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Research Paper

Cost, Return and Profitability Structure of Barley and Maize Production in Rajasthan, India

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ABSTRACT

The present investigation was conducted on economics of cost of cultivation and return of barley and maize in Rajasthan. The study used the cost of cultivation data for the period from 2000-01 to 2015-16 compiled from various sources and publications for profitability analysis of barley and maize crop. In the present study, the cost C_2 was considered for computing profitability. Net income and return per rupee invested on barley crop had increased while net income of maize was found to decrease and return per rupee invested was increased during the period TE 2003 to TE 2015. Farmer received ₹ 3.23 after spending one rupee on barley crop in TE 2015. Total cost per hectare at cost C_2 for barley crop was found to be ₹ 15007.20 in TE 2003 and ₹ 48348.28 in TE 2013, it showed 222.16 per cent increase. Gross income from barley increased from ₹ 17179.07/hectare to ₹ 59900.87/hectare between TE 2003 to TE 2015 with 248.68 per cent increase in gross return. Return per rupee invested for maize crop was increased from ₹ 1.80 in TE 2003 to ₹ 2.53 in TE 2015. The cost of cultivation of maize crop at cost C_2 increased from ₹ 13689.66/ha to ₹ 44301.40/ha which was 223.61 per cent increase between TE 2003 to TE 2015. Findings also showed that gross income increased from ₹ 10988.94/ha to ₹ 41601.89/ha between TE 2003 to TE 2015 for maize which showed 278.57 per cent increase in gross returns; whereas net income was observed to be decreasing for maize crop.

HIGHLIGHTS

- Barley crop was observed to be profitable to the farmers under all the parameters considered during the study period.
- Net income of maize was found to decrease during the study period. Therefore, proper processing and procurement policy for this crop grown by the farmers at should be implemented.
- Cost of cultivation increased for both crops. This needs proper management of agronomical practices to keep low production cost.

Keywords: Cost, crop, return, income barley and maize

Agriculture sector in India contributes as the most strategic component in the country's economy. Agricultural research plays an essential role in improving production of crops and livestock as the agricultural research system has expanded research productivity and research resource allocation, which are the issues of prime concern (Sahu *et al*. 2018). Barley is the most important *rabi* seasonal cereal food grain crop of Rajasthan state and mainly it is grown in northern western zone of Rajasthan. Barley is mainly used as animal feed and rest of the

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production is used as malt in whiskey or sugar as well as in health food. It is basically a grass crop that comes from the family of *Poaceae* and considered to be the fourth most important crop in the world after wheat, rice and maize. Barley sustains water stress and is suitable for drought conditions. Barley is not only the food crop, but also has industrial value in beverages and beers.

Maize is a one of the most important cereal crop in the world agricultural economy both as food for man and feed for animals. It is a miracle crop having high yield potential. There is no cereal on the earth which has so immense potentiality and that is why it is called "Queen of Cereals". Maize is the only cereal which can be grown throughout the year in all three season of kharif, rabi and zaid. Maize (*Zea mays* L.) is being grown in tropics, sub-tropics and temperate regions up to 500 N and S from the equator to more than 3000 m above sea level (Patel *et al*. 2014). In India, maize is an important dual purpose cereal crop which is cultivated by farmers for food, feed and fodder purposes. Maize area and production is growing due to diverse uses and increase in demand from poultry, starch industries and application in diversified industries such as alcoholic beverages, bio-fuel, processed food and corn oil (FICCI, 2014). Maize silage is important forage and major energy source in dairy cattle rations both in Europe and North America (Ettle and Schwarz, 2003). Presently there is a chronic shortage of green fodder in the country and therefore, silage may play a critical role in filling the wide gap in availability and requirement of quality green forages for animals. Due to efforts of public sector institutes, private sector companies and from implementation of centrally funded dairy development programme like National Dairy Plan I (NDP I) during 2012-20, have created clear understanding about ensiling technology among farmers leading to successful silage production for lean period in large quantities.

Sustained growth in barley and maize production can be attained provided the sustainable growth in productivity fuelled with higher yield, at the same time outpacing the growth in cost of production. Adequate returns from the crop encourage farmers to continue with the crop over the years in the cropping structure and also effect changes in crop mix in non-traditional areas. The question ascends whether cost of cultivation of crop is rising or profitability is decrease from crops? Against this backdrop, it is related to understand the changes in cost of cultivation and profitability from crop cultivation over time (Verma and Singh, 2021).

MATERIALS AND METHODS

Profitability analysis

The study used the cost of cultivation data for the period from 2000-01 to 2015-16, which was compiled from various published sources. In the present study, the cost C_2 was considered for computing the profitability. Cost C_2 in CCPC data covers all the variables and fixed costs (Sood *et al*. 2018).

(i) Profitability = Gross value of output - Cost C_2

(ii) The income measures: The following measure were worked out to compute profitability.

1. Farm business income = Gross return - Cost A_2
2. Family labour income = Gross return - Cost B_2
3. Net income = Gross return - Cost C_2
4. Farm investment income = Farm business income - Imputed value of family labour.

The items of cost of cultivation cover both paid out cost and the imputed costs. The item covered under these costs were (Perke *et al*. 2017).

Paid out costs

1. Hired labour (human, animal and machinery)
2. Maintenance expenses on owned animals and machinery
3. Expenses on material inputs such as seed (home grown and purchased), fertilizer, manure (owned and purchased), pesticides and irrigation
4. Depreciation on implements and farm buildings (such as cattle sheds, machine sheds and storage sheds)
5. Land revenue
6. Rent paid for leased- in land

Imputed Costs

Value of family labour / managerial input of the farmer, rent of owned land and interest on owned

fixed capital for which farmer does not incur any cash expenses.

Costs were generated following certain cost concepts. These cost concepts and the items of costs included under each concept are given below (Pushpa *et al*. 2017).

Cost A_1:

1. Value of hired human labour
2. Value of hired bullock labour
3. Value of owned bullock labour
4. Value of owned machinery labour
5. Hired machinery charge
6. Value of insecticides and pesticides
7. Value of seed (both farm produced and purchased)
8. Value of fertilizer
9. Value of manure (owned and purchased)
10. Depreciation on implements and farm building
11. Irrigation charges
12. Interest on working capital
13. Land revenue, cesses and other taxes
14. Miscellaneous expenses

Cost A_2: Cost A_1 + rent paid for leased-in land.

Cost B_1: Cost A_1+ interest on value of owned fixed capital assets (excluding land)

Cost B_2: Cost B_1 + rental value of owned land (net of land revenue) and rent paid for leased - in land

Cost C_1: Cost B_1+ imputed value of family labour

Cost C_2: Cost B_2+ imputed value of family labour

Cost C_3: Cost C_2*+ 10 per cent of Cost C_2* to account for managerial input of the farmer (Murthy *et al*. 2015).

RESULTS AND DISCUSSION

Cost of Cultivation of Barley

The estimates of different costs incurred in barley cultivation on per hectare and production per quintal basis are given in Table 1.

Cost of cultivation indicates total expenses incurred on barley cultivation in one hectare of land. During TE 2003 and TE 2015 direct cost, cost A_1 which covered all expenses paid by the farmer in cash and kind, accounted for ₹ 7409.19/ha and ₹ 18616.78/ha, respectively. Out of pocket cost of farmer, rent paid for leased – in land value included in cost A_2 showed 145.23 per cent increase during the study period. In TE 2003, cost B_1 was ₹ 8733.14/ha and ₹ 21927.76/ha in TE 2015. Between TE 2003 to TE 2015, cost B_1 showed 151.08 per cent increase which included direct cost plus interest on working capital (excluding land). Cost of cultivation had increased with increase in level of adoption of new technology (*Viz.* machinery, family and hired labour, seeds and fertilizer) and increased input prices. Actual expenses incurred in cash and kind by the farmer, interest value on owned capital assets, rental land value and value of imputed family labour were included in cost C_2. Cost C_2 showed 222.16 per cent increase during the study period. Total cost, cost C_3 covers all the component of cost C_2 and plus 10 per cent of cost C_2 on account of managerial functions performed by farmer. It was increased from ₹ 16507.92 per hectare to ₹ 53183.08 per hectare during the study period with 222.16 per cent. This

Table 1: Cost of Cultivation and Cost of Production of Barley

Sl. No.	Costs	Cost of cultivation (₹/ha)			Cost of production (₹/Quintal)		
		TE 2003	TE 2015	Per cent change	TE 2003	TE 2015	Per cent change
1	Cost A_1	7409.19	18616.78	151.26	221.25	381.87	72.59
2	Cost A_2	7626.62	18703.18	145.23	227.65	383.51	68.47
3	Cost B_1	8733.14	21927.76	151.08	260.21	450.91	73.28
4	Cost B_2	13173.00	32074.95	143.49	395.50	652.72	65.03
5	Cost C_1	10567.34	36796.65	248.21	314.96	749.60	137.99
6	Cost C_2	15007.20	48348.28	222.16	450.24	980.51	117.77
7	Cost C_3	16507.92	53183.08	222.16	495.26	1078.56	117.77

is in accordance with the findings of (Deshmukh *et al.* 2010) in Maharashtra state.

Cost of production per quintal calculation was done by using material cost, rent cost, wage cost, interest cost and normal profit of the entrepreneur as per different cost concepts. Table 1 revealed that ₹ 221.25 in TE 2003 and ₹ 381.87 in TE 2015 were spent as cash expenses (cost A_1) for producing one quintal of barley. The cost of production found to increase from ₹ 495.26 per quintal in TE 2003 to ₹ 1078.56 per quintal in TE 2015 when all the imputed and actual cost were considered for hired and owned resources together. Similar finding were observed by (Kumar *et al*. 2011) in Andhra Pradesh state in wheat crop.

Income from barley cultivation

Gross and net income per hectare from barley cultivation to the producer farmer are shown in Table 2.

Due to use of improved technology in barley (timely sowing, quality seed and use of machinery etc.) gross income increased from ₹ 17179.07/ha to ₹ 59900.87/ha between TE 2003 to TE 2015 *i.e.* 248.68 per cent increase in gross returns. Gross income attributed to main product value and by product value. Main product value increased from ₹ 14259.95 per hectare to ₹ 44967.84 per hectare *i.e*. 215.34 per cent increase in main product value during the study period. Value of by product increased from ₹ 2919.12 to ₹ 14933.03 per hectare, which showed 411.55 per cent increase between TE 2003 to TE 2015. During TE 2003 to TE 2015 net income over cost A_2 showed 331.27 per cent increase and net income over cost C_2 showed 431.92 per cent increase. Net income of farmer at cost A_2 and at cost C_2 showed that farmers' income was increasing during the study period.

Income measures of barley cultivation

Income measures comparison of barley cultivation in Rajasthan is given in Table 3. Income measures states correct income expenditure statement of the crop and reveals its profitability to the farmer.

Return over variable cost (seed, fertilizer, manure and irrigation charges etc.) increased from ₹ 9769.88/ha to ₹ 41284.08/ha during the study period. Farm business income remained positive and showed increment of 331.27 per cent over the study years which includes returns over fixed capital including owned land and family labour. The family labour income per hectare from barley cultivation increased from ₹ 4006.07 in TE 2003 to ₹ 27825.92 in TE 2015. The farm investment income *i.e.* return to fixed capital including land showed increasing trend with 241.12 per cent increase during the study years. During the study period, return per rupee invested at (A_2 cost) increased from ₹ 2.26 in TE 2003 to ₹ 3.23 in TE 2015 which showed 42.92 percent increase. Thus, on all kind of parameters the barley crop was profitable to the farmers.

Table 2: Gross and net income per hectare from Barley Cultivation

Sl. No.	Items	TE 2003	TE 2015	Per cent change
1	Value of Main Product (₹/ha)	14259.95	44967.84	215.34
2	Value of Byproduct (₹/ha)	2919.12	14933.03	411.55
3	Gross income (₹/ha)	17179.07	59900.87	248.68
4	Net income over Cost A_2 (₹/ha)	9552.44	41197.69	331.27
5	Net income over Cost C_2 (₹/ha)	2171.86	11552.59	431.92

Table 3: Return from Cultivation of Barley Crop (₹/ha)

Sl. No.	Particulars	TE 2003	TE 2015	Per cent change
1	Returns over variable cost	9769.88	41284.08	322.56
2	Farm business income	9552.44	41197.69	331.27
3	Family labour income	4006.07	27825.92	594.59
4	Farm investment income	7718.26	26328.80	241.12
5	Return per rupee (Cost A_2)	2.26	3.23	42.92

Cost of Cultivation of Maize

The estimates of different costs incurred in maize cultivation on per hectare and production per quintal basis are given in Table 4.

Cost of cultivation indicates total expenses incurred on maize cultivation in one hectare of land. During TE 2003 and TE 2015 direct cost, cost A_1 which covered all expenses paid by the farmer in cash and kind, accounted for ₹ 5847.14/ha and ₹ 16210.22/ha, respectively. Out of pocket cost of farmer, rent paid for leased – in land value included in cost A_2 which showed 169.01 per cent increase during the study period. In TE 2003, cost B_1 was ₹ 7182.34/ha and ₹ 19289.03/ha in TE 2015. Between TE 2003 to TE 2015, cost B_1 showed 168.56 per cent increase which included direct cost plus interest on working capital (excluding land). Cost of cultivation had increased due to increase in level of adoption of new technology (*Viz.* machinery, family and hired labour, seeds and fertilizer) and increased input prices. Actual expenses incurred in cash and kind by the farmer, interest value on owned capital assets, rental land value and value of imputed family labour were included in cost C_2. Cost C_2 showed 223.61 per cent increase during the study period. Total cost, cost C_3 covered all the component of cost C_2 and plus 10 per cent of cost C_2 on account of managerial functions performed by farmer. It was increased from ₹ 15058.62 to ₹ 48731.54 per hectare during the study period witch 223.61 per cent increase. Similar result reported by (Ahirwar *et al*. 2014) wheat cultivation in Vindhyan Plateau of Madhya Pradesh

Cost of production per quintal calculation was calculated by using material cost, rent cost, wage cost, interest cost and normal profit of the entrepreneur as per different cost concepts. Table 4 revealed that ₹ 273.51 in TE 2003 and ₹ 607.18 in TE 2015 were spent as cash expenses (cost A_1) for producing one quintal of maize. The cost of production found to increase from ₹ 696.59 per quintal in TE 2003 to ₹ 1892.95 per quintal in TE 2015 if all the imputed and actual cost were considered for both hired and owned resources together.

Income from maize cultivation

Gross and net income per hectare from maize cultivation to the producer farmer are shown in Table 5.

Due to use of improved technology in maize (timely sowing, quality seed and use of machinery etc.) gross income increased from ₹ 10988.94/ha to ₹ 41601.89/ha between TE 2003 to TE 2015 which showed 278.57 per cent increase in gross returns.

Table 4: Cost of Cultivation and Cost of Production of Maize

Sl. No.	Costs	Cost of cultivation (₹/ha)			Cost of production (₹/Quintal)		
		TE 2003	TE 2015	Per cent change	TE 2003	TE 2015	Per cent change
1	Cost A_1	5847.14	16210.22	177.23	273.51	607.18	121.99
2	Cost A_2	6115.70	16452.14	169.01	288.42	619.92	114.94
3	Cost B_1	7182.34	19289.03	168.56	333.84	745.96	123.44
4	Cost B_2	9184.00	26376.55	187.20	425.43	969.66	127.92
5	Cost C_1	11688.00	37213.88	218.39	541.68	1497.17	176.39
6	Cost C_2	13689.66	44301.40	223.61	633.27	1720.87	171.74
7	Cost C_3	15058.62	48731.54	223.61	696.59	1892.95	171.74

Table 5: Gross and Net Income per Hectare from Maize Cultivation

Sl. No.	Particulars	TE 2003	TE 2015	Per cent change
1	Value of Main Product (₹/ha)	7205.00	33023.32	358.33
2	Value of Byproduct (₹/ha)	3783.95	8578.57	126.70
3	Gross income (₹/ha)	10988.94	41601.89	278.57
4	Net income over Cost A_2 (₹/ha)	4873.24	25149.75	416.07
5	Net income over Cost C_2 (₹/ha)	-2700.72	-2699.51	-0.044

Table 6: Return from Cultivation of Maize Crop (₹/ha)

Sl. No.	Particulars	TE 2003	TE 2015	Per cent change
1	Returns over variable cost	5141.80	25391.67	393.82
2	Farm business income	4873.24	25149.75	416.07
3	Family labour income	1804.94	15225.34	743.53
4	Farm investment income	367.58	7224.9	1865.53
5	Return per rupee (Cost A_2)	1.80	2.53	40.55

Gross income attributed to main product value and by product value. Main product value increased from ₹ 7205.00 per hectare to ₹ 33023.32 per hectare along with 358.33 per cent increase during the study period. Value of by product increased from ₹ 3783.95 to ₹ 8578.57 per hectare, which showed 126.70 per cent increase in value of by product between TE 2003 to TE 2015. During TE 2003 to TE 2015 net income over cost A_2 showed 416.07 per cent increase and net income over cost C_2 showed -0.044 per cent change. Net income of farmer at cost A_2 observed that farmer's income was increasing and at cost C_2 it was decreasing. These finding were also in consonance with studies done by (Shelke *et al*. 2016) in Beed district of Maharashtra state in cotton crop.

Income measures of maize cultivation

Income measures comparison of maize cultivation in Rajasthan is given in Table 6. Income measures states correct income expenditure statement of the crop and reveals its profitability to the farmer.

Return over variable cost (seed, fertilizer, manure and irrigation charges etc.) increased from ₹ 5141.80/ha to ₹ 25391.67/ha during the study period. Farm business income was positive and showed increment of 416.07 per cent over the study years which included returns over fixed capital including owned land and family labour. The family labour income per hectare from maize cultivation increased from ₹ 1804.94 in TE 2003 to ₹ 15225.34 in TE 2015. The farm investment income *i.e.* return to fixed capital including land showed increasing trend with 1865.53 per cent increase during the study years. During the study period, return per rupee invested over A_2 cost increased from 1.80 in TE 2003 to 2.53 in TE 2015 which showed 40.55 percent increase. Thus, on all kind of parameters the maize crop was profitable to the farmers. Similar results were also reported by (Murthy *et al.* 2015) in maize crop in North Karnataka state.

CONCLUSION

Cost, returns and profitability of barley and maize cultivation was analysed by using CACP data In Rajasthan. Different costs affect barley and maize returns and profitability. In this study, some important costs were taken into account to calculate economics of selected crop. The results of analysis indicated that cost of cultivation of barley crop at cost C_2 increased from ₹ 15007.20/ha to ₹ 48348.28/ha and *i.e.* 222.16 per cent increase between TE 2003 to TE 2015. The actual cost of production of maize had increased from ₹ 696.59 per quintal in TE 2003 to ₹ 1892.95 per quintal in TE 2015. Farmer's profit on one rupee and net income of barley had increased during the study period. Gross income of barley and maize had increased during TE 2003 to TE 2015. Net income and return per rupee invested on barley crop had increased while net income of maize was found to decrease and return per rupee invested was increased during the period TE 2003 to TE 2015. All kind of parameters the barley crop was profitable to the farmers.

REFERENCES

Ahirwar, R.F., Verma, A.K. and Shekhawat, L.S. 2014. Cost and income structure of wheat cultivation in Vindhyan Plateau of Madhya Pradesh. *Econ. Aff.*, **60**(1): 83-88.

Deshmukh, D.S., Pawar, B.R., Yewere, P.P. and Landge, V.V. 2010. Costs, returns and profitability of pearl millet production. *Int. J. Commer. Business Manag*., **3**(1): 95-99.

Ettle, T. and Schwarz, F.J. 2003. Effect of maize cultivar harvested at different maturity on feeding value and performance of dairy cows. *Anim. Res.*, **52**: 337-349.

FICCI. 2014. Maize in India. India Maize Summit 14. http://ficci.in/sp d o c u m e n t/2 0 3 8 6/ In d ia- M a iz e - 2014_v2.pdf. pp. 32 (accessed on Nov. 20, 2018).

Kumar, S., Suresh, R., Singh, V. and Singh, A.K. 2011. Economic analysis of menthol mint cultivation in Uttar Pradesh: A Case Study of Barabanki District. *Agricul. Econ. Res. Rev.*, **24**: 345-350.

Patel, K.H., Parmar, P.K., Khanorkar, S.M. and Patel, P.M. 2014. Effect of in-organic fertilisers and bioorganics on green

cob yield, green fodder yield, quality and yield attributes of sweet corn (*Zea mays* L.). *Maize J.*, **3**: 43-46.

Perke, D.S., Puri, R.V. and Karnawar, G.H. 2017. Economics of Soybean production in Hingoli district of Maharashtra. Bulletin of Environment, *Pharmacology and Life Sci.*, **6**(3): 106-107.

Pushpa, Srivastava, S.K. and Agarwal, P.K. 2017. Comparative study on cost of cultivation and economic returns from major crops in eastern region of Uttar Pradesh. *Int. J. Agric., Environ. Biotech.*, **10**(3): 387-399.

Murthy, C. Kulkarni, V. and Bouramma, P. 2015. Cost and return structure of maize production in North Karnataka. *Int. Res. J. Agricul. Econ. Statistics*, **6**(2): 364-370.

Sahu, P.K., Kant, K., Choudhry, H.P.S. and Singh, G.P. 2018. Cost of cultivation of mustard crop in Fatehpur district of Uttar Pradesh. *Int. J. Curr. Microb. and Appl. Sci.*, **7**(8): 3356-3361.

Shelke, R.D., Bhogaonkar, M.M. and Chavan, R.V. 2016. Cost, returns and profitability of *Bt*-cotton production in Beed district. *Int. J. Commerce Business Manag.*, **9**(1): 58-61.

Sood, S., Singh, H. and Soumya, C. 2018. Temporal changes in economics of pulses and their comparative advantage in Rajasthan. *Agril. Sci. Digest.*, **38**(4): 241-247.

Verma, D.K. and Singh, H. 2021. Whether Cultivation Cost is Rising or Profitability is Decreasing for Wheat Production? A case from Rajasthan, India. *Int. J. Soc. Sci.*, **10**(3): 295-300.