Indian Journal of Agricultural Sciences **88** (9): 1419–28, September 2018/Article

Profitability and marketing behavior of cauliflower crop in Sonipat district of Haryana

AJAY KUMAR[1] and ANIL KUMAR ROHILA[2]

National Agricultural Higher Education Project, Indian Council of Agricultural Research, Krishi Anusandhan Bhavan-II, Pusa, New Delhi 110 012

Received: 03 June 2018; Accepted: 10 July 2018

ABSTRACT

India is the second largest producer of vegetables in the world next to China. The cauliflower, potato, onion, tomato and radish are the major vegetable crops of Haryana. The present investigation was carried out to study the cost structure, returns, resource use efficiency, price spread and marketing efficiency of cauliflower. Present study was conducted in Sonipat district of Haryana. From selected district one tehsil and two villages from tehsil were selected on the basis of highest area and 15 farmers from each selected village were interviewed. Thus, sample of 30 cauliflower growers were studied. The vegetable markets of Sonipat district was purposively selected as these are near to the main production area. While, Sonipat and Panipat markets were selected for the marketing efficiency. Ten intermediaries from each market were selected randomly making a sample of 20 intermediaries. The cost of cultivation of cauliflower was higher on large farms as compared to medium and small farms.The gross returns were found higher in medium farms as compared to large and small farms. The cost of production per quintal was lower on medium farms and highest on large and small farms indicating that the medium farms are having economies of scale in production. The net income was higher on medium farms as compared to small and large farms in cauliflower.There was no difference in marketable and marketed surplus because of perishable nature of vegetable and farmers were hard pressed by their cash needs for post-harvest immediate sale. In cauliflower channel-I (Producer → Commission agent cum wholesaler →Retailer →Consumer) was more efficient as it ensured higher percent share of farmer in the consumer's rupee as compared to channel-II (Producer → Village trader → Commission agent cum wholesaler →Retailer →Consumer).

Key words: Intermediaries, Marketing efficiency, Price spread, Resource use efficiency

Vegetable cultivation occupies an important place in the agricultural economy of our country. With increase in economic standards, urbanization of growing Indian villages, international market integration and trade liberalization, the demand for horticultural products is expected to increase even further. On the production side, if cereal pricing is left to market forces, land will be released from traditional cultivation to meet the growing demand for non-cereal crops such as oilseeds, fruits and vegetables in accordance with the diversification in consumption pattern (Mittal 2006). India is the second largest producer of vegetables in the world next only to China with a production of 162.90 million metric tonnes (14.04% of the total production in the world) from 9.40 million ha (15.88% of the total area under vegetables in the world) of land area in the year 2013-14 (Anonymous 2014). Vegetable cultivation occupies an important place in the agricultural economy of the country. The agricultural economy of our country has the characteristics of preponderance of small and marginal land holdings and family labor for which vegetable cultivation is more suitable. Though, vegetable crops hold a great promise for fostering the economic growth and improving the diet of the people, yet they received limited attention in marketing research programmes in India.

MATERIALS AND METHODS

Selection of districts: Sonipat district was selected purposively on the basis of their highest area under cauliflower crops for this study. On the basis of highest area, one tehsil, i.e. Sonipat was selected from the district. Further, two villages, i.e. *Kumaspur* and *Tajpur* were selected from the tehsil. For the selection of farmers, a complete list of all the vegetable growers of selected villages were prepared and arranged in ascending order on the basis of area under the selected crop. The farmers were categorized as small, medium and large by cumulative total method on the basis of area under cauliflower crops. Farmers on the top of the list representing 1/3rd of total cultivated area were categorized as small farmers, next representing 1/3rd of total cultivated area as medium farmers and the remaining were categorized as large farmers. Thereafter, a sample of 15 farmers from

[1]e mail: ajayyadav62063@gmail.com

Table 1 Selected number of cauliflower growing farmers in different size groups

Size of land holding	Villages		Number of farmers
	Kumaspur	Tajpur	
Small	9	8	17
Medium	4	4	8
Large	2	3	5
Total	15	15	30

each selected village was selected by probability proportion in each size group holding; thereby making a sample of 30 cauliflower growers.The distribution of selected farmers in different size groups grownig cauliflower are presented in Table 1.

Selection of markets: The vegetable markets of Sonipat and Panipat were purposively selected as these are near to the main production area.

Selection of intermediaries: Ten intermediaries from each market were selected randomly making a sample of 20 intermediaries.

Collection of data: Primary data was used for the present study. Information regarding cost of cultivation, returns and inputs used in production of cauliflower crop was collected from selected vegetable farmers on pre-structured and pre-tested schedules through personal interview method for the year 2014-15. The information about marketing of vegetables, price received and cost incurred in marketing was collected from farmers, commission agents, wholesalers and retailers. The channels of marketing were identified. The information about the marketing costs and margins in the selected markets were collected from the farmers and commission agents who sold their produce in these markets.

Analysis of data: The data were analyzed using various statistical techniques to achieve the objectives as specified below:

Cost of cultivation: The cost of cultivation of vegetable crops was worked out by using various cost concepts defined below:

Cost A_1 : It includes: 1. Value of hired human labour, 2. Value of hired and owned bullock labour, 3. Value of hired and owned machine labour, 4. Value of seed (both farm seed or purchased), 5. Value of manures and fertilizers (owned and purchased), 6. Depreciation, 7. Irrigation charges, 8. Land revenue, 9. Interest on working capital, 10. Miscellaneous expenses.

Cost A_2 : Cost A_1 + rent paid for leased –in land value

Cost B_1 : Cost A_1 + interest on working capital (excluding land)

Cost B_2 : Cost B_1 + rental value of owned land + rent 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 as management cost.

Resource use efficiency: The use of different inputs in production of selected vegetable crops on sample farms was studied. To analyse the resource use efficiency in vegetable crops, CobbDouglas production function was fitted to analyse elasticity of production, marginal physical products and marginal value productivity. The production function used is given as under:

$$Y = a.X_1^{b1}.X_2^{b2}.X_3^{b3}\ldots\ldots\ldots\ldots\ldots X_n^{bn}.U_i$$

The regression coefficients, their significance, standard errors and co-efficient of multiple determination (R^2) were worked out. Marginal physical product and marginal physical productivity were worked out for each significant input.

The marginal physical product (MPD) of the input used in each vegetable crop was worked out with the help of following equation

$$MPP = bi \frac{\overline{Y}}{\overline{X}}$$

The marginal value productivity (MVP) was worked out as follows:

$$MVP = MPP \times Price/q$$

where, MPP = marginal physical product, MVP = marginal value productivity, bi = elasticity of production of i^{th} input, $\overline{Y}$ = Geometric mean of output per ha, $\overline{X}$ = Geometric mean of input per ha.

*Marketing cost***:** The marketing cost incurred by farmers was computed by using following formula:

$$MCi = CGi + CPi + CTi + CCi + CMi$$

where, MCi = Average marketing cost of i^{th} vegetable (₹/q), CGi = Average cost of grading i^{th} vegetable (₹/q), CPi = Average cost of packing i^{th} vegetable (₹/q), CTi = Average cost of transporting i^{th} vegetable (₹/q), CCi = Average amount of commission paid for i^{th} vegetable (₹/q), CMi = Average miscellaneous cost of i^{th} vegetable (₹/q).

$$\text{Absolute margin} = P_{Ri} - (P_{Pi} + C_{Mi})$$

$$\text{Percentage margin} = \frac{P_{Ri} - (P_{Pi} + C_{Mi})}{P_{Ri}} \times 100$$

where, P_{Ri} = Total value of receipts (sale price), P_{Pi} = Total purchase value of goods (purchase price), and C_{Mi}= Cost incurred in marketing.

The producer's share in the consumer's rupee was worked out as under:

$$Ps = \frac{P_F}{P_C} \times 100$$

where, P_s = Producer's share in consumer's rupee, P_F = Price of the produce received by the farmer, and P_c =Price of the produce paid by the consumer.

The modified marketing efficiency (MME) suggested by Acharya was worked out:

$$MME = \frac{RP}{MC + MM} - 1$$

where, MME = Modified measure of marketing efficiency,

Table 2 Resource use pattern for cauliflower cultivation on different land size holdings

Inputs	Units	Size of land holdings			Average
		Small	Medium	Large	
Seed rates	gram/ha	376.75	438.50	500.83	438.68
FYM	tonnes/ ha	30.22	33.88	35.10	33.03
Fertilizers					
Nitrogen	kg/ha	123.33	125.89	130.87	126.70
Phosphorus	kg/ha	45.70	51.25	54.89	50.61
Potassium	kg/ha	34.50	36.25	41.83	37.52
Zinc	kg/ha	9.50	10.89	13.33	11.24
Insecticide / Pesticide sprays	no.	3.39	3.45	3.89	3.58
Hoeing and weeding	no.	1.00	1.30	1.50	1.27
Irrigations	no.	15.5	17.02	18.0	16.84

MC = Marketing cost, MM = Marketing margin, RP = Price paid by consumer / retail price.

RESULTS AND DISCUSSION

Resources use pattern

It is depicted from Table 2 that seed rate used was 376.75 g, 438.50 g and 500.83 g per ha on small, medium and large size holdings, respectively. The average quantity of seed used was 438.68 g per ha by the sample farms. The FYM applied to the field were 30.22, 33.88 and 35.10 tonnes per ha on small, medium and large size holdings, respectively. The average quantity used was 33.03 tonnes/ ha by the sample farms. In case of chemical fertilizer, urea and DAP were mainly used by the sample farmers. The quantity of nitrogen used was 123.33, 125.89 and 130.87 kg/ha and quantity of phosphorus used was 45.70, 51.25 and 54.89 kg per ha at small, medium and large farms. The quantity of potassium used was 34.50, 36.25 and 41.83 kg/ ha on small, medium and large farms, respectively. The quantities of zinc used were 9.50, 10.89 and 13.33 kg/ha on small, medium and large farms, respectively. On an overall basis, 126.70 kg nitrogen, 50.61 kg phosphorus, 37.52 kg potassium and 11.24 kg zinc were used by sample farmers. Singh and Vashist (1999) and Ayoola *et al.* (2009) also found similar results who obtained that the yield was higher in main season than in summer season.

The numbers of sprays done were 3.39, 3.45 and 3.89 by the small, medium and large farmers, respectively. The average number of sprays was 3.58 by the sample farmers. This is because cauliflowers are more prone to insect/pest and diseases.The number of hoeing and weeding done were 1.00, 1.30 and 1.50 by the small, medium and large farmers, respectively. On an average, 1.27 weeding were done manually during growing season of cauliflower crop by the sample farmers. The numbers of irrigations done were 15.5, 17.2 and 18.0 by the small, medium and large farmers, respectively. On an average, 16.84 irrigations were given to the cauliflower crop by sample farmers. Similar

Table 3 Item-wise break up of cost of cultivation/ha in cauliflower crop

Item	Size groups						Average	
	Small		Medium		Large			
	Value (₹)	per cent	Value (₹)	per cent	Value (₹)	per cent	Value (₹)	per cent
Human labour								
Family	42870	27.94	22260	13.41	10590	5.69	25240	14.98
Hired	683	0.45	26910	16.21	48003	25.79	25199	14.95
Seeds	11302	7.37	13155	7.92	15024	8.07	13160	7.81
FYM	12485	8.14	13075	7.88	14582	7.83	13381	7.94
Fertilizers	5969	3.89	6256	3.77	7025	3.77	6417	3.81
Machinery	13100	8.54	14950	9.01	19100	10.26	15717	9.33
PP chemicals	4560	2.97	4720	2.84	5210	2.80	4830	2.87
Weedicides	1350	0.88	1385	0.83	1400	0.75	1378	0.82
Irrigation charges	4986	3.25	5050	3.04	5125	2.75	5054	3.00
Land revenue	150	0.10	150	0.09	150	0.08	150	0.09
Depreciation	1454	0.95	1501	0.90	1587	0.85	1514	0.90
Miscellaneous	1280	0.83	1450	0.87	1650	0.89	1460	0.87
Interest on working capital @ 4.5%	2579	1.68	3987	2.40	5349	2.87	3972	2.36
Total variable cost	59898	39.04	92589	55.78	124205	66.72	92231	54.73
Interest on fixed capital	660	0.43	1150	0.69	1354	0.73	1055	0.63
Rental value of land	50000	32.59	50000	30.12	50000	26.86	50000	29.67
Total cost	153428	100.00	165999	100.00	186149	100.00	168525	100.00

findings were also obtained by Wadhvani and Bhogal (2001).

Cost structure

Table 3 shows breakup of the cost incurred by different size groups in various operations of cauliflower cultivation. On an average, ₹ 168525 was spent on cauliflower per ha. Cost of cultivation of large farm category were highest, ₹ 186149, followed by medium farms (₹ 165999) and small farms (₹ 153428). Among the different components of cost of cultivation, human labour accounted for the largest portion (29.93%) followed by machinery (9.33%). The other major components were rental value of land (29.67%), irrigation charges (3%), seed (7.81%), plant protection chemicals (2.87%) and fertilizers (3.81%). The cultivation of cauliflower require more labour use for harvesting and cutting, application of irrigation and transplanting/sowing and as such the share of human labour accounted for the highest share of ₹ 50439/ha (31.48%). Large farmers spent ₹ 21607 on manures and fertilizers, which were higher than that of medium (₹ 19331) and small farmers category (₹ 18454).

Cost of cultivation on different cost concepts basis

The data in Table 4 showed that total cost of cultivation (C_2) per ha of cauliflower amounted to ₹ 153428, 16599 and 186149, respectively on small, medium and large farm, respectively with an average of ₹ 168525. On an average, cost A_1 was ₹ 92231, which were highest on large farms (₹ 124205) and low on small farms (₹ 59898). The average cost B_1 and cost B_2 was ₹ 93285 and 143285, respectively. Among different land size categories, Cost C_1 was highest (₹ 143285) on large farms and lowest (₹ 103428) on small farms with an average of ₹ 118525. Cost C_3, which includes managerial cost, were worked out to be ₹ 185378 per ha on an overall basis. An increasing trend was observed in different costs with increase in the farm size. Singh (2004) also observed similar cost concepts.

Table 4 Cost of cultivation (₹/ha) of cauliflower on different cost concepts basis on different size holdings

Costs	Small	Medium	Large	Average
Cost A_1	59898	92589	124205	92231
Cost A_2	59898	92589	124205	92231
Cost B_1	60558	93739	125559	93285
Cost B_2	110558	143739	175559	143285
Cost C_1	103428	115999	136149	118525
Cost C_2	153428	165999	186149	168525
Cost C_3	168771	182599	204763	185378

Table 5 Gross income per ha from cauliflower cultivation on different size holdings

Size of land holding	Yield (q/ha)	Gross income (₹/ha)
Small	250	330000
Medium	276	364320
Large	259	341880
Average	262	345400

Productivity and profitability of cauliflower

The data in Table 5 revealed that on an overall basis, productivity of cauliflower was 262 q/ha. The yield were highest (276 q) on medium farms, followed by large farms (259 q) and small farms (250 q) which indicated that the gross returns were found higher in medium farms as compared to large and small farms. It is due to better management practices, sound financial position and efficient use of resources by medium farmers. The overall gross returns were ₹ 345400/ha. Sidhu *et al.* (2010) also reported that the total cost of cultivation was estimated at ₹ 49563/ha for onion and ₹ 34840/ha for cauliflower. The net returns were found higher for onion (₹ 74597/ha) as compared to that from cauliflower (₹ 38072/ha).

The data in Table 6 revealed that returns over variable cost varied between ₹ 217675 to ₹ 271731. The return over variable cost was highest on medium farms followed by small and large farms. Farm business income which represents returns over cost A_2 were same as returns over variable cost as there were no difference between cost A_1 and A_2 because the leasing in land for vegetable production were not in practice in the study area. The family labour income per ha of cauliflower cultivation varied from ₹ 166321 in large farms to ₹ 220581 on medium farms. On an overall basis, family labour income was worked out to be ₹ 202115/ha. Net income implies profit/ha after deducting cost C_2 from gross income. The overall net income from cauliflower cultivation was ₹ 176875/ha. Among different size groups, it varied between ₹ 155731/ha to ₹ 198321/ha on different land size holdings. The overall returns to management (cost C_3 basis) from cauliflower cultivation were ₹ 160022/ha. It varied between ₹ 137117 to ₹ 181721 on different land size holdings.

Net returns on different cost concepts basis

It is evident from Table 7 that on an overall basis, returns from the cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3 were ₹ 253169, 253169, 252115, 202115, 226875, 176875 and ₹ 159187/ha of cauliflower cultivation, respectively. Results of present study are in total agreement with Lokapur and Kulkarni (2014).

Table 6 Return (₹/ha) from cultivation of cauliflower crop on sample farms

Particulars	Size of land holdings			Average
	Small	Medium	Large	
Returns over variable cost	270102	271731	217675	253169
Farm business income	270102	271731	217675	253169
Family labour income	219442	220581	166321	202115
Net income	176572	198321	155731	176875
Return to management	161229	181721	137117	160022
Return per rupee	2.15	2.19	1.84	2.06

Table 7 Net returns (₹/ha) from cauliflower cultivation on different cost concepts

Particulars	Size land holdings			Average
	Small	Medium	Large	
Cost A_1	270102	271731	217675	253169
Cost A_2	270102	271731	217675	253169
Cost B_1	269442	270581	216321	252115
Cost B_2	219442	220581	166321	202115
Cost C_1	226572	248321	205731	226875
Cost C_2	176572	198321	155731	176875
Cost C_3	158914	178489	140158	159187

Cost of production per q

The cost of production of cauliflower across different land size categories is given in Table 8. It revealed that on an average, ₹ 644.63 was spent on producing a quintal of cauliflower on cost C_2 basis. The cost of production on cost C_3 basis was ₹ 709.09, while on cost A_1, cost A_2, cost B_1 and cost B_2 basis, these were ₹ 351.54, 351.54, 355.55 and 546.95, respectively. The cost of production on cost C_2 basis were found to be lowest on medium farms (₹ 601.45), followed by small farms (₹ 613.71) and large farms (₹ 718.72)/q. The cost of production on cost C_3 basis was higher on large farms than that of other two categories. This indicates that medium farms were more efficient and have economies of scale on their farms as compared to small and large.

Returns per rupee of investment

It is evident from the Table 9 that on an average, the returns per rupee of investment on cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3 were ₹ 4.07, 4.07, 4.02, 2.49, 2.95, 2.06 and 1.87, respectively. The returns per rupee of investment on medium farms on cost C_2 basis were highest (₹ 2.19), followed by small (₹ 2.15) and large farmers (₹ 1.84). This showed that medium farms were more efficient than small and large farms mainly because of lower cost per unit of output.

Resource use efficiency

Linear and Cobb-Douglas production functions were used for the purpose of finding out elasticity of different inputs used on the farms. Cobb-Douglas function was found to be the best fit because of high R^2 value and the results are presented in the Table 10. The value of R^2 (coefficient of multiple determination) was 0.86 indicating that independent variables included in the model explained 86% of variation in yield of cauliflower (dependent variable). However, only nitrogen, human labour and irrigation variables were found significantly positive, whereas machine labour was negatively significant.

Table 8 Cost of production (₹/q) of cauliflower on different size holdings

Costs	Small	Medium	Large	Average
Cost A1	239.59	335.47	479.55	351.54
Cost A_2	239.59	335.47	479.55	351.54
Cost B_1	242.23	339.63	484.78	355.55
Cost B_2	442.23	520.79	677.83	546.95
Cost C_1	413.71	420.29	525.67	453.22
Cost C_2	613.71	601.45	718.72	644.63
Cost C_3	675.08	661.59	790.59	709.09

Table 9 Returns per rupee of investment in cauliflower cultivation

Particulars	Size of land holding			Average
	Small	Medium	Large	
Cost A_1	5.51	3.93	2.75	4.07
Cost A_2	5.51	3.93	2.75	4.07
Cost B_1	5.45	3.89	2.72	4.02
Cost B_2	2.98	2.53	1.95	2.49
Cost C_1	3.19	3.14	2.51	2.95
Cost C_2	2.15	2.19	1.84	2.06
Cost C_3	1.96	2.00	1.67	1.87

Marginal physical product and marginal value product

It is depicted from the Table 11 that additional rupees invested in nitrogen, human labour and irrigations brings additional ₹ 2815.15, 7.90 and 54.49, respectively. This indicated that these resources can be used further till their

Table 10 Regression coefficients of different production variables and their significance in cultivation of cauliflower

Input variable	Regression coefficients	Standard errors	T-value	R^2
Seeds	0.2845	0.2417	1.1773	
FYM	-2.2367	1.8933	-1.1814	
Nitrogen	10.3428*	2.1193	4.8803	
Phosphorus	-0.0509	0.4375	-0.1164	
Human labour	1.1562*	0.3063	3.7751	0.86
Machine labour	-2.2634*	0.5989	-3.7792	
Irrigations	0.7950*	0.3515	2.2621	
Sprays	-0.2941	0.1597	-1.8421	
Weeding	-0.3386	0.2845	-1.1898	

* Significant at 5%

Table 11 GM, MPP and MVP of different inputs for cauliflower

Input variable expenditure	GM	MPPxi (q)	MVPxi (₹)	MPPxi/ Pxi
Yield (q)	261.66			
Nitrogen (kg)	126.70	21.35	28152	2815.15
Human labour (man-days)	161.71	1.87	2466	7.90
Machine labour (hr)	31.32	-18.91	-24929	-49.80
Irrigations (no.)	16.77	12.40	16353	54.49

GM = Geometric mean, MPP = Marginal physical product and MVP = Marginal value product

MVPxi=Pxi, whereas machine labour has to be decreased.

Marketing of cauliflower

Marketable and marketed surplus

Table 12 showed marketable and marketed surplus of cauliflower. It is observed from the table that 5726 q of cauliflower was produced by the sample households, of which 5700 q was the marketable surplus. Due to perishable nature of vegetable, the farmers did not stock cauliflower for sale in lean months. Therefore, there was no difference in marketable and marketed surplus of cauliflower.

Place-wise disposal

There were mainly two markets namely village market and regulated market for the farmers to sell their produce. Table 13 revealed that on an average, selling price in the village market was ₹ 1180/q while it was ₹ 1325/q in the regulated market of Sonipat mandi. It was found that out of 30 farmers, 13 farmers sold their produce in the regulated market, out of which 8 were small farmers, 4 medium and 1 were large farmers. The remaining 2 small farmers sold their produce in the village market. In Panipat mandi, the selling price of cauliflower was 1180/q in village market and 1349 per quintal in regulated market. Out of 15 farmers, 13 farmers sold their produce in the regulated market and 2 sold the produce in the village market.

Table 14 provides the average marketing charges incurred in marketing of cauliflower. The commission agent charges 7.00% of value as commission. Loading and weighing charges were ₹ 16.00/q of quantity handled and was paid by the farmer.

The commission agent charges 6.00% of value as commission. Loading and weighing charges were ₹ 14.50/q of quantity handled and was paid by the farmer at Panipat mandi.

Marketing cost, marketing margin, price spread and marketing efficiency in Sonipat district

Two marketing channels were prevailing in the study area as under;

Channel-I: Producer-Commission agent cum wholesaler-Retailer-Consumer

Channel-II: Producer-Village trader-Commission agent cum wholesaler-Retailer-Consumer

Marketing cost, marketing margin, price spread and marketing efficiency were calculated for two channels separately and are presented in Table 15 and Table 16. Whereas, Table 15 provides the marketing cost and margin for market functionaries involved in sale of cauliflower in channel-I. Marketing cost borne by producer was ₹ 73.00/q, while, net price received by farmer was 66.25% of price paid by consumer. Average selling price of commission agent cum wholesaler agent was ₹ 1550.00/q and it was 77.50% of consumer's rupee. The commission agent cum wholesaler incurred marketing cost of ₹ 39.98. The commission agent cum wholesaler sold it to retailer at an average price of

Table 12 Marketable and marketed surplus of cauliflower on sample farms

Size groups	Total production (q)	Family and farm requirements (q)	Marketable surplus (q)	Marketed surplus (q)
Small	1828	17	1811	1811
Medium	2098	6	2092	2092
Large	1800	3	1797	1797
Overall	5726	26	5700	5700

Table 14 Marketing charges for sale of cauliflower in Sonipat and Panipat mandi

Particulars	Units	Rates (₹) Sonipat mandi	Rates (₹) Panipat mandi
Commission	Per 100 rupees worth of produce	7	6
Unloading charges	Per q	8	6.5
Poly bags	Per q	12	12
Loading and weighing charges	Per q	16	14.5

Table 13 Place wise disposable pattern of cauliflower by the sample farmers of Sonipat and Panipat mandi

Size group	Total No. of farmers	Village sale			Market sale			Total quantity sold (q)
		No. of farmers	Quantity (quintal)	Selling price (₹)	No. of farmers	Quantity (q)	Selling price (₹)	
Sonipat Mandi								
Small	10	2	214	1180	8	852	1325	1066
Medium	4				4	1040	1325	1040
Large	1				1	355	1325	355
Overall	15	2	214	1180	13	2247	1325	2461
Panipat Mandi								
Small	7	1	100	1180	6	645	1349	745
Medium	4	1	250	1180	3	802	1349	1052
Large	4				4	1442	1349	1442
Overall	15	2	350	1180	13	2889	1349	3239

Table 15 Marketing cost and margins in channel-I in Sonipat

Particulars	₹/q	Per cent of consumer's purchase price
Producer's net price	1325.00	66.25
Cost incurred by producer		
Labour charges (grading, packing, loading and unloading charges)	20.00	1.00
Poly bags	12.00	0.60
Transportation charges	16.00	0.80
Post-harvest losses	15.00	0.75
Miscellaneous	10.00	0.50
Total cost	73.00	3.65
Producer's sale price/ Commission agent cum wholesaler purchase price	1398.00	69.90
Cost incurred by Commission agent cum wholesaler		
Labour charges	8.00	0.40
Weighing charges	8.00	0.40
Quantity loss @ 1%	13.98	0.70
Miscellaneous	10.00	0.50
Total cost	39.98	2.00
Net margin of Commission agent cum wholesaler	112.02	5.60
Sale price of Commission agent cum wholesaler/ purchase price of retailer	1550.00	77.50
Cost incurred by retailer		
Commission @ 7%	108.50	5.43
Loading charges	8.00	0.40
Transportation charges	10.00	0.50
Unloading charges	8.00	0.40
Quantity loss @ 2%	31.00	1.55
Miscellaneous	10.00	0.50
Total cost	175.50	8.78
Retailer's net margin	274.50	13.73
Sale price of retailer/purchase price of consumer	2000.00	100.00

₹ 1550.00, and earned a margin of ₹ 112.02/q. The retailer incurred an average cost of ₹ 175.50/q and received on an average margin of ₹ 274.00/q, which accounted for 28.33% of consumer's rupee. The average price paid by the consumer was ₹ 2000.00 for a quintal.

The marketing costs in channel-II are presented in Table 16. The table revealed that total cost incurred by village trader was ₹ 78.00/q of cauliflower, which was 3.90% of consumer rupee. Cost incurred by commission agent cum wholesaler was ₹ 40.10/q of cauliflower, which was 2.01% of consumer rupee. Margins earned by village trader and commission agent cum wholesaler were ₹ 152.00 and ₹ 100.00/q, respectively. Cost incurred by retailer was ₹ 175.50/q of cauliflower, which was 8.78% of consumer rupee. The producer's share in consumer rupee was 59.00%.

Table 16 Marketing cost and margins in Channel-II in Sonipat

Particulars	₹/q	Per cent of consumer's purchase price
Producer's net price/ purchase price of village trader	1180.00	59.00
Cost incurred by village trader		
Labour charges (grading, packing, loading and unloading charges)	20.00	1.00
Poly bags	12.00	0.60
Transportation charges	16.00	0.80
Quantity losses	20.00	1.00
Miscellaneous	10.00	0.50
Total cost	78.00	3.90
Net margin of village trader	152.00	7.60
Producer's sale price/ Commission agent cum wholesaler purchase price	1410.00	70.50
Cost incurred by retailer		
Labour charges	8.00	0.40
Weighing charges	8.00	0.40
Quantity loss @ 1%	14.10	0.71
Miscellaneous	10.00	0.50
Total cost	40.10	2.01
Net margin of commission agent cum wholesaler	100.00	5.00
Sale price of commission agent cum wholesaler/ purchase price of retailer	1550.00	77.50
Cost incurred by retailer		
Commission @ 7%	108.50	5.43
Loading charges	8.00	0.40
Transportation charges	10.00	0.50
Unloading charges	8.00	0.40
Quantity loss @ 2 per cent	31.00	1.55
Miscellaneous	10.00	0.50
Total cost	175.50	8.78
Retailer's net margin	274.50	13.73
Sale price of retailer/purchase price of consumer	2000.00	100.00

Margin earned by retailer was ₹ 274.50, which was 13.73% of consumer's rupee.

Total cost incurred and margin earned along with price spread for different intermediaries is presented Table 17. These figures have been derived from Table 15 and 16. Channel-I is more efficient as the producer's share in consumer's rupee was 66.25% in channel-I and 59.00% in channel-II. Total cost of marketing in channel-I was 14.42 and 14.68%, respectively in channel-II. Analysis of marketing margin showed that higher margin of 26.33% was earned by intermediaries in channel-II as compared

Table 17 Price spread in marketing of cauliflower in different marketing channels in Sonipat mandi

Particulars	Channel-I (Mandi sale)		Channel-II (Village sale)	
	₹/ha	Per cent share in consumer's rupee	₹/ha	Per cent share in consumer's rupee
Producer's net price	1325.00	66.25	1180.00	59.00
Cost incurred by				
Producer	73.00	3.65	0.00	0.00
Village trader	0.00	0.00	78.00	3.90
Commission agent cum wholesaler	39.98	2.00	40.10	2.01
Retailer	175.50	8.78	175.50	8.78
Total cost	288.48	14.42	293.60	14.68
Margin earned by				
Village trader	0.00	0.00	152.00	7.60
Commission agent cum wholesaler	112.02	5.60	100.00	5.00
Retailer	274.50	13.73	274.50	13.73
Total margin	386.52	19.33	526.50	26.33
Consumer's price	2000.00	100.00	2000.00	100.00

to 19.33% in channel-I.

Marketing efficiency for channel-I and channel-II in Sonipat was worked out and presented in Table 18. Marketing efficiency was 1.96 for channel-I and 1.44 for channel-II. Table reveals that efficiency was higher in channel-I, hence; it was the most efficient market.

Marketing cost, marketing margin, price spread and marketing efficiency in Panipat district

There were two common marketing channels identified in marketing of cauliflower in Panipat district.

Channel-I: Producer-Commission agent cum wholesaler-Retailer-Consumer

Channel- II: Producer-Village trader-Commission agent cum wholesaler-Retailer-Consumer

Marketing cost, marketing margin, price spread and marketing efficiency were calculated for two channels separately and are presented in Table 19 and Table 20. Whereas, Table 19 provides the marketing cost and margin for market functionaries involved in sale of cauliflower in channel- I. Marketing cost borne by producer was ₹ 82.00/q.

Table 18 Marketing efficiency in marketing of cauliflower in Sonipat mandi

Particulars	Channel-I	Channel-II
Price paid by consumer ₹/q	2000	2000
Marketing cost ₹/q	288.48	293.6
Marketing margin ₹/q	386.52	526.5
Marketing efficiency	1.96	1.44

Table 19 Marketing cost and margins in Channel-I in Panipat

Particulars	₹/q	Per cent of consumer's purchase price
Producer's net price	1349.00	70.26
Cost incurred by producer		
Labour charges (grading, packing, loading and unloading charges)	20.00	1.04
Poly bags	12.00	0.63
Transportation charges	25.00	1.30
Post-harvest losses	15.00	0.78
Miscellaneous	10.00	0.52
Total cost	82.00	4.27
Producer's sale price/ Commission agent cum wholesaler purchase price	1431.00	74.53
Cost incurred by Commission agent cum wholesaler		
Labour charges	6.50	0.34
Weighing charges	8.00	0.42
Quantity loss @ 1%	14.31	0.75
Miscellaneous	10.00	0.52
Total cost	38.81	2.02
Net margin of Commission agent cum wholesaler	105.19	5.48
Sale price of Commission agent cum wholesaler/ purchase price of retailer	1575.00	82.03
Cost incurred by retailer		
Commission @ 6%	94.50	4.92
Loading charges	6.50	0.34
Transportation charges	8.00	0.42
Unloading charges	6.50	0.34
Quantity loss @ 2%	31.50	1.64
Miscellaneous	10.00	0.52
Total cost	157.00	8.18
Retailer's net margin	188.00	9.79
Sale price of retailer/ purchase price of consumer	1920.00	100.00

However, net price received by farmer was 70.26% of price paid by consumer. Average selling price of commission agent cum wholesaler agent was ₹ 1431.00/q and it was 74.53% of consumer's rupee. The commission agent cum wholesaler incurred marketing cost of ₹ 38.81. The commission agent cum wholesaler sold it to retailer at an average price of ₹ 1575.00, and earned a margin of ₹ 105.19/q. The retailer incurred an average cost of ₹ 157.00/q and received on an average margin of ₹ 188.00/q, which accounted for 9.79% of consumer's rupee. The average price paid by the consumer was ₹ 1920.00/q.

Whereas, the marketing costs and margins in channel-II are presented in Table 20. It indicated that the total cost

Table 20 Marketing cost and margins in Channel-II in Panipat

Particulars	₹/q	Per cent of consumer's purchase price
Producer's net price/ purchase price of village trader	1180.00	61.46
Cost incurred by village trader		
Labour charges (grading, packing, loading and unloading charges)	20.00	1.04
Poly bags	12.00	0.63
Transportation charges	25.00	1.30
Quantity losses	25.00	1.30
Miscellaneous	10.00	0.52
Total cost	92.00	4.79
Net margin of village trader	168.00	8.75
Producer's sale price/ Commission agent cum wholesaler purchase price	1440.00	75.00
Cost incurred by commission agent cum wholesaler		
Labour charges	6.50	0.34
Weighing charges	8.00	0.42
Quantity loss @ 1%	14.40	0.75
Miscellaneous	10.00	0.52
Total cost	38.90	2.03
Net margin of Commission agent cum wholesaler	96.10	5.01
Sale price of Commission agent cum wholesaler/ purchase price of retailer	1575.00	82.03
Cost incurred by retailer		
Commission @ 6%	94.50	4.92
Loading charges	6.50	0.34
Transportation charges	8.00	0.42
Unloading charges	6.50	0.34
Quantity loss @ 2%	31.50	1.64
Miscellaneous	10.00	0.52
Total cost	38.90	2.03
Retailer's net margin	188.00	9.79
Sale price of retailer/ purchase price of consumer	1920.00	100.00

incurred by village trader was ₹ 92.00/q of cauliflower, which was 4.79% of consumer rupee. Cost incurred by commission agent cum wholesaler was ₹ 38.90/q of cauliflower, which was 2.03% of consumer rupee. Margin earned by village trader and commission agent cum wholesaler agent was ₹ 168.00 and 96.10/q, respectively. Whereas, cost incurred by retailer was ₹ 157.00/q of cauliflower, which was 8.18% of consumer's rupee. The producer's share in consumer rupee was 61.46%. Margin earned by the retailer was ₹ 188.00, which was 9.79% of consumer's rupee.

Total cost incurred and margin earned along with price spread for different intermediaries is presented in Table 21. Channel-I was more efficient as the producer's share

Table 21 Price spread in marketing of cauliflower in different marketing channels in Sonipat mandi

Particulars	Channel-I (Mandi sale)		Channel-II (Village sale)	
	₹/q	Per cent share in consumer's rupee	₹/q	Per cent share in consumer's rupee
Producer's net price	1349.00	70.26	1180.00	61.46
Cost incurred by				
Producer	82.00	4.27	0.00	0.00
Village trader	0.00	0.00	92.00	4.79
Commission agent cum wholesaler	38.81	2.02	38.90	2.03
Retailer	157.00	8.18	157.00	8.18
Total cost	277.81	14.47	287.90	14.99
Margin earned by				
Village trader	0.00	0.00	168.00	8.75
Commission agent cum wholesaler	105.19	5.48	96.10	5.01
Retailer	188.00	9.79	188.00	9.79
Total margin	293.19	15.27	452.10	23.55
Consumer's price	1920.00	100.00	1920.00	100.00

Table 22 Marketing efficiency in marketing of cauliflower in Panipat mandi

Particulars	Channel-I	Channel-II
Price paid by consumer (₹/q)	1900	1900
Marketing cost (₹/q)	277.81	287.90
Marketing margin (₹/q)	293.19	452.10
Marketing efficiency	2.33	1.57

in consumer's rupee was 70.26% in channel- I and 61.46% in channel-II. Total cost of marketing in channel-I was 14.47% and 14.99% in channel-II. Analysis of marketing margin showed that higher margin of 23.55% was earned by intermediaries in channel-II compared to 15.27% in channel-I.

Marketing efficiency for Channel-I and Channel-II in Panipat was worked out and presented in Table 22. Marketing efficiency was 2.33 for channel-I and 1.57 for channel-II. Table reveals that efficiency was higher in channel-I, hence; it was the most efficient channel.

Conclusion

Study concluded that a gross return was higher for medium farmers as compared to large and small farmers. It might be due to better management practices, sound financial position and efficient use of resources by medium farmers. Marketable surplus was also higher about medium category

of farmers followed by small and large.

REFERENCES

Ayoola O T, Saka J O and Lawal B O. 2009. Resource-use efficiency in dry season vegetable production. *International Journal of Vegetable Science* **15**: 86–95.

Lokapur, Sameer and Kulkarni G N. 2014.Economic production of vegetables in Belgaum district in Karnataka. *International Research Journal of Agricultural Economics and Statistics* **5**(2): 139–42.

Sidhu R S, Kumar S, Vatta K and Singh P. 2010. Supply chain analysis of onion and cauliflower in Punjab. *Agricultural Economics Research Review* **23**: 445–53.

Singh M K. 2004. Economics of efficiency in vegetable business system of Mahakoshal Region in Madhya Pradesh (India). *Indian Journal of Agricultural Marketing* **19**(3): 3–9.

Singh, Kehar and Vashist G D. 1999.An analysis of production and marketing system of vegetable in Lamdagaon block of district Kangra, Himachal Pradesh. *Bihar Journal of Agricultural Marketing* **7**(4): 377–89.

Wadhwani, Mukesh K and Bhogal T S. 2001. Economic analysis of production, post-harvest management and price behaviour of potato in western region of Utter Pradesh. *Bihar Journal of Agricultural Marketing* **9**(4): 433–47.