

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 adaptable emerging crops, with a wide range of adaptation under a multitude of agro-climatic conditions. Maize is renowned as the "Queen of Cereals" because it has the largest genetic yield potential among the cereals. Maize is cultivated all year round in India. It is primarily a kharif crop, with 85 per cent of the season's land under cultivation. 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 a 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

Introduction

Maize (*Zea mays* L.) is one of the most versatile emerging crop shaving 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 staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that 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 few portion 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 documented. The findings of the study are useful to answer the queries concerning the profitability of maize crop in the area under study.

Methodology

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 for maize crop 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. 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 in total of 120 sample farmers were selected for the study purpose. Tabular analysis was used to work out the costs, returns and problems faced by the farmers in production and marketing of maize crop.

Results and discussion

The details of per acre cost incurred on variable inputs and fixed inputs in the cultivation of maize among different categories of farmers have been analyzed and presented in Table 1. It is clear from the table that, the total cost of cultivation was found to be higher in case of large farmers (20,687.99/acre) as they used more inputs and labours in different operations, followed by medium farmers (20,239.58/acre) and small and marginal farmers (19650.71/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 was accounted for 78.87 per cent (15498.11/acre) for small and marginal farmers, 79.32 per cent (16054.58/acre) for medium and 79.64 per cent (16475.99/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 Murthy *et al.* (2015) and Srikanth *et al.* (2017).

The distribution pattern of operational costs for various inputs indicated that, the labour cost was higher in case of in large farmers (4770.00/acre), compared to medium farmers (4642.00/acre) and small and medium farmers (4417.50/acre). The cost of machine labour was calculated to be highest in large farmers (3014.50/acre) and followed by medium farmers (2840.97/acre) and small and marginal farmers (2727.40/acre). Bullock labour cost was highest in case of small and marginal farmers (2600.00/acre) followed by medium (2432.00/acre) and large farmers (2368.00/acre) as the small and marginal and medium farmers depend mainly on the bullock for the various operations compared to the large farmers. The cost of FYM was the lowest on small and marginal farmers (1520.00/acre) compared to medium farmers (1536.00/acre) and large farmers

(1664.00/acre). The highest expenditure on fertilizers (1566.08/acre) was observed on medium farms followed by large farms (1510.05 /acre) and small farms (1420.00/acre). Similarly, the cost incurred on seeds was more in large farmers (1417.00/ acre) followed by medium farmers (1392.30/acre) and small and marginal famers (1345.20/acre). It could also be observed from the table that, the expenditure on PPC was the highest in large farmers (512.00/acre) followed by medium farmers (456.00/acre) and small and marginal farmers (320.00/acre). The interest on working capital worked out to be higher in large farmers (1220.44/acre) compared to medium (1189.23/acre) and small and marginal farmers (1148.01/ acre), respectively.

The farm category-wise analysis indicated that fixed cost incurred by large farmers was higher (4212.00/acre) as compared to medium (4185.00/acre) and small farmers (4152.00/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 (375.00/acre) and rental value of land (3000.00/acre) were same in all categories of farmers. The depreciation cost was more in large farmers (525.00/acre) as they owned machineries more than the other category farmers, followed by medium (500.00/acre) and small and marginal farmers (470.00/acre). Whereas, interest on fixed capital worked out to be higher in large farmers (312.00/acre) compared to medium (310.00/acre) and small and marginal farmers (307.06/acre). Whereas, the share of total fixed cost in total cost of cultivation per acre was more in small and medium farmers (21.13%) as compared to medium farmers (20.68%) and large farmers (20.36%). These results are in line with the study conducted by Murthy *et al.* (2015). 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 in the study area is presented in Table 2. The packing costs (12.50/quintal), weighment costs (1.50/quintal) and the market commission (9.75/quintal) were same for all the categories of farmers in the study area. The cost incurred on transportation by the small and medium farmers

(20/quintal) was more compared to large farmers (18.00/quintal). This was because of the small amount of produce by small and medium farmers and the distance of the market was same for all the categories of the farmers. Whereas, loading and unloading charges were more in large farmers (14.21/quintal) as the quantity of the produce brought to the market by the large farmers were more compared to the rest of the two categories of the farmers, followed by medium (12.37/quintal) and small and marginal farmers (10.17/quintal). The miscellaneous expenses was higher in large farmers (7.31/quintal) followed by medium (₹6.02/quintal) and small and marginal farmers (5.25/quintal). The total marketing was found more in large farmer category (63.27/quintal) followed by medium (62.14/quintal) and small and marginal farmers (59.17/quintal). Overall marketing cost incurred by all categories of farmers was around sixty two rupee per quintal in the study area.

Returns realised by maize farmer respondents is presented in the Table 3. There was difference in main yield and by product among small and marginal farmers (15.38 quintal and 1.50 tractor load/ acre), medium (15.78 quintal and 1.79 tractor load/ acre) and large farmers (16.23 quintal and 1.95 tractor load). Marketing cost per acre was more in large farmers (1026.87/acre) as compared to medium (980.56/acre) and small and medium farmers (910.03/acre). The cost of cultivation including marketing cost accounts more in large farmers (21714.86/acre) compared to medium (21220.14/acre) and small and marginal farmers (20560.74/acre). The gross returns earned by large farmers (35098.48/acre) were more than medium farmers (33754.21/acre) and small and marginal farmers (32490.99/acre). Similarly, the net returns realized by large farmers (13383.62/acre) were found to be more than medium (12534.07/acre) and small and marginal farmers (11930/acre). Average cost of production per quintal was 1339.90. 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), this was because the large farmers had more quantity of the produce to sell in the market and which allowed them to bargain for the better price and they use more quantity of inputs than the small and marginal and medium farmers.

Above results conclude that, transportation and packing costs were more in all the categories of farmers. The transportation cost varied with quantity of produce and distance of regulated market from the study area. Weighment (1.50/quintal) and market

commission (9.75/quintal) charges remains same in all the categories of farmers. The gross returns, net returns and BC ratio were more in large farmers as compared to medium and small and marginal farmers. The results are in line with the study conducted by Murthy *et al.* (2015) and Srikanth *et al.* (2017).

Production constraints faced by major coarse grains growing respondent farmers in study area is depicted in the Table 4. The results revealed that, erratic behaviour of rainfall was major constraint reported by the maize respondents (90.00%), as the study area Koppal district comes under the Northern Dry Zone of Karnataka state. Further it could be observed that, high cost of inputs was a second major constraint opined by the maize farmers (87.50%). Non-availability of credit for the production was another constraint opined by the maize farmer and it was ranked third (80.00%). Non-availability of the labours were ranked (70.00%), pest and disease problems were ranked fifth with share of 67.50% per cent. The results observed were similar with results of Chahal and Poonam (2010) and Krishna *et al.* (2018).

Lack of irrigation facilities, lack of technical guidance share equal percentage (52.50%) and lack of sufficient soil testing facilities in the nearest area (45.00%) were ranked sixth and seventh, respectively.

Constraints faced by respondent farmers in marketing of selected major coarse grains are presented in the Table 5. In maize crop, results indicated that lack of dissemination of news was major marketing constraint and ranked first with 85.00 per cent. High transportation cost was ranked second with 82.50 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 Chahal and Poonam (2010) and Gopal *et al.* (2012).

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 60.00 per cent. High commission charges (57.50%), not economical transportation due to small quantity of produce (42.50%) 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.

Conclusion

Per acre total cost of cultivation of maize worked out to be to be higher in case of large farmers (20687.99/acre) followed by medium farmers (20239.58/acre) and marginal and small farmers (19650.71/acre). Average marketing cost per quintal incurred by the farmers in maize was found to be 61.86. Marketing cost was more in small and marginal farmers followed by medium and large farmers for the maize crop in the study area. The return per rupee of expenditure in maize cultivation was found to be 1.67. 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 growing areas. It can be concluded that, the productivity of maize has decreased over the years and it has stagnated in many of the districts. 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.

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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 (Inr) | % | Cost (Inr) | % | Cost (Inr) | % | Cost (Inr) | % |
| 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 | 15498.11 | 78.87 | 16054.58 | 79.32 | 16475.99 | 79.64 | 16009.56 | 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 | 4152.60 | 21.13 | 4185.00 | 20.68 | 4212.00 | 20.36 | 4183.20 | 20.72 |
| III | Cost of cultivation (I+II) | 19650.71 | 100.00 | 20239.58 | 100.00 | 20687.99 | 100.00 | 20192.76 | 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 (Inr) | % | Cost (Inr) | % | Cost (Inr) | % | Cost (Inr) | % |
| 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 | 31648.50 | 30810.00 |
| 4 | Value of by product (₹) | 2499.99 | 2983.21 | 3449.98 | 2866.65 |
| 5 | Marketing cost (₹) | 910.03 | 980.56 | 1026.87 | 977.73 |
| 6 | Cost of cultivation (₹) | 20560.74 | 21220.14 | 21714.86 | 21170.50 |
| 7 | Gross returns (₹) | 32490.99 | 33754.21 | 35098.48 | 33781.23 |
| 8 | Net returns (₹) | 11930.00 | 12534.07 | 13383.62 | 12610.63 |
| 9 | Cost of production per quintal (₹) | 13336.84 | 1344.74 | 1337.94 | 1339.90 |
| 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