Comparative analysis of Organic and Conventional Tomato cultivation in North-western Himalayas

Abstract

The present study was carried out in Sirmour district of Himachal Pradesh. Primary data have been collected through survey method for the agricultural year 2018-19. Using thepurposive sampling technique, the districts and villages were selected based on the highest area under organic farming. By using simple random sampling, a sample of 80 farmers were selected, out of which 40 were organic growers and 40 were conventional growers, who were further categorized as marginal, small and medium farms. The cost incurred was higher for the cultivation of tomato in conventional farming, whereas returns and output-input ratio was higher in organic tomato cultivation.In organic farming system, farmyard manure (44.70 per cent) constituted highest share in Cost A_1 followed by plant protection (17.09 per cent), human hired labour (10.37 per cent), seed/plant (6.53 per cent), bio-fertilizers (4.72 per cent), stalking (2.33 per cent) and hired machinery labour (1.53 per cent). In conventional farming, farmyard manure (33.37 per cent) constituted highest share in total variable Cost A_1 followed by plant protection (28.92 per cent), human hired labour (8.46 per cent), fertilizers (6.23 per cent) and seed/plant (6.20 per cent), stalking (2.29 per cent) and owned machinery labour (1.34 per cent). It was also found that human labour was more employed in organic farming as compared to conventional farming system. Education of farmers for scientific management of crops and provision of improved tools for efficient use of labour have also been suggested to lower production costs and make the organic vegetable cultivation more beneficial to farmers, particularly to the small and marginal farmers in the state.

Keywords: organic farming, conventional farming, farmyard manure, random sampling, purposive sampling

Introduction

Conventionally grown foods have massive adverse health effects due to the presence of higher pesticide residue, heavy metals, more nitrate, antibiotic residue, hormones, and genetically modified organisms. Moreover, conventionally grown foods lack necessary nutrition and contain lesser amounts of protective antioxidants. With growing awareness, health benefits, food safety concerns and in the quest for healthy food, the demand for organically grown foods has increased during the last decades. Even in developing countries

like India, the demand for organically grown produce is increasing as people are more aware now about the safety and quality of food, and the organic process has an enormous influence on soil health as well the environment, which devoid of chemical pesticides. Organic cultivation has an immense prospect of income generation too (Bhardwaj and Dhiman, 2019).In India, agriculture is not extremely intense in terms of the use of agrochemicals in a number of different types of soil land. Gujarat, Kerala, Karnataka, Uttarakhand, Sikkim, Rajasthan, Maharashtra, Tamil Nadu, Madhya Pradesh, and Himachal Pradesh are the main states in India engaged in organic agriculture (Das et al., 2020). The use of agricultural chemicals is generally quite low, particularly in tribal and mountainous areas, which helps the switch to organic farming (Manida and Nedumaran, 2021).

India grows a large number of vegetables from temperate to humid tropics and from sea level to the snowline. Vegetables are an excellent source of vitamins, particularly niacin, riboflavin, thiamin and vitamins A and C. They also supply minerals such as calcium and iron besides proteins and carbohydrates. Vegetables are known to be the cheapest source of natural beneficial ingredients. Most of the vegetables being short-duration crops fit very well in the intensive cropping system and are capable of giving very high yields with very high economic returns to the growers. The major areas producing fresh vegetables are West Bengal, Uttar Pradesh, Bihar, Andhra Pradesh, Madhya Pradesh, Gujarat, Orissa, Tamil Nadu, Maharashtra, Karnataka, Haryana, Chhattisgarh and Jharkhand.India has witnessed increase in horticulture production over the last few years. Significant progress has been made in area expansion of different horticulture crops resulting in higher production. Over the last decade, the area under horticulture grew by 2.1% per annum and annual production increased by 3.9%. During 2020-21, the production of horticulture crops was 334.60 Million Tonne from an area of 27.74 Million Hectare (Anonymous, 2021). The area under vegetable cultivation was 11.35 Million Ha with a production of 204.84 million tonnes in the year 2021-22. India is a prominent exporter of fresh vegetables in the world. The country has exported 827,288.05 MT of Fresh Vegetables other than Onion to the world, worth Rs. 2,443.04 crores during the year 2022-23(Anonymous, 2024).

Agriculture in Himachal Pradesh is a way of life for the agrarian population and nearly 70 per cent of population is directly or indirectly dependent on farming. Presently, farmers of Himachal Pradesh are passing through a transitional phase, comprising of several factors and processes, which include both constraints and opportunities. The ongoing diversification drive has conclusively proved that economic prosperity of hill farmers lies in

growing off season vegetables and production of fruits. This prospect, however, is limited by rising input costs and depleted soils. Farmers are looking for alternatives in view of ever increasing cost of synthetic inputs and poor input output ratio. The vegetable and fruit business of Himachal farmers can be transformed drastically by adopting organic farming.

In this backdrop, the present study was conducted to investigate the costs involved and returns obtained from the cultivation of organic and conventional tomato in the Sirmaur district of Himachal Pradesh.

Methodology

Sirmaur, being one of the leading districts of Himachal Pradesh in the production of vegetables, was purposively selected for study (Table 1). Further, two blocks, Sangrah and Pachhad block were selected purposively from Sirmour district were selected on the basis of maximum area under organic farming. At the second stage, a complete list of villages engaged in organic cultivation in selected blocks was prepared, and out of which, five villages were selected randomly from each selected block. Lastly, at the final stage, from each of the selected villages four farmers practising organic farming and same number of farmers following conventional farming were randomly selected from the same village for the purpose of comparison. Thus, a total sample of 80 respondents were interviewed. Primary data were collected during 2018-19 through the survey method using specially designed and pre-tested schedules. The data were collected on cropping pattern, farm- inputs and crop yields.

The secondary information was obtained from various published and unpublished reports and from government officials like ADOs, patwaris, gram panchayat pardhans, etc. The tabular method of data analysis was employed in the study. Among the leading vegetables, tomato was selected for the study.

Table 1: Detail of selected area of tomato growers in Himachal Pradesh

Sirmaur	Sangrah	Arat	80 farmers
		Tuheri	
		Lajwa	
		Garari	
		Ser	
	Pachhad	Malhoti	
		Malanon ki Ber	
		Talhari Madho ka Nala	
		Gadshaya	
		Mehli	

Analytical Techniques

Cost of cultivation concepts as recommended by, "Special expert committee on cost estimates, GOI, New Delhi" were used in this study.For the estimation of profitability from organic and conventional tomato cultivation, farm business efficiency measures were used.The selected farmers were classified into marginal (up to 1 ha), small (1-2 ha) and medium (2-4 ha) for equity considerations (Table 2).

Table 2: Farm category wise distribution of sampled tomato growers in study area

Particulars	Marginal	Small	Medium	Total
Size of land holding (ha)	<1	1-2	2-4	
Organic	19	13	8	40
Conventional	16	16	8	40

Simple tabular analysis was used to examine socio-economic status, cropping pattern, cropping intensity, cost and return of organic and conventional tomato cultivation. Simple statistical tools like averages and percentages were used to compare, contrast and interpret the

results. The literacy rate, literacy index and cropping intensity were calculated using the following formulae

$$\text{Literacy rate} = \frac{\text{Total no.of literate person}}{\text{Total population}} \times 100$$

$$\text{Literacy Index} = \frac{\Sigma \text{ Wi Xi}}{\Sigma \text{ Xi}}$$

Where; W_i = Weights (0, 1,2,3,4 and 5) for illiterate, primary, middle, matric, secondary and graduate and above respectively.

X_i = Number of persons in respective category.

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

In order to assess the profitability of organic and conventional tomato cultivationin the study area, the various cost components such as Costs A_1, A_2, B_1, B_2, C_1, C_2 and C_3 were calculated.

The cost of production of tomato was calculated as per the definition given by Commission on Agricultural Costs and Prices (CACP).

Cost A_1 includes cost of hired human labour, cost of owned machinery, cost of hired machinery, cost of bio- fertilizer/fertilizer, cost of farm yard manure, cost of seed (owned / purchased), cost of plant protection chemicals, land revenue, depreciation on farm machinery, equipment's and farm buildings and interest on owned working capital

Cost A_2 = Cost A_1 + Rent paid for leased in land

Cost B_1 = Cost A_1 + Interest on owned fixed capital assets excluding land

Cost B_2 = Cost B_1 + Rental value of own land (net of land revenue) + Rent paid 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 percent of cost C_2 on account of managerial function performed by the farmer.

For working out profitability of organic and conventional tomato cultivation in the study areas following income measures were worked out:

Farm business income = Gross income – Cost A_1

Family labour income = Gross income – Cost B_2

Net income over Cost C_1 = Gross income – Cost C_1

Net income over Cost C_2 = Gross income – Cost C_2

Net income over Cost C_3 = Gross income – Cost C_3

Results and discussion

Family structure

At overall level the average family size in organic farm was 5.45 persons per households, out of which 44.81 per cent were males, 40.65 per cent females, 8.77 per cent male children and 5.77 per cent female children in the sampled households (Table 3). The number of females per thousand of males ranged between 892 in case of marginal farm to 886 in medium farms with an average of 866 at overall level. It was further observed that 53.75 per cent household had nuclear family structure and 46.25 per cent had joint family structure at overall level.

The table further showed that at overall level the average family size in conventional farm were 5.13 persons per households, out of which 45.95 per cent were males, 39.83 per cent females, 8.30 per cent male children and 5.92 per cent female children in the sampled households. The number of females per thousand of males ranged between about 807.69 in case of marginal farm to 891 in medium farms with an average of 915.49 at overall level. A positive relationship was found between the farm size and the family in both organic and conventional farms in the study area. Mehta et al. (1996) had also revealed a direct relationship between the sizes of farm and family. It was further observed that 59.72 per cent household had nuclear family structure and 40.28 per cent had joint family structure at overall level.

Table 3 Demographic profile of sampled organic and conventional tomato growers (No.)

Particulars	Marginal		Small		Medium		Overall	
	OFS	CFS	OFS	CFS	OFS	CFS	OFS	CFS
No. of selected families	19.00	16.00	13.00	16.00	8.00	8.00	40.00	40.00

Joint family %	43.02	32.06	40.50	41.15	63.25	55.00	46.25	40.28
Nuclear family %	56.98	67.94	59.50	58.85	36.75	45.00	53.75	59.72
Adults								
Male	45.28	46.81	43.45	44.92	45.81	46.51	44.81	45.95
Female	41.51	38.30	39.33	39.74	40.77	42.65	40.65	39.83
Children								
Male	7.55	8.51	11.61	9.43	7.21	5.70	8.77	8.30
Female	5.66	6.38	5.62	5.91	6.21	5.15	5.77	5.92
Average family size	5.30	4.70	5.34	5.41	5.96	5.44	5.45	5.13
Sex ratio	892.86	807.69	816.33	840.14	886.08	915.49	866.63	842.23

Figures in parentheses are percentage to average family size

Socio-economic profile

Marginal farmers were dominated in the sampling area. Out of the total organic farming practitioners, 47.50, 32.50 and 20.00 per cent were marginal, small and medium farmers, respectively (Table 4). Average area under organic farming was less (1.23 ha) compared to the conventional farming (1.36 ha). There was not much difference in the age but farmers practicing organic farming were more experienced than conventional farmers.

Table 4General Information about the selected organic and conventional tomato growers

Particulars	**Marginal**		**Small**		**Medium**		**Overall**	
	OFS	**CFS**	**OFS**	**CFS**	**OFS**	**CFS**	**OFS**	**CFS**
Number of farms	19	16	13	16	8	8	40	40
Sampled farms (per cent)	47.50	40.00	32.50	40.00	20.00	20.00	100.00	100.00
Average size of holding (ha)	0.62	0.71	1.28	1.34	2.61	2.71	1.23	1.36
Age of head of the	50.01	47.40	53.10	49.12	51.35	49.03	51.28	48.41

family (Years)								
Farming experience of the head (Years)	21.32	17.05	20.23	19.20	18.21	15.61	20.34	17.62
Education of the head of the family (per cent)								
Illiterate	-	3.13	2.24	4.11	-	-	0.73	2.90
Primary	9.91	7.34	7.31	19.74	9.72	11.22	9.03	13.08
Middle	11.22	11.11	13.61	24.22	7.71	32.22	11.29	20.58
Secondary	25.19	28.65	22.91	21.82	35.79	23.11	26.57	24.81
Higher secondary	34.79	33.75	30.98	20.79	24.07	20.33	31.41	25.88
Graduation	18.96	16.02	22.95	9.32	22.71	13.12	21.01	12.76

It was found that head of the family practicing organic farming had attained high level of education as compared to the conventional farmers. Further, the average age of the family head was comparatively lower in the family practicing conventional farming than the organic farming.

Literacy status

Literacy rate of organic farmers is more than conventional farmers. Literacy rate in the study areas was higher, but the quality of education was poor as indicated by low literacy index, so there is scope of improvement in the literacy status.

Land use pattern

The average size of organic farmers land holding on overall category basis was found 1.27 hectares out of which 60.27 per cent cultivated area (Table 5). The other uses of land were area under Ghasnis and Pastures land (30.39 %), Barren and fellow land (9.34 %). Total operational area was varied between 49.81to 69.57 per cent among the different categories of the organic farmers. The average size of holding on marginal, small and medium farms was found to be 0.69, 1.28 and 2.65 hectares respectively. In conventional farms, average size of land holding on overall category basis was found 1.35 hectares out of which 66.35 per cent cultivated area. The other uses of land were area under Ghasnis and Pastures land (20.42 %), Barren and fellow land (5.23%). Total operational area was varied between 57.71 to 71.62 per cent among the different categories of the conventional farms. The average size of

holding on marginal, small and medium farms was found to be 0.74, 1.36 and 2.79 hectares respectively. Average size of holding of organic farmer were less than conventional farmers because farmers did not much aware about practices of organic farming.

Table 5 Land utilization pattern of sampled organic and conventional tomato growers (Ha.)

Particulars	Marginal		Small		Medium		Overall	
	OFS	CFS	OFS	CFS	OFS	CFS	OFS	CFS
Average cultivated area other than orchard area								
Irrigated	0.23 (47.92)	0.22 (41.51)	0.25 (36.76)	0.33 (37.93)	0.34 (25.76)	0.55 (34.16)	0.26 (39.86)	0.32 (38.88)
Unirrigated	0.25 (52.08)	0.31 (58.49)	0.36 (52.94)	0.46 (52.87)	0.67 (50.76)	0.66 (40.99)	0.37 (52.10)	0.43 (53.17)
Average orchard area								
Irrigated	-	-	0.02 (2.94)	0.01 (1.15)	0.06 (4.55)	0.10 (6.21)	0.02 (1.86)	0.02 (1.62)
Unirrigated	-	-	0.05 (7.35)	0.07 (8.05)	0.25 (18.94)	0.30 (18.63)	0.07 (6.18)	0.08 (6.34)
Total operational area	0.48 (69.57)	0.53 (71.62)	0.68 (53.13)	0.87 (63.97)	1.32 (49.81)	1.61 (57.71)	0.71 (60.27)	0.86 (66.35)
Ghasnis/Pasture	0.17 (24.64)	0.20 (27.03)	0.43 (33.59)	0.37 (27.21)	1.03 (38.87)	0.94 (33.69)	0.43 (30.39)	0.40 (28.42)
Fallow land	0.04 (5.80)	0.01 (1.35)	0.12 (9.38)	0.09 (6.62)	0.21 (7.92)	0.16 (5.73)	0.10 (7.39)	0.07 (3.94)
Barren land	-	-	0.05 (3.91)	0.03 (2.21)	0.09 (3.40	0.08 (2.87)	0.03 (1.95)	0.03 (1.29)
Total land holding	0.69 (100)	0.74 (100)	1.28 (100)	1.36 (100)	2.65 (100)	2.79 (100)	1.27 (100)	1.35 (100)

Figures in parentheses are percentage to average total land holding

Cropping pattern

The cropping pattern presented in Table6, revealed that vegetables were grown in different

seasons (kharif, rabi and summer) all the year round. The average area allocated to vegetables during the kharif season was 32.23 percent of the total cropped area. Tomato, capsicum, beans were the main vegetables which are grown in kharif season. Among food grains, maize was the main cereal crop occupying about 10.23 per cent of the total cropped area. Cereals and pulses were grown mainly on the un-irrigated land during both the seasons. During the rabi season, the area allocated to vegetables was 21.56 per cent and the main vegetables grown were peas, cauliflower, onion and garlic.

In organic farms among rabi crops, wheat occupied largest share (23.11 per cent) followed by pea (13.04 per cent), fruits (4.84), cauliflower (3.51 per cent), garlic (3.48 per cent), others crops (2.46 per cent) and onion (1.56 per cent).The farm size wise analysis also indicated wheat was the leading rabi crop for all size classes (Table 6). In conventional farms, among rabi crops, wheat occupied large proportion (23.93 per cent) of the total cropped area followed by pea (9.79 per cent), fruits (5.66 per cent), cauliflower (5.15 per cent), garlic (3.14 per cent), other crops (2.77 per cent) and onion (0.88 per cent). Cropping intensity for organic farm (188.29 percent) is more than conventional farms (182.12 percent).

Table 6Cropping pattern of the sampled organic and conventional tomato growers

(Ha.)

Particulars	**Marginal**		**Small**		**Medium**		**Overall**	
	OFS	**CFS**	**OFS**	**CFS**	**OFS**	**CFS**	**OFS**	**CFS**
Kharif								
Maize	0.10 (10.42)	0.09 (9.18)	0.16 (11.94)	0.14 (8.86)	0.17 (7.02)	0.21 (7.58)	0.13 (10.23)	0.13 (8.73)
Tomato	0.10 (10.42)	0.12 (12.24)	0.12 (8.96)	0.18 (11.39)	0.16 (6.61)	0.19 (6.86)	0.12 (9.18)	0.16 (10.83)
Capsicum	0.09 (9.38)	0.09 (9.18)	0.10 (7.46)	0.12 (7.59)	0.15 (6.20)	0.16 (5.78)	0.11 (8.12)	0.12 (7.87)
Beans	0.10 (10.42)	0.09 (9.18)	0.10 (7.46)	0.15 (9.49)	0.21 (8.68)	0.24 (8.66)	0.12 (9.11)	0.14 (9.20)
Ginger	0.06 (6.25)	0.08 (8.16)	0.07 (5.22)	0.08 (5.06)	0.14 (5.79)	0.15 (5.42)	0.08 (5.82)	0.09 (6.37)
Others	0.04	0.04	0.10	0.10	0.14	0.21	0.08	0.10

	(4.17)	(4.08)	(7.46)	(6.33)	(5.79)	(7.58)	(5.56)	(5.68)
Rabi								
Wheat	0.23 (23.96)	0.24 (24.49)	0.31 (23.13)	0.39 (24.68)	0.51 (21.07)	0.59 (21.30)	0.31 (23.11)	0.37 (23.93)
Peas	0.15 (15.63)	0.10 (10.20)	0.15 (11.19)	0.16 (10.13)	0.24 (9.92)	0.23 (8.30)	0.17 (13.04)	0.15 (9.79)
Onion	0.02 (2.08)	0.01 (1.02)	0.01 (0.75)	0.01 (0.63)	0.04 (1.65)	0.03 (1.08)	0.02 (1.56)	0.01 (0.88)
Garlic	0.03 (3.13)	0.03 (3.06)	0.04 (2.99)	0.05 (3.16)	0.12 (4.96)	0.09 (3.25)	0.05 (3.45)	0.05 (3.14)
Cauliflower	0.02 (2.08)	0.05 (5.10)	0.07 (5.22)	0.08 (5.06)	0.10 (4.13)	0.15 (5.42)	0.05 (3.51)	0.08 (5.15)
Others	0.02 (2.08)	0.02 (2.04)	0.04 (2.99)	0.04 (2.53	0.06 (2.48)	0.13 (4.69)	0.03 (2.46)	0.05 (2.77)
Fruit Crops	-	0.02 (2.04)	0.07 (5.22)	0.08 (5.06)	0.38 (15.70)	0.39 (14.08)	0.10 (4.84)	0.12 (5.66)
Gross cropped area	0.96 (100)	0.98 (100)	1.34 (100)	1.58 (100)	2.42 (100)	2.77 (100)	1.38 (100)	1.58 (100)
Net sown area	0.51	0.53	0.70	0.87	1.32	1.56	0.73	0.87
Cropping intensity	188.24	184.91	191.43	181.61	183.33	177.56	188.29	182.12

Figures in parentheses are percentage to gross cropped area

Farm business analysis of tomato cultivation

In organic farms, yield was comparatively higher for marginal farmers (288 q/ha) than the small farmers (285 q/ha) and medium farmers (281 q/ha). It may be due to better management practices and efficient use of resources by marginal farmers. Consequently, the per hectare family labour income of marginal farmers (Rs. 301135 /ha) was higher than small (Rs. 288857/ha) and medium farmers (Rs. 285264/ha) in the study area (Table 7). Among different categories, the total cost (represented by the cost C_3), was highest for marginal farmers (Rs. 174982/ha) and lowest for medium farmers (Rs. 155250/ha). Further, the results revealed that the family labour income was found highest on marginal farmers because in

organic farming, there was considerable more participation of family labour on marginal farmers than other categories of farmers. Same trend was observed on conventional farms. Yield was found comparatively higher for marginal farmers (302 q/ha) than the small farmers (299 q/ha) and medium farmers (293 q/ha).

Table 7 Costs and returns of tomato cultivation on organic and conventional vegetable farming

(Rs/ha)

Particulars	Marginal		Small		Medium		Overall	
	OFS	CFS	OFS	CFS	OFS	CFS	OFS	CFS
Yield of tomato (qtl)	288	302	285	299	281	293	286	299
Cost A_1	75248	76470	83834	86934	80815	89251	79152	83212
Cost A_2	75248	76470	83834	86934	80815	89251	79152	83212
Cost B_1	76900	78226	85578	88829	82971	91551	80935	85133
Cost B_2	102065	103391	110743	113994	108136	116716	106100	110298
Cost C_1	133909	122246	125618	120828	115971	116602	127627	120550
Cost C_2	159074	147411	150783	145993	141136	141767	152792	145715
Cost C_3	174982	162153	165862	160593	155250	155944	168071	160287
Gross return	403200	362400	399000	358800	393400	351600	399875	358800
Farm business income	327952	285930	315166	271866	312585	262349	320723	275588
Family labour income	301135	259009	288257	244806	285264	234884	293775	248502
Net income over Cost C_1	269291	240154	273382	237972	277429	234998	272248	238250
Net income over Cost C_2	244126	214989	248217	212807	252264	209833	247083	213085
Net income over Cost C_3	228218	200247	233138	198207	238150	195656	231804	198513
Output- Input ratio	2.30	2.23	2.41	2.23	2.53	2.25	2.38	2.24

Consequently, the per hectare family labour income of marginal farmers (Rs. 259009/ha) was higher than small (Rs. 244806/ha) and medium farmers (Rs. 234884/ha) in the study area. Among different categories, the total cost was highest for marginal farmers (Rs. 162153/ha) and lowest for medium farmers (Rs. 155944/ha). Further, the results revealed that the family

labour income was found highest in case of marginal farmers. Cost A_1 which represented the actual operational costs was less for organic farming. On overall basis Cost A_1 was Rs. 79152 per hectare for organic farming and Rs. 83212 per hectare for conventional farming. In conventional farm, Cost A_1 showed increasing trend with the farm size. While in organic farm Cost A_1 was found highest on small farms and lowest in marginal farms. Thus even though Cost C_3 was higher for organic farming than conventional farming, organic farming can be said to be feasible due to the lesser Cost A_1. It is interesting to note that overall net income over C_3 was higher on organic tomato (Rs. 231804/ha) cultivation than conventional cultivation (Rs. 198513/ha) mainly on account of premium price received by organic producers. Similar results were obtained byNaik et. al. (2012)a study on organic and inorganic cultivation of chilli. In organic and conventional farms, category wise gross return in tomato cultivation was maximum in small farms and minimum in medium farms.

Inputs cost of organic and conventional tomato cultivation

In organic farming, farmyard manure (46.01per cent) constituted highest share in total variable Cost A_1 followed by plant protection (15.78 per cent), human hired labour (10.70 per cent), seed/plant (6.49 per cent), bio- fertilizers (4.60 per cent), stalking (2.32 per cent) and hired machinery labour (1.43 per cent). The share was however least for owned machinery labour (1.38 per cent). Land holding category wise examination revealed that for marginal farmers, farmyard manure constituted 48.90 per cent and the plant protection constituted 16.01 per cent to the total variable cost (Table 8). In the case of small farms, Cost A_1 was worked out to Rs. 83834 of which farmyard manure accounted to about 46.01 per cent, followed by plant protection which worked out to 16.76 per cent. In the case of medium farmer category, the contribution of farmyard manure was 39.60 per cent and that of plant protection was 13.64 per cent.

Table 8Input costs and their share in total variable cost of tomato cultivation

(Rs/ha)

Particulars	Marginal		Small		Medium		Overall	
	OFS	CFS	OFS	CFS	OFS	CFS	OFS	CFS
Human hired labour	6150 (8.17)	5240 (6.85)	8421 (10.04)	7155 (8.23)	14058 (17.40)	11050 (12.38)	8470 (10.70)	7168 (8.61)
Owned machinery labour	519 (0.69)	545 (0.71)	1725 (2.06)	1625 (1.87)	1413 (1.75)	1503 (1.68)	1090 (1.38)	1169 (1.40)

Hired machinery labour	2223 (2.95)	2456 (3.21)	151 (0.18)	161 (0.19)	152 (0.19)	156 (0.17)	1135 (1.43)	1078 (1.30)
Seed/ plants	4909 (6.52)	5546 (7.25)	5602 (6.68)	5506 (6.33)	4907 (6.07)	4810 (5.39)	5134 (6.49)	5383 (6.47)
FYM	36800 (48.90)	31562 (41.27)	38565 (46.00)	29022 (33.38)	32005 (39.60)	31030 (34.77)	36415 (46.01)	30440 (36.58)
Bio-fertilizers/ fertilizers	3425 (4.55)	4851 (6.34)	3800 (4.53)	5650 (6.50)	3909 (4.84)	5024 (5.63)	3644 (4.60)	5205 (6.26)
Plant protection	12045 (16.01)	16256 (21.26)	14050 (16.76)	25501 (29.33)	11020 (13.64)	21506 (24.10)	12492 (15.78)	21004 (25.24)
Staking	1840 (2.45)	1949 (2.55)	1885 (2.25)	1940 (2.23)	1740 (2.15)	1926 (2.16)	1835 (2.32)	1941 (2.33)
Depreciation	4250 (5.65)	4956 (6.48)	6265 (7.47)	6898 (7.93)	8466 (10.48)	8750 (9.80)	5748 (7.26)	6492 (7.80)
Land revenue	31 (0.04)	31 (0.04)	31 (0.04)	31 (0.04)	31 (0.04)	31 (0.04)	31 (0.04)	31 (0.04)
Interest on working capital	3056 (4.06)	3078 (4.03)	3339 (3.98)	3445 (3.96)	3114 (3.85)	3465 (3.88)	3160 (3.99)	3302 (3.97)
Cost A_1	75248 (100)	76470 (100)	83834 (100)	86934 (100)	80815 (100)	89251 (100)	79152 (100)	83212 (100)

Figures in parentheses are percentage to total

In conventional farming, farmyard manure (36.58 per cent) constituted highest share in total variable Cost A_1 followed by plant protection (25.24 per cent), human hired labour (8.61 per cent), seed/plant (6.47 per cent), chemical fertilizers (6.26 per cent), stalking (2.33 per cent) and owned machinery labour (1.40 per cent). The share was least for hired machinery labour (1.30 per cent). Land holding category wise examination revealed that for marginal farmers, farmyard manure constituted 41.27 per cent and plant protection constituted 21.26 per cent to the total variable cost. In the case of small farmer category, Cost A_1 was worked out to Rs. 86934 per hectare of which farmyard manure accounted to about 33.38 per cent, followed by plant protection, which worked out to 29.33 per cent of Cost A_1. In the case of medium farmer category, the contribution of farmyard manure was 34.77 per cent and that of plant protection was 24.10 per cent. The total input costs were found higher in conventional farming on account of higher inorganic plant protection chemicals. However, cost of farmyard manure was found higher in organic cultivation.Similar results were reported

byRamesh et. al. (2010) and also byAkter et. al. (2011).

CONCLUSIONS

The average size of organic farmers' land holdings on an overall category basis was 1.27 hectares, with 60.27 percent of the area cultivated.The sample farms' average landholding size was 0.79 ha, which comprises more than 79% of the cultivated land. In conventional farms, the average land holding size on an overall category basis was 1.35 hectares, with 66.35 percent of the area being cultivated Small farms have a lower proportion of uncultivated land than large farms, indicating that small farmers use their land more efficiently. The average area allocated to vegetables during the kharif season was 32.23 per cent of the total cropped area. Tomato, capsicum, beans were the main vegetables which are grown in kharif season. Among food grains, maize was the main cereal crop occupying about 10.23 per cent of the total cropped area. Cereals and pulses were grown mainly on the un-irrigated land during both the seasons. During the rabi season, the area allocated to vegetables was 21.56 per cent and the main vegetables grown were peas, cauliflower, onion and garlic. The cost incurred was higher for the cultivation of tomato in conventional farming, whereas returns and output-input ratio was higher in organic tomato cultivation.In the aggregate, the Cost A1 for organic farming totaled Rs. 79,152 per hectare, while conventional farming incurred a higher cost of Rs. 83,212 per hectare. Across the board, the Cost A1 amounted to Rs. 79,152 per hectare for organic farming and Rs. 83,212 per hectare for conventional farming. In conventional farm, Cost A_1 showed increasing trend with the farm size. While in organic farm Cost A_1 was found highest on small farms and lowest in marginal farms. It is interesting to note that overall net income over C_3 was higher on organic tomato (Rs. 231804/ha) cultivation than conventional cultivation (Rs. 198513/ha) mainly on account of premium price received by organic producers.The study found that organic vegetable farming is a very profitable enterprise in the study area. It could potentially harness the potential in regions with adequate irrigation facilities. This suggests that, in order to promote this enterprise, specialized locations for organic vegetable cultivation must be identified, and attempts to access irrigation potential in those areas should be accelerated.Vegetable farming, being a labor-intensive activity, can give meaningful employment to the rural population. It can also help with urban migration. The lower female literacy rate in the study area must be increased so that they can adopt cutting-edge technologies in agriculture and related industries. The cost of plant protection can be minimised by teaching farmers on the use of integrated pest management and organic farming practices. Extension services for the transfer

of scientific crop production techniques should be encouraged. Similarly, providing farmers with useful and effective instruments for conducting intercultural tasks such as hoeing, weeding, and so on can save labour costs and make the firm more profitable.

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