IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 10, Issue 10 Ver. II (October 2017), PP 24-29
www.iosrjournals.org

Cost- Returns Analysis and Marketable Surplus of Ragi in Central Dry Zone of Karnataka

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Abstract: *A study was carried out to explore the cost and returns of ragi under rainfed condition and irrigated situation in Central Dry Zone of Karnataka (CDZ) in 2015-16 and its marketable surplus. To analyse cost and returns; and marketable surplus, the techniques such as tabular method with percentage and numbers were used. Random sampling technique was employed in the selection of 160 farmers for the study, which comprises of 45 irrigated farmers and 45 rainfed farmers in Tumakuru and Hassan districts of Karnataka, as they are the major ragi growing districts of Karnataka. The study showed that cost structure for rainfed and irrigated ragi were Rs. 45,979 and Rs. 57,904 respectively. Yield was higher in irrigated (28.50 q/ha) compared with rainfed situation (1700 q/ha). Per hectare gross returns were Rs. 41,075 and Rs.64,428 in rainfed and irrigated ragi cultivation, respectively. Rainfed ragi received marginally lesser price (Rs. 1850 per quintal) than irrigated ragi (Rs. 1,900 per quintal). Marketable surplus of ragi was more in irrigated (43.59 %) situation compared to the rainfed (39.45 %) situation. Hence, the researchers and University scientists need to develop a new ragi varieties which are high yielding and short duration crop and it can withstand drought in order to attain higher returns.*

Keywords: *Cost and net returns, rainfed situation, irrigated situation, marketable surplus, Central Dry Zone (CDZ).*

Date of Submission: 28-09-2017 Date of acceptance: 23-10-2017

I. Introduction

Agriculture is the backbone of Indian economy. Around 53 per cent of its population depends on this sector (Anonymous, 2015). Agriculture and allied sectors contributes 13.9 per cent of the total gross domestic product and accounted for 263.2 million tonnes food grain production in 2013 (Anonymous, 2014). India accounts for 2.4 per cent of the world geographical area and has to feed about 17 per cent of the population in the world. The challenges have been emerging on Indian agriculture to meet the food requirement of increasing population. Hence, accelerating the growth of agriculture production is necessary not only to meet the rising demand for food, but also to increase incomes of those dependent on agriculture to ensure inclusiveness.

Rainfed farming contributes to 42 per cent of the total food grain production in the country. Minor millets, pulses and oilseeds are being predominantly cultivated in rainfed areas. This scenario clearly reflects the role of rainfed agriculture in sustaining the food and fodder security of the nation. Karnataka is the largest producer of finger millet in India. In Karnataka, it is mainly grown in Bengaluru Urban, Bengaluru Rural, Ramanagara, Kolar, Mysuru, Mandya, Hassan, Tumakuru and Chikkamagalore districts. In Karnataka, finger millet is grown in an area of 6.80 lakh ha, with an annual production of 12.72 lakh tonnes and productivity of 1955 kg per hectare (DES, 2011-12).

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. The administrators and policy planners are the prime users of cost of cultivation data for policy formation and recommendation. The cost of cultivation survey is statistically well planned so that the required information can be obtained efficiently and precisely. It is appropriate to mention that due to the changes taking place at the global level, the importance of cost of cultivation data has increased manifold. This is attributable to the

phenomenon of global competitiveness which implies that those who are efficient and can produce the crops at competitive prices will survive in the market. This study is aimed at exploring cost and profitability of ragi and its marketablesurplus in central dry zone of Karnataka.

II. Methodolgy

The study was conducted in Tumakuru and Hassan districts of Karnataka, as they are the major ragi growing districts of Karnataka. Simple random sampling technique was employed for the selection of 80 sample farmers in each district, comprises of 40 rainfed and 40 irrigated ragi growing farmers, thus takes the total sample size of 160.

a. Nature and sources of data

The primary data was collected from 160 selected sample farmers. General information regarding socio-economic status, size of land holdings, livestock inventory, costs and returns of ragi crop, traits preferred by producers and consumers and also the relevant data on variables required for evaluating the objectives of the study was collected from the sample farmers using pre-tested and well-structured schedule through personal interview method.

b. Analytical tools and techniques employed

Estimation of costs and returns

The costs were classified into variable and fixed costs. Variable cost includes cost of inputs (seed, FYM, fertilizer), labour cost and interest on working capital. Fixed cost includes depreciation on farm implements, rental value of land and interest on fixed farm implements. The measurement and definitions of various cost components are as follows,

Variable cost

Those costs which vary with the level of production were included in this category. The items included under this section are given below.

a) Labour cost

The cost on human labour was calculated by multiplying the man days with existing wage rate. Women days were converted into man days by multiplying it with the ratio of wages given to women labour to that of men labour (0.75). The cost on family labour was imputed by multiplying man days with the prevailing wage rate. The bullock labour was taken in pair days and the cost towards it was estimated by multiplying pair days with wage rate. Machine labour was measured in hours and valued at prevailing hourly rates in the study area.

b) Cost of inputs

Cost of various inputs like seeds, fertilisers, and FYM were included in this category. Non-farm inputs were valued at prevailing prices while owned farm inputs were imputed at current prices.

c) Irrigation cost

The cost of electricity (subsidy by Government) to lift the water from bore well was calculated using the following formula (Rs. 3.5 is the cost of electricity per KWH),

Electricity charges =No. of irrigations x No. of hours irrigated per irrigation x Area x hp of motor x 0.75 KWH x 3.5 per KWH.

Amortization cost of bore well, pump and conveyance structure was calculated using the formula,

Amortized cost = Initial investment x $[(1+i)^{AL}x\ i\ ] \div [(1+i)^{AL}–1]$,

Where, AL- Average life of bore well, pump and other assets.

i - Discounting rate of interest.

Thus, Irrigation cost was obtained by the summation of electricity charges and amortization cost.

Irrigation cost = Electricity charges + Amortized cost

d) Interest on working capital

The prevailing bank rate of eight per cent (Commercial bank lending rate in study area) was taken to work out the interest on working capital for the duration of the crop.

Fixed cost

This consists of those cost items which do not vary with the level of production. The items included under this section were,

a) Rental value of land

The prevailing rental value of the land for the crop depending on the duration of the crop was considered.

b) Depreciation

Depreciation on each capital equipment and machinery owned by the farmers were calculated separately, by using straight line method. The average life of the asset as indicated by each farmer was used in computation of the depreciation.

c) Interest on fixed capital

Interest on fixed capital was computed at the rate of ten per cent per annum. The interest was worked out on the values of fixed assets, after deducting depreciation for the year.

d) Land revenue and taxes

Land revenue and taxes was charged at the rates levied by the government.

e) Total cost

Total cost is the summation of total variable cost and total fixed cost.

Returns

a) Gross return

Gross returns including the gross value of main product and by product imputed on the basis of post-harvest prices prevailing in the study area.

b) Net returns over total cost

Net return was computed by subtracting the total cost of cultivation from gross returns.

c) Cost of production per quintal

Cost of production per quintal was worked out by dividing total cost of cultivation by the yield of main product.

d) Returns per rupee of expenditure

Return per rupee of expenditure was calculated by dividing the gross return by total cost.

III. Results And Discussion

a. Cost and returns of rainfed and irrigated ragi cultivation

The details on the costs incurred on variable and fixed factors in rainfed and irrigated ragi production are presented in Table 1 and Table 2, respectively. It can be observed from the tables that, the average working expenses incurred in rainfed and irrigated ragi cultivation was Rs. 37,957 per ha and Rs. 50,811 per ha, respectively. Working expenses constituted about 86.85 per cent and 87.80 per cent in rainfed and irrigated ragi cultivation, respectively.

In rainfed ragi cultivation, the major cost item in variable cost was the cost on human labour (31.12 %) followed by cost on FYM (15.70 %), machine labour (12.81 %), fertilizer (10.26 %) bullock labour (9.15 %) and interest on working capital (6.82 %). Out of the total variable cost, 53.08 per cent was incurred only on the labour (Jimjel *et al.* 2015), indicating that cultivation of ragi is labour intensive (Lal and Sharma, 2006).

This was clearly indicated that human labour was the most important input in ragi cultivation which is mainly required for activities such as sowing/transplanting, weeding, harvesting and post-harvest operations (threshing, cleaning and bagging). In irrigated ragi cultivation expenditure on human labour (31.79 %), followed by cost on machine labour (14.20 %), FYM (12.96 %), fertilizer cost (8.53 %), bullock labour (6.26 %), interest on working capital (6.51 %), irrigation (6.05 %) were found to be major costs. The results are in contrary with the study conducted by Paraveen and Banafar (2013).

Fixed costs accounted for 13.15 per cent and 12.20 per cent of the total cost of cultivation in rainfed and irrigated ragi cultivation. Among fixed cost, rental value of land was major chunk in both rainfed (9.15 %) and irrigated (8.64 %) ragi cultivation. The average fixed cost was found to be Rs. 5,749 per ha and Rs. 7,063 per ha in rainfed and irrigated ragi cultivation, respectively.

The average cost of cultivation of rainfed ragi and irrigated ragi was Rs. 43,706 and Rs. 57,874 per hectare, respectively. Cost of cultivation was found to be higher in irrigated situation compared to rainfed situation, because of more labour, FYM, fertilizer use and irrigation cost. Of total cost of cultivation, variable cost forms the major chunk in the total cost of cultivation, whereas fixed cost forms meager proportion indicating that ragi cultivation is less capital intensive.

Returns from ragi cultivation

The gross return includes returns from main product (grain) as well as by-product (straw) and the details were presented in the Table 3 and Table 4. The average grain yield obtained per hectare under rainfed and irrigated situation was 17 quintals and 28.50 quintals, respectively. Per hectare gross returns were Rs. 41,075 and Rs. 64,428 in rainfed and irrigated ragi cultivation, respectively. The results indicating that, yield was high in irrigated situation compared to rainfed situation which was mainly because of the management practices like maintaining optimum plant spacing, use of fertilizer, FYM and timely irrigation. Irrigated ragi also fetched higher price compared to rainfed ragi because of off season production and produce will be ready for sale during the month of February to March because of market arrivals are less in these time periods, resulting in high price for the produce.

The analysis of net return from ragi cultivation revealed that the net return per hectare was negative *i.e.* Rs. 2,631 per hectare under rainfed cultivation, whereas, the net return was Rs.6,554 per hectare under irrigated ragi

cultivation. Rainfed farmers realized negative net returns because of higher cost of cultivation and also very low yield. In spite of loss, farmers continue to persist with ragi mainly for the purpose of consumption and for the quantity and quality of the fodder that it provides. The cost of production was high in rainfed ragi cultivation (Rs. 2,570 per quintal) compared to that of irrigated ragi cultivation (Rs. 2,030 per quintal) due to low yield in rainfed situation.

The rate of return per rupee of expenditure incurred in rainfed and irrigated ragi cultivation was found higher in case of irrigated (1.11) condition than in rainfed situation (0.94). (Ramarao, 2012), indicated that cultivation of ragi under rainfed condition was not profitable (Narayanamoorthy, 2013). Cultivation of ragi is profitable in irrigated situation but Karnataka has more area under rainfed situation than irrigated situation, hence there is a need to make ragi profitable by revising the minimum support price of ragi which helps in inducing farmers to grow more. Negative net return is also one of the reasons for the decrease in area under ragi in both the study districts in particular as well as Karnataka in general.

Marketable surplus of ragi

Marketable surplus of ragi under rainfed and irrigated situation is represented in the Table 5. Total quantity of ragi produced in the study area was 1370 quintal in rainfed situation and 1068 quintal in case of irrigated situation. More than half of the total production was used for family consumption (57.26 % in case of rainfed situation and 54.31 per cent in case of irrigated situation). In the study area, farmers have adopted kind payment mechanism, 45 quintal of ragi in rainfed and 22.50 quintal in irrigated situation was used as payment in kind to the labours used in different activities. Since ragi is the staple diet in the study area, labours prefer to accept their wages in the form of kind. None of the farmers used ragi as seed material for the next year because they were buying seeds from the nearest Raitha Samparka Kendra's (RSK's) and to some extent from neighbors. It indicates that, seed replacement was 100 per cent in the study area.

Marketable surplus of ragi was more in irrigated situation compared to the rainfed situation after meeting the family requirement of farmers. Marketable surplus was 39.45 per cent under rainfed situation and 43.59 per cent under irrigation situation. Marketable surplus was high in irrigated situation compared to rainfed situation which was because of higher yield. More than 60 per cent of the total quantity produced was used for family consumption in rainfed situation, this clearly indicates that, even though ragi was not profitable it was grown for consumption purpose.

IV. Conclusion And Policy Implications

The economic performance of crop cultivation by farmers is greatly influenced by input prices. It is uneconomical to cultivate rainfed ragi in CDZ. Per hectare cost of cultivation of ragi was Rs. 45,979 and Rs. 57, 904 in rainfed and irrigated situations, respectively. Variable costs accounted for about 87 per cent in ragi cultivation indicating that, ragi is not a capital intensive crop. Out of the total cost of cultivation, major cost was incurred on labour in rainfed (55.40%) and irrigated situations (53.18%), respectively indicating that ragi is labour intensive crop. Yield was higher in irrigated (28.50 q/ha) compared with rainfed situation (17.00 q/ha). Marketable surplus of ragi was more in irrigated (43.59 %) situation compared to the rainfed (39.45 %) situation. More than 50 per cent of the produce was used for family consumption. Hence, the researchers and University scientists need to develop a new ragi varieties which are high yielding and short duration crop and it can withstand drought in order to attain higher returns. The existing procurement price for ragi was Rs. 2100 per quintal through Ragi Market Centre (RMC) but the cost of production was Rs. 2570/q under rainfed condition and Rs. 2030/q under irrigated condition. Hence, Government should increase the procurement price at least to cover its cost of production in order to help the farmers to continue to grow ragi under both the situations.

V. Acknowledgement

The Authors wish to thank, farmers for sparing their valuable time in providing precious information and Department of Biotechnology, Ministry of Agriculture, Government of India (Grant No. BT/IC-2/ISCB/Phase-IV/03/RAGI/2014 dated: 23-01-2015) for the financial support for the duration of three years (2015-16 to 2017-18) under Indo-Swiss collaboration in Biotechnology.

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Table 1. Per hectare cost of cultivation of rainfed ragi in the study area

Sl. No.	Particulars	Quantity	Per unit cost (Rs.)	Cost (Rs.)	Per cent share
I	**Variable cost**				
1	Human labour (mandays)	68	200	13600	31.12
2	Bullock labour (pair days)	5	800	4000	9.15
3	Machine labour (hours)	8	700	5600	12.81
4	Seed (kg)	21	20.6	433	0.99
5	FYM (tractor load)	3	2287	6861	15.70
6	Fertilizer cost	-	-	4483	10.26
7	Interest on working capital @ 8 per cent per annum	-	-	2980	6.82
Total variable cost				**37957**	**86.85**
II	**Fixed cost**				
1	Depreciation	-	-	1575	3.60
2	Land revenue	-	-	15	0.03
3	Interest on fixed capital @ 10 per cent per annum	-	-	159	0.36
4	Rental value of land	-	-	4000	9.15
Total fixed cost				**5749**	**13.15**
III	**Total cost of cultivation**			**43706**	**100.00**

Table 2. Per hectare cost of cultivation of irrigated ragi in the study area

Sl. No.	Particulars	Quantity	Perunit cost (Rs.)	Cost (Rs.)	Per cent share
I	**Variable cost**				
1	Human labour (mandays)	92	200	18400	31.79
2	Bullock labour (pair days)	5.18	800	4144	7.16
3	Machine labour (hours)	10.96	750	8220	14.20
4	Seed (kg)	19	18	342	0.59
5	FYM (tractor load)	3	2500	7500	12.96
6	Fertilizer cost	-	-	4939	8.53
7	Irrigation (acre inch)	-	-	3500	6.05
8	Interest on working capital @ 8 per centper annum	-	-	3766	6.51
Total variable cost				**50811**	**87.80**
II	**Fixed cost**				
1	Depreciation	-	-	1850	3.20
2	Land revenue	-	-	25	0.04
3	Interest on fixed capital @ 10 per centper annum	-	-	187	0.32
4	Rental value of land	-	-	5000	8.64
Total fixed cost				**7063**	**12.20**
III	**Total cost of cultivation**			**57874**	**100.00**

Table 3. Per hectare returns from rainfed ragi in the study area

Sl. No.	Returns	Quantity	Price/unit (Rs.)	Total (Rs.)
1	Main product (quintals)	17	1850	31450
2	By product (tractor load)	2.75	3500	9625
3	Gross returns (Rs.)			41075
4	Net returns (Rs.)			-2631
5	Cost of production (Rs. /q)			2570
6	Returns per rupee of expenditure			0.94

Table 4. Per hectare cost of cultivation of irrigated ragi in the study area

Sl. No.	Returns	Quantity	Price/ Unit (Rs.)	Total (Rs.)
1	Main product (quintals)	28.50	1900	54150
2	By product (tractor load)	3.05	3370	10278
3	Gross returns (Rs.)			64428
4	Net returns (Rs.)			6554
5	Cost of production (Rs. /q)			2030
6	Returns per rupee of expenditure			1.11

Table 5. Marketable surplus of ragi under rainfed and irrigated situation in the study area

Particulars	Total quantity produced (q)		quantity used for family consumption (q)		quantity used for kind payment (q)		Quantity used for seed purpose (q)		Marketable Surplus (q)	
	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated
Total	1370.50 (100)	1068.00 (100)	784.50 (57.26)	641.00 (54.31)	45.00 (3.28)	22.50 (2.11)	0 (0.00)	0 (0.00)	540.5 (39.45)	465.5 (43.59)

Note: Figures in parentheses indicate percentages.

Veerabhadrappa Bellundagi Cost- Returns Analysis and Marketable Surplus of Ragi in Central Dry Zone of Karnataka". IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), vol. 10, no. 10, 2017, pp. 24-29.