

RESEARCH STUDY NO. 2017/02

**AN ECONOMIC ANALYSIS OF COST AND RETURN  
OF OFF-SEASON VEGETABLES  
WITH FOCUS ON POLY HOUSE EFFECT IN UTTARAKHAND**

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**Agricultural Economics Research Centre  
University of Delhi  
Delhi**

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## **Research Team**

Professor Surender Kumar

Dr. Paramjit

Ms. Papiya Ghosh

Dr. Subhash Chandra

Dr. Vishnu Shanker Meena

Mr. Vishal Dagar

Mr. Narinder Singh

Ms. Nandi Negi

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## Executive Summary

### Background

For the hilly state of Uttarakhand, cultivation of vegetables constitutes an important part of agricultural activity undertaken with about 22.65<sup>1</sup> per cent of the area under production being devoted to vegetables. Since the climatic conditions of the hilly states are not suitable for production of conventional crops, diversification in terms of the vegetables offers enormous opportunity for the cultivators in the state. In that respect off-season vegetable crops have huge potential. Here off-season vegetables' farming refers to the production of vegetables by using different agro-climatic condition, adjusting the time of transplanting, selecting and improving the varieties and/or creating a controlled environment. In fact, the agro-climatic condition of the hills is conducive in the production of vegetables such as tomato, cauliflower, cabbage, vegetable pea, cucumber, French beans, capsicum etc. in different zones in the hills. Farmers also have higher incentive to grow off-season vegetables since they get higher value from producing these vegetables during summer and rainy season. This is because the off-season vegetables that are raised in the hilly areas are made available to the consumers in the plains at the time when these cannot be grown there due to hot climatic condition. Moreover, with the availability of new technology, it has become much easier for them to overcome the seasonal barriers associated with hill farming making farming more remunerative for them.

However for marketing of vegetables, Indian farmers have traditionally depended heavily on middlemen since major marketing costs are incurred on transport, loading/ unloading etc. Marketing of vegetable crops is quite complex owing to short shelf-life, high seasonality in production and bulkiness. These features make the marketing system for vegetables unique in terms of time, form, and space utilities. Moreover, the efficiency of vegetables marketing in India has been of significant concern in recent years; on the one hand is high and fluctuating consumer prices and on the other hand producer farmers end up getting only a small share of the consumer rupee. Therefore to make vegetable production in hills viable these factors need to be taken care of.

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<sup>1</sup> Horticulture Production Data (2002-03 to 2010-11), Department of Horticulture and Food Processing, Uttarakhand.

## **Objectives**

The specific objectives of the study are as under:

- To analyse the trends in area and production of vegetables in the State;
- To examine the costs and returns in various vegetables grown by farmers in Uttarakhand;
- To assess the marketing costs, margins and price spread in various vegetables in different markets;
- To study the various problems faced by vegetable growers in production and marketing of vegetables in the State.

In addition to the above objectives, the following objectives are specific to off- season vegetables in polyhouses.

- To study the costs and returns of off season vegetables in polyhouses;
- To study the marketing system of polyhouse vegetable crops;
- To study the problems faced by polyhouse farmers in the State.

## **Methodology**

The study is conducted in the state of Uttarakhand. It is based on both primary data and secondary data collected from various sources. The scope of the study is limited to six off-season vegetable crops, namely peas, tomato, cauliflower, cabbage, capsicum and French bean. Even for these six vegetables the primary data has been collected in two phases- once for those grown without polyhouse and then for those grown inside it. Using multistage stratified random sampling five blocks each of district Dehradun and Nainital were selected for study of off-season vegetable cultivation without poly house technology and district Chamoli was selected for studying cultivation inside poly house.

## **Main Findings**

Roughly 56 per cent of the total area in the state of Uttarakhand has been assigned for cultivation of the six off-season vegetables under study during the year 2014-15. The cumulative increase in the area under these vegetables in the state between year 2005-06 and 2014-15 is close to 43 per cent. In terms of the area under different crops in the two districts under study, highest

percentage share of land under vegetables in Nainital district goes towards tomato cultivation (22.94) followed by peas (21.91), cabbage, beans and capsicum in that order whereas the highest percentage share of land under vegetables in Dehradun district goes to peas, followed by tomato, beans, cauliflower, cabbage and capsicum. Although intermittent decline in production has been recorded between 2005-06 and 2014-15, overall the production has increased by 59.06 per cent from the base year. The overall age distribution of the heads in the sampled farms is that 50 per cent of the household heads are in the age group of 41-60 years while only 14.75 per cent and 35.25 per cent respectively are in the age group 20-40 years and above 61 years. 87.7 per cent of the heads are involved primarily in agricultural activity. As far as literacy of the household heads is concerned, in Nainital district while 8.16 per cent of the heads in the marginal households are illiterate, none of the heads in the small and medium farm households was found to be illiterate. Further, while large proportion (44.26 per cent) of the household heads had completed primary level of education, 40.98 per cent had completed matriculation. Only 8.2 per cent of them have a literacy level of graduation and above. However in Dehradun district, the percentage of illiterate household heads is higher at 40.98 which is second only to the percentage of heads completing matriculation (44.26). Highest percentage of illiterate heads was found among small households (50) followed by marginal (42.31) and medium households (20). The average family size of the sampled farmers in Nainital ranges between 6 and 9 while it is between 11 and 21 in Dehradun. In Nainital 45.35 per cent of the household members are males, roughly 36 per cent are females and nearly 19 per cent are children. While the male to female ratio is 1 in medium (each constituting 41.18 per cent of the total) and small households (each constituting 40.48 per cent of the total), percentage of male members is higher at 46.86 vis-à-vis 34.59 per cent of females in marginal households. Children constitute less than 20 per cent of the total members across farmers of all categories. In Dehradun district male-female ratio is close to one across categories of farmers with the number of females being higher than male in small farm households. The proportion of females among the workers in total is higher in Dehradun at 46.37 per cent compared to 41.83 per cent in Nainital with the percentage of males among the agricultural and non-agricultural labours being 55.22 and 46.25 per cent respectively in Dehradun whereas the corresponding figures for Nainital are 61.29 per cent and 51.67 per cent. Work participation of females as non-agricultural labour is much higher than in the agricultural labour category in both the districts. About 65 per cent of the marginal famers, 71 per cent of the small farmers and 86

per cent of the medium farmers have taken loan. All of them have borrowed from banks with the loan amount being highest in case of medium farmers. The rate of interest faced by small farmers is highest at 5.5 per cent followed by 4.92 per cent for marginal farmers and 4.75 per cent for medium farmers. As far as the land owned by the sampled farmers is concerned, while the average area per farm for marginal and medium farmers is higher in Nainital than in Dehradun, it is lower for the small farmers. It can be further seen that the farmers in either district hold very little barren land or fallow land, with the proportions of both barren and fallow lands being relatively higher in Dehradun (11.81 per cent and 13.5 per cent respectively) as compared to Nainital (4.45 per cent and 6.10 per cent respectively). In Nainital there is very little grassland, that too only with marginal farmers. In Dehradun grassland occupies 4.03 per cent of the total owned land. Much of the cultivated land, that is about 57 per cent in Nainital and roughly 56 per cent land in Dehradun is cultivated and field crops are grown in it. 31.57 per cent of the land is utilized as orchard in Nainital while only about 15 per cent of the owned land in Dehradun is used for the same. While about 61 per cent of the total owned land is irrigated in Nainital, nearly 59 per cent land is irrigated in Dehradun. As regards the land under field crop, irrigated to unirrigated area is only 1.33 in Nainital whereas it is 2.33 in Dehradun. With respect to orchards, irrigated to unirrigated area is close to 5 in Nainital whereas it is roughly 1.8 in Dehradun. The net operated area of the sampled farmers is roughly same as the land owned by them since leasing (in or out) of land is not very common among the sampled farmers. The primary sources of irrigation are canal, kuhl, pipeline, nalcoop and rainfed in both districts with an additional source of tank being used in Nainital. However, in terms of basic amenity like access to drinking water the status of the two districts is quite varied. In Nainital district while natural source of drinking water is not available to small and medium farmers, it is closest among the various sources for marginal farmers. On the other hand, while tap water is the closest source of drinking water for the medium farmers, it is farthest for marginal farmers. In Dehradun district however tap water is more difficult to access for farmers of all types with higher average distance compared to other sources. While for marginal farmers sources like pipeline/ handset/ stampost/ nalcoop are closer than natural sources, it is the opposite for small and medium farmers. The cropping pattern of the sampled farmers show that apart from growing vegetables, medium farmers in Nainital grow maize, wheat, potato, fruits and some other crops, small farmers grow barley and pulses along with these crops and the marginal farmers grow paddy as well. The

cropping pattern is however quite different in Dehradun district. While both small and medium farmers grow paddy, wheat, barley, potato, pulses and fruits, marginal farmers grow maize instead of barley. The cropping intensity (with fruits) ranges between 133 and 136 in Nainital with highest intensity being observed for marginal farmers and lowest for small farmers whereas it lies between 122 and 139 in Dehradun with highest intensity for small farmers and lowest for medium farmers. While fruit is most productive of all crops grown (excluding the vegetables under study) in both the districts among all categories of farmers (with the exception of small farmers in Nainital), potato turns out to be the second most productive crop among all the sampled farmers with a huge difference in the productivities of fruits and potato. The least productive crop is pulses with its productivity being less than even 10 quintals per hectare for all sampled farmers. As far as yield of these six vegetables under study is concerned, it is highest for cauliflower in case of small farmers in Nainital, for tomato in case of medium farmers and for cabbage at 244 qtls per hectare for marginal farmers. On the other hand, it is lowest for peas in case of marginal farmers, beans in case of small and marginal farmers. On the contrary, yield of beans is highest at 198 qtls per hectare for medium farmers in Dehradun district. For small and marginal farmers the yield is highest for cauliflower and tomato respectively. The yield of peas however is lowest for all categories of farmers in Dehradun. It has been further observed that crop rotation is widely practiced in both Nainital and Dehradun districts of Uttarakhand. In both districts all crops under study excluding peas are sown in the first half of the year in irrigated lands and harvested two-three months after planting whereas peas is sown throughout the year and harvested two to three months after planting. However, in parts of the districts where irrigation facility is not available sowing is usually done during monsoon, in the month of July and harvested in September. The cost of cultivation per hectare for tomato comes out to Rs. 178775 at cost C in Nainital district and Rs. 183068 in Dehradun district. The total cost of cultivation on marginal farms is higher than that of medium and small farms. Rental value of land constitutes a sizable part of the cost in both districts on all size of farms. Further, the involvement of family labour was found to be quite high. The net return per hectare was found to Rs. 191215 at cost C in Nainital and Rs. 262445 in Dehradun which indicates that farms of Dehradun were able to generate significantly higher gross return and net return in tomato farming. Peas, grown as vegetable, is another remunerative crop for all the hill farmers. Imputed value of family labour accounts for majority of cost C and the costs of hired human labour and

seed/ seedlings are also substantial for all crops. In Dehradun district the net return per hectare from peas is Rs. 65600 at cost C which is significantly lower than that generated in Nainital. In district Nainital the output- input ratio over cost C is 2.07 for tomato, 2.42 for peas, 2.15 for cabbage, 2.77 for cauliflower, 2.68 for capsicum and 2.52 for beans indicating that cauliflower cultivation was most profitable among all six off-season vegetables crops under study. In district Dehradun the output- input ratios are 2.37 for tomato, 1.25 for peas, 1.72 for cabbage, 2.86 for cauliflower, 3.00 for capsicum and 2.64 for beans indicating that capsicum cultivation was most profitable among all the off-season vegetable crops. When the overall situation is examined capsicum cultivation is found to be more profitable than cauliflower, beans, tomato, peas and cabbage. Not only is the total production of all vegetables higher in Dehradun district than in Nainital district across farmers, higher percentage of the produce is being marketed in the former than in the latter. Both wages in kind and losses constitute very negligible share of the produce thereby leaving out 85-99 per cent of the produce to be marketed. The losses, however much they are, happen primarily due to natural calamities, pests and diseases, due to packing and grading. The farmers in Nainital district market their entire produce in Haldwani market whereas those in Dehradun district sell their vegetables in Vikas Nagar market, both within the respective district itself. A huge gap has been noticed in the price paid by the consumers and those received by the growers indicating presence of middlemen in the supply chain. A major part of this gap is accounted for by the retailers' as well as mashkors' margin. The survey on polyhouse covered only five vegetables, namely tomato, capsicum, peas, cauliflower and French beans. In the studied area, Chamoli district, the size of most polyhouses is 33 m<sup>2</sup> although there were two farmers who were operating on polyhouses of size 100 m<sup>2</sup>. The state government of Uttarakhand has announced an average subsidy of Rs. 38678 for construction of a poly-house under the state horticulture mission because of which the average net cost paid per farmer for constructing a polyhouse turns out to be about Rs. 3609. The most important cost item for polyhouse cultivation is manures. Other significant cost heads are formation of beds, seeds/ seedlings, harvesting/ picking and interculture. Net returns from cultivating these vegetables inside poly houses were invariably negative indicating that it was not economically viable to produce these vegetables inside polyhouses. Accordingly, output- input ratios are invariably less than one for all these vegetables indicating that by cultivating these vegetables inside poly houses commensurate return is not being generated. The losses in production of these vegetables are less than 2 per cent

of the production. Between 15 and 20 per cent of the produce are retained for family consumption and another 2-6 per cent are retained for gifts and wages in kind. Rest of the produce is marketed. All the vegetables are being sold entirely in one or more of the three major markets of the district itself, namely Joshimath, Gopeshwar and Karna Prayag, which are located at a distance of roughly 60- 80 kms from the polyhouses covered under the study. Although French beans and peas are sold at higher prices, very less quantity of these vegetables (5-18 boxes) are sold in the market whereas 249 boxes of capsicum are being sold by the farmers in spite of it being the least valuable of these vegetables. Farmers growing vegetables inside polyhouse stated delayed or lack of information, cumbersome clearance process, unavailability of construction material at the local level, delay in technology transfer, lack of skilled labour, high construction cost as some of the problems they have encountered. Low quality and high price of inputs required in cultivation are reported as two major problems by these farmers. Sowing time and intensity and irrigation intensity are some other problems they encounter with respect to cropping practice. All the growers said that they have problem with the time and method of such farming as well as marketing them. For farmers growing vegetables without using polyhouse technology, transporting their produce is a big issue and so are packing and storage. Inadequate storage facility or complete lack of it, inadequacy or non- availability of packing material at the time of need are some of the common problems reported by them. Late and partial or misleading information regarding marketing is a handicap that these farmers feel they are faced with quite frequently. Last but not the least, the problem of malpractice plague the system as has been reported by the sampled growers. Many of them complained about late payment, part payment, overcharging, undue deductions, quotation of less than actual prices in the market.

## **Policy Implications**

- The profitability of these crops can be improved if steps are taken towards regulating the markets.
- Keeping a check on the middlemen can reduce the gap between the final price charged at the market and that received by the growers.

- Improving storage facility is another direction where government interventions would be helpful.
- Since grading and packing is another area where the farmers encounter problems, timely availability of packing material should be ensured and the price of such materials should be controlled.
- Information communication should be made more effective. In fact, various media like television, radio, newspapers and even internet can be used more effectively to achieve this.
- Cultivation inside poly house should be promoted and encouraged more. Towards this 100 per cent subsidies, at least in the initial phase, should be continued for construction of poly houses and technology transfer should be done in a timely manner and should be managed well.



# CHAPTER 1

## Introduction

### Background

1.1 For the hilly state of Uttarakhand, cultivation of vegetables constitutes an important part of agricultural activity undertaken with about 22.65<sup>2</sup> per cent of the area under production being devoted to vegetables. Since the climatic conditions of the hilly states are not suitable for production of conventional crops, diversification in terms of the vegetables offers enormous opportunity for the cultivators in the state. In that respect off-season vegetable crops have huge potential. Here off-season vegetables' farming refers to the production of vegetables by using different agro-climatic condition, adjusting the time of transplanting, selecting and improving the varieties and/or creating a controlled environment. In fact, the agro-climatic condition of the hills is conducive in the production of vegetables such as tomato, cauliflower, cabbage, vegetable pea, cucumber, French beans, capsicum etc. in different zones in the hills. Farmers also have higher incentive to grow off-season vegetables since they get higher value from producing these vegetables during summer and rainy season. This is because the off-season vegetables that are raised in the hilly areas are made available to the consumers in the plains at the time when these cannot be grown there due to hot climatic condition. Moreover, with the availability of new technology, it has become much easier for them to overcome the seasonal barriers associated with hill farming making farming more remunerative for them.

1.2 However for marketing of vegetables, Indian farmers have traditionally depended heavily on middlemen since major marketing costs are incurred on transport, loading/ unloading etc. Marketing of vegetable crops is quite complex owing to short shelf-life, high seasonality in production and bulkiness. These features make the marketing system for vegetables unique in terms of time, form, and space utilities. Moreover, the efficiency of vegetables marketing in India has been of significant concern in recent years; on the one hand is high and fluctuating consumer prices and on the other hand producer farmers end up getting only a small share of the

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<sup>2</sup> Horticulture Production Data (From 2002-03 to 2010-11), Department of Horticulture and Food Processing, Uttarakhand.

consumer rupee. Therefore to make vegetable production in hills viable these factors need to be taken care of.

## **Literature Survey**

1.3 A comprehensive and critical review of the past studies provides a sound basis for scientific investigation. Keeping in view the objectives of the present investigation some of the earlier related findings and reports have been delineated in the present chapter under the following sub heads Cost and returns of vegetables production and Marketing pattern.

### **Cost and returns of vegetables production**

1.4 Maurya and Maurya. (2015) indicates that climate change and global warming have been challenging our natural and agro-ecosystem to a great extent in the recent past. It has been affecting sustainability of living beings. The success and failure of farm enterprises especially vegetable production depends on the vagaries of weather and hence the increase in average temperature induced by climate change and global warming may have disastrous impact on vegetable production and hence on the food security of poor, marginal and small farmers in any region because these groups subsist on climate sensitive crops like vegetable production which are fast growing high value crops. Therefore, to achieve sustainable production of vegetable crops, scientific production technologies, such as mulches need to be adopted to enhance nitrogen use efficiency and hence pot culture, hydroponics and river bed cultivation should be prioritized. However, as rightly pointed out by them, emphasis should also be given to the strategies like crop diversification, adoption of weather wise farming, stress tolerance and hybridization to overcome the impact of climate change on vegetable production. This calls for devoting attention to farming off-season vegetables in the hills, especially when they cannot be grown in plains, as part of weather-wise farming.

1.5 In that direction, Baba and Mann (2005) analyzed the resource efficiency of important vegetables during main season as well as off season under irrigated conditions of Himachal Pradesh for the year 2004-05. The study revealed that the state has made a good progress in vegetable production during the last two decades. The area under vegetables has almost doubled from 21,977 ha in 1990-91 to about 44,274 ha in 2003-04. The production has increased more than three-fold. The net returns of the vegetables were found to be much higher during off-

season than in the main season because of high demand of the off-season vegetables in the plains where they are otherwise not available. On fitting a Cobb- Douglas production function it could be seen that in the main season coefficient of seed cost turned out to be positively significant for pea, garlic and radish indicating that farmers were making their expenditure on local variety seeds having low germination and it is suggested that this cost variable has positive impact on net returns, provided it is spent on improved seed varieties of potential genotype. During off-season all the crops except radish has shown significantly positive coefficient for seed expenditure. The coefficient of fertilizer expenditure appeared to be negative in case of peas, cauliflower and radish in main-season and cauliflower in off-season, indicating that fertilizer usage should be optimized and it should be applied as per scientific package and practices. A significantly positive coefficient of irrigation expenditure in case of garlic in both the seasons suggested need for irrigation to improve productivity. The coefficient of plant protection expenditure turned out to be positive and significant in case of cauliflower (main season), radish and pea (off season) suggesting that attention should be paid towards reducing the insect-pest incidences of these crops. But coefficient for the same in case of radish (main season) turned out to be negative and significant indicating too much plant protection measures can be counterproductive. During main season labour cost in cauliflower cultivation could be increased to manage the farm in view of its positive impact, while these costs need to be decreased in case of cauliflower and radish during off-season. The bullock labour cost posed a problem only in the cultivation of peas. Since this crop is laid on farms with steep slope, these costs are higher as compared to that in plains. The paper points out that the net returns could be improved if positive and negative coefficients of the regression are taken care of. The paper further suggested that vegetable cultivation, particularly during off-season, has potential to raise the standard of living of the hill farmers and government should strengthen efforts in this direction by providing proper irrigation infrastructure, especially for off-season vegetables.

1.6 Parmar (2009) investigates impact of integrated effect of fertilizers, bio-fertilizers and organic manures in enhancing overall productivity, profitability and quality of off-season vegetables under cold arid Himalayan conditions. The study revealed that the productivity, profitability and quality of pea, potato and cabbage in cold arid conditions could be increased with the combined application of synthetic fertilizer, farmyard manure and bio-fertilizers.

1.7 Bala et al. (2010) attempted to examine the costs and returns involved in production of major off-season vegetables in Kullu district of Himachal Pradesh. For this study, primary data on various socio-economic aspects, cropping pattern, inputs used and crop yields were collected for a sample of 100 farmers in two vegetable-dominated developmental blocks, namely, Banjar and Kullu of Kullu district using survey method. The study was confined to selected vegetables like tomato, cabbage, cauliflower and pea. The average operational holding of the sampled farms was found to be 0.64 hectare and a cropping intensity of 250 per cent was realized. Vegetables were found to occupy above 80 per cent of the total cropped area. The per quintal cost of cultivation is found to be highest for peas, followed by cauliflower, tomato and cabbage. The study revealed that per hectare cost  $A_1$ <sup>3</sup> was highest for tomato followed by cabbage. It was minimum for pea among the selected vegetables. The cost  $A_1$  was lower for the large farm category farmers as compared to the small farms for all the crops except tomato. Plant protection was the major constituent of cost  $A_1$  incurred for the production of all crops followed by the expenditure on seed and fertilizers. Since vegetable cultivation is labour intensive, significantly high costs were incurred for human labour ranging from Rs. 13,555 to 14,999 per hectare. Per hectare gross returns were the highest for tomato followed by cauliflower, cabbage and pea. The net returns over cost  $A_1$  also varied. The cost of plant protection can be reduced by educating farmers about the integrated measures of pest management and by adopting organic farming practices. The study suggested that if some handy and efficient tools are made available to the farmers for performing intercultural operations like hoeing, weeding etc., the labour cost can be reduced and the enterprise can become remunerative.

1.8 Joshi et al. (2012) in their paper attempt to (i) estimate cost of production of various crop enterprise and crop rotations followed under polyhouse cultivation (ii) workout financial feasibility of vegetable cultivation under polyhouse and (iii) seek farmers' opinion about the polyhouse scheme and its prospects for future expansion. The analysis of the data collected through survey method for the agricultural year 2007-08 from Lohaghat block of Champawat district, Uttarakhand revealed that in Champawat district production of off- season vegetables in polyhouse was found to be beneficial to the producers as well as consumers. The establishment cost of polyhouse was found to be economically feasible and benefit-cost ratio was greater than one in presence of subsidy. The farmers were satisfied with the financial scheme of polyhouse

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<sup>3</sup> As per CACP definition, Cost  $A_1$  only includes all actual expenses in cash and kind incurred in production by owner operator.

executed by government in the studied area. However, certain additional provisions like drip irrigation system, availability of water tanks and sprinklers etc. have to be included in the scheme for secured irrigation. Currently vegetables produced under polyhouse are locally disposed off. However, in future, if the area under polyhouse cultivation is increased, there will be need of developing transportation facilities and good market for viability of vegetable cultivation in polyhouses in the district of Champavat, Uttarakhand.

1.9 Singh et al (2014) focuses on study of off season vegetables in Uttarakhand. The climatic conditions of hills in Uttarakhand offer bright potential for cultivation of off-season vegetables in different altitudes in summer and rainy seasons. However, various biotic and abiotic factors are the major hindrance in achieving the desired yield potential. Use of mulches in vegetable production offers a cheap and practical solution to combat these problems under the existing climatic conditions. In the course of this study, Krishi Vigyan Kendra, Gwaldam (Chamoli) conducted workshops at farmers' field about off season vegetable cultivation using black plastic mulching technology in five adopted villages during 2008- 2010 (three years) in order to extend the technology to vegetable growers and to assess its economic feasibility under hilly terraced land. The study revealed that black plastic mulching advanced the harvesting of summer squash by 10 days, while in tomato and capsicum, the advancement was of two weeks. This intervention increased the yield of tomato and summer squash by 31.60 per cent and 46.69 per cent respectively. The maximum benefit per unit cost of cultivation was observed in summer squash, while tomato cultivation under black plastic mulch was found to be the best with respect to net returns and benefit-cost ratio (BCR). In fact, IBCR value was maximum for summer squash (4.26), followed by tomato and capsicum. Authors concluded that plastic mulching increases production and productivity of off season vegetables and help vegetable growers in achieving self sufficiency besides reducing work load of women.

1.10 Another study on off-season vegetables, Imran et al. (2015), presents the result of an experimental project entitled "Introduction and promotion of off season vegetables production under natural environment in hilly area of Swat-Pakistan" undertaken in Swat district of Pakistan during *Kharif* season 2014. The field experiment was carried out in randomized complete block design (RCBD) having 600 plots at three different locations and altitudes and tomato, cucumber, French bean, squash and peas were grown in all three locations. From the results it was observed by the authors that all types of vegetable cultivars positively responded for high yield at different

location and altitude. Maximum yield of tomato and cucumber was recorded in Kalam while in Behrain, squashes and peas produced highest yield and in Madyan highest yield was observed in case of French beans. Kalam valley temperature was a little bit varied in vegetable growing season. 15- 20 days difference was recorded in crop germination, development and growth in different location due to different altitudes in Madyan, Behrain and Kalam. On the basis of the above result it was concluded that Swat valley, especially Upper Swat is most suitable for off-season vegetable production under natural environment to enhance the socio-economic condition of the farmer community.

1.11 Although not for off-season vegetables per se, Priscilla L. and S. P. Singh (2015) analysed economics of vegetable production in Manipur. The result revealed that both the cost of cultivation and cost of production was found to be highest in the case of peas followed by cauliflower and cabbage. The human labour cost was found to be a major cost component in the cultivation of all three vegetables suggesting that vegetables are labour intensive crops. While the highest gross returns was reported in pea cultivation followed by cauliflower and cabbage cultivation, the net return was found to be highest in case of cauliflower followed by pea and cabbage cultivation. High cost of seeds and unavailability of good quality seeds were cited as the major constraints faced by the vegetable growers. The study revealed that vegetable production was a remunerative enterprise which could be made more profitable if farmers are made aware of new and improved technologies for crop management. Also, human labour cost can be reduced by use of efficient tools and equipments which will lead to overall reduction in cost incurred in vegetable cultivation. To mitigate the production constraints, research and extension facilities in the state should be strengthened and efforts for timely supply of crucial inputs to the farmers in adequate quantity and at reasonable price should be made.

### **Marketing pattern**

1.12 One of the important papers which look at marketing aspect of vegetable cultivation is Tripathi and Sharma (1998) which attempts to work out farm gate price, mandi sale price, marketing costs, margins and price spread of vegetable pea grown by 20 farmers sampled from two villages at Tehri Garhwal district of Uttarakhand. They marketed their produce at Dehradun Mandi of the state through various marketing channels. The study revealed that vegetable pea, grown as offseason vegetable crop in the month of March, occupied 37 per cent of total

vegetable area. The produce of the area was marketed through three main marketing channels: (i) producer-consumer, (ii) producer-commission agent/wholesaler-retailer-consumer and (iii) producer-local contractor/forwarding agent/ commission agent/wholesaler-retailer-consumer. Of the total marketing cost of green pods of vegetable pea, about 20 per cent was handling and transportation charges, 10 per cent octroi and other taxes. Further 5 per cent were packing charges and 6.5 per cent were miscellaneous expenses.

1.13 Baba et al. (2010) analysed the growth of vegetables sector in relation with technology mission, extent and determinants of marketed surplus and price spread of vegetables in the Kashmir Valley. A substantial increase in the area and production of vegetables has been observed under Mini-Mission-II scheme of Technology Mission. The intensity of cropping in the study area has become more than 250 per cent due to multiple cropping of vegetable crops. On an average, producers' marketed surplus has been found more than 92 per cent of the total production of selected vegetables. However, the estimates of regression function have revealed that spoilage at farm level and consumption has shown a negative contribution to marketed surplus. Moreover, marketing losses at various stages have also been noticed. The price spread of vegetables with respect to various marketing channels has indicated that producers share has an inverse relationship with the number of intermediaries. The net price received by the producer is relatively higher in the channels in which the produce is directly sold to the consumers. Across different vegetables, producers could receive higher absolute net returns in tomato, followed by brinjal and cauliflower in all the channels. The paper therefore highlighted the need for effective measures to reduce marketing losses at various stage and has emphasized on the strengthening of institutions and development of market infrastructure in the area.

1.14 Poudel (2012) on the other hand analysed marketing margin of off-season vegetables value chain in Surkhet-Dailekh road corridor. Cost of production and producer's price were calculated at collection point of Bubairakhe in Goganpani VDC of Surket, and consumer's price observed at 30 km far end market in Brindranagar municipality of Surkhet. The authors found a huge gap in the marketing margin in all types of off-season vegetables value chain. The share of post-harvest loss was observed as the first important factor for high marketing margin in tomato (42 per cent) and cauliflower (37 per cent). However, it was found to be the third important factor in cabbage (28 per cent). The profit margin kept by value chain actors, in contrast to common perception, was observed to be the second most important factor for increasing

marketing margin in tomato (31 per cent), cauliflower (28 per cent) and cabbage (44 per cent). The paper concluded that appropriate attempts to reduce post harvest loss in off-season vegetables value chain might be an important way for reducing marketing margin in off-season vegetables value chain.

1.15 Mishra et al. (2014) carried out an economic analysis of the marketing of major vegetables in Varanasi district of Uttar Pradesh. The paper studied the marketing channels and examined the marketing efficiency of organized retail chain. Spencer retail, Bhelupur was selected purposively and a total of 45 farmers, 4 intermediaries, one retailer and 60 consumers were selected. Vegetables viz tomato, cabbage, pea, okra and brinjal were selected for the study. Among the organized supply chain i.e. channel II (Producer-Retailer-Consumer), the cost incurred per kg of vegetables was much lower than the cost incurred in the traditional supply chain i.e. channel I (Producer-Commission Agent/Adhatia-Retailer-Consumer). The net return and marketing efficiency were higher for channel II than channel I for all the vegetables under study. At the same time organized supply chain was found to have smallest price spread. Hence organized supply chain (channel – I) was found to be more efficient as compared to unorganized supply chain (Channel – II) on the basis of which the authors concluded that it is advisable for the farmers to sell their produce through modern supply chain i.e. channel II. One advantage of Channel II is that they are supposed to purchase the commodity directly from the producer. However due to APMC Act Spencer retail was not permitted to procure commodities directly from the farmers. Therefore it was suggested that policy reform should be done to facilitate direct marketing.

1.16 Along similar lines Singh et al. (2015) investigates the marketing efficiency of vegetable cultivation in Manipur and factors affecting marketing efficiency. The economics of vegetables production in Manipur was also computed. It was found that marketing efficiency is inversely related with the length of the channel. The marketing efficiency of tomato and cabbage in Manipur is significantly affected by marketing costs, marketing margins, open market price, volume of produce handled and cost of transport. It was observed yet again that farmers – retailers – consumers channel in vegetable marketing showed highest efficiency. A farmer's market model may be developed, particularly for vegetables with basic infrastructure such as storage, weight, drinking water, and electricity. Such a system would successfully integrate



producers with consumers/retailers, and eliminate middlemen, cut marketing costs and provide good market infrastructure and environment.

1.17 Lastly, Tuteja U. and Subhash Chandra (2014) attempted to examine the impact of Emerging Marketing Channel (EMC), Reliance Fresh on agricultural marketing in Haryana in terms of returns, price spread and marketing efficiency vis-à-vis Traditional Marketing Channel (TMC). Results based on analysis of 200 farmers revealed that gross and net returns from selling the crops to Reliance Fresh were higher than TMC. Second, producers received 49 and 44 per cent share of the consumer's rupee for tomato and 44 and 42 per cent share for muskmelon by disposing off produce through TMC and EMC respectively and marketing efficiency was observed to be better under the Emerging Marketing Channel. The paper comes up with the following suggestions: (i) barrier- free movement of the produce across the country by lifting restrictions, (ii) increasing the number of alternate marketing channels, (iii) establishing processing centers accessible to producers and (iv) regulating the margins of EMC.

## **Objectives**

1.18 The overall aim of the study is to analyse the cost and return of the six aforementioned off-season vegetables, both outside and inside polyhouse cultivation, in the state of Uttarakhand. The following are the specific objectives of the study.

- ❖ To analyse the trends in area and production of vegetables in the state;
- ❖ To examine the costs and returns of various vegetables grown by farmers in the state;
- ❖ To assess the marketing costs, margins and price spread of various vegetables in different markets;
- ❖ To study the various problems faced by vegetable growers in production and marketing of vegetables in the state.

1.19 In addition, the following objectives are specific to off-season vegetables in polyhouses.

- ❖ To study the costs and returns of off season vegetables in polyhouses;
- ❖ To study the marketing system of polyhouse vegetable crops;
- ❖ To study the problems faced by polyhouse farmers in the state.

## **Organization of Report**

1.20 The present report is divided into nine chapters. In the introductory chapter, that is in the current chapter, some background information, literature survey, objectives of the study and the plan of study have been outlined. The second chapter deals particularly with the methodology adopted to complete the study. The third chapter is devoted to study the trends in area, production and productivity of vegetable crops in the state. The fourth chapter discusses the socio-economic conditions of the vegetable growers in the state. Chapters 5 and 6 discuss the costs and returns of off-season vegetables and aspects related to marketing of off-season vegetables respectively whereas chapter 7 is an extension of chapters 5 and 6 where special focus is given to vegetables grown in poly houses. Chapter 8 discusses the problems faced by the vegetable growers in growing the vegetables both inside and outside poly houses and chapter 9 concludes by presenting a summary of findings from the study and some policy implications.

## CHAPTER 2

### Methodology

2.1 The study is conducted in the state of Uttarakhand. It is based on both primary data and secondary data collected from various sources. The scope of the study is limited to six off-season vegetable crops, namely peas, tomato, cauliflower, cabbage, capsicum and French bean. Even for these six vegetables the primary data has been collected in two phases- once for those grown without polyhouse and then for those grown inside it.

#### Without polyhouse cultivation

2.2 The secondary data on area, production and productivity of vegetable crops grown in Uttarakhand has been collected from the Directorate of Horticulture, Uttarakhand. On the basis of the information contained in this data selection of the districts, blocks, villages and ultimately the sample farmers to be canvassed are made by using multistage stratified random sampling, as laid out by the nodal agency. Precisely, two districts of the state, namely Dehradun and Nainital, were chosen on the basis of highest area under cultivation of vegetables. From each of these districts one development block is selected, viz. Chakrata and Dhari, based on the highest area under cultivation of these vegetables. Two vegetable growing pockets are identified with the help of the officials of the department of agriculture and in each of these pockets a cluster of five villages is formed again on the advice of the ADO, Agriculture. From each of the cluster a random sample of 61 vegetable growers are selected. The size of the total sample thus constructed is 122. The details of the districts, blocks and villages selected for in depth study are given in the table below.

**Table 2.1. Selection of Area**

<b>District</b>	<b>Block</b>	<b>Village</b>
Dehradun	Chakrata	Atal, Anu, Mahendrath, Thartha, Kotikanasar
Nainital	Dhari	Gahna, Parvada, Ladphora, Gunigaon, Dhanachuli

## Classification of data

2.3 The selected farmers were grouped into three categories according to their land holding i.e. marginal (upto 1 ha.), small (1 to 2 ha.) and medium (above 2 ha.). It can be seen that in Nainital district about 80 percent of the farmers are marginal (up to 1 ha.), 16 percent belong the small category (1-2 ha.) and only 3 percent are medium (above 2 ha.); none of the sampled farmers are growing vegetables in a landholding of size above 4 hectares. In Dehradun district, however, while both the percentages of marginal and medium farmers are higher at 85 percent and 8 percent respectively, the proportion of small famers is substantially lower at 7 percent as shown in the table below. No large landholding has been observed even in Dehradun.

**Table 2.2. Classification of Sampled Farms according to their Size of Land Holding**

Category	Districts		All
	Nainital	Dehradun	
Marginal (up to 1 ha.)	49 (80)	52 (85)	101 (83)
Small (1-2 ha.)	10 (16)	4 (7)	14 (11)
Medium (above 2 ha.)	2 (3)	5 (8)	7 (6)
Total	61 (100)	61 (100)	122 (100)

**Note.** Figures in parenthesis denote the percentages.

## Collection of Data

2.4 The secondary information has been obtained from the Directorate of Horticulture, Uttarakhand and the official records of the Department of Agriculture, Uttarakhand. As regards the primary data, from each of the vegetable growers covered by the primary survey detailed information about the size of their land holdings, their socio-economic profile, problems faced by them and aspects related to the costs, returns and marketing of these six vegetables have been collected by personal interview method. The primary data is collected in the year 2016.

## **Analysis of Data and Computation of Cost of Cultivation**

2.5 To make the analysis simple and more understandable, the simple tabular method of data analysis has mainly been used in the study. The cost of cultivation 'C' of individual crops have been estimated using the standard CACP definition.

## **Inside polyhouse cultivation**

2.6 On the basis of the secondary data, Chamoli district has been selected for the study since it has the highest number of poly-houses in the state of Uttarakhand. From among the registered poly-houses, seventy one growers of vegetables have been randomly selected. Since the number of growers of flowers is very limited in this area, we exclude them from our study.

## **Classification of sample**

2.7 The sample has been classified on the basis of the size of the polyhouses into three categories; namely, small (250 m<sup>2</sup>), medium (500 m<sup>2</sup>) and large (1000 m<sup>2</sup>). It has been noticed that all 71 farmers belong to the small category with the size of their polyhouses ranging between 32.85 m<sup>2</sup> and 100 m<sup>2</sup>.

## **Collection of Data**

2.8 As in the case of without poly-house cultivation the secondary data here has also been collected from the same source Directorate of Horticulture, Uttarakhand and the official records of the Department of Agriculture, Uttarakhand and primary data has been collected through personal interview method.

## **Analysis of Data**

2.9 Like in the case of cultivation without poly-house, the simple tabular method of data analysis has been used here.

## **Limitations of the Study**

2.10 The main objective of the study is to assess the costs and benefits from production of off-season vegetables both under polyhouse cultivation and without it. However, although six vegetables were selected for study in case of cultivation without polyhouse, data on all six vegetables could not be obtained for cultivation inside polyhouse because one of the vegetables, cabbage, was grown by only one of the sampled farmers farming inside polyhouse and hence was dropped from the study for rationalization. Secondly, for cultivation without polyhouse the sample size of this study turned out to be 122 instead of 120 since the field data was available for that many farmers and no criteria was available to exclude some. Thirdly, instead of selecting two districts for studying vegetable cultivation inside polyhouse as was laid down in the sampling design, a single district was selected since most of the polyhouses in the state were located in this district and the rest had very either very few or none. Lastly, in many cases, especially with respect to the problems faced by the farmers, the responses of the sampled farmers to similar questions seemed inconsistent. However, they have not been excluded to maintain the sample size specified under study.

## CHAPTER 3

### **Area, Production and Productivity of Vegetable Crops**

3.1 In this chapter the detailed status of the vegetable crops cultivated in the state of Uttarakhand has been provided in terms of their area, production and productivity, with special reference to the six off-season vegetable crops selected for study. In particular, the district-wise data on the area devoted to the production of each of these crops, their share of production in total area under production of vegetables and their productivity are presented here.

#### **Area Under Vegetables**

3.2 Although this study pertains to Nainital and Dehradun districts, for a comprehensive analysis we report figures for area under the aforementioned crops for each district of the state in table 3.1. It can be seen from the table that roughly 56 per cent of the total area in the state of Uttarakhand has been assigned for cultivation of the six vegetables under study during the year 2014-15. Whereas only 13.07 per cent of the total area under vegetable cultivation is devoted to tomato in the state, districts like Nainital, Champavat, Haridwar, Pithoragarh and Udham Singh Nagar allocate higher than average share of their district land under vegetables, viz. 22.94, 20.13, 18.16, 16.10 and 13.23 per cent respectively for cultivation of tomato with the maximum area under tomato in the entire state (21.58 per cent) being assigned in Nainital district. The only other vegetable to which higher share of land is being allocated in the state is peas (17.80 per cent). In terms of hectares, roughly 12873 hectares of land has been devoted for peas cultivation whereas only 9457.51 hectares of land was utilized for tomato. Among the districts while Udham Singh Nagar devotes disproportionately high share of its area (40.79 per cent) to cultivation of peas followed by Tehri (27.52), Nainital (21.91 per cent) and Dehradun (17.82), Pithoragarh devotes only about 3.06 per cent of its land for the same, constituting only 1.27 per cent of the total area under pea in the whole of Uttarakhand.

**Table 3.1. District-wise Area Under Different Vegetables in Uttarakhand During 2014-15  
(Percentages)**

Districts	Vegetables							
	Tomato	Peas	Cabbage	Cauliflower	Beans	Capsicum	Other vegetables	Total Area (ha.)
Nainital	(22.94) {21.58}	(21.91) {15.15}	(11.56) {16.09}	(2.52) {7.08}	(3.73) {5.60}	(2.63) {8.55}	(34.71) {9.72}	(100) {12.30} 8899
Udham Singh Nagar	(13.23) {10.22}	(40.79) {23.16}	(5.87) {6.71}	(4.27) {9.86}	(1.97) {2.43}	(2.43) {6.51}	(31.45) {7.24}	(100) {10.11} 7311
Almora	(7.11) {3.31}	(14.33) {4.90}	(5.91) {4.06}	(5.52) {7.68}	(13.49) {10.01}	(9.52) {15.31}	(44.13) {6.11}	(100) {6.09} 4403
Bageshar	(5.61) {1.12}	(6.45) {0.95}	(7.83) {2.31}	(5.13) {3.06}	(8.46) {2.70}	(4.81) {3.33}	(61.71) {3.67}	(100) {2.61} 1891
Pithoragarh	(16.10) {9.13}	(3.06) {1.27}	(12.58) {10.54}	(1.40) {2.37}	(15.99) {14.44}	(7.13) {13.96}	(43.74) {7.38}	(100) {7.41} 5359
Champavat	(20.13) {7.99}	(14.17) {4.13}	(13.18) {7.74}	(1.60) {1.90}	(13.53) {8.56}	(7.64) {10.49}	(29.75) {3.52}	(100) {5.19} 3755
Dehradun	(12.17) {12.45}	(17.82) {13.38}	(6.66) 10.07	(8.95) {27.32}	(10.95) 17.85	(0.96) {3.40}	(42.49) {12.93}	(100) 13.37 9669
Pauri	(6.84) {4.20}	(6.17) {2.78}	(5.40) {4.89}	(2.79) {5.12}	(7.81) {7.64}	(3.52) {7.46}	(67.47) {12.32}	(100) {8.02} 5801
Tehri	(9.33) {8.01}	(27.52) {17.34}	(8.41) {10.67}	(2.09) {5.35}	(8.09) {11.07}	(3.79) {11.24}	(40.76) {10.41}	(100) {11.21} 8112
Chamoli	(10.43) {3.75}	(12.05) {3.18}	(12.22) {6.50}	(7.26) {7.80}	(9.17) {5.26}	(3.85) {4.79}	(45.02) {4.82}	(100) {4.70} 3403
Rudraprayag	(10.01) {1.07}	(17.64) {1.38}	(12.39) {1.95}	(2.87) {0.92}	(7.93) {1.35}	(1.83) {0.68}	(47.32) {1.50}	(100) {1.39} 1009
Uttarkashi	(10.33) {9.57}	(13.56) {9.23}	(6.69) {9.17}	(2.96) {8.19}	(7.50) {11.08}	(2.99) {9.58}	(55.98) {15.44}	(100) {12.12} 8766
Haridwar	(18.16) {7.60}	(10.15) {3.12}	(15.03) {9.30}	(10.68) {13.36}	(3.03) {2.02}	(3.26) {4.71}	(39.70) {4.95}	(100) {5.47} 3960
<b>Total Area (ha.)</b>	<b>(13.07) {100}</b> 9457.51	<b>(17.80) {100}</b> 12873.17	<b>(8.84) {100}</b> 6397.15	<b>(4.38) {100}</b> 3165.72	<b>(8.20) {100}</b> 5932.86	<b>(3.78) {100}</b> 2736.02	<b>(43.93) {100}</b> 31775.90	<b>(100) {100}</b> 72338.33

**Source:** Directorate of Horticulture, Uttarakhand.

**Note.** Figures in ( ) represent percentage share of area of a vegetable in total area under all vegetables in a district.

Figures in { } represent percentage share of a vegetable in total area under that vegetable in the state.



3.3 Cabbage and Beans turn out to be the next two important vegetables in terms of the total area under them in the entire state (8.84 and 8.20 per cent respectively) followed by cauliflower and lastly by capsicum (4.38 and 3.78 per cent respectively). In fact, Haridwar is the only district to utilize more than 15 per cent of its total area under vegetables for cabbage cultivation. It is followed by Champavat (13.18), Pithoragarh (12.58), Rudraprayag (12.39) and Chamoli (12.22) with the rest devoting less than even 9 per cent of their land under vegetables to cabbage. On the other hand, highest area is allotted for beans cultivation in Pithoragarh (15.99) followed by Champavat (13.53), Almora (13.49) and Dehradun (10.95) with the rest using less than 10 per cent of their area under vegetables for beans cultivation. As far as cauliflower and capsicum are concerned, only Haridwar grows cauliflower in more than 10 per cent (10.68) of its land under vegetables whereas in none of the districts more than 10 per cent of their land under vegetables have been devoted to capsicum with Almora district recording highest percentage share of its area under vegetables for capsicum at 9.52 per cent.

3.4 In terms of the area under different crops in the two districts under study, namely Nainital and Dehradun, table 3.1 shows highest percentage share of the land under vegetables in Nainital district goes towards tomato cultivation (22.94) followed by peas (21.91), cabbage, beans and capsicum in that order. Similarly, highest percentage share of land under vegetables in Dehradun district goes to peas, followed by tomato, beans, cauliflower, cabbage and capsicum. Highest share of land in a particular district have been devoted to tomato in other districts like Pithoragarh, Champavat and Haridwar as well. In rest of the districts, by and large either peas or tomato has a higher share of the land under vegetables allotted to them with the least priority been given to capsicum and cauliflower.

### **Production of Vegetables**

3.5 The following table shows the district-wise break up of production of these six vegetables under study in Uttarakhand during the year 2104-15. From the table it can be seen that out of a total production of 657157.23 tons of vegetables in the state, production of these six off-season vegetables constitute about 56 per cent of the total vegetable production in the state. With the

**Table 3.2. District-wise Production of Different Vegetables in Uttarakhand During 2014-15**  
(Percentages)

Districts	Vegetables							Total production (tonnes)
	Tomato	Peas	Cabbage	Cauliflower	Beans	Capsicum	Other vegetables	
Nainital	(25.07) {18.47}	(13.09) {12.73}	(19.37) {21.96}	(1.64) {3.64}	(3.57) {7.54}	(1.31) {7.63}	(35.95) {10.68}	(100) {12.94} 85022
Udham Singh Nagar	(21.92) {16.78}	(28.01) {28.32}	(8.62) {10.16}	(6.28) {14.49}	(1.11) {2.43}	(0.81) {4.89}	(33.24) {10.26}	(100) {13.44} 88338
Almora	(11.32) {4.27}	(8.05) {4.01}	(8.33) {4.84}	(5.40) {6.15}	(10.49) {11.38}	(2.81) {8.39}	(53.59) {8.16}	(100) {6.63} 43574
Bageshar	(3.85) {0.48}	(6.43) {1.05}	(9.21) {1.76}	(5.46) {2.04}	(5.65) {2.01}	(2.86) {2.80}	(66.52) {3.32}	(100) {2.18} 14297
Pithoragarh	(14.25) {8.93}	(1.60) {1.33}	(12.79) {12.34}	(1.12) {2.11}	(13.57) {24.43}	(6.38) {31.61}	(50.29) {12.71}	(100) {11.01} 72344
Champavat	(29.91) {7.20}	(5.74) {1.83}	(10.64) {3.94}	(2.34) {1.70}	(5.51) {3.81}	(3.10) {5.89}	(42.77) {4.15}	(100) {4.23} 27784
Dehradun	(19.95) {17.56}	(8.99) {10.46}	(7.16) {9.71}	(15.90) {42.17}	(6.19) {15.66}	(0.77) {5.34}	(41.03) {14.57}	(100) {15.46} 101623
Pauri	(11.32) {2.91}	(7.21) {2.45}	(5.56) {2.20}	(2.84) {2.20}	(9.27) {6.85}	(2.95) {5.99}	(60.85) {6.31}	(100) {4.52} 29706
Tehri	(5.08) {3.21}	(29.03) {24.27}	(9.25) {9.01}	(0.72) {1.37}	(7.19) {13.07}	(1.89) {9.47}	(46.84) {11.95}	(100) {11.12} 73057
Chamoli	(11.87) {2.70}	(11.28) {3.38}	(14.11) {4.93}	(8.33) {5.70}	(6.39) {4.17}	(2.17) {3.89}	(45.86) {4.20}	(100) {3.99} 26215
Rudraprayag	(5.20) {0.14}	(7.93) {0.27}	(19.32) {0.77}	(2.03) {0.16}	(8.66) {0.65}	(0.52) {0.11}	(56.35) {0.59}	(100) {0.46} 3002
Uttarkashi	(31.07) {9.30}	(12.03) {4.75}	(8.04) {3.70}	(1.61) {1.45}	(4.15) {3.57}	(1.56) {3.68}	(41.55) {5.01}	(100) {5.25} 34527
Haridwar	(16.10) {8.05}	(7.80) {5.15}	(19.07) {14.67}	(11.18) {16.83}	(3.10) {4.44}	(2.61) {10.31}	(40.13) {8.08}	(100) {8.78} 57669
<b>Total production (tonnes)</b>	<b>(17.56) {100}</b> 115413.40	<b>(13.30) {100}</b> 87391.57	<b>(11.41) {100}</b> 74982.65	<b>(5.83) {100}</b> 38320.06	<b>(6.12) {100}</b> 40186.75	<b>(2.22) {100}</b> 14607.51	<b>(43.56) {100}</b> 286255.29	<b>(100) {100}</b> 657157.23

**Source:** Directorate of Horticulture, Uttarakhand.

**Note.** Figures in ( ) represent percentage share of production of a vegetable in total production of all vegetables in a district.

Figures in { } represent percentage share of a vegetable in total production of that vegetable in the State.

exception of Bageshar, Pauri, Rudraprayag and Almora, in all the districts percentage share of these six vegetables in the total production of all vegetables is at least 50 per cent. Further, tomato production at 17.56 per cent of the total vegetable production is the highest in the state followed by 13.3 per cent of peas, 11.41 per cent cabbage, 6.12 per cent beans, 5.83 per cent cauliflower and 2.22 per cent capsicum. In all districts, except Tehri and Rudraprayag, tomato is among the top two vegetables in terms of its percentage share in production of all vegetables in a particular district. On the other hand, even though cauliflower is at number 5 in terms of its share of production in the whole state, its share in the total production of vegetables in Dehradun district is 15.9 per cent, second only to tomato. Similarly, in spite of beans occupying second position in Almora, Pithoragarh, Pauri and Rudraprayag in terms of percentage of vegetable production in a district, it stands at number 4 when seen in the context of the whole state. The production of capsicum as a percentage of total production of all vegetables in a district is invariably among the last two in all the districts and accordingly its total production in the state is very low at 14607.51 tons vis-a-vis 115413.40 tons of tomato.

### **Productivity of Vegetable Crops**

3.6 Upon concentrating on the district-wise productivity of various crops, it can be seen from table 3.3 that in five out of 13 districts, namely Udham Singh Nagar, Almora, Champavat, Pauri and Uttarkashi, productivity of tomato is highest of all the six off-season vegetables whereas in seven other districts, viz. Nainital, Bageshar, Pithoragarh, Tehri, Chamoli, Rudraprayag and Haridwar, cabbage records highest productivity. However overall in the state tomato records highest productivity of 122.03 qtls./ ha. followed by 121.05 qtls./ha. of cauliflower and then by 117.21 qtls./ha. of cabbage. This is owing to the fact that the productivity of cauliflower in Dehradun is one of the highest in the state. On the other hand, productivity of beans is lowest in almost all districts resulting in one of the overall lowest productivity of 67.74 qtls./ha., second only to capsicum which is the least productive yielding only 53.39 quintals per hectare. However although the percentage share of area under vegetables devoted to growing peas is among the highest in most of the districts, owing to low production its productivity is among the lowest in almost every district,.

**Table 3.3. District-wise Productivity of Vegetables in Uttarakhand During 2014-15****(Qtls./ha)**

Districts	Vegetables							Total
	Tomato	Peas	Cabbage	Cauliflower	Beans	Capsicum	Other vegetables	
Nainital	104.45	57.06	160.05	62.23	91.33	47.65	98.95	95.54
Udham Singh Nagar	200.28	82.98	177.60	177.95	67.85	40.17	127.72	120.83
Almora	157.60	55.59	139.54	96.91	76.97	29.26	120.19	98.96
Bageshar	51.98	75.41	88.99	80.52	50.50	44.95	81.50	75.61
Pithoragarh	119.43	70.73	137.27	107.87	114.55	120.86	155.21	135.00
Champavat	109.92	29.98	59.70	108.33	30.12	29.97	106.39	73.99
Dehradun	172.22	53.04	113.04	186.83	59.42	83.87	101.51	105.10
Pauri	84.74	59.86	52.75	52.10	60.77	42.89	46.18	51.21
Tehri	49.00	95.00	99.00	31.00	80.00	45.00	103.49	90.06
Chamoli	87.63	72.12	88.94	88.42	53.65	43.36	78.47	77.03
Rudraprayag	15.45	13.37	46.40	21.03	32.50	8.38	35.42	29.75
Uttarkashi	118.50	34.93	47.30	21.43	21.80	20.50	29.24	39.39
Haridwar	129.17	111.94	184.87	152.43	148.75	116.74	147.22	145.63
Total	122.03	67.89	117.21	121.05	67.74	53.39	90.09	90.84

**Source:** Directorate of Horticulture, Uttarakhand.

### Changes in Area Under Vegetables

3.7 The following table 3.4 captures the change in area under vegetables in Uttarakhand in the last decade, i.e. between 2005-06 and 2014-15. It can be observed from the table that the year-to-year increase in area under vegetables varied between 0.35 per cent to 10.95 per cent during this period with the maximum change of 10.95 per cent taking place in the end year, i.e. 2014-2015 and the lowest increase of 0.35 per cent happening in the preceding year. However, an overall increase of 42.61 per cent has been recorded since the year 2005-06.

The sudden increase of 10.95 per cent in the last year could indicate that the state has witnessed a shift in the pattern of cultivation in favour of vegetables during that year. The only other year when the increase in area from the previous year was more than 6 per cent was 2006-07. The compound annual growth in area over the decade turns out to be 4.02 per cent. On fitting a linear trend equation to the data on area under vegetables over time, it can be seen that the following equation explains the data.

$$A = 2.036t + 49.17$$

Here ‘A’ denotes the area under vegetables in Uttarakhand (in 000’ hectares) and ‘t’ which takes the integer values 1-10 denotes the years during the period 2005-06 to 2014-15.

**Table 3.4. Changes in Area Under Vegetables in Uttarakhand During the period 2005-06 to 2014-15**

Year	Area in 000’ Hectares	Year to year percentage change	Percentage change from the base year 2005-06
2005-06	50.72		
2006-07	53.97	6.40	6.40
2007-08	56.24	4.21	10.87
2008-09	57.55	2.33	13.45
2009-10	58.45	1.57	15.23
2010-11	61.39	5.04	21.03
2011-12	62.96	2.55	24.12
2012-13	64.97	3.20	28.09
2013-14	65.20	0.35	28.54
2014-15	72.34	10.95	42.61

**Source:** Directorate of Horticulture, Uttarakhand.

### **Changes in Production Under Vegetables**

3.8 Table 3.5 showing changes in production of vegetables during last ten years reveal that an increase in vegetables production of about 59 per cent took place since the year 2005-06. However underlying such increase there have been periods of high to marginal increase in production as well as periods when sharp fall in production have been witnessed. In particular, while the total production of vegetables was 392380 tons in the year 2005-06 it fell to 348430 tons in the following year. This has happened in spite of an increase in area under vegetables of 6.4 per cent during that year. However, this fall was followed by a marked increase in annual production by about 50 per cent in the next year. Similarly, while in the year 2008-09 production has decreased by 11.65 per cent from the previous year it was followed by an increase of 63.17 tons. Also noticed was a decline of 1.87 per cent from the previous year in the year 2012-13 which was followed by an increase in production of about 7.5 per cent in the successive year.

However, as could be observed from table 3.4 area under vegetables has increased throughout the decade. The compound annual growth rate of vegetable production in Uttarakhand in the decade 2005-06 to 2014-15 turns out to be 5.29 per cent.

**Table 3.5. Changes in Production Under Vegetables in Uttarakhand During the period 2005-06 to 2014-15**

<b>Year</b>	<b>Production (000' MT)</b>	<b>Year to year percentage change</b>	<b>Percentage change from the base year 2005-06</b>
2005-06	392.38		
2006-07	348.43	-11.20	-11.20
2007-08	521.85	49.77	32.99
2008-09	461.07	-11.65	17.51
2009-10	524.24	13.70	33.60
2010-11	560.74	6.96	42.91
2011-12	575.04	2.55	46.55
2012-13	564.28	-1.87	43.81
2013-14	606.51	7.48	54.57
2014-15	624.12	2.90	59.06

**Source:** Directorate of Horticulture, Uttarakhand.

The following trend equation can be fitted to the data on production of vegetables in Uttarakhand:

$P = 27.16t + 368.4$  where P denotes the production in 000' MT and the variable t which takes integer values between 1 and 10 denotes the years starting 2005-06 till 2014-15.

## CHAPTER 4

### **Socio-Economic Profile of Selected Vegetable Growers in Uttarakhand**

4.1 In this chapter socio-economic condition of the growers of the six off-season vegetables under study is presented. In particular, closer look has been taken at the age, literacy and occupation of the head of the family, district - wise and overall demographic profile of the sampled farmers and their social classification. Further examined are the farming related aspects like the proportion of various types of lands owned by the sampled farmers, the distribution of leased-in and leased out-land, aspects related to irrigation facilities available to them, their cropping pattern, productivity and yield of various vegetables grown by them, area they have devoted to different vegetables, crop rotation details and their credit details.

#### **Age, Occupation and Literacy of the Head**

4.2 The following table 4.1(a) shows the age and occupation of the head of the family as percentage of total sample. It can be seen from the table that in the Nainital district, irrespective of the size of the landholding that the family owns, in majority of the sampled farm households (50.82), head of the family belongs to the age group of 41-60 years. Among the marginal farm households, age of the head in 32.65 per cent families is above 61 years, while only 16.33 per cent households have heads belonging to the age group 20-40 years. In the small households the corresponding figures are 40 and 10 respectively whereas in the medium category there is no household with a head in the age group 20-40 years but 50 per cent households have heads in the age group 41-60 years and the rest are of above 60 years. However the age distribution is quite different in Dehradun district. Although in the marginal category 53.85 per cent family heads are in the age group 41-60 years, in small and medium category only 25 per cent and 20 per cent families respectively have family heads in that age group. In these categories the age group of the heads in rest of the families is above 61 years. In marginal category however, about 17 per cent households have head of age 21-40 years.

**Table 4.1(a) Age and Occupation of the Head of the Family  
(Percentages)**

Category	Age of the head				Occupation			
	20-40 yrs.	41-60 yrs.	Above 61 yrs.	Total	Agri.	Non-agri.	Any other	Total
<b>Nainital</b>								
Marginal	16.33	51.02	32.65	100	85.71	6.12	8.16	100
Small	10.00	50.00	40.00	100	80.00	10.00	10.00	100
Medium	0.00	50.00	50.00	100	100.00	0.00	0.00	100
All	14.75	50.82	34.43	100	85.25	6.56	8.20	100
<b>Dehradun</b>								
Marginal	17.31	53.85	28.85	100	90.38	0.00	9.62	100
Small	0.00	25.00	75.00	100	100.00	0.00	0.00	100
Medium	0.00	20.00	80.00	100	80.00	0.00	20.00	100
All	14.75	49.18	36.07	100	90.16	0.00	9.84	100
<b>Overall</b>								
Marginal	16.83	52.48	30.69	100	88.12	2.97	8.91	100
Small	7.14	42.86	50.00	100	85.71	7.14	7.14	100
Medium	0.00	28.57	71.43	100	85.71	0.00	14.29	100
All	14.75	50.00	35.25	100	87.70	3.28	9.02	100

The overall age distribution of the heads in the sampled farms shows that of the 50 per cent of the household heads are in the age group of 41-60 years while only 14.75 per cent and 35.25 per cent respectively are in the age group 20-40 years and above 61 years. Overwhelmingly high proportion of medium households (71.43 per cent) has heads aged above 61 years, whereas the corresponding figures for small and medium households are 50 and 30.69 respectively. While no medium household has a young head of less than 41 years of age, 7.14 per cent of small households and 16.83 per cent of the marginal households have heads in this age group. Further occupation of at least 80 per cent of the heads is agriculture in both the districts with 100 per cent of the medium farm heads in Nainital and small farm heads in Dehradun being involved primarily in agriculture. On an average it can be seen that 87.7 per cent of the heads' occupation is agriculture while only 3.28 per cent are involved in non- agricultural activity. Looking at the



occupation category-wise, it can be seen that household heads of 88.12 per cent of the marginal farm households, 85.71 per cent of the small farm households and 85.71 per cent of the medium farm households are involved primarily in agricultural activity.

4.3 As far as literacy of the household heads is concerned, in Nainital district while 8.16 per cent of the heads in the marginal households is illiterate, none of the heads in the category of small and medium farmers were found to be illiterate. A large proportion (44.26 per cent) of them has completed primary level of education whereas another 40.98 per cent have completed matriculation. Only 8.2 per cent of them have a literacy level of graduation and above. However in Dehradun district, the percentage of illiterate household heads is higher at 40.98 which is second only to the percentage of heads completing matriculation (44.26). Highest percentage of illiterate heads (50) was found among small households followed by marginal households (42.31) and medium households (20).

**Table 4.1(b) Literacy of the Head of the Family  
(Percentages)**

Category	Literacy				Total
	Illiterate	Primary	Matric	Graduate & above	
<b>Nainital</b>					
Marginal	8.16	38.78	44.90	8.16	100
Small	0.00	50.00	40.00	10.00	100
Medium	0.00	50.00	50.00	0.00	100
All	6.56	44.26	40.98	8.20	100
<b>Dehradun</b>					
Marginal	42.31	42.31	7.69	7.69	100
Small	50.00	50.00	0.00	0.00	100
Medium	20.00	60.00	20.00	0.00	100
All	40.98	8.20	44.26	6.56	100
<b>Overall</b>					
Marginal	25.74	40.59	25.74	7.92	100
Small	14.29	50.00	28.57	7.14	100
Medium	14.29	57.14	28.57	0.00	100
All	23.77	26.23	42.62	7.38	100

## Demographic Profile

4.4 The following tables 4.2 (a) - (c) show district-wise as well as overall demographic profile of the sampled farmers. The profile of Nainital presents quite an impressive picture of the district. It can be seen from table 4.2 (a) that the average family size of the sampled farmers in Nainital

**Table 4.2 (a) Demographic Profile of Sampled Farmers of District Nainital  
(Percentages)**

Particulars	Marginal	Small	Medium	All
Male	46.86	40.48	41.18	45.35
Female	34.59	40.48	41.18	36.04
Children	18.55	19.05	17.65	18.62
Total	100	100	100	100
Avg. Family size	6.49	8.40	8.50	6.87
<b>Workers (16-60 yrs.)</b>				
Male	58.08	57.14	63.64	58.17
Female	41.92	42.86	36.36	41.83
Total	100	100	100	100
<b>Occupation</b>				
Agri. labour				
Male	62.33	57.14	60.00	61.29
Female	37.67	42.86	40.00	38.71
Non-agri. labour				
Male	48.94	57.14	66.67	51.67
Female	51.06	42.86	33.33	48.33

ranges between 6 and 9 with the size of 6.5 for marginal farmers, 8.4 and 8.5 for small and medium farmers respectively. While the male to female ratio is 1 in medium (each constituting 41.18 per cent of the total) and small households (each constituting 40.48 per cent of the total), percentage of male members is higher at 46.86 vis-à-vis 34.59 per cent of females in marginal households. Children constitute less than 20 per cent of the total members across farmers of all categories. Overall, 45.35 per cent of the total is male, roughly 36 per cent are females and nearly 19 per cent are children.

4.5 However, lower percentage of females belong to the working age group compared to males across categories as a result of which depending on the categories, between 58 and 63.64

per cent of the workers are males with the percentage being lowest for small farmers. As expected, in all categories of farm households, majority of the agricultural and non-agricultural labours are males with 62.33, 57.14 and 60 per cent respectively of the agricultural labours in the category of marginal, small and medium farmers being male and 57.14 per cent and 66.67 per cent respectively of the non-agricultural labour from small and medium categories being males. The only exception, however, is the marginal farmer category where 51.06 per cent of the non-agricultural labours are female. It can be observed that the work participation of the females as non-agricultural labour is much higher than in the agricultural labour category with only 38.71 per cent of the agricultural labour being females whereas 48.33 per cent of the non-agricultural labours are females. This disparity can be attributed entirely to high presence of females from marginal households in the non-agricultural workforce.

4.6 On the other hand as Table 4.2 (b) shows, with an average family size of 11 - 21, the families of the sampled farmers are much bigger in Dehradun district than in Nainital. Male-female ratio is

**Table 4.2(b) Demographic Profile of Sampled Farmers of District Dehradun  
(Percentages)**

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>All</b>
Male	39.65	47.50	46.53	41.40
Female	39.48	48.75	41.58	40.74
Children	20.87	3.75	11.88	17.86
Total	100	100	100	100
Avg. Family size	11.06	20.00	20.20	12.39
<b>Workers (16-60 yrs.)</b>				
Male	55.12	52.17	45.00	53.63
Female	44.88	47.83	55.00	46.37
Total	100	100	100	100
<b>Occupation</b>				
Agri. labour				
Male	55.83	57.89	47.37	55.22
Female	44.17	42.11	52.63	44.78
Non-agri. labour				
Male	52.38	25.00	23.08	46.25
Female	47.62	75.00	76.92	53.75

close to one across categories of farmers with the number of females being higher than male in small farm households. Although higher proportion of the workforce is males in marginal and small categories, it is the opposite in case of medium farm households with 55 per cent of the total workers being female. Overall, the proportion of females among the workers is higher in Dehradun at 46.37 compared to 41.83 per cent in Nainital.

4.7 When examined category-wise, it can be seen that while marginally higher percentage of agricultural labour are males among small farm households in Dehradun as compared to Nainital (57.89 vis-à-vis 57.14), the percentage is much lower at 55.83 and 47.37 respectively for marginal and medium farmers. Per se, higher percentage of agricultural labours among the marginal farm households is females at 52.53 per cent. Further, while a slightly higher percentage of non-agricultural labours are males in the marginal farm households in Dehradun, it is much lower for the other two categories of farmers at 25 and 23.08 per cents respectively for small and medium households which mean that the non-agricultural labour force comprises majorly of females. Accordingly, across the sampled farming households in Dehradun 53.75 per cent of the non-agricultural workers are females as opposed to the corresponding figure of 48.33 per cent in Nainital.

4.8 The demographic profile of all 122 sampled farmers is presented in the following table 4.2 (c) Though the average family size of the sampled farmers ranges between 8 and 17 depending upon the type of farm household, the overall scenario in the state appears to be promising. Large family size was not only because of high total fertility rate but also because of the joint family system prevailing in several blocks of these two districts. In fact, during the survey it was observed that polygamy was a very common phenomenon there. Not only did some men have multiple wives in certain areas, quite unusually few female members of a family were also found to have more than one husband within the family.

4.9 While about 56 per cent of the workforce comprise of adult males, slightly more than 40 per cent of the agricultural labour is female whereas 51.43 per cent of the non- agricultural labour are female. The non-agricultural labour force is constituted mainly of construction workers where females are employed in large numbers.

**Table 4.2. (c) Demographic Profile of All Sampled Farmers  
(Percentages)**

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>All</b>
Male	42.22	43.90	45.76	42.81
Female	37.74	44.51	41.53	39.06
Children	20.04	11.59	12.71	18.13
Total	100	100	100	100
Avg. Family size	8.84	11.71	16.86	9.63
<b>Workers (16-60 yrs.)</b>				
Male	56.42	55.38	49.02	55.63
Female	43.58	44.62	50.98	44.37
Total	100	100	100	100
<b>Occupation</b>				
Agri. labour				
Male	58.90	57.41	50.00	58.14
Female	41.10	42.59	50.00	41.86
Non-agri. labour				
Male	50.91	45.45	36.84	48.57
Female	49.09	54.55	63.16	51.43

### **Social Classification**

4.10 Table 4.3 classifies the sampled farmers according to the social category, viz. scheduled caste, scheduled tribe, other backward class or general, they belong to. It can be seen that in the entire sample no farmer belongs to the OBC category. Moreover, in Nainital district no farmer even belongs to the ST category. In fact, all the medium farmers are from general category whereas among the small and marginal farmers 40 per cent and 20.41 per cent respectively belong to the SC category with the rest belonging to general category.

### **Farm Size and Utilization Pattern**

4.11 Table 4.4 provides information on various types of land owned by the sampled farmers. It shows that while the average area per farm for marginal and medium farmers is higher in Nainital, it is lower for the small farmers. It can be further seen that the farmers in either district hold very little barren or fallow land, though the proportions of both barren and fallow lands are relatively higher in Dehradun (11.81 per cent and 13.5 per cent respectively) as compared to

Nainital (4.45 per cent and 6.10 per cent respectively). Further, there is very little grassland in Nainital, that too with only marginal farmers. The sampled farmers in Dehradun district have relatively more grassland amounting to 4.03 percent of the total owned land. Much of owned land, that is more than 57 per cent in Nainital and roughly 56 per cent land in Dehradun, is cultivated and field crops are grown in it. Further, 31.57 per cent of the land is utilized as orchard in Nainital while only about 15 per cent of the owned land in Dehradun is used for the same. In terms of area under irrigation, while about 61 per cent of the total owned land is irrigated in Nainital, nearly 59 per cent land is irrigated in Dehradun. A more detailed look at the irrigation

**Table 4.3. Social Classification of Sampled Farmers  
(Percentages)**

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>Total</b>
<b>Nainital</b>				
SC	20.41	40	0	22.95
ST	0	0	0	0
OBC	0	0	0	0
General	79.59	60	100	77.05
Total	100	100	100	100
<b>Dehradun</b>				
SC	1.92	0	0	1.64
ST	94.23	100	100	95.08
OBC	0	0	0	0
General	3.85	0	0	3.28
Total	100	100	100	100
<b>Overall</b>				
SC	10.89	28.57	0.00	12.30
ST	48.51	28.57	71.43	47.54
OBC	0	0	0	0
General	40.59	42.86	28.57	40.16
Total	100	100	100	100

coverage in our sample would reveal that much of the orchard is irrigated in both the districts with much higher irrigation coverage (irrigated area is close to 5 times the unirrigated area) in Nainital than in Dehradun (ratio of irrigated area to unirrigated area is roughly 1.8). As regards the land under field crop, ratio of irrigated area to unirrigated area is only 1.33 in Nainital whereas it is 2.33 in Dehradun. When looked category-wise, quite surprisingly for small farmers in Nainital the ratio of irrigated area to unirrigated land is close to 1 for field crops whereas it is higher for marginal and medium farmers. A similar trend is visible in Dehradun as well. However, very high proportion of the orchard area, if not the entire area, is irrigated by all types of farmers in both the districts excepting marginal farmers in Dehradun where the amount of irrigated area is less than the unirrigated area.

**Table 4.4. Proportion of Various Type of Land Owned by Sampled Farmers**

District	Total land owned			Cultivated land		Orchard		Ghasni (Grass land)	Barren	Fallow land	Others
	Irri.	Un-irri.	Total	Field crops		Irri.	Un-irri.				
				Irri.	Un-irri.						
<b>Nainital</b>											
Marginal	59.68	40.32	100.00 (0.50)	39.04	26.29	19.65	4.29	0.99	5.28	4.46	0.00
Small	65.74	34.26	100.00 (1.09)	21.30	20.37	42.59	5.93	0.00	2.78	7.04	0.00
Medium	60.00	40.00	100.00 (2.53)	32.00	20.00	16.00	16.00	0.00	4.00	12.00	0.00
All	61.35	38.65	100.00 (0.66)	33.38	23.91	25.38	6.19	0.60	4.45	6.10	0.00
<b>Dehradun</b>											
Marginal	60.90	39.10	100.00 (0.39)	43.81	18.92	6.59	10.53	4.41	5.44	10.30	0.00
Small	53.64	46.36	100.00 (1.39)	31.82	10.91	14.55	0.00	3.64	28.18	10.91	0.00
Medium	58.22	41.78	100.00 (2.28)	36.89	12.89	8.89	2.22	3.56	15.11	20.44	0.00
All	58.99	41.01	100.00 (0.61)	39.89	15.87	8.49	6.40	4.03	11.81	13.50	0.00
<b>Overall</b>											
Marginal	60.23	39.77	100.00 (0.44)	41.19	22.96	13.75	7.11	2.53	5.35	7.10	0.00
Small	61.66	38.34	100.00 (1.18)	24.85	17.18	33.13	3.93	1.23	11.35	8.34	0.00
Medium	58.77	41.23	100.00 (2.35)	35.38	15.08	11.08	6.46	2.46	11.69	17.85	0.00
All	60.22	39.78	100.00 (0.64)	36.49	20.06	17.30	6.29	2.24	7.97	9.64	0.00

**Note.** Figures in parenthesis denote area in ha / farm

Further, it can be observed from the table that the total percentage of irrigated area under field crops and orchard is less than the total percentage of owned land which is irrigated. This difference is due to the fact that both these districts have some amount of fallow land which were not used for farming during the time of survey.

## Leased in and Leased out Land

4.12 The next table shows the details of the leased land for the sampled farmers. It can be seen from the table that with the exception of very negligible amount of un-irrigated land, constituting about 0.02 hectare per farm, been leased out by the medium farmers in Dehradun, farmers in no category lease out land in general in either district of the state. Likewise leasing in land does not appear to be in trend among the sampled farmers with only 0.04 hectares of unirrigated land being leased in per farm by the small farmers in Nainital and about 0.01 hectares of land per farm being leased in by the marginal farmers in Dehradun. As a result, net operated area per farm of the sampled farmers is roughly the same as the land owned by them.

**Table 4.5. Distribution of Leased in and Leased out Land of Sampled Farmers**  
(Area in ha / farm)

Category	Total land owned		Leased in (+)		Leased out (-)		Net operated	
	Irri	Un-irri	Irri	Un-irri	Irri	Un-irri	Irri	Un-irri
<b>Nainital</b>								
Marginal	0.30	0.20	0	0	0	0	0.30	0.20
Small	0.72	0.37	0	0.04	0	0	0.72	0.42
Medium	1.52	1.01	0	0	0	0	1.52	1.01
All	0.41	0.26	0	0.007	0	0	0.41	0.26
<b>Dehradun</b>								
Marginal	0.24	0.15	0.006	0.005	0	0	0.24	0.16
Small	0.75	0.65	0	0	0	0	0.75	0.65
Medium	1.33	0.95	0	0	0	0.02	1.33	0.93
All	0.36	0.25	0.005	0.004	0	0.002	0.36	0.25
<b>Overall</b>								
Marginal	0.27	0.18	0.003	0.003	0	0	0.27	0.18
Small	0.73	0.45	0	0.029	0	0	0.73	0.48
Medium	1.38	0.97	0	0	0	0.014	1.38	0.95
All	0.38	0.25	0.002	0.005	0	0.001	0.39	0.26



## Sources of Water for Irrigation

4.13 As regards the source of irrigation, it can be seen from Table 4.6 that for none of our sampled farmer water for irrigation comes from tube well. Moreover, while canal irrigation is not practiced in Nainital, irrigation by using tank water is not an option for farmers in Dehradun. In fact, even among the sampled farmers in Nainital tank water is being used only by marginal farmers with an average distance of 1 km between the source and the farmland. Further, while

**Table 4.6. Average Distance of the Source of Water for Irrigation of Sampled Farmers**  
(In Km.)

Categories	Source				
	Canal	Tube well	Tank	Kuhl	Others
<b>Nainital</b>					
Marginal	0.00	-	1.00	2.22	1.50
Small	-	-	-	3.00	1.00
Medium	-	-	-	-	5.50
All	0.00	-	1.00	2.39	1.77
<b>Dehradun</b>					
Marginal	1.63	-	-	8.64	4.34
Small	3.00	-	-	9.00	1.50
Medium	2.00	-	-	8.00	10.00
All	1.75	-	-	8.61	4.47
<b>Overall</b>					
Marginal	1.53	-	1.00	4.72	2.85
Small	3.00	-	-	4.50	1.17
Medium	2.00	-	-	8.00	7.00
All	1.66	-	1.00	4.82	3.01

**Note:** Others includes pipeline, nalcoop and rainfed.  
- means NA

other sources of irrigation like pipeline, nalcoop and rainfed are more popularly used in all types of farmers in Nainital, their distance from the source is maximum at 5.5 km for medium farmers followed by 1.5 km for marginal farmers and 1km for small farmers. The only other source of irrigation for small farmers in Nainital is kuhl with an average distance of 3 kms whereas the average distance of kuhl from the marginal farmers is about 2.22 km. On the other hand, medium farmers in Dehradun use sources of irrigation other than canal and tank even when their

distance from the source is greater than that from canal or tank and is about 10 km. For both small and marginal farmers in Dehradun even though kuhl is a common source of irrigation, the average distance of kuhl is greater than that of canal, pipeline or nalcoop.

## Source of Water for Drinking

4.14 While the above table presents some of the information relating to farming practices of the sampled farmers, the following table reveals some information about their living condition by telling us how far they have to travel to get access to something as basic as drinking water. In Nainital district while natural source of drinking water is not available to small and medium farmers, it is closest among the various sources for marginal farmers. On the other hand, while tap water is the closest source of drinking water for the medium farmers, it is farthest for marginal farmers. In Dehradun district however tap water is more difficult to get for farmers of

**Table 4.7. Average Distance of the Source of Drinking Water of Sampled Farmers (In Km.)**

Category	Source		
	Natural	Tap water	Others
Nainital			
Marginal	0.57	1.84	0.91
Small	-	2.24	0.50
Medium	-	1.00	4.20
All	0.57	1.88	0.96
Dehradun			
Marginal	1.99	7.41	0.00
Small	0.00	9.00	1.50
Medium	3.33	8.00	-
All	2.05	7.61	0.75
Overall			
Marginal	1.59	4.48	0.85
Small	0.00	4.17	0.67
Medium	3.33	5.67	4.20
All	1.66	4.51	0.95

**Note:** Others includes pipeline, handpump, stampost and nalcoop.

all types with higher average distance compared to other sources. While for marginal farmers sources like pipeline/ handset/ stampost/ nalcoop are closer than natural sources, it is the opposite for small and medium farmers.

## **Cropping Pattern**

4.15 As far as cropping pattern of the sampled farmers are concerned it can be seen from table 4.8 below that apart from growing vegetables, medium farmers in Nainital grow maize, wheat, potato, fruits and some other crops, small farmers grow barley and pulses along with these crops whereas the marginal farmers grow paddy as well. Leaving out crops in “others” category, maximum farmers in the medium category grow fruits (25.38 per cent) followed by potato (17.77 per cent), maize (7.61 per cent) and wheat (6.09 per cent). However, most of the small farmers grow wheat (37.23 per cent) followed by potato and fruits (close to 15 per cent) and less than 6 per cent of farmers grow maize, barley and pulses. In the marginal category, 25.43 per cent farmers grow potato, which is closely followed by 25.24 per cent growing wheat, 11.28 and 11.14 per cent growing maize and fruits respectively and negligible proportion of them growing barley and maize (1.48 and 1.11 per cent respectively).

4.16 The cropping pattern is however quite different in Dehradun district. While both small and medium farmers grow paddy, wheat, barley, potato, pulses and fruits, marginal farmers grow maize instead of barley. Among these crops, maximum farmers in the medium and marginal categories (34.71 and 26.03 per cent respectively) grow flowers and less than 2 per cent marginal and small farmers grow potato. While paddy is the second most important crop grown by the medium farmers, it is wheat for marginal farmers. However, paddy is grown by about 44 per cent small farmers followed by wheat (11.33 per cent), fruits (6.47 per cent), barley and pulses (4.85 per cent each) and potato (1.62 per cent).

4.17 Overall, about 23.5 per cent marginal farmers grow wheat followed by 18.17 per cent growing fruits, 14.10 per cent growing potato, 12.88 per cent growing maize, 10.48 per cent growing pulses, 5.09 per cent growing paddy and less than 1 per cent growing barley. The corresponding ordering for small farmers is wheat, fruits, paddy, potato, maize, barley and pulses and that for medium farmers is fruits, wheat, potato, paddy, pulses, maize and barley.

4.18 While the gross cropped area (GCA) in Dehradun district is highest for marginal farmers followed by small farmers and lastly by medium farmers, in Nainital district, GCA is still highest for marginal farmers but is followed by medium farmers and then by small farmers which is also the overall scenario. The cropping intensity (with fruits) ranges between 133 and 136 in Nainital with highest intensity being observed for marginal farmers and lowest for small farmers whereas

**Table 4.8. Cropping Pattern of Sampled Farmers (Excluding Vegetables)**

Category	Crops								Gross cropped area (ha.)	(Percentages)	
	Maize	Paddy	Wheat	Barley	Potato	Pulses	Fruits	Others		Cropping intensity with fruits (%)	Cropping intensity without fruits (%)
<b>Nainital</b>											
Marginal	11.28	1.11	25.24	1.48	25.43	7.98	11.14	16.33	29.68	136	129
Small	5.24	0.00	37.23	3.49	14.54	2.04	14.43	23.04	13.10	133	120
Medium	7.61	0.00	6.09	0.00	17.77	0.00	25.38	43.15	5.69	134	110
All	8.73	0.58	26.30	1.92	20.67	4.81	14.38	22.61	48.46	135	124
<b>Dehradun</b>											
Marginal	14.67	9.53	21.55	0.00	1.45	13.26	26.03	13.51	22.15	137	118
Small	0.00	43.69	11.33	4.85	1.62	4.85	6.47	27.18	4.44	139	133
Medium	0.00	17.30	15.83	4.87	1.22	11.33	34.71	14.74	8.45	122	101
All	9.19	16.67	18.69	1.82	1.43	11.50	24.74	15.97	35.05	134	115
<b>Overall</b>											
Marginal	12.88	5.09	23.50	0.78	14.10	10.48	18.17	15.00	51.83	136	124
Small	3.85	11.55	30.38	3.85	11.13	2.78	12.32	24.13	17.54	134	123
Medium	3.73	8.83	11.06	2.49	9.32	5.78	30.14	28.65	14.14	126	105
All	8.93	7.42	23.06	1.88	12.48	7.65	18.79	19.78	83.51	134	120

GCA includes area under 6 selected vegetables covered under our study.

it lies between 122 and 139 in Dehradun with highest intensity for small farmers and lowest for medium farmers. The difference between cropping intensity with and without fruits is highest at 24 in Nainital district for medium farmers followed by small farmers and marginal farmers whereas it is highest for medium famers (21) followed by 19 for marginal farmers and 7 for small farmers.

## Productivity of Crops

4.19 The following table 4.9 showing productivity of the crops grown (excluding vegetables) by the sampled farmers reveals that fruit is most productive in both the districts among all categories of farmers excepting small farmers in Nainital. Potato turns out to be the second most productive crop among all the sampled farmers with a huge difference in the productivities of fruits and potato. The least productive crop is pulses with its productivity being less than even 10 quintals per hectare for all sampled farmers. The productivities of the rest of the crops vary with the category of the farmers in these two districts.

**Table 4.9. Productivity of Various Crops Grown by Sampled Farmers  
(Excluding Vegetables)**

Category	Crops							
	Maize	Paddy	Wheat	Barley	Potato	Pulses	Fruits	Others
<b>Nainital</b>								
Marginal	27.54	29.65	15.11	17.30	226.11	9.88	442803	6.02
Small	26.36	-	14.98	18.45	105.96	2.65	0	32.92
Medium	16.47	-	32.95	-	134.14	-	133434	0.00
All	25.84	29.65	15.68	17.99	186.19	8.87	213272	13.34
<b>Dehradun</b>								
Marginal	45.20	25.31	17.83	-	121.43	5.59	446983	26.62
Small	-	35.51	19.77	8.24	237.22	2.44	395360	4.57
Medium	-	28.54	21.29	8.90	197.68	5.61	731763	12.50
All	45.20	30.31	18.64	8.61	156.35	5.38	529982	17.82
<b>Overall</b>								
Marginal	37.04	25.81	16.29	17.30	221.02	7.32	445632	14.79
Small	26.36	35.51	15.45	15.05	111.00	2.55	54911	24.47
Medium	16.47	28.54	24.43	8.90	138.38	5.61	485029	3.28
All	34.32	30.28	16.70	14.13	184.73	6.64	390711	14.88

Yield of fruits is in Rs./ha

## Area under Off- Season Vegetables Among Sampled Farmers

4.20 Now coming back to the six vegetables covered under our study, tables 4.10 show that maximum area has been consistently devoted to peas by all categories of farmers in Nainital with 77.38, 43.68 and 42.67 per cent of the total areas under vegetables been allocated for peas

cultivation by marginal, small and medium farmers respectively. Cabbage occupies the second highest area for all categories of farmers followed by cauliflower for small and medium farmers and tomato for marginal farmers. In Dehradun district as well peas claim the highest area under vegetables for small and medium farmers (44.20 and 41.76 per cent respectively) whereas tomato occupies the highest area of about 50 per cent of the total area under vegetables in case of marginal farmers. While cauliflower occupies the second highest area under vegetables followed by capsicum for marginal farmers, the corresponding vegetables are tomato and cauliflower respectively for small and marginal farmers. However, French beans consistently occupies least area (less than 0.5 hectares) for all the sampled farmers. Overall the highest area is under peas

**Table 4.10. Area Under Different Vegetables Among Sampled Farmers (Ha.)**

Category	Vegetables						
	Tomato	Peas	Cabbage	Cauliflower	Capsicum	Beans	All
<b>Nainital</b>							
Marginal	1.56 (9.74)	6.85 (42.67)	5.01 (31.20)	1.48 (9.23)	0.34 (2.14)	0.80 (5.01)	16.05 (100)
Small	0.19 (4.37)	1.92 (43.68)	1.05 (23.91)	0.58 (13.10)	0.27 (6.21)	0.38 (8.74)	4.40 (100)
Medium	0.02 (1.19)	1.32 (77.38)	0.20 (11.90)	0.10 (5.95)	0.04 (2.38)	0.02 (1.19)	1.70 (100)
All	1.78 (8.02)	10.09 (45.54)	6.26 (28.27)	2.16 (9.75)	0.66 (2.97)	1.21 (5.46)	22.15 (100)
<b>Dehradun</b>							
Marginal	5.01 (50.38)	0.97 (9.79)	0.71 (7.12)	1.97 (19.86)	1.03 (10.31)	0.25 (2.54)	9.95 (100)
Small	0.30 (23.06)	0.58 (44.20)	0.10 (7.69)	0.18 (13.53)	0.10 (7.69)	0.05 (3.84)	1.32 (100)
Medium	1.16 (27.06)	1.80 (41.76)	0.43 (10.00)	0.66 (15.29)	0.15 (3.53)	0.10 (2.35)	4.30 (100)
All	6.48 (41.62)	3.35 (21.54)	1.24 (7.96)	2.81 (18.06)	1.28 (8.21)	0.40 (2.60)	15.56 (100)
<b>Overall</b>							
Marginal	6.57 (25.29)	7.82 (30.09)	5.72 (21.99)	3.46 (13.30)	1.37 (5.27)	1.06 (4.07)	26.00 (100)
Small	0.50 (8.67)	2.50 (43.80)	1.15 (20.17)	0.75 (13.20)	0.37 (6.55)	0.44 (7.61)	5.72 (100)
Medium	1.18 (19.73)	3.11 (51.85)	0.63 (10.54)	0.76 (12.65)	0.19 (3.20)	0.12 (2.02)	6.00 (100)
All	8.25 (21.88)	13.44 (35.63)	7.50 (19.89)	4.97 (13.18)	1.94 (5.13)	1.61 (4.28)	37.71 (100)

**Note.** Figures in parentheses denote percentages.

for the entire sample followed by tomato for marginal and medium farmers and cabbage for small farmers. The least amount of land is being utilized for beans by marginal and medium farmers whereas capsicum occupies least area of 0.37 hectares for small farmers.

## Productivity of Vegetable Crops

4.21 As far as yield of these six vegetables under study is concerned, it is highest for cauliflower for small farmers in Nainital, for tomato in case of medium farmers and for cabbage at 244 qtls per hectare for marginal farmers. On the other hand, it is lowest for peas in case of marginal farmers, beans in case of small and marginal farmers. On the contrary, yield of beans is

**Table 4.11. Yield of Different Vegetables Grown by Sampled Farmers (Qtls./Ha.)**

Vegetables							
Category	Tomato	Peas	Cabbage	Cauliflower	Capsicum	Beans	All
<b>Nainital</b>							
Marginal	166	91	244	139	160	107	151
Small	146	113	166	323	157	94	166
Medium	198	69	138	178	124	25	122
Total	164	93	227	190	157	101	155
<b>Dehradun</b>							
Marginal	241	97	151	205	204	149	174
Small	191	101	188	253	173	119	171
Medium	159	74	153	151	171	198	151
Total	224	85	155	195	198	158	169
<b>Overall</b>							
Marginal	223	92	232	177	193	117	172
Small	173	111	168	306	162	97	169
Medium	160	72	149	154	161	169	144
Total	211	91	215	193	184	115	168

highest at 198 qtls per hectare for medium farmers in Dehradun district. For small and marginal farmers the yield is highest for cauliflower and tomato respectively. The yield of peas however is lowest for all categories of farmers in Dehradun. The overall picture that emerges is that cabbage records highest yield followed closely by tomato for marginal farmers, for small farmers the

maximum yield is for cauliflower followed by tomato and for the medium farmers it is maximum for beans followed very closely by capsicum and tomato.

### Off- Season Vegetables Crop Rotation

4.22 Tables 4.12 (a) and (b) suggest that crop rotation is widely practiced in both Nainital and Dehradun districts of Uttarakhand. In both districts wherever crops are grown in irrigated land, all crops under study excluding peas are sown in the first half of the year and harvested two-three months after planting whereas peas is sown throughout the year and harvested two to three months after planting. However, in un-irrigated lands, sowing is done during the rainy season, in

**Table 4.12. (a) Off Season Vegetables Crop Rotation in District Nainital**

Vegetables	Irrigated		Un-irrigated	
	Sowing/Planting	Harvesting	Sowing/Planting	Harvesting
Tomato	February, March, April, June	May, June, July, August	July	September
Peas	February, April, June, September, October	April, July, September, November, January	July	September
Cabbage	March, April, June	June, July, September	July	September
Cauliflower	March, April, June	June, July, August	July	September
Capsicum	March, April	May, July	-	-
Beans	February, April	May, July	July	September

**Table 4.12. (b) Off Season Vegetables Crop Rotation in District Dehradun**

Vegetables	Irrigated		Un-irrigated	
	Sowing/Planting	Harvesting	Sowing/Planting	Harvesting
Tomato	February, March, April	May, June, July	July	September
Peas	March, June, August, October	April, June, November, January	July	September
Cabbage	February, March, June	April, June, September	July	September
Cauliflower	January, March	April, May	July	September
Capsicum	March, April, June	June, July, October	-	-
Beans	February, April	April, June	July	September



the month of July and the crops are harvested after two months. This is primarily because vegetables cultivation is water-intensive and hence in absence of irrigation they can be grown only during the rainy season.

### Credit Structure of Sampled Farmers

4.23 Table 4.13 gives us an idea about the credit habits of the sampled farmers. It can be seen from the table that farmers from all categories take loans only from banks. Hence, the dependence on moneylenders is nil for our sampled farmers. Contrary to our expectations, while close to 65 per cent of the sampled marginal farmers have taken loans, more farmers from the small and medium categories; about 71.4 per cent and 85.7 per cent respectively have taken credit. However, all these farmers have borrowed money only from banks. Further, the average loan amount is highest at Rs. 199167 for medium farmers followed by Rs.71606 for marginal farmers and accordingly, the outstanding amount also maintains the same order. This could be because marginal farmers are eligible for higher loans compared to small and marginal farmers. In addition, the outstanding loan amount is also highest for medium farmers at 47.80 per cent followed by 41.42 per cent for marginal farmers and 34.03 per cent for small farmers. The rate of interest faced by small farmers is highest at 5.5 per cent followed by 4.92 per cent for marginal farmers and 4.75 per cent for medium farmers.

**Table 4.13. Credit Structure of all Sampled Farmers  
(for vegetables only)  
(Rs./farm)**

Particulars	Category		
	Marginal	Small	Medium
i.Source of loan			
Bank	100%	100%	100%
Any other	-	-	-
ii.Principal amount	71606	183100	199167
iii.Out standing amount	29662 (41.42)	62303 (34.03)	95200 (47.80)
Rate of interest (%)	4.92	5.50	4.75
No. of farmers taken loan	66	10	6

**Note:** Figures in parentheses indicate percentages of outstanding amount against the loan availed.

## CHAPTER 5

### **Costs and Returns of Off-Season Vegetables**

5.1 Different components of cost of cultivation for the selected offseason vegetables crops are estimated and discussed in this chapter. For inputs cost estimates various factors which add to the cost such as human labour (both family and hired), bullock labour, machinery charges, seed costs, manure and fertilizers, irrigation, plant protection, depreciation of implements and farm building, interest on working capital, rent paid for leased in land, rental value of owned land and interest on fixed capital assets have been considered.

#### **Cost of Cultivation of Vegetable Crops**

##### **Cost of Cultivation of Tomato**

5.2 The average cost of cultivation of tomato in Nainital district with detailed breakup of the cost under different heads is given in Table 5.1(a). The overall paid out cost of tomato cultivation was observed to be Rs. 67070. With respect to size group of farms, average cost was maximum for medium farms at Rs. 75911 followed by Rs. 67250 for small farms and Rs. 66933 for marginal farms. The component- wise details show that seed/seedlings account for a large part of cost C equal to 8.53 per cent for small farms, 8.47 per cent for medium farms and close to 8 per cent each in marginal farms. This is second only to human labour which accounts for 13.74, 10.11 and 8.19 per cent of total paid out cost in marginal, small and marginal farms respectively. The study further reveals that other major cost components are manures, bullock labours, fertilizers, insecticides and pesticides. While irrespective of farm size close to 5 per cent of the cost is incurred for bullock labour, depending on farm size 3-3.5 per cent of the cost is due to plant protection and the cost of manures vary between 4.72 and 5.64 per cent of the total cost. Further, each of fertilizer or insecticides and pesticides cover between 2.9 and 3.63 per cent of the total cost. Other minor costs of at most 3.05 per cent are incurred due to depreciation of implements and farm building, interest on working capital and other running expenses like machinery, electric charges, water charges etc.

5.3 All our sampled farmers reportedly cultivate their own land and do not depend on leased in land as a result of which costs  $A_1$  and  $A_2$  are the same. The cost of cultivation per hectare comes out to Rs. 105366 at cost B, Rs. 178775 at cost C respectively. While the interest paid on

fixed capital by the farmers in all categories is close to 3 per cent with the highest interest rate of 2.6 per cent for small farmers, the rental value of owned land constitutes 19.24 per cent and 18.74 per cent of the total cost respectively for medium and marginal farms and close to 20 per cent for small farms. The total cost of cultivation (C) on marginal farms is higher than that in medium and small farms. Finally, the imputed value of family labour is quite high, contributing between 34.87 and 41.47 per cent to the total cost C. This shows that the farming is done primarily by members of the families with little help from hired labour. It also indicates that vegetables cultivation could generate substantial employment in the rural areas of Nainital.

5.4 On the other hand, the average cost of cultivation with detailed breakup of cost item in Dehradun district is given in Table 5.1 (b). In contrast to Nainital, here total cost  $A_1$  is highest in marginal farms followed by medium farms and small farms and the overall average cost of Rs. 72340 is higher than that in Nainital. A closer look at the cost figures reveal that across farms of different sizes hired human labour accounts for major share of the cost lying between 8.25 and 9.43 per cent followed by seed/seedlings the cost of which varies between 5.85 and 8.94 per cent of the total cost, bullock labour which costs between Rs. 10229 and Rs. 12103, manure and fertilizer the share of which varies between 3.57 and 5.32 per cent of the total cost and plant protection of less than 3 per cent. The cost of hired human labour was more on medium and small farms and they were generally hired at the time of transplanting, intercultural operation and harvesting/picking of the produce. Further, while in Nainital no land was leased in by any of our sampled farmers, in Dehradun only marginal farmers would lease in land for cultivation the rent for which constituted merely 1.57 per cent of the cost as a result of which cost  $A_2$  are same as a cost  $A_1$  for small and medium farmers. However, although the rental value of owned land per hectare is same in both districts for small and medium farmers, it is lower for marginal farmers in Dehradun. It accounts for 15.81- 18.57 per cent of the cost of cultivation of tomato in Dehradun district. Moreover, the interest on fixed capital is same in both districts across all categories of farmers though it constitutes lower percentage (less than 2.5) of cost in Dehradun. Lastly, human labour is costlier in Dehradun so that the imputed value of family labour is at least Rs. 8200 higher in Dehradun depending on the size of the operational holding of the farmers. Overall the cost C, which takes into account even the imputed value of the family labour apart from all paid-out costs, turns out to be Rs. 191243 per hectare in Dehradun vis-à-vis Rs. 178775 per hectare in Nainital.

**Table 5.1. (a) Cost of Cultivation of Tomato Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	14205	17257	24065	14648	7.90	10.11	13.74	8.19
b. Bullock Labour	8361	8097	8264	8331	4.65	4.74	4.72	4.66
c.Seed/Seedlings	13946	14566	14826	14023	7.76	8.53	8.47	7.84
d.Manure	9903	8063	9884	9704	5.51	4.72	5.64	5.43
e.Fertilizer	6529	4994	5436	6350	3.63	2.93	3.10	3.55
f.Insecticides and pesticides	5223	5462	6178	5260	2.90	3.20	3.53	2.94
g.Sticks	0	0	0	0	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149	5198	5198	3395	1.75	3.05	2.97	1.90
i.Land Revenue and taxes	0	0	0	0	0.00	0.00	0.00	0.00
j.Interest on working capital	1745	1753	2060	1750	0.97	1.03	1.18	0.98
k.Miscellaneous expenditure (Machinery, water, elect. charges etc.)	3870	1860	0	3609	2.15	1.09	0.00	2.02
Total (Cost A <sub>1</sub> )	66933	67250	75911	67070	37.22	39.41	43.35	37.52
l.Rent paid for leased in land	0	0	0	0	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	66933	67250	75911	67070	37.22	39.41	43.35	37.52
m.Rental value of owned land	33695	33695	33695	33695	18.74	19.74	19.24	18.85
n.Interest on fixed capital (excluding land)	4623	4437	4437	4601	2.57	2.60	2.53	2.57
Cost B (Cost A <sub>2</sub> +m+n)	105252	105382	114043	105366	58.53	61.75	65.13	58.94
o.Imputed value of family labour	74569	65280	61065	73409	41.47	38.25	34.87	41.06
Cost C (Cost B+o)	179820	170662	175108	178775	100	100	100	100

**Table 5.1. (b) Cost of Cultivation of Tomato Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	15996	16225	17261	16234	8.25	9.03	9.43	8.49
b. Bullock Labour	10229	11255	12103	10614	5.28	6.26	6.61	5.55
c.Seed/Seedlings	11347	12026	16373	12282	5.85	6.69	8.94	6.42
d.Manure	9900	7248	6532	9171	5.11	4.03	3.57	4.80
e.Fertilizer	10321	7759	7658	9723	5.32	4.32	4.18	5.08
f.Insecticides and pesticides	3940	4613	5157	4190	2.03	2.57	2.82	2.19
g.Sticks	0	0	0	0	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149	5198	5198	3613	1.62	2.89	2.84	1.89
i.Land Revenue and taxes	0	0	0	0	0.00	0.00	0.00	0.00
j.Interest on working capital	1852	1774	1953	1866	0.96	0.99	1.07	0.98
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	6008	0	0	4647	3.10	0.00	0.00	2.43
Total (Cost A <sub>1</sub> )	72742	66096	72234	72340	37.53	36.78	39.46	37.83
l.Rent paid for leased in land	3044	0	0	2354	1.57	0.00	0.00	1.23
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	75786	66096	72234	74694	39.10	36.78	39.46	39.06
m.Rental value of owned land	30652	33695	33695	31341	15.81	18.75	18.41	16.39
n.Interest on fixed capital (excluding land)	4623	4437	4437	4581	2.39	2.47	2.42	2.40
Cost B (Cost A <sub>2</sub> +m+n)	111061	104228	110366	110616	57.30	57.99	60.29	57.84
o.Imputed value of family labour	82778	75498	72702	80627	42.70	42.01	39.71	42.16
Cost C (Cost B+o)	193839	179726	183068	191243	100	100	100	100

**Table 5.1. (c) Cost of Cultivation of Tomato Among all the Sampled Farmers**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a. Human Labour (Hired)	15570	16625	17378	15893	8.17	9.43	9.50	8.43
b. Bullock Labour	9785	10030	12037	10123	5.14	5.69	6.58	5.37
c. Seed/Seedlings	11965	13011	16347	12656	6.28	7.38	8.94	6.71
d. Manure	9901	7564	6589	9285	5.20	4.29	3.60	4.92
e. Fertilizer	9419	6687	7620	8997	4.94	3.79	4.17	4.77
f. Insecticides and pesticides	4245	4942	5174	4420	2.23	2.80	2.83	2.34
g. Sticks	0	0	0	0	0.00	0.00	0.00	0.00
h. Depreciation (Implements and farm building)	3149	5198	5198	3566	1.65	2.95	2.84	1.89
i. Land Revenue and taxes	0	0	0	0	0.00	0.00	0.00	0.00
j. Interest on working capital	1827	1766	1954	1841	0.96	1.00	1.07	0.98
k. Miscellaneous expenditure (Machinery, water, elect. charges etc.)	5500	721	0	4424	2.89	0.41	0.00	2.35
Total (Cost A <sub>1</sub> )	71361	66544	72297	71206	37.46	37.76	39.52	37.76
l. Rent paid for leased in land	2320	0	0	1848	1.22	0.00	0.00	0.98
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	73681	66544	72297	73054	38.68	37.76	39.52	38.74
m. Rental value of owned land	31375	33695	33695	31848	16.47	19.12	18.42	16.89
n. Interest on fixed capital (excluding land)	4623	4437	4437	4585	2.43	2.52	2.43	2.43
Cost B (Cost A <sub>2</sub> +m+n)	109680	104676	110429	109487	57.57	59.40	60.37	58.06
o. Imputed value of family labour	80826	71536	72503	79074	42.43	40.60	39.63	41.94
Cost C (Cost B+o)	190505	176211	182932	188560	100	100	100	100

5.5 Finally, the cost of cultivation of tomato among all the sampled farms has been presented in the following table 5.1 (c). The average cost of cultivation in overall situation turned out to be Rs. 71206 at cost A<sub>1</sub>, Rs. 73054 at cost A<sub>2</sub>, Rs. 109487 at cost B and Rs. 188560 at cost C. The study further reveals that major components on which substantial cost was incurred are hired human labour and seed/seedling followed by bullock labour, manure and fertilizers and plant protection measures. Rental value of owned land is the major cost item on all farms accounting for 16.89 per cent of the total cost of cultivation on an average

### **Cost of Cultivation of Peas**

5.6 Peas, grown as vegetable, is quite remunerative crop for all the hill farmers. The component-wise cost of cultivation of different size of farms among our sampled farmers in Nainital and Dehradun districts are presented in tables 5.2 (a) and (b) whereas the overall cost figures for our sample are given in table 5.2 (c). On an average total cost of cultivation (C) in Nainital district comes to Rs. 151593 per hectare. The total cost of cultivation of marginal farms comes to Rs. 151982 per hectare, while it is slightly higher (Rs. 153295) for small farmers. The medium farmers' cost is the least standing at Rs. 147080. In case of vegetable pea, on an average 33 per cent of the total cost depends on the use of different inputs with the percentage share being higher for medium farmers at 36.2 while slightly lower for small farmers at 34.33 and even lower for marginal farmers at roughly 32; overall the cost A<sub>1</sub> per hectare was Rs.49952. The investment of hired human labour constituted the highest proportion (7.52 per cent) of the total cost under single head followed by investment on seed (6.43 per cent), bullock labour and manure (4.32 per cent and 4.23 respectively) and fertilizer and plant protection measure (about 2 per cent each). Cost A<sub>1</sub> and A<sub>2</sub> are same because no farmer leased in land for cultivation. Out of the total cost of cultivation rental value of land is the major cost item on all size of farms varying between 21.98 and 22.91 per cent of the cost depending on farm size. Since the interest on fixed capital is roughly 3 per cent across farmers and rentals of owned land are also same for all, cost B is also higher for medium than small and marginal farms. The maximum cost towards cultivation of pea is due to imputed value of family labour which varies between 37.87 and 42.83 per cent of the total cost of cultivation.

5.7 From table 5.2 (b) we can see in Dehradun district the total cost of cultivation for marginal farms comes to about Rs. 166775 per hectare, while it is slightly lower (Rs. 162685) for small farms and even much lower at Rs. 149681 for the medium farms which takes the all farms average cost to Rs. 156905 per hectare. Overall, the cost  $A_1$  accounted for 33.14 per cent (Rs. 51996) of the cost C with the share of cost  $A_1$  in the cost C being slightly higher than average for small farmers. The study further reveals that the major components on which good amount of costs are being incurred include human labour (8.91 per cent) followed by seed/seedlings (6.88 per cent), bullock labour (5.36 per cent), fertilizer (3.37 per cent) and insecticides and pesticides and manure (close to 2.5 per cent each). Only single case of leased in land was reported, that too under marginal farms, so that the cost  $A_2$  for marginal farms is marginally higher than cost  $A_1$  at Rs. 55525 and for farms in other categories cost  $A_2$  is same as cost  $A_1$ . Cost B overall was worked out as Rs. 90182. Rental value of land is the major cost items on all size of farms (21 per cent) out of the total cost of cultivation. Imputed value of family labour is higher for marginal farms as compared to small and medium farms with the value decreasing as the size increases.

5.8 The average cost of cultivation of peas per hectare for all the sampled farmers, shown in table 5.2 (c), was worked out as Rs. 50462 at cost  $A_1$ , Rs. 50555 at cost  $A_2$ , Rs. 88703 at cost B and Rs. 152918 at cost C. Being a labour intensive crop, human labour is an important factor of cultivation across all size of farms. Apart from high labour cost, the paid out cost borne by the growers on seed and seedlings constituted the highest proportion (6.54 per cent) of total cost followed by manure and fertilizers, bullock labour and plant protection measures. Since land was leased in only in Dehradun district and that too very small amount, the overall rent per hectare for leased in land was negligible. Further, the rental value of owned land accounted for roughly 22 per cent of the total cost of cultivation and imputed value of family labour stood at approximately 42 per cent.



**Table 5.2. (a) Cost of Cultivation of Peas Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	10832.75	12057.82	13346.90	11394.03	7.13	7.87	9.07	7.52
b. Bullock Labour	6610.75	6424.13	6357.21	6542.12	4.35	4.19	4.32	4.32
c.Seed/Seedlings	9243.80	11577.29	9655.91	9742.23	6.08	7.55	6.57	6.43
d.Manure	6453.07	6398.59	6234.52	6414.19	4.25	4.17	4.24	4.23
e.Fertilizer	2827.01	4286.53	3649.48	3212.40	1.86	2.80	2.48	2.12
f.Insecticides and pesticides	2746.20	2653.07	3345.35	2806.58	1.81	1.73	2.27	1.85
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3806.84	2.07	3.39	3.53	2.51
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1161.41	1301.92	1277.68	1203.35	0.76	0.85	0.87	0.79
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	5544.47	2731.11	4181.69	4830.63	3.65	1.78	2.84	3.19
Total (Cost A <sub>1</sub> )	48568.93	52628.05	53246.33	49952.37	31.96	34.33	36.20	32.95
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	48568.93	52628.05	53246.33	49952.37	31.96	34.33	36.20	32.95
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	22.17	21.98	22.91	22.23
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4563.35	3.04	2.89	3.02	3.01
Cost B (Cost A <sub>2</sub> +m+n)	86887.60	90760.19	91378.47	88211.18	57.17	59.21	62.13	58.19
o.Imputed value of family labour	65094.17	62534.42	55701.85	63381.68	42.83	40.79	37.87	41.81
Cost C (Cost B+o)	151981.77	153294.61	147080.31	151592.85	100.00	100	100	100

**Table 5.2. (b) Cost of Cultivation of Peas Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	13318.21	13185.38	14601.63	13982.87	7.99	8.10	9.76	8.91
b. Bullock Labour	9372.33	9861.32	7405.46	8403.26	5.62	6.06	4.95	5.36
c.Seed/Seedlings	11193.31	12204.59	10134.58	10801.53	6.71	7.50	6.77	6.88
d.Manure	5031.85	4899.03	2784.23	3804.41	3.02	3.01	1.86	2.42
e.Fertilizer	5129.41	5457.69	5317.87	5287.38	3.08	3.35	3.55	3.37
f.Insecticides and pesticides	5134.55	4984.97	2338.75	3610.46	3.08	3.06	1.56	2.30
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	4602.48	1.89	3.19	3.47	2.93
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1475.39	1517.79	1277.48	1376.70	0.88	0.93	0.85	0.88
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	436.44	0.00	0.00	126.81	0.26	0.00	0.00	0.08
Total (Cost A <sub>1</sub> )	54240.95	57308.36	49057.59	51995.90	32.52	35.23	32.77	33.14
l.Rent paid for leased in land	1283.64	0.00	0.00	372.98	0.77	0.00	0.00	0.24
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	55524.58	57308.36	49057.59	52368.89	33.29	35.23	32.77	33.38
m.Rental value of owned land	32411.82	33695.45	33695.45	33322.47	19.43	20.71	22.51	21.24
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4490.88	2.77	2.73	2.96	2.86
Cost B (Cost A <sub>2</sub> +m+n)	92559.62	95440.49	87189.72	90182.24	55.50	58.67	58.25	57.48
o.Imputed value of family labour	74215.15	67244.88	62491.69	66723.21	44.50	41.33	41.75	42.52
Cost C (Cost B+o)	166774.78	162685.38	149681.41	156905.45	100	100	100	100

**Table 5.2. (c) Cost of Cultivation of Peas Among all the Sampled Farmers**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	11142.12	12319.78	14071.17	12039.66	7.24	7.92	9.47	7.87
b. Bullock Labour	6954.49	7222.67	6962.30	7006.27	4.52	4.65	4.69	4.58
c.Seed/Seedlings	9486.47	11723.02	9932.21	10006.41	6.17	7.54	6.68	6.54
d.Manure	6276.16	6050.21	4242.89	5763.34	4.08	3.89	2.86	3.77
e.Fertilizer	3113.60	4558.62	4612.53	3729.88	2.02	2.93	3.10	2.44
f.Insecticides and pesticides	3043.49	3194.83	2764.31	3007.06	1.98	2.05	1.86	1.97
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	4005.26	2.05	3.34	3.50	2.62
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1200.49	1352.07	1277.56	1246.58	0.78	0.87	0.86	0.82
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	4908.65	2096.61	1767.87	3657.55	3.19	1.35	1.19	2.39
Total (Cost A <sub>1</sub> )	49274.95	53715.40	50828.44	50462.01	32.03	34.55	34.21	33.00
l.Rent paid for leased in land	159.78	0.00	0.00	93.02	0.10	0.00	0.00	0.06
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	49434.73	53715.40	50828.44	50555.02	32.14	34.55	34.21	33.06
m.Rental value of owned land	33535.67	33695.45	33695.45	33602.44	21.80	21.67	22.68	21.97
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4545.28	3.01	2.85	2.99	2.97
Cost B (Cost A <sub>2</sub> +m+n)	87593.63	91847.53	88960.57	88702.74	56.94	59.07	59.87	58.01
o.Imputed value of family labour	66229.50	63628.77	59621.19	64215.02	43.06	40.93	40.13	41.99
Cost C (Cost B+o)	153823.12	155476.30	148581.76	152917.75	100	100	100	100

## Cost of Cultivation of Cabbage

5.9 Cabbage is one of the important off-season vegetables grown in hilly areas of Uttarakhand. The costs incurred in its cultivation in Nainital district are presented in table 5.3 (a). The average cost of cultivation per hectare in the district as a whole turned out to be Rs. 62242 against cost A<sub>1</sub>/ A<sub>2</sub>, Rs.100523 against cost B and Rs.159968 against cost C. Cost A<sub>2</sub> is same as cost A<sub>1</sub> since no leased-in land case was found. The paid out costs borne by growers on manure and fertilizer constituted 11.97 per cent of the total cost followed by seed/seedlings (7.71 per cent), bullock labour (5 per cent) and plant protection measure (1.6 per cent). Land revenue and taxes are not charged by the state government for hill cultivation. Like tomato and peas, rental value of owned land is a major component in cabbage cultivation with a contribution of 21.06 per cent in the cost of its cultivation. The share of imputed value of family labour is however much less than these two vegetables ranging between 31.97 and 37.73 per cent of the cost C with its shares decreasing with increase in the size of farms.

5.10 From the cost figures in Dehradun district, as shown in table 5.3 (b), it can be seen that the average cost of cultivation in overall situation turned out to be Rs. 54396 at cost A<sub>1</sub>/ A<sub>2</sub>, Rs. 92635 at cost B and Rs. 145332 at cost C. No one was reportedly cultivating a land which was leased in. The cost of manure and fertilizers constituted 9.75 per cent of cost C followed by seed/seedlings (4.3 per cent), bullock labour (3.75 per cent) and plant protection measures (5.16 per cent). The highest share in the total paid out cost was that of hired human labour among all categories of farms. Regarding cost of seed/seedling, manure and fertilizers and insecticides and pesticides the amount spent on these items invariably decrease as the farm size increases from marginal to small which however is not maintained for the increase in size from small to medium farmers. This may be due to the tendency of small growers to get maximum returns from their small acreage by way of higher doses of these inputs. Interest on fixed capital is same in both districts. Moreover, although the wage rate is lower in Nainital, owing to large amount of family labour being used in Nainital the imputed value of family labour turns out to be lower in Dehradun than in Nainital.

**Table 5.3. (a) Cost of Cultivation of Cabbage Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	9628.34	9961.51	11190.22	9734.78	5.98	6.46	6.95	6.09
b. Bullock Labour	8476.28	6063.80	6357.21	8002.48	5.26	3.93	3.95	5.00
c.Seed/Seedlings	12096.42	13001.26	14826.00	12336.64	7.51	8.43	9.21	7.71
d.Manure	7116.48	7080.37	9884.00	7199.83	4.42	4.59	6.14	4.50
e.Fertilizer	11907.72	12031.87	12355.00	11943.03	7.39	7.80	7.67	7.47
f.Insecticides and pesticides	2545.38	2642.07	2471.00	2559.22	1.58	1.71	1.53	1.60
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3559.75	1.95	3.37	3.23	2.23
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1553.12	1523.43	1712.50	1553.28	0.96	0.99	1.06	0.97
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	5535.04	4088.08	7413.00	5352.61	3.44	2.65	4.60	3.35
Total (Cost A <sub>1</sub> )	62008.24	61589.97	71406.53	62241.63	38.49	39.92	44.35	38.91
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	62008.24	61589.97	71406.53	62241.63	38.49	39.92	44.35	38.91
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	20.91	21.84	20.93	21.06
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4585.85	2.87	2.88	2.76	2.87
Cost B (Cost A <sub>2</sub> +m+n)	100326.92	99722.10	109538.66	100522.94	62.27	64.64	68.03	62.84
o.Imputed value of family labour	60793.80	54558.66	51469.62	59444.95	37.73	35.36	31.97	37.16
Cost C (Cost B+o)	161120.71	154280.76	161008.29	159967.88	100	100	100	100

**Table 5.3. (b) Cost of Cultivation of Cabbage Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	11779.87	12449.09	14758.44	12867.88	7.79	8.94	10.77	8.85
b. Bullock Labour	5154.78	6958.95	5579.29	5449.34	3.41	5.00	4.07	3.75
c.Seed/Seedlings	6707.00	5436.20	5697.84	6253.14	4.43	3.90	4.16	4.30
d.Manure	9742.80	8895.60	7907.20	9036.80	6.44	6.39	5.77	6.22
e.Fertilizer	5718.60	5436.20	4104.77	5135.65	3.78	3.90	3.00	3.53
f.Insecticides and pesticides	7554.20	7116.48	7488.58	7495.70	4.99	5.11	5.47	5.16
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	4027.23	2.08	3.73	3.79	2.77
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1399.72	1388.78	1366.08	1387.16	0.93	1.00	1.00	0.95
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	2541.60	3953.60	2790.78	2743.31	1.68	2.84	2.04	1.89
Total (Cost A <sub>1</sub> )	53748.03	56832.49	54890.57	54396.22	35.53	40.82	40.07	37.43
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	53748.03	56832.49	54890.57	54396.22	35.53	40.82	40.07	37.43
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	22.27	24.20	24.60	23.19
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4543.28	3.06	3.19	3.24	3.13
Cost B (Cost A <sub>2</sub> +m+n)	92066.71	94964.63	93022.71	92634.95	60.86	68.20	67.91	63.74
o.Imputed value of family labour	59209.49	44274.29	43952.95	52697.20	39.14	31.80	32.09	36.26
Cost C (Cost B+o)	151276.20	139238.92	136975.65	145332.15	100.00	100	100	100

**Table 5.3. (c) Cost of Cultivation of Cabbage Among all the Sampled**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	9894.90	10179.71	13616.61	10252.39	6.19	6.66	9.41	6.51
b. Bullock Labour	8064.77	6142.32	5828.23	7580.69	5.04	4.02	4.03	4.81
c.Seed/Seedlings	11428.70	12337.66	8618.85	11331.61	7.15	8.07	5.96	7.19
d.Manure	7441.86	7239.60	8539.78	7503.31	4.65	4.73	5.90	4.76
e.Fertilizer	11140.93	11453.30	6744.84	10818.41	6.97	7.49	4.66	6.87
f.Insecticides and pesticides	3165.94	3034.56	5882.96	3374.76	1.98	1.98	4.07	2.14
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3636.98	1.97	3.40	3.59	2.31
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1534.11	1511.61	1476.94	1525.83	0.96	0.99	1.02	0.97
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	5164.17	4076.28	4269.89	4921.54	3.23	2.66	2.95	3.12
Total (Cost A <sub>1</sub> )	60984.85	61172.65	60175.68	60945.52	38.14	39.99	41.60	38.68
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	60984.85	61172.65	60175.68	60945.52	38.14	39.99	41.60	38.68
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	21.07	22.03	23.29	21.39
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4578.82	2.89	2.90	3.07	2.91
Cost B (Cost A <sub>2</sub> +m+n)	99303.53	99304.78	98307.81	99219.80	62.10	64.92	67.95	62.98
o.Imputed value of family labour	60597.51	53656.52	46358.28	58330.18	37.90	35.08	32.05	37.02
Cost C (Cost B+o)	159901.04	152961.30	144666.10	157549.98	100	100	100	100

5.11 As the table 5.3 (c) shows, the average cost of cultivation per hectare for all the sampled farmers has been calculated to be Rs. 60946 at cost A<sub>1</sub>/ A<sub>2</sub>, Rs. 99220 at cost B and Rs. 157550 at cost C. The paid out cost borne by growers on manure and fertilizers constituted the highest proportion of total cost (11.63 per cent) followed by seed/ seedling (about 7 per cent), bullock labour (4.81 per cent) and plant protection measures (roughly 2 per cent). Overall the cost of hired labour is lower at Rs. 10252 vis-à-vis the cost of seed/ seedlings at Rs. 11332. While the share of interest on fixed capital is about 3 per cent of the total cost, the share of imputed value of family labour in the cost C is as high as 37 per cent.

### **Cost of Cultivation of Cauliflower**

5.12 Cauliflower is another important vegetable crop of the hills of Uttarakhand. Harvesting of the produce is timed during summer when it is not produced in plains. Cauliflower thrives only under cool and rather humid seasonal conditions. The detailed break-up of the cost of cultivation of the crop in Nainital district is presented in table 5.4 (a). The average cost of production in overall situation was worked out as Rs. 54368 per hectare at cost A<sub>1</sub>/ A<sub>2</sub>, Rs. 92628 per hectare at cost B, Rs. 152881 per hectare at cost C. The paid out cost borne by cauliflower growers on manure and fertilizer constituted 8.37 per cent of total cost, second only to hired labour (8.87 per cent), followed by bullock labour (approximately 6 per cent), investment on seed/seedlings (5.8 per cent), and plant protection measures (2.02 per cent). Rental value of owned land is a major cost item on all size of farms accounting for an overall 22 per cent of the total cost of cultivation of cauliflower. Further the share of imputed value of family labour is as high as 39.41 per cent with the share being highest for marginal farms at 41.06 per cent.

5.13 The overall per hectare cost of cultivation of cauliflower in Dehradun district, as shown in table 5.4 (b), was worked out to Rs. 48155 at cost A<sub>1</sub>, Rs. 50295 at cost A<sub>2</sub>, Rs. 86418 at cost B, Rs. 146411 at cost C. The paid out cost borne by cauliflower growers accounts for nearly 33 per cent of the total cost. Manure and fertilizer measure constituted 5.8 per cent of the total cost followed by investment on seed/seedlings which constituted 5.38 per cent of cost C and insecticides and pesticides which accounts for 2.6 per cent of the cost. The cost involved in



hiring human labour however is highest at 10.51 per cent and the cost involved in hiring bullock labour and transplanting material manure are inversely related to the size of farms. Contrary to what was seen in case of other vegetable growers, some of the marginal farmers growing cauliflower were cultivating leased- in land. Rental value of owned land is also a major imputed cost item on all categories of farms which accounted 22 per cent of total cost of cultivation of cauliflower. Overall, the imputed value of labour contributed by the families was Rs. 59993.

5.14 The cost of cultivation of cauliflower for all the sampled farmers came up to Rs. 50885 per hectare at cost A<sub>1</sub>, Rs. 52062 per hectare at cost A<sub>2</sub>, Rs. 89117 per hectare at cost B and Rs. 149223 at cost C. The study further reveals that the major cost components are hired human labour, manure and fertilizer, seed/ seedlings, bullock labour and insecticides and pesticides in that order. While hiring human labour accounts for nearly 10 per cent of the cost C, plant protection measures like insecticides and pesticides constitute 2.34 per cent of the total cost. While the interest on fixed capital is same as in the case of all other vegetables, share of imputed cost of family labour is roughly 40 per cent.

**Table 5.4. (a) Cost of Cultivation of Cauliflower Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	12763.41	15219.99	15882.57	13565.36	8.26	10.16	10.76	8.87
b. Bullock Labour	9308.00	8643.57	8900.09	9111.50	6.03	5.77	6.03	5.96
c.Seed/Seedlings	9074.39	8323.37	8895.60	8865.51	5.88	5.56	6.03	5.80
d.Manure	7273.00	7109.54	5930.40	7166.48	4.71	4.75	4.02	4.69
e.Fertilizer	5616.68	5288.81	7709.52	5627.17	3.64	3.53	5.22	3.68
f.Insecticides and pesticides	3295.79	2670.41	2471.00	3090.20	2.13	1.78	1.67	2.02
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3792.20	2.04	3.47	3.52	2.48
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1419.94	1417.67	1493.68	1422.79	0.92	0.95	1.01	0.93
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	812.98	4378.44	0.00	1726.81	0.53	2.92	0.00	1.13
Total (Cost A <sub>1</sub> )	52713.65	58249.41	56480.45	54368.01	34.13	38.89	38.27	35.56
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	52713.65	58249.41	56480.45	54368.01	34.13	38.89	38.27	35.56
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	21.82	22.50	22.83	22.04
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4564.68	2.99	2.96	3.01	2.99
Cost B (Cost A <sub>2</sub> +m+n)	91032.33	96381.54	94612.58	92628.15	58.94	64.35	64.11	60.59
o.Imputed value of family labour	63414.68	53403.40	52967.39	60252.54	41.06	35.65	35.89	39.41
Cost C (Cost B+o)	154447.01	149784.94	147579.97	152880.70	100	100	100	100

**Table 5.4. (b) Cost of Cultivation of Cauliflower Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	14727.80	15928.61	17245.97	15393.09	9.80	11.28	12.68	10.51
b. Bullock Labour	6285.03	6150.59	5154.78	6012.06	4.18	4.36	3.79	4.11
c.Seed/Seedlings	8354.82	7300.68	6576.66	7871.98	5.56	5.17	4.84	5.38
d.Manure	5271.13	3931.14	3041.23	4664.48	3.51	2.78	2.24	3.19
e.Fertilizer	3724.22	3060.67	4333.75	3824.80	2.48	2.17	3.19	2.61
f.Insecticides and pesticides	3711.56	3369.55	4181.69	3799.90	2.47	2.39	3.08	2.60
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3758.45	2.09	3.68	3.82	2.57
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1262.24	1192.24	1216.02	1246.99	0.84	0.84	0.89	0.85
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	2253.27	0.00	0.00	1583.29	1.50	0.00	0.00	1.08
Total (Cost A <sub>1</sub> )	48739.53	46131.06	46947.71	48155.02	32.42	32.68	34.53	32.89
l.Rent paid for leased in land	3038.11	0.00	0.00	2134.77	2.02	0.00	0.00	1.46
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	51777.65	46131.06	46947.71	50289.79	34.44	32.68	34.53	34.35
m.Rental value of owned land	30657.34	33695.45	33695.45	31560.68	20.39	23.87	24.78	21.56
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4567.76	3.07	3.14	3.26	3.12
Cost B (Cost A <sub>2</sub> +m+n)	87058.21	84263.20	85079.84	86418.23	57.90	59.69	62.57	59.02
o.Imputed value of family labour	63299.27	56905.35	50900.68	59993.15	42.10	40.31	37.43	40.98
Cost C (Cost B+o)	150357.48	141168.55	135980.52	146411.38	100	100	100	100

**Table 5.4. (c) Cost of Cultivation of Cauliflower Among all the Sampled Farmers**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	13885.59	15387.17	17064.18	14598.83	9.13	10.41	12.41	9.78
b. Bullock Labour	7581.09	8055.42	5654.16	7358.96	4.98	5.45	4.11	4.93
c.Seed/Seedlings	8663.32	8082.09	6885.85	8303.73	5.70	5.47	5.01	5.56
d.Manure	6129.41	6359.68	3426.45	5751.75	4.03	4.30	2.49	3.85
e.Fertilizer	4535.59	4763.13	4783.86	4608.04	2.98	3.22	3.48	3.09
f.Insecticides and pesticides	3533.31	2835.36	3953.60	3491.49	2.32	1.92	2.87	2.34
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3773.12	2.07	3.52	3.78	2.53
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1329.85	1364.49	1253.04	1323.38	0.87	0.92	0.91	0.89
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	1635.76	3345.46	0.00	1645.66	1.08	2.26	0.00	1.10
Total (Cost A <sub>1</sub> )	50443.39	55390.39	48218.74	50854.95	33.16	37.49	35.06	34.08
l.Rent paid for leased in land	1735.56	0.00	0.00	1207.08	1.14	0.00	0.00	0.81
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	52178.95	55390.39	48218.74	52062.03	34.30	37.49	35.06	34.89
m.Rental value of owned land	31959.90	33695.45	33695.45	32488.37	21.01	22.81	24.50	21.77
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4566.42	3.04	3.00	3.23	3.06
Cost B (Cost A <sub>2</sub> +m+n)	88762.07	93522.52	86350.87	89116.82	58.35	63.30	62.79	59.72
o.Imputed value of family labour	63348.75	54229.60	51176.24	60105.87	41.65	36.70	37.21	40.28
Cost C (Cost B+o)	152110.82	147752.12	137527.12	149222.69	100	100	100	100

## Cost of Cultivation of Capsicum

5.15 Capsicum, commonly known as Shimla Mirch, is very popular vegetable crop in the hills of Uttarakhand. The per hectare average cost of cultivation came out to be Rs. 47021 per hectare at cost A<sub>1</sub>/ A<sub>2</sub>, Rs. 85250 per hectare at cost B and Rs. 145184 per hectare at cost C. The detailed breakup of input cost items is given in table 5.5 (a), from where it may be observed that total cost of cultivation is highest (Rs. 153093) on marginal farms followed by medium and small farms. The paid out cost borne by sampled growers accounts for 32.39 per cent of the cost C. Investment for seed/seedlings constituted the highest proportion of total cost at 9.57 per cent, followed by manure and fertilizers (6.87 per cent), bullock labour (5.09 per cent), depreciation (2.84 per cent) and marginal cost on insecticides and pesticides (1.84 per cent). The cost share of human labour ranges between 4.19 per cent for marginal farms and 6.13 per cent for medium farms. Rental value of owned land for all the sampled farms accounted for approximately 23 per cent of the total cost of cultivation of capsicum. No leased in land case was reported.

5.16 On the other hand, the per hectare average cost of cultivation of capsicum in Dehradun was worked out as Rs. 51805 at cost A<sub>1</sub>, Rs. 55716 at cost A<sub>2</sub>, Rs. 90086 at cost B and Rs. 146856 at cost C. The detailed breakup of input cost items are given in Table 5.5 (b) which reveals that the total cost of cultivation (C) is highest on marginal farms (Rs. 150712) followed by small (Rs. 132334) and medium farms (Rs. 130481). The study further reveals that the major components on which huge cost has been incurred are seed/ seedlings and manure and fertilizers. While the share of seed/seedlings in total cost C is 9.84 per cent, it is closely followed by manure and fertilizer (8.85 per cent), bullock labour (4.46 per cent) and plant protection measures (2.74 per cent). Here again some marginal farmers were seen to be leasing in land for cultivation and it accounted for 3.24 per cent of the total cost. Considering the imputed costs, overall the rental value of land accounted for 20.28 per cent of the total cost of cultivation with its share being lowest at 19.12 per cent for marginal farms. However, the total cost of cultivation on marginal farms was higher than small and medium farms. As can be seen from the table, this difference is because of too much involvement of family labour in marginal farms as compared to other farms of bigger size.

5.17 The per hectare average cost of cultivation was worked out as Rs. 50180 at cost A<sub>1</sub>, Rs. 52762 at cost A<sub>2</sub>, Rs. 88444 at cost B and Rs. 146288 at cost C. The major components, like other vegetables, are seed/seedlings, manure and fertilizers, human labour and bullock labour

with their respective shares being 9.75 per cent, 8.19 per cent, 5.28 and 4.67 per. Due to the practice of cultivating leased-in land in Dehradun, here it can be seen that 1.77 per cent of the cost C is due to the rent for leased-in land. Among the imputed costs, the overall per hectare rental value of land accounts for 21.27 per cent of the total cost of cultivation.

### **Cost of Cultivation of Beans**

5.18 For the cultivation of vegetable beans the farmers have incurred on an average, a cost of Rs. 48187 per hectare at cost A<sub>1</sub>/A<sub>2</sub>, Rs. 86444 per hectare at cost B and Rs. 146630 per hectare at cost C. As can be seen from the table 5.6 (a), the paid out cost on marginal, small and medium farms are Rs. 48316, Rs. 47686 and Rs. 52601 per hectare respectively. The proportion of paid out cost in total cost is higher on medium as compared to small and marginal farms. The study reveals that the major input items were manure and fertilizer followed by human labour, seed/seedling, bullock labour and plant protection measures with the share of cost due to insecticides and pesticides being less than 2 per cent. The imputed value of human labour varies between 37.61 and 41.70 per cent of total cost of cultivation depending on the size of farms. This also indicated that vegetables cultivation could generate sufficient employment. Out of the total cost of cultivation, rental value of land is a major cost item on all size of farms which accounted for 22.67 – 23.64 per cent of the total cost of cultivation.

5.19 On the other hand, as can be seen from table 5.6 (b), the overall cost of beans cultivation in Dehradun district turned out to be Rs. 47442 per hectare at cost A<sub>1</sub>, Rs. 59797 per hectare at cost A<sub>2</sub>, Rs. 85691 per hectare at cost B and Rs. 145903 per hectare at cost C. The paid out cost on marginal, small and medium farms are Rs. 47497, Rs. 49148 and Rs. 46453 per hectare, respectively. The study reveals that the major components on which substantial cost has been incurred are seed/seedling followed by bullock labour, manure, fertilizers and plant protection measures. But the highest share of per hectare paid out costs is due to human labour (9.58 per cent). Rent on leased-in land contributes a good 8.47 per cent to the cost of cultivating beans in Dehradun. Further, the imputed value of family labour which is included in the total cost C varies between 37.07 – 43.01 per cent of the cost. Rental value of owned land constituting 14.63 per cent of the cost C also forms a major part of the cost.

**Table 5.5. (a) Cost of Cultivation of Capsicum Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	6416.12	6764.89	8603.06	6695.58	4.19	4.98	6.13	4.61
b. Bullock Labour	7946.51	6828.11	6357.21	7384.14	5.19	5.02	4.53	5.09
c.Seed/Seedlings	14215.52	13544.74	13590.50	13898.42	9.29	9.96	9.69	9.57
d.Manure	5436.20	5491.11	6177.50	5504.63	3.55	4.04	4.40	3.79
e.Fertilizer	4971.07	3843.78	4447.80	4470.61	3.25	2.83	3.17	3.08
f.Insecticides and pesticides	2543.68	2855.38	2471.00	2668.68	1.66	2.10	1.76	1.84
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	4126.26	2.06	3.82	3.71	2.84
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1245.87	1179.84	1249.41	1218.66	0.81	0.87	0.89	0.84
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	1191.89	1035.99	0.00	1053.79	0.78	0.76	0.00	0.73
Total (Cost A <sub>1</sub> )	47116.33	46741.44	48094.07	47020.77	30.78	34.38	34.29	32.39
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	47116.33	46741.44	48094.07	47020.77	30.78	34.38	34.29	32.39
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	22.01	24.78	24.02	23.21
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4534.26	3.02	3.26	3.16	3.12
Cost B (Cost A <sub>2</sub> +m+n)	85435.00	84873.57	86226.21	85250.48	55.81	62.43	61.48	58.72
o.Imputed value of family labour	67658.44	51080.41	54025.72	59933.25	44.19	37.57	38.52	41.28
Cost C (Cost B+o)	153093.45	135953.98	140251.92	145183.73	100	100	100	100

**Table 5.5. (b) Cost of Cultivation of Capsicum Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	7615.15	11764.41	10153.46	8244.89	5.05	8.89	7.78	5.61
b. Bullock Labour	6993.41	4639.30	4811.13	6548.02	4.64	3.51	3.69	4.46
c.Seed/Seedlings	14945.47	12849.20	12190.27	14452.47	9.92	9.71	9.34	9.84
d.Manure	8582.06	4942.00	6589.33	8057.40	5.69	3.73	5.05	5.49
e.Fertilizer	5037.09	4447.80	4612.53	4940.04	3.34	3.36	3.54	3.36
f.Insecticides and pesticides	3983.83	3953.60	4283.07	4016.96	2.64	2.99	3.28	2.74
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3554.71	2.09	3.93	3.98	2.42
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1414.71	1277.89	1279.19	1387.79	0.94	0.97	0.98	0.95
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	750.93	0.00	0.00	602.35	0.50	0.00	0.00	0.41
Total (Cost A <sub>1</sub> )	52472.11	49071.79	49116.58	51804.63	34.82	37.08	37.64	35.28
l.Rent paid for leased in land	4876.17	0.00	0.00	3911.36	3.24	0.00	0.00	2.66
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	57348.28	49071.79	49116.58	55715.99	38.05	37.08	37.64	37.94
m.Rental value of owned land	28819.28	33695.45	33695.45	29784.10	19.12	25.46	25.82	20.28
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4586.31	3.07	3.35	3.40	3.12
Cost B (Cost A <sub>2</sub> +m+n)	90790.79	87203.93	87248.71	90086.40	60.24	65.90	66.87	61.34
o.Imputed value of family labour	59921.36	45129.88	43231.91	56769.35	39.76	34.10	33.13	38.66
Cost C (Cost B+o)	150712.14	132333.81	130480.63	146855.74	100.00	100.00	100.00	100.00



**Table 5.5. (c) Cost of Cultivation of Capsicum Among all the Sampled**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	7313.95	8116.11	9827.06	7718.60	4.83	6.01	7.41	5.28
b. Bullock Labour	7232.83	6236.54	5136.62	6832.04	4.78	4.62	3.88	4.67
c.Seed/Seedlings	14762.10	13356.76	12485.05	14264.26	9.76	9.90	9.42	9.75
d.Manure	7791.82	5342.70	6502.63	7190.24	5.15	3.96	4.91	4.92
e.Fertilizer	5020.50	4007.03	4577.85	4780.58	3.32	2.97	3.45	3.27
f.Insecticides and pesticides	3622.06	3152.19	3901.58	3558.96	2.39	2.34	2.94	2.43
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3748.86	2.08	3.85	3.92	2.56
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1372.30	1206.34	1272.92	1330.34	0.91	0.89	0.96	0.91
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	861.70	755.99	0.00	755.70	0.57	0.56	0.00	0.52
Total (Cost A <sub>1</sub> )	51126.74	47371.26	48901.31	50179.59	33.79	35.10	36.90	34.30
l.Rent paid for leased in land	3651.27	0.00	0.00	2582.70	2.41	0.00	0.00	1.77
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	54778.01	47371.26	48901.31	52762.30	36.20	35.10	36.90	36.07
m.Rental value of owned land	30044.18	33695.45	33695.45	31112.75	19.86	24.96	25.42	21.27
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4568.63	3.06	3.29	3.35	3.12
Cost B (Cost A <sub>2</sub> +m+n)	89445.41	85503.40	87033.45	88443.68	59.11	63.35	65.67	60.46
o.Imputed value of family labour	61864.92	49472.16	45504.29	57844.10	40.89	36.65	34.33	39.54
Cost C (Cost B+o)	151310.33	134975.56	132537.74	146287.77	100.00	100.00	100.00	100.00

**Table 5.6. (a) Cost of Cultivation of Beans Among Sampled Farmers of District Nainital**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	10821.67	10100.75	16544.34	10688.20	7.28	7.09	11.38	7.29
b. Bullock Labour	6557.12	5018.85	4767.91	6038.02	4.41	3.52	3.28	4.12
c.Seed/Seedlings	6626.63	7504.04	7413.00	6918.80	4.46	5.26	5.10	4.72
d.Manure	8752.62	10404.21	9884.00	9296.75	5.89	7.30	6.80	6.34
e.Fertilizer	5016.60	4629.87	4942.00	4892.37	3.38	3.25	3.40	3.34
f.Insecticides and pesticides	2455.46	2835.15	2471.00	2576.46	1.65	1.99	1.70	1.76
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3835.03	2.12	3.65	3.57	2.62
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1206.90	1214.79	1380.67	1212.32	0.81	0.85	0.95	0.83
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	3729.81	780.32	0.00	2729.47	2.51	0.55	0.00	1.86
Total (Cost A <sub>1</sub> )	48316.28	47685.57	52600.51	48187.42	32.51	33.45	36.17	32.86
l.Rent paid for leased in land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	48316.28	47685.57	52600.51	48187.42	32.51	33.45	36.17	32.86
m.Rental value of owned land	33695.45	33695.45	33695.45	33695.45	22.67	23.64	23.17	22.98
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4560.78	3.11	3.11	3.05	3.11
Cost B (Cost A <sub>2</sub> +m+n)	86634.96	85817.70	90732.64	86443.66	58.30	60.21	62.39	58.95
o.Imputed value of family labour	61979.05	56724.02	54688.34	60185.97	41.70	39.79	37.61	41.05
Cost C (Cost B+o)	148614.00	142541.72	145420.98	146629.63	100	100	100	100

**Table 5.6. (b) Cost of Cultivation of Beans Among Sampled Farmers of District Dehradun**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	13872.41	13235.43	14637.15	13983.97	9.21	9.54	10.63	9.58
b. Bullock Labour	7422.88	6701.21	5154.78	6765.65	4.93	4.83	3.74	4.64
c.Seed/Seedlings	9310.73	8895.60	7413.00	8784.41	6.18	6.41	5.38	6.02
d.Manure	6325.76	5930.40	4942.00	5930.40	4.20	4.28	3.59	4.06
e.Fertilizer	2684.49	4348.96	4942.00	3456.93	1.78	3.14	3.59	2.37
f.Insecticides and pesticides	3439.63	3558.24	2965.20	3335.85	2.28	2.57	2.15	2.29
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3917.51	2.09	3.75	3.77	2.69
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1291.68	1280.10	1201.62	1267.72	0.86	0.92	0.87	0.87
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (Cost A <sub>1</sub> )	47497.05	49147.54	46453.35	47442.43	31.53	35.43	33.74	32.52
l.Rent paid for leased in land	19768.00	0.00	0.00	12355.00	13.12	0.00	0.00	8.47
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	67265.05	49147.54	46453.35	59797.43	44.66	35.43	33.74	40.98
m.Rental value of owned land	13927.45	33695.45	33695.45	21340.45	9.25	24.29	24.47	14.63
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4553.27	3.07	3.20	3.22	3.12
Cost B (Cost A <sub>2</sub> +m+n)	85815.72	87279.67	84585.48	85691.16	56.97	62.93	61.43	58.73
o.Imputed value of family labour	64813.68	51421.44	53103.50	60212.10	43.03	37.07	38.57	41.27
Cost C (Cost B+o)	150629.40	138701.11	137688.98	145903.26	100	100	100	100

**Table 5.6. (c) Cost of Cultivation of Beans Among all the Sampled Farmers**

Cost Components	Value in Rs./ha				Percentage to Cost C			
	Marginal	Small	Medium	All	Marginal	Small	Medium	All
a.Human Labour (Hired)	11551.51	10465.25	14955.02	11514.73	7.75	7.36	10.76	7.86
b. Bullock Labour	6764.24	5214.47	5090.30	6220.50	4.54	3.67	3.66	4.25
c.Seed/Seedlings	7268.76	7665.85	7413.00	7386.66	4.88	5.39	5.33	5.04
d.Manure	8172.03	9884.00	5765.67	8452.52	5.48	6.96	4.15	5.77
e.Fertilizer	4458.68	4597.21	4942.00	4532.39	2.99	3.24	3.56	3.09
f.Insecticides and pesticides	2690.91	2919.23	2882.83	2766.90	1.80	2.05	2.07	1.89
g.Sticks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
h.Depreciation (Implements and farm building)	3149.46	5197.59	5197.59	3855.72	2.11	3.66	3.74	2.63
i.Land Revenue and taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
j.Interest on working capital	1227.18	1222.38	1231.46	1226.21	0.82	0.86	0.89	0.84
k.Miscellaneous expenditure (Machinery,water,elect. Charges etc.)	2837.51	689.58	0.00	2044.97	1.90	0.49	0.00	1.40
Total (Cost A <sub>1</sub> )	48120.29	47855.56	47477.88	48000.59	32.27	33.68	34.16	32.78
l.Rent paid for leased in land	4729.19	0.00	0.00	3098.43	3.17	0.00	0.00	2.12
Cost A <sub>2</sub> (Cost A <sub>1</sub> +l)	52849.48	47855.56	47477.88	51099.02	35.45	33.68	34.16	34.89
m.Rental value of owned land	28966.27	33695.45	33695.45	30597.02	19.43	23.71	24.25	20.89
n.Interest on fixed capital (excluding land)	4623.22	4436.68	4436.68	4558.90	3.10	3.12	3.19	3.11
Cost B (Cost A <sub>2</sub> +m+n)	86438.97	85987.70	85610.01	86254.94	57.98	60.51	61.60	58.90
o.Imputed value of family labour	62657.19	56107.44	53367.64	60192.52	42.02	39.49	38.40	41.10
Cost C (Cost B+o)	149096.16	142095.14	138977.65	146447.47	100	100	100	100

5.20 The following table 5.6 (c) shows the composition of total cost of cultivating French beans among all the sampled farmers. As can be seen from the table, the overall cost per hectare was Rs. 48001 at cost A<sub>1</sub>, Rs. 51099 at cost A<sub>2</sub>, Rs. 86255 at cost B and Rs. 146447 at cost C. Highest cost share of 7.86 per cent is that of human labour followed by 5.77 per cent due to manure, 5.04 per cent for seed/seedlings, 4.25 per cent for bullock labour, 3.09 per cent for fertilizer and 1.89 per cent for plant protection measures. Rental value of owned land is the major cost item on all size of farms with its share in total cost being 19.43 per cent for marginal farms whereas the corresponding figures for small and medium farms are 23.71 per cent and 24.25 per cent respectively. Imputed value of family labour stands at 41.10 per cent of the total cost C.

### **Input/output Analysis**

5.21 It is important for the producer farmers and the agriculturalists to know whether the cultivation of certain vegetables they have undertaken is economically viable or not. This section presents the gross as well as net returns from the production of selected off season vegetables by the sampled farmers in the state of Uttarakhand.

### **Returns from Cultivation of Tomato**

5.22 The size-wise costs of tomato cultivation in Nainital and Dehradun districts as per CACP cost concepts are presented again in table 5.7 (a) as well the gross returns from its cultivation so as to calculate the net returns from it. As was seen in table 5.1 (a), in Nainital district the overall per hectare cost A<sub>1</sub>/A<sub>2</sub> was Rs. 67070, cost B was Rs. 105366 per hectare and the per hectare cost C was Rs. 178775. It has been observed that as land holding size increases the costs A<sub>1</sub>, A<sub>2</sub> and B also increase but cost C was more in case of marginal size of farm than that of medium and small sized farms. The gross returns per hectare were estimated at Rs. 380971, Rs. 284785, Rs. 331114 and Rs. 369990 on marginal, small, medium, large and overall farms, respectively. Therefore, the net returns per hectare came up to Rs. 302920, Rs. 264624 and Rs. 191215 at cost A<sub>1</sub>/ A<sub>2</sub>, cost B and cost C, respectively.

**Table 5.7.(a) Input-Output Analysis in Tomato Production**

(Rs./hectare)

Particulars	Marginal	Small	Medium	Overall
<b>Nainital</b>				
Cost A <sub>1</sub>	66933	67250	75911	67070
Cost A <sub>2</sub>	66933	67250	75911	67070
Cost B	105252	105382	114043	105366
Cost C	179820	170662	175108	178775
<b>Gross returns</b>	380971	284785	331114	369990
<b>Net returns over</b>				
Cost A <sub>1</sub>	314039	217535	255203	302920
Cost A <sub>2</sub>	314039	217535	255203	302920
Cost B	275720	179403	217071	264624
Cost C	201151	114123	156006	191215
<b>Dehradun</b>				
Cost A <sub>1</sub>	72742	66096	72234	72340
Cost A <sub>2</sub>	75786	66096	72234	74694
Cost B	111061	104228	110366	110616
Cost C	193839	179726	183068	191243
<b>Gross returns</b>	476333	404227	369081	453688
<b>Net returns over</b>				
Cost A <sub>1</sub>	403590	338130	296847	381349
Cost A <sub>2</sub>	400547	338130	296847	378994
Cost B	365272	299998	258715	343072
Cost C	282494	224501	186013	262445
<b>Overall</b>				
Cost A <sub>1</sub>	71361	66544	72297	71206
Cost A <sub>2</sub>	73681	66544	72297	73054
Cost B	109680	104676	110429	109487
Cost C	190505	176211	182932	188560
<b>Gross returns</b>	453656	357913	368432	435680
<b>Net returns over</b>				
Cost A <sub>1</sub>	382295	291369	296135	364475
Cost A <sub>2</sub>	379975	291369	296135	362627
Cost B	343976	253237	258003	326194
Cost C	263150	181701	185500	247120

5.23 In Dehradun district, the overall per hectare cost  $A_1$  was Rs. 72340,  $A_2$  was Rs. 74694, B was Rs. 110616 and C was Rs. 191243. Cost C was more in case of marginal size of farm than that of medium and small size of farms. The gross returns per hectare were estimated Rs. 476333, Rs. 404227, Rs. 369081 and Rs.453688 on marginal, small, medium and overall size of farms, respectively. Accordingly the net returns per hectare were estimated to be Rs. 381349, Rs. 378994, Rs. 343072 and Rs. 262445 at cost  $A_1$ ,  $A_2$ , B and C, respectively.

5.24 When all the sampled farmers are considered the per hectare cost  $A_1$  turned out to be Rs. 71206, cost  $A_2$  came up to Rs. 73054, cost B was Rs. 109487 and cost C was Rs. 188560. Cost C was more in case of marginal than that of medium and small size of farms. The gross returns per hectare were estimated at Rs. 453656, Rs. 357913, Rs. 368432, Rs. 435680 on marginal, small, medium and all farms respectively. The overall net returns per hectare were found Rs. 364475, Rs. 362627, Rs. 247120 at cost  $A_1$ ,  $A_2$ , B and C, respectively.

**5.25** The analysis indicates that the gross returns of the farms of Dehradun were significantly higher than in Nainital although the costs per hectare were comparable. As a result, the net returns from tomato farming are much higher in Dehradun as compared to Nainital.

### **Returns from Cultivation of Peas**

5.26 From the costs figures of peas cultivation presented in Table 5.7 (b) it can be seen that in Nainital district the per hectare cost  $A_1/ A_2$  was Rs. 49952, cost B was Rs. 88211 and cost C was Rs. 151593 on the overall situation. It has been observed that as land holding size increases the cost also increases. But cost C was more in case of small size of farm than that of marginal and medium size groups. From the same table the gross returns per hectare can be seen to be Rs. 365066, Rs. 434310, Rs. 273600 and Rs. 366336 on marginal, small, medium, large and all farms respectively. Hence, the net returns per hectare turned out to be Rs. 316383, Rs. 278125 and Rs. 214743 at cost  $A_1/ A_2$ , cost B and cost C, respectively.

5.27 Likewise a comparison of the various costs and the gross returns from peas cultivation in Dehradun district shows that the net return per hectare from peas were Rs. 170510, Rs. 170137, Rs. 132323 and Rs. 65600 at cost  $A_1$ ,  $A_2$ , B and C, respectively which were significantly lower than that generated in Nainital.

5.28 For all the sampled farmers the per hectare cost  $A_1$  went up to Rs. 50462, cost  $A_2$  was Rs. 50555, cost B was Rs. 88703 and cost C was Rs. 152918. Cost C was more in case of small than

that of marginal and medium size of farms. The gross returns per hectare on the other hand were estimated at Rs. 453656, Rs. 357913, Rs. 368432 and Rs. 435680 on marginal, small, medium and overall size of farms, respectively. Accordingly, the net returns per hectare were Rs. 385218, Rs. 385125, Rs. 346978 and Rs. 282763 at cost  $A_1/A_2$ , B and C respectively.

### **Returns from Cultivation of Cabbage**

5.29 From the figures for costs  $A_1$ ,  $A_2$ , B and C for different sized farms presented in table 5.7 (c) it can be seen that in Nainital district the overall per hectare cost  $A_1/A_2$  was Rs. 62242, cost B was Rs. 100523 and cost C was Rs. 159968 whereas in Dehradun district the corresponding figures were Rs. 54396, Rs. 92635 and Rs. 145332. Surprisingly, gross returns per hectare in Nainital district were lower for bigger sized farms and so were the net returns over C (as well as  $A_1/A_2$  and B) which were found to be Rs. 188837, Rs. 172584 and Rs. 115744 respectively for marginal, small and medium farms. This indicates that in Nainital district cabbage cultivation was more productive in smaller farms than in bigger farms. However in Dehradun district although the gross as well as net returns are higher in small farms than in marginal farms, when the size of the farms increases from small to medium the returns fall drastically to a level even lower than that for marginal farms. This is indicative of the fact that in Dehradun district cabbage cultivation is most productive in small farms and least productive in medium farms. The net returns per hectare in Dehradun were Rs. 195814, Rs. 157575 and Rs. 104878 at cost  $A_1/A_2$ , B and C, respectively. The table further reveals that the cabbage cultivation generates higher net returns in Nainital district than in Dehradun district.

5.30 Overall for all our sampled farmers while the per hectare costs  $A_1/A_2$ , B and C were Rs. 60946, Rs. 99220 and Rs. 157550 respectively, the overall gross returns per hectare was estimated at Rs. 152918 with Rs. 153823, Rs. 155476, Rs. 148582 as returns on marginal, small and medium farms respectively. The net returns per hectare turned out to be Rs. 267320, Rs. 229046 and Rs. 170715 at cost  $A_1/A_2$ , B and C respectively.



**Table 5.7(b) Input-Output Analysis in Peas Production**

(Rs./hectare)

Particulars	Marginal	Small	Medium	Overall
<b>Nainital</b>				
Cost A <sub>1</sub>	48569	52628	53246	49952
Cost A <sub>2</sub>	48569	52628	53246	49952
Cost B	86888	90760	91378	88211
Cost C	151982	153295	147080	151593
<b>Gross returns</b>	365066	434310	273600	366336
<b>Net returns over</b>				
Cost A <sub>1</sub>	316497	381682	220354	316383
Cost A <sub>2</sub>	316497	381682	220354	316383
Cost B	278179	343550	182222	278125
Cost C	213084	281015	126520	214743
<b>Dehradun</b>				
Cost A <sub>1</sub>	54241	57308	49058	51996
Cost A <sub>2</sub>	55525	57308	49058	52369
Cost B	92560	95440	87190	90182
Cost C	166775	162685	149681	156905
<b>Gross returns</b>	259705	267470	187768	222506
<b>Net returns over</b>				
Cost A <sub>1</sub>	205464	210161	138711	170510
Cost A <sub>2</sub>	204181	210161	138711	170137
Cost B	167146	172029	100578	132323
Cost C	92931	104784	38087	65600
<b>Overall</b>				
Cost A <sub>1</sub>	49275	53715	50828	50462
Cost A <sub>2</sub>	49435	53715	50828	50555
Cost B	87594	91848	88961	88703
Cost C	153823	155476	148582	152918
<b>Gross returns</b>	453656	357913	368432	435680
<b>Net returns over</b>				
Cost A <sub>1</sub>	404381	304197	317604	385218
Cost A <sub>2</sub>	404221	304197	317604	385125
Cost B	366062	266065	279472	346978
Cost C	299833	202436	219850	282763

**Table 5.7 (c) Input-Output Analysis in Cabbage Production**  
(Rs./hectare)

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>Overall</b>
<b>Nainital</b>				
Cost A <sub>1</sub>	62008	61590	71407	62242
Cost A <sub>2</sub>	62008	61590	71407	62242
Cost B	100327	99722	109539	100523
Cost C	161121	154281	161008	159968
<b>Gross returns</b>	349958	326865	276752	343713
<b>Net returns over</b>				
Cost A <sub>1</sub>	287950	265275	205345	281471
Cost A <sub>2</sub>	287950	265275	205345	281471
Cost B	249631	227143	167213	243190
Cost C	188837	172584	115744	183745
<b>Dehradun</b>				
Cost A <sub>1</sub>	53748	56832	54891	54396
Cost A <sub>2</sub>	53748	56832	54891	54396
Cost B	92067	94965	93023	92635
Cost C	151276	139239	136976	145332
<b>Gross returns</b>	256754	294190	229083	250210
<b>Net returns over</b>				
Cost A <sub>1</sub>	203006	237358	174192	195814
Cost A <sub>2</sub>	203006	237358	174192	195814
Cost B	164688	199226	136060	157575
Cost C	105478	154951	92107	104878
<b>Overall</b>				
Cost A <sub>1</sub>	60985	61173	60176	60946
Cost A <sub>2</sub>	60985	61173	60176	60946
Cost B	99304	99305	98308	99220
Cost C	159901	152961	144666	157550
<b>Gross returns</b>	338410	323998	244337	328265
<b>Net returns over</b>				
Cost A <sub>1</sub>	277426	262826	184161	267320
Cost A <sub>2</sub>	277426	262826	184161	267320
Cost B	239107	224694	146029	229046
Cost C	178509	171037	99671	170715

### **Returns from Cultivation of Cauliflower**

5.31 Table 5.7 (d) presents a comparative picture of costs and returns from cauliflower cultivation among our sampled farmers. As per the table in Nainital district the per hectare cost  $A_1/A_2$  was Rs. 54368, cost B was Rs. 92628 and cost C was Rs. 152881 whereas the gross returns per hectare were estimated at Rs. 334100, Rs. 633673, Rs. 533736 and Rs. 423430 on marginal, small, medium and all farms respectively. The net returns per hectare were accordingly found out to be Rs. 369062, Rs. 330802 and Rs. 270549 at cost  $A_1/A_2$ , cost B and cost C respectively. A size-wise comparison of net returns from cauliflower farming clearly shows that the returns are highest in small sized farms followed by medium and marginal farms.

5.32 On the other hand, in Dehradun district the gross returns per hectare were estimated Rs. 444577, Rs. 542496, Rs. 307425 and Rs. 418690 on marginal, small, medium and all farms respectively which on comparison with costs C gives the net returns per hectare as Rs. 294219, Rs. 401328, Rs. 171444 and Rs. 272278 respectively thereby indicating that the net returns are highest in small farms even in Dehradun although the lowest returns are generated in medium sized farms. A district-wise comparison would indicate that excepting for marginal farms; the net returns are significantly higher in Nainital than in Dehradun.

5.33 In Uttarakhand as a whole the per hectare cost  $A_1$  was Rs. 50855, cost  $A_2$  was Rs. 52062, cost B was Rs. 89117 and cost C was Rs. 149223. Cost C was more in case of marginal than that of small and medium size of farms. The gross return per hectare were estimated Rs. 397211, Rs. 612162, Rs. 337600 and Rs. 420750 on marginal, small, medium and all farms respectively and the net returns per hectare were Rs. 369895, Rs. 368688, Rs. 331633 and Rs. 271527 at costs  $A_1/A_2$ , B and C respectively.

**Table 5.7(d) Input-Output Analysis in Cauliflower Production**  
(Rs./hectare)

Particulars	Marginal	Small	Medium	Overall
<b>Nainital</b>				
Cost A <sub>1</sub>	52714	58249	56480	54368
Cost A <sub>2</sub>	52714	58249	56480	54368
Cost B	91032	96382	94613	92628
Cost C	154447	149785	147580	152881
<b>Gross returns</b>	334100	633673	533736	423430
<b>Net returns over</b>				
Cost A <sub>1</sub>	281386	575424	477256	369062
Cost A <sub>2</sub>	281386	575424	477256	369062
Cost B	243067	537292	439123	330802
Cost C	179652	483888	386156	270549
<b>Dehradun</b>				
Cost A <sub>1</sub>	48740	46131	46948	48155
Cost A <sub>2</sub>	51778	46131	46948	50290
Cost B	87058	84263	85080	86418
Cost C	150357	141169	135981	146411
<b>Gross returns</b>	444577	542496	307425	418690
<b>Net returns over</b>				
Cost A <sub>1</sub>	395837	496365	260477	370535
Cost A <sub>2</sub>	392799	496365	260477	368400
Cost B	357519	458233	222345	332271
Cost C	294219	401328	171444	272278
<b>Overall</b>				
Cost A <sub>1</sub>	50443	55390	48219	50855
Cost A <sub>2</sub>	52179	55390	48219	52062
Cost B	88762	93523	86351	89117
Cost C	152111	147752	137527	149223
<b>Gross returns</b>	397211	612162	337600	420750
<b>Net returns over</b>				
Cost A <sub>1</sub>	346768	556772	289381	369895
Cost A <sub>2</sub>	345032	556772	289381	368688
Cost B	308449	518640	251249	331633
Cost C	245100	464410	200073	271527

### **Returns from Cultivation of Capsicum**

5.34 The figures related to various cost concepts as per CACP as well as returns from cultivating capsicum in different sized farms are presented in table 5.7 (e). From the table it can be seen that the cost C is minimum at Rs. 135954 for small farms and increases marginally both with increase or decrease in size of the farms. The gross return per hectare were estimated to be Rs. 355137, Rs. 415832, Rs. 494200 and Rs. 388906 on marginal, small, medium and all farms respectively and accordingly the net returns per hectare were Rs. 341886, Rs. 303656 and Rs. 243723 at cost A<sub>1</sub>/ A<sub>2</sub>, cost B and cost C respectively. Size-wise comparison of net returns shows that returns increase with increase in size of the farms. The costs and returns comparison in Dehradun district show that the net returns per hectare were Rs. 388847, Rs. 384936, Rs. 350565 and Rs. 293796 at cost A<sub>1</sub>, A<sub>2</sub>, B and C respectively and that the net returns decrease drastically to Rs. 182085 from Rs. 319677 with the increase in farm size from marginal to small whereas it increases marginally to Rs. 193400 for medium-sized farms. The analysis further indicates that with the exception of marginal farms all other farms of Nainital are able to generate higher net returns from capsicum cultivation in Nainital district than in Dehradun.

5.35 In overall situation the per hectare cost A<sub>1</sub> was Rs. 50180, cost A<sub>2</sub> was Rs. 52762 cost B was Rs. 88444 and cost C was Rs. 146288. Cost C was more in case of marginal than that of small and medium size of farms. The gross return per hectare were estimated Rs. 441438, Rs. 388423, Rs. 359738 and Rs. 423074 on marginal, small, medium and overall size of farm respectively. The net returns per hectare were found Rs. 372895, Rs. 370312, Rs. 334630 and Rs. 276786 at cost A<sub>1</sub>, A<sub>2</sub>, B and C respectively.

### **Returns from Cultivation of Beans**

5.36 The costs-returns comparison of beans cultivation presented in Table 5.7 (f) shows that in Nainital district not only is the net returns per hectare declining with the increase in size of farms, it is negative for medium farms. The net returns per hectare in Dehradun district were found to be highest for medium farms followed by marginal and small farms. Further the net returns from beans cultivation were higher for marginal and small farms in Nainital as compared to Dehradun.

**Table 5.7 (e) Input- Output Analysis in Capsicum Production  
(Rs./hectare)**

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>Overall</b>
<b>Nainital</b>				
Cost A <sub>1</sub>	47116	46741	48094	47021
Cost A <sub>2</sub>	47116	46741	48094	47021
Cost B	85435	84874	86226	85250
Cost C	153093	135954	140252	145184
<b>Gross returns</b>	355137	415832	494200	388906
<b>Net returns over</b>				
Cost A <sub>1</sub>	308021	369090	446106	341886
Cost A <sub>2</sub>	308021	369090	446106	341886
Cost B	269702	330958	407974	303656
Cost C	202044	279878	353948	243723
<b>Dehradun</b>				
Cost A <sub>1</sub>	52472	49072	49117	51805
Cost A <sub>2</sub>	57348	49072	49117	55716
Cost B	90791	87204	87249	90086
Cost C	150712	132334	130481	146856
<b>Gross returns</b>	470389	314419	323881	440652
<b>Net returns over</b>				
Cost A <sub>1</sub>	417917	265347	274764	388847
Cost A <sub>2</sub>	413041	265347	274764	384936
Cost B	379598	227215	236632	350565
Cost C	319677	182085	193400	293796
<b>Overall</b>				
Cost A <sub>1</sub>	51127	47371	48901	50180
Cost A <sub>2</sub>	54778	47371	48901	52762
Cost B	89445	85503	87033	88444
Cost C	151310	134976	132538	146288
<b>Gross returns</b>	441438	388423	359738	423074
<b>Net returns over</b>				
Cost A <sub>1</sub>	390311	341051	310836	372895
Cost A <sub>2</sub>	386660	341051	310836	370312
Cost B	351992	302919	272704	334630
Cost C	290127	253447	227200	276786

**Table 5.7. (f) Input-Output Analysis in Beans Production**

(Rs./hectare)

<b>Particulars</b>	<b>Marginal</b>	<b>Small</b>	<b>Medium</b>	<b>Overall</b>
<b>Nainital</b>				
Cost A <sub>1</sub>	48316	47686	52601	48187
Cost A <sub>2</sub>	48316	47686	52601	48187
Cost B	86635	85818	90733	86444
Cost C	148614	142542	145421	146630
<b>Gross returns</b>	396408	327837	74130	369210
<b>Net returns over</b>				
Cost A <sub>1</sub>	348092	280152	21529	321022
Cost A <sub>2</sub>	348092	280152	21529	321022
Cost B	309774	242020	-16603	282766
Cost C	247794	185296	-71291	222580
<b>Dehradun</b>				
Cost A <sub>1</sub>	47497	49148	46453	47442
Cost A <sub>2</sub>	67265	49148	46453	59797
Cost B	85816	87280	84585	85691
Cost C	150629	138701	137689	145903
<b>Gross returns</b>	380831	272798	454664	385785
<b>Net returns over</b>				
Cost A <sub>1</sub>	333333	223651	408211	338342
Cost A <sub>2</sub>	313565	223651	408211	325987
Cost B	295015	185519	370079	300094
Cost C	230201	134097	316975	239882
<b>Overall</b>				
Cost A <sub>1</sub>	48120	47856	47478	48001
Cost A <sub>2</sub>	52849	47856	47478	51099
Cost B	86439	85988	85610	86255
Cost C	149096	142095	138978	146447
<b>Gross returns</b>	392682	321438	391242	373366
<b>Net returns over</b>				
Cost A <sub>1</sub>	344561	273582	343764	325366
Cost A <sub>2</sub>	339832	273582	343764	322267
Cost B	306243	235450	305632	287112
Cost C	243586	179342	252264	226919

5.37 Overall for all the sampled farmers in Uttarakhand the per hectare cost A<sub>1</sub> was Rs. 48001, cost A<sub>2</sub> was Rs. 51099 cost B was Rs. 86235 and cost C was Rs. 146447. Cost C was more in case of marginal than that of small and medium size of farms. The gross return per hectare were estimated at Rs. 392682, Rs. 321438, Rs. 391242 and Rs. 373366 on marginal, small, medium and all farms respectively. Therefore, the net returns per hectare were Rs. 325366, Rs. 322267, Rs. 287112 and Rs. 226919 at cost A<sub>1</sub>, A<sub>2</sub>, B and C respectively.

### **Input- Output Ratio**

5.38 The following tables provide input-output ratio for all the selected off season vegetables crops. In fact, it actually furnishes the reciprocal of it, i.e., for each of the vegetables it shows the gross returns generated per hectare for each rupee invested per hectare.

5.39 In district Nainital the input-output ratio over cost C for tomato was 2.07, 2.42 for pea, 2.15 for cabbage, 2.77 for cauliflower, 2.68 for capsicum and 2.52 for beans. The highest returns per rupee invested in case of cauliflower cultivation indicates that cauliflower cultivation was the most profitable among all six off-season vegetable crops selected for the study. However, it is closely followed by capsicum and beans and the ratio is never less than 2 for the rest. On the other hand, in district Dehradun the input-out ratio over cost C accounted 2.37 for tomato, 1.25 for pea, 1.72 for cabbage, 2.86 for cauliflower, 3.00 for capsicum and 2.64 for beans. The highest return per rupee invested was recorded in case of capsicum followed by cauliflower and beans while the lowest returns per unit spent could be observed for pea. Overall, capsicum cultivation was found to generate highest returns per unit cost of cultivation followed by cauliflower, beans, tomato, pea and cabbage.



**Table 5.8. Input-Output Ratio in Various Vegetables Production Among sampled farmers**

**(Output/Cost C)**

Category	Vegetables						
	Tomato	Peas	Cabbage	Cauliflower	Capsicum	Beans	All
<b>Nainital</b>							
Marginal	2.12	2.40	2.17	2.16	2.32	2.67	2.29
Small	1.67	2.83	2.12	4.23	3.06	2.30	2.75
Medium	1.89	1.86	1.72	3.62	3.52	0.51	1.97
Total	2.07	2.42	2.15	2.77	2.68	2.52	2.35
<b>Dehradun</b>							
Marginal	2.46	1.56	1.70	2.96	3.12	2.53	2.47
Small	2.25	1.64	2.11	3.84	2.38	1.97	2.16
Medium	2.02	1.25	1.67	2.26	2.48	3.30	1.75
Total	2.37	1.42	1.72	2.86	3.00	2.64	2.26
<b>Overall</b>							
Marginal	2.38	2.29	2.12	2.61	2.92	2.63	2.36
Small	2.03	2.54	2.12	4.14	2.88	2.26	2.61
Medium	2.01	1.51	1.69	2.45	2.71	2.82	1.81
Total	2.31	2.16	2.08	2.82	2.89	2.55	2.31

## CHAPTER 6

### **Marketing of Off-Season Vegetables**

6.1 While the quantity of production, yield, cost of production and returns from these six vegetables are important parameters to be studied in the context of assessing the profitability of these crops, it is no less important to look at how the produce is ultimately utilized or how effectively they are marketed because at that end that determines whether the cultivation of the crops generate any surplus for the farmers growing them. This chapter deals with the details regarding marketing of these vegetables like how much of the produce is marketed in different markets, how much is wasted before being taken to the market, margin kept in marketing them and so on.

#### **Production and Utilization Pattern of Vegetables**

##### **Production and Utilization Pattern of Tomato**

6.2 From Table 6.1 (a) it can be observed that the total quintals of tomato produced per farm is higher in Dehradun district than Nainital district across farmers and at the same time higher percentage of the produce is being marketed in the former than in the latter. Wages in kind constitute an insignificant proportion of less than even 1.5 % of the produce for all categories of farmers with the highest percentage of 1.43 for small farmers in Nainital and 1.38 for small farmers in Dehradun. While very less percentage of the produce is retained for home consumption in Nainital (4.15, 2.86, 12.50 for marginal, small and medium respectively), it is still higher than the corresponding figures in Dehradun. Although nothing is retained for seed, some losses are incurred nevertheless. In effect, the percentage share of the produce marketed lies between 80 and 92 for Nainital district and between 92 and 94.5 in Dehradun.

##### **Production and Utilization Pattern of Peas**

6.3 For the vegetable peas it can be seen from table 6.1 (b) that with the exception of the small farmers, production of peas per farm is higher in Dehradun than in Nainital for all categories of

sampled farmers with the total production per farm among the sampled farmers standing at 16.55 quintals. In contrast to what has been observed in case of tomato, the percentage of produce retained for home consumption is higher across farmers in Dehradun district than in Nainital. Wages, though a very small proportion of the produce, is not only higher in Dehradun district, it is in fact higher than the wages (in kind) in case of though the percentage of peas produce going as wages is higher than in case of tomato, the loss is much less though the loss is by and large higher in Dehradun district. As a result the percentage of peas marketed in Dehradun district is much lower than what is marketed of tomato, though the corresponding percentage is marginally higher in case of Nainital district.

**Table 6.1. (a) Utilization Pattern of Tomato Among Sampled Farmers (Percentages)**

Category	Total production (Qtls./farm)	Home consumption	Given as wages in kind	Retained for seed	Losses	Marketed
<b>Nainital</b>						
Marginal	10.83	4.15	1.08	0.00	2.81	91.96
Small	9.33	2.86	1.43	0.00	5.79	89.93
Medium	4.00	12.50	0.00	0.00	7.50	80.00
All	10.43	4.14	1.10	0.00	3.16	91.60
<b>Dehradun</b>						
Marginal	24.60	2.52	0.74	0.00	2.46	94.28
Small	19.33	3.10	1.38	0.00	3.16	92.36
Medium	37.00	1.46	1.14	0.00	1.23	96.17
All	25.41	2.41	0.82	0.00	2.33	94.45
<b>Overall</b>						
Marginal	20.07	2.81	0.80	0.00	2.52	93.87
Small	14.33	3.02	1.40	0.00	4.01	91.57
Medium	31.50	1.69	1.11	0.00	1.37	95.83
All	20.48	2.70	0.86	0.00	2.47	93.97

**Table 6.1.(b) Utilization Pattern of Peas Among Sampled Farmers****(Percentages)**

Category	Total production (Qtls./farm)	Home consumption	Given as wages in kind	Retained for seed	Losses	Marketed
<b>Nainital</b>						
Marginal	13.08	4.00	1.23	0.00	2.58	92.19
Small	21.80	2.06	1.58	0.00	3.15	93.20
Medium	38.00	1.64	0.66	0.33	1.58	95.79
All	15.57	3.30	1.27	0.03	2.64	92.76
<b>Dehradun</b>						
Marginal	13.50	4.44	2.01	0.00	4.57	88.97
Small	14.75	3.22	1.78	0.00	2.24	92.76
Medium	44.00	5.15	2.20	0.00	1.39	91.26
All	20.39	4.52	2.05	0.00	2.62	90.81
<b>Overall</b>						
Marginal	13.14	4.06	1.34	0.00	2.87	91.72
Small	19.79	2.31	1.62	0.00	2.96	93.11
Medium	41.60	3.87	1.63	0.12	1.46	92.91
All	16.55	3.60	1.46	0.02	2.63	92.28

**Production and Utilization Pattern of Cabbage**

6.4 With respect to cabbage, as the table 6.1 (c) shows, overall the total production per farm in Nainital is more than double that in Dehradun. However, the percentage share retained for home consumption is much lower in Nainital as compared to Dehradun across all categories of farmers and so is the share of the produce given out as wage in kind as well as the losses. As a result percentage share of the produce that is marketed is way higher in Nainital across all farmer categories (95.84, 93.04, and 94.29 per cent for marginal, small and medium farmers respectively) than in Dehradun (corresponding figures are 84.92, 75, 88.97).

**Table 6.1. (c) Utilization Pattern of Cabbage Among Sampled Farmers****(Percentages)**

Category	Total production (Qtls./farm)	Home consumption	Given as wages in kind	Retained for seed	Losses	Marketed
<b>Nainital</b>						
Marginal	29.78	2.06	0.61	0.00	1.50	95.84
Small	21.88	2.86	1.03	0.00	3.07	93.04
Medium	28.00	3.57	0.00	0.00	2.14	94.29
All	28.48	2.18	0.65	0.00	1.70	95.46
<b>Dehradun</b>						
Marginal	10.70	6.36	2.15	0.00	6.58	84.92
Small	9.50	15.79	4.21	0.00	5.00	75.00
Medium	22.00	6.06	2.27	0.00	2.70	88.97
All	12.80	7.19	2.40	0.00	5.09	85.33
<b>Overall</b>						
Marginal	26.04	2.40	0.73	0.00	1.91	94.96
Small	19.40	4.12	1.34	0.00	3.26	91.27
Medium	23.50	5.32	1.60	0.00	2.53	90.55
All	24.86	2.78	0.86	0.00	2.11	94.26

**Production and Utilization Pattern of Cauliflower**

6.5 For cauliflower the total production per farm is very close in both Nainital and Dehradun. However, it can be discerned from table 6.1 (d) that noticeable difference exists within categories. For instance, while for marginal and medium farmers in Nainital they are 10.29 and 18 respectively with the corresponding figures for Dehradun being 14.46 and 24, for small farmers total production in Nainital is over slightly more than double that in Dehradun.

6.6 Moreover, the percentage share retained for home consumption by small farmers is less than even one per cent in Nainital. Not only is it less than the respective shares for the other categories of farmers in the same district it is lowest among all categories in both districts. Further, the share of the produce retained as wages and the losses are also the lowest for small farmers in Nainital. As a result, the percentage of their produce which is marketed is much higher at 97.07 for small farmers in Nainital as compared to the rest of the farmer categories in either district with the lowest share recorded for medium farmers in Nainital at 88.33 per cent.

**Table 6.1.(d) Utilization Pattern of Cauliflower Among Sampled Farmers****(Percentages)**

<b>Category</b>	<b>Total production (Qtls./farm)</b>	<b>Home consumption</b>	<b>Given as wages in kind</b>	<b>Retained for seed</b>	<b>Losses</b>	<b>Marketed</b>
<b>Nainital</b>						
Marginal	10.29	4.67	1.77	0.00	2.62	90.94
Small	31.00	1.21	0.48	0.00	2.02	96.28
Medium	18.00	5.56	0.00	0.00	6.11	88.33
All	15.18	3.14	1.11	0.00	2.50	93.25
<b>Dehradun</b>						
Marginal	14.46	3.19	1.14	0.00	2.20	93.47
Small	15.00	3.89	2.56	0.00	3.18	90.38
Medium	24.75	3.94	1.11	0.00	1.71	93.24
All	15.69	3.38	1.25	0.00	2.19	93.18
<b>Overall</b>						
Marginal	12.72	3.68	1.35	0.00	2.35	92.62
Small	25.67	1.73	0.89	0.00	2.25	95.13
Medium	23.40	4.19	0.94	0.00	2.38	92.49
All	15.46	3.28	1.19	0.00	2.33	93.21

**Production and Utilization Pattern of Capsicum**

6.7 For the vegetable capsicum the total production per farm in Dehradun is slightly above one and half times that of the total production in Nainital. Compared to cabbage, cauliflower and peas, the percentage of capsicum kept for home consumption is much higher in Nainital standing at 5.91, 3.26 and 10 per cent respectively for marginal, small and medium farmers. The corresponding figures for Dehradun district are 4.92, 4.29 and 8.46 respectively. While wages constitute very low share of the produce for almost all the sampled farmers, the medium farmers in Nainital do not seem to pay wages in kind at all. Further, losses constitute less than 3 per cent of the produce for all categories of farmers in both districts. This leads to a high percentage of produce being marketed in both districts ranging between 88 per cent and 95 per cent.

**Table 6.1.(e) Utilization Pattern of Capsicum Among Sampled Farmers****(Percentages)**

<b>Category</b>	<b>Total production (Qtls./farm)</b>	<b>Home consumption</b>	<b>Given as wages in kind</b>	<b>Retained for seed</b>	<b>Losses</b>	<b>Marketed</b>
<b>Nainital</b>						
Marginal	5.50	5.91	2.09	0.00	1.05	90.95
Small	8.60	3.26	2.67	0.00	2.58	91.49
Medium	5.00	10.00	0.00	0.00	1.20	88.80
All	6.44	5.00	2.23	0.00	1.70	91.07
<b>Dehradun</b>						
Marginal	9.95	4.92	1.48	0.00	2.19	91.41
Small	8.75	4.29	0.29	0.00	1.20	94.23
Medium	13.00	8.46	1.92	0.00	1.38	88.23
All	10.10	5.24	1.45	0.00	2.04	91.28
<b>Overall</b>						
Marginal	8.52	5.13	1.61	0.00	1.95	91.31
Small	8.64	3.55	1.98	0.00	2.18	92.28
Medium	10.33	8.71	1.61	0.00	1.35	88.32
All	8.67	5.17	1.67	0.00	1.94	91.22

**Production and Utilization Pattern of French beans**

6.8 As far as the remaining vegetable under study, French beans, is concerned it is not one of the main off-season vegetables grown by the medium farmers in Nainital since only half a quintal of it is produced and that too entire amount of it is retained for home consumption. This can be seen from the following table 6.1 (f). For the other categories of farmers total production per farm is higher in Nainital than in Dehradun. Although losses are at the minimum for the farmers in Nainital, over 10 per cent of the produce is retained on account of home consumption and payment of wages resulting in less than 90 per cent of the produce being marketed. However, in Dehradun district very less proportion of the produce is retained for home consumption or wages by medium farmers. Since losses are also negligible close to 99 per cent of the produce is marketed. For the other categories of farmers in Dehradun close to 90 per cent of the produce is

marketed. When all the sampled farmers are considered, close to 90 per cent of the produce has been found to be marketed.

**Table 6.1.(f) Utilization Pattern of Beans Among Sampled Farmers**  
(Percentages)

Category	Total production (Qtls./farm)	Home consumption	Given as wages in kind	Retained for seed	Losses	Marketed
<b>Nainital</b>						
Marginal	5.72	7.17	3.44	0.00	0.93	88.45
Small	7.20	4.17	3.47	0.00	3.22	89.14
Medium	0.50	100.00	0.00	0.00	0.00	0.00
All	5.82	6.67	3.44	0.00	1.60	88.29
<b>Dehradun</b>						
Marginal	4.72	4.50	1.59	0.00	4.22	89.69
Small	6.00	8.33	0.00	0.00	0.33	91.33
Medium	20.00	0.50	0.50	0.00	0.05	98.95
All	6.38	3.61	1.10	0.00	2.54	92.75
<b>Overall</b>						
Marginal	5.37	6.36	2.87	0.00	1.94	88.83
Small	7.00	4.76	2.98	0.00	2.81	89.45
Medium	10.25	2.93	0.49	0.00	0.05	96.54
All	6.00	5.62	2.63	0.00	1.93	89.82

## Losses in Vegetables

6.9 The gap between the amount of vegetables produced and marketed, as could be seen from tables 6.1 (a)- (f), exists because of several reasons ranging from natural calamities to pests and diseases to loss during transit to losses while packaging. Tables 6.2 (a)- (b) show how much and what share of the loss could be attributed to which factor. As can be seen from the above table, excepting French beans for all other vegetables natural calamities account for most of the loss followed by disease and pests. In most cases these are followed by loss at the time of assembling and packing. For capsicum and French beans total loss however is negligible. The next table displays the proportions of losses attributable to various factors. It can be seen that the total loss



**Table 6.2 (a) Losses in Vegetables up to Market on Sampled Farms (Qtls./farm)**

Particulars	Farm size			
	Marginal	Small	Medium	All
<b>Tomato</b>				
-Due to natural calamities	0.18	0.16	0.13	0.18
Due to disease & Pests	0.13	0.21	0.12	0.13
-.At the time of picking/assembling	0.09	0.10	0.07	0.09
-Grading and packing	0.06	0.03	0.05	0.06
-.Field to road head	0.02	0.02	0.04	0.02
-.Road head to market	0.01	0.03	0.02	0.02
Market & Storage	0.01	0.03	0.00	0.01
-Total losses	0.51	0.58	0.43	0.51
<b>Peas</b>				
-Due to natural calamities	0.16	0.22	0.23	0.18
Due to disease & Pests	0.13	0.22	0.16	0.15
-.At the time of picking/assembling	0.04	0.07	0.07	0.05
-Grading and packing	0.02	0.04	0.05	0.02
-.Field to road head	0.01	0.02	0.06	0.01
-.Road head to market	0.03	0.01	0.02	0.02
Market & Storage	0.00	0.00	0.02	0.00
-Total losses	0.38	0.59	0.61	0.44
<b>Cabbage</b>				
-Due to natural calamities	0.21	0.22	0.20	0.21
Due to disease & Pests	0.15	0.19	0.15	0.16
-.At the time of picking/assembling	0.06	0.16	0.09	0.08
-Grading and packing	0.04	0.05	0.08	0.05
-.Field to road head	0.01	0.01	0.05	0.01
-.Road head to market	0.01	0.01	0.03	0.01
Market & Storage	0.01	0.00	0.00	0.01
-Total losses	0.50	0.63	0.60	0.52

<b>Cauliflower</b>				
-Due to natural calamities	0.12	0.13	0.28	0.13
Due to disease & Pests	0.09	0.16	0.20	0.11
-.At the time of picking/assembling	0.05	0.13	0.02	0.06
-Grading and packing	0.02	0.10	0.03	0.03
-.Field to road head	0.01	0.02	0.00	0.01
-.Road head to market	0.01	0.03	0.02	0.01
Market & Storage	0.01	0.00	0.00	0.00
-Total losses	0.30	0.58	0.56	0.36
<b>Capsicum</b>				
-Due to natural calamities	0.05	0.05	0.03	0.05
Due to disease & Pests	0.04	0.06	0.02	0.04
-.At the time of picking/assembling	0.02	0.07	0.01	0.03
-Grading and packing	0.04	0.00	0.01	0.03
-.Field to road head	0.00	0.00	0.07	0.01
-.Road head to market	0.01	0.00	0.00	0.00
Market & Storage	0.01	0.00	0.00	0.00
-Total losses	0.17	0.19	0.14	0.17
<b>Beans</b>				
-Due to natural calamities	0.00	0.00	0.00	0.00
Due to disease & Pests	0.03	0.03	0.01	0.03
-.At the time of picking/assembling	0.04	0.06	0.00	0.04
-Grading and packing	0.01	0.11	0.00	0.03
-.Field to road head	0.01	0.00	0.00	0.01
-.Road head to market	0.00	0.00	0.00	0.00
Market & Storage	0.01	0.00	0.00	0.00
-Total losses	0.10	0.20	0.01	0.12

**Table 6.2 (b) Losses in Vegetables up to Market on Sampled Farms  
(Percent to total production)**

Particulars	Farm size			
	Marginal	Small	Medium	All
<b>Tomato</b>				
-Total production	1465	86	189	1740
-Due to natural calamities	0.92	1.10	0.41	0.87
-Due to disease & Pests	0.65	1.45	0.39	0.66
-.At the time of picking/assembling	0.45	0.66	0.22	0.43
-Grading and packing	0.31	0.20	0.16	0.29
-.Field to road head	0.08	0.16	0.12	0.09
-.Road head to market	0.07	0.20	0.06	0.08
-Market & Storage	0.05	0.23	0.00	0.05
-Total losses	2.52	4.01	1.37	2.47
<b>Peas</b>				
-Total production	657	277	208	1142
-Due to natural calamities	1.24	1.10	0.55	1.08
-Due to disease & Pests	0.97	1.13	0.39	0.90
-.At the time of picking/assembling	0.31	0.36	0.16	0.29
-Grading and packing	0.11	0.21	0.11	0.14
-.Field to road head	0.04	0.11	0.15	0.08
-.Road head to market	0.19	0.05	0.05	0.13
-Market & Storage	0.01	0.00	0.05	0.01
-Total losses	2.87	2.96	1.46	2.63
<b>Cabbage</b>				
-Total production	1328	194	94	1616
-Due to natural calamities	0.82	1.11	0.86	0.85
-Due to disease & Pests	0.58	0.99	0.63	0.64
-.At the time of picking/assembling	0.24	0.80	0.36	0.31
-Grading and packing	0.16	0.26	0.35	0.18
-.Field to road head	0.03	0.05	0.21	0.04
-.Road head to market	0.04	0.05	0.12	0.04
-Market & Storage	0.04	0.00	0.00	0.03
-Total losses	1.91	3.26	2.53	2.11

<b>Cauliflower</b>				
-Total production	611	231	117	959
-Due to natural calamities	0.92	0.52	1.21	0.86
-Due to disease & Pests	0.70	0.63	0.85	0.70
-.At the time of picking/assembling	0.41	0.51	0.07	0.39
-Grading and packing	0.15	0.38	0.13	0.20
-.Field to road head	0.05	0.08	0.02	0.05
-.Road head to market	0.08	0.13	0.10	0.09
-Market & Storage	0.04	0.00	0.00	0.03
-Total losses	2.35	2.25	2.38	2.33
<b>Capsicum</b>				
-Total production	264	60.5	31	355.5
-Due to natural calamities	0.63	0.53	0.32	0.58
-Due to disease & Pests	0.48	0.74	0.23	0.51
-.At the time of picking/assembling	0.25	0.83	0.10	0.33
-Grading and packing	0.45	0.05	0.06	0.35
-.Field to road head	0.02	0.02	0.65	0.08
-.Road head to market	0.06	0.02	0.00	0.05
-Market & Storage	0.06	0.00	0.00	0.05
-Total losses	1.95	2.18	1.35	1.94
<b>Beans</b>				
-Total production	123.5	42	20.5	186
-Due to natural calamities	0.00	0.00	0.00	0.00
-Due to disease & Pests	0.64	0.36	0.05	0.51
-.At the time of picking/assembling	0.72	0.83	0.00	0.67
-Grading and packing	0.26	1.57	0.00	0.53
-.Field to road head	0.16	0.02	0.00	0.11
-.Road head to market	0.06	0.02	0.00	0.04
-Market & Storage	0.10	0.00	0.00	0.06
-Total losses	1.94	2.81	0.05	1.93

as percentage to total production ranges between 1.93 and 2.63 with beans recording the lowest percentage and peas recording the highest percentage. While for most vegetables the highest loss is attributable to natural calamities and diseases and pests, in case of French beans no loss is registered due to vagaries of weather. Further, the percentage of loss due to storage problems is

negligible (less than 0.1) for all vegetables since the produce is marketed in nearby markets soon after harvest.

**Table 6.3. (a) Quantity of Tomato Marketed to Different Markets by Sampled Farmers**

(Qtls./farm)					
Category	Total marketed	Marketed in the village	Marketed in local market	Marketed in Haldwani market	Marketed in Vikas Nagar market
<b>Nainital</b>					
Marginal	9.96 (100)	0	0	9.96 (100)	0
Small	8.39 (100)	0	0	8.39 (100)	0
Medium	3.20 (100)	0	0	3.20 (100)	0
All	9.55 (100)	0	0	9.55 (100)	0
<b>Dehradun</b>					
Marginal	23.19 (100)	0	0	0	23.19 (100)
Small	17.86 (100)	0	0	0	17.86 (100)
Medium	35.58 (100)	0	0	0	35.58 (100)
All	24.00 (100)	0	0	0	24.00 (100)
<b>Overall</b>					
Marginal	33.16 (100)	0	0	9.96 (30)	23.19 (70)
Small	26.25 (100)	0	0	8.39 (32)	17.86 (68)
Medium	38.78 (100)	0	0	3.20 (8)	35.58 (92)
All	33.55 (100)	0	0	9.55 (28)	24.00 (72)

**Table 6.3. (b) Quantity of Peas Marketed to Different Markets by Sampled Farmers**

(Qtls./farm)

Category	Total marketed	Marketed in the village	Marketed in local market	Marketed in Haldwani market	Marketed in Vikas Nagar market
<b>Nainital</b>					
Marginal	12.06 (100)	0	0	12.06 (100)	0
Small	20.32 (100)	0	0	20.32 (100)	0
Medium	36.40 (100)	0	0	36.40 (100)	0
All	14.45 (100)	0	0	14.45 (100)	0
<b>Dehradun</b>					
Marginal	12.01 (100)	0	0	0	12.01 (100)
Small	13.68 (100)	0	0	0	13.68 (100)
Medium	40.15 (100)	0	0	0	40.15 (100)
All	18.52 (100)	0	0	0	18.52 (100)
<b>Overall</b>					
Marginal	24.07 (100)	0	0	12.06 (50)	12.01 (50)
Small	34.00 (100)	0	0	20.32 (60)	13.68 (40)
Medium	76.55 (100)	0	0	36.40 (48)	40.15 (52)
All	32.97 (100)	0	0	14.45 (44)	18.52 (56)

**Table 6.3. (c) Quantity of Cabbage Marketed to Different Markets by Sampled Farmers**

(Qtls./farm)

Category	Total marketed	Marketed in the village	Marketed in local market	Marketed in Haldwani market	Marketed in Vikas Nagar market
<b>Nainital</b>					
Marginal	28.54 (100)	0	0	28.54 (100)	0
Small	20.35 (100)	0	0	20.35 (100)	0
Medium	26.40 (100)	0	0	26.40 (100)	0
All	27.19 (100)	0	0	27.19 (100)	0
<b>Dehradun</b>					
Marginal	9.09 (100)	0	0	0	9.09 (100)
Small	7.13 (100)	0	0	0	7.13 (100)
Medium	19.57 (100)	0	0	0	19.57 (100)
All	10.92 (100)	0	0	0	10.92 (100)
<b>Overall</b>					
Marginal	37.63 (100)	0	0	28.54 (76)	9.09 (24)
Small	27.48 (100)	0	0	20.35 (74)	7.13 (26)
Medium	45.97 (100)	0	0	26.40 (57)	19.57 (43)
All	38.11 (100)	0	0	27.19 (71)	10.92 (29)

## Markets for Vegetable Crops

6.10 The six vegetables produced by the farmers are supplied primarily to two markets, namely Vikas Nagar in Dehradun district and Haldwani in Nainital district. The following six tables show the quantities of these vegetables marketed by farmers of each category in different markets. It is to be noticed from these tables that all the sampled farmers in Nainital district sell the vegetables they grow in Haldwani and those in Dehradun district sell their vegetables in Vikas Nagar market, i.e. within the district itself. From table 6.2 (a) it can be seen that while marginal farmers supply highest quantity of tomato equal to 9.96 quintals per farm, medium farmers market only 3.20 quintals per farm. The scenario is however different in Dehradun with medium farmers marketing highest quantity followed by marginal and small farmers. The overall ordering from highest to lowest supplier is medium, marginal and small. As is shown in table 6.2 (b), the order of highest to lowest supplier in Nainital is medium, small and marginal which is reflected in the overall picture as well in spite of the fact that in Dehradun the ordering is slightly different with medium at the top followed by small and then by marginal farmers.

6.11 In spite of smaller farm area marginal farmers in Nainital supply higher quantity of cabbage than farmers in any other category in that district. However, the ranking in case of Dehradun is medium followed by marginal and small which is also the picture overall.

6.12 For the vegetable cauliflower small farmers in Nainital supply highest quantity followed by medium farmers and lastly by marginal farmers which also is the overall picture. The corresponding order in Dehradun is medium followed by small and marginal farmer.

6.13 The supply of capsicum per farm is much lower than other vegetables. For this particular vegetable small farmers supply highest quantity in Nainital followed by marginal and medium farmers whereas in Dehradun it is the medium farmers who market highest quantity followed by marginal and small farmers.

6.14 In case of French beans medium farmers in Nainital do not market any of their produce as was seen from table 6.1 (f) whereas small farmers market higher per farm output than marginal farmers. In contrast medium farmers supply highest quantity per farm followed by small farmers and finally by marginal ones in Dehradun.



**Table 6.3 (d) Quantity of Cauliflower Marketed to Different Markets by Sampled Farmers**

(Qtls./farm)					
Category	Total marketed	Marketed in the village	Marketed in local market	Marketed in Haldwani market	Marketed in Vikas Nagar market
<b>Nainital</b>					
Marginal	9.36 (100)	0	0	9.36 (100)	0
Small	38.18 (100)	0	0	38.18 (100)	0
Medium	15.90 (100)	0	0	15.90 (100)	0
All	16.00 (100)	0	0	16.00 (100)	0
<b>Dehradun</b>					
Marginal	13.52 (100)	0	0	0	13.52 (100)
Small	13.56 (100)	0	0	0	13.56 (100)
Medium	23.08 (100)	0	0	0	23.08 (100)
All	14.62 (100)	0	0	0	14.62 (100)
<b>Overall</b>					
Marginal	22.88 (100)	0	0	9.36 (41)	13.52 (59)
Small	51.74 (100)	0	0	38.18 (74)	13.56 (26)
Medium	38.98 (100)	0	0	15.90 (41)	23.08 (59)
All	30.62 (100)	0	0	16.00 (52)	14.62 (48)

**Table 6.3. (e) Quantity of Capsicum Marketed to Different Markets  
by Sampled Farmers**

<b>(Qtls./farm)</b>					
<b>Category</b>	<b>Total marketed</b>	<b>Marketed in the village</b>	<b>Marketed in local market</b>	<b>Marketed in Haldwani market</b>	<b>Marketed in Vikas Nagar market</b>
<b>Nainital</b>					
Marginal	5.00 (100)	0	0	5.00 (100)	0
Small	7.87 (100)	0	0	7.87 (100)	0
Medium	4.44 (100)	0	0	4.44 (100)	0
All	5.86 (100)	0	0	5.86 (100)	0
<b>Dehradun</b>					
Marginal	9.10 (100)	0	0	0	9.10 (100)
Small	8.25 (100)	0	0	0	8.25 (100)
Medium	11.47 (100)	0	0	0	11.47 (100)
All	9.22 (100)	0	0	0	9.22 (100)
<b>Overall</b>					
Marginal	14.10 (100)	0	0	5.00 (35)	9.10 (65)
Small	16.11 (100)	0	0	7.87 (49)	8.25 (51)
Medium	15.91 (100)	0	0	4.44 (28)	11.47 (72)
All	15.08 (100)	0	0	5.86 (39)	9.22 (61)

**Table 6.3. (f) Quantity of French Beans Marketed to Different Markets  
by Sampled Farmers**

(Qtls./farm)					
Category	Total marketed	Marketed in the village	Marketed in local market	Marketed in Haldwani market	Marketed in Vikas Nagar market
<b>Nainital</b>					
Marginal	5.06 (100)	0	0	5.06 (100)	0
Small	6.42 (100)	0	0	6.42 (100)	0
Medium	0.00	0	0	0.00	0
All	5.14 (100)	0	0	5.14 (100)	0
<b>Dehradun</b>					
Marginal	4.23 (100)	0	0	0	4.23 (100)
Small	5.48 (100)	0	0	0	5.48 (100)
Medium	19.79 (100)	0	0	0	19.79 (100)
All	5.91 (100)	0	0	0	5.91 (100)
<b>Overall</b>					
Marginal	9.29 (100)	0	0	5.06 (54)	4.23 (46)
Small	11.90 (100)	0	0	6.42 (54)	5.48 (46)
Medium	19.79 (100)	0	0	0	19.79 (100)
All	11.05 (100)	0	0	5.14 (47)	5.91 (53)

### **Producers' Share and Marketing Margin**

6.15 The next four tables show how much of the price paid by the consumers actually reaches the producers of these vegetables. As can be seen from tables 6.4 (a), for Haldwani market the net

**Table 6.4 (a) Producers' Share and Marketing Margin in Marketing of Vegetables  
(For Haldwani Market)**

**(Rs./Qtl.)**

<b>Particulars</b>	<b>Tomato</b>	<b>Peas</b>	<b>Cabbage</b>	<b>Cauliflower</b>	<b>French beans</b>	<b>Capsicum</b>
1.Net price received by growers	2250	4314	1512	2203	3651	2483
2.Expenses incurred by growers						
i)Assembling, packing and grading	301	298	270	293	310	336
ii)Packing material	57	53	39	42	43	77
iii)Carriage upto road head	22	34	46	69	20	23
iv)Transportation upto ..... market	59	87	54	78	113	100
v)Loading/unloading	11	8	7	11	12	13
vi)Commission & market fee	10	16	5	13	21	15
vii)State tax, octrio etc.	0	0	0	0	0	0
viii) Miscellaneous	0	0	0	2	0	3
Sub-Total	460	496	421	508	520	567
3. Wholesale price	3818	4700	3000	3063	4100	4900
4. Expenses incurred by commission agent/mashakhors						
a)Carriage, handling & transport etc.	120	50	40	107	75	117
b)Market fee & commission	0	0	0	0	0	0
Sub-Total	120	50	40	40	107	117
5.Mashakhors' margin	443	417	460	360	343	884
6. Mashakhors sale price	4382	5167	3500	3462.5	4550	5900
7.Retailers' Expenses						
-Carriage & handling charges	155	160	150	125	140	156
- Retailer losses	0	0	0	0	0	0
Sub-total	155	160	150	150	125	156
8.Retailers' margin	558	500	1000	533	425	1000
9.Consumers' price	5095	5827	4650	4146	5100	7056

**Table 6.4 (b) Producers' Share and Marketing Margin in Marketing of Vegetables  
(For Haldwani Market)**

(Percentage to total)

<b>Particulars</b>	<b>Tomato</b>	<b>Peas</b>	<b>Cabbage</b>	<b>Cauliflower</b>	<b>French beans</b>	<b>Capsicum</b>
1.Net price received by growers	44	74	33	53	72	35
2.Expenses incurred by growers	-	-	-	-	-	-
i)Assembling, packing and grading	6	5	6	7	6	5
ii)Packing material	1	1	1	1	1	1
iii)Carriage upto road head	0	1	1	2	0	0
iv)Transportation upto ..... market	1	1	1	2	2	1
v)Loading/unloading	0	0	0	0	0	0
vi)Commission & market fee	0	0	0	0	0	0
vii)State tax, octrio etc.	0	0	0	0	0	0
viii) Miscellaneous	0	0	0	0	0	0
Sub-Total	9	9	9	12	10	8
3. Wholesale price	75	81	65	74	80	69
4. Expenses incurred by commission agent/mashakhors	0	0	0	0	0	0
a)Carriage, handling etc.	2	1	1	3	1	2
b)Market fee & commission	0	0	0	0	0	0
Sub-Total	2	1	1	1	2	2
5.Mashakhors' margin	9	7	10	9	7	13
6. Mashakhors sale price	86	89	75	84	89	84
7.Retailers' Expenses						
- Carriage & handling charges	3	3	3	3	3	2
- Retailer losses	0	0	0	0	0	0
Sub-total	3	3	3	4	2	2
8.Retailers' margin	11	9	22	13	8	14
9.Consumers' price	100	100	100	100	100	100

**Table 6.4 (c) Producers' Share and Marketing Margin in Marketing of Vegetables  
(For Vikas Nagar Market)**

(Rs./Qtl.)

<b>Particulars</b>	<b>Tomato</b>	<b>Peas</b>	<b>Cabbage</b>	<b>Cauliflower</b>	<b>French beans</b>	<b>Capsicum</b>
1.Net price received by growers	2029	2612	1615	2143	2449	2231
2.Expenses incurred by growers						
i)Assembling, packing and grading	237	258	309	337	258	316
ii)Packing material	29	39	49	39	53	70
iii)Carriage upto road head	57	72	51	48	47	44
iv)Transportation upto ..... market	110	141	132	155	138	143
v)Loading/unloading	9	13	10	10	12	10
vi)Commission & market fee	9	11	9	33	89	27
vii)State tax, octrio etc.	0	0	0	0	0	0
viii) Miscellaneous	0	0	0	0	0	0
Sub-Total	450	535	560	622	596	610
3. Wholesale price	3818	4700	3000	3063	4100	4900
4. Expenses incurred by commission agent/mashakhors						
a)Carriage, handling etc.	120	50	40	107	75	117
b)Market fee & commission	0	0	0	0	0	0
Sub-Total	120	50	40	40	107	117
5.Mashakhors' margin	443	417	460	360	343	884
6. Mashakhors sale price	4382	5167	3500	3463	4550	5900
7.Retailers' Expenses						
- Carriage & handling charges	155	160	150	125	140	156
- Retailer losses	0	0	0	0	0	0
Sub-total	155	160	150	150	125	156
8.Retailers' margin	558	500	1000	533	425	1000
9.Consumers' price	5095	5827	4650	4146	5100	7056

**Table 6.4 (d) Producers' Share and Marketing Margin in Marketing of Vegetables  
(For Vikas Nagar Market)**

**(Percentage to total)**

<b>Particulars</b>	<b>Tomato</b>	<b>Peas</b>	<b>Cabbage</b>	<b>Cauliflower</b>	<b>French beans</b>	<b>Capsicum</b>
1.Net price received by growers	40	45	35	52	48	32
2.Expenses incurred by growers	0	0	0	0	0	0
i)Assembling, packing and grading	5	4	7	8	5	4
ii)Packing material	1	1	1	1	1	1
iii)Carriage upto road head	1	1	1	1	1	1
iv)Transportation upto ..... market	2	2	3	4	3	2
v>Loading/unloading	0	0	0	0	0	0
vi)Commission & market fee	0	0	0	1	2	0
vii)State tax, octrio etc.	0	0	0	0	0	0
viii) Miscellaneous	0	0	0	0	0	0
Sub-Total	9	9	12	15	12	9
3. Wholesale price	75	81	65	74	80	69
4. Expenses incurred by commission agent/mashakhors	0	0	0	0	0	0
a)Carriage, handling etc.	2	1	1	3	1	2
b)Market fee & commission	0	0	0	0	0	0
Sub-Total	2	1	1	1	2	2
5.Mashakhors' margin	9	7	10	9	7	13
6. Mashakhors sale price	86	89	75	84	89	84
7.Retailers' Expenses						
- Carriage & handling charges	3	3	3	3	3	2
- Retailer losses	0	0	0	0	0	0
Sub-total	3	3	3	4	2	2
8.Retailers' margin	11	9	22	13	8	14
9.Consumers' price	100	100	100	100	100	100

price received by the growers range between 33 per cent and 74 per cent with cabbage and capsicum growers getting as low as 33 per cent and 35 per cent of the consumers' price respectively whereas the growers of French beans and peas getting as high as 72 and 74 per cent of the price respectively. The whole sale prices for these vegetables on the hand range between 65 and 81 per cent of the consumer price. On the other hand table 6.4 (b) shows that this difference between the wholesale price and the consumer price is on account of Mashakors' and retailers' margin. While Mashakors' margin ranges between 7 and 13 per cent, retailers' margin can be as high as 22 per cent with the lowest such margin recorded as 8 per cent of the price.

However the situation is more precarious for those marketing their produce in Vikas Nagar market, as shown in tables 6.4 (c) and (d) below. For example, when the price paid for capsicum by the consumers is Rs 7056 per quintal, the net price received by the producer is only Rs 2231 per quintal. If the situation is not this bad for other vegetables they are comparable. With producers receiving between 32 and 52 per cent of the consumer price there must be host of intermediaries in the entire chain. The wholesale price lying between 65 and 81 per cent of the market price, the difference from the price paid by the consumers is accounted for by the retailers' and Mashakors' margin.



## **CHAPTER 7**

### **Off-Season Vegetables in Polyhouses**

7.1 The adoption of poly house technology for growing off-season vegetables demonstrated a strong correlation between agricultural growth and economic prosperity in high hills of Chamoli district in Uttarakhand. However, the current scenario in the studied area reflects the need for a new and effective technology which can improve continuously the productivity, profitability and sustainability of poly house farming systems. According to this study about 80 per cent of the crops, either food crops or cash crops are grown in open field whereas 20 per cent of the crops, mostly off season vegetables, are grown in poly houses. The farmers of the studied region are growing some high-value off season vegetables inside poly-houses on a regular basis by providing protection from excessive cold. The present chapter discusses the costs and returns of growing off-season vegetables in poly houses and the marketing system in place for these vegetables.

#### **7.1. Costs and Returns of Off-Season Vegetables in Poly houses**

##### **Cost of construction of Polyhouse**

7.2 This section deals with the cost of constructing multi-span structure of polyhouses as well as the cost and returns from cultivation of off-season vegetables inside poly house. The cost estimates may vary considerably for farmers operating different sizes of poly houses and there might be no difference in the cost of the farmers among those who have operated in the polyhouses of same size as the proportionate subsidy scheme was announced by the state government for the area size of 30-200 square meters of polyhouse and other construction inputs for building up a poly house. The cost specification for construction of a single poly house to grow off season vegetables is given in the following table. The construction of a poly house in the studied area require land leveling, planning and drawing the lay out, erection of structure and trellis, installation of drip irrigation, provision of sun shades and coverage of the polyhouse by polythene. For leveling of land both the imputed value of family labor and the value of hired labor are Rs. 1268.62 which leads to an approximate cost of about Rs. 2537 for land leveling. For planning and drawing the lay out, both the imputed value of family labor and the value of hired labour are Rs. 475.48 and the material cost is Rs. 158.58 so that the total cost for drawing lay out is approximately Rs. 1110. The third and very important variable contributing towards the cost of

construction of a poly-house is the erection of structure in which again both the imputed value of family labor and the value of hired labor are Rs. 1268.62 followed by the material cost of Rs. 9831.80 so that the total cost for the erection of structure is Rs. 12369 per poly-house. The fourth component is covering by polythene in which the value of hired labor is Rs. 1585.77, the material cost is Rs. 16914.93 which totals to a figure of Rs. 18501. Further, the cost for provision of sun shades includes only the value of hired labor of Rs. 370.01 and the material cost of Rs. 1427.20 since no family labour being used for this purpose. This brings the total cost calculated under this head approximately to Rs. 1797. However, for erection of trellis only family labour is being used, the imputed value of which is Rs. 845.75 and the material cost is Rs. 364.73. In absence of hired labour the total cost figure comes to approximately Rs. 1210.

**Table 7.1.1.(a) Cost of Construction of Polyhouse (33-1 00M<sup>2</sup>)**

<b>Particulars</b>	<b>Imputed value of family labour</b>	<b>Value of hired labour</b>	<b>Material cost</b>	<b>Total Cost</b>
Land leveling	1268.62	1268.62	0	<b>2537</b>
Lay out	475.73	475.73	158.58	<b>1110</b>
Erection of structure	1268.62	1268.62	9831.80	<b>12369</b>
Covering by polythene	0	1585.77	16914.93	<b>18501</b>
Provision of sun shades	0	370.01	1427.2	<b>1797</b>
Erection of Trellis	845.75	0	364.73	<b>1210</b>
Provision of shelves	0	0	0	<b>0</b>
Heaters	0	0	0	<b>0</b>
Coolers	0	0	0	<b>0</b>
Humidifiers	0	0	0	<b>0</b>
Drip irrigation system	0	237.87	2008.65	<b>2247</b>
Drip irrigation	264.3	0	1797.21	<b>2062</b>
Fogger	0	0	0	<b>0</b>
Other	0	211.44	243.15	<b>455</b>
Total cost	4123.01	5418.06	32746.25	<b>42287</b>
Amount of subsidy	-	-	-	<b>38678</b>
Net cost paid by farmer	-	-	-	<b>3609</b>

7.3 Among other items on which significant costs are being incurred is setting up drip irrigation system in place and running it. The value of hired labour per poly house for installing drip irrigation system is Rs. 237.87 and the material cost is 2008.65 which take the total cost on this account to approximately Rs. 2247. Further for maintaining drip irrigation the imputed value of labour is Rs, 264.30 and the material cost is Rs. 1797.21 with the total cost coming to Rs. 2062. Total costs under some other miscellaneous heads stands at Rs. 455. As a result, the average cost of construction of a poly-house of size 33- 100 square meters is Rs. 42287 which can be split into imputed value of family labor at Rs. 4123.01; value of hired labor of Rs. 5418.06 and the material cost of Rs. 32746.25. Since the state government of Uttarakhand has announced an average subsidy of Rs. 38678 for construction of a poly-house under the state horticulture mission, the net cost paid per farmer turns out to be about Rs. 3609.

7.4 During the field survey it has come to the notice of the survey team that although under poly house cultivation yield may be 10-12 times higher than that of outdoor cultivation depending upon the type of poly-house, type of vegetable crop and other advanced environmental control facilities, from the perspective of economic growth adoption of poly-house techniques for protected cultivation has not been quite successful in high hills, for instance in the blocks of Tapovan and Urgam due to the fact that advanced technologies like Provision of shelves, heaters, coolers, humidifiers, evaporative cooling, nutrient application system, porous flooring and benches are still not in use there.

## **Cost of Cultivation of Vegetable Crops**

### **Cost of Cultivation of Capsicum**

7.5 The present study is mainly focused on calculation of cost of five off season vegetables such as capsicum, cauliflower, tomato, peas and French beans. Table 7.1.2. (a) presents the cost of cultivation of capsicum inside polyhouse. The costs of different items were calculated in rupees per poly- house and the percentage shares of cost of each of these items were also calculated for the sampled farmers.

7.6 According to the table the cost of formation of beds for the sampled farmers amounts to Rs. 1190, this cost is also the overall cost for formation of beds and contributed 11.76 per cent of

the total cost incurred in cultivation of capsicum in poly- house. The cost of seed/ seedlings was calculated to Rs. 1156.75 and contributed 11.43 per cent of total cost of cultivation.

7.7 The cost of transplanting was calculated to be Rs. 602.26 and constituted about 5.95 per cent of the total cost of cultivation of capsicum. Another item was manuring/ farm yard manuring which costs Rs. 2031.75 and contributed around 20.08 per cent to the total cost of cultivation.

**Table 7.1.2.(a) Cost of Cultivation of Capsicum in Poly-house**  
(Rs./poly-house)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	1190.00	0.00	0.00	1190.00	11.76
Seed/ seedlings	1156.75	0.00	0.00	1156.75	11.43
Transplanting	602.26	0.00	0.00	602.26	5.95
Manuring /FYM	2032.75	0.00	0.00	2032.75	20.08
Vermicompost	0.00	0.00	0.00	0.00	0.00
Fertilizer	0.00	0.00	0.00	0.00	0.00
Insecticides/pesticides	53.34	0.00	0.00	53.34	0.53
Inter culture	1239	0.00	0.00	1239	12.24
Irrigation	1137.5	0.00	0.00	1137.5	11.24
Spraying	993.59	0.00	0.00	993.59	9.82
Stalking etc.	439.09	0.00	0.00	439.09	4.34
Harvesting/ picking	1277.5	0.00	0.00	1277.5	12.62
Soil sterilization	0.00	0.00	0.00	100.0	0.00
Total	10121.78	0.00	0.00	10121.78	100.00

7.8 The items like vermicompost and other chemical fertilizers were not in use in the studied area and hence have a zero value. The cost of items like insecticides and pesticides was calculated Rs. 53.34 which further amounted to 0.53 per cent of the total cost incurred in cost of cultivation of capsicum. The item, inter culture was calculated at Rs. 1239 and it contributed 12.24 per cent of the total cost of cultivation. The cost of irrigation was calculated at Rs. 1137.5 and it amounted to 11.24 per cent of the total cost of cultivation incurred in producing capsicum under poly- house pattern.

7.9 There are items like spraying which added Rs. 993.59 to the cost of cultivation in case of small farmers and contributed 9.82 per cent of the total cost of cultivation of capsicum. Cost of staking is Rs. 439.09 and added 4.34 per cent to total cost of cultivation. The last item is harvesting and picking of capsicum the cost of which comes out to Rs. 1277.5 and added 12.62 per cent to the total cost of cultivation of capsicum. There were no provision for soil sterilization and hence it cost to zero value. This way the total cost of cultivation of capsicum amounts to Rs. 10121.78 for the small farmers.

**Table 7.1.2.(b) Cost of Cultivation of Tomato in Poly house**  
(Rs. /polyhouse)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	700.00	0.00	0.00	700.00	13.23
Seed/ seedlings	700.00	0.00	0.00	700.00	13.23
Transplanting	300.00	0.00	0.00	300.00	5.67
Manuring/FYM	791.67	0.00	0.00	791.67	14.96
Vermicompost	0.00	0.00	0.00	0.00	0.00
Fertilizer	0.00	0.00	0.00	0.00	0.00
Insecticides/pesticides	195.00	0.00	0.00	195.00	3.69
Inter culture	583.33	0.00	0.00	583.33	11.03
Irrigation	525.00	0.00	0.00	525.00	9.92
Spraying	272.92	0.00	0.00	272.92	5.16
Staking etc.	464.58	0.00	0.00	464.58	8.78
Harvesting/ picking	758.33	0.00	0.00	758.33	14.33
Soil sterilization	0.00	0.00	0.00	0.00	0.00
Total	5290.83	0.00	0.00	5290.83	100.00

7.10 Table 7.1.2. (b) shows the total cost of cultivation incurred during the production of tomato in rupees per poly- house. Of the various items which contributed to the total cost of cultivation of tomato, the cost of formation of beds is found to be Rs. 700 which accounts for 13.23 per cent of the total cost. Seed or seeding was another item in table which shows an amount of Rs. 700 and contributed 13.23 per cent of the total cost of cultivation.

7.11 Transplanting was the next item which was contributing Rs. 300 to total cost and was adding only 5.67 per cent to calculate the total cost of cultivation. The other most important item was manuring and farm yard manuring which amounts to Rs. 791.67 and added 14.96 per cent to the total cost of cultivation of tomato per poly house.

7.12 In cultivation of tomato also there were no use of vermicompost and other chemically treated fertilizer hence no cost was added to the total on that account. The cost of next item insecticides and pesticides was Rs. 195 and added only 3.69 per cent to the total cost of cultivation of tomato per poly- house. The cost of inter culture was calculated to be Rs. 583.33 which contributed 11.03 per cent to the total cost of cultivation. Similarly, the cost of irrigation was calculated at Rs. 525 and contributed 9.92 per cent to the total cost of cultivation of tomato.

7.13 There was use of chemically treated spray which prevent the vegetable of tomato from insects and fungus which amounts to Rs. 272.92 for small farmers per poly house and contributed 5.16 per cent of the total cost of cultivation of tomato. There was use of stalking sticks for the cultivation of tomato of which the cost was found to be Rs. 464.58 for small farmers per poly house and it accounts for 8.78 per cent of the total cost of cultivation.

7.14 The last and the most important item was harvesting and picking up the tomato of which the cost was calculated to be Rs. 758.33 for small farmers per poly house and contributed 14.33 per cent of the total cost cultivation of the tomato. There was no use of soil sterilization hence the cost was zero. This way the total cost of cultivation of tomato was found Rs. 5290.83 for small farmers per poly house of 33 square meters.

7.15 Table 7.1.2. (c) shows the detailed break-up of the total cost of cultivation per poly house for the vegetable peas. The first item was formation of beds which was amounted to Rs. 840 and contributed 14.28 per cent to the total cost of cultivation of pea. The seed and seedlings is also the same as that for the formation of bed. The next item was transplanting the cost of which amounts to Rs. 450 and it has been contributing 7.65 per cent of the total cost of cultivation. The most important item was manuring and farm yard manuring of the cost of Rs. 896 and contributed 15.23 per cent to the total cost cultivation. In the production of pea also there was no use of vermicompost and other chemically treated fertilizer and hence the cost of these two items was. The next very important item is insecticides and pesticides used to grow pea in poly house by the small farmers which costs Rs. 330 per poly house and added 5.61 per cent to the total cost of cultivation of pea. The use of inter culture for growing pea under protected agricultural pattern

was amounted to Rs. 770 and added 13.09 per cent to the total cost of cultivation of pea. Irrigation was calculated of Rs. 437.50 and added 7.44 per cent to the total cost of cultivation of the pea for small poly house farmers of an area of 33 square meters. The use of spray inside a poly house for growing pea was calculated of an amount of Rs. 290 and it contributed 4.93 per cent of the total cost of cultivation of pea. The cost of staking is calculated at Rs. 260 and contributed 4.42 per cent of the total cost of cultivation. The last important item is harvesting and picking of pea the

**Table 7.1.2.(c) Cost of Cultivation of Pea in Poly house**

(Rs. /poly house)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	840.00	0.00	0.00	840.00	14.28
Seed/ seedlings	840.00	0.00	0.00	840.00	14.28
Transplanting	450.00	0.00	0.00	450.00	7.65
Manuring/FYM	896.00	0.00	0.00	896.00	15.23
Vermicompost	0.00	0.00	0.00	0.00	0.00
Fertilizer	0.00	0.00	0.00	0.00	0.00
Insecticides/pesticides	330.00	0.00	0.00	330.00	5.61
Inter culture	770.00	0.00	0.00	770.00	13.09
Irrigation	437.50	0.00	0.00	437.50	7.44
Spraying	290.00	0.00	0.00	290.00	4.93
Staking etc.	260.00	0.00	0.00	260.00	4.42
Harvesting/ picking	770.00	0.00	0.00	770.00	13.09
Soil sterilization	0.00	0.00	0.00	0	0.00
Total	5883.50	0.00	0.00	5883.5	100.00

the cost of which stands at Rs. 770 and added 13.09 per cent to the total cost of cultivation of pea. There was no use of soil sterilization hence added zero to the cost of cultivation of pea. Thus the total cost of cultivation of pea was calculated around Rs. 5883.50 under protected agricultural pattern for small poly house farmers in district Chamoli of state Uttarakhand.

7.16 Table 7.1.2. (d) shows the total cost of different items which involves in calculation of the total cost of cultivation of cauliflower in rupees per poly house. The first item is formation of beds which costs Rs. 910 per poly house and added 15.44 per cent to the total cost of cultivation. The next item was seed and seedlings which costs Rs. 840 and added 14.25 per cent to the total cost of cultivation. Transplanting was next item which was amounts to Rs. 360 and added 6.11 per cent for calculating the total cost of cultivation. A cost of Rs. 815 was incurred for manuring and farm yard manuring and added 13.83 per cent to the total cost of cultivation of cauliflower. The items like vermicompost and chemically treated fertilizers are not in use hence they are show to be zero in the table. The cost of insecticides and pesticides are calculated to be Rs. 285 and added only 4.83 per cent to the total cost of cultivation of cauliflower. Inter culture has added an expense of Rs. 840 per house and contributed 14.25 per cent to the total cost of cultivation. On account of irrigation a cost of Rs. 490 is incurred which added 8.31 per cent to the total cost of cultivation of cauliflower.

**Table 7.1.2.(d) Cost of Cultivation of Cauliflower in Poly house**

(Rs. /poly house)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	910.00	0.00	0.00	910.00	15.44
Seed/ seedlings	840.00	0.00	0.00	840.00	14.25
Transplanting	360.00	0.00	0.00	360.00	6.11
Manuring/FYM	815.00	0.00	0.00	815.00	13.83
Vermicompost	0.00	0.00	0.00	0.00	0.00
Fertilizer	0.00	0.00	0.00	0.00	0.00
Insecticides/pesticides	285.00	0.00	0.00	285.00	4.83
Inter culture	840.00	0.00	0.00	840.00	14.25
Irrigation	490.00	0.00	0.00	490.00	8.31
Spraying	380.00	0.00	0.00	380.00	6.45
Stalking etc.	205.00	0.00	0.00	205.00	3.48
Harvesting/ picking	770.00	0.00	0.00	770.00	13.06
Soil sterilization	0.00	0.00	0.00	0.00	0.00
Total	5895.00	0.00	0.00	5895	100.00



7.17 The cost of spraying to grow cauliflower for a small poly house farmer of has been calculated to be Rs. 380 and it further added 6.45 per cent to the total cost of cultivation. The next item was staking for which a cost of Rs. 205 is incurred and contributed 3.48 per cent to the total cost of cultivation of cauliflower. The last and very important item is harvesting and picking for which a cost of Rs. 770 is borne and which added 13.06 per cent to the total cost of cultivation. Again there was no use of soil sterilization and hence the cost of this was zero. The total cost of cultivation added up to Rs. 5895 for a small poly house farmer.

7.18 Finally, table 7.1.2. (e) shows the total cost of various items which contributed to calculate the total cost of cultivation of French beans for small poly house farmers as the area of the poly houses in the studied region was only 33 square meters. The first item was formation of beds of which the cost was calculated around Rs. 816.67 and that item contributed 18.97 per cent to the total cost of cultivation of French beans under poly house agriculture.

**Table 7.1.2.(e) Cost of Cultivation of French bean in Poly house**

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	816.67	0.00	0.00	816.67	18.97
Seed/ seedlings	583.33	0.00	0.00	583.33	13.55
Transplanting	116.67	0.00	0.00	116.67	2.71
Manuring/FYM	381.67	0.00	0.00	381.67	8.87
Vermicompost	0.00	0.00	0.00	0.00	0.00
Fertilizer	0.00	0.00	0.00	0.00	0.00
Insecticides/pesticides	422.50	0.00	0.00	422.50	9.82
Inter culture	700.00	0.00	0.00	700.00	16.26
Irrigation	350.00	0.00	0.00	350.00	8.13
Spraying	154.17	0.00	0.00	154.17	3.58
Staking etc.	195.83	0.00	0.00	195.83	4.55
Harvesting/ picking	583.33	0.00	0.00	583.33	13.55
Soil sterilization	0.00	0.00	0.00	0.00	0.00
Total	4304.17	0.00	0.00	4304.17	100.00

7.19 Cost of seed and seedling amounts to Rs. 583.33 and added 13.55 per cent to the total cost of cultivation. Transplanting was calculated for an amount of Rs. 116.67 and added 2.71 per cent to the total cost of cultivation. Manuring and farm yard manuring was having a cost of Rs. 381.67 and contributed 8.87 per cent to the total cost of cultivation.

7.20 Again the items like vermicompost and fertilizer was not in use during the farming of French beans and was having a zero cost for the studied region and period hence they were not contributing to the total cost of cultivation. Insecticides and pesticides were used to grow the French beans and was having a cost of Rs. 422.50 and contributed 9.82 per cent of the total cost of cultivation.

7.21 Inter culture was calculated to be Rs. 700 and thus it contributed 16.26 per cent of the total cost of cultivation. Irrigation was amounted to Rs. 350 and added 8.13 per cent to the total cost of cultivation. Spraying and staking was calculated for an amount of Rs. 154.17 and Rs. 195.83 respectively, these two items (spraying and staking) added 3.58 per cent and 4.55 per cent respectively to the total cost of cultivation. The last and very important item harvesting and picking was calculated for an amount of Rs. 583.33 and added 13.55 per cent to the total cost of cultivation of French beans for small poly house farmers. There is no tradition of using soil sterilization hence the cost of this item has been shown to be zero. Therefore in total, the cost of growing French beans under protected farming for small poly house farmers is calculated at Rs. 4304.17.

### **Net Returns From Cultivation of Vegetable Crops**

7.22 In this section net returns from all five vegetables are being calculated. It must be noted here that for arriving at the total cost figures used in calculating net returns, respective marketing costs are being added to the production costs of the vegetables represented in the tables 7.1.2 (a) - (e). As can be seen from the following tables, net returns from cultivating these vegetables inside poly houses were invariably negative indicating that it was not economically viable to produce these vegetables inside polyhouses.

### **Net Returns From Cultivation of Capsicum**

7.23 Table 7.1.3.(a) shows the net returns from cultivation of capsicum in poly house. The gross return was the selling price which a farmer received after selling his produce in the market.

**Table 7.1.3.(a) Net Returns From Cultivation of Capsicum in Poly house**

(Rs. /poly house)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	10121.78	0.00	0.00	10121.78
Marketing cost	243.04	0.00	0.00	243.04
Total cost	10364.82	0.00	0.00	10364.82
Gross Returns	4348.8	0.00	0.00	4348.8
Net returns	-6016.02	0.00	0.00	-6016.02

To obtain the net returns total cost was subtracted from gross return. As can be seen from the table the production cost for a farmer amounts to Rs. 10121.78 and the marketing cost amounts to Rs. 243.04 which gave the total cost of Rs. 10365 approximately. The gross return was from capsicum cultivation was Rs. 4348.8 and hence the net return was - Rs. 6016.02.

#### **Net Returns From Cultivation of Tomato**

7.24 Table 7.1.3.(b) shows the net returns from cultivation of tomato in poly house in rupees per poly house. The production cost as has been obtained from table 7.1.2 (b) was Rs. 5290.83 and the marketing cost was Rs. 236.17 which resulted in a total cost of Rs. 5527. Since the gross return or the selling price received by the farmer was Rs. 4428.33, the net returns were obtained as - Rs. 1098.67.

**Table 7.1.3.(b) Net Returns From Cultivation of Tomato in Poly house**

(Rs. /poly house)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	5290.83	0.00	0.00	5290.83
Marketing cost	236.17	0.00	0.00	236.167
Total cost	5527.00	0.00	0.00	5527
Gross Returns	4428.33	0.00	0.00	4428.33
Net returns	-1098.67	0.00	0.00	-1098.7

### Net Returns From Cultivation of Peas

7.25 Table 7.1.3. (c) shows the net return from cultivation of pea in rupees per poly house. While the production cost was found to be Rs. 5883.50, the total marketing cost was Rs. 179. Hence the total cost incurred on cultivation of pea during the studied season was Rs. 6062.50. On the other hand, the farmers received an amount of Rs. 3829.20 as a gross return after selling the produce in the market. Therefore, the net returns from cultivation of peas were Rs. -2233.30 for the farmers growing it.

**Table 7.1.3.(c) Net Returns From Cultivation of Pea in Poly house**

(Rs. /poly house)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	5883.50	0.00	0.00	5883.50
Marketing cost	179.00	0.00	0.00	179
Total cost	6062.50	0.00	0.00	6062.50
Gross Returns	3829.20	0.00	0.00	3829.20
Net returns	-2233.30	0.00	0.00	-2233.30

### Net Returns From Cultivation of Cauliflower

7.26 Table 7.1.3. (d) shows the net returns from cultivation of cauliflower for the sampled farmers. Here the total cost incurred per polyhouse was Rs. 6069.40, the gross return received was Rs. 3270.50 per poly house resulting in a net returns of -Rs.2798.90.

**Table 7.1.3.(d) Net Returns From Cultivation of Cauliflower in Poly house**

(Rs. /poly house)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	5895.00	0.00	0.00	5895
Marketing cost	174.40	0.00	0.00	174.4
Total cost	6069.40	0.00	0.00	6069.4
Gross Returns	3270.50	0.00	0.00	3270.5
Net returns	-2798.90	0.00	0.00	-2798.9

## Net Returns From Cultivation of French bean

The net return from cultivation of French bean is shown in table 7.1.3. (e). The total production cost incurred was Rs. 4304.17 per poly house and the total marketing cost was Rs. 173.33 per poly house. Hence the total cost was Rs. 4477.50 per poly house. Further the table shows a gross return of Rs. 2007.50 per poly house for French bean and hence the net return per poly house turned out to be negative (-Rs. 2470) after deduction of total cost of Rs. 4477.50 from gross return of Rs. 2007.50 per poly house.

**Table 7.1.3.(e) Net Returns From Cultivation of French bean in Poly house**  
(Rs. /poly house)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	4304.17	0.00	0.00	4304.17
Marketing cost	173.33	0.00	0.00	173.33
Total cost	4477.50	0.00	0.00	4477.5
Gross Returns	2007.50	0.00	0.00	2007.5
Net returns	-2470.00	0.00	0.00	-2470

## Net Returns per box From Vegetable Cultivation

7.27 Since the produce is being packed or marketed in bags/ boxes, here the costs and gross/ net returns of each vegetable are being computed per box on the basis of which input – output ratio (or out- input ratio) is being calculated. It is to be noted here that the cost per box includes only the production cost and does not include marketing cost. Input-output ratio has been computed using the formula: Value (Gross returns) per box/ Cost per box. It can be seen from the following tables that the values of input-output ratio are invariably less than 1 which indicates that the value of the output generated per unit cost incurred for producing a vegetable is less than 1. In other words, by cultivating these vegetables inside poly houses commensurate return is not being generated rendering the cultivation of these vegetables unprofitable.

### Net Returns per box From Capsicum Cultivation

7.28 Table 7.1.4. (a) shows the net returns per box and input-output ratio from cultivation of capsicum in poly house. As can be seen from the table, total number of boxes in which the entire production was packed was 321. The average cost per box was Rs. 1579 and the value per box was Rs. 678 so that the average (net) return per box was - Rs. 901. Hence the input output ratio was 0.43 for capsicum.

**Table 7.1.4 (a) Net Returns per Box and Input-output Ratio  
From Cultivation of Capsicum in Poly house**

Cost Items	Category			
	Small	Medium	Large	Over all
Total Production (Boxes)	321	0.00	0.00	321
Cost per Box	1579	0.00	0.00	1579
Value per Box	678	0.00	0.00	678
Return Per Box	-901	0.00	0.00	-901
Input Output ratio	0.43	0.00	0.00	0.43

### Net Returns per box From Tomato Cultivation

7.29 Table 7.1.4. (b) shows the net returns per box and input-output ratio for tomato cultivation in poly house by the sampled farmers. The total number of boxes used for storing the entire produce was 37. The average cost per box was Rs. 853 and the average value per box turned out to be Rs. 714. Accordingly, the average net returns per box were Rs. -139. Hence the input output ratio was found to be 0.84 for tomato which, though better than capsicum, is still indicative of unproductive farming.

**Table 7.1.4(b) Net Returns per Box and Input-output Ratio  
From Cultivation of Tomato in Poly house**

Cost Items	Category			
	Small	Medium	Large	Over all
Total Production (Boxes)	37	0.00	0.00	37
Cost per Box	853	0.00	0.00	853
Value per Box	714	0.00	0.00	714
Return Per Box	-139	0.00	0.00	-139
Input Output ratio	0.84	0.00	0.00	0.84

### Net Returns per box From Peas Cultivation

7.30 Table 7.1.4. (c) defines the net returns per box and input- output ratio from cultivation of peas by the sampled poly house farmers. Since the total produce was contained in 18 boxes, the average cost per box was found to be Rs. 1634 and the average value per box was Rs. 1064. Hence the average net returns per box were turned out to be Rs. -571. The input-output ratio was found to be 0.65, which though is not the lowest but is significantly less than 1.

**Table 7.1.4(c) Net Returns per Box and Input-output Ratio  
From Cultivation of Peas in Polyhouse**

Cost Items	Category			
	Small	Medium	Large	Over all
Total Production (Boxes)	18	0.00	0.00	18
Cost per Box	1634	0.00	0.00	1634
Value per Box	1064	0.00	0.00	1064
Return Per Box	-571	0.00	0.00	-571
Input Output ratio	0.65	0.00	0.00	0.65

### Net Returns per box From Cauliflower Cultivation

7.31 Table 7.1.4 (d) presents the average net returns per box and input- output ratio from cultivation of cauliflower by the sampled poly house farmers during the studied season. The table exhibits that the entire produce of cauliflower could be contained in 25 boxes. The average cost per box went up to Rs. 1179 per box and the average value per box was Rs. 654. Hence the average net return per box was -Rs. 525 during the studied period.

Further the table shows that the input-output ratio was 0.55 for cultivation of cauliflower in the poly houses which clearly indicates the cauliflower cultivation inside polyhouse is not economical.

**Table 7.1.4(d) Net Returns per Box and Input-output Ratio  
From Cultivation of Cauliflower in Polyhouse**

Cost Items	Category			
	Small	Medium	Large	Over all
Total Production (Boxes)	25	0.00	0.00	25
Cost per Box	1179	0.00	0.00	1179
Value per Box	654	0.00	0.00	654
Return Per Box	-525	0.00	0.00	-525
Input Output ratio	0.55	0.00	0.00	0.55

**Net Returns per box From French beans Cultivation**

7.32 Table 7.1.4 (e), besides revealing that the 6 boxes were used to pack the produce of French bean also shows that the average cost of production per box was Rs. 2152 and the average value per box was Rs. 335. Hence the average net returns per box were -Rs. 1818 which leads to an

**Table 7.1.4(e) Net Returns per Box and Input-output Ratio  
From Cultivation of French Beans in Polyhouse**

Cost Items	Category			
	Small	Medium	Large	Over all
Total Production (Boxes)	6	0.00	0.00	6
Cost per Box	2152	0.00	0.00	2152
Value per Box	335	0.00	0.00	335
Return Per Box	-1818	0.00	0.00	-1818
Input Output ratio	0.16	0.00	0.00	0.16



input-output (rather output-input) ratio of just 0.16. The ratio is lowest among all the vegetables under study indicating that French beans is the most unproductive among the vegetables cultivated inside polyhouse by the sampled farmers.

### **Comparison of costs and returns from vegetables grown inside and outside poly house**

7.33 For farmers cultivating inside poly houses, construction of poly houses themselves accounts for a huge cost in the first place which their counterparts, farming outside poly houses, do not have to bear. However, the state government in a bid to promote poly house farming has subsidized the construction of the polyhouses, sometimes to the extent of covering full cost borne by the farmers. Even then, the input-output ratio was found to be much lower when the same vegetable was grown inside polyhouse as compared to when it was cultivated without polyhouse. In fact, when the vegetables were grown outside polyhouse the input-output ratio were found to be invariably greater than 2, in some cases ending up very close to 3, whereas when they are grown inside polyhouse they are always less than 1 with the lowest ratio being as low as 0.16. A quick comparison between tables 5.8 and 7.1.4 (a)- (e) would reveal that while the overall input-ratio for tomato, capsicum, cauliflower, peas and French bean are 2.31, 2.89, 2.82, 2.16, and 2.55 respectively when they are grown outside polyhouse, the corresponding figures for cultivation inside polyhouse are 0.84, 0.43, 0.55, 0.65 and 0.16.

## **7.2. Marketing System of Poly house Vegetable Crops**

### **Production and Utilization of Vegetable Crops**

7.34 Table 7.2.1 shows the production and utilization of the five vegetable crops, tomato, capsicum, cauliflower, peas and French beans in sampled poly houses. As was noted earlier, poly houses were all small hence the corresponding values are all same for small and overall category. From the table it can be easily read that the total production of capsicum was approximately 64 quintals. On the other hand, 1.64 per cent is lost for various reasons related to production and marketing, further 15.21 per cent is used for family consumption, 3.21 per cent retained as gifts and 2.29 per cent is handed out as wages in kind to the hired labours. The rest amount of only about 50 quintals of capsicum

**Table 7.2.1. Production and Utilization of Vegetable Crops in Sampled Poly houses**

Category	Production (Boxes/year)	(% of total production)			
		Losses	Retained for		
			Family	Gifts	Wages
<b>Capsicum (Box/ Bag of 20 Kgs.)</b>					
Small	321	1.64	15.21	3.21	2.29
Medium	0	0	0	0	0
Large	0	0	0	0	0
Overall	321	1.64	15.21	3.21	2.29
<b>Tomato (Box/Bag of 25 Kgs.)</b>					
Small	37	0.43	15.59	1.61	0.65
Medium	0	0	0	0	0
Large	0	0	0	0	0
Overall	37	0.43	15.59	1.61	0.65
<b>Pea(Box/Bag of 25 Kgs.)</b>					
Small	18	0.00	17.02	3.19	0.00
Medium	0	0	0	0	0
Large	0	0	0	0	0
Overall	18	0.00	17.02	3.19	0.00
<b>Cauliflower (Box/Bag of 25 Kgs.)</b>					
Small	25	0.88	16.67	2.28	0.35
Medium	0	0	0	0	0
Large	0	0	0	0	0
Overall	25	0.88	16.67	2.28	0.35
<b>Frenchbean(Box/Bag of 25 Kgs.)</b>					
Small	6	0.00	20.00	0.00	0.00
Medium	0	0	0	0	0
Large	0	0	0	0	0
Overall	6	0.00	20.00	0.00	0.00

was marketed. Similarly, while the total production of 37 boxes (of 25 kg each) of tomato was recorded, the farmers have borne a total loss equal to 0.43 per cent of the total production. Further 15.59 per cent of the total production was retained for family usage, 1.61 per cent and 0.65 per cent respectively were give out as gifts and wages in kind. The residual amount of 7.6 quintals was sold in the market. However no losses were reported in case of beans. Further, while about 20 per cent of the total produce of both the crops did not reach market, that entire amount was used for family consumption in case of French beans whereas 3.19 per cent of peas were given out as wages. As far as cauliflower is concerned, out of 5.7 quintals of production 4.55 quintals were marketed.

### **Marketing Pattern of Vegetables**

7.35 Since Chamoli district, where the field survey was being conducted, is high up in the hills, it is not very well connected to the other parts of the states. As a result, the vegetables grown by the sampled farmers from this district are being sold entirely in one or more of the three major markets of the district itself, namely Joshimath, Gopeshwar and Karna Prayag, which are located at a distance of roughly 60- 80 kms from the polyhouses covered under the study. Since these markets are far from local, they will be treated as far-off markets in this study. The following table 7.2.2 provides details of the quantity (in boxes) of each vegetable sold in these markets and the rate at which they are sold. As can be seen from the table, peas is being sold at the highest price of Rs. 1016 per box followed by French beans which is sold for Rs. 1004. However, surprisingly these are the two vegetables which are sold in very less quantity of 5-18 boxes. On the other while capsicum is the least valuable of these vegetables, 249 boxes of it are being sold by the farmers in far-off markets.

**Table 7.2.2. Marketing Pattern of Protected Crops on Sampled Farm**  
(Qty. in boxes, rate in Rs.)

Category	Sold at							
	Joshimath/Go peshwar/ Karna Prayag		Neighbouring States		Local markets		Total	
	Qty	Rate/box	Qty	Rate/box	Qty	Rate/box	Qty	Rate/box
<b>Capsicum</b>								
Small	249	668					249	668
Medium	-							
Large								
Overall	249	668					249	668
<b>Tomato</b>								
Small	30	708					30	708
Medium								
Large								
Overall	30	708					30	708
<b>Peas</b>								
Small	15	1016					15	1016
Medium								
Large								
Overall	15	1016					15	1016
<b>Cauliflower</b>								
Small	18	718					18	718
Medium								
Large								
Overall	18	718					18	718
<b>Frenchbeans</b>								
Small	5	1004					5	1004
Medium								
Large								
Overall	5	1004					5	1004

### Marketing Costs of Vegetables in Far-off market

7.36 Table 7.2.3 shows the cost in rupees per quintal of different variables incurred during sell out the total produce of the vegetables under study in far off market by the small poly house farmers. The table shows the grower's expenses at different stages of marketing. While an amount of Rs. 105.84 and Rs. 78 per quintal were incurred on picking, packing, grading and assembling of capsicum and pea respectively, the cost under same head for French bean is only about Rs. 13.33 per quintal. However, the cost of packing material in case of French bean is substantially

higher at Rs. 20 per quintal compared to Rs. 6.6 per quintal for capsicum. The cost of packing material is highest for tomato though at Rs. 54.17 per quintal because it is more perishable in nature and hence needs better packaging.

**Table 7.2.3. Marketing Costs of Capsicum & Tomato in Far Off Market**  
(Rs./Qtl.)

Particulars	Capsicum	Tomato	Pea	Cauliflower	French bean
Gross returns received by grower	3368.88	3585.83	3046.55	2614.75	1606.25
<b>Growers' expenses on</b>					
Picking, packing, grading and assembling	105.84	58.67	78	51.2	13.33
Packing material	6.6	54.17	37	41.2	20.00
Transportation					
(i) Carriage up to road head	130.6	75.00	64	22	140.00
(ii) Freight up to market	0	41.67	0	60	0.00
(iii) Loading/unloading charges	0	0.00	0	0	0.00
Commission of C.A. and market fee	0	6.67	0	0	0.00
Other charges	0	0.00	0	0	0.00
Total expenses paid by the grower	243.04	236.17	179.00	174.40	173.33

7.37 Moreover, in transporting the harvest costs are incurred at three stages- in carrying the produce up to road head using local means, in loading and unloading the produce and in transporting them to the market. It can be seen from the table that the maximum cost of carriage up to road head is incurred for French beans followed by capsicum, tomato, peas and cauliflower. Surprisingly, freight up to market can be seen to be zero except in case of tomato and beans in spite of the fact that the produce are being sold to markets which are at a distance of 60 – 80 kms. Further, loading/ unloading charges are also found to be zero. No further expenses are reportedly incurred by the growers excepting a negligible commission of C.A. and market fee for tomato. The total expenses paid by the grower therefore were Rs. 243.04 and Rs. 236.17 per quintal for capsicum and tomato respectively and Rs. 179, Rs. 174.40 and Rs. 173.33 for peas, cauliflower and French beans respectively. The average total gross returns received were Rs. 3368.88 and Rs.

3585.83 per quintal for capsicum and tomato respectively during the studied period and region by the small poly house farmers.

### **Comparison of marketing system of vegetables grown inside and outside poly house**

7.38 On comparing the marketing costs and the producers' share in marketing of tomato and capsicum grown inside and outside poly houses it can be seen that the marketing expenses incurred on account of packing, grading and assembling and that for packing material is much less for those farms growing these vegetables inside poly houses than those grown outside poly houses. This could be because of the fact that they are being sold in markets which are not too far away from the farms and hence do not require as much prevention from decay. Quite surprisingly though the cost of carriage up to road head is much higher for the vegetables grown by the sampled farmers in Chamoli than that incurred for the vegetables grown outside poly houses in Dehradun and Nainital. However, there are no additional costs of transportation in Chamoli unlike in the other two districts where farmers have to incur some costs for loading and unloading and transportation up to the respective market.

## CHAPTER 8

### **Problems Faced by Vegetable Growers**

8.1 Understanding the difficulties faced by the vegetable growers in growing these six crops may have important policy implications. Addressing such problems and difficulties may not only be helpful for farmers, they may increase the profitability of the crops thereof. This chapter is divided into two sections. In the first section the problems faced by the farmers in grow these vegetables inside poly houses will be highlighted whereas in second section problems specific to the farmers growing these vegetables outside poly houses are examined.

#### **Problems in Growing Off- Season Vegetables Inside Poly houses**

##### **Problems Faced in Adoption and Construction of Polyhouse**

8.2 The adoption of poly house technology involves huge cost and effort. In the following table 8.1.1 some of the common problems faced by the farmers who have adopted this farming procedure in Chamoli district are enlisted. As per the categorization all the poly houses are of small size and hence the problems are typically that of constructing small polyhouses. Close to 58 per cent farmers stated that information has not been provided clearly to them regarding adoption and construction of poly houses. The bureaucratic hassles involved in getting clearance from various departments before adopting this technique has been reported to be a major problem by about 76 per cent of the sample. Though government promotes the use of this technology by announcing attractive schemes, about 52 per cent farmers report that there is a long wait involved in getting clearance and subsidy from them and 77.46 per cent say that there is delay in technology transfer. With respect to the construction of the poly houses, close to 96 per cent report that construction materials are difficult to procure, about 44 per cent say that the execution is delayed by the contractor, about 50 per cent complain about high cost involved in the construction and more than 63 per cent report unavailability of skilled labour required in its construction.

**Table 8.1.1. Problems Faced in Adoption and Construction of Polyhouse**  
(Multiple Responses in %)

Type of Problem	Category			Overall
	Small	Medium	Large	
Information not provided clearly	57.75	0.00	0.00	57.75
Cumbersome clearance from department	76.06	0.00	0.00	76.06
Delays in technology transfer	77.46	0.00	0.00	77.46
Long wait for loan clearance/subsidy	52.11	0.00	0.00	52.11
Construction materials not locally available	95.77	0.00	0.00	95.77
Contractor delayed the execution	43.66	0.00	0.00	43.66
High construction cost	49.30	0.00	0.00	49.30
Unavailability of skilled labour	63.38	0.00	0.00	63.38

### Problems Faced in Inputs Availability

8.3 As far as inputs are concerned, table 8.1.2 reveals that about 66 per cent farmers complained of unavailability of inputs, close to 96 per cent complained about the quality of inputs and about 97 per cent posed high input price as a problem faced by them.

8.4

**Table 8.1.2. Problems Faced in Inputs Availability**  
(Multiple Responses in %)

Type of problem	Category			Overall
	Small	Medium	Large	
Unavailability	66.20	0.00	0.00	66.20
Higher prices	97.18	0.00	0.00	97.18
Low quality	95.77	0.00	0.00	95.77



## Problems Faced in Cropping Practices

8.5 The farmers also pointed out problems faced by them in cropping practices. For instance, as presented in table 8.1.3, 67.61 per cent complained about sowing time, 70.42 per cent complained about cultural practices, about 93 per cent said they faced problem with time and intensity of irrigation and nearly 68 per cent complained about sowing intensity.

**Table 8.1.3. Problems Faced in Cropping Practices**

(Multiple Responses in %)

Type of problem	Category			Overall
	Small	Medium	Large	
Sowing time	67.61	0.00	0.00	67.61
Sowing Intensity	67.61	0.00	0.00	67.61
Cultural practices	70.42	0.00	0.00	70.42
Time and intensity of irrigation	92.96	0.00	0.00	92.96

## Problems Faced in Harvesting and Marketing

8.6 Apart from the problems highlighted above farmers also faced problems with respect to harvesting and marketing their produce. As shown in table 8.1.4, without exception all the sampled farmers said they faced problem with the time and method of harvesting while about 41 per cent said they had marketing issues as well. However, nobody complained about any problem with storage or packing and processing.

**Table 8.1.4. Problems Faced in Harvesting, Storage, Packing and Marketing**

(Multiple Responses in %)

Type of problem	Category			Overall
	Small	Medium	Large	
<b>Harvesting</b>				
Time	100.00	0.00	0.00	100.00
Method	100.00	0.00	0.00	100.00
<b>Storage</b>	0.00	0.00	0.00	0.00
<b>Packing/Processing</b>	0.00	0.00	0.00	0.00
<b>Marketing</b>	40.85	0.00	0.00	40.85

## Problems in Growing Off- Season Vegetables Outside Poly houses

### Problems in Availability of Transport

8.7 One of the major problems faced by those farmers who are growing some or all of these six vegetables in unprotected environment is with respect to transportation. In both districts while all the small farmers complained that transport is not available on time, about 94 per cent marginal farmers in Nainital and 83 per cent marginal farmers in Dehradun complained about the same. However, only 50 per cent and 40 per cent respectively of the medium farmers in Nainital and Dehradun said they also faced the same problem. Further excepting medium farmers in Nainital all farmers in the sample faced an issue with transportation charges with higher percentage of them in Dehradun complaining of higher charges while only 24 per cent and 20 per cent respectively of the marginal and small farmers in Nainital encountering the same problem with respect to transportation charges. While very high percentage of small farmers in Nainital reported other problems, about 50 per cent of the small and medium farmers in Nainital, 50 per cent small farmers and 40 per cent medium farmers in Dehradun mentioned other problems as well.

**Table 8.2.1. Problems in Availability of Transport Faced by Sampled Farmers**  
(Multiple response %)

Particulars	Not available in time	Higher charges	Any other	No problem	Sample size
	<b>Nainital</b>				
Marginal	94	24	53	41	49
Small	100	20	80	70	10
Medium	50	0	50	50	2
All	93	23	57	46	61
	<b>Dehradun</b>				
Marginal	83	54	27	31	52
Small	100	50	50	50	4
Medium	40	40	40	80	5
All	80	52	30	36	61
	<b>Overall</b>				
Marginal	88	40	40	36	101
Small	100	29	71	64	14
Medium	43	29	43	71	7
All	87	38	43	41	122

8.8 However, the responses seem contradictory. For instance, while on the one hand 94 per cent of the marginal farmers in Nainital cited the non-availability of transport on time as one of the problems they face, it is not possible that 41 per cent farmers said they had no problem with respect to transportation. Similar contradictions appear in their response in all other aspects relating to marketing and storage.

### Problems of Packing Material

8.9 Table 8.2.2 points out some of the problems faced by the farmers in packaging. Shortage of packing material comes out as a major problem in Nainital with at least 76 per cent farmers in a particular category reporting about the shortage. However, the problem is less severe in Dehradun district with 58, 50 and 40 per cent of the marginal, small and medium farmers respectively facing the same problem. Not only is its shortage a problem, most farmers (92 per cent in Nainital and

**Table 8.2.2. Problems of Packing Material Faced by Sampled Farmers**

(Multiple response %)

Particulars	Shortage	High price	Not available in time	No problem	Sample size
	<b>Nainital</b>				
Marginal	76	90	49	10	49
Small	90	100	10	10	10
Medium	100	100	100	50	2
All	79	92	44	11	61
	<b>Dehradun</b>				
Marginal	58	94	42	12	52
Small	50	75	50	0	4
Medium	40	100	20	20	5
All	56	93	41	11	61
	<b>Overall</b>				
Marginal	66	92	46	11	101
Small	79	93	21	7	14
Medium	57	100	43	29	7
All	67	93	43	11	122

93 per cent in Dehradun) say they feel that the price of the material is too high. Non-availability is another major problem faced by a lot of them, particularly medium farmers in Nainital. Discrepancy arises again between the responses against the column “no problem” and responses to questions about shortage of packing material, their price and their availability. Overall 67 per cent farmers reported shortage of packing material, 93 per cent complained of high prices, 43 per cent complained of their non-availability on time and 11 per cent mentioned no problems at all.

### **Storage Problems**

8.10 Unlike the farmers growing vegetables inside poly house, those growing vegetables outside poly houses said they faced problems with storage facility. As Table 8.2.3 shows, all farmers in the medium category in Nainital and medium category in Dehradun said there is no storage facility. Very high percentage of marginal farmers in both Nainital and Dehradun (86 and 94 respectively) complained of no storage facility as well. Further, 70 per cent small farmers in Nainital and 80 per cent medium farmers in Dehradun also faced the same problem of no storage. 50 per cent of both small and medium farmers in Nainital reported of inadequate storage whereas 10 and 50 per cent of them respectively said they faced no problem with storage. However, in the marginal category whereas 61 per cent complained of inadequate storage, 29 per cent said they faced no problem. The scenario in Dehradun is a little different with no one saying that they have no storage problem whereas only 23 per cent marginal farmers said the same. Of the marginal and medium farmers, 94 per cent and 60 per cent respectively complained of inadequate storage. Overall, very few farmers in each category said they did not face any storage problem, very high percentage said they faced the problem of no storage whereas between 50 and 78 per cent of the farmers said they are faced with inadequate storage.

### **Problems of Market Intelligence**

8.11 The problems of the farmers do not end with storage. They have to face further problems with market intelligence. As shown in Table 8.2.4, between 50 and 80 per cent of the sampled farmers in Nainital district complained of late information, between 40 and 100 per cent said that information was available for few markets only, between 50 and 100 per cent reported inadequate information, between 40 and 55 per cent said they had misleading information while between 10 and 50 per cent farmers said they had no problems. In Dehradun district the problem seem to be

more acute with farmers in almost all categories reportedly having delayed or inadequate or misleading information, sometimes available only for few markets. In all, a high percentage of marginal and medium farmers have to face all kinds of informational problems whereas less percentage of small farmers seems to face problems other than late information.

### Problems of Mal-Practices

8.12 There were further problems of malpractice in the market like multiplicity of charges, undue deductions, quoting less than actual prices, partial or delayed payment. As Table 8.2.5 shows higher percentages of medium farmers in Nainital and marginal farmers in Dehradun face these problems compared to farmers in the other categories. While 100 per cent of the medium farmers in Nainital reported deduction of more charges, 90 per cent and 86 per cent respectively of small and marginal farmers in the district said the same. The problem is less acute in Dehradun with 79, 80 and 50 per cent respectively of the marginal, small and medium farmers reporting

**Table 8.2.3. Problems of Storage Facility Faced by Sampled Farmers**  
(Multiple response %)

Particulars	No storage facility available	Inadequate storage facility	No problem	Sample size
<b>Nainital</b>				
Marginal	86	61	29	49
Small	70	50	10	10
Medium	100	50	50	2
All	84	59	26	61
<b>Dehradun</b>				
Marginal	94	94	23	52
Small	100	50	0	4
Medium	80	60	0	5
All	93	89	20	61
<b>Overall</b>				
Marginal	90	78	26	101
Small	79	50	7	14
Medium	86	57	14	7
All	89	74	23	122

**Table 8.2.4. Problems of Market Intelligence Faced by Sampled Farmers****(Multiple response %)**

<b>Particulars</b>	<b>Late information</b>	<b>Available for few markets</b>	<b>Inadequate information</b>	<b>Misleading information</b>	<b>No problem</b>	<b>Sample size</b>
	<b>Nainital</b>					
Marginal	67	61	59	55	16	49
Small	80	40	50	40	10	10
Medium	50	100	100	50	50	2
All	69	59	59	52	16	61
	<b>Dehradun</b>					
Marginal	60	85	87	90	17	52
Small	50	75	50	50	0	4
Medium	100	60	100	60	0	5
All	62	82	85	85	15	61
	<b>Overall</b>					
Marginal	63	73	73	73	17	101
Small	71	50	50	43	7	14
Medium	86	71	100	57	14	7
All	66	70	72	69	16	122

similar deductions. The problem of part payment or late payment is rampant among the medium farmers in Nainital (50 per cent each reporting these problems) and marginal farmers in Dehradun (52 per cent and 69 per cent reporting these problems respectively); it is less so for other categories of farmers in both districts. Multiplicity of charges seem to plague Dehradun district more than Nainital with 54 per cent sampled farmers in Nainital reporting this as a problem they have to deal with while close to 80 per cent sampled farmers in Dehradun dealing with it on a regular basis. On the other hand, quoting less price than actual is more severe a problem in Nainital than in Dehradun. Undue deductions are however reported only by the marginal farmers in both districts.

In spite of all odds, a negligible proportion of farmers still say that they do not have to deal with malpractice in markets. They belong primarily to the marginal and small farmer category in Nainital and marginal category in Dehradun.

**Table 8.2.5. Problems of Mal-Practices in Market Faced by Sampled Farmers**  
(Multiple response %)

Particulars	Deduct more charges	Part payment	Late payment	Multiplicity of charges	Undue deductions	Quote less prices than actual prices	No problem	Sample size
<b>Nainital</b>								
Marginal	86	35	39	57	8	92	27	49
Small	90	20	20	40	0	90	20	10
Medium	100	50	50	50	0	100	0	2
All	87	33	36	54	7	92	25	61
<b>Dehradun</b>								
Marginal	79	52	69	83	21	81	29	52
Small	50	0	25	75	0	50	0	4
Medium	80	20	20	40	0	80	0	5
All	77	46	62	79	18	79	25	61
<b>Overall</b>								
Marginal	82	44	54	70	15	86	28	101
Small	79	14	21	50	0	79	14	14
Medium	86	29	29	43	0	86	0	7
<b>All</b>	<b>82</b>	<b>39</b>	<b>49</b>	<b>66</b>	<b>12</b>	<b>85</b>	<b>25</b>	<b>122</b>

## CHAPTER 9

### Conclusions and Policy Implications

9.1 For this study on off seasonal vegetables in the state of Uttarakhand six vegetables viz. tomato, capsicum, French beans, peas, cabbage and cauliflower were selected and the districts of Nainital and Dehradun were chosen for collecting field data on cultivation without poly house on the basis of highest acreage under production of these vegetables whereas for studying various aspects of production inside polyhouse Chamoli district was chosen because this district reportedly has the highest number of polyhouse in the state.

9.2 It has been seen that roughly 56 per cent of the total area in the state of Uttarakhand has been assigned for cultivation of the off-season vegetables under study during the year 2014-15. The cumulative increase in the area under these vegetables in the state between year 2005-06 and 2014-15 is close to 43 per cent. In terms of the area under different crops in the two districts under study, highest percentage share of the land under vegetables in Nainital district goes towards tomato cultivation (22.94) followed by peas (21.91), cabbage, beans and capsicum in that order whereas the highest percentage share of land under vegetables in Dehradun district goes to peas, followed by tomato, beans, cauliflower, cabbage and capsicum. The production of these vegetables has been dwindling in the state. Although intermittent decline in production has been recorded between 2005-06 and 2014-15, overall the production has increased by 59.06 per cent from the base year.

9.3 On examining the socio-economic profile of the sampled farmers it has been observed that the overall age distribution of the family heads in the sampled farms is such that 50 per cent of the household heads are in the age group of 41-60 years while only 14.75 per cent and 35.25 per cent respectively are in the age group 20-40 years and above 61 years. 87.7 per cent of the heads are involved primarily in agricultural activity. Looking at the occupation category-wise, it can be seen that household heads of 88.12 per cent of the marginal farm households, 85.71 per cent of the small farm households and 85.71 per cent medium farm households are in agriculture. As far as literacy of the household heads is concerned, in Nainital district while 8.16 per cent of the heads in the marginal households is illiterate, none of the heads in the small and medium farm households was found to be illiterate. Further, while large proportion (44.26 per cent) of them had



completed only primary level of education, 40.98 per cent had completed matriculation. Only 8.2 per cent of them have a literacy level of graduation and above. However in Dehradun district, the percentage of illiterate household heads is higher at 40.98 which is second only to the percentage of heads completing matriculation (44.26). Highest percentage of illiterate heads (50) was found among small households followed by marginal (42.31) and medium households (20).

9.4 The demographic profile of these districts show that the average family size in Nainital ranges between 6 and 9 while it is between 11 and 21 in Dehradun. In Nainital 45.35 per cent of the total is male, roughly 36 per cent are females and nearly 19 per cent are children. While the male to female ratio is 1 in medium households (with each constituting 41.18 per cent of the total household members) and small households (each constituting 40.48 per cent of the total), percentage of male members is higher at 46.86 vis-à-vis 34.59 per cent of females in marginal households. Children constitute less than 20 per cent of the total members across farmers of all categories. In Dehradun district, on the other hand, male-female ratio is close to one across categories of farmers with the number of females being higher than male in small farm households. Interestingly, the proportion of females among the workers in total is higher in Dehradun at 46.37 per cent compared to 41.83 per cent in Nainital with the percentage of males among the agricultural and non-agricultural labours being 55.22 and 46.25 per cent respectively in Dehradun whereas the corresponding figures for Nainital are 61.29 per cent and 51.67 per cent. It can be discerned from these figures that work participation of the females as non-agricultural labour is much higher than in the agricultural labour category in both the districts.

9.5 With respect to their credit behaviour, About 65 per cent of the marginal famers, 71 per cent of the small farmers and 86 per cent of the medum farmers have taken loan. All of them have borrowed from banks with the loan amount being highest in case of medium farmers. The rate of interest faced by small farmers is highest at 5.5 per cent followed by 4.92 per cent for marginal farmers and 4.75 per cent for medium farmers.

9.6 As far as the land owned by the sampled farmers are concerned, it has been observed that while the average area per farm for marginal and medium farmers is higher in Nainital, it is lower for the small farmers. It can be further seen that the farmers in either district hold very little barren land or fallow land, though the proportions of both barren and fallow lands are relatively higher in Dehradun (11.81 per cent and 13.5 per cent respectively) as compared to Nainital (4.45 per cent and 6.10 per cent respectively). Further, there is very little grassland in Nainital, that too only

with marginal farmers. In Dehradun district however, grassland constituted about 4.03 per cent of the total owned land. Much of the cultivated land, that is about 57 per cent in Nainital and roughly 56 per cent land in Dehradun is cultivated and devoted to field crops. 31.57 per cent land is utilized as orchard in Nainital whereas only 15 per cent of the land in Dehradun is used for the same. In terms of area, while about 61 per cent of the total owned land is irrigated in Nainital, nearly 59 per cent land is irrigated in Dehradun. As regards the land under field crop, irrigated to unirrigated area is only 1.33 in Nainital whereas it is 2.33 in Dehradun. The irrigated to unirrigated ratio in case of orchard however is close to 5 in Nainital but 1.8 in Dehradun.

9.7 The net operated area of the sampled farmers is roughly same as the land owned by them since leasing (in or out) of land is not very common among the sampled farmers.

9.8 The primary sources of irrigation are canal, kuhl, pipeline, nalcoop and rainfed in both districts with an additional source of tank being used in Nainital. However, in terms of basic amenity like access to drinking water the status of the two districts is quite varied. In Nainital district while natural source of drinking water is not available to small and medium farmers, it is closest among the various sources for marginal farmers. On the other hand, while tap water is the closest source of drinking water for the medium farmers, it is farthest for marginal farmers. In Dehradun district however tap water is more difficult to access for farmers of all types with higher average distance compared to other sources. While for marginal farmers sources like pipeline/ handset/ stampost/ nalcoop are closer than natural sources, it is the opposite for small and medium farmers.

9.9 The cropping pattern of the sampled farmers show that apart from growing vegetables, medium farmers in Nainital grow maize, wheat, potato, fruits and some other crops, small farmers grow barley and pulses along with these crops whereas the marginal farmers grow paddy as well. The cropping pattern is however quite different in Dehradun district. While both small and medium farmers grow paddy, wheat, barley, potato, pulses and fruits, marginal farmers grow maize instead of barley. The cropping intensity (with fruits) ranges between 133 and 136 in Nainital with highest intensity being observed for marginal farmers and lowest for small farmers whereas it lies between 122 and 139 in Dehradun with highest intensity for small farmers and lowest for medium farmers. While fruit is most productive of all crops grown (excluding the vegetables under study) in both the districts among all categories of farmers (with the exception of small farmers in Nainital), potato turns out to be the second most productive crop among all the

sampled farmers with a huge difference in the productivities of fruits and potato. The least productive crop is pulses with its productivity being less than even 10 quintals per hectare for all sampled farmers.

9.10 As far as yield of these six vegetables under study is concerned, it is highest for cauliflower in case of small farmers in Nainital, for tomato in case of medium farmers and for cabbage at 244 qtls per hectare for marginal farmers. On the other hand, it is lowest for peas in case of marginal farmers, beans in case of small and marginal farmers. On the contrary, yield of beans is highest at 198 qtls per hectare for medium farmers in Dehradun district. For small and marginal farmers the yield is highest for cauliflower and tomato respectively. The yield of peas however is lowest for all categories of farmers in Dehradun.

9.11 Crop rotation is widely practiced in both Nainital and Dehradun districts of Uttarakhand. In both districts all crops under study excluding peas are sown in the first half of the year in irrigated lands and harvested two-three months after planting whereas peas is sown throughout the year and harvested two to three months after planting. However, in parts of the districts where irrigation facility is not available sowing is usually done during monsoon, in the month of July and harvested in September.

9.12 In the course of this study, attempts have been made to calculate the costs (using standard CACP definitions) and returns from growing these vegetables. For inputs estimates for those farmers who grow these vegetables without protection as provided inside polyhouse, the various factors which enters into cost have been considered such as, human labour (both family and hired), bullock labour, machinery charges, seed costs, manure and fertilizers, irrigation, plant protection, depreciation implements and farm building, interest on working capital, rent paid for leased in land, rental value of owned land and interest on fixed capital assets. For tomato it has been seen that in Nainital district the cost of cultivation per hectare comes out to Rs. 105366 at cost B, Rs. 178775 at cost C respectively. The total cost of cultivation on marginal farms is higher than that of medium and small farms. Rental value of land is also the major cost items on all size of farms (19 per cent ). Further, the involvement of family labour was found to be quite high. The net return per hectare were found Rs. 302920, Rs. 264624 and Rs. 191215 at cost A<sub>1</sub>/ A<sub>2</sub>, cost B and cost C, respectively. In Dehradun district however, the cost C was found to be Rs. 183068. Even in this case rental value of land leased in forms a major part, which is 16 per cent in the cost of cultivation of tomato. The net returns per hectare were estimated to be Rs. 381349, Rs. 378994,

Rs. 343072 and Rs. 262445 at cost A<sub>1</sub>, A<sub>2</sub>, B and C, respectively. The analysis indicates that farms of Dehradun were able to generate significantly higher gross return and net return in tomato farming.

9.13 Peas, grown as vegetable, is another remunerative crop for all the hill farmers. For peas, in Nainital costs A<sub>1</sub> and A<sub>2</sub> are same because no leased-in land case was reported and it contributed to 33 per cent of cost C. Out of the total cost of cultivation, rental value of land is the major cost item on all size of farms. This item accounted for 22 to 23 per cent of total cost of cultivation of pea for the sample as a whole. The imputed value of family labour varies between 38 to 43 per cent of the total cost of cultivation depending on the category of farms. In Dehradun district, the cost A<sub>2</sub> of cultivation of peas for marginal farms is Rs. 55525. Cost B overall has been worked out as Rs. 90182. Rental value of land is the major cost items on all size of farms (21 per cent). Imputed value of family labour is higher for marginal farms as compared to small and medium farms.

9.14 Similar figures have been obtained for the rest four vegetables as well which reveal that imputed value of family labour accounts for majority of cost C and the costs of hired human labour and seed/ seedlings are also substantial.

9.15 An overall comparison of the costs and returns across vegetables show that in district Nainital the input-output ratio over cost C is Rs. 2.07 for tomato, Rs. 2.42 for peas, Rs. 2.15 for cabbage, Rs. 2.77 for cauliflower, Rs. 2.68 for capsicum and Rs. 2.52 for beans. The highest returns per rupee invested in cauliflower indicate that cauliflower cultivation was most profitable among all six off-season vegetables crops under study. The corresponding figures in district Dehradun are Rs. 2.37 for tomato, Rs. 1.25 for peas, Rs. 1.72 for cabbage, Rs. 2.86 for cauliflower, Rs. 3.00 for capsicum and Rs. 2.64 for beans. The highest returns per rupee invested in capsicum cultivation indicate that capsicum cultivation was most profitable among all the off-season vegetable crops. When the overall situation is examined capsicum cultivation is found to be more profitable than cauliflower, beans, tomato, peas and cabbage.

9.16 When looked at how the produce is ultimately utilized or how effectively they are marketed, it has been found that not only is the total production of all vegetables is higher in Dehradun district than in Nainital district across farmers, higher percentage of the produce is also being marketed in the former than in the latter. Both wages in kind and losses constitute very negligible share of the produce thereby leaving out 85-99 per cent of the produce to be marketed.

The losses, however much they are, happen primarily due to natural calamities, pests and diseases, due to packing and grading. It has been further seen that the farmers in Nainital district market their entire produce in Haldwani market whereas those in Dehradun district sell their vegetables in Vikas Nagar market, both within the respective district itself.

9.17 A huge gap has been noticed in the price paid by the consumers and that received by the growers indicating presence of middlemen in the course of marketing the produce. A major part of this gap is accounted for by the retailers' as well as mashkors' margin.

9.18 Next, for polyhouse cultivation only five vegetables, tomato, capsicum, peas, cauliflower and French beans are considered for this study and since the concentration of polyhouses is maximum in Chamoli district, this particular district was selected for study. The size of most polyhouses is 33 m<sup>2</sup> although there were two farmers who were operating on polyhouses of size 100 m<sup>2</sup>.

9.19 For polyhouse cultivation, construction of polyhouse itself is a cost-intensive first step. However, since the state government of Uttarakhand has announced an average subsidy of Rs. 38678 for construction of a poly-house under the state horticulture mission, the net cost paid per farmer for constructing a polyhouse turns out to be about Rs. 3609.

9.20 The most important cost item for polyhouse cultivation is manures. Other significant cost heads are formation of beds, seeds/ seedlings, harvesting/ picking and interculture.

9.21 Net returns from cultivating these vegetables inside poly houses were invariably negative indicating that it was not economically viable to produce these vegetables inside polyhouses. Accordingly, output- input ratios are invariably less than one for all these vegetables indicating that by cultivating these vegetables inside poly houses commensurate return is not being generated.

9.22 The losses in production of these vegetables are less than 2 per cent of the production. Between 15 and 20 per cent of the produce are retained for family consumption and another 2-6 per cent are retained for gifts or wages in kind. Rest are marketed.

9.23 All the vegetables are being sold entirely in one or more of the three major markets of the district itself, namely Joshimath, Gopeshwar and Karna Prayag, which are located at a distance of roughly 60- 80 kms from the polyhouses covered under the study. Although French beans and peas are sold at higher prices, very less quantity of these vegetables (5-18 boxes) are sold in the

market whereas 249 boxes of capsicum are being sold by the farmers in spite of it being the least valuable of these vegetables.

9.24 Lastly, as regards the problems faced by these vegetable growers those growing these vegetables inside polyhouse stated delayed or lack of information, cumbersome clearance process, unavailability of construction material at the local level, delay in technology transfer, lack of skilled labour, high construction cost as some of the problems they have encountered. Low quality and high price of inputs required in cultivation are reported as two major problems by these farmers. Sowing time and intensity and irrigation intensity are some other problems they encounter with respect to cropping practice. All the growers said that they have problem with the time and method of such farming as well as marketing them. For those growing these vegetables without using polyhouse technology, transporting their produce is a big issue and so are packing and storage. Inadequate storage facility or complete lack of it, inadequacy or non-availability of packing material at the time of need are some of the common problems reported by them. Late and partial or misleading information regarding marketing is a handicap that these farmers feel they are faced with quite frequently. Last but not the least, the problem of malpractice plague the system as has been reported by the sampled growers. Many of them complained about late payment, part payment, overcharging, undue deductions, quotation of less than actual prices in the market.

9.25 From this study it can very well be understood that growing these vegetables offer huge promises for the farmers in Uttarakhand.

- The profitability of these crops can be improved if steps are taken towards regulating the markets.
- Keeping a check on the middlemen can reduce the gap between the final price charged at the market and that received by the growers. Improving storage facility is another direction where government intervention would be helpful.
- Thirdly, since grading and packing is another area where the farmers encounter problems, timely availability of packing material should be ensured and the price of such materials should be controlled.
- Fourth, information communication should be made more effective. In fact, various media like television, radio, newspapers and even internet can be used more effectively to achieve this.

- Lastly, cultivation inside poly house should be promoted and encouraged more. Towards this 100 per cent subsidies, at least in the initial phase, should be continued for construction of poly houses and technology transfer should be done in a timely manner and should be managed well.

## Bibliography

1. Baba, Sajad Hassan and Amitoj Singh Mann. (2005). Resource use Efficiency of Main and Off-Season Vegetables under Irrigated Condition of Himachal Pradesh. *Indian Journal of Agricultural Economics*, 60(3): 533-534.
2. Baba S.H., M.H.Wani, S.A. Wani and Shahid Yousuf (2010) Marketed Surplus and Price Spread of Vegetables in Kashmir Valley. *Agricultural Economics Research Review*, 23:115-127.
3. Bala, Brij; Nikhil Sharma and R.K. Sharma. (2011). Cost and Return Structure for the Promising Enterprise of Off-Season Vegetables in Himachal Pradesh. *Agricultural Economics Research Review*, 24(1): 141-148.
4. Bala, Brij; Nikhil Sharma and R.K. Sharma. (2010). Off-Season Vegetable Cultivation - A Remunerative Enterprise for Small and Marginal Farmers of Himachal Pradesh. *Indian Journal of Agricultural Economics*, 65(3): 382-382.
5. Fartyal, Sonu and Surya Rathore. (2013). Vegetable Cultivation in Uttarakhand Hills: Viewing Through a Gender Lens. *Tropical Agricultural Research*, 24 (3): 238-248.
6. Imran,M. Uzair,F. Maula,M. Vacirca,S. Farfaglia and M. N. Khan. (2015). Introduction and promotion of off season vegetables production under natural environment in hilly area of Swat-Pakistan. *Journal of Biology, Agriculture and Healthcare*, 5(11):42-48
7. Joshi, Deepika; S.P.R Chaurasia and H.P. Singh. (2012). Protected Cultivation of Vegetables in Uttarakhand: An Economic Analysis. *Indian Journal of Agricultural Economics*, 67(3): 434-435.
8. Krishna, Sridhar. (2002). Economic Profile of Uttaranchal. *Economic and Political Weekly*, 37(19): 1843-1849.
9. Mallikarjunarao, K.; Rojalin Pradhan and Ranjit Kumar Das. (2015). Dry Land Techniques for Vegetable Production in India-A Review. *Agricultural Reviews*, 36 (3): 227-234.



10. Manjari , M. Bhavya. (2015). Knowledge of the Respondents about Vegetable Cultivation Practices. *International Journal of Advanced Research in Management and Social Sciences*, 4(7): 157-170.
11. Maurya, A.K. and R. Maurya. (2015). Management Strategies in Vegetable Production under Climate Change Agro-Ecosysteme. *ZIJBEMR, International Journal of Business Economics & Management Research*, 5 (7): 88-94
12. Meena, Om Prakash and Nirmal Kumar Meena. (2014). Impact of Climate Change on Vegetable Cultivation: A Review. *Trends in Biosciences*, 7(18): 2614-2621.
13. Mishra S.,Rakesh Singh and O.P. Singh(2014) economic analysis of marketing of major vegetables in Varanasi district of Uttar Pradesh India. *Economic Affairs*, 59(4):649-652.
14. Parmar, D.K. (2009). Integrated Nutrient Management for Sustainable Production and Profitability of Off-season Vegetables in Cold Arid Region of Kinnaur, Himachal Pradesh. *Journal of the Indian Society of Soil Science*, 57(3): 378-381.
15. Poudel Prabin. (2012).Marketing Margin Assesment of Off-Season Vegetables Value Chain in Surkhet-Dailekh Road Corridor. *The Journal of Agriculture and Environment*, 13:27-31
16. Prakash, Brahm; D.K. Sharma and V.P. Tyagi. (2003). Emerging Trends in Fruits and Vegetables Processing in India. *Indian Journal of Agricultural Economics*, 58(3): 608-609.
17. Priscilla L. and S. P. Singh. (2015). Economics of Vegetable Production in Manipur. *Indian Journal of Economics and Development*, 11(4):933-938.
18. Roy, B C. (2008). Fruit and Vegetable Processing in India and Its Role in Agricultural Development. *Indian Journal of Agricultural Economics*, 63(3): 381-381.
19. Sharma, D.; N. Mehta, J. Trivedi, D. Upadhyay and C.R. Gupta. (2015). Variability Studies in Vegetable Type Cowpea under Variable Environments. *Progressive Horticulture*, 47(2): 300-304.

20. Sharma, Gaurav and S.P. Singh. (2011). Economic Analysis of Post-Harvest Losses in Marketing of Vegetables in Uttarakhand. *Agricultural Economics Research Review*, 24(2): 309-315.
21. Shukla, Archana. (2008). An Appraisal of Growth and Prospects of Fruits and Vegetables Processing Industry in India. *Indian Journal of Agricultural Economics*, 63(3): 387-388.
22. Siddayya and S. Vijayachandra Reddy. (2015). An Intervention Approach to Enhance Vegetable Production Through Growers Association in Karnataka. *Indian Journal of Economic Development* 11(3): 685-692.
23. Sidhu, M.S. (2005). Fruit and Vegetable Processing Industry in India: An Appraisal of the Post-Reform Period. *Economic and Political Weekly*, 40 (28): 3056-3061.
24. Singh, B and T. Chaubey. (2013). Vegetable Research in India: An overview. *Progressive Horticulture*, 45(1): 9-35.
25. Singh, S. B.; A. Roy, Anju Choudhury; N.U. Singh and S.P. Singh. (2015). Production and Marketing of Vegetables in Manipur: Some Policy Issues. *Annals of Horticulture*, 8 (1): 38-45
26. Singh, V.P., Lalit Bhatt and Netrapal Malik. (2014). Impact of Plastic Mulching Technology on Production Economics of Off-Season Vegetables in Uttarakhand Hills. *Journal of Community Mobilization and Sustainable Development*, 9(2): 155-158.
27. Subrahmanyam, K.V. and T.M. Gajanana. (2000). Co-operative Marketing of Fruits and Vegetables in India. Concept Publishing Company: New Delhi.
28. Tripathi, R.S. and M.L. Sharma. (1998). Farmgate Price, Mandi Price and Marketing Margin of Vegetable Pea Production in Garhwal Hills and Marketed at Dehradun Mandi of UP. *Indian Journal of Agricultural Economics*, 53(3): 414-414.
29. Tuteja,U. and Subhash Chandra. (2014). Impact of Emerging Marketing Channel on Stakeholders: An Anlysis of Horticultural crops in Haryana. *Asia-Pacific Journal of Rural Development*, 24(1):67-81.

## Appendix I: Coordinator's Comments on the draft report

### 1. Title of the draft report examined:

The title should be:

Economic Analysis of Cost and Return of Off-Season Vegetables with Focus on Poly House Effect in Uttarakhand

### 2. Date of assignment receipt to the reviewer: 24.03. 2017

### 3. Date of dispatch of the comments: March 25.03, 2017

### 4. Comments on the objectives of the study:

All the objectives of the study have been achieved.

### 5. Comments on methodology , analysis, organization, presentation *etc.* :

- a) Proper editing of the manuscript may be done to avoid mistakes, typographical or otherwise. For example:
- b) Para 2.10: especially with respect to the problems faced
- c) Para 4.5: agricultural labours is female
- d) Para 4.12: ratio of irrigated to unirrigated area
- e) Para 2.3 : medium (2-4 ha.) **should be** medium ( above 2 ha.) in text and tables as well.
- f) In chapter III, Table-3.1 & Table- 3.2, may also display absolute figures on area and production in the last column.
- g) As per the peer reviewer's suggestion, Table-3.3 may indicate the state average productivity as well against the vegetable crops under reference. Trend equation can be fitted for the data presented in Table 3.4 & Table 3.5. Additionally, the compound annual growth rate (CAGR) can be worked out for area and production.
- h) The percentage of outstanding amount (Table-4.13) against the loan availed by the sample beneficiaries may be given in Chapter IV.
- i) **Table 7.2.3. Marketing Costs of Capsicum & Tomato in Far Off Market.**  
Name the far off market in text and tables.
- j) The policy implications should be given in bullets in Chapter 9.
- k) In Executive Summary, Main findings may be in paragraphs whereas Policy Implications in bullets as given already.

### l) Overall view on the acceptability of the report:

The report may be accepted after incorporation of necessary modifications as suggested.

## **Appendix II: Action taken on the comments of the draft report**

All the comments were taken into consideration while finalizing the report. The necessary changes have been made in the relevant chapters and sections. The point-wise details on the action taken on the comments are as follows:

1. The title of the report has been changed to *Economic Analysis of Cost and Return of Off-Season Vegetables with Focus on Poly House Effect in Uttarakhand*
2. As desired, the manuscript has been edited carefully.
3. Tables 3.1 and 3.2 have been modified to accommodate the suggestions.
4. In the draft sent to the coordinator for review, Table-3.3 already indicates the state average productivity against the vegetable crops under reference.
5. Trend equation has been fitted for the data presented in Table 3.4 & Table 3.5.
6. The compound annual growth rate (CAGR) has been worked out for area and production.
7. The percentage of outstanding amount (Table-4.13) against the loan availed by the sample beneficiaries are now included in Chapter IV.
8. The policy implications in Chapter 9 are given in bullets.
9. Although names of the far off markets were already given in text, they have been added in the tables as well.
10. The main findings in Executive Summary are now given in paragraphs instead of bullet points.