

Economics and Production Pattern of Maize Crop under Rainfed Conditions in the Jammu Region of Jammu & Kashmir State

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Received: 17-08-2021

Revised: 19-10-2021

Accepted: 28-11-2021

ABSTRACT

Maize is one of the prominent crops that is being cultivated in the rainfed regions of Jammu region of J&K. the cost of cultivation was calculated in four districts of Jammu region and was highest in case of Kathua district i.e., ₹ 8883.34 per acre and least in case of Rajouri district i.e., ₹ 5952.57 per acre, respectively. Further, the net returns were highest in case of Jammu district i.e., ₹ 685.17 per acre. CACP analysis revealed that the overall cost benefit ratio of the maize crop in the four districts was 1:1.74 with highest ratio in case of Jammu district i.e., 1:1.79. In addition, the production pattern of the maize crop under rainfed conditions revealed that the 8.20 quintals, 8.00 quintals, 5.80 quintals and 5.00 quintals were the production of maize crop per unit area in the Jammu, Kathua, Udhampur and Rajouri districts, respectively. Further, the by-product was highest in case of Rajouri district (8.85 quintals per acre) and least in case of Jammu district (5.11 quintals per acre).

Keywords: CACP, maize, cost-benefit ratio, production pattern

Maize (*Zea mays*) is considered as the 'queen of cereals' because of its higher genetic yield potentiality. In India, it is the third major important crop after rice and wheat. As per APEDA, it is grown in the 85 per cent of the area during the *khari*f season and comprised up to the 10 per cent of the total food grain production in the nation. Various studies in the past have highlighted cost of cultivation of major crops to signify the importance of their cultivation on farm economy {Tirlapur *et al.* (2014); Uday and Raghuwanshi (2016)}. The total cost per hectare incurred in hybrid maize production decreases as the farm size increased. Similarly, Bhat *et al.* (2020) conducted a study in the Ganderbal district of Jammu and Kashmir and found that the net income

of SMC (Shalimar maize composite)-7 under front line demonstrations was ₹ 111,000/ha with a benefit cost ratio of 3.35. In addition, the net returns in case of SMC-4 were found out to be ₹ 80,153. The present study was conducted in rainfed areas of Jammu region. As the maize crop cannot tolerate water stagnation, therefore, this crop was found to be grown predominantly in the rainfed areas of the Jammu region and therefore the marketed surplus is also low (Sharma *et al.* 2011).

How to cite this article: Bhagat, V. and Dwivedi, S. (2021). Economics and Production Pattern of Maize Crop under Rainfed Conditions in the Jammu Region of Jammu & Kashmir State. *Agro Economist - An International Journal*, 08(02): 153-158.

Source of Support: None; **Conflict of Interest:** None



MATERIALS AND METHODS

The study was conducted in the four districts i.e., Rajouri, Jammu, Udhampur and Kathua. Out of these four districts, two blocks in each district were selected. Subsequently, two villages from each block were selected. Finally, fifteen respondents were selected from each village. A total sample of 240 farmers were thereby selected for the present study. The study was conducted using both primary as well as secondary data. The primary data was based on survey of farmers engaged in rainfed farming through personal interview method in four districts of the Jammu region. A well-structured schedule was prepared for collecting information while interviewing the farmers.

As far as statistical analysis of the present study was concerned, the cost concepts framed by the CACP were used. The different cost concepts used in the study includes:

Cost A_1 = All actual expenses in cash and kind incurred in production by the producer. The items covered in cost A_1 are costs on purchasing chick, feed, hired human labor, bullock labour, machine labour, litter, medicine, electricity, depreciation on farm machinery, equipment and farm building, interest on working capital and 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 capital assets (excluding land)
- ♦ Cost B_2 = Cost B_1 + Rental value of owned land and rent paid for leased-in land
- ♦ Cost C_1 = Cost B_1 + Imputed value of family labor
- ♦ Cost C_2^* = Cost B_2 + Imputed value of family labor
- ♦ Cost C_2 = Cost C_2^* estimated by taking into account statutory or actual wage rate whichever is higher
- ♦ Cost C_3 = Cost C_2^* + 10 per cent of Cost C_2^* to (on account of managerial functions performed by farmer)

Apart from the above analysis, the formulas for calculations of gross returns, net returns, family labour income and farm business income were also been utilised in the study. These includes:

Gross returns

It was calculated using the formula:

$$GR = Y_M P_M + Y_B P_B$$

Where,

GR = Gross Returns; Y_M = Yield level of the main produce of the crop; P_M = Price/q of the main product of the crop; Y_B = Yield level of the by-product of the crop; P_B = Price/q of the by-product of the crop

Family Labour Income

Family Labour Income = Net profit + Imputed wages of labour of farmer

Farm Business income:

Farm Business income = Family labour income + interest on fixed capital

RESULTS AND DISCUSSION

Survey across the four districts showed wide variations in the economics of the cultivation of the maize crop. This can be delineated from the descriptive statistics (Table 1) of the samples of the farmers cultivating maize crop under the rainfed areas of the four districts of the Jammu region.

With respect to the economics of the maize crop, the analysis has been done on the basis of the item-wise cost structure (Table 2) as well as on the basis of concept-wise cost structure (Table 3).

Concept wise cost of cultivation emphasise that there is need of input adjustment in the crop so the increase in the income of the farmers can be attained. Similarly, enhancement in the income with the adoption of improved cultivation practices was also confirmed by the studies by Yadav *et al.* (2020) and Sing and Bisen (2020).

Maize cultivation is most profitable in Jammu district with cost-benefit ratio of 1:1.79 and the least was found in case of Udhampur district. Overall average of cost-benefit ratio was 1:1.74 (Table 4).

Maximum quantity was found to be maximum in case of Jammu district (8.20 quintals/acre) with the least in case of Rajouri district (5.00 quintals/acre). The overall average was thereby found out to be 6.75 quintals per acre (Table 5), respectively.

Table 1: Descriptive statistics of maize cultivation

District	Particulars	Units	Mean	Standard error	Range
Jammu	Area	acres	1.42 (± 0.86)	0.11	0.25-4.50
	Seed	kg.	22.75 (± 13.69)	1.76	4-72
	Production	q	11.64 (± 5.83)	0.75	1.80-30
	FYM	q	6.29 (± 5.50)	0.71	1-36
	NPK	kg.	54.38 (± 46.15)	5.96	7.20-324
	Yield	q	8.20 (± 6.78)	6.82	7.20-6.67
	Human Labour*	days	16.55 (± 4.22)	0.54	3-45
	Machine Labour*	days	3.1 (± 1.77)	0.22	2-10
Kathua	Area	acres	2.83 (± 2.17)	0.28	0.25-11.25
	Seed	kg.	38.43 (± 26.93)	3.47	3.4-135
	Production	q	22.64 (± 19.55)	2.52	3-90
	FYM	q	25.55 (± 28.10)	3.63	1-80
	NPK	kg.	153.65 (± 186.31)	24.05	4-850
	Yield	q	8.00 (± 9.01)	7	6-12
	Human Labour*	days	20.13 (± 10.17)	1.31	3-48
	Machine Labour*	days	5.51 (± 2.98)	0.38	2-12
Udhampur	Area	days	3.42 (± 1.80)	0.23	0.75-8.13
	Seed	acres	50.36 (± 28.21)	3.64	12.00-130.00
	Production	kg.	19.84 (± 7.79)	2.40	6.00-80.00
	FYM	q	36.83 (± 21.62)	2.79	10.00-104.00
	NPK	q	220.13 (± 130.32)	16.82	60.00-465.00
	Yield	kg.	5.80 (± 4.33)	5.43	8.00-9.84
	Human Labour*	q	23.13 (± 10.73)	1.39	5.00-45.00
	Machine Labour*	days	6.53 (± 3.13)	0.40	2.00-12.00
Rajouri	Area	acres	1.63 (± 1.22)	0.16	0.25-6.00
	Seed	kg.	24.22 (± 19.84)	2.56	3.00-96.00
	Production	q	8.15 (± 4.55)	1.69	2.00-55.00
	FYM	q	17.75 (± 13.83)	1.79	3.00-60.00
	NPK	kg.	89.92 (± 81.04)	10.46	9.00-432.00
	Yield	q	5.00 (± 3.73)	10.56	4.00-9.17
	Human Labour*	days	14.18 (± 9.15)	1.18	2.00-40.00
	Machine Labour*	days	4.2 (± 3.02)	0.39	2.00-15.00

*Includes imputed values; Figures in parentheses show standard deviation.

Table 2: Item-wise cost structure of maize (₹/acre)

Items	Jammu	Kathua	Udhampur	Rajouri	Overall average
Variable Cost					
Seed	809.72	785.83	690.69	571.66	714.47
Farm produced seeds	566.80	550.08	552.55	457.33	531.69
Purchased seeds	242.92	235.75	138.14	114.33	182.78
Manure	477.63	456.82	345.16	207.56	371.79
Farm produced manure	382.10	365.46	310.64	186.80	311.25
Purchased manure	95.53	91.36	34.52	20.76	60.54
Chemical fertilisers (NPK)	458.59	591.40	204.64	130.38	346.25
Human Labour	1884.73	2050.4	1927.54	1636.5	1874.8
Owned	1042.37	1125.20	1063.77	918.25	1037.40
Hired	842.36	925.20	863.77	718.25	837.40

Machine Labour	1227.62	1249.51	520.83	871.61	967.4
Owned	409.21	416.50	130.21	217.90	293.46
Hired	818.41	833.01	390.62	653.71	673.94
Bullock labour	0.00	0.00	1011.57	1135.72	1073.65
Owned	0.00	0.00	606.94	757.15	682.05
Hired	0.00	0.00	404.63	378.57	391.60
Plant protection chemicals	344.47	293.31	60.00	91.78	197.39
Interest on working capital	364.19	379.91	333.23	325.16	350.62
Total	5566.95	5807.18	5093.65	4970.36	5896.37
Fixed Cost					
Depreciation on farm buildings & equipment	621.39	579.10	128.50	43.35	343.09
Estimated rental value	2200.91	2167.47	1372.73	833.62	1643.68
Land revenue	0.00	0.00	0.00	0.00	0.00
Interest on fixed capital	338.68	329.59	180.15	105.24	238.41
Total	3160.98	3076.16	1681.38	982.21	2225.18
Total Cost (A+B)	8727.93	8883.34	6775.03	5952.57	8121.55

Table 3: Concept-wise cost of cultivation of maize crop (₹/acre)

Particulars	Jammu	Kathua	Udhampur	Rajouri	Overall average
Cost A₁					
Hired Labour	842.36	925.20	863.77	718.25	837.40
Machine Labour	1227.62	1249.51	520.83	871.61	967.39
Bullock Labour	0.00	0.00	1011.57	1135.72	1073.65
FYM	477.63	456.82	345.15	207.55	371.79
Seed	809.72	785.83	690.69	571.66	714.48
Fertilisers (NPK)	458.59	591.40	204.64	130.38	346.25
Plant protection chemicals	344.47	293.31	60.00	91.78	197.39
Interest on working capital	364.19	379.91	333.23	325.16	350.62
Depreciation charges	621.39	579.10	128.50	43.35	343.09
Total cost- A ₁	5145.97	5261.08	4158.38	4095.46	5202.06
Cost-A₂					
Cost-A ₁	5145.97	5261.08	4158.38	4095.46	5202.06
Rent paid for leased-in land	0.00	0.00	0.00	0.00	0.00
Total cost- A ₂	5145.97	5261.08	4158.38	4095.46	5202.06
Cost- B₁					
Cost A ₁	5145.97	5261.08	4158.38	4095.46	5202.06
Interest on fixed capital (excluding land)	338.68	329.59	180.15	105.24	238.41
Total cost- B ₁	5484.65	5590.67	4338.53	4200.70	5440.47
Cost- B₂					
Cost B ₁	5484.65	5590.67	4338.53	4200.70	5440.47
Land Revenue	0.00	0.00	0.00	0.00	0.00
Estimated rental value	2200.91	2167.47	1372.73	833.62	1643.68
Total cost-B ₂	7685.56	7758.14	5711.26	5034.32	7084.15
Cost -C₁					
Cost B ₁	5484.65	5590.67	4338.53	4200.70	5440.47
Imputed value of family labour	1042.37	1125.20	1063.77	918.25	1037.40
Total cost- C ₁	6527.02	6715.87	5402.30	5118.95	6477.87
Cost-C₂					

Cost B ₂	7685.56	7758.14	5711.26	5034.32	7084.15
Imputed value of family labour	1042.37	1125.20	1063.77	918.25	1037.40
Total cost- C ₂	8727.93	8883.34	6775.03	5952.57	8121.55
Cost- C ₃					
Cost of management (10% of Cost-C ₂)	872.79	888.33	677.50	595.26	812.16
Total cost- C ₃	9600.72	9771.67	7452.53	6547.83	8933.71

Table 4: Cost and returns of maize crop (₹/acre)

Particulars	Jammu	Kathua	Udhampur	Rajouri	Overall average
Cost					
Total variable cost	5566.95	5807.18	5093.65	4970.36	5359.54
Total fixed cost	8727.93	8883.34	6775.03	5952.57	7584.72
Total cost (C ₂)	8727.93	8883.34	6775.03	5952.57	8121.55
Returns					
Gross returns	15585.10	15240.53	11749.54	10370.38	13236.39
Net returns	6857.17	6357.19	4186.08	3571.53	5242.99
Family labour income	7899.54	7482.39	5249.85	4489.78	6280.39
Farm business income	8238.22	7811.98	5430.00	4595.02	6518.80
Cost-Benefit Ratio	1:1.79	1:1.72	1:1.73	1:1.74	1:1.74

Table 5: Production pattern of maize crop under rainfed conditions cultivation (per acre)

Particulars	Jammu	Kathua	Udhampur	Rajouri	Overall average
Main product					
Quantity (quintals)	8.20	8.00	5.80	5.00	6.75
Average Price per quintal (₹)	1620.00	1600.00	1576.00	1490.00	1571.50
Total amount (A)	13284.00	12800.00	9140.80	7450.00	10668.70
By- product					
Quantity (quintals)	5.11	5.36	7.67	8.85	6.75
Average Price per quintal (₹)	450.00	455.00	340.00	330.00	393.75
Total amount (B)	2301.10	2440.53	2608.74	2920.38	2567.69
Total (A+B)	15585.10	15240.53	11749.54	10370.38	13236.39

It becomes pertinent to mention here that in the *Budhal* and *Doongi* block, by-product was also of much importance as this was utilized as fodder. Therefore, it was not uncommon to observe the fact that the quantity of by-product was high in case of Udhampur and Rajouri district in comparison to that of Jammu and Kathua districts. Rana *et al.* (2018) carried out a study on the maize production viability in the eastern Uttar Pradesh and found in their study

that, ₹ 37387.13 per ha was found out to be the cost of cultivation of maize crop. 31.97 quintals per ha. was found to be the productivity. In addition, the gross returns were worked out to be ₹ 43062.50 and the value of C1, C2 and C3 was worked out to the tune of ₹ 37003.98, ₹ 24143.98 and ₹ 20281.83 per ha, respectively. The comparative analysis of the total cost and gross returns can be made with the help of Fig. 1.

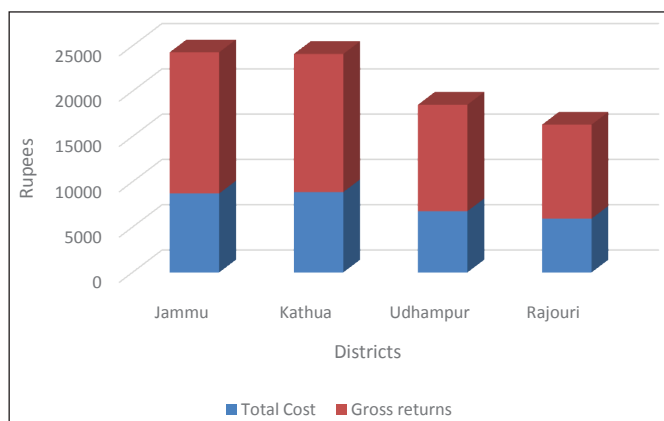


Fig. 1: Costs and returns of maize crop in the rainfed area of four districts

Similarly, a comparative analysis of the production pattern of four districts has been shown in Fig. 2.

CONCLUSION

It is concluded that total cost was highest in Kathua district (₹ 8883.34 per acre) and least in case of Rajouri district (₹ 5952.57 per acre).. The overall average cost of maize cultivation was ₹ 8121.55 per acre. The net returns were found highest in case of Jammu district (₹ 6857.17 per acre) and the least in case of Rajouri district (₹ 3571.53 per acre). Consequently, the cost-benefit ratio was found out to be highest in case of Jammu district (1:1.79), which was followed by Rajouri (1:1.74), Udhampur (1:1.73) and Kathua (1:1.72). The overall cost-benefit ratio came out to be 1:1.74. The overall family labour income and farm business income was ₹ 6280.39 per acre and 6518.80 per acre. It is also pertinent to mention here that, the highest quantity of the main product per acre was found to be 8.20 quintals, 8.00 quintals, 5.80 quintals and 5.00 quintals in case of Jammu, Kathua, Udhampur and Rajouri district with the overall average found out to be 6.75 quintals.

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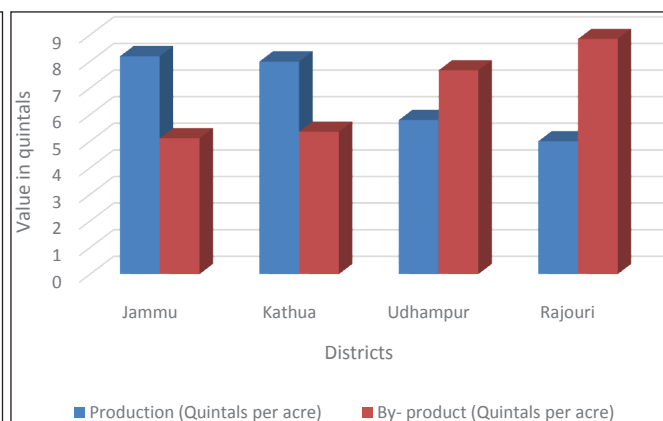


Fig. 2: Production pattern of maize crop in the rainfed areas of four districts

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