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, 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 analyse the cost and return structure of the maize crop in the study area, 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, FYM, fertilizer, PPCs, human labour and machine labours. 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 (90.00 percent), whereas lack of news dissemination was a major marketing constraint, ranking first with 85.00 percent.

Kay words: Hyderabad Karnataka region, 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 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 39.00 per cent in the global grain production.

In India, maize is grown throughout the year. It is predominantly a *kharif* crop 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 being 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 rank 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, Belagum, Haveri and Hassan.

The Hyderabad-Karnataka region is one of the most backward regions where agriculture is dependent on rainfall and very less cultivated area have access to irrigation facility. In this regard majority of the area under agriculture is being cultivated under rainfed conditions. The present study tries to analyse the cost and return structure of maize crop in the study area. 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 and Raichur districts of Hyderabad-Karnataka region. Hyderabad-Karnataka region comprises of six districts *viz.,* Bellary, Koppal, Raichur, Yadgir, Kalaburagi and Bidar districts. Multistage sampling technique was adopted in selection of farmers. In the first stage, Koppal district was purposively selected

based on the highest area under maize. Similarly in the second stage, two taluks *viz.*, Koppal and Yalburga taluks were selected based on the highest area under maize in the district. In the third stage, two villages were selected from each of the selected taluk based on highest area under maize in consultation with local officials of department of Agriculture, Government of Karnataka. Finally 30 farmers from each village were selected randomly. While selecting the farmers care was taken to include small and marginal, medium and large farmers. Thus a total of 120 sample farmers were selected for the study purpose. Tabular method was employed to work out the costs, returns and problems faced by the farmers in 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 cost of inputs (seed, FYM, fertilizer and PPC's), labour cost and interest on working capital. Fixed cost includes depreciation on farm implements, land rent, 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 including the gross value of main product and by-product imputed on the basis of post-harvest prices prevailing in the selected study area. Net return was computed by subtracting the gross return from total cost of cultivation. 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 marketing of maize were considered for the study period. These marketing costs include cost of packing, loading and unloading charges, labour charges, transportation costs, commission charges and miscellaneous costs.

3. RESULTS AND DISCUSSION

Costs per acre incurred on variable inputs and fixed inputs in cultivation of maize among different categories of farmers have been analyzed and presented in Table 1. The total cost of cultivation was found to be higher in 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). The share of total

variable cost was higher than the share of total fixed cost in the total cost of cultivation. The share 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 due to increasing trend with increase in size of land holdings and increase in expenditure on material cost and labour cost. 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, the labour cost was higher in case of large farmers (₹4770.0/acre) compared to 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 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 lowest on small and marginal farmers (₹1520.0/acre). Whereas, highest expenditure on fertilizers (₹1566.0/acre) was observed in medium farms. Large farmers incurred maximum cost on seeds, PPC and interest on working capital.

The farm category-wise analysis indicated that 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 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.

It can be concluded from above results that, large farmers have incurred higher costs in all the inputs such as seed, FYM, fertilizer, PPCs, human labour and machine

labours. Both the medium and large farmers depend on machine labour rather than on bullock power for cultural operations.

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

Returns structure for maize cultivation in study area revealed that all the parameters *viz*. main product (16.23 quintals), by product (1.95 tractor load), value of main product (₹31649.0/acre), value of by product (₹3450.0/acre) was more in category of large 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 was 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.

Production constraints faced by major coarse grains growing respondent farmers in study area in the Table 4 revealed that, erratic behaviour of rainfall was major constraint reported by the maize respondents (90%), as the study area Koppal district comes under the Northern Dry Zone of Karnataka state. 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 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. The results observed were similar with results of Patil *et al.* (2019) and Lyngkhoi *et al.* (2021).

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.

Constraints faced by respondent farmers in marketing of selected major coarse grains (Table 5) indicated that lack of dissemination of news was 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 72.50 per cent of the sample farmers. Farmers opined about severe shortage of storage infrastructure in the study area. The results observed were similar with results of Krishna *et al*. (2018).

Lack of transportation facilities and road from 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 regulated market from the crop growing area and low price received by farmers were ranked fifth with equal share of 60.0 per cent. High commission charges (57.5%), not economical transportation due to small quantity of produce (42.5%) and lack of timely payment (30%) were ranked sixth, seventh and eighth, respectively. 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

Per acre total cost of cultivation of maize was higher in case of large farmers whereas marketing cost was more in small and marginal farmers. The large farmers were accruing higher return to scale than other category farmers in the study area. The major constraints regarding to maize production were erratic behaviour of rainfall, high cost of inputs, non-availability of timely credit, non-availability of labour, followed by pest and disease problems. The major constraints pertaining to marketing of maize were lack of dissemination of news followed by high transportation cost and lack of storage facilities in maize growing areas. An 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 lack of technological breakthrough in maize production and fluctuations in prices. Hence, there is a need for gearing up the research

and extension activities so as to improve the productivity of maize and provide remunerative price 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=45)		Large farmers (n=15)		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=45)		Large farmers (n=15)		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=45)	Large farmers (n=15)	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 major coarse grains growing respondent farmers in study area

Sl. No.	Particulars	Maize (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 major coarse grains growing respondent farmers in study area

Sl. No.	Particulars	Maize (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 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 small quantity of produce	42.50	VII
9	Lack of timely payment	30.00	VIII

*Multiple responses