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Cost and Return Structure for the Promising Enterprise of Off-Season Vegetables in Himachal Pradesh§

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Abstract

The costs and returns structure has been reported for the production of major off-season vegetables, viz. tomato, cabbage cauliflower and peas in two vegetable-dominated developmental blocks of the district Kullu. Primary data have been collected through survey method for the agricultural year 2007-08. The study has revealed that per hectare cost A_1 was highest for tomato, followed by cabbage, cauliflower and lowest for peas, among the selected vegetables. However, per quintal cost of cultivation has been found to be highest for peas, followed by cauliflower, tomato and cabbage. Costs on plant protection measures have been the major constituents of cost A_1 in all the crops, followed by expenditure on seed and fertilizers. Vegetables being the labour-intensive crops, have incurred significantly high costs on human labour, ₹ 13200-₹ 15600/ha. Gross returns as well as net returns per hectare have been observed to be highest for tomato, followed by cauliflower, cabbage and peas. The study has suggested that to promote this enterprise, niche areas for off-season vegetable cultivation need to be identified and efforts to tap irrigation potential in those areas should be enhanced. 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 vegetable cultivation more beneficial to farmers, particularly to the small and marginal farmers in the state.

Key words: Off-season vegetables, Himachal Pradesh, cabbage, tomato, cauliflower, peas, cropping pattern, economics of off-season vegetables

JEL Classification: Q13, Q12, Q18

Introduction

Agriculture plays an important role in the economy of Himachal Pradesh as 67 per cent of the total population depends on agriculture for its livelihood. Only 11 per cent of the total geographical area is available for agriculture, out of which 80 per cent is rain-fed and the holdings are small and scattered. More than 67 per cent of the farmers fall in the category of marginal (<1ha) and 19 per cent farmers belong to small farm (1-2ha) category. Despite all these barring factors, climate of the state, especially in the hilly regions of the districts of Kullu, Solan and Shimla, is congenial for the cultivation of many off-season vegetables, horticultural and floricultural crops. In the valley areas of the district Kullu, the acreage of cereal crops has declined from 59 per cent to 5 per cent but has been recompensed by vegetable crops over a period from 1990-91 to 2002-03 (Bala and Sharma, 2005). Farmers have tapped underground water sources through bore-wells, tube-wells and hand pumps, to meet their water requirement.

In the state, several vegetables grown in the summer season and some vegetables grown during the

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kharif season are harvested at a time when they can't be produced in the plains. These off-season vegetables have a definite market advantage and provide assured better returns to the farmers. The Kullu district of the state has become famous for the production of quality peas, cabbage, cauliflower, french bean and capsicum. Also, being short-duration crops, 3-4 crops of vegetables can be taken by the farmers in the mid-hills per annum to augment their income. According to Thakur (1994), "Off-season vegetable production and marketing is the most profitable farm business giving very high production and income to farmers per unit area of land".

In this backdrop, the present study was conducted to investigate the costs involved and returns obtained from the cultivation of major off-season vegetables in the Kullu district of Himachal Pradesh.

Methodology

Kullu, being one of the leading districts of Himachal Pradesh in the production of off-season vegetables, was purposively selected for study. Further, two blocks, Banjar and Kullu, were selected purposively. At the first stage of sampling, a list of all vegetable-growing villages (that had approximately one-third of the total cultivated area under vegetable cultivation) was prepared for each of the selected blocks and a sample of eight villages (four from each block) was selected randomly. Then, the complete list of vegetable growers in the selected villages of respective blocks was prepared. Finally, a sample of 100 farmers was proportionally allocated among the selected villages. The selected farmers were post-stratified into two categories, viz. large and small by using cumulative square root frequency method.

Primary data were collected through the survey method using specially designed and pre-tested schedules. The data were collected on land inventory, farm implements and machinery, cropping pattern, farm-inputs and crop yields. Crop production data were collected for the off-season crops grown from February-March to May-June. 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. Four vegetables, viz. tomato, cabbage, cauliflower and peas were selected for the study.

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

Results and Discussion

Socio-Economic Profile of Households

Family Structure and Size — The overall family size of sample households was 6.89 persons per farm, comprising 45.86 per cent females and 54.14 per cent males. Further, family was comprised of 30.19 per cent children (below 18 years) and 69.81 per cent adults (above 18 years). This means that about 70 per cent of the family members were available for work force and had to bear the burden of only 30 per cent members. The average family size was bigger of large (8.43 persons/farm) than small (6.49 persons/farm) farms. Mehta *et al*. (1996) had also revealed a direct relationship between the sizes of farm and family.

Age-wise Distribution — Since farming is a labour-intensive activity, the number as well as age and composition of family members available for farming determine the efficiency of farm households. The family members in the age group of 15-60 years are assumed to be workers in agriculture, they constituted about 62 per cent of the total population and it could help in efficient management of the farm.

Educational Status — The overall literacy rate in the sample households was about 88.35 per cent which was higher than the literacy rate of the state (*Statistical Outline of Himachal Pradesh*, 2006-07). This enabled the farmers to adopt the recommended technology on their farms. The overall literacy rate was higher of males (91.39 %) than of females (84.77 %). Singh and Bhati (1996) had also reported a considerable gap between literacy rate of males and females. The literacy rate was slightly higher on small farms (88.92 %) in comparison to large farms (86.91 %); it could be because of the fact that small farmers were more cautious about the education of their wards so that they could earn their livelihood from the non-farm avocations as well, while large farmers were of the view that their wards could sustain only on the farms even if they do not go to school. A majority of the population was educated up to the middle level and the proportion of graduates and above was very small.

Landholdings and their Utilization — The average landholding size was 0.79 ha, which ranged from 1.39

Table 1. Landholdings and their utilization pattern

(in ha)

Particulars	Small farms			Large farms			All farms		
	IR*	UR*	Total	IR*	UR*	Total	IR*	UR*	Total
Total landholding	0.58	0.06	0.65	1.09	0.30	1.39	0.68	0.11	0.79
Owned land	0.49	0.03	0.52	1.15	0.16	1.31	0.62	0.06	0.68
Leased-in land	0.11	-	0.11	-	-	-	0.09	-	0.09
Leased-out land	0.04	-	0.04	0.24	-	0.24	0.08	-	0.08
Horticultural crops	0.02	0.03	0.06	0.18	0.14	0.32	0.06	0.06	0.11
Cultivated land	0.56	-	0.56	0.91	0.02	0.93	0.63	0.01	0.63
Uncultivated land	-	0.03	0.03	-	0.14	0.14	-	0.05	0.05
Land under horticultural crops (%)	4.11	52.38	8.81	16.51	46.67	23.02	8.22	49.11	13.70

*IR = Irrigated *UR = Un-irrigated

ha on large farms to 0.65 ha on small farms (Table 1). The cultivated land constituted a lower proportion (67 %) of the total holdings on large than small (87%) farms because they kept a sizeable proportion of their holdings as pastures and orchards. The small farmers devoted 8.8 per cent of the total holdings to the horticultural crops while on large farms, it was 23 per cent. Interestingly, it was noticed that almost hundred per cent of the cultivated land on small farms and 98 per cent on large farms was irrigated. The main sources of irrigation were bore-wells and irrigation channels constructed by the IPH department.

Cropping Pattern, Average Yields and Utilization Pattern of Selected Crops

Cropping Pattern

The cropping pattern presented in Table 2, 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 27 per cent of the total cropped area. Cauliflower, cabbage and tomato were the main vegetables which could be termed as off-season vegetables. Among foodgrains, which accounted for 4.42 per cent of the total cropped area, maize was the main cereal crop occupying about 2.36 per cent and pulses were given only 1.42 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 28.4 per cent and the main vegetables grown were cauliflower, cabbage, peas and potato. Foodgrains

Table 2. Cropping pattern on sample farms

(% area cropped)

Crops	Small farms	Large farms	All farms
	Kharif		
Foodgrains (ha)	0.06	0.11	0.07
	(4.26)	(4.87)	(4.42)
Vegetables (ha)	0.37	0.64	0.43
	(26.54)	(27.82)	(26.92)
Tomato (% area)	23.26	19.39	22.15
Peas (% area)	8.02	11.73	9.09
Cabbage (% area)	29.41	32.68	30.30
Cauliflower (% area)	33.42	31.90	33.10
	Rabi		
Food grains (ha)	0.06	0.09	0.07
	(4.4)	(3.79)	(4.21)
Vegetables (ha)	0.40	0.64	0.46
	(28.53)	(28.09)	(28.41)
Peas (% area)	19.90	21.86	20.09
Cabbage (% area)	28.61	28.37	30.02
Cauliflower (% area)	31.84	32.87	31.53
	Summer/Zaid		
Vegetables (ha)	0.51	0.81	0.58
	(36.36)	(35.43)	(36.02)
Tomato (% area)	21.14	15.23	19.30
Peas (% area)	15.66	17.20	16.17
Cabbage (% area)	23.48	26.04	24.17
Cauliflower (% area)	23.09	23.59	23.30
Net cropped area (ha)	0.56	0.93	0.64
Total cropped area (ha)	1.41	2.30	1.60
Cropping intensity (%)	251.79	247.31	250.00

Note: Figures within the parentheses are the percentages to total cropped area.

occupied about 4.2 per cent of the total cropped area in this season. The summer season was completely dominated by vegetables and accounted for 36 per cent of the total cropped area. The main crops grown in this season were cabbage, cauliflower, tomato and peas, which were mostly off-season vegetables and were in big demand in the plains. The overall cropping intensity turned out to be 250 per cent.

Average Yield of Selected Vegetable Crops

The overall average yields of tomato, peas, cabbage and cauliflower were 341 q/ha, 111 q/ha, 295 q/ha and 162 q/ha, respectively (Table 3). The average yields of off-season vegetables were higher in large than small farms. Marketable surpluses varied from 96 to 99 per cent of the total produce in different vegetables. Post-harvest losses were highest in tomato (6%) and lowest in peas (1.5%).

Economics of Selected Off-Season Vegetables

The economics of selected vegetable crops, computed on per hectare basis, is presented in Table 3 and discussed below vegetable-wise:

Tomato — The cost of tomato cultivation amounted to be ₹ 54,800/ha (Table 3). It was higher for large (₹ 60,700/ha) than small (₹ 53,200/ha) farms due to more expenditure on plant protection measures by the large farmers. However, small farmers received a higher price for their produce, maybe because they could clean, grade and sort out their produce nicely. Thus, the net returns per quintal were higher (₹ 1348) on small than large (₹ 1308) farms.

Peas — The cost of peas production was ₹ 28,600/ha. The average cost per quintal turned out to be lower on large farms indicating the fact that the economies of scale were obtained on these farms. Resultantly, the net returns realized per hectare as well as on per quintal basis were higher on large farms (Table 3).

Cabbage — The cost A_1 for cabbage turned out to be ₹ 34,200/ha and was lower on large farms (Table 3). There was negligible difference in the average yields of both farm-sizes, and thus, the cost of cultivation per quintal was slightly lower on larger farms. This small gain in the production cost across the farms was done away by the prices received, thus equalizing the net returns on both the categories of farms.

Table 3. Economics of selected vegetable cultivation across different farm categories in Himachal Pradesh

Particulars	Small farms	Large farms	All farms
Tomato			
Cost of cultivation ('000 ₹/ha)	53.2	60.7	54.8
Average yield (q/ha)	338	354	341
Average cost of production (₹/q)	157	172	160
Average price received (₹/q)	1505	1480	1500
Gross returns ('000 ₹/ha)	508.8	523.8	512.0
Net returns over cost A1 ('000 ₹/ha)	455.6	463.1	457.2
Net returns (₹/q)	1348	1308	1339
Peas			
Cost of cultivation ('000 ₹/ha)	28.9	27.8	28.6
Average yield (q/ha)	110	115	111
Average cost of production (₹/q)	262	242	257
Average price received (₹/q)	1243	1248	1244
Gross returns ('000 ₹/ha)	137.2	143.4	138.5
Net returns over cost A1 ('000 ₹/ha)	108.3	115.6	109.9
Net returns (₹/q)	981	1006	987
Cabbage			
Cost of cultivation ('000 ₹/ha)	34.7	32.3	34.2
Average yield (q/ha)	294	295	295
Average cost of production (₹/q)	118	110	116
Average price received (₹/q)	551	543	549
Gross returns ('000 ₹/ha)	162.1	160.0	161.7
Net returns over cost A1 ('000 ₹/ha)	127.4	127.6	127.5
Net returns (₹/q)	433	433	433
Cauliflower			
Cost of cultivation ('000 ₹/ha)	33.4	33.4	33.4
Average yield (q/ha)	162	163	162
Average cost of production (₹/q)	206	205	206
Average price received (₹/q)	1054	1023	1048
Gross returns ('000 ₹/ha)	170.8	166.6	169.9
Net returns over cost A1 ('000 ₹/ha)	137.4	133.2	136.5
Net returns (₹/q)	848	818	842

Cauliflower — In the case of cauliflower, the net returns were slightly higher (₹ 848/q) on small than large (₹ 818/q) farms. Small farmers managed to receive higher prices because they supplied most of their produce in the beginning of the season when prices were high.

To sum-up, the cost of cultivation was highest for peas, followed by cauliflower, tomato and cabbage. The average yield obtained per hectare and the prices received per quintal were highest for tomato, making it the most remunerative crop with highest net returns per quintal among the selected crops.

Cost and Return Structure of Selected Vegetables and Different Costs according to the Cost Concepts of CACP

Different components of cost of production for the selected vegetable crops were estimated and have been presented in Table 4. Farm management costs (Cost A_1, A_2———D), as per the guidelines of Commission for Agricultural Costs and Prices (CACP), have also been computed. Actual input-use, crop-wise and farm size-wise, on the basis of which the costs have been worked out, has been given in Table 5.

Tomato — The overall total cost on tomato production turned out to be ₹ 54,775/ha. Expenditure on plant protection measures accounted for a major proportion (37 %) of the cost, followed by costs on seeds (27 %) and FYM & fertilizers (23 %). The cost of hired human labour was more on large than small farms. Labour was generally hired at the time of transplanting and harvesting/picking of the produce. Cost A_2, which included the rent for leased-in land, came out to be ₹ 55,006/ha. The Costs C_1 and C_2 gave the additional impression of the imputed cost of the family labour which amounted to be ₹ 14,099/ha. This also indicated the fact that vegetable cultivation could generate sufficient employment in the rural and hilly areas. The Cost D came out to be ₹ 80,814/ha after adding 10 per cent of the Cost C_2 as management cost. The gross returns from tomato being ₹ 5,12,000/ha, the returns over Cost D turned out to be ₹ 4,31,186/ha, which means that after deducting all the costs one can earn up to ₹ 4.3 lakh/ha from tomato cultivation.

The cost of production was higher on large than small farms, mainly due to more expenditure on plant protection measures. The small farmers used plant protection measures only when there was incidence of insect-pests, but large farmers followed the package of practices and used protection measures as preventive measures too. Also, large farmers hired more human labour as compared to the smaller ones.

Peas — In peas also, the investment on plant protection measures constituted the highest proportion (37 %) of the total cost, followed by investment on FYM & fertilizers (30 %), seed (21 %), bullock labour (4.4 %), and hired human labour (3.9 %). In terms of farm management costs on the overall farm situation, the cost D was ₹ 48,192/ha; it was higher for small (₹ 48,339/ha) than large (₹ 47,638/ha) farms. Similarly, the costs C_1, B_1, and A_1 were also higher on small than large farms. The reason behind lower costs was efficient use of inputs on large farms. The returns over cost A_1 were about ₹ 1.1 lakh/ha, which were reduced to Rs.0.9 lakh/ha over cost D.

Cabbage — In the case of cabbage, the cost on plant protection chemicals constituted 42 per cent of the total cost, followed by cost of seed/seedlings (24%) and FYM & fertilizer (21%). The cost D was higher on small (₹ 61,379/ha) than large (₹ 58,379/ha) farms. The net returns over cost D were about Rs.1.01 lakh/ha in the overall situation. Costs B_1 and C_1 were ₹ 35,572/ha and ₹ 49,409/ha, respectively indicating that the imputed cost for the human labour contributed by family was up to ₹ 13,837/ha.

Cauliflower — The cost of plant protection chemicals accounted for 43.4 per cent of the total cost on cauliflower production, followed by cost on seed/seedlings (23%) and fertilizer & manures (21.4%). Only 3.11 per cent of the total cost was spent on the hired human labour because the majority of the labour required was supplied by the family itself. The cost of bullock labour required for ploughing and land preparation was estimated to be 4.32 per cent of the cost A_1.

As may be seen from Table 4, there existed a negligible difference in the costs A_1 between the two categories of farms. The returns over cost A_1 were ₹ 1,36,520/ha while those over cost D were ₹ 1,08,223/ha.

Thus, the study has revealed that Cost A_1 was highest for tomato and lowest for peas. The expenditure on plant protection measures constituted the major proportion of cost A_1. The similar results were obtained

Table 4. Cost and return structure of different vegetables by farm-sizes in Himachal Pradesh

(₹/ha)

Items of cost	Tomato			Peas			Cabbage			Cauliflower		
	Small farms	Large farms	All farms	Small farms	Large farms	All farms	Small farms	Large farms	All farms	Small farms	Large farms	All farms
Land preparation	2340	2071	2285	1183	1481	1255	1596	1504	1577	1439	1451	1442
Nursery/seedlings	14559	15218	14701	6055	5342	5892	8297	7447	8109	7899	7255	7751
Irrigation	574	607	581	390	347	380	510	430	492	471	414	458
Manures+ Fertilizers	12208	13469	12474	8759	8075	8606	7343	6894	7251	7175	7075	7152
Plant protection	19660	23835	20533	10797	9922	10600	14381	13477	14194	14493	14614	14521
Hired human labour	2665	4038	2951	938	1803	1144	1284	1452	1328	895	1575	1051
Land revenue & depreciation on buildings, equipments, etc.	410	662	462	358	408	370	670	543	641	574	504	558
Interest on working capital @ 6% p.a.	777	826	787	381	400	386	621	589	615	441	470	448
Total Cost A_1	53,193	60,725	54,775	28,861	27,777	28,633	34,703	32,335	34,206	33,386	33,358	33,380
Cost A_2	53,688	59,966	55,006	28,977	27,401	28,646	35,399	31,075	34,491	34,276	31,820	33,760
Cost B_1	54,136	61,640	55,712	29,082	28,230	28,903	36,029	33,855	35,572	35,080	35,214	35,108
Cost B_2	58,311	63,346	59,368	29,944	29,908	29,936	41,900	39,472	41,390	42,583	42,071	42,475
Cost C_1	67,836	77,240	69,811	43,082	41,630	42,777	49,929	47,455	49,409	48,780	48,414	48,703
Cost C_2	72,011	78,946	73,467	43,944	43,308	43,810	55,799	53,072	55,226	56,283	55,271	56,070
Cost D	79,212	86,840	80,814	48,339	47,638	48,192	61,379	58,379	60,749	61,911	60,798	61,677

Table 5. Input-use and yield from vegetable cultivation across different farm-sizes in Himachal Pradesh

(per ha)

Items of inputs	Tomato			Peas			Cabbage			Cauliflower		
	Small farms	Large farms	All farms	Small farms	Large farms	All farms	Small farms	Large farms	All farms	Small farms	Large farms	All farms
Seed/Seedlings (kg/No.)	41597	43480	42066	101kg	89 kg	98 kg	37992	30924	31512	26410	26310	24200
FYM (q)	122	140	126	96	86	94	75	60	72	70	70	70
Urea (kg)	455	435	450	145	180	153	380	395	383	280	300	285
SSP (kg)	275	290	278	250	240	248	160	132	154	150	155	151
MOP (kg)	38	40	38	35	32	34	32	26	31	28	28	28
Total chemical fertilizers (kg)	768	765	767	430	452	435	572	553	568	458	483	464
Family labour (human days)	171	195	176	175	168	173	174	170	173	171	165	170
Hired labour (human days)	33	50	37	12	23	14	22	15	19	16	11	20
Total human labour (human days)	204	245	213	187	190	187	195	185	192	187	176	190
Yield (q)	338.08	353.95	341.41	110.36	114.95	111.32	294.48	294.66	294.52	162.00	162.83	162.17

by Sharma (2005) in a study conducted in three districts of Himachal Pradesh. On the contrary, the study by Singh *et al.* (2009) in Uttar Pradesh have reported that expenditure on crop protection in vegetable-based farming system was negligible.

A very small difference was registered between cost A_1 and cost A_2, which implied that the leasing-in and leasing-out of land was practised by sample farmers at a small scale. However, small farmers had a tendency to lease-in the land while large farmers leased-out the land. A considerably high jump was observed from cost B to cost C in all the crops which indicated that vegetable production was a labour-intensive venture. The cost D was highest in tomato, followed by cauliflower, cabbage and peas. Similar results were reported by Kumar (1999) and also by Sharma *et al.* (2004).

To sum-up, the gross returns as well as the net returns over cost D were maximum for tomato and minimum for peas. Thakur (1994) had also reported that the total costs as well as the margins were highest for tomato, followed by cauliflower, cabbage and peas. However, Kumar *et al.* (2002) have observed that peas gave a higher net return over variable costs.

Conclusions and Policy Implications

The average landholding size of the sample farms has been found to be 0.79 ha, with more than 79 per cent of the cultivated land. The proportion of uncultivated land has been found less in case of small than large farms, showing better utilization of land by small farmers. More than 91 per cent of the total cropped area has been under vegetable cultivation and cropping intensity is more on small than large farms. The main crops grown in the area are cabbage, cauliflower, peas, tomato, potato and capsicum. The yield has been found highest for tomato, followed by cabbage. The marketable surplus for the selected vegetables has been between 96 per cent and 99 per cent of the total production.

The cost of cultivation per hectare has been observed highest for tomato, followed by cabbage, cauliflower and peas. The plant protection measures constituted the major part of cost A_1, followed by investment on seeds and fertilizers & manures. Gross returns as well as the net returns over cost D on per hectare basis have been found maximum in tomato, followed by cauliflower, cabbage and peas.

The study has concluded that the off-season vegetable cultivation is a highly remunerative enterprise

in the study area. It could still exploit the potential in the areas having sufficient irrigation facilities. This implies that in order to promote this enterprise, niche areas for off-season vegetable cultivation need to be identified and efforts to tap irrigation potential in those areas should be speeded up. Vegetable production being a labour-intensive activity can provide gainful employment to the rural populace. It can also palliate migration to the urban areas. Female literacy rate being lower in the study area, needs to be enhanced so that they are empowered to adopt the latest technology in agriculture and allied fields.

The cost of plant protection can be reduced by educating the farmers about adoption of integrated measures of pest management and organic farming practices. Extension services for the transfer of scientific crop production technology need to be exhorted. Similarly, some handy and efficient tools if made available to the farmers for performing intercultural operations like hoeing, weeding, etc., the labour cost can be reduced and the enterprise can become more remunerative.

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