

Economics Analysis of *Kharif* Sweet Corn in Kolhapur District of Maharashtra

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Abstract: The present investigation was undertaken to examine the resource use productivity and resource use efficiency, costs and returns, marketing channels, disposal pattern, estimate the marketing cost and price spread in production and marketing of sweet corn. The results revealed that the average per hectare total cost of cultivation (cost 'C') was ₹ 97,832.79 at the overall level. The average per hectare production and gross income were worked out to 96.13 quintals and ₹ 1,97,263.50, respectively. The benefit cost ratio of *kharif* sweet corn was 2.02. The production function analysis revealed that regression coefficient of bullock labour and nitrogen were positive and significant and the highest MVP to price ratio was of bullock labour followed by nitrogen which were greater than unity. This implied that further increase use of above indicated resource would bring higher returns. Per quintal net price received by producer was ₹ 1428.67 and ₹ 1429.52 for Channel-I and Channel-II, respectively. The per quintal marketing cost incurred by producer was highest in Channel-II (₹ 54.77) and Marketing efficiency of *kharif* sweet corn it was highest in Channel-I (7.33).

The study therefore recommended that, government and the private sector should make timely availability of affordable soft micro credits or loans to the farmers to strengthening production activities, for excellent and effective processing and storage of the product as well as organizing out growers to same as source of recommended variety of seeds for specially sweet corn production purpose to the farmers. Government and research institutions should provide improved agricultural inputs like seeds with traits of drought and pest resistant, short duration. Therefore, government should focus on technological upgradation and effective market support to the producers. Efforts should be taken by the government to procure seeds and chemicals at a lower cost to the farmers and also the middlemen involvement should be reduced.

Keywords: Marketing, Input out, Production Function

JEL Classification Code: L19, M31, R18

INTRODUCTION

Sweet corn is a particular maize species which differ genetically from the field maize. Its kernels are tender, delicious and eaten as a vegetable in many cuisines worldwide. In contrast to the traditional field corn, sweet corn crops are harvested while their corn-ears have just attained the milky stage. Corn is native to the Central Americas which then introduced to the rest of the world through Spanish explorers. Sweet

corn differs genetically from the field maize by mutation at the sugary locus.

Generally sweet corn is early in maturity. It is harvested in 75-85 days during *kharif* season. Green cobs are harvested after 18-20 days of pollination during *kharif* but the duration may varies season to season. At the harvest time the moisture is generally 70 per cent in the grain and sugar content varies from 11 to more than 20 per cent.

Sweet corn is one of the most popular vegetables in the USA, Europe and other developed countries of the world. It is a very delicious and rich source of energy, vitamin C and A. It is eaten as raw, boiled or steamed green cobs/grain. It is also used in preparation of soup, salad, pizza and other recipes. Besides this, its fodder is highly succulent, palatable and digestible. Sweet corn is used as a human food in the soft dough stage with succulent grain. The higher content of a water soluble polysaccharide in the kernel adds texture and quality in addition to sweetness.

Maharashtra State ranks seventh in maize production in India. In Maharashtra, maize is mainly grown in *kharif* season (816 hectares), *rabi* season (115 hectares) and *summer* season. In Maharashtra, the cultivation of sweet corn is mostly concentrated in Kolhapur, Satara and Pune districts. The area under *kharif* maize in Kolhapur district was 13.9 hectares with production of 43.2 metric tons and productivity of 3108.3 kg/hectare during the year 2018-19.

The results of the study based on the above objectives would be useful to the farmers from Kolhapur district in knowing the present technology of sweet corn production, gain due to value addition and possibilities of increasing the returns through optimum utilization of resources. The study would also provide the guidelines and directives for proper use of resources, marketing practices and time to be followed for maximization of profit from sweet corn production.

MATERIAL AND METHOD

In Maharashtra state, Kolhapur district is one of the leading districts in *kharif* sweet corn cultivation and contributing near about five per cent of the total area under *kharif* sweet corn cultivation in the state. The study was based on primary data for the year 2018-19.

I. The standard cost concepts were used (cost A, cost B and cost C).

II. Production function analysis

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} x_7^{b_7} x_8^{b_8} \dots x_n^{b_n} + e$$

Where,

Y = Output (q/ha)

X₁ = Total human labour (manures/ha)

X₂ = Total bullock labour (pair days/ha)

X₃ = Manures (q/ha)

X₄ = Nitrogen (kg/ha)

X₅ = Phosphorus (kg/ha)

X₆ = Potash (kg/ha)

X₇ = Zinc sulphate (kg/ha)

X₈ = Plant protection (₹/ha)

III. Formula for estimating marginal value product (MVP)

$$\text{Marginal value product of } X_i = b_i \frac{\bar{Y}}{\bar{X}} P_y$$

Where,

b_i = regression coefficient

Y = geometric mean of yield

X = geometric mean of independent variable

P_y = price of output

IV. Total Marketing Cost

$$C = C_f + C_{m1} + C_{m2} \dots C_{mi}$$

Where,

C = Total marketing cost.

C_f = Cost paid by the producer from the time of produce leaves the farm till he sells it.

C_{mi} = Cost incurred by ith middleman in the process of buying and selling the produce.

V. Price Spread

Price spread = Consumer's price - Price received by farmer i.e.

$$P_s = C_p - P_f$$

Where,

P_s = Price spread

C_p = Consumer's price

P_f = Price received by farmer.

VI. Marketing Margin

$$MT = \sum (S_i - P_i) / Q_i$$

Where,

MT = Total Marketing Margin

S_i = Sale value of a product paid by ith firm

P_i = Purchase value of a product paid by ith firm

Q_i = Quantity of product handled by ith firm

RESULTS AND DISCUSSION

Table 1. Itemwise Cost of Cultivation of kharif Sweet Corn (₹/ha)

Sr. No.	Cost Items	Size Group			Overall
		Small	Medium	Large	
1	Total hired human labour (Man days)	12371.54 (11.52)	7815.53 (7.81)	7503.55 (7.95)	8267.07 (8.45)
2	Bullock labour (Pair days)	3201.58 (2.98)	2262.14 (2.26)	2065.37 (2.19)	2278.59 (2.33)
3	Machine power (hrs)	4881.42 (4.54)	3640.78 (3.64)	2501.18 (2.65)	3153.28 (3.22)
4	Manures (q)	3854.74 (3.59)	8917.48 (8.91)	7460.92 (7.90)	7371.95 (7.54)
5	Seed (kg)	12526.68 (11.66)	12459.71 (12.44)	12495.97 (13.24)	12489.99 (12.77)
6	Fertilizers (kg)	9383.16 (8.74)	7910.02 (7.90)	7850.27 (8.31)	8079.83 (8.26)
7	Plant protection charges (₹)	1120.55 (1.04)	1253.40 (1.25)	1165.99 (1.23)	1184.37 (1.21)
8	Weedicide (₹)	768.77 (0.72)	1620.39 (1.62)	1440.08 (1.53)	1397.86 (1.43)
9	Incidental charges (₹)	827.08 (0.77)	671.84 (0.67)	912.60 (0.97)	832.74 (0.85)
10	Repairs (₹)	651.19 (0.61)	552.91 (0.55)	659.17 (0.70)	628.05 (0.64)
	Working capital (₹)	49586.72 (46.16)	47104.20 (47.04)	44055.10 (46.66)	45683.72 (46.70)
11	Int. on Working Capital @ 6 % (₹)	1487.60 (1.40)	1413.13 (1.41)	1321.65 (1.40)	1370.51 (1.40)
12	Depre. on implements and machinery	8342.81 (7.76)	9121.35 (9.11)	8761.50 (9.28)	8805.04 (9.00)
13	Land revenue and taxes (₹)	236.96 (0.21)	209.81 (0.21)	176.50 (0.19)	194.30 (0.20)
	Cost 'A'	59654.09 (55.53)	57848.48 (57.77)	54314.76 (57.53)	56053.57 (57.30)
14	Rental value of land	34683.99 (32.29)	33498.93 (33.45)	34157.22 (36.18)	34044.39 (34.80)
15	Int. on fixed capital @ 10 % (₹)	2506.57 (2.33)	2485.02 (2.48)	2506.41 (2.65)	2500.39 (2.56)
	Cost 'B'	96844.66 (90.16)	93832.43 (93.71)	90978.40 (96.36)	92598.35 (94.65)
16	Family labour				
	Male	5988.14 (5.57)	3640.78 (3.64)	1890.10 (2.00)	2953.11 (3.02)
	b. Female	4584.98 (4.27)	2660.19 (2.66)	1544.29 (1.64)	2281.33 (2.33)
	Cost 'C'	107417.78 (100)	100133.40 (100)	94412.79 (100)	97832.79 (100)
II	Gross Income	209525.69	202252.43	191890.10	197263.50
III	Per quintal cost (₹)	1266.98	1025.22	962.36	1022.38
IV	B:C ratio	1.95	2.02	2.03	2.02

(Figures in parentheses indicate the percentages to the cost C)

1. Cost of Cultivation of Sweet corn

It is observed from the Table 1, the per hectare cost of cultivation of *kharif* sweet corn in small, medium and large size group was estimated to ₹ 1,07,417.78, ₹ 1,00,133.40 and ₹ 94,412.79, respectively. The per hectare output (yield) obtained was 84.78, 97.67 and 98.11 quintals in small, medium and large size group, respectively with an average of 96.13 quintals per hectare at overall level. This has resulted into gross returns of ₹ 2,09,525.69, ₹ 2,02,252.43 and ₹ 1,91,890.10 per hectare in small, medium and large size group, respectively with average gross return of ₹ 1,97,263.50 per hectare at overall level. At overall level, per hectare gross returns obtained were found to be ₹ 1,97,263.50. The per hectare cost 'C' was worked out to ₹ 97,832.79, respectively. The per hectare gross returns obtained were ₹ 2,09,525.69, ₹ 2,02,252.43 and ₹ 1,91,890.10 with benefit cost ratio of 1.95, 2.02 and 2.03, respectively in small, medium and large size group. The B:C ratio of more than unity indicated that the *kharif* sweet corn cultivation in the study area is a economically viable proposition

There was no specific trend in per hectare cost of cultivation of sweet corn was observed amongst the size groups, whereas increasing

trend in yield was observed across the size groups. This has resulted in showing the decreasing trend in per quintal cost of production amongst the size groups in sweet corn cultivation.

2. Functional Analysis

It is revealed from Table 2, the 8 independent variables used in the production function model as indicated by R^2 have explained 55 per cent variation in output of sweet corn at overall level. At overall level the inputs *viz.*, bullock labour (X_2) and nitrogen (X_4) were positive and highly significant at one per cent level, whereas inputs *viz.*, human labour (X_1) and phosphorus (X_5); were negative and significant.

This indicated that, the *kharif* sweet corn production is positively influenced by increasing the use of these resources in production of *kharif* sweet corn. The regression coefficients of the individual resource variables indicates that if there is one per cent increase in use of the respective resource variable the output of *kharif* sweet corn would increase by the magnitude of respective resource variable in that per cent. *e.g.* if the use of nitrogenous fertilizer (X_5) is increased by five per cent in cultivation of *kharif* sweet corn crop the output of sweet corn would increase by 0.41795 per cent.

Table 2: Results of estimated Cobb- Douglas production function (Per ha)

Sr. No.	Particulars	Unit	Groups			
			Small	Medium	Large	Overall
1	Intercept		0.11086	0.42462	0.77817	0.33232
2	Human labour (X_1)	Days	-0.00812 (0.22528)	-0.24733* (0.14456)	-0.03832 (0.10757)	-0.2052*** (0.0652)
3	Bullock labour (X_2)	Days	0.3878** (0.1567)	0.20236 (0.13698)	0.14540* (0.08452)	0.22199*** (0.0708)
4	Manures (X_3)	q	0.00445 (0.01268)	0.00673 (0.01290)	-0.02491*** (0.00751)	-0.00208 (0.00632)
5	Nitrogen (X_4)	kg	0.2952 (0.3101)	0.30571 (0.40938)	0.34887 (0.62651)	0.41795** (0.35943)
6	Phosphorus (X_5)	kg	-0.12759 (0.08541)	-0.20883 (0.19528)	-0.09526 (0.19750)	-0.16133*** (0.04471)
7	Potash (X_6)	kg	0.02176 (0.03061)	-0.07608 (0.13664)	-0.04327 (0.09270)	0.00497 (0.02005)
8	Zinc sulphate (X_7)	kg	0.03856 (0.14735)	0.47101** (0.21981)	0.30301 (0.35003)	-0.04785 (0.07106)
9	Plant protection (X_8)	₹	0.33771* (0.16669)	0.40870*** (0.11578)	0.13931 (0.09881)	0.42214 (0.06723)
	R^2		0.57	0.56	0.58	0.55

(***, ** and * Indicate significant at 1, 5 and 10 per cent level, respectively)

(Figures in the parentheses are the standard errors of the respective regression coefficient)

3. Resources Use Efficiency

It is revealed from the Table 3, at overall level the ratio of marginal value of product to factor cost ratio (MVP/MC) was greater than unity in case of resources such as bullock labour (X_2), nitrogen (X_4) and plant protection charges (X_8) indicated the higher resource use efficiency of these resources as they were underutilized and there is further scope for increasing the use of these resources in production of sweet corn. Whereas, the MVP/MC ratio of the resources viz., human labour (X_1), manures (X_3),

phosphorus fertilizer (X_5) and zinc sulphate (X_7) were found to be negative indicating the excess use of these resources which needs to be reduced in production of kharif sweet corn.

4. Disposal Pattern of Kharif Sweet corn

It is seen from the Table 4, at overall level the total quantity of kharif sweet corn produced was 96.13 quintals per hectare, of which the marketable surplus was 99.28 per cent and the total retention which includes home consumption, labours and wastages etc. together constituted 0.72 per cent to the total production.

Table 3: Resource Use Efficiency of Kharif Sweet Corn Production

Particulars	bi Value	MP	MVP	MC	MVP/MC
Human labour (X_1)	-0.2052	-0.356077	-526.60	300.00	-1.76
Bullock labour (X_2)	0.2220	4.461529	6598.11	400.00	15.81
Manures (X_3)	-0.0021	-0.003949	-5.84	125.00	-0.05
Nitrogen (X_4)	0.4179	0.269962	399.24	28.19	14.16
Phosphorus (X_5)	-0.1613	-0.179700	-265.76	28.20	-9.42
Potash (X_6)	0.0050	0.009052	13.39	28.20	0.47
Zinc sulphate (X_7)	-0.0478	-0.455727	-673.97	28.19	-23.91
plant protection (X_8)	0.4221	0.033883	50.11	1.00	50

Table 4: Disposal Pattern of Kharif Sweet corn (q/ha)

Sr. No.	Particulars	Size group			Overall
		Small	Medium	Large	
1	Per Farm Production	84.78 (100)	97.67 (100)	98.11 (100)	96.13 (100)
2	Home Consumption	0.72 (0.85)	0.48 (0.49)	0.35 (0.36)	0.44 (0.46)
3	Labour Use	0.29 (0.34)	0.23 (0.24)	0.15 (0.16)	0.19 (0.20)
4	Wastage	0.05 (0.05)	0.05 (0.05)	0.07 (0.07)	0.06 (0.06)
5	Marketed surplus	83.73 (98.76)	96.91 (99.22)	97.53 (99.41)	95.44 (99.28)

(Figures in parentheses are the percentage to the quantity produced)

Table 5: Channel Wise Marketing Cost of Kharif Sweet Corn (₹/q)

Sr. No.	Particulars	Channels	
		Channel I (Producer → Retailer → Consumer)	Channel II (Producer → Wholesaler → Retailer → Consumer)
	Price received by farmer	1477.38	1484.29
1	Packaging charges	15.00 (30.80)	15.00 (27.39)
2	Transport charges	20.15 (41.37)	25.98 (47.44)
3	Hamali	5.00 (10.27)	5.00 (9.13)

Sr. No.	Particulars	Channels	
		Channel I (Producer → Retailer → Consumer)	Channel II (Producer → Wholesaler → Retailer → Consumer)
4	Commission charges	8.00 (16.42)	8.00 (14.61)
5	Other charges	0.56 (1.15)	0.79 (1.44)
6	Total marketing cost	48.71 (100.00)	54.77 (100.00)
7	Net price received by farmer	1428.67	1429.52

(Figures in the parentheses indicates the percentages to the total marketing cost)

5. Marketing Channels of Sweet corn

It can be seen from the Table 5, the per quintal cost of marketing of *kharif* sweet corn for Channel-I was ₹ 48.71 and in case of channel II it was ₹ 54.77, respectively. Thus, per quintal cost of marketing was highest in Channel-II (Producer → Wholesaler → Retailer → Consumer) in which packaging and transportation charges

were the major items of cost which contributed 27.39 and 47.44 per cent, respectively to the total cost of marketing. While in case of channel-I (Producer → Retailer → Consumer) the major items of marketing cost were packaging and transportation charges which shared 30.80 and 41.37 per cent, respectively to the total cost of marketing.

Table 6: Price Spread in Marketing of Kharif Sweet Corn (₹/q)

Sr. No.	Particulars	Channel I	Channel II
1	Gross price received by the farmer	1477.38 (91.00)	1484.29 (87.14)
	i) Marketing cost	48.71 (3.00)	54.77 (3.22)
	ii) Net price realized	1428.67 (88.00)	1429.52 (83.92)
2	Wholesaler		
	i) Price paid	-	1484.29 (87.14)
	ii) Marketing cost	-	27.38 (1.61)
	iii) Marketing margin	-	54.77 (3.22)
	iv) Price received	-	1566.44 (91.96)
3	Retailer		
	i) Price paid	1477.38 (91.00)	1566.44 (91.96)
	ii) Marketing cost	48.71 (3.00)	27.38 (1.61)
	iii) Marketing margin	97.42 (6.00)	109.53 (6.43)
	iv) Price received	1632.51 (100)	1703.35 (100)
4	Consumer		
	i) Price paid	1623.51 (100)	1703.35 (100)
	Price spread	194.84	273.83

(Figures in parentheses are the percentage to the price paid by consumers)

6. Price Spread in Marketing of Sweet corn

From the Table 6, the higher marketing cost was incurred by wholesaler (1.61 %) followed by retailer (1.61 %) in channel II. It was observed from the table that, the net price realized by the producer was ₹'1428.67' in Channel-I and ₹'1429.52' in channel-II.

Price spread was less in Channel-I i.e. 194.84 as there were less marketing costs and market margins as compared to channel-II (273.83). The producer's share in consumer rupee was highest in channel-I (91.00%) as compare to channel-II (87.14%). This clearly indicated that, channel-I was found to be more efficient channel in marketing of *kharif* sweet corn in Kolhapur district.

Table 7: Marketing Efficiency of Kharif Sweet Corn

Channel	Price Paid by Consumer	Net price received by Sweet corn growers	MC	MM	MC+MM	MME
I	1623.51	1428.67	97.42	97.42	194.84	7.33
II	1703.35	1429.52	109.53	164.30	273.83	5.22

7. Marketing Efficiency of Sweet corn

It is seen from the Table 7, the marketing efficiency was maximum for Channel-I (7.33) as compare to channel-II (5.22).

CONCLUSIONS

The study as whole, the total cost i.e. cost 'C' of *kharif* sweet corn production per hectare was ₹ 97,832.79. The Gross returns, per quintal cost and net farm income per hectare were calculated to be ₹ 2,09,525.69, ₹ 2,02,252.43 and ₹ 1,91,890.10 and it was 2.02 B:C ratio. The functional analysis indicated that two variables *viz.*, bullock labour (X_2) and nitrogen (X_4) were significant at overall level. Therefore these were the major variables for which the output is responsive. The resource use efficiency shows that the resources *viz.*, bullock labour, nitrogen and plant protection measures were under used, which means that there was scope to increase the utilization of these variables. In marketing of *kharif* sweet corn, farmers were mostly preferred channel II and channel-I (Producer-Retailer-Consumer) has highest marketing efficiency.

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