21021	29692	8671	55	50	36
Groundnut	51619	68750	17131	18171	25186	7015	65	63	59

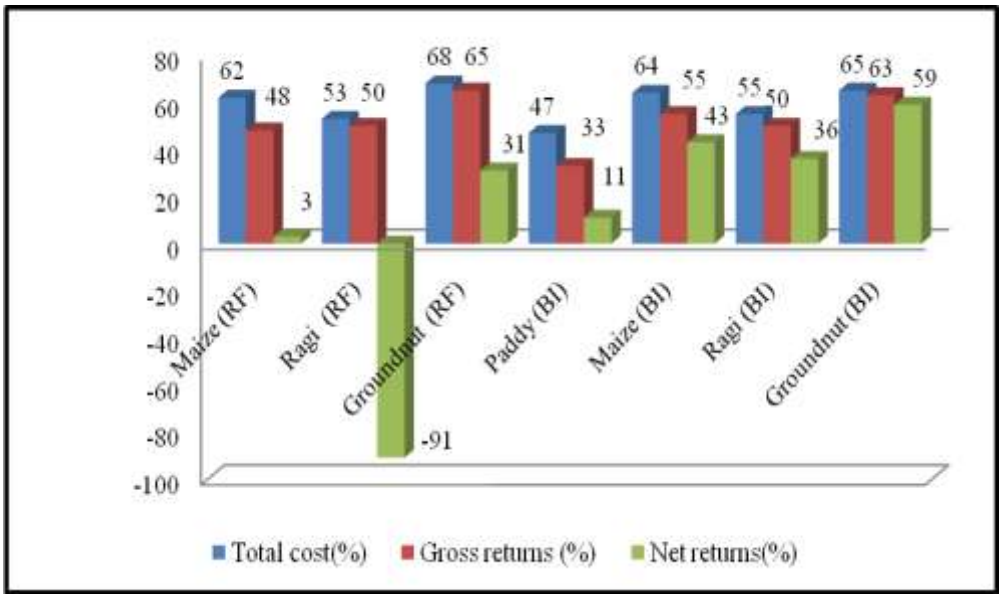

Figure 1: Deviation in total cost, gross returns and net returns of crops in Central Dry Zone from CCS estimates for Karnataka state (%)