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Research Paper

Economic Analysis of Production of Maize in Meghalaya and Constraints Associated with it

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ABSTRACT

The present study was undertaken to estimate the costs and returns structure of maize cultivation and identifying the prominent production constraints in West Khasi Hills district of Meghalaya. A sample of 60 farmers was randomly drawn from six villages of Mawthadraishan and Nongstoin block of the selected district. The costs and returns per hectare were calculated on the basis of cost concepts and Garett ranking method was used for employed for determination of constraints in maize production. The overall cost of cultivation was found to be ₹ 37185.22 per ha and the major cost components were manures (48.25%) and human labour (34.73%). The overall net return was evaluated at ₹ 19038.20 with small, medium and large farmers having similar returns with the exception of marginal farmers gaining a net return of only ₹ 13889.83 which was 27.04 per cent lower than the average return among the sample farmers. It may be attributed to their heavy dependence on labour and lack of investment on irrigation, plant protection and better-quality seeds. The realised average yield was found to be 23.65 q/ha which was abysmally low compared to other maize producing states of India. A positive trend between the return over cost ratio and the operational holding was observed with an average of 1.51. The prominent constraints as perceived by the farmers were unfavorable weather conditions, the incidence of pests and diseases and costly fertilizers and manures with the Garrett's score of 64.70, 62.75 and 54.40 respectively.

Highlights

- Cost of cultivation was comparable among all the farm holdings.
- Net returns were lower in marginal farmers in comparison to other farm groups.
- Return over cost ratio was found to be proportional to operational holding.

Keywords: Cost and returns, Garrett score, Maize, Meghalaya

In India, maize is considered to be the third most important crop based on area and production after rice and wheat. India contributes to about 4.6 per cent and 2.4 per cent of global maize acreage and production respectively (IIMR, 2021). During the last decade, consumption of maize in India grew at a CAGR of 5.6 per cent while production grew at just about 2.9 per cent. Increase in production was primarily driven by improved yields, which enhanced from 2.5 MT/ha to 3.1 MT/ha over the period. This growth was principally achieved by use of high yielding variety seeds (FASAR and FICCI, 2021). Maize is a versatile crop contributing immensely to food and nutritional security and also the industrial sector of the country with the bulk of the maize production, approximately 47 per cent, being used as poultry feed; from the remaining, 14 per cent was utilised in starch industry, 13 per cent as livestock feed, 13 per cent for the purpose of food, 7 per cent as processed food and only 6 per

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cent for export and other purposes (FASAR and FICCI, 2021). Rising demands for maize could triple the imports by 2050 (FAO, 2018). With the increase in the demand for maize as feed and its less than required growth in production coupled with the fact that maize is capable of providing the right opportunity for crop diversification and increasing farmer income (specially for small and marginal farmer in rainfed areas), the need to identify the barriers to growth of the maize ecosystem is indispensable.

In the North Eastern Himalayan Region (NEHR) of India, maize ranked 2nd after rice in significance and had been mostly grown under rainfed hilly upland conditions. In this region, production of maize played a significant role in ensuring food security and used both for direct consumption and as well as indirect consumption in the form of feed for piggery and poultry farming. Among the seven North-eastern states, Meghalaya occupied the 5th position in terms of area and production. Maize occupies about 7 percent of the net cropped area in Meghalaya and is the second most important cereal crop in the state. Although the state had registered the second highest yield leaving behind the two leading maize producing states, the average productivity of maize in the state was considerably low compared to the rest of the country (Subhash *et al*. 2019). Despite being an important crop in the region, there has been no enquiry into its economic aspects. Under this pretext, the present study has been undertaken in West Khasi Hills district in Meghalaya with the following specific objectives:

(i) To estimate the cost and returns structures of maize cultivation and constraints associated with it.

MATERIALS AND METHODS

The present study was carried out in West Khasi Hills district as it had the highest area under maize in Meghalaya contributing 18.05 per cent to the total area under maize with a production of 9973 MT (GoM, 2020). Multi-stage sampling technique was adopted where in two clusters of three villages each; Mawkynbat, Mawduhand Nonglwai from Nongstoin block and Markasa, Nong shillong and Pariong from Mawthadraishan block were purposively selected based on the highest maize yield and data was collected from 60 randomly selected farmers using Probability Proportional to Size Sampling method. 60 farmers were then grouped into four categories based on farm size: 8 marginal (less than 1 ha), 36 small (1 to 3 ha),13 medium (3 to 5 ha) and 3 large (more than 5 ha).

Empirical strategy

Cost concepts

For computation of costs and returns, cost concepts used in farm management studies such as cost A_1, A_2, B_1, B_2, C_1 and C_2have been followed in the analysis.

Cost A_1: All paid out costs

Cost A_2: Cost A_1 + rent paid for leased in land (if any)

Cost B_1: Cost A_1 + interest value on fixed capital asset

Cost B_2: Cost B_1+ rent paid on leased in land + rental value of owned land

Cost C_1: Cost B_1 + imputed value of family labour

Cost C_2: Cost B_2 + imputed value of family labour

Cost A_1 was considered as cost A since all sample farmers were owner cultivator.

Interest on working capital was charged at the rate of 7 per cent per annum, according to the prevailing rate for acquiring crop loan from the financial institution.

For return analysis the following measures were employed

Gross return (GR): Value of main crop and by product

Net return (NR): Gross return – Cost C_2

Return over cost ratio: Gross Return/Total cost

Garrett's ranking technique

This technique had been used to determine the main constraints perceived by farmers in maize cultivation. In this method, respondents were asked to rank the specific problems faced by them according to their own perception which was subsequently transferred into Garett scores. Thus, mean score for each constraint had been ranked by arranging them in descending order.

The percentage position was determined by the given formula,

Percentage position = $100 \times (R_{ij} - 0.5)/N_j$

Where, R_{ij} = Rank given for the i^{th} item by j^{th} individual

N_j = Number of items ranked by the j^{th} individual

RESULTS AND DISCUSSION

Socio-economic characteristics of the sample

The socio-economic parameters are important determinants of knowledge and skill of farmers (Singh *et al*. 2016). The important characteristics have been evaluated and presented in Table 1.

Table 1: Summary statistics of socio-economic characteristics of sample respondents

Sl. No.	Particulars	Marginal	Small	Medium	Large	Overall
1	Age	43	47.43	50.46	44	46.22
2	Family size (no.)	5.63	6.86	6.69	9.67	6.80
3	Literacy rate (%)	62.50	61.11	76.92	100.00	66.67
4	Land holding (ha)	0.72	1.78	3.83	6.67	2.33
5	Earners per family (no.)	1.63	2.11	2.23	3.00	2.12

The average age of the respondents was 46.22 years. The overall family size was found to be 6.8 with 2.12 earners per family. The average land holding was worked out at 2.33 ha. The overall literacy rate of the sampled respondents was 66.67 per cent.

Economics of maize production

It has been demonstrated in Table 2 that the sample farmers had made an expenditure of ₹ 37185.22 /ha towards the payment for various inputs, although no definite trend was observed across the farm size groups. Expenditure on manures and fertilizers appeared to be the most dominant cost component constituting 39.34 per cent of the total cost followed by hired human labour claiming 28.32 per cent. Family labour and rental value of owned land were the imputed cost and did not involve the actual outlay of cash. Payment for interest on working capital and spending on machinery came next at tandem by contributing 5.58 and 5.54 per cent, respectively. Expenditure on seed, irrigation charges, plant protection chemicals and miscellaneous charges came next and were arranged in descending order in their respective contribution. The highest per ha cost was ₹ 38014.07, incurred by small farmers and lowest was noted in case of large farmers. Lower cost in large farmers may be associated with lack of investment in irrigation and minimal dependence on family labour. The remaining three farm size groups show an almost equal expenditure on all cost items at ₹ 36731.94, ₹ 36415.87, ₹ 35570.64 per ha for marginal, medium and large farmers respectively. Similar results were obtained pertaining to the cost items with variations in land holding in Ahmednagar district of Maharashtra (Navadkar *et al.* 2012).

The overall cost of cultivation A_1, B_1, B_2, C_1 and C_2 was calculated to be ₹ 30320.59, ₹ 32801.6, ₹ 34704.21 and ₹ 37185.22. Cost A_1 and cost B_1 were

Table 2: Economics of Maize cultivation under different size farm groups

Sl. No.	Cost items (₹/ha)	Marginal	Small	Medium	Large	Overall
1	Hired human labour	8513.89 (23.18)	10979.59 (28.88)	10390.6 (28.53)	9811.11 (27.58)	10529.13 (28.32)
2	Family labour	9443.75 (25.71)	4688.85 (12.33)	3600 (9.89)	2283.33 (6.42)	4383.62 (11.79)
3	Machinery	0	2180.86 (5.74)	2024.69 (5.56)	2772.39 (7.79)	2059.95(5.54)
4	Seed	324.54 0.88	356.24 (0.94)	424.19 (1.16)	427.78 (1.20)	383.23 (1.03)
5	Manures and fertilizers	14090.74 (38.36)	14410.14 (37.91)	14736.15 (40.47)	15764.9 (44.32)	14629.6 (39.34)
6	Irrigation	0	319.07 (0.84)	344.83 (0.95)	0	276.93 (0.74)
7	Plant protection	108.24 (0.29)	213.62 0.56	250.22 (0.69)	218.82 (0.62)	219.64 (0.59)
8	Miscellaneous	120.94 (0.33)	140.39 (0.37)	135.3 (0.37)	232.69 (0.65)	146.72 (0.39)
9	Interest on working capital	1659.25 (4.52)	2248.38 (5.91)	2028.5 (5.57)	1564.47 (4.40)	2075.39 (5.58)
10	Rental value	2470.58 (6.73)	2476.91 (6.52)	2481.39 (6.81)	2495.14 (7.01)	2481.01 (6.67)
	Total	**36731.94 (100)**	**38014.07 (100)**	**36415.87 (100)**	**35570.64 (100)**	**37185.22(100)**

Note: *figures within parentheses represent the per cent to total.*

considered equal as the farmers only possessed land as their fixed capital. No definite relationship between farm size and cost was observed and the variations among the farm size classes were minimal. The overall gross return and net return was calculated to be ₹ 56223.42 and ₹19038.2, respectively with the small farmers earning a higher return compared to the other groups. The net return was found to be lowest in the marginal farmer group at ₹ 13889.83. This may be due to their adherence to old traditional systems of farming and lack of good quality planting material which is common among resource poor farmers (Ansari *et al*. 2015).

The return over cost ratio reflects the criteria for economic viability of the crop based on return per rupee invested. The data furnished in the Table 3 showed that the overall return over cost ratio was 1.51. A rising trend was observed in the return over cost ratio with the increase in operational holding except in the case of the small farmers which showed the highest return over cost ratio which was also true in case of maize farmers in Karnataka (Srikanth *et al.* 2017). This may be attributed to better cultivation practices adopted by these farmers, due to the awareness created by the demonstrations conducted in their farms by the agricultural department and access to good quality planting material.

The realised average yield accounting 23.65 q/ha was found to be abysmally low compared to other maize producing states of India. The cost of production showed a decreasing trend with increase in farm size *i.e*., ₹ 2299.90, ₹ 2156.53, ₹ 2058.54, ₹ 2050.16 from marginal, small, medium, large farmers respectively and an overall of ₹ 2179.65 which can be due to variation in seed quality and investment in plant protection among the small, medium and large farmers.

Constraining factors associated with cultivation of maize

The prominent constraints as perceived by the sample farmers (Table 5) were adverse weather conditions with score 64.70, the incidence of pests and diseases and costly fertilizers and manures comes next with the Garret's score 62.75 and 54.40 respectively. The unavailability and negative outlook of plant protection chemicals could be a major reason for the loss crop to pest and diseases (Ansari *et al.* 2015). The farmers also opined on problems of high labour wages, untimely rainfall, lack of improved varieties, lack of credit facilities, lack of technical knowledge, insufficient irrigation

Table 3: Details of group wise cost pattern, return structure (₹/ha)

Particulars	Marginal	Small	Medium	Large	Overall
Cost A_1/B_1	24817.59	30848.29	30334.47	30792.16	30320.59
B_2	27288.18	33325.20	32815.86	33287.31	32801.60
C_1	34261.34	35537.15	33934.47	33075.49	34704.21
C_2	36731.93	38014.06	36415.86	35570.64	37185.22
Gross return	50621.76	58019.01	54655.75	54444.44	56223.42
Net return	13889.83	20004.95	18239.89	18873.80	19038.20
Return over cost	1.38	1.53	1.50	1.53	1.51

Table 4: Economics of yield/ha and cost of production in different farm groups

Sl. No.	Farm size (ha)	Total yield per ha (q)	Cost of production (₹/q)
1	Marginal	21.5	2299.90
2	Small	24.55	2156.53
3	Medium	24.45	2058.54
4	Large	24.1	2050.16
5	Overall	23.65	2179.65

Table 5: Prioritization of constraints pertaining to cultivation of maize

Sl. No.	Particulars	Total score	Mean score	Rank
1	Adverse weather conditions	3882	64.70	I
2	Pest and diseases	3765	62.75	II
3	Costly fertilizers and manures	3264	54.40	III
4	High labour wages	3148	52.47	IV
5	Untimely rainfall	3102	51.70	V
6	Lack of improved varieties	3098	51.63	VI
7	Lack of credit facilities	2685	44.75	VII
8	Lack of technical knowledge	2640	44.00	VIII
9	Insufficient irrigation	2334	38.90	IX
10	Poor quality of land	1962	32.70	X

and poor quality of land with Garrett's score 52.47, 51.70, 44.75, 44.00, 38.90 and 32.70, respectively.

CONCLUSION

The cost and returns of maize cultivation were higher in case of small farmers who had received good quality planting material from the agricultural department and were exposed to improved technologies. Human labour and manures comprised a major part of the cost of cultivation in all farm holdings. Expenditure on irrigation and plant protection was negligible even as the farmers prioritized unfavorable weather conditions and pest and diseases as the major constraints faced. The maize yield was found to be far below the national average, hence timely intervention from government agencies is of utmost importance. Awareness to proper management practices will go a long way in the securing maximum profits and thereby improve the production as well as the income of the farmers.

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