AN ECONOMIC ANALYSIS OF THE COST STRUCTURE AND CONSTRAINTS OF MAIZE CULTIVATION IN HYDERABAD-KARNATAKA REGION

Abstract

Maize (Zea mays L.) is one of the most ==versatile== emerging crops, with a wide range of adaptation under a multitude of agro-climatic ==conditions.== ==It is== primarily a kharif crop ==(the kharif cropping season is also called as fall harvest season and is from July to October during the south-west monsoon in Indian subcontinent),== with 85 per cent of the ==area under== cultivation ==during kharif season.== After rice and wheat, maize is India's third most important cereal crop. The current study attempts to analyze the cost and return structure of the maize crop in Koppal district of Karnataka state, as well as the marketing costs incurred by 120 maize respondent farmers and the constraints coupled with maize production and marketing. The study concluded that large farmers have incurred higher costs in all the inputs such as seed, farm yard manure (henceforth FYM), fertilizer, plant protection chemicals (henceforth PPCs), human labour and machine labour. For cultural operations, both medium and large agriculture depends on machine labour rather than bullock power. Transportation and packing costs were higher in all farmer categories. The transportation cost varied according to the quantity of produce and the distance between the regulated market and the study area. The maize respondents said that erratic rainfall behaviour was a major production constraint (90.0%), ==whereas lack== of news dissemination was a major marketing constraint, ranking first with 85 per cent.

Kay words: maize, production, marketing, costs, returns, constraints

1. Introduction

Maize (*Zea mays* L.) is one of the most versatile emerging crops showing wider adaptability under varied agro-climatic conditions. Globally, maize is known as the queen of cereals because it has the highest genetic yield potential among the cereals. It is cultivated on nearly 190 million hectares in about 165 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 39.0 per cent in global grain production.

In India, maize is grown throughout the year. It is predominantly a *kharif* crop (the *kharif* cropping season is from July–October during the southwest monsoon) with 85 per cent of the area under cultivation in the season. Maize is the third most important cereal crop in India after rice and wheat. It accounts for around 10 per cent of total food grain production in the country. It was grown over an area of 9.38 million hectares with a production of 28.7 million tonnes during 2017-18 (www.Indiastat.com). In addition to source of staple food for human beings and quality feed for animals, maize serves as a basic raw material as an ingredient to many industrial products which includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries, etc. Karnataka state ranks first in the production of maize in the country followed by Madhya Pradesh Maharashtra, Bihar and Andhra Pradesh. Major maize growing districts in Karnataka are Koppal, Raichur, Davangere, Belgaum, Haveri and Hassan.

The Hyderabad-Karnataka region is one of the most backward regions where agriculture is dependent on rainfall and very less cultivated areas have access to irrigation facilities. In this regard, the majority of arable land is cultivated under rainfed conditions. The present study tries to analyze the cost and return structure of maize crop in rainfed conditions of Koppal district in Hyderabad-Karnataka region of Karnataka state. Marketing costs incurred by maize respondent farmers in the study area were also recorded. The findings of the study are useful to answer the queries concerning the profitability of maize crop in the area under study.

2. MATERIALS AND METHODS

The study was conducted in Koppal district of the Hyderabad-Karnataka region. Hyderabad-Karnataka region comprises six districts *viz.,* Bellary, Koppal, Raichur,

Yadgir, Kalaburagi and Bidar districts. A multistage sampling technique was adopted in the selection of farmers. In the first stage, Koppal district was purposively selected based on the highest area under maize in the region and it has its own problems of production and marketing. Similarly in the second stage, two taluks (taluk is a subdivision of a district consisting of several villages for revenue purposes. It is called tehsil/tahsil in northern and central India) *viz.,* Koppal and Yalburga taluks were selected based on the highest area under maize in the district. The soil and agro-climatic conditions prevailing in the selected taluks were more favorable for growing maize. In the third stage, two villages were selected from each of the selected taluk based on the highest area under maize in consultation with local officials of the Department of Agriculture.

For selection of the sample cultivators, a list of maize growers was prepared from the revenue records of each of the villages. They were grouped into three categories on the basis of their operational holding *viz*., marginal and small farmers (below 5acre), medium farmers (5.01 to 10 acre) and large farmers (above 10.01 acre). 15 farmers from marginal and small category, 10 farmers from medium and 5 large farmers were selected in each village randomly. In all, total 30 farmers were selected from each village from three categories of farms. Thus a total of 120 sample farmers were selected for the study purpose. The tabular method based on means and percentages was employed to work out the costs, returns and problems faced by the farmers in the production and marketing of maize crop.

2.1 ESTIMATION OF COSTS AND RETURNS

The costs were classified into variable and fixed costs. Variable cost includes the cost of inputs (seed, FYM, fertilizer and PPCs), labour cost and interest on working capital. Fixed cost includes depreciation on farm implements, land rent, the rental value of land and interest on fixed farm implements. Total cost is the summation of total variable cost and total fixed cost. Gross return includes the gross value of the main product and by-product imputed based on post-harvest prices prevailing in the selected study area. Net return was computed by subtracting the gross return from the total cost of cultivation. The cost of production per quintal was worked out by dividing total cost by the yield of main product. Return per rupee of expenditure was calculated by dividing the gross return by total cost.

2.2 MARKETING COSTS

The actual marketing charges incurred by the respondents in the marketing of maize were considered for the study period. These marketing costs include the cost of packing, loading and unloading charges, labour charges, transportation costs, commission charges and miscellaneous costs.

3. RESULTS AND DISCUSSION

The costs per acre incurred on variable and fixed inputs in maize cultivation by different categories of farmers have been analyzed and presented in Table 1. The total cost of cultivation was found to be higher in the case of large farmers (₹20,688.0/acre) as they used more inputs and labours in different operations, followed by medium farmers (₹20,240.0/acre) and small and marginal farmers (₹19,651.0/acre). In the total cost of cultivation, the proportion of total variable cost was greater than the share of total fixed cost. The percentage of total variable cost in total cost of cultivation accounted for 78.87 per cent (₹15498.0/acre) for small and marginal farmers, 79.32 per cent (₹16055.0/acre) for medium and 79.64 per cent (₹16476.0/acre) for large farmers. It was attributed to an increasing trend with an increase in the size of land holdings and an increase in material and labour costs. The results are in line with the study conducted by Srikanth *et al*. (2017) and Satapathy *et al.* (2020).

The distribution pattern of operational costs for various inputs indicated that large farmers (₹4770.0/acre) have higher labour costs than medium farmers (₹4642.0/acre) and small and marginal farmers (₹4418.0/acre). The cost of machine labour was calculated to be highest in large farmers (₹3015.0/acre) and followed by medium farmers (₹2841.0/acre) and small and marginal farmers (₹2727.0/acre). Bullock labour cost was highest in the case of small and marginal farmers (₹2600.0/acre) followed by medium (₹2432.0/acre) and large farmers (₹2368.0/acre) as the small and marginal and medium farmers mainly depend on the bullock for various agricultural operations compared to the large farmers. The cost of FYM was the least expensive for small and marginal farmers (₹1520.0/acre). Medium farmers, on the other hand, had the highest fertilizer expenditure (₹1566.0/acre). Large farmers incurred maximum cost on seeds, PPC and interest on working capital.

The farm category-wise analysis indicated that the fixed cost incurred by large farmers was higher (₹4212.0/acre) as compared to medium (₹4185.0/acre) and small farmers (₹4152.0/acre). The large farmers had capacity to purchase and use the machineries compared to the rest of the two categories. Among the different items of fixed costs, land revenue (₹375.0/acre) and rental value of land (₹3000.0/acre) were the same in all categories of farmers. The depreciation cost was more in large farmers (₹525.0/acre) as they owned machineries more than the other category farmers. These results are in line with the study conducted by Choudhri *et al*. (2018) and Jain *et al*. (2019). In the overall costs, the share of variable costs and fixed costs in the total cost of cultivation were 79.28 and 20.72 per cent, respectively.

The aforementioned results indicate that large farmers have experienced higher costs in all inputs such as seed, FYM, fertilizers, PPCs, human labour, and machine labour. For cultural operations, both medium and large farmers rely on machine labour rather than bullock power.

Marketing costs incurred by maize respondent farmers were found to be higher in the large farmer category (₹63.27/quintal) followed by medium (₹62.14/quintal) and small and marginal farmers (₹59.17/quintal) due to higher loading and unloading charges and miscellaneous expenses by large farmers in the study area (Table 2).

The returns structure for maize cultivation in the studied area revealed that all of the parameters, namely main product (16.23 quintals), by product (1.95 tractor load), value of main product (₹31649.0/acre) and value of by product (₹3450.0/acre) were more in large category farmers (Table 3). Marketing cost (₹1027.0/acre), cost of cultivation (₹21715.0/acre) and cost of production per quintal (₹1338.0) also remained higher in large farmers' category than the two other categories of farmers. The gross returns (₹35098.0/acre), net returns (₹13384.0/acre) and returns per rupee of expenditure (1.61) were more in large farmers as compared to medium and small and marginal farmers. The results are in line with the study conducted by Srikanth *et al*. (2017). The returns per rupee spent were higher in large farmers (1.61) as compared to medium (1.59) and small and marginal farmers (1.58), because the large farmers had more quantity of the produce to sell in the market which allowed them to bargain for the better price and they use more quantity of inputs than the small and marginal and medium farmers.

The production constraints experienced by maize respondent farmers in the study area were revealed in Table 4 as erratic rainfall behaviour was the major constraint identified by the maize respondents (90%) since the study area Koppal district is located in the Northern Dry Zone of Karnataka state. The high cost of inputs was the second major constraint opined by the maize farmers (87.5%) followed by non-availability of credit for the production at a third rank (80%). Non-availability of the labours (70%) and pest and disease problems (67.5%) were ranked fourth and fifth by the maize growing farmers. Lack of irrigation facilities, lack of technical guidance share equal percentage (52.5%) and lack of sufficient soil testing facilities in the nearest area (45%) were ranked sixth and seventh, respectively. The results observed were similar to the results of Patil *et al.* (2019) and Lyngkhoi *et al.* (2021).

Constraints faced by respondent farmers in marketing the maize crop (Table 5) indicated that lack of dissemination of news was a major marketing constraint and ranked first with 85.0 per cent. High transportation cost was ranked second with 82.5 per cent. Lack of storage facilities in growing areas was the third major constraint faced by the sample farmers (72.5%). Farmers opined about the severe shortage of storage infrastructure in the study area. Lack of transportation facilities and road from the village to market was ranked fourth with 67.50 per cent. Farmers faced road connectivity was the main problem and the farmers could not be able to get the private transportation facility as it was too costly. Long distance of the regulated market from the crop growing area and low price received by farmers were ranked fifth with an equal share of 60.0 per cent. High commission charges (57.5%), not economical transportation due to a small quantity of produce (42.5%) and lack of timely payment (30%) were ranked sixth, seventh and eighth, respectively. The results observed were similar with results of Krishna *et al.* (2018). It is worth to note that, the farmers have paid the commission charges while trading their produce in the regulated market. This need to be addressed urgently, as collecting market commission from farmer producer is illegal in regulated markets.

4. CONCLUSION

The overall cost of maize cultivation per acre was higher for large farmers, whereas marketing costs were higher for small and marginal growers. The large farmers were accruing higher return to scale than other category farmers in the study area. The major constraints to maize production were erratic rainfall, high input costs, a lack of

timely credit, and a lack of labour, followed by insect and disease problems. The major constraints pertaining to marketing of maize were lack of dissemination of news followed by high transportation costs and lack of storage facilities in maize growing areas. Optimum utilization of the resources available at the disposal of the maize growers together with necessary efforts to address the problems identified in the maize cultivation will ensure a higher net return to the maize growers in the study area. It can be concluded that the productivity of maize has decreased over the years and has stagnated and this may be attributed to the lack of a technological breakthrough in maize production and fluctuations in prices. Hence, there is a need for gearing up the research and extension activities to improve the productivity of maize and provide remunerative prices to farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Table 1. Cost structure for maize cultivation in the study area

(per acre)

Sl. No.	Particulars	Small and marginal farmers (n=60)		Medium farmers (n=40)		Large farmers (n=20)		Over all (N=120)	
		Cost (₹)	%	Cost (₹)	%	Cost (₹)	%	Cost (₹)	%
I	**Variable cost**								
1	Seed	1345.20	6.85	1392.30	6.88	1417.00	6.85	1384.83	6.86
2	Farm yard manure	1520.00	7.74	1536.00	7.59	1664.00	8.04	1573.33	7.79
3	Fertilizer	1420.00	7.23	1566.08	7.74	1510.05	7.30	1498.71	7.42
4	Plant protection chemicals	320.00	1.63	456.00	2.25	512.00	2.47	429.33	2.12
5	Human labour	4417.50	22.48	4642.00	22.94	4770.00	23.06	4609.83	22.83
6	Bullock labour	2600.00	13.23	2432.00	12.02	2368.00	11.45	2466.67	12.23
7	Machine labour	2727.40	13.88	2840.97	14.04	3014.50	14.57	2860.96	14.16
8	Interest on working capital	1148.01	5.84	1189.23	5.88	1220.44	5.90	1185.89	5.87
	Total variable cost	**15498.00**	78.87	**16055.00**	79.32	**16476.00**	79.64	**16010.00**	79.28
II	**Fixed cost**								
1	Land revenue	375.00	1.91	375.00	1.85	375.00	1.81	375.00	1.86
2	Depreciation	470.00	2.39	500.00	2.47	525.00	2.54	498.33	2.47
3	Rental value of land	3000.00	15.27	3000.00	14.82	3000.00	14.50	3000.00	14.86
4	Interest on fixed capital	307.06	1.56	310.00	1.53	312.00	1.51	309.69	1.53
	Total fixed cost	**4153.00**	21.13	**4185.00**	20.68	4212.00	20.36	4183.00	20.72
III	**Cost of cultivation (I+II)**	**19651.00**	100.00	**20240.00**	100.00	**20688.00**	100.00	**20193.00**	100.00

*Percentages to total

Table 2. Marketing costs incurred by maize respondent farmers in the study area

(Rs. per quintal)

Sl. No.	Particulars	Small and marginal farmers (n=60)		Medium farmers (n=40)		Large farmers (n=20)		Over all (N=120)	
		Cost (₹)	%	Cost (₹)	%	Cost (₹)	%	Cost (₹)	%
1	Packing	12.50	21.13	12.50	20.11	12.5	19.76	12.50	20.21
2	Transportation	20.00	33.80	20.00	32.18	18.00	28.45	19.33	31.25
3	Loading and unloading	10.17	17.19	12.37	19.90	14.21	22.46	12.51	20.23
4	Weighment charges	1.50	2.54	1.50	2.41	1.50	2.37	1.50	2.42
5	Market commission	9.75	16.48	9.75	15.69	9.75	15.41	9.75	15.76
6	Miscellaneous	5.25	8.87	6.02	9.68	7.31	11.55	6.26	10.13
	Total marketing cost	59.17	100.00	62.14	100.00	63.27	100.00	61.86	100.00

*Percentages to total

Table 3. Returns structure for maize cultivation in the study area

(per acre)

Sl. No.	Particulars	Small and marginal farmers (n=60)	Medium farmers (n=40)	Large farmers (n=20)	Overall (N=120)
1	Main product (Quintals)	15.38	15.78	16.23	15.80
2	By product (tractor load)	1.50	1.79	1.95	1.75
3	Value of main product(₹)	29991.00	30771.00	31649.00	30810.00
4	Value of by product (₹)	2500.00	2983.00	3450.00	2867.00
5	Marketing cost (₹)	910.03	981.00	1027.00	978.00
6	Cost of cultivation (₹)	20561.00	21220.00	21715.00	21171.00
7	Gross returns (₹)	32491.00	33754.00	35098.00	33781.00
8	Net returns (₹)	11930.00	12534.00	13384.00	12611.00
9	Cost of production per quintal (₹)	13337.00	1345.00	1338.00	1340.00
10	Returns per rupee of expenditure	1.58	1.59	1.61	1.67

Table 4. Production constraints faced by maize growing respondent farmers in study area

Sl. No.	Particulars	Maize farmers (n=120)	
		%*	Rank
1	Erratic behaviour of rainfall	90.00	I
2	High cost of inputs	87.50	II
3	Non availability of credit	80.00	III
4	Non-availability of labour	70.00	IV
5	Pest and disease problems	67.50	V
6	Lack of irrigation facilities	52.50	VI
7	Lack of technical guidance	52.50	VI
8	Lack of sufficient soil testing facilities in the nearest area	45.00	VII

*Multiple responses

Table 5. Marketing constraints faced by maize growing respondent farmers in study area

Sl. No.	Particulars	Maize farmers (n=120)	
		%*	Rank
1	Lack of dissemination of news	85.00	I
2	High transportation cost	82.50	II
3	Lack of storage facilities in growing areas	72.50	III
4	Lack of transportation facilities and road from the village to market	67.50	IV
5	Long distance of regulated market from the crop growing area	60.00	V
6	Low price received by farmers	60.00	V
7	High commission charges	57.50	VI
8	Not economical transportation due to a small quantity of produce	42.50	VII
9	Lack of timely payment	30.00	VIII

*Multiple responses