AN ECONOMIC ANALYSIS OF CABBAGE PRODUCTION

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ABSTRACT

The present investigation was undertaken to study the cost and returns of cabbage in North Gujarat by using multistage random sampling. The study covered 4 talukas, 12 villages and 120 cabbage cultivators from Banaskantha and Sabarkantha districts. The tabular analysis and cost concept (Cost A, Cost B, Cost C1 and Cost C2) was used. The overall total cost of cultivation per hectare was Rs 82405.24. It was highest in medium farms followed by small farms, large farms and marginal farms. An overall, among Cost A, the cost of human labour ranked first and this is because cabbage requires a greater number of labours particularly for picking, weeding and irrigation activities. It was found that the overall yield of cabbage was 308.83 quintals per hectare. Per quintal average, the farm harvest price received by the cabbage growers were Rs 507.27. In general, large and medium farm growers sell their produce at higher prices compared to small and marginal farms, which was mainly due to the time of sale and the agencies to which the product was sold. It was seen that the net return increased based on the increase in farm size. The overall input-output ratio indicated that an investment worth Rs 1 on all the inputs used in the cultivation of cabbage yielded an output worth Rs 1.90.

Keywords : *cost of cultivation, cost concepts, net return, input-output ratio*

INTRODUCTION

The agro-climatic conditions of India are suitable for growing numbers of fruits, oilseeds and vegetables throughout the whole year (Rai *et al.,* 2020). Apart from fruits, vegetables are the only protective food supplying all the nutrients and crude fibers.

Cabbage (*Brassica oleraceae var. capitata* L.) is one of the most popular winter vegetable crops grown in India. Cultivation of such crops is remunerative under irrigated conditions particularly during the Rabi season and hence gaining popularity among the vegetable growers of Gujarat state. The cabbage has originated from wild cabbage. The head cabbage was referred to too much late in about the 16th century. It is mostly employed as a culinary and diet article. It is also used in curries pickles **etc.** It may be used for feeding stock and chicken also. Cabbage is used as salad, boiled vegetable as well as dehydrated vegetable.

Indian Scenario

India is the world's second-largest producer of vegetables next to china. According to the third advance estimate of 2018-19 of the National horticulture board for total vegetables and cabbage crop, India produced 1858.83 lakh tonnes of vegetables from an area of 101.00 lakh hectares. In the year 2018-19, cabbage production with 90.95 lakh tonnes from 3.99 lakh hectares of the area which accounted for 4.89 per cent of total production and 3.95 per cent of total area, respectively of India (National Horticulture Board).

The important cabbage growing states in India are West Bengal, Bihar, Odisha, Assam, Madhya Pradesh, Gujarat, Chhattisgarh, Haryana and Jharkhand. Among all the cabbage producing states, Gujarat occupies the 6th position in respect to area and production (National Horticulture Board).

Gujarat Scenario

The important vegetables grown in Gujarat are cabbage, cauliflower, potato, tomato, brinjal, onion and chillies. During the year 2017-18, Gujarat produced 132.33 lakh tonnes of total vegetables from an area of 6.5 lakh hectares. In Gujarat, cabbage production was 6.45 lakh tonnes from 0.285 lakh hectares of the area which accounted for 4.87 per cent of the total production of vegetables and 4.38 per cent of total area, respectively (Directorate of Horticulture, Gandhinagar, Gujarat).

During the year 2017-18, the major cabbage producing districts are Sabarkantha, Banaskantha, Gandhinagar, Kheda,

Rajkot, Anand, Mehsana and Aravalli which together contributed about 67.96 and 71.63 per cent of total area and total production under cabbage cultivation in the state, respectively. It is also noteworthy that in Gujarat, North Gujarat districts contribute the highest area **i.e.** 9648 hectares (33.73 %) under cabbage cultivation with 254323 tonnes (39.41 %) of production in the year 2017-18 (Directorate of Horticulture, Gandhinagar, Gujarat).

Cultivation of cabbage has been found considerably remunerative than the other normal rabi crops in particularly Gujarat. Cabbage cultivation is gaining popularity due to its short lifespan, easy cutting and comparatively good returns. That's why, even though being perishable, due to considering all factors, the cultivation of cabbage is adopted by small and marginal farmers. With the cultivation of cabbage crops, it is also important to understand the cost and returns relationship. By knowing the cost and returns of cabbage, farmers can decide whether they are in benefit or not. The information on cost and returns helps credit institutions in deciding the scale of finance for crop loans and the schedule of repayment.

OBJECTIVES

(1) To estimate the cost of cultivation and returns per hectare for cabbage crop

(2) To estimate the cost of production per quintal and the input-output ratio of cabbage

METHODOLOGY

The Gujarat state comprises 33 districts, among them Banaskantha, Sabarkantha, Aravalli, Patan, Gandhinagar, Mehsana are covered under North Gujarat region. The North Gujarat region was selected for the study as it contributed about 40.93% of the total area under cabbage cultivation in 2017-18 in Gujarat state (Directorate of Horticulture, Gandhinagar, Gujarat).

Selection of districts

Multistage stratified sampling was adopted. In the first stage, out of six districts in North Gujarat, Banaskantha and Sabarkantha districts was selected purposively, as it collectively covers about 66.14 per cent area of cabbage cultivation during the year 2017-18 (Directorate of Horticulture, Gandhinagar, Gujarat).

Selection of the talukas

Selected two talukas from each selected district based on the concentration of the area of cabbage cultivation. Palanpur and Deesa from Banaskantha district and Vadali and Prantij from Sabarkantha district were selected. Hence, a total of four talukas were selected for the study.

Selection of village

Three villages were selected randomly from each selected taluka. Thus, a total of 12 villages were selected for the study.

Selection of respondents

The sample of 10 cabbage growers was selected at random from each of the selected villages ensuring proportionate representation of the four strata marginal (up to 1.00 hectare), small (>1.00 to 2.00 hectares), medium (>2.00 to 4 hectares) and large (above 4.00 hectares) . Thus, all 120 growers (43 marginal, 39 small, 21 medium and 17 large farm sizes) were selected for the study.

Primary and secondary data

The data regarding the cost of cultivation were collected by interviewing respondents for February-April, 2019 and the data on the area under cabbage for the selected talukas and districts were compiled from the records of the National Horticulture Board, Directorate of Horticulture, Government of Gujarat etc.

Analysis

Tabular analysis was employed to work out the cost of cultivation per hectare, per quintal cost of production, gross and net returns. Simple comparisons were made based on percentages. Besides, wherever necessary cumulative percentages were calculated. Ratios were also calculated for the interpretation of data.

Economics of cabbage cultivation

These two concepts are often used in the economic analysis of crops. Cost of cultivation refers to the economic valuation of variable inputs and fixed inputs per unit area say per hectare, while the cost of production for the crop is computed in terms of output per unit of weight say per quintal.

Cost concepts : The cost concepts used in the present analysis are those laid down in the farm management study.

Cost A: The following items are included in cost A

(i) Cost of hired human labour,

(ii) Cost of hired and owned bullock labour,

(iii) Tractor charges,

(iv) Cost of planting materials,

(v) Cost of manures (owned and purchased),

(vi) Cost of fertilizers,

(vii) Cost of plant protection chemicals,

(viii) Irrigation charges,

(ix) Depreciation

(x) Interest on working capital

(xi) Miscellaneous

However, Cost A can be divided into two parts *viz*., Cost A_1 and Cost A_2, if tenant farmers are there in the study. But in the present study, Cost A was considered without dividing into cost A_1 and Cost A_2 as there was no tenant farmer in the list of selected respondents. The expenses incurred towards land revenue, transport charges, charges to contract work *etc.,* were included under the head of other paid out expenses.

Cost B:

Cost A + Imputed rental value of owned land + Imputed interest on

owned fixed capital (excluding land)

Cost C_1:

Cost B + Imputed value of family labour

Cost C_2:

Cost C_1 + 10 per cent of cost C_1 as managerial charges

Cost of Production per Quintal:

Total Cost (cost C_2) / Yield of main product in quintal

Cost of Production on different costs:

Different cost *viz;* Cost A, Cost B, Cost C_1 and Cost C_2 / Yield of main product in quintal

Income Measures

The various income measures used in the present study are shown as under.

(i) Gross Income

It is calculated by considering the total production of Cabbage in quintal and the price prevailing of product per quintal.

(ii) Farm Business Income

Gross Income minus Cost A

(iii) Family Labour Income

Gross Income minus Cost B

(iv) Farm Investment Income

Net Income + Rental value of owned land + Interest on owned fixed Capital

(v) Net Income (profit or loss)

Value of gross output minus Cost C_2

RESULTS AND DISCUSSION

Cost structure

The cost of cultivation of cabbage plays an important role in determining the net income which helps in defining the economic status of the respondents by adopting vegetable cultivation like cabbage. The details about component-wise costs for cabbage cultivation on different sizes of farms per hectare are computed and the results are shown in Table 1.

Table 1: Break-up of the total cost of cultivation for cabbage (₹/hectare)

Sr. No.	Item	Category of farm				
		Marginal	Small	Medium	Large	Overall
1	**Human Labour**	17097.38 (21.06)	19442.15 (23.51)	18880.95 (22.76)	18434.56 (22.45)	18286.15 (22.19)
	(a) Family	9638.23 (11.87)	9727.08 (11.76)	7995.24 (9.64)	7700.00 (9.38)	8765.14 (10.80)
	(b) Hired	7459.16 (9.19)	9388.62 (11.35)	10885.71 (13.12)	10734.56 (13.07)	9617.14 (11.39)
2	**Bullock labour and Tractor charges**	5004.07 (6.16)	5136.75 (6.21)	5104.17 (6.15)	5245.96 (6.39)	5098.98 (6.19)

Sr. No.	Item	Category of farm				
3	**Seedlings**	9554.65 (11.77)	9380.77 (11.34)	9471.43 (11.42)	9206.47 (11.21)	9434.25 (11.44)
4	**Manures and cakes**	9872.09 (12.16)	8923.08 (10.79)	7928.57 (9.56)	8382.35 (10.21)	9012.50 (10.94)
5	**Irrigation charges**	7249.77 (8.93)	7951.03 (9.61)	8281.43 (9.98)	8178.82 (9.96)	7789.83 (9.45)
6	**Fertilizer**	7186.44 (8.85)	7457.51 (9.02)	7892.57 (9.51)	7383.65 (8.99)	7426.05 (9.01)
7	**Plant protection chemicals**	4744.44 (5.84)	4368.21 (5.28)	4861.90 (5.86)	4690.06 (5.71)	4635.13 (5.62)
8	**Miscellaneous**	896.51 (1.10)	865.38 (1.05)	883.33 (1.06)	873.53 (1.06)	880.83 (1.07)
9	**Depreciation**	1016.74 (1.25)	959.59 (1.16)	995.24 (1.20)	1098.65 (1.36)	1006.04 (1.22)
10	**Interest on working capital**	1585.26 (1.95)	1660.43 (2.01)	1689.13 (2.04)	1671.51 (2.04)	1640.09 (1.99)
11	**Interest on fixed capital**	1754.46 (2.16)	1702.16 (2.06)	1557.23 (1.88)	1657.67 (2.02)	1667.88 (2.02)
12	**Rental value of owned land**	7837.21 (9.65)	7666.67 (9.27)	7880.95 (9.50)	7823.53 (9.53)	7787.50 (9.45)
13	**Managerial cost**	7379.99 (9.09)	7518.72 (9.09)	7602.21 (9.09)	7464.68 (9.09)	7491.39 (9.09)
14	**Cost A**	54569.13 (67.22)	56091.37 (67.82)	57993.48 (69.90)	57465.56 (69.98)	56529.94 (68.60)
15	**Cost B**	64160.80 (79.04)	65460.21 (79.15)	67431.66 (81.27)	66946.76 (81.53)	65999.91 (80.09)
16	**Cost C_1**	73799.03 (90.91)	75187.29 (90.91)	76022.14 (90.91)	74646.76 (90.91)	74913.85 (90.91)
17	**Cost C_2**	81178.93 (100.00)	82706.01 (100.00)	83624.35 (100.00)	82111.44 (100.00)	82405.24 (100.00)

Note: Figures in parentheses indicate percentage to Cost-C_2

The data the Table 1 show that the overall total cost of cultivation per hectare of cabbage was Rs 82405.24. It was highest in medium farms Rs 83624.35 followed by small farms (Rs 82706.01), large farms (Rs 82111.44) and marginal farms (Rs 81178.93).

Overall, among paid out (Cost A), the cost of human labour ranked first with 22.19 per cent of the total Cost C2 and this is because cabbage requires more labour particularly for picking, weeding and irrigation activities. The other operational expenditure was on seedlings (11.44 per cent), manures and cakes (10.94 per cent), irrigation cost (9.45 per cent), fertilizer cost (9.01 per cent), bullock labour and tractor charges (6.19 per cent), plant protection chemicals (5.62 per cent), depreciation (1.22 per cent) and miscellaneous (1.07 per cent).

From the Table, it can be seen that overall per hectare Cost A was found to be Rs 56529.94. The highest per hectare Cost A was Rs 57993.48 on medium farms and the lowest Rs 54569.13 on marginal farms. The results of Patel **et al.** (2018) and Rai *et al.,* (2020) also show that cost of cultivation was higher in the case of larger landholders than the smaller landholders.

Yield, price, gross income and net returns

Yield, farm harvest price and gross income from cabbage production on different farm sizes are presented in Table 2.

The data of the Table 2 revealed that the overall yield of cabbage was 308.83 quintals per hectare. It ranged from 304.28 quintals on marginal farms to 316.35 quintals on large farms. Higher yield levels on large farms may be due to timely important operations carried out and proper selection of varieties of cabbage, which affect the output to a greater extent, as compared to other farms. The yield variation might be due to the different times of sowing, types of land and use of hybrid variety **etc**.

Table 2: Yield, farm harvest price and gross income per hectare

Category of farm	Yield (quintal)	Harvest price (₹/quintal)	Value of gross output (₹)
Marginal	304.28	501.00	152444.65
Small	309.05	507.77	156944.23
Medium	311.62	511.57	159414.05
Large	316.35	516.65	163453.41
Overall	**308.83**	**507.27**	**156686.23**

The data in Table 2 also shows that per quintal average farm harvest price received by the cabbage growers was ₹ 507.27. The large size growers had higher prices per quintal **i.e.** (₹ 516.65) followed by medium (₹ 511.57), small (₹ 507.77) and marginal (₹ 501.00) farms. In general, large and medium farm growers sell their produce at higher prices compared to small and marginal farms, which was mainly due to the time of sale and the agencies to which the product was sold.

The overall average gross returns per hectare found to be ₹ 156686.23 and it varied from ₹ 152444.65 on marginal farms to ₹ 163453.41 on large farms. Thus, it can be concluded that gross income increased with an increase in the size of the farms.

Table 3: Net returns over different costs per hectare

Category of farm	Net returns over different costs (₹/hectare)			
	Cost A	Cost B	Cost C_1	Cost C_2
Marginal	97875.52	88283.85	78645.62	71265.72
Small	100852.86	91484.03	81756.94	74238.22
Medium	101420.57	91982.39	83391.91	75789.70
Large	105987.85	96506.65	88806.65	81341.97
Overall	**100156.29**	**90686.32**	**81772.38**	**74280.99**

The data of the Table 3 shows that per hectare net returns over operational cost (Cost A) was the highest (₹ 105987.85) on large farms and the lowest (₹ 97875.52) on marginal farms with an overall of ₹ 100156.29 on sample farms. An overall, based on Cost B, Cost C1 and Cost C2, net returns from cabbage were ₹ 90686.32, ₹ 81772.38 and ₹ 74280.99 per hectare, respectively. Further, per hectare, net returns over Cost C2 ranged from ₹ 71265.72 on marginal farms to ₹ 81341.97 on large farms. It can be concluded that net return increased based on the increase in farm size.

Table 4: Farm business income, family labour income, farm investment income and net profit over cost-C_2 ((₹/hectare)

Particulars	Category of farm				
	Marginal	Small	Medium	Large	Overall
Farm business income (₹)	97875.52	100852.90	101420.57	105987.85	100156.30
Family labour income (₹)	88283.85	91484.03	91982.39	96506.65	90686.32
Farm investment income (₹)	80857.39	83607.05	85227.88	90823.17	83736.37
Net income (₹)	71265.72	74238.22	75789.70	81341.97	74280.99

It can be seen from Table 4 that the overall per hectare farm business income, family labour income and farm investment income were found to be ₹ 100156.30, ₹ 90686.32 and ₹ 83736.37, respectively. The net profit per hectare (over Cost C_2) was ₹ 74280.99 for all farms. The analysis shows that the farm business income, family labour income, farm investment and net income increased as the category of the farm changed from marginal to large.

Cost per quintal

The estimated cost of production per quintal of cabbage is given in Table 5. The overall Cost A (paid out cost) per quintal was ₹ 183.05, which was 68.60 per cent of the total cost. The overall total cost of production (cost C_2) per quintal of cabbage was about ₹ 266.83. It was highest on medium farms (₹ 268.35), followed by small farms (₹ 267.61), marginal farms (₹ 266.79) and large farms (₹259.56). As the category of farm increased the total cost per quintal was declined. It was mainly due to the higher productivity seen in cabbage on the higher category of farms.

Table 5: Cost of production per quintal based on different cost concepts

Category of farm	Different costs (₹ per quintal)			
	Cost A	Cost B	Cost C_1	Cost C_2
Marginal	179.34 (67.22)	210.86 (79.04)	242.54 (90.91)	266.79 (100.00)
Small	181.50 (67.82)	211.81 (79.15)	243.29 (90.91)	267.61 (100.00)
Medium	186.10 (69.35)	216.39 (80.64)	243.96 (90.91)	268.35 (100.00)
Large	181.65 (69.98)	211.62 (81.53)	235.96 (90.91)	259.56 (100.00)
Overall	**183.05 (68.60)**	**213.71 (80.09)**	**242.57 (90.91)**	**266.83 (100.00)**

Note: Figures in parentheses indicate the percentages to Cost-C_2

Input-output ratio

The input-output ratio indicates the criteria for the economic viability of the crop based on return per rupee invested. The input-output ratios were worked out based on different costs (Cost A, Cost B, Cost C_1 and Cost C_2) and the same is presented in Table 6.

Table 6: Input-output ratio

Category of farm	Cost A	Cost B	Cost C_1	Cost C_2
Marginal	1: 2.79	1: 2.38	1: 2.07	1: 1.88
Small	1: 2.80	1: 2.40	1: 2.09	1: 1.90
Medium	1: 2.75	1: 2.36	1: 2.10	1: 1.91
Large	1: 2.84	1: 2.44	1: 2.19	1: 1.99
Overall	1: 2.77	1: 2.37	1: 2.09	1: 1.90

The overall input-output ratio was found to be 1: 1.90 based on Cost C2 indicated that an investment worth ₹ 1 on all the inputs used in the cultivation of cabbage yielded an output worth ₹ 1.90. It can also be seen that the input-output ratio was the lowest (1: 1.88) on marginal farms and the highest (1: 1.99) on large farms.

Further, it was observed that the input-output ratio based on cost A **i.e.** paid out cost, was highest (1:2.84) on large farms followed by small farms (1:2.80), marginal farms (1:2.79) and medium farms (1:2.75). The overall input-output ratio over cost A, cost B, Cost C1 and Cost C2 were 2.77, 2.37, 2.09 and 1.90, respectively.

CONCLUSION

The overall total cost of cultivation per hectare of cabbage was ₹ 82405.24. An overall, among cost A, the cost of human labour ranked first with this is because cabbage requires a greater number of labours particularly for picking, weeding and irrigation activities. The overall yield of cabbage was 308.83 quintals per hectare. It ranged from 304.28 quintals on marginal farms to 316.35 quintals on large farms. Higher yield levels on large farms may be due to timely important operations carried out and proper selection of varieties of cabbage, which affect the output to a greater extent, as compared to other farms. Per quintal average farm harvest price received by the cabbage, growers were Rs 507.27. In general, large and medium farm growers sell their produce at higher prices compared to small and marginal farms, which was mainly due to the time of sale and the agencies to which the product was sold. It can also be seen that gross income and net return increased with an increase in the size of the farms. The farm business income, family labour income, farm investment and net income increased as the category of the farm changed from marginal to large. The overall input-output ratio indicated that an investment worth ₹ 1 on all the inputs used in the cultivation of cabbage yielded an output worth Rs 1.90.

REFERENCES

Bala, B., Sharma, N and Sharma, R. K. 2011. Cost and return structure for the promising enterprice of off season vegetables in Himachal Pradesh, *Agricultural Economics Research Review,*24(1): 141-148.

Chotaliya, J. 2017. An economic analysis of production and marketing of little gourd in central Gujarat. Master Thesis, Anand Agricultural University, Anand.

Directorate of Horticulture, Gandhinagar, Gujarat: http://doh.gujarat.gov.in (Last accessed on 30th April, 2018).

Godambe, R. B.,Torane, S. R., Talathi, J. M., and Kshirsagar, P. J. 2016. Cost return and profitability of okra in Thane district of Maharashtra. *The Asian Journal of Horticulture*, 11(1): 14-18.

Guhe, N. 2011. Economics of production and marketing of cabbage in Betul district of Madhya Pradesh (Doctoral dissertation, JNKVV, Jabalpur).

Jadav, K. S., Leua, A. K. and Darji, V. B. 2011. Economics of supply chain of fresh potato in Middle Gujarat, *Indian Journal of Agriculture Research,* 45(4):266-274.

Kale, N. K., Navadkar, A. V., and Sale, D. L. 2005. Resource use efficiency in chili cultivation in Thane District of Kankan region, *Indian Journal of Agricultural Economics*, 60(3): 529-530.

Maurya, O. P. and Pal, S. L. 2012. Economics of production and marketing of okra in district Bijnor (U.P.).*Hortflora Research Spectrum*, 1(3): 274-277.

National Horticulture Board: http://nhb.gov.in (Last accessed on 30th April, 2018).

Nikam, A. V., Shendage, P. N.,Jadhav, K. L. and Deokate, T. B. 2007. Marketing of kharif potato in Satara district Maharashtra.*Indian Journal of Agricultural Marketing*, 21(2): 188-196.

Palak. 2013. An economic analysis of production and marketing of cauliflower middle Gujarat. Msc(agri) unpublished thesis, AAU, Anand.

Patel, D., Thakar, K. P., Soumya, C. and Modi, D. B. 2018. Cost of Cultivation And Marketable Surplus of Major Vegetables of North Gujarat. *International Journal of Agriculture Sciences,* 10(10), 6018-6024.

Rai, A. K., Raj, Kumar and Kanak, Lata (2020) Impact of frontline demonstration on mustard through improved production technology under renfed condition. *Guj. J. Ext. Edu.* 31(2):5-8.

Zala, Y. C. Patel, G. N. Khatra, R. G. & Shaikh, A.S. 2005. Marketing of potato in middle Gujarat. The compendium of a National Seminar on Changing Dimensions of Marketing of Farm Commodity. pp: 1-10.

http://agri.gujarat.gov.in/hods/dir-horticulture.htm.(Last Accessed on 30th April 2018)

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