



## Research Article

# COST OF CULTIVATION AND MARKETABLE SURPLUS OF MAJOR VEGETABLES OF NORTH GUJARAT

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**Abstract:** India holds the second position in vegetable production in the world after China. North Gujarat contributed 30.10 per cent area under vegetables and 42.43 per cent of production of vegetables in the year 2015-16. In Gujarat, Banaskantha, Mehsana and Sabarkantha districts contributed about 23.55 per cent area under vegetables and 29.85 per cent of production of vegetables in the year 2015-16. Therefore, these three districts were selected purposively for the study. Palanpur taluka from Banaskantha, Kadi taluka from Mehsana and Idar taluka from Sabarkantha districts were randomly chosen and three villages from Palanpur taluka, three villages from Kadi taluka and three villages from Idar taluka were chosen in proportionate to their share in area. Considering the different categories of farmers, 12 farmers were selected from each village adopting multi-stage random sampling technique. A total of 108 farmers, 20 wholesalers and 40 retailers were selected for this study. The average total cost of cultivation per hectare of tomato farms was Rs. 78668 and the average yield of tomato per hectare was 330.20 quintals. The gross income and net income on sampled farms were Rs. 211295 and Rs. 132627, respectively. On an average, cost of cultivation per hectare for brinjal farms was Rs. 64469. In case of brinjal, yield, gross income and net income per hectare were 223.44 quintals, Rs. 111995 and Rs. 47526, respectively. The average cost of cultivation per hectare for cabbage farms was Rs. 71737. The average yield of cabbage per hectare was 248.88 quintals. The gross income and net income on sampled farm was Rs. 119817 and Rs. 48080, respectively. On an average cost of cultivation per hectare for cauliflower farms was Rs. 71170. In case of cauliflower, yield, gross income and net income per hectare were 222.22 quintals, Rs. 146781 and Rs. 75610, respectively. The total marketable surplus was observed highest in case of cauliflower (99.70 %), followed by cabbage (99.68 %), brinjal (99.34 %) and tomato (99.30 %).

**Keywords:** Vegetables, Tomato, Brinjal, Cabbage, Cauliflower

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## Introduction

India is a country with varied agro-climatic conditions having total geographical area of 328.27 million hectares. During the year 2014-15, gross cropped area of India was 194.4 million hectares and that of Gujarat was 19.60 million hectares. India produced 169.47 million tonnes of vegetables from an area of 9.54 million hectares during the year 2014-15 as per the National Horticulture Database published by National Horticulture Board. The vegetables have vital place in vegetarian diet. In terms of income, vegetables give four times more returns as compared to food crops [1]. Moreover, they can be grown round the year and provide regular flow of income and employment. India ranks second in vegetables production in the world next to china and shares about 13 percent of the world vegetable production from 2 percent of cropped area of the country [2]. But, per capita availability of vegetables is still about 135 g/day, which is far less than the recommended levels of 285 g/day [3].

## Scenario of area and production

West Bengal, Uttar Pradesh, Bihar, Odisha, Maharashtra, Karnataka and Gujarat are the major vegetables producing states of India. Gujarat occupies 4th position in respect to vegetable area and production [Table-1].

## Objectives of the study

1. To calculate the cost of cultivation and returns for selected vegetables in North Gujarat
2. To estimate the marketable surplus for selected vegetables in North Gujarat

## MATERIAL AND METHODS

### Selection of districts

Among the seven districts of North Gujarat, Banaskantha, Mehsana and Sabarkantha districts have fertile land with good irrigation facility. Moreover, these districts are well connected by road and rail with other parts of the state and country. These three districts contributed about 23.55 percent area under vegetables and 29.85 percent production of vegetables in year 2015-16. Therefore, these three districts were selected purposively for the study.

### Selection of talukas

A list of all talukas of Banaskantha, Mehsana and Sabarkantha districts were prepared along with their respective share in area under each of the vegetable crops chosen for the study. Thus, Palanpur taluka from Banaskantha, Kadi taluka from Mehsana and Idar taluka from Sabarkantha districts were randomly chosen for the study of selected vegetables.

### Sampling technique

In order to justify the objectives, a multi-stage random sampling technique was adopted. In the first stage Banaskantha, Mehsana and Sabarkantha districts were chosen purposively on the basis of maximum vegetable area and at the subsequent stages, villages were chosen randomly. Finally, from each selected village, 12 vegetable growers were selected at random.

Cost of Cultivation and Marketable Surplus of Major Vegetables of North Gujarat

Table-1 State wise area, production and productivity of vegetables (2015-16)

SN	State	Area ('000'ha)	Production ('000'MT)	Productivity (tonnes/ha)
1	Andhra Pradesh	234.75	5409.07	23.04
2	Bihar	837.51	14400.12	17.19
3	Chhattisgarh	475.23	6318.41	13.3
4	Gujarat	626.21	12682.28	20.25
5	Jharkhand	193.92	2561.44	13.21
6	Karnataka	509.54	9080.8	17.82
7	Orissa	578	8193.2	14.18
8	Madhya Pradesh	703.39	14797.74	21.04
9	Maharashtra	619.14	9376.29	15.14
10	West Bengal	1391.43	22825.57	16.4

(Source : Ministry of Agriculture and Farmers Welfare, Government of India)

Table-2 District wise area and production of selected vegetable crops in Gujarat state (2016-17) (Area in Ha, Production in MT)

SN	District	Tomato		Brinjal		Cabbage		Cauliflower	
		Area	Production	Area	Production	Area	Production	Area	Production
1	Banaskantha	4848	174528	4036	89195.6	3620	71857	3825	72675
2	Gandhinagar	445	10301.75	2805	62691.75	1910	51417.2	1230	23739
3	Kutch	1955	56988.25	3143	56165.41	1167	19839	719	11446.48
4	Mehsana	4541	146901.35	2536	44760.4	1040	22516	1030	18797.5
5	Patan	100	2470	330	6138	175	3188.5	275	5115
6	Sabarkantha	1950	62595	780	21933.6	2870	107682.4	4860	145022.4
7	Aravalli	290	8714.5	365	10165.25	258	8885.52	273	7704.06
8	North Gujarat	14129	462498.85	13995	291050.01	11040	285385.62	12212	284499.44
9	Gujarat	48758	1411851.99	74339	1486553.25	28339	637619.75	25838	568950.54

(Source : Ministry of Agriculture and Farmers Welfare, Government of India).

North Gujarat region contributed to 28.98 %, 18.83 %, 38.96 % and 47.26 % in area of tomato, brinjal, cabbage and cauliflower respectively and it also contributed to 32.76 %, 19.58 %, 44.76 % and 50.00 % in production of these vegetables. Therefore, these vegetables were selected for the study.

Table-3 Details of cost of cultivation of tomato crop per hectare in North Gujarat (2016-17)

Particulars	Small farmers		Medium farmers		Large farmers		Average farmers	
	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>
Hired labour	14050	18.05	14500	18.38	14850	18.72	14467	18.38
Bullock labour	1935	2.48	1625	2.06	1500	1.89	1687	2.14
Seedling	8000	10.28	8012	10.02	8020	10.11	8011	10.14
Manure	9651	12.4	9725	12.32	9836	12.4	9737	12.37
Fertilizer	4446	5.71	4523	5.73	4644	5.86	4538	5.77
Insecticide	4050	5.2	4225	5.35	4358	5.49	4211	5.35
Irrigation	8121	10.43	8686	11.01	8695	10.96	8500	10.88
Miscellaneous cost	3538	4.54	3697	4.68	3887	4.9	3707	4.71
Interest on working capital	2173	2.79	2222	2.81	2255	2.84	2217	2.81
Depreciation	550	0.7	555	0.7	580	0.73	562	0.71
Cost A	56514	72.62	57770	73.24	58625	73.91	57636	73.26
Rental value of owned land	5248	6.74	5311	6.73	5425	6.84	5328	6.77
Interest on fixed capital	786	1.01	796	1	810	1.02	797	1.01
Cost B	62549	80.38	63876	80.98	64860	81.77	63761	81.04
Imputed value of family labour	8190	10.53	7830	9.93	7245	9.13	7755	9.87
Cost C <sub>1</sub>	70739	90.91	71706	90.91	72105	90.91	71516	90.91
10 % of Cost C <sub>1</sub>	7074	9.09	7171	9.09	7211	9.09	7152	9.09
Cost C <sub>2</sub>	77813	100	78876	100	79316	100	78668	100
Main product (/qtl)	638.76		639.17		641.79		639.9	
Gross income	209085		210990		213832		211295	

Table-4 Details of cost of cultivation of brinjal crop per hectare in North Gujarat (2016-17)

Particulars	Small farmers		Medium farmers		Large farmers		Average farmers	
	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>
Hired labour	12050	18.87	13300	20.66	13650	20.95	13000	20.16
Bullock labour	1750	2.74	1625	2.52	1500	2.3	1625	2.52
Seedling	7695	12.05	7592	11.79	7583	11.64	7623	11.83
Manure	4801	7.52	4851	7.53	4975	7.64	4876	7.56
Fertilizer	4345	6.8	4446	6.9	4525	6.95	4439	6.88
Insecticide	2660	4.16	2710	4.21	2780	4.27	2717	4.21
Irrigation	8550	13.39	8696	13.51	8790	13.49	8679	13.46
Miscellaneous cost	1921	3.01	2051	3.19	2190	3.36	2054	3.18
Interest on working capital	1774	2.78	1835	2.85	1864	2.86	1824	2.84
Depreciation	580	0.91	600	0.93	611	0.94	597	0.93
Cost A	46126	72.21	47704	74.09	48468	74.39	47432	73.57
Rental value of owned land	4825	7.55	5010	7.78	5031	7.72	4955	7.69
Interest on fixed capital	771	1.21	776	1.2	780	1.2	775	1.2
Cost B	51721	80.98	53489	83.08	54278	83.31	53163	82.46
Imputed value of family labour	6345	9.93	5040	7.83	4950	7.6	5445	8.45
Cost C <sub>1</sub>	58066	90.91	58529	90.91	59228	90.91	58608	90.91
10 % of Cost C <sub>1</sub>	5807	9.09	5853	9.09	5923	9.09	5861	9.09
Cost C <sub>2</sub>	63873	100	64382	100	65151	100	64469	100
Main product (/qtl)	499.11		501.23		503.35		501.23	
Gross income	110004		111990		114009		111995	

Table-5 Details of cost of cultivation of cabbage crop per hectare in North Gujarat (2016-17)

Particulars	Small farmers		Medium farmers		Large farmers		Average farmers	
	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>
Hired labour	12700	17.91	13750	19.23	14500	19.92	13650	19.02
Bullock labour	1375	1.94	1000	1.4	1125	1.54	1167	1.63
Seedling	12038	16.97	12000	16.78	12000	16.48	12013	16.75
Manure	4765	6.72	4771	6.67	4771	6.55	4769	6.65
Fertilizer	4550	6.42	4595	6.43	4597	6.31	4581	6.39
Insecticide	1975	2.78	2125	2.97	2264	3.11	2121	2.96
Irrigation	9760	13.76	9950	13.92	10120	13.9	9944	13.86
Miscellaneous cost	1540	2.17	1710	2.39	1774	2.43	1675	2.33
Interest on working capital	1972	2.78	2021	2.83	2051	2.82	2015	2.81
Depreciation	610	0.86	625	0.87	633	0.87	623	0.87
Cost A	51286	72.32	52548	73.5	53835	73.95	52556	73.27
Rental value of owned land	4930	6.95	5000	6.99	5115	7.03	5015	6.99
Interest on fixed capital	786	1.11	786	1.1	795	1.09	789	1.1
Cost B	57002	80.38	58333	81.59	59746	82.07	58360	81.36
Imputed value of family labour	7470	10.53	6660	9.32	6435	8.84	6855	9.55
Cost C <sub>1</sub>	64472	90.91	64993	90.91	66181	90.91	65215	90.91
10 % of Cost C <sub>1</sub>	6447	9.09	6499	9.09	6618	9.09	6522	9.09
Cost C <sub>2</sub>	70919	100	71493	100	72799	100	71737	100
Main product (/qtl)	479.43		482.37		482.47		481.42	
Gross income	118184		119555		121727		119817	

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Table-6 Details of cost of cultivation of cauliflower crop per hectare in North Gujarat (2016-17)

Particulars	Small farmers		Medium farmers		Large farmers		Average farmers	
	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>	Value (Rs.)	Per cent to cost C <sub>2</sub>
Hired labour	12850	18.15	13500	18.98	13750	19.21	13367	18.8
Bullock labour	1375	1.94	1125	1.58	1250	1.75	1250	1.8
Seedling	12038	17	12030	16.91	12023	16.8	12030	16.9
Manure	4871	6.88	4876	6.85	4896	6.84	4881	6.86
Fertilizer	4676	6.6	4671	6.57	4696	6.56	4681	6.58
Insecticide	1934	2.73	1978	2.78	2035	2.84	1982	2.78
Irrigation	8936	12.62	9185	12.91	9295	12.99	9139	12.79
Miscellaneous cost	1326	1.87	1480	2.08	1490	2.08	1432	2
Interest on working capital	1944	2.75	1958	2.75	2002	2.8	1968	2.76
Depreciation	600	0.85	610	0.86	630	0.88	613	0.86
Cost A	50550	71.38	51413	72.28	52066	72.76	51343	72.14
Rental value of owned land	4820	6.81	4826	6.78	4875	6.81	4840	6.8
Interest on fixed capital	775	1.09	777	1.09	779	1.09	777	1.09
Cost B	56145	79.28	57016	80.15	57720	80.66	56960	80.03
Imputed value of family labour	8235	11.63	7650	10.75	7335	10.25	7740	10.87
Cost C <sub>1</sub>	64380	90.91	64666	90.91	65055	90.91	64700	90.9
10 % of Cost C <sub>1</sub>	6438	9.09	6467	9.09	6505	9.09	6470	9.1
Cost C <sub>2</sub>	70818	100	71133	100	71560	100	71170	100
Main product (q/tl)	659		659.87		662.44		660.52	
Gross income	144224		146689		149446		146781	

Table-7 Gross and net income from tomato over different costs of tomato production in North Gujarat

Particulars	Small farmers (Rs. ha <sup>-1</sup> )	Medium farmers (Rs. ha <sup>-1</sup> )	Large farmers (Rs. ha <sup>-1</sup> )	Average (Rs. ha <sup>-1</sup> )
Gross income	209085	210990	213832	211295
Net income over:				
Cost A	152571	153220	155207	153659
Cost B	146537	147114	148972	147533
Cost C <sub>1</sub>	138347	139284	141727	139778
Cost C <sub>2</sub>	131272	132114	134516	132627

Table-8 Gross and net income from brinjal over different costs of brinjal production in North Gujarat

Particulars	Small farmers (Rs. ha <sup>-1</sup> )	Medium farmers (Rs. ha <sup>-1</sup> )	Large farmers (Rs. ha <sup>-1</sup> )	Average (Rs. ha <sup>-1</sup> )
Gross income	110004	111990	114009	111995
Net income over:				
Cost A	63878	64286	65541	64562
Cost B	58282	58500	59730	58832
Cost C <sub>1</sub>	51937	53460	54780	53386
Cost C <sub>2</sub>	46131	47607	48858	47526

Table-9 Gross and net income from cabbage over different costs of cabbage production in North Gujarat

Particulars	Small farmers (Rs. ha <sup>-1</sup> )	Medium farmers (Rs. ha <sup>-1</sup> )	Large farmers (Rs. ha <sup>-1</sup> )	Average (Rs. ha <sup>-1</sup> )
Gross income	118184	119555	121727	119817
Net income over:				
Cost A	66898	67008	67892	67260
Cost B	61182	61222	61981	61456
Cost C <sub>1</sub>	53712	54562	55546	54601
Cost C <sub>2</sub>	47265	48063	48928	48080

Table-10 Gross and net income from cauliflower over different costs of cauliflower production in North Gujarat

Particulars	Small farmers (Rs. ha <sup>-1</sup> )	Medium farmers (Rs. ha <sup>-1</sup> )	Large farmers (Rs. ha <sup>-1</sup> )	Average (Rs. ha <sup>-1</sup> )
Gross income	144224	146689	149446	146781
Net income over:				
Cost A	93675	95276	97380	95438
Cost B	88079	89673	91727	89820
Cost C <sub>1</sub>	79844	82023	84392	82080
Cost C <sub>2</sub>	73406	75556	77886	75610

Table-11 Disposal pattern and marketable surplus of different vegetables (kg/ha)

SN	Particulars	Tomato	Brinjal	Cabbage	Cauliflower
1	Production	33020.17	22344.7	24888.9	22258.89
		100	100	100	100
2	Retained for home consumption	115.31	67.73	37.17	33.94
		0.34	0.30	0.14	0.15
3	Relatives	82.09	51.13	23.08	20.87
		0.24	0.23	0.09	0.09
4	Labour	33.07	26.66	17.6	14.52
		0.10	0.12	0.07	0.06
5	Total consumption	230.48	142.52	77.85	69.33
		0.70	0.65	0.31	0.30
6	Marketable surplus	32789.69	22199.18	24811.05	22189.56
		99.30	99.34	99.68	99.70

Table-12 Distribution of vegetable growers according to marketing behaviour

SN	Particulars	Marketing behavior	Total-108	Percentage-100
1	Types of packing	Bamboo-basket	3	2.77
		Polythene bag	80	74.07
		Gunny bag	25	23.14
2	Mode of transport	Tempo rickshaw	108	100
3	Place of sale	Nearby city	98	90.74
		Distant from city	10	9.26
4	Mode of sale	Private negotiation	4	3.7
		Open auction	96	88.88
		Contract	8	7.4
5	Distance of the market	Less than 10 km	84	77.77
		More than 10 km.	24	22.22

**Economics of vegetable cultivation**

Cost of cultivation refers to the economic valuation of variable inputs and fixed inputs per unit area say per hectare.

**[A] Cost concepts**

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

**Cost-A: It include**

- 1 Value of hired human labour,
- 2 Value of hired bullock labour,
- 3 Value of owned bullock labour,
- 4 Value of tractor charges,
- 5 Value of seed/seedlings (Both farm produced and purchased),
- 6 Value of manure and cakes (Both farm owned and purchased),
- 7 Value of fertilizers,
- 8 Value of insecticides and pesticides,
- 9 Irrigation charges,
- 10 Depreciation on farm building and implements,
- 11 Interest on working capital, and
- 12 Other paid out expenses, if any.

**Cost-B: It includes**

Cost A + Rental value of owned land + Interest on value of owned fixed capital (excluding land).

**Cost-C<sub>1</sub>: It includes**

Cost B + Imputed value of family labour.

**Cost- C<sub>2</sub>: It includes**

Cost C<sub>1</sub> + 10 percent of cost C<sub>1</sub> (as managerial charges).

**[B] Net return**

Net return per hectare at the different costs concept has been worked by deducting the respective costs from the gross monetary returns per hectare.

**[C] Marketable surplus**

The marketable surplus of the selected vegetables was worked out by subtracting the requirement for family consumption, seed purpose, labour requirement and requirement of relatives from the total production of the crop on the farms.

Symbolically,

$$MS = P - C$$

Where,

- MS = Marketable surplus,
- P = Total production, and
- C = Total Consumption.

**Results and Discussion**

**Cost of cultivation and returns for selected vegetables**

Cost of cultivation has a paramount importance in determining the net income from different crops. Hence, the details of per hectare cost and various factor costs for the production of tomato, brinjal, cabbage and cauliflower on different size of farmers were studied and the results are presented in [Table-3,4,5,6]. The [Table-2] infers that the average cost of cultivation per hectare of tomato farms was Rs. 78668. It was highest (Rs. 79316) in case of large farmers and the lowest (Rs. 77813) in small farmers. Among the different items of cash expenditure, the cost of hired labour ranked first with 18.38 percent of the total cost, followed by manure (12.37 %), irrigation (10.88 %), seedling (10.14 %), imputed value of family labour (9.87 %), rental value of owned land (6.77 %), fertilizer (5.77 %), insecticide (5.35 %), miscellaneous cost (4.71 %), interest on working capital (2.81 %) and bullock labour (2.14 %). The details of cost of cultivation on different categories of brinjal farmers in North Gujarat are given in [Table-4]. It can be seen from table that the average cost of cultivation per hectare for brinjal farms was Rs. 64469. It was highest (Rs. 65151) in large farmers and the lowest (Rs. 63873) in case of small farmers. Among the different items of cash expenditure, the cost of hired labour ranked first with 20.16 percent of the total cost, followed by irrigation (13.46 %), seedling (11.83 %), imputed value of human labour (8.45 %), rental value of owned land (7.69 %), manure (7.56 %), fertilizer (6.88 %),



insecticide (4.21 %), miscellaneous cost (3.18 %), interest on working capital (2.84 %) and bullock labour (2.52 %). The details of cost of cultivation on different categories of cabbage farmers in North Gujarat are given in [Table-5]. It can be seen from table that the average cost of cultivation per hectare for cabbage farms was Rs. 71737. It was highest (Rs. 72799) in case of large farmers and the lowest (Rs. 70919) in small farmers. Among the different items of cash expenditure, the cost of hired labour ranked first with 19.02 percent of the total cost, followed by seedling (16.75 %), irrigation (13.86 %), imputed value of family labour (9.55 %), rental value of owned land (6.99 %), manure (6.65 %), fertilizer (6.39 %), insecticide (2.96 %), interest on working capital (2.81 %), miscellaneous cost (2.33 %) and bullock labour (1.63 %). The details of cost of cultivation on different categories of cauliflower farmers in North Gujarat are given in [Table-6]. It can be seen from table that the average cost of cultivation per hectare for cauliflower farms was Rs. 71170. It was highest (Rs. 71560) in large farmers and the lowest (Rs. 70818) in case of small farmers. Among the different items of cash expenditure, the cost of hired labour ranked first with 18.80 percent of the total cost, followed by seedling (16.90 %), irrigation (12.79 %), imputed value of family labour (10.87 %), manure (6.86 %), rental value of owned land (6.80 %), fertilizer (6.58 %), insecticide (2.78 %), interest on working capital (2.76 %), miscellaneous cost (2.00 %) and bullock labour (1.80 %). The details of gross and net income from tomato over different costs of tomato production in North Gujarat are given in [Table-7]. The average gross returns per hectare of tomato farmers amounted to Rs. 211295. It varied from Rs. 209085 in case of small farmers to Rs. 213832 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 153659, Rs. 147533, Rs. 139778 and Rs. 132627 respectively. The details of gross and net income from brinjal over different costs of brinjal production in North Gujarat are given in [Table-8]. The average gross returns per hectare of brinjal farmers amounted to Rs. 111995. It varied from Rs. 110004 in case of small farmers to Rs. 114009 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 64562, Rs. 58832, Rs. 53386 and Rs. 47526, respectively. The details of gross and net income from cabbage over different costs of cabbage production in North Gujarat are given in [Table-9]. The average gross returns per hectare of cabbage farmers amounted to Rs. 119817. It varied from Rs. 118184 in case of small farmers to Rs. 121727 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 67260, Rs. 61456, Rs. 54601 and Rs. 48080, respectively. The details of gross and net income from cauliflower over different costs of cauliflower production in North Gujarat are given in [Table-10]. The average gross returns per hectare of cauliflower farmers amounted to Rs. 146781. It varied from Rs. 144224 in case of small farmers to Rs. 149446 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 95438, Rs. 89820, Rs. 82080 and Rs. 75610, respectively.

#### Marketable surplus of selected vegetables

The pattern of disposal and marketable surplus of selected vegetables are shown in [Table-11]. It was observed from [Table-11] that the highest production i.e., 330 qtl/ha, was obtained in case of tomato crop and the lowest production was observed in cauliflower crop (222 qtl/ha). Total quantity retained by the vegetable producers varied from 0.14 percent of total production (cabbage) to 0.34 percent (tomato) of total production. Of the total retained quantity, quantity kept for home consumption was the major portion, followed by quantity given to relatives and labour in case of most of the vegetables. The total marketable surplus was found varying from 99.30 percent in tomato to 99.70 percent in cauliflower [4]. The marketing behaviour of vegetable growers is described in [Table-12]. It can be seen from the results that packing of vegetables in polythene bag (74.07 %) was the most preferable type of packing material, followed by gunny bag (23.14 %), while least preferred types of packing material were bamboo-basket (2.77 %). Most of the selected vegetable growers used tempo-rickshaw as their mode of transportation and most of them sold their produce in nearby city markets. Open auction was the most preferred (88.88 %) mode of sale, followed by selling through contract (7.40 %) and private negotiation (3.70 %). Most of the vegetable growers were found in the proximity of market i.e., less than 10 km from market.

#### Conclusions

##### Cost of cultivation and returns for selected vegetables

- On an average total cost of cultivation per hectare on tomato farms was Rs. 78668. It was the highest (Rs. 79316) in case of large farmers and the lowest (Rs. 77813) in small farmers. The average gross returns per hectare on tomato farmers amounted to Rs. 211295. It varied from Rs. 209085 in small farmers and Rs. 213832 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 153659, Rs. 147533, Rs. 139778 and Rs. 132627, respectively.
- On an average total cost of cultivation per hectare on brinjal farms was Rs. 64469. It was the highest (Rs. 65151) in large farmers and the lowest (Rs. 63873) in case of small farmers. The average gross returns per hectare on brinjal farmers amounted to Rs. 111995. It varied from Rs. 110004 in case of small farmers and Rs. 114009 in large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 64562, Rs. 58832, Rs. 53386 and Rs. 47526, respectively.
- On an average total cost of cultivation per hectare on cabbage farms was Rs. 71737. It was the highest (Rs. 72799) in case of large farmers and the lowest (Rs. 70919) in small farmers. The average gross returns per hectare on cabbage farmers amounted to Rs. 119817. It varied from Rs. 118184 in small farmers and Rs. 121727 in case of large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 67260, Rs. 61456, Rs. 54601 and Rs. 48080, respectively.
- On an average total cost of cultivation per hectare on cauliflower farms was Rs. 71170. It was the highest (Rs. 71560) in large farmers and the lowest (Rs. 70818) in case of small farmers. The average gross returns per hectare on cauliflower farmers amounted to Rs. 146781. It varied from Rs. 144224 in case of small farmers and Rs. 149446 in large farmers. Average net returns per hectare over cost A, cost B, cost C<sub>1</sub> and cost C<sub>2</sub> was Rs. 95438, Rs. 89820, Rs. 82080 and Rs. 75610, respectively.

##### Marketable surplus for selected vegetables

- On an average, marketable surplus on sample farms was 99.30 percent of total tomato production and its proportion increased with the increase in size of farms. While 0.34, 0.24 and 0.10 percent of the total tomato production was retained for home consumption, for relative and for labour, respectively.
- In case of brinjal, marketable surplus on sample farms was 99.34 percent on an average of total brinjal production and its proportion increased with the increase in size of farms. While the total brinjal production was retained for home consumption, for relative and for labour, 0.30, 0.23 and 0.12 percent, respectively.
- On an average marketable surplus on sample farms were 99.68 percent of total cabbage production and its proportion increased with the increase in size of farms. While 0.14, 0.09 and 0.07 percent of the total cabbage production was retained for home consumption, for relative and labour, respectively.
- In case of cauliflower, marketable surplus on sample farms was 99.70 percent on an average of total cauliflower production and its proportion increased with the increase in size of farms. While the total cauliflower production was retained for home consumption, for relative and labour 0.15, 0.09 and 0.06 percent, respectively.

**Application of research:** Through the research work, the components which are contributing more to the cost of cultivation of had been found out. An effort to decrease the cost of these components will help in decreasing the cost of cultivation of vegetables. Through the research work, the vegetables which are giving higher returns to the farmers are also found out. The knowledge about the marketable surplus helped to know the quantity of vegetables reaching the market and the factors influencing it.

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