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AN ECONOMIC ANALYSIS OF PROTECTED CULTIVATION UNDER MIDH IN HIMACHAL PRADESH

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Background

The greenhouse technology is still in its developing stage in the country and concerted efforts are required from all concerned agencies to bring it at par with the global standards. Inside polyhouse crops can be grown throughout the year. The quality of flowers produced in open fields is not of international standards. Production of vegetables and flowers crops under protected conditions not only is of high quality, but also increases the productivity and profitability of crops over open field cultivation and give better living standard to farmers.

Agriculture is the main occupation of the people in Himachal Pradesh and has an important place in the economy of the State. In the state, 89.96 percent population lives in rural areas The economy of the state is highly dependent on agriculture, apart from hydroelectric power and tourism. But most of its farmers have small landholdings on hill slopes, and need to augment their incomes. The state and central governments are encouraging construction of polyhouses by giving subsidies to the farmers. It makes small holdings more viable by producing more high value crops like vegetables and flowers from limited land with the adoption of all weather technology. Thus it becomes essential to study the costs, returns and economic feasibility of flowers and vegetable production under protected cultivation in Himachal Pradesh. With this aim, the Ministry of Agriculture and Farmers Welfare entrusted this study to Agro Economic Research Centre, H.P. University, Shimla.

The present study has been planned with the following specific objectives:

Objectives

- To study the progress in providing assistance for establishing the poly houses under MIDH programme and to examine the expenditure incurred in establishment of poly houses and means of financing.

- To study the economics of production of flowers and vegetables under protected conditions in the State and to analyze the worth of protected cultivation venture.
- To analyze the systems adopted for marketing the produce under protected conditions in the State.
- To examine the problems faced by the farmers in production and marketing of Flowers and vegetables under protected conditions in the State.

To fulfil the above objectives, two districts viz. Mandi, Kangra have been purposely selected on the basis of highest number of polyhouses. From the selected districts two development blocks have been selected, again on the basis of highest number of polyhouses. From each of these development blocks, a cluster of villages having polyhouses was identified with the help of the local officials of the department of horticulture. All the registered polyhouse were listed and a sample of 50 growers of vegetables and flowers was randomly selected. Thus a total sample of 100 vegetable growers (50 from each district) was selected for detailed study.The study refers to the agriculture year 2015-16.

Main Findings

The area under polyhouses has been increasing continuously in the State. As per latest figures provided by Directorate of Horticulture, there was 140 hectares area under green/polyhouses with a total financial outlay of Rs.5271.94 lakhs under HTM/HMNEH/MIDH. Additional 7.91 hectares area was brought under low poly tunnels and an expenditure of Rs.3.952 lakhs was made on this account. Polyhouse was also an important component of Macro Management Scheme and an area of 6.71 hectares was brought under polyhouses under this scheme. As such the total area of polyhouses in the State stands at 154.62 hectares.

Though the horticulture department was the main source of authentic and detailed information about the polyhouses, the friends & relatives, awareness camps and mass media were also main sources that inspired the farmers to set up polyhouses. The decision making process of the farmers was influenced by variety of motivational factors

and hindrances they encountered before setting up of polyhouses. Most of the polyhouses were supervised by the department officers/officials whose attitude was very supportive towards the farmers. There were not many deviations from the approved design of the polyhouses.

At overall level, average net return from cultivation of carnation was Rs.1467278 per polyhouse, whereas category-wise net returns were Rs.323830, Rs.1124394, and Rs.2602367 for small, medium and large polyhouse farms respectively. In the case of rose, at overall level, average net return was Rs.1612012 per polyhouse. However, the net returns were Rs.363307, Rs.1254842 and Rs.2871538 for small, medium and large polyhouses farms respectively.

On an average total production of carnation was 460 boxes per polyhouse in a year. The cost per box was Rs.2210 and its value in the market was Rs.5400 resulting in net returns of Rs.3190 per box at overall level. The net returns per box were Rs.2865 for small, Rs.3176 for medium and Rs.3229 of large polyhouse farmers On an average total production of rose was 464 boxes per polyhouse in a year. The cost per box was Rs.2346 and its value in the market was Rs.5850 resulting in net return of Rs.3474 per box at overall level. The net returns per box were Rs.3186 for small, Rs. 3495 for medium and Rs.3540 for large polyhouse farmers.

The flowers produced by the selected farmers under protected conditions were marketed mainly at Delhi market. The tendency of retaining flowers for family and kind wages and gifts was not in practice among the sampled growers. In carnation, on an average, marketing cost per 100 spikes, incurred by producers was Rs.212.85 which was 19.5 percent of the consumer's price of Rs.1090 per 100 spikes. In case of rose, on an average, marketing cost per 100 spikes, incurred by producers was Rs.298 which was 19.26 percent of the consumer price of Rs.1184 per 100 spikes.

Net price received by the producer in marketing of carnation, in Delhi market, was Rs.387 per 100 spikes which was 35.50 percent of consumer price. In the case of rose, the share of producer in consumers' rupee was 35.64 percent and net price received by the producer in marketing of rose, in Delhi market, was Rs.422 per 100 spikes.

The costs paid in marketing of carnation by the farmers, wholesales, mashakhor and retailers were 19.53, 1.65, 1.28 and 8.80 percent respectively and thus total marketing cost of intermediaries was Rs.128 i.e. 11.74 percent of the consumer paid price. The total margins were 33.21 percent of the consumer price.In case of rose, the costs paid by the farmers, wholesalers mashokhars and retailers were 19.25, 1.77, 1.26 and 8.95 percent respectively and thus total marketing cost of intermediaries was Rs.142 i.e. about 12 percent of consumer paid price. The total margins were 33.10 percent of the consumer price.

On an average, the net return from capsicum cultivation was Rs.149686 per polyhouse, whereas category wise net returns were Rs.69205, Rs.117623 for and Rs.235839 for small, medium and large polyhouse farmers respectively. In the case of tomato cultivation, net returns were Rs.101196, Rs.194072 and Rs.347928 for small, medium and large polyhouses farmers respectively. At overall level, net return from cultivation of tomato was Rs.227142 per polyhouse.

On an average, the total production of capsicum and tomato was 402 and 566 boxes per polyhouse in a year having cost per box Rs.194 and Rs.185 respectively. Their value in the market was Rs.574 and Rs.592 per box resulting in net returns of Rs.260 and Rs.407 per box. Out of total marketed surplus of 389 boxes of capsicum, 345 boxes i.e. 88.69 percent were marketed in Chandigarh market and rest 44 boxes i.e. 11.31 percent in the local markets. In the case of tomato, out of total marketed produce of 552 boxes, 496 boxes i.e. 90 percent were marketed in Chandigarh market and rest 56 boxes i.e. 10 percent in the local market.

The net price received by capsicum producers was Rs.2545 per quintal which was about 65 percent of consumer price of Rs. 3935 in Chandigarh market whereas in the marketing of tomato, the net price received by producers was Rs. 2050 per quintal which was 58.44 percent of consumer price of Rs. 3508.

The total cost of marketing of intermediaries was Rs.2319 i.e. 8.11 percent of the consumer paid price for capsicum and the total margins were 18.88 percent of the

consumer price. In the case of tomato, total marketing cost of intermediaries was Rs.387 i.e. 11.03 percent of the consumer price. The total margins were 21.41 percent of the consumer price.

Overall pre-harvest losses were 0.42 and 0.84 percent in carnation and rose respectively. In the case of capsicum and tomato, these losses were 0.72 and 0.34 percent respectively. At post harvest stages, highest losses were during transportation in all the selected crops and farms except on large farms where these were highest at the time of grading and packing. Overall, at post harvest stages, transportation losses were 0.42, 0.21, 0.48 and 0.34 percent in carnation, rose, capsicum and tomato respectively.

Although the polyhouse farming was found to be profitable regarding income and employment generation, the activity is not free from problems. In most of the cases execution of the polyhouse was delayed due to the long and cumbersome clearance procedure adopted by various departments for sanctioning polyhouse and clearance of loan & subsidy. The construction was further delayed by the contractor. Delay in technology transfer was another reason due to which the polyhouses could not become operational well in time. Once a polyhouse became operational, unavailability of inputs, higher prices or poor quality of inputs were the problems faced by farmers. Lack of knowledge of most appropriate sowing time and cultural practices i.e. raising nursery and crops etc. was another major problem. The polyhouse growers also faced the problems related to harvesting, packing/processing, storage, marketing etc.

It can be concluded that overall in polyhouse cultivation, the input output ratio was 1:2.44, 1:2.48, 1: 3.11 and 1:2.85 in case of carnation, rose, tomato and capsicum respectively making the venture profitable as most of the farmers have already recovered the cost of construction of polyhouse. Cultivation of these crops in a polyhouse of large category was found to be highly feasible as reflected in higher values of NPV (Rs. 3040661), BCR (1.86) and IRR (71%) with payback period of two years. The investment in other two categories of polyhouses was also found to be economically sound and quite remunerative.

Policy Implications

The growing of flowers and vegetables inside a polyhouse in Himachal Pradesh has improved the quality of life of the growers by improving income and employment. However, the profitability of these crops still can be improved by taking the following steps.

- . Low cost technologies, required on small holdings, should be developed. There is a strong need for developing the required minimum infrastructure in major production zones to be used by growers on community/cooperative basis.
- Keeping in view the perishable nature of vegetables and variations in market prices, adequate storage facilities should be developed.
- Arrangements should be made to provide latest information regarding prices and arrivals of the vegetables in the markets.
- The emphasis should be given to expand the market and develop infrastructure by improving packing and transportation facilities.
- In the present marketing system of flowers and vegetables, most of the benefits are reaped by the middlemen. An attempt should be made to strengthen the marketing system by organizing cooperative societies, particularly for small growers. This will help in minimizing the margin of the intermediaries and will ultimately ensure better producers' share in consumer's rupee.
- The cropping practices of crop production are significantly different in polyhouses than that of in growing crops or vegetables outside the polyhouse. Polyhouse farming requires skill monitoring and care. Before polyhouses become operational, the growers should be given proper training related to cultural practices i.e. raising nursery and crops, intensity of irrigation, the most appropriate sowing and harvesting time.
- The polyhouses in H.P. were prone to damage by heavy rain and storms. Such farmers found difficult to reconstruct these polyhouses due to lack of funds. Polyhouses should be insured at the time of construction.

CHAPTER–1

Introduction

1.1 Due to the increasing population, climate change, decreasing land holdings, increasing pressure on natural resources i.e. land and water and high demand of quality horticultural fresh produce, shift becomes necessary towards modern technologies of crop production like protected cultivation. Protected cultivation is a unique and specialized form of agriculture. It is the technique of providing favourable conditions for plant growth and enhances the production level. It protects plants from the adverse climate conditions by providing optimum conditions of light, temperature, humidity, Co_2 and air circulation for the best growth of plants to achieve maximum yield and best quality.

1.2 In India use of green house technology started only during 1980's and it was mainly used for research activities. However in recent years in view of the globalization of international market, there is a lot of scope for export of high value cash crops like flowers and vegetables from India, besides meeting the increasing demand in domestic market. The new and effective technology which can improve continuously the productivity, profitability and sustainability of crops is 'Protected Cultivation" and is generally called greenhouse technology. With the coordinated efforts of the Centre and state governments, protected cultivation is gaining popularity in India. At present in India, the area under protected cultivation is around 25 thousand hectares while the area under protected cultivation is about 2 thousand hectares. Leading states in protected cultivation in India are Maharashtra, Gujrat, Karnatka, Haryana, J&K, Himachal Pradesh and Uttarakhand.

1.3 The national committee on the use of plastics in Agriculture (NSPA- 1982) has recommended location specific trials of green house technology for adoption in various regions of the country. In the present day context a good number of different type of structure are built for protected cultivation. These are polythene covered green houses (polyhouses), shade-net houses, plastic tunnels, plastic mulching etc. Among these

protective cultivation techniques, greenhouse/polyhouse is useful for the hill zones. Protected cultivation provides various benefits over open field cultivation as follows:

- Protection from adverse climatic conditions.
- Moderates temperature and humidity.
- Plant propagation is effective.
- Helps to improve quality and quantity of produce.
- Reduces infestation of disease/plants.
- Savings in water and fertilizer requirements as compared to open field cultivation.
- Reduces gestation period of the crop.
- Harvesting time can be adjusted.
- Round the year cultivation is possible.
- Useful technology for hybrid seed production.
- Employment generating technology.

History of Protected Cultivation

1.4 Protected cultivation is not new technology and is more than 200 years old. From the ancient times, man strived to modify the environment through the use of devices such as windbreaks, shading, irrigation, drainage, fertilizers, and other cultural practices to improve the cultivation of different crops under varying conditions. All such efforts were to modify the environment but has little control on climate and other factors which is responsible for the crop production. Structures for crop protection began in early part of roman Empire (14-37 AD), which have movable beds of cucumbers or other crops, placed outside on favourable days and inside during inclement weather. Transparent state like plates or sheets of mica or alabaster were used as covers (Wittwer and Castilla, 1995). During late 15^{th} to 18^{th} centuries that the precursors of greenhouses appeared, primarily in England, Holland, France, Japan, and China. Later oiled translucent paper and glass were used to grow and warm plants against severe cold (Jensen & Malter, 1994). After 1600 AD, glass was the major covering material. Polythene film was developed in the late 1930s. The polythene film was first used to cover greenhouse to replace expensive glass panels in 1948 by Prof. E.M. Emmert in

University of Kentucky to reduce the cost of construction (Espi et al. 2006). After that it is adopted all over world and almost replaced the glass panels except for special purpose greenhouses. However, plastic rigid panels are also being used in place of glass panels with similar results. Bamboo and wooden sticks were the popular material for construction of frame of the structure in 15-19th century which was slowly replaced with metallic channels or pipes. Presently, all over the world, GI pipes or channels are most preferred material with varying specifications, while MS pipes angles are also being used at some locations with required paints/coatings.

Protected Cultivation in H.P

1.5 Agriculture is the main occupation of the people in Himachal Pradesh and has an important place in the economy of the State. In the state, 89.96 percent population lives in rural areas. Agriculture/Horticulture provides direct employment to about 62 per cent of total workers of the State. About 10.4 per cent of the total GSDP comes from agriculture and its allied sectors. The average holding size is about 1 hectare. Out of total land holdings 87.95 per cent area is of small and marginal. About 11.71 percent of the holdings are owned by semi-medium farmers and only 0.34 percent by large farmers. The net sown area in the State is 539462 hectares. The percentage of net irrigated area to net sown area is about 20 percent. Food-grains dominated the scene in cropping pattern followed by fruits and vegetables. The agro-climatic conditions in the State are congenial for the production of cash crops like seed potato, off season vegetables and ginger. The economy of the state is highly dependent on agriculture, apart from hydroelectric power and tourism. But most of its farmers have small landholdings on hill slopes, and need to augment their incomes.
It is difficult to grow anything outdoors in the harsh Himalayan winters. So the government is now promoting protected cultivation. It makes small holdings more viable by producing more high value crops like vegetables and flowers from limited land with the adoption of all weather technology. Production of vegetables and flowers crops under protected conditions not only provides high water and nutrient use efficiency, but it increase the productivity and profitability of crops over open field cultivation and give better living standard to hill farmers. It helps the farmer to generate income around the year. It can be used as an effective strategy to generate self employment for the educated rural youth in the farm sector.

1.6 Protected conditions for vegetables and flowers are created by using different type of structures as per season and location specific among them most common and widely used as modern greenhouses called polyhouses in the State. Polyhouses are based on the greenhouse concept to let in heat and light, while preventing the heat from getting out. But instead of the glass on a green house roof, polyhouses are made of cheaper polythene or plastic. By reducing evaporation, they also allow farmers to use sprinkler and drip irrigation system, thus saving water

1.7 The government of Himachal Pradesh is promoting farming inside polyhouses to improve the earning potential of farmers by offering subsidies for the construction of polyhouses. Farmers are being motivated toward cultivation using the scheme of subsidies. When polyhouse farming in H.P was first introduced in 2003-04, farmers were reluctant to adopt this farming technique. Later some farmers adopted it through advertisements in newspaper and by seeing polyhouses in some other states. Then they constructed polyhouses and started growing vegetables and flowers on large scale.

Mission for Integrated Development of Horticulture

1.8 A centrally sponsored scheme of MIDH has been launched for the holistic development of horticulture in the country during XII plan. The scheme which has taken off from 2014-15, integrated the ongoing schemes of National Horticulture Mission, Horticulture Mission for North East & Himalayan States (HMNEH, the scheme being implemented for overall development of Horticulture in NE and three Himalayan states, Jammu & Kashmir, Himachal Pradesh and Uttarakhand), National Bamboo Mission, National Horticulture Board, Coconut Development Board and Central Institute of Horticulture Nagaland.

Main objectives of the Mission

a) To promote holistic growth of horticulture sector, through area based regionally differentiated strategies.

b) To encourage aggregation of farmers into farmer groups like FIGs/FPOs and FPCs to bring economy of scale and scope.

c) To enhance horticulture production, augment farmers' income;

d) To improve productivity by way of quality germplasm, planting material and water use efficiency through micro irrigation; and

e) To support skill development and create employment generation opportunities for rural youth in horticulture and post harvest management, especially in the cold chain sector.

In order to achieve above objectives, the mission adopted the following strategies:

a) Adopt an end-to-end holistic approach covering pre-production, production, post harvest management, processing and marketing to assure appropriate returns to growers/producers;

b) Promote R&D technologies for cultivation, production, post-harvest management and processing with special focus on cold chain infrastructure for extending the shelf life of perishables;

c) Improve productivity by way of quality through:

   i. Diversification, from traditional crops to plantations, orchards, vineyards, flowers, vegetable gardens and bamboo plantations.

   ii. Extension of appropriate technology to farmers for high-tech horticulture including protected cultivation and precision farming.

   iii. Increase of acreage of orchards and plantation crops including bamboo and coconut, particularly in states where total area under horticulture is less than 50% of agricultural area

d) Improve post harvest management, processing for value addition and marketing infrastructure.

e) Adopt a coordinated approach and promote partnership, convergence and synergy among R&D, processing and marketing agencies in public as well as private sectors, at the national, regional, state and sub-state levels;

f) Promote FPOs and their tie up with Market Aggregators (MAs) and Financial Institutions (FIs) to support and adequate returns to farmers.

g) Support capacity-building and Human Resource Development at all levels, including, change in syllabus and curriculum of graduation courses at Colleges, Universities, ITIs, Polytechnics, as appropriate.

Review of Literature

1.9 Kumar and Srivastava (1997) studied the influence of plastic coverings on the temperature and relative humidity under low plastic tunnels in tomato field during the winter-spring season in 1990-1991 at horticultural research centre, G.B. Pant University of Agriculture and Technology, Pantnagar. The minimum and maximum temperature and relative humidity were significantly increased inside the polyethylene tunnels of all gauges viz. 200, 300 and 400 as compared to no cover in all the weeks. The 300 and 400 gauge plastic always proved superior to lower gauge. The 100 perforations/m^2 always showed highest minimum temperature whereas, maximum temperature continuously from 50 perforations to 150 perforations. In most of the weeks, perforations had no significant effect on relative humidity.

1.10 Ganesam, M, (1999) found that the yield performance of tomato inside the green house was highest 2145g per plant and 2156g per plant in the first and second season (January to May and June to October) than the open field crops. The fruit yield of tomato inside the green house was nearly two times more than in the open field condition.

1.11 Singh et al (2002) conducted a study on sustainable technology for peri-urban areas of northern India. Protected cultivation of vegetables provides the best way to increase the productivity and quality of vegetables especially cucurbits. The yield of cucumber can be increased manifold compared to open field cultivation. Normally the economics of protected cultivation directly depends upon the initial cost of fabrication of the protected structure, its running cost and the available market for the high quality produce. Therefore, low cost protected structure, which can generally be fabricated just like naturally ventilated green houses, walk in tunnels and plastic low tunnels are very

suitable for off-season cultivation of vegetables and highly economical for peri-urban areas of northern plains of India.

1.12 Cheema et al. (2004) studied the off season cultivation of tomato under net house conditions and found that net house cultivation has extended the fruit availability of tomato from last week of January to first week of June. The study has offered the possibility of raising off-season crop of tomato and enhancing the fruit availability period by using non-chemical methods of pest control.

1.13 Singh and Asrey (2005) studied the performance of tomato and sweet pepper under unheated green house. The production of tomato and sweet pepper under medium cost green house was found top the tune of 93.2 and 76.4 t/ha respectively. It was of excellent quality as compared to outside where the crop could not survive due to prevailing low temperature. The study also indicated that cultivation of tomato and sweet pepper under green house would not only help in getting higher productivity but also fetch better returns (Rs.7-8 per m^2 per season),

1.14 Dixit (2007) studied the performance of leafy vegetables under protected environment and open field condition. An experiment was conducted on leafy vegetables (Spianch, amarathus, fenugreek, and coriander) at horticultural research farm, India Gandhi Agricultural University, Raipur (C.G), to see the performance of leafy vegetables under protected environment and in open field condition. Green house crops yield several times more than the yields obtained from outdoor cultivation depending upon the cropping system and the degree of environmental control. The germination percentage was found 10-20% more in green house as compared to open field. The yield was found to be more and superior as compared to open field condition.

1.15 Singh and Sirohi (2008) found that protected cultivation vegetables offers distinct advantages of quality, productivity and favourable market price to the growers. Vegetable growers can substantially increase their income by protected cultivation of vegetables in off-season as the vegetables produced during their normal season generally do not get good returns due to large availability of these vegetables in the markets. Off-season cultivation of cucurbits under low plastic tunnels is one of the most

profitable technologies under northern plains of India. Walk-in tunnels are also suitable and effective to raise off-season nursery and off-season vegetable cultivation due to their low initial cost. Insect proof net houses can be used for virus free cultivation of tomato, chilli, sweet pepper and other vegetables mainly during the rainy season. These low coat structures are also suitable for growing pesticide free green vegetables. Low cost green houses can be used for high quality vegetable cultivation for long duration (6-10 months) mainly in peri-urban areas of the country to fetch commensurate prices of produces. Polytrenches have proved extremely useful for growing vegetables under cold desert condition in upper reaches of Himalayas in the country.

1.16 Murthy D.S. et. al. (2009) studied the economic feasibility of vegetable production under polyhouse and found that cultivation of capsicum in a polyhouse was highly feasible as reflected in higher values of NPV (Rs.3,23,145/500 m^2), BCR (1.80) and IRR (53.7%) with payback period of less than two years. Breakeven price for capsicum production in a polyhouse (Rs.11.80/kg) was lesser than average wholesale price. Production of tomato in a polyhouse was found not feasible, as the breakeven price was more than the average market price and all the project appraisal parameters indicated that it was not feasible. Only at about 48% premium price over the prevailing market price or reduction of cost of polyhouse structure by 60% from Rs.400 to Rs.160/m^2, could make the tomato production viable in a poly house.

1.17 Bahirat J.B. and Jadhav H.G. (2011) studied the cost, returns and profitability of rose production in the Satara district of Maharastra and found that per hectare cost of cultivation of rose was Rs.2,94,791. Among the various items of cost, maximum cost was incurred on family labour (30.41%) followed byrental value (21.50%). Cultivation of rose was profitable at all the level of cost. Per hectare yield of rose was 2,24,166. The gross value received was Rs.380242. Benefit cost ratio was 1:1.29.

1.18 Sudhagar, S. (2013) studied the production and marketing of cut flower in Hosur taluk of tamil Nadu and concluded that floriculture has emerged as a lucrative profession with higher potential for returns compared to other agricultural, horticultural crops. Ornamental crop culture technology is improving with the availability of equipment and there is a major change in the trend of consumers. A new generation of

growers is coming forward to employ modern technology for maximising production and offer quality produce for consumer acceptability, thus fetching a better price.

1.19 Brij Bala (2013), studied the investment pattern of different polyhouse and economics of crop cultivation in polyhouses in Kullu and Mandi district of Himachal Pradesh. It was found that the total cost of construction was Rs.100500, Rs.216250 and Rs.481600, respectively for polyhouses of 100, 250 and 500 sq.meter and farmers had to invest only 20 percent of the total cost. It was observed that 85 percent of the farmers grew capsicum, tomato and cucumber in their polyhouses as main crops and exotic vegetables as covering crops. It was estimated that a farmer could have net returns upto Rs.1.42 lacs per annum from a 500 sq.m polyhouse. A manifold increase in resource use efficiency crop production can be obtained through protected cultivation when compared with the open field conditions.

1.20 Tarannum et.al. (2014) studied the economic feasibility and profitability of carnation cultivation under protected condition. Carnation being a perennial crop with an economic life span of 3-5 years, the annual establishment and maintenance cost worked out to Rs. 1, 39,657/560 m2 . Among the different genotypes studied highest gross returns were obtained from genotype Soto (Rs. 4,90,140.00/ 560 m2), followed by Dona (Rs. 4,20,00.00/560 m2) and White Dona (Rs. 3,99,000.00/560 m2) with a net return of Rs. 3,50,483.00, 2,80,343.00, and Rs. 2,59,43.00/560 m2 , respectively compared to other genotypes grown under polyhouse. The investment in Carnation crop was found to be economically sound and highly remunerative as these genotypes produce highest yield (flower stalks) per unit area resulted in maximum B:C ratio of 2.50, 2.00 and 1.85 respectively, hence the same can be exploited for commercial cultivate on to meet the increasing global demand.

1.21 Ghanghas, B.S. and Mukteshwar, Rati (2015) studied the problems and prospects of protected (polyhouse) cultivation in Hisar and Rohtak districts of Haryana state and found that vast majority of farmers used to grow vegetable (cucumber and tomato) crops . Multiple cropping on the same piece of land, increased production and productivity per unit of land, water, energy and labour, high quality and clean products, high water and fertilizer use efficiency, subsidy provision for establishment of this high

cost infrastructure, round the year employment to the farmers were the major prospective aspects of the polyhouse cultivation by farmers. Population explosion of minute insects like mites and white flies, poor quality of cladding material, frequent occurrence of wind storms, lack of cold storage facilities in villages, high cost of hybrid seed and problem of nematode infestation were the major serious constraints faced by the polyhouse growers.

1.22 Spehia, R.S. (2015), studied the status and impact of protected cultivation in Himachal Pradesh. The study revealed that on an average, the productivity under protected cultivation was 3.36 times more than compared to open cultivation. Capsicum was the most dominant crop under polyhouse cultivation getting maximum income from polyhouses at it showed net income of Rs.213, 830(including self labour) in a 500 sq mt. Area. This was followed by tomato (Rs.77,127) and cucumber (Rs.34,756). A total of 0.132 man days were required per sq.mt. for carrying out different operations from soil bed preparation to harvesting, making it an attractive option for the youth.

1.23 Duhan Kumar Pardeep (2016) has made an attempt to examine the comparative economics of tomato under polyhouses and open field conditions in Haryana and concluded that the production cost and production were higher in polyhouse as compare to open farm. Moreover, the production of tomato was more than three times in polyhouse as compare to open farm. The market price of tomato that produces in polyhouse was higher than the tomato produce in open farm. In long run polyhouse seems more economic as polyhouse production earn more than ten time benefit to the farmers as compare to open farm farmers.

1.24 Kumar, Parveen, Chauhan, R.S and Grover, R.K. (2016) studied the comparative economics of tomato cultivation under polyhouse and open field conditions in Karnal district, Haryana. Production and marketing constraints under polyhouse cultivation have also been identified. The study revealed that the cost of cultivation of tomato under polyhouse were higher by Rs.206816.80/acre as compared to open field conditions. At the same time, the net returns under polyhouse were higher by Rs.51097.54/acre. Farmers realized 53.71% higher yield of tomato under polyhouse as compared to open field conditions. The gross return, returns over variable cost and net

returns were also higher by 106.94%, 160.70% and 48.70% respectively in case of polyhouse as compared to open field conditions. The results of the study also revealed that the tomato cultivation under polyhouses has significantly contributed to the yield.

1.25 Choudhary, A.K. (2016), studied the potential and prospects of protected cultivation in Himachal Pradesh and found that protected cultivation has great potential in the State to increase quality production per unit area per unit time. Timely efforts by the state government under Horticulture Technology Mission (HTM) and Pandit Dean Dayal Kisan Bagwan Samridhi Yojna (PDDKBSY) have scaled up protected cultivation and have proved to be a boon to small and marginal hill farmers.

1.26 The review of literature given above indicates that the studies of protected cultivation season are generally confined either to the analysis of off season vegetables or floriculture. The present study deals with both type of cultivation; that is, off season vegetables as well as of flowers under protected conditions in the State. Vegetables and flowers grown under protected cultivation have an advantage of quality, productivity and favourable market price to the growers.

1.27 With this background and the need of the day to develop low cost technologies, required on small holdings, the present study has been planned with the following specific objectives:

Objectives

- To study the progress in providing assistance for establishing the poly houses under MIDH programme and to examine the expenditure incurred in establishment of poly houses and means of financing.
- To study the economics of production of flowers and vegetables under protected conditions in the State and to analyze the worth of protected cultivation venture.
- To analyze the systems adopted for marketing the produce under protected conditions in the State.
- To examine the problems faced by the farmers in production and marketing of Flowers and vegetables under protected conditions in the State.

Organization of the Report

1.28 This report is divided into nine chapters. In the introductory chapter, that is the current chapter, some background information, literature survey, objectives of the study and the plan of the study are given. The second chapter presents the detailed information on the methodology adopted in the selection of the sample, analytical tools etc. In the third chapter present scenario of polyhouse cultivation in the State has been presented taking into consideration various schemes etc. available to farmers for adoption of this technology. The profile of the sampled polyhouse growers is given in fourth chapter. Fifth chapter concentrates on motivational factors and hindrances encountered by the farmers during the whole adoption and construction process and the costs involved in its construction. Costs and returns from crops grown in the protected environment forms the sixth chapter of the study. In the seventh chapter the marketing system of the protected crops has been presented. The problems in production and marketing of polyhouse growers are discussed in eighth chapter and chapter nine concludes the study with policy implications.

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CHAPTER-2

Methodology

2.1 This chapter deals with the selection procedure adopted for finalizing the sample for detailed study. During this exercise, care has been taken to make the sample as representative of the population as possible so that the findings based on sample could be applied for the population as a whole without significant error.

Selection of Study Districts and Blocks

2.2 Two districts viz. Mandi and Kangra have been purposely selected on the basis of highest number of polyhouses. From the selected districts two development blocks have been selected, again on the basis of highest number of polyhouses. From each of these development blocks, a cluster of villages having polyhouses was identified with the help of the local officials of the department of horticulture. All the registered polyhouse were listed and a sample of 50 growers of vegetables and flowers was randomly selected. Thus a total sample of 100 vegetable growers (50 from each district) was selected for detailed study. The details of the districts, blocks and villages selected for the study are given below:

Table 2.1. Selection Area of the Sample

District	Blocks	Villages
Mandi	Balh	Shamani Behaldhar Darbathu
	Sarkaghat	Surajpur, Rodi, Kunlog, Baroh, Chadi, Jhittar, Aima
Kangra	Rait	Shahpur, Dodhamb, Ruhru, Gamn, Lehar, Dibber
	Bhawarna	Saloh, Bhatoo, Bhattu, Kaloond

Classification of Sample

2.3 It was observed during the survey that predominantly there are three sizes of polyhouses in the State. Thus, the sample has been classified into three size classes on the basis of the size of the polyhouses. These are polyhouses covering an area of

about 250, 500 and 1000 square meters. These sizes were termed as small, medium and large categories, respectively. The detailed distribution has been presented in Table 2.2. The study is thus, based on 100 polyhouse cultivators; 29 small, 32 medium and 39 large polyhouse farmers under study (Table 2.2).

Table 2.2. Classification of Sampled Polyhouse Owners Under MIDH

(No.)

District	Size class			Total
	Small (250 M^2)	Medium (500 M^2)	Large (1000 M^2)	
Mandi	8 (16.00)	19 (38.00)	23 (46.00)	50(100.0)
Kangra	21 (42.00	13 (26.00)	16 (32.00)	50 (100.0)
All	29 (29.00)	32 (32.00)	39 (39.00)	100(100.0)

Note. Figures in parentheses denote percentages.

Social Classification

2.4 The cast wise distribution of sampled polyhouse farmers is given in Table 2.3. Overall, most of the households (98%) fall in the general category and very few households belong to scheduled caste and other backward class each (1%). In the case of Mandi and Kangra, 100 and 96 percent respectively belong to general category.

Table 2.3. Social Classification of Sampled Polyhouse Owners

(No.)

Particulars	Small	Medium	Large	Total
Mandi				
SC	-	-	-	-
ST	-	-	-	-
OBC	-	-	-	-
General	8(100.0)	19(100.0)	23(100.0)	50(100.0)
Total	8(100.0)	19(100.0)	23(100.0)	50(100.0)
Kangra				
SC	-	1(7.69)	-	1(2.00)
ST	-	-	-	-
OBC		1(7.69)		1(2.00)
General	21(100.0)	11(84.62)	16(100.0)	48(96.00)
Total	21(100.0)	13(100.0)	16(100.0)	50(100.0)
Overall				
SC		1(3.13)		1(1.00)
ST	-	-	-	-
OBC	-	1(3.13)	-	1(1.00)
General	29(100.0)	30(93.74)	39(100.0)	98(98.00)
Total	29(100.0)	32(100.0)	39(100.0)	100(100)

Note. Figures in parentheses denote percentages.

The Data

2.5 Both secondary as well as primary data has been used in this study. The secondary information was collected from the various levels of administrative machinery of the State. It includes the records maintained at block, district and State levels.

Analytical Tools

2.6 In general to make the analysis simple and more understandable, tabular analysis has been used. However, to analyse the project worth of protected cultivation venture, the project evaluation techniques like pay-back period (PBP), net present value (NPV) internal rate of return (IRR) and benefit-cost ratios (BCR) shall be worked out. The pay back period is the number of years an investment project takes to recover its costs from its returns. The pay back period equals t^x, where t^x is the lowest value of t for which the following inequality holds:

$$\sum_{t=0}^{t^x} C_t < \sum_{t=0}^{t^x} R_t$$

where R_t = Return in period t, C_t = Cost in period t.

2.7 The net present value (NPV) of an investment is the discounted value of all cash inflows and outflows of the project during its life time.

$$NPV = \sum_{t=0}^{T} (R_t - C_t)/(1+i)^t$$

where i = Discount rate, T = Project life.

2.8 Internal rate of return r is the discount rate at which NPV is zero. This can be computed from the equation:

$$\sum_{t=0}^{T} (R_t - C_t)/(1+r)^t = 0.$$

2.9 The benefit-cost ratio (BCR)of an investment is the ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of the project and is computed as:

$$\sum_{t=0}^{T} {R_t}/{(1+i)^t} \Big/ \sum_{t=0}^{T} {C_t}/{(1+i)^t}$$

2.10 On the basis of the criteria of pay-back period, a project is worth undertaking if and only if its PBP is not greater than the investor's desired maximum pay-back period. If the NPV is positive, the investment is profitable. If IRR is greater than the cost of borrowing the capital, the project is economically viable. Similarly, if BCR is greater than unit, the investment is profitable according to this criterion.

Limitations of the Study

2.11 There are some limitations of the study, but it is hoped that quality of this report is not affected on this account. Some of the limitations are given below:

- The farmers were not aware of the exact costs involved in polyhouse construction;
- It was difficult for the farmers to segregate the costs of various equipments installed in polyhouse. However, some information regarding this was gathered from the contractors.
- The data and information reported in this study was gathered from various sources and the findings of the study are based on unrecorded data pertaining to input use, production, marketing and sale price from growers who knowingly or unknowingly do not come out with actual facts.

Reference Period

The study refers to the agriculture year 2015-16.

CHAPTER-3

Present Scenario of Polyhouse Development in the State

3.1 Himachal Pradesh produces about 2.12 m MT of horticultural crops from an area of 0.31 m ha. The horticultural production comprises fruits (26.2%) and vegetables (71.6%). In the State majority of marginal and small farmers practise traditional farming, which is not profitable. A sea increase in the resource-use efficiency in crop production can be obtained through protected cultivation compared to open-field cultivation. In protected cultivation, high-value cash crops, vegetables and flowers are grown and managed under controlled conditions with higher per unit productivity and profitability. Protected cultivation has become a new agri-entrepreneurship in HP with the support of state and central governments. The state government has initiated protected farming through mission for integrated development of horticulture.

General Horticulture Scenario in H.P.

Total Cultivable area	6.15 Lac hect.
Total irrigated area	102617 Hect
Per Capita cultivable area	0.10 Hect
Total number of operational holdings (2000-01)	9,13,914
Average size of Land Holdings	1.07 Hect.
Total number of orchardists (1989 Census)	4.64 Lakh
Small and Marginal farmers	96%
'Horticulture Card' holders	112192 Nos.
Annual Employment generation through Horticulture	900 Lakh man days
Total area under Horticulture (2013-14)	2,20,706 Hect.
Record Fruit Production level achieved (2010-11)	10.28 Lakh MT
Total Fruit Production 2013-14	8.66 MT
Apple production (2013-14)	7.39 Lakh MT
Area under Floriculture (2013-14)	823.34 Hect.
Mushroom Production (2013-14)	6313 M.T
Honey produced (2013-14)	1515.3 M.T
Area covered under Medicinal & Aromatic plants (up to 2014)	813 Hect.
Annual gross Domestic Income from Horticulture	Rs. 5000 crore
% age of irrigated area to total cultivable area	20%

Mission for Integrated Development of Horticulture (MIDH)

3.2 Mission for Integrated Development of Horticulture (MIDH) is a Centrally Sponsored Scheme for the holistic growth of the horticulture sector covering fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo. While government of India (GOI) contributes 85% of total outlay for developmental programmes in all the states except the states in North East and Himalayas, 15% share is contributed by State Governments. In the case of North Eastern States and Himalayan States, GOI contribution is 100%. Guidelines regarding implementation of the scheme are described hereunder.

- MIDH has the following sub-schemes and area of operation

NHM

3.3 National Horticulture Mission (NHM) is one of the sub schemes of Mission for Integrated Development of Horticulture (MIDH) which is being implemented by State Horticulture Missions (SHM) in selected districts of 18 States and four Union Territories.

HMNEH

3.4 Horticulture Mission for North East & Himalayan States (HMNEH) is one of the sub schemes of Mission for Integrated Development of Horticulture (MIDH) which is being implemented by State Horticulture Missions (SHM) in the North Eastern States and Himalayan States.

NBM

3.5 National Bamboo Mission (NBM) is one of the sub schemes of Mission for Integrated Development of Horticulture (MIDH) which is being implemented by State Bamboo Development Agencies (BDA)/ Forest Development Agency (FDA) in all the States and UTs.

NHB

3.6 National Horticulture Board (NHB) is implementing various schemes under Mission for Integrated Development of Horticulture (MIDH) in all States and UTs.

CDB

3.7 Coconut Development Board (CDB) is implementing various schemes under Mission for Integrated Development of Horticulture (MIDH) in all Coconut growing states in the country.

- MIDH will work closely with National Mission on Sustainable Agriculture (NMSA) to wards development of Micro-Irrigation for all horticulture crops and protected cultivation on farmers' field.

- MIDH will also provide technical advice and administrative support to State Governments/ State Horticulture Missions (SHMs) for the Saffron Mission and other horticulture related activities like Vegetable Initiative for Urban Clusters (VIUC), funded by Rashtriya Krishi Vikas Yojana (RKVY)/NMSA.

Horticulture Mission for North East and Himalayan States (HMNEH) in H.P

3.8 The Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) is being implemented in Himachal Pradesh since 2003-04. From April 2014 onwards, HMNEH has been subsumed under MIDH and is being implemented in all the districts of the State covering important horticulture crops.

3.9 The area under polyhouses has been increasing continuously in the State. As per latest figures provided by Directorate of Horticulture, there was 140 hectares area under green/polyhouses with a total financial outlay of Rs.5271.94 lakhs under HTM/HMNEH/MIDH. Additional 7.91 hectares area was brought under low poly tunnels and an expenditure of Rs.3.952 lakhs was made on this account. Polyhouse was also an important component of Macro Management Scheme and an area of 6.71 hectares was brought under polyhouses under this scheme. As such the total area of polyhouses in the State stands at 154.62 hectares.

3.10 The protected cultivation in the State is regulated by the provisions of Operational guidelines (2014) issued by Government of India, Ministry of Agriculture. These operational guidelines are applicable for all the North East and Himalayan States. Activities like construction of shade net house, green houses, mulching, and plastic tunnels, anti bird/hail nets would be promoted under the Mission, and assistance for different components/sub components have been presented in Table 3.1(a&b). Provision has been made for selecting a variety of construction material for green houses and shade net houses. Separate provision has been made for meeting the cost of cultivation under green house and shade nets, which includes cost of planting material and inputs. Preference has been given to the use of locally available material, to minimize the cost of construction of such structures.

Table 3.1(a). Cost Norms and Pattern of Assistance Under MIDH during XII for NHM and HMNEH Sub Schemes

Particulars	Maximum permissible cost	Pattern of assistance
Green House Structure		
Fan and pad system	Rs.1650/Sq.m (up to area 500 Sq.m) Rs.1465/Sq.m (>500 Sq.m up to 1008 Sqm) Rs.1420/Sq.m (>1008 Sq.m up to 2080 Sq.m) Rs.1400/Sq.m (>2080 Sq.m upto 4000 Sq.m) Above rates will be 15% higher for hilly areas.	50% of the cost limited to 4000 Sq. m per beneficiary
Naturally ventilated system		
Tubular Structure	Rs.1060/Sq.m (up to area 500 Sq.m) Rs.935/Sq.m (>500 Sq.m up to 1008 Sq.m) Rs.890/Sq.m (>1008 Sqm upto 2080 Sq.m) Rs.844/Sq.m (>2080 Sq.m upto 4000 Sq.m) Above rate will be 15% higher for hilly areas.	50% of the cost limited to 4000 Sq. m per beneficiary
Wooden Structure	Rs.540/Sq.m and Rs.621/Sq.m for hilly areas	50% of the cost limited to 20 units per beneficiary (each unit not to exceed 200 sq.m.)
Bamboo Structure	Rs.450/Sq.m and Rs.518/Sq.m for hilly areas	50% of the cost limited to 20 units per beneficiary (each unit should not exceed 200 sq.m)
Shade Net House		
Tubular Structure	Rs.710/Sqm and Rs.816/Sq.m for hilly areas	50% of cost limited to 4000 sq.m. per beneficiary.
Wooden Structure	Rs.492/Sqm and Rs.566/Sqm for hilly areas	50% of cost limited to 20 units per beneficiary(each unit not to exceed 200 sq.m.)
Bamboo Structure	Rs.360/Sqm and Rs.414/Sqm for hilly areas	50% of cost limited to 20 units per beneficiary(each unit not to exceed 200 sq.m.
Plastic Tunnels	Rs.60/Sqm and Rs.75/Sqm for hilly areas	50% of cost limited 1000 sq.m. per beneficiary.
Walk in Tunnels	Rs.600/Sqm	50% of cost limited to 5000 sq.m. per beneficiary
Anti Bird/Anti Hail Nets	Rs.35/Sqm	50% of cost limited to 5000 sq.m. per beneficiary
Cost of planting material & cultivation of high value vegetables grown in polyhouse	Rs.140/Sq.m	50% of cost limited to 4000 sq.m. per beneficiary.
Cost of planting material & cultivation of Orchid and Anthurium under polyhouse /shade net house	Rs. 700/Sq.m	50% of cost limited to 4000 sq.m. per beneficiary.
Cost of planting material and cultivation of Carnation and Gerbera under poly house/share net house	Rs.610/Sq.m	
Cost of planting material & cultivation of Rose and Lilum under polyhouse /shade net house	Rs.426/Sq.m	50% of cost limited to 4000 sq.m. per beneficiary
Plastic Mulching	Rs.32000/ha and Rs.36800/ha for hilly areas	50% of the total cost limited to 2 ha per beneficiary

3.11 The cost norms and pattern of assistance under MIDH applicable for protected cultivation in Himachal Pradesh are given in the following table.

Table 3.1(b). Cost Norms and Pattern of Assistance Under MIDH for Protected Cultivation in Himachal Pradesh during 2015-16

Name of Components	Cost Norms (Rs.)	Subsidy %age	ROA Applicable (Rs.)	Total	
				Physical	Financial (Rs.in lakh)
1.Protected cultivation					
Green House structure					
a) Fan & Paid system (Sq. M)					
Up to area 500 Sq. m	1897.50	50	948.75	10000	94.88
>500 Sqm up to 1008 Sq. m	1684.80	50	8423.75	10000	84.24
>1080 Sq.m up to 2080 Sq.m	1633.00	50	816.50	2000	16.33
>2080 Sq. m 4000 Sq. m	1610.00	50	805.00	2000	16.10
b) Naturally ventilated system					
i)Tubular structure (Sq.M)					
Up to area 500 Sq. m	1219.00	50	609.50	100000	609.50
>500 Sqm up to 1008 Sq. m	1075.30	50	537.63	100000	537.63
>1008 Sq.m up to 2080 Sq.m	1023.50	50	511.75	20000	102.35
>2080 Sq.m 4000 Sq.m	970.60	50	485.30	20000	97.06
ii)Wooden structure	620.00	50	310.00	800	2.48
iii)Bamboo structure	518.00	50	259.00	100000	259.00
2.Shade Net House					
a)Tubular structure (Sq.M)	816.00	50	408.00	40000	163.20
b)Wooden structure (Sq.M)	566.00	50	283.00	0	0
c)Bamboo structure (Sq.M)	410.00	50	205.00	5000	10.35
3.Plastic tunnels(Sq.M)	75.00	50	37.50	10000	3.75
4.Walk in tunnels (Sq.M)	600.00	50	300.00	10000	30.00
5.Anti Bird/Anti Hail Nets (Sq.M)	35.00	50	17.50	2000000	350.00
6.Cost of planting material of high value vegetables grown in poly house(Sq.M)	140.00	50	70.00	150000	105.00
7.Cost of planting material and cultivation of Orchid and Anthurium under poly house/shade net house.(Sq.M)	700.00	50	350.00	5000	17.50
8.Cost of planting material & cultivation of Carnation & Gerbera under poly house/shade net house (Sq.M)	610.00	50	305.00	410364	1251.61
9.Cost of planting material cultivation of Rose under poly house/shade net house (Sq.M)	426.00	50	213.00	52750	112.36
10.Plastic Mulching (Ha).	36800.00	50	18400.00	38.824	18.40

CHAPTER- 4

Socio-Economic Features of Polyhouse Owners in the State

4.1 Information about the socio-economic conditions of the sampled polyhouse farmers of the study areas provide the basis for understanding the background of these farmers and the conditions under which they function. Such conditions influence the processes followed in the production and marketing to a great extent. In this chapter, an attempt has been made to study the socio-economic characteristics of all the sampled polyhouse farmers of Mandi and Kangra districts of Himachal Pradesh. It is in this context that the demographic structure i.e. family size, education occupation and economic factors like land utilization, income etc. have been discussed.

Family Size

4.2 The study of family size is important from the labour availability point of view. Table 4.1 reveals that at overall level the average family size was 4.58 persons and it ranged between 4.40 persons in medium category to 4.96 persons in small category.

Table 4.1. Average Family Size of Sampled Households

Family Size	Category			
	Small	Medium	Large	All
No. of persons	4.96	4.40	4.44	4.58

Educational Status

4.3 The proportion of literates is an important indicator of the quality of man power. Since cultivation of commercial crops like vegetables and flowers need special attention for obtaining better productivity, the knowledge of modern inputs and techniques of production and marketing is essential. For this, education level of every member of farm family plays a crucial role. Keeping in view the importance of education, the educational level of members of the sampled families is given in Table 4.2. According to this table at overall level only 3.08 percent population of sampled households was illiterate and remaining 96.92 percent was literate. The percentage of illiterates was high (6.86%) in medium category as compared to small category(3.03%). There was no illiterate in the category of large polyhouse farmers. Among the literates, the most

prevailing standard of education was secondary level (42.52%) followed by graduate level (23.28%). The same trend was observed in the category wise also. There were 10.27 percent having qualification above graduation level. The percentages of middle and primary were 10.22 and 10.68 respectively.

Table 4.2. Educational Level of Family Members of Sampled Household

(Percentages)

Particulars	Category			
	Small	Medium	Large	All
Illiterate	3.03	6.86	0	3.08
Primary	7.58	9.16	13.29	10.22
Middle	14.39	7.63	10.14	10.68
Secondary	39.39	45.03	43.03	42.52
Graduates	25.76	21.38	22.78	23.28
Above graduation	9.85	9.93	10.76	10.27
Total	100	100	100	100

Occupational Structure

4.4 The main as well as subsidiary occupation of the sampled polyhouse farmers was analysed and presented in Tables 4.3 and 4.4 respectively.

Main Occupation

4.5 It can be seen from Table 4.3 that agriculture was the main occupation of the majority (42.36%) of the farmers. The same situation was observed in category-wise

Table 4.3. Occupational Pattern of Sampled Households (Main Occupation)

(No.)

Particulars	Category			
	Small	Medium	Large	All
Farming	51(35.42)	59(41.84)	84(48.55)	194(42.36)
Service	20(13.89)	20(14.18)	16(9.25)	56(12.23)
Agri. Labour	-	-	-	-
Non-agri. Labour	-	-	-	-
Retired	11(7.64)	1(0.71)	6(3.47)	18(3.93)
Dependents	32(22.22)	28(19.86)	32(18.50)	92(20.09)
Household workers	4(2.78)	-	-	4(0.87)
Students	26(18.05)	33(23.41)	35(20.23)	94(20.52)
Others	-	-	-	-
Total population	144(100)	141(100)	173(100)	458(100)

Note: Figures in () denote the percentages.

also. Service was the main occupation of 12.23 percent of the farmers and 0.87 percent reported household work as their main occupation. About 21, 20 and 4 percent were of students, dependents and retired persons respectively. Workers were not working as agricultural and non-agricultural labour.

Subsidiary Occupation

4.6 The secondary occupational structure of the sampled ployhouse farmers was also studied along with the main occupational structure and presented in Table 4.4. Here too, farming was the most common subsidiary occupation (47.60%) and 7.86 percent reported household work to be their subsidiary occupation. Category-wise only small farmers reported household work as their subsidiary occupation.

Table 4.4. Occupational Pattern of Sampled Households (Subsidiary Occupation)

(No.)

Particulars	Category			
	Small	Medium	Large	All
Farming	39(27.08)	79(56.02)	100(57.80)	218(47.60)
Service	-	-	-	-
Agri. Labour	-	-	-	-
Non-agri. Labour	-	-	-	-
Retired	11(7.64)	1(0.71)	6(3.47)	18(3.93)
Dependents	32(22.22)	28(19.86)	32(18.49)	92(20.08)
Household workers	36(25.00)	-	-	36(7.86)
Students	26(18.6)	33(23.41)	35(20.24)	94(20.53)
Others	-	-	-	-
Total population	144(100)	141(100)	173(100)	458(100)

Note. Figures in ()denote the percentages.

Land Resources

4.7 Land being the primary factor of production, the economic activity of a region mainly depends on the quantum of land resources available and their use. The land resources of the sampled polyhouse farmers are presented in Table 4.5 in absolute terms and in Table 4.6 in percentage terms.

Table 4.5. Land Resources of Selected Protected Cultivators

(Ha./Farm)

Particulars	Category			
	Small	Medium	Large	All
1.Total land owned	0.83	0.55	0.65	0.68
a. Cultivated land				
- Irrigated	0.25	0.23	0.27	0.25
- Un-Irrigated	0.52	0.16	0.18	0.27
b.Cultivable waste				
c.Non cultivable	0.06	0.15	0.20	0.15
2.Leased in land	-	-	-	-
- Irrigated	-	-	-	-
- Un-Irrigated	-	-	-	-
3.Leased out land	-	-	-	-
- Irrigated	-	-	-	-
- Un-Irrigated	-	-	-	-
4.Net operated area	-	-	-	-
- Irrigated	0.25	0.24	0.27	0.25
- Un-Irrigated	0.51	0.16	0.18	0.27
Total	0.76	0.40	0.45	0.52

Table 4.6. Land Resources of Selected Protected Cultivators

(Percentages)

Particulars	Category			
	Small	Medium	Large	All
1.Total land owned	100	100	100	100
a.Cultivated land	92.70	72.20	68.32	78.01
- Irrigated	29.91	42.60	40.68	37.35
- Un-Irrigated	62.79	29.60	27.64	40.66
b.Cultivable waste	-	-	-	-
c.Non-cultivable	7.30	27.80	31.68	21.99

4.8 The average size of land holding provides the basis for judging whether a holding is good enough for cultivation. The average size of land holding was observed to be 0.83, 0.55 and 0.65 hectare for small, medium and large category respectively (Table 4.5). As a whole, the average land holding size was 0.68 hectares, out of which 78.01 percent was cultivated land (Table 4.6) and these figures were 92.70, 72.20 and 68.32 percent for small, medium and large category respectively. The proportion of un-irrigated land was higher at overall level but was lower than irrigated land in case of medium and large farmers. Non-cultivable land (Ghasni or grass land) was 21.99

percent at overall level and higher in case of large category as compared to other categories. As seen above, land holdings in Himachal Pradesh are generally small. Therefore, the protected cultivation is the need of the day.

Income From Sources Other Than Crop Farming

4.9 In addition to income from farming, the farming households derive income from various other sources like animal husbandry, salary, business and agricultural and non-agricultural labour etc. The per farm annual income from various sources (other than crop farming) of sampled polyhouse farmers is given in Table 4.7 and the percentage of income from various sources is presented in Table 4.8.

Table 4.7. Per Farm Annual Income From Other Sources

(Rs.)

Source of Income	Category			
	Small	Medium	Large	Overall
Animal husbandry	74827	73281	63461	69900
Income from salary	344045	374182	338667	357177
Business	-	-	-	-
Income from wages	175000	350000	400000	308333
Pension	367090	232000	370000	347700
Other	-	-	-	-
Total income	960962	1029463	1172178	1083110

Table 4.8. Per Farm Annual Income From Other Sources

(Percentages)

Source of Income	Category			
	Small	Medium	Large	Overall
Animal husbandry	7.79	7.11	5.42	6.45
Income from salary	35.80	36.35	28.89	32.98
Business	-	-	-	-
Income from wages	18.21	34.00	34.12	28.47
Pension	38.20	22.54	31.57	32.10
Other	-	-	-	-
Total income	100	100	100	100

4.10 It can be seen from Table 4.7 that at overall level, annual income per farm from animal husbandry, salary, wages and pension was Rs.69900, Rs.357177, Rs.308333 and Rs.347700 respectively. In percentage terms, out of total income of all sampled

farmers, the income from salary was maximum (32.98%) followed by pension (32.10%), wage labour (28.47%) and animal husbandry (6.45%). Category-wise in small and medium category the maximum income (36.35%) was derived from the pension whereas in medium category of farmers salary was the main source of income (36.35%) followed by the income from wages (34%) and pension (22.54%).

CHAPTER- 5

Motivations/Hindrances and Costs Involved in Polyhouse Construction

5.1 Protected cultivation is an alternative new technique in agriculture, gaining popularity among the farmers in the State. The polyhouses are used to grow high value crops (vegetables and flowers) in Himachal with the adoption of all weather technology. Crops that are grown in polyhouses are protected from unfavourable weather conditions such as hailstorms, extremely cold weather, wind etc. Polyhouse farming help the farmers generate income around the year growing multiple crops and fetching handsome price for off-season vegetables. The information about polyhouses is the starting point for the adoption of polyhouse technology by the farmers. After getting information about various aspects of the technology, they analyse the pros and cons of it to take a decision about its adoption. At the same time, there are various factors and situations which act as deterrent and may act as hindrances that come in the way of adoption of polyhouse farming. It is with this background that the present chapter has been designed to see the motivations/hindrances in the adoption of the polyhouse technology and the costs involved in polyhouse construction.

5.2 Depending on the control system using polyhouse can be with semi automatic control system or with fully automatic control system. In semi automatic control system, manual adjustments are needed to maintain the polyhouse in good condition whereas in automatic system-pre setting is enough for the maintenance of polyhouse. Proper alertness and technical skills should be needed which manage semi-automatic polyhouse. Any deviation may result in damage of crop and many kinds to loss. In an automatic system of polyhouse, less attention is enough for maintenance, but it is very costlier compared to semi-automatic type. Polyhouses have a variety of applications, the majority being, growing of vegetables and flowers in Himachal Pradesh. There are two types of polyhouses as revealed by the sampled farmers of selected areas i.e. simple and Hi-Tech polyhouses but not fully Hi-Tech. Table 5.1 depicts that out of total

polyhouses 54 percent were simple and 46 percent Hi-Tech. The number of simple type of polyhouses decreased with the increase in the size of polyhouses whereas the number of Hi-Tech polyhouses showed a direct trend. All the polyhouses were of single tier cultivation polyhouses.

Table 5.1. Type of Polyhouses

(No.)

Type	Small	Medium	Large	All
Simple	25	20	9	54
Hi.Tech.	4	12	30	46
- Single Tier Cultivation	29	32	39	100
- Multi Tier Cultivation	-	-	-	-

Sources of Information About Polyhouse

5.3 There are various sources of information from which the farmers get the information about the benefits of polyhouses. Majority of the respondents received information from more than one source and so analysis in this respect is based on multiple responses (Table 5.2). It can be seen from the table that for detailed and authentic information regarding polyhouses, horticulture department was the main source of information as revealed by 94 percent of polyhouse farmers followed by the information from friends and Relatives (69%), seen in other villages and through awareness camps each (45%) and radio/newspaper etc. (36%). More or less same pattern was observed in the category-wise also.

Table 5.2. Sources of Information About Polyhouse

(Multiple Responses in %)

Sources	Category			All
	Small	Medium	Large	
Horticulture Department	89.65	93.75	97.43	94.00
Friends/relatives	68.96	75.00	64.10	69.00
Seen in other villages	51.72	37.50	46.15	45.00
Awareness camps	34.48	46.87	51.28	45.00
Radio/News Paper etc.	34.48	37.50	35.89	36.00

Sources of Information About Scheme/Subsidy/Technical Details

5.4 The polyhouse farmers were also asked about the sources of information about the formalities for getting loans/subsidies and for other operations/technical details, by using the technique of multiple response and the results are presented in Table 5.3. The table depicts that at overall level, horticulture department was the main source of information to farmers (87 %) followed by the radio/Newspaper etc. (60%), awareness camps (59%), seen in other villages (46%) and friends and relatives (45%). Category-wise also horticulture department was the main source of information followed by radio and newspaper etc. except in the case of large farmers where awareness camps were the second main source of information.

Table 5.3. Sources of Information About Scheme/Subsidy/ Technical Details

(Multiple Responses in %)

Sources	Category			Overall
	Small	Medium	Large	
Horticulture department	82.75	96.87	82.05	87.00
Friends/relatives	41.37	46.87	46.15	45.00
Seen in other villages	44.48	56.25	38.46	46.00
Awareness camps	48.27	62.50	64.10	59.00
Radio/News Paper etc.	51.72	78.12	51.28	60.00

Motivation Factors

5.5 Motivational factors are the situations or reasons which induce the farmers to adopt the activity. A list of such possible factors was prepared and multiple responses in this regard were taken from the respondents and presented in Table 5.4. The table shows that at overall level possibility of high income was the largest motivating factor to 65 percent of the respondents. Same trend was observed in the category-wise also. Demonstration effect also played an important role in motivating the farmers and at overall level, was the second important motivating factor as revealed by 62 percent of the farmers. Category wise large farmers (79.48%) were mainly motivated by this factor. Sixty one percent of the respondents adopted this activity because they have low availability of water for irrigation and polyhouse cultivation requires less water for irrigation. Long crop duration was the another important factor which motivated about

60 percent of the respondents at overall level and large farmers were more motivated by this factor (71.79%).

Table 5.4. Motivation Factors for Adoption of Polyhouse

(Multiple Responses in %)

Sources	Category			All
	Small	Medium	Large	
Having less land	51.72	62.50	64.10	50
Suitable land is available	37.93	37.50	25.64	33
Availability of manpower	34.48	31.25	12.82	25
Possibility of high income	65.51	62.50	66.67	65
Availability of subsidy	51.72	53.12	46.15	50
Availability of easy loan	34.48	40.62	46.15	41
Long crop duration	55.17	50.00	71.79	60
Easy control of insects/pests	51.72	43.75	58.97	52
Ready market for products	27.58	31.25	23.07	27
New crops can be grown	48.27	50.00	64.10	55
Enough financial resources	24.13	34.37	25.64	27
Availability of technology	13.79	25.00	20.51	20
Demonstration effect	55.17	46.87	79.48	62
Low availability of water for irrigation	65.51	68.75	76.92	61

5.6 In addition to these important motivational factors other factors like new crops can be grown in the polyhouses and easy control of insects and pests were also equally important factors which motivated 55 and 52 percent of the respondents respectively at overall level. Half of the respondents stated that they had less land and by adopting this technology they are making better use of it. Same percentage of the respondents motivated to this activity due to the subsidy.

Hindrances in Adoption of Polyhouse

5.7 Despite the fact that the farmers were motivated for adoption of polyhouses, there were many hindrances which the farmers faced during the adoption process. The analysis of such factors is important from the point of view of streamlining and refining the programme for higher adoption rates. A list of such possible hindrances was prepared and multiple responses in this regard were taken from the respondents and are presented in Table 5.5.

Table 5.5. Hindrances Encountered for Adoption of Polyhouse

(Multiple Responses in %)

Hindrances	Category			Overall
	Small	Medium	Large	
Cumbersome clearance from department	48.27	53.12	48.71	50.00
Delays in technology transfer	41.37	56.25	51.25	50
Long wait for loan clearance/subsidy	51.72	40.62	35.89	42
Construction materials not locally available	34.46	53.13	48.71	46
Contractor delayed the execution	55.17	45.87	51.28	51
High construction cost	34.48	43.75	53.85	45
Unavailability of skilled labour	37.93	46.87	43.58	43
Unsuitable farm location	48.27	56.25	20.51	40
Marketing problems of crops	89.65	87.50	100.0	93
Took time to adjust new crops growing technology	37.93	46.87	23.07	35

5.8 It can be seen from the table that most of the respondents (93%) reported about the marketing problems. Same trend was observed in all the categories. Fifty one percent respondents stated that execution was delayed by the contractor. Fifty percent complained about the clearance procedure adopted by various departments, which in their opinion was long and cumbersome. Delays in technology transfer was the another hindrance stated by the 50 percent of the respondents. Forty six percent respondents said that the construction material is not locally available and 45 percent complained that the cost of construction of polyhouse was high. Forty two percent stated that there was long wait involved in getting clearance of loan and subsidy from the departments and 28 percent were of the view that the information was not provided clearly by the department to them regarding adoption and construction of polyhouse.

Departmental Supervision

5.9 The department supervises the construction of polyhouses to ensure that these are constructed according to approved design and quality control in the construction. The results in the Table 5.6 reveal that at overall level 76 percent of the polyhouses were supervised by the officials. It is pertinent to note that the attitude of officials during the supervision, in addition to ensure the quality and design aspect, was supportive to

farmers. Sixty six percent respondents were of the view that the attitude of officials was very supportive and appreciable. Most of the medium (75%) and large (87%) farmers supported this view. Only 34 percent respondents felt that the attitude of the officials was neutral at overall level, this view was supported by most (72.42%) of the small farmers. But the positive point about the attitude of the officials is that none of the respondents found it to be discouraging. This fact can go a long way in making this scheme successful.

Table 5.6. Supervision of Polyhouse Construction by Officials

(%)

Particulars	Categories			All
	Small	Medium	Large	
Cases supervised	70.31	62.50	84.61	76
Attitude of Officials				
- Supportive	27.58	75.00	87.17	66
-Neutral	72.42	25.00	12.83	34
-Discouraging	-	-	-	-

Farmer's Suggestions for Improvement of Ployhouses

5.10 Farmers were asked about the suggestions for improvement of polyhouses and they had some suggestions for improving the sustainability and viability of present systems which are given in Table 5.7. At overall level 76 percent of the respondents had some suggestions for the improvement of polyhouses. This percentage was highest (87.18%) among the large farmers followed by small (79.31%) and medium (59.37%) farmers. Majority of the farmers (76%) wanted the design of the polyhouses to be according to local conditions. Sixty percent respondents were in favour of organic farming to make the produce healthy and 58 percent said that training should be provided about product processing and packing. According to 57 percent respondents felt that the conditions will improve if cost saving techniques are applied or made available and 56 percent desired to have information on cropping practices under protected conditions. Fifty five percent of the respondents stated that storage facilities be given and 52 percent suggested that some assistance in marketing should be provided to them.

Table 5.7. Suggestions for Improvement of Polyhouses

(%)

Particulars	Categories			All
	Small	Medium	Large	
Farmers with suggestions	79.31	59.37	87.18	76
Suggestions (Multiple Responses in %)				
Adaptation of design to local conditions	75.86	75.00	76.92	76
Cost saving measures	34.48	46.87	82.05	57
Crops to be grown	-	37.50	76.92	42
Cropping practices	41.37	50.00	71.79	56
Sources of inputs	-	43.75	74.35	43
Organic farming	34.48	53.12	84.61	60
Product processing and packing	44.82	46.87	76.92	58
Storage techniques	48.27	40.62	71.79	55
Marketing assistance	27.58	56.25	79.48	52

Delays in No Objection Certificate

5.11 Many respondents felt that there were delays in granting of No Objection Certificate (NOC) from the department (Table 5.8) which could have been due to long departmental procedures or other priority assignments with the concerned officials. On the whole, 76 percent respondents said that they had to face some delay in granting NOC from the department due to which they had to face the financial hardships.

Table 5.8. Delays in No Objection Certificates (NOC)

(%)

Particulars	Categories			All
	Small	Medium	Large	
Farmers reporting delay	82.76	59.37	84.61	76
Farm ers reporting No delay	17.24	40.63	15.39	24

Action by Contractor in Case of Delay in NOC

5.12 Only three percent respondents at overall level (all of large category) reported some action taken by contractor in case of delay in NOC (Table 5.9).

Table 5.9. Action by Contractor in Case of Delay in NOC

(%)

Particulars	Categories			All
	Small	Medium	Large	
Action reported	-	-	7.69	3
No action reported	100	100	92.31	97

Equipments Installed in Polyhouses

5.13 There are various types of equipments installed in the polyhouses, especially in the polyhouses of high tech design. Farmers installed more than one equipment and therefore, analysis of multiple response has been used and results are presented in Table 5.10. The table reveals that at overall level, sun shade, water tank, vermi-compost pit and fogger were installed by the 99, 98, 91 and 55 percent polyhouse farmers respectively. It was also found that all the polyhouses had drip irrigation. About 29 and 26 percent reported installation of humidifier and cooler respectively.

Table 5.10. Equipments Installed in Polyhouses

(% of Farmers)

Equipments installed	Categories			All
	Small	Medium	Large	
Heater	-	-	-	-
Cooler	13.79	31.25	30.76	26
Humidifier	13.79	31.25	38.46	29
Sun shade	96.55	100.0	100.0	99
Drip irrigation	100.0	100.0	100.0	100
Fogger	13.79	37.50	100.0	55
Water tank	100.0	93.75	100.0	98
Vermicompost pit	82.75	87.50	100.0	91

Deviations from Recommended Design

5.14 Some minor deviations from the recommended designs were made by the polyhouse farmers which were mainly due to three reasons as given in Table 5.11. Thirty nine percent farmers reported deviation from the recommended design at overall level. This percentage was highest among the medium farmers (43.75%) followed by large farmers (43.58%) and small farmers (27.58%). The deviation was due to financial problems as reported by 45 percent of polyhouse owners. Twenty six respondents did it

on the recommendations of the contractor who suggested it due to unsuitable shape of land on which the polyhouse was to be constructed. Twenty two percent farmerst just followed others.

Table 5.11. Reasons for Deviation From Recommended Design of Polyhouse

(%)

Equipments installed	Categories			All
	Small	Medium	Large	
Farmers reporting deviation	27.58	43.75	43.58	39
Reasons(Multiple Responses in %)				
Financial problems	72.41	59.37	12.82	45
Contractors' recommendations	27.59	43.75	10.25	26
Followed others	13.79	46.87	7.69	22

Sources of Training/Dissemination

5.15 There are various sources from where the farmers could take the training related to protected cultivation. Table 5.12 reveals that at overall level horticulture department was the main source of training of the majority (50%) of the farmers. This percentage was highest (68.96%) among the small farmers followed by medium (56.25%) and large (30.76%). The other sources of training were krishi vigyan kendras and state agricultural/horticultural University as reported by 30 and 24 percent respondents respectively.

Table 5.12. Sources of Training/Dissemination Provided to Farmers for Protected Cultivation

(Multiple Responses in %)

Sources	Categories			All
	Small	Medium	Large	
1.State Horticulture Department	68.96	56.25	30.76	50
2.State Agricultural/Horticulture University	13.79	31.25	25.64	24
3.Krishi Vigyan Kendras	17.24	25.00	43.58	30
4.Kisan Call Centre	-	-	-	-
5.Cooperatives/Local Bodies	-	-	-	-
6.Input Dealers/Private Company Representatives	-	-	-	-
7.Spcial Research Stations set up by the Government	-	-	-	-
8.Non Government Organizations (NGOs)	-	-	-	-
9. Any Other	-	-	-	-

Cost of construction of Polyhouse

5.16 The cost of construction of polyhouse basically depends upon the size and shape of polyhouse structure and type of polyhouse. Recently the polyhouse structure have been made possible on subsidized cost for growing off-season vegetables and raising nursery successfully in abnormal weather conditions. The Himachal Pradesh government gives 80 percent subsidy to the farmers for the construction of polyhouse and the farmers has to pay only 20 percent of the project cost. The cost of construction of sampled polyhouses of different sizes i.e. 250 sq. meter, 500 sq. meter and 1000 sq. meter is given in Tables 5.13-15. The construction of polyhouse in the studied area includes the components such as land levelling, planning and drawing the layout, erection of structure, covering the polyhouse by polythene, provision of sunshades and the installation of drip irrigation system. The cost of coolers and humidifiers were not available as separate.

Cost of Construction of Polyhouse (250m^2)

5.17 It can be seen from the Table 5.13 that the total cost of polyhouse construction was Rs.270860 in which Rs.54172 was the net cost paid by the farmers

Table 5.13. Cost of Construction of Polyhouse (250m^2)

(Rs./Polyhouse)

Particulars	Imputed value of family labour	Value of hired labour	Material cost	Total Cost
Land levelling		9000	1000	10000(3.69)
Lay out		2500	150000	152500(56.30)
Erection of structure		2680	20000	22680(8.37)
Covering by polythene		3000	42360	45360(16.75)
Provision of sun shades		-	10080	10080(3.72)
Erection of Trellis		-	-	-
Provision of shelves		-	-	-
Heaters		-	-	-
Coolers		-	-	-
Humidifiers		-	-	-
Drip irrigation system		5000	25080	30080(11.11)
Drip irrigation		-	-	-
Fogger		-	160	160(0.06)
Other		-	-	-
Total cost		22180(8.19)	248680(91.81)	270860(100)
Amount of subsidy		-	-	216688(80.00)
Net cost paid by farmer		-	-	54172(20.00)

Note. Figures in parenthesis denote percentages to total.

and the rest Rs.216688 was the subsidy amount. In total cost, value of hired labour was Rs.22180 (8.19%) and material cost of Rs.248680 (91.81%). The most important component of total cost of construction was drawing the layout of polyhouse accounting for Rs.152500 which is 56.30 percent of the total cost. The other components of total cost were the covering of polyhouses by polythene (Rs.45360), followed by installation of drip irrigation (Rs.30080), erection of structure (Rs.22680) provision of sunshades (Rs.10080) and land levelling (Rs.10000).

Cost of Construction of Polyhouse (500m^2)

5.18 The Table 5.14 reveals that the total cost of polyhouse was Rs.517180 in which the net cost paid by the farmer was Rs.103436 and the rest Rs.413744 was the subsidy amount. In total cost the value of hired labour and material costs were

Table 5.14. Cost of Construction of Polyhouse (500m^2)

(**Rs./Polyhouse)**

Particulars	**Imputed value of family labour**	**Value of hired labour**	**Material cost**	**Total Cost**
Land levelling		9000	1000	10000(1.93)
Lay out		5000	290500	295500(57.14)
Erection of structure		6000	34320	40320(7.80)
Covering by polythene		7600	83120	90720(17.54)
Provision of sun shades		-	20160	20160(3.90)
Erection of Trellis		-	-	-
Provision of shelves		-	-	-
Heaters		-	-	-
Coolers		-	-	-
Humidifiers			-	-
Drip irrigation system		10500	49730	60230(11.64)
Drip irrigation		-	-	-
Fogger		-	250	250(0.05)
Other		-	-	-
Total cost		38100(7.37)	479080(92.63)	517180(100)
Amount of subsidy		-	-	413744(80.00)
Net cost paid by farmer		-	-	103436(20.00)

Note. Figures in parenthesis denote percentages to total.

Rs.38100 (7.37 %) and Rs.479080 (92.63 %) respectively. The cost of drawing the layout of polyhouse was observed to be Rs.295500 which is 57.14% percent of the total cost, followed by the cost of covering of polyhouses by polythene (Rs.90720), installation of drip irrigation (Rs.60230), erection of structure (Rs.40320), provision of sunshades (Rs.20160) and land levelling (Rs.10000).

Cost of Construction of Polyhouse (1000m^2)

5.19 It may be seen from the Table 5.15 that the total cost of a polyhouse was Rs.1003740 in which the net cost paid by the farmer was Rs.200748 and the rest Rs.802992 was the subsidy amount. In total cost the value of hired labour and material costs were Rs.60000 (5.98%) and Rs.943740 (94.02 %) respectively. In total cost the

Table 5.15 Cost of Construction of Polyhouse (1000m^2)

(Rs./Polyhouse)

Particulars	Imputed value of family labour	Value of hired labour	Material cost	Total Cost
Land levelling		13000	2000	15000(1.49)
Lay out		12000	568500	580500(57.83)
Erection of structure		10000	55520	65520(6.53)
Covering by polythene		13000	168440	181440(18.08)
Provision of sun shades		-	40320	40320(4.02)
Erection of Trellis		-	-	-
Provision of shelves		-	-	-
Heaters		-	-	-
Coolers		-	-	-
Humidifiers		-	-	-
Drip irrigation system		12000	108610	120610(12.02)
Drip irrigation		-	-	-
Fogger		-	350	350(0.03)
Other		-	-	-
Total cost		60000(5.98)	943740(94.02)	1003740(100)
Amount of subsidy		-	-	802992(80.00
Net cost paid by farmer		-	-	200748(20.00)

Note. Figures in parenthesis denote percentages to total.

cost of drawing the layout of polyhouse was observed to be maximum i.e. Rs.580500 (57.83 %) followed by the cost of covering of polyhouse by polythene (Rs.181440, installation of drip irrigation (Rs.120610), erection of structure (Rs.65520), provision of sunshades (Rs.40320) and land levelling (Rs.15000).

5.20 In the selected areas, most of the polyhouses were more than five years old and during the survey, the farmers informed that it was possible to get back the investment on polyhouse within a period of 3 to 5 years. After this period, whatever they earned (Gross return – (production cost + marketing cost)) from the crops/vegetables was their profit.

Loan for Construction of Polyhouses

5.21 The details of loans taken for the construction of polyhouses by the sampled polyhouse farmers are given in Table 5.16. It can be seen from the table that all the sampled farmers of different categories have taken loans and only from commercial banks. The average loan amount was maximum at Rs.100000 for large category followed by Rs.51000 for medium category and Rs.27000 for small category. The same trend was observed in the case of outstanding amount of loan.

Table 5.16. Details of Loans for Construction of Polyhouses

(No.)

Particulars	**Categories**		
	Small	**Medium**	**Large**
Total number of farmers who took loan	29	32	39
1.Source of loan			
- Commercial bank	29	32	39
- Cooperative bank	-	-	-
- Land development bank	-	-	-
- Government programme	-	-	-
- Traders/money lenders	-	-	-
- Aharti/commission agent	-	-	-
- Landloard/employer	-	-	-
- Friends/relatives	-	-	-
- Others	-	-	-
2. Amount of loan taken (Rs./person)	27000	51000	100000
3.Out standing amount (Rs./person)	9000	16000	48000

CHAPTER- 6

Costs and Returns from Protected Crops

6.1 This chapter mainly deals with the costs and returns from cultivation of crops under protected conditions by different categories of sampled polyhouse farmers in Himachal Pradesh. In addition to this, the cropping pattern, production pattern and economics of crops grown in open farms are also studied. It was found during the field survey that the sampled farmers were growing large variety of crops under protected conditions, but it was also observed that the area devoted to most of these crops was very less and farmers also did not pay much attention to these crops. Therefore, the present analysis has been carried out only for selected important protected crops. These crops are carnation, rose (floriculture crops), capsicum and tomato (vegetable crops) under protected conditions. The unit for cost of cultivation for selected crops, under protected conditions has been taken to be the average size of polyhouse. These sizes are 250 sq. meters for small, 500 sq. meters for medium and 1000 sq. meters for large category of farmers.

6.2. Cost of cultivation of crops includes various operations and inputs. The labour (family and hired) used for different operations has been evaluated at current market wage rate prevailing in different villages. The input costs have been taken to be the actual costs of inputs and costs of transportation, carriage handling etc. if any, have been added to purchase price of inputs to work out the actual costs of inputs applied. The home produced inputs have been evaluated at the current market price for working out the cost of cultivation of selected crops.

Cost of Cultivation of Flower Crops

6.3 With changing life styles and increased urban influence, floriculture has assumed a definite commercial status in recent times and during the past 1-2 decades particularly. It has emerged as an economically viable agri-business option. The quality of flowers produced is superior, because inside climate such as temperature, humidly, light, ventilation etc. is controlled.

Cost of Cultivation of Carnation

6.4 Carnation (Gulnar, Lili) is one of the beautiful flowers after rose and commercially cultivated crop in polyhouse/greenhouse. The cost of cultivation of carnation is presented in Table 6.1(a).

Table 6.1.(a) Cost of Cultivation of Carnation Under Protected Condition

(Rs. /polyhouse)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	1245	2676	5452	3344	2.40
Value of sapling	19767	26425	53767	35158	25.28
Sowing/ Transplanting	625	1265	2135	1419	10.20
Manuring/FYM	8930	17666	33420	21277	15.30
Vermicompost	7937	12847	21855	14936	10.74
Fertilizer	6665	9889	25842	15176	10.91
Insecticides/pesticides	4492	6531	10175	7361	5.29
Interculture	3420	8320	15494	9697	6.97
Irrigation	1748	2990	4515	3225	2.31
Spraying	4050	4175	7900	5592	4.02
Stalking etc.	3642	5150	6745	5335	3.83
Harvesting/ picking	6245	10025	18565	12259	8.82
Soil sterilization	2000	3815	6320	4266	3.06
Total production cost	70766	111774	212185	139042	100.00

6.5 The table reveals that the cost of cultivation of carnation, at overall level, was Rs.139042 per polyhouse. Category wise, the cost was found to be Rs.70766 for small, Rs.111774 for medium and Rs.212185 for large category. The table further reveals that value of sapling was the largest cost component accounting for 25.28 percent of the total cost of cultivation. The second important cost component was the application of manure/FYM. constituting 15.30 percent of the total cost followed by the cost of fertilizer (10.91%), vermicompost (10.74%), making the manures and fertilizers,

considered together, the largest cost component. Interculture and insecticides/pesticides application was about 7 and 5 percent of the total cost respectively. The cost of harvesting of these flowers was 8.82 percent of the total cost. The details of different categories can also be seen from this table and reveals that the cost of different components and the total cost increases with the increase in the size of polylhouse.

Cost of Cultivation of Rose

6.6 Rose is one of the most beautiful flowers grown in polyhouses/greenhouses. The cost of cultivation of rose is presented in Table 6.1(b). It can be seen from the table that the cost of cultivation of rose, at overall level was Rs.136340 and category wise, the cost was Rs.69665 for small, Rs.108640 for medium and Rs.208640 for large polyhouse farms showing increasing trend with the increase in the size of polyhouse.

Table 6.1.(b) Cost of Cultivation of Rose Under Protected Condition

(Rs. /polyhouse)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	1230	2597	4950	3118	2.29
Value of sapling	18669	26230	52789	34395	25.23
Sowing/ Transplanting	525	1145	2095	1336	0.98
Manuring/FYM	8860	16775	32465	20599	15.11
Vermicompost	7920	12230	20765	14309	10.49
Fertilizer	6345	9235	25545	14758	10.82
Insecticides/pesticides	4395	6420	10260	7330	5.38
Interculture	4230	8525	15795	10115	7.42
Irrigation	1646	2888	4406	3120	2.29
Spraying	3938	4095	7845	5512	4.04
Stalking etc.	3580	5070	6739	5289	3.88
Harvesting/ picking	6425	10115	18780	12424	9.11
Soil sterilization	1902	3315	6212	4035	2.96
Total production cost	69665	108640	208640	136340	100.00

The analysis also reveals that value of sapling was the largest cost component accounting for 25.22 percent of the total cost followed by the cost of manure/FYM application (15.11%), fertilizer (10.82%) and vermicompost (10.49%). Interculture and insecticides/pesticides application was 7.42 and 5.38 percent of the total cost respectively. The cost of harvesting of these flowers was 9.11 percent of the total cost. The cost of different components increases with the increase in the size of polyhouse.

Net Returns from Cultivation of Flower Crops

6.7 The net returns have been calculated by adding the marketing costs to the total cost of production and then subtracting it from the value of output. The net returns from carnation and rose cultivation are given in Tables.6.2(a) & 6.2(b).

Net Returns from Cultivation of Carnation

6.8 The net returns from carnation cultivation are presented in Table 6.2 (a) wherein it can be seen that at overall level, average net return from cultivation of carnation was Rs.1467278 per polyhouse, whereas category-wise net returns were Rs.323830, Rs.1124394, and Rs.2602367 for small, medium and large polyhouse farms respectively.

Table 6.2.(a) Net Returns From Cultivation of Carnation Under Protected Condition

(Rs. /polyhouse)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	70766(24.71)	111774(14.20)	212185(12.12)	139042(13.68)
Marketing cost	215604(75.29)	675432(85.80)	1537847(87.88)	877680(86.32)
Total cost	286370(100)	787206(100)	1750033(100)	1016722(100)
Value of output	610200	1911600	4352400	2484000
Net returns	323830	1124394	2602367	1467278

Note. Figures in parenthesis denote percentages to total.

Net Returns from Cultivation of Rose

6.9 The net returns from rose cultivation for different size categories of polyhouse farmers are presented in Table 6.2 (b). The analysis reveals that cost of rose cultivation was Rs.303593, Rs.845308, Rs.1872812 and Rs.1088468 for small, medium, large and for all polyhouse farms respectively. It was found that at overall level, average net return from cultivation of rose was Rs.1612012 per polyhouse. However, the net returns were Rs.363307, Rs.1254842 and Rs.2871538 for small, medium and large polyhouses farms respectively.

Table 6.2.(b) Net Returns From Cultivation of Rose Under Protected Condition

(Rs. /polyhouse)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	69665(22.95)	108640(12.85)	208640(11.14)	136340(12.53)
Marketing cost	233928(77.05)	736668(87.15)	1664172(88.86)	952128(87.47)
Total cost	303593(100)	845308(100)	1872812(100)	1088468(100)
Value of output	666900	2100150	4744350	2700480
Net returns	363307	1254842	2871538	1612012

Note. Figures in parenthesis denote percentages to total.

Net Returns per box From Carnation Cultivation

6.10 The net returns per box of carnation cultivation are presented in Table 6.3 (a). It can be seen from this table that on an average total production was 460 boxes per polyhouse in a year. The cost per box was Rs.2210 and its value in the market was Rs.5400 resulting in net returns of Rs.3190 per box at overall level. The net returns per box were Rs.2865 for small, Rs.3176 for medium and Rs.3229 of large polyhouse farmers. The input output ratio (gross returns/(PC+MC) were 1:2.44 at overall level and 1:2.13, 1:2.42 and 1:2.48 on small, medium and large polyhouse farms respectively.

Net Returns per box From Rose Cultivation

6.11 The net returns per box of rose cultivation are presented in Table 6.3 (b). The table reveals that on an average total production was 464 boxes per polyhouse in a year. The cost per box was Rs.2346 and its value in the market was Rs.5850 resulting in net return of Rs.3474 per box at overall level. The net returns per box were Rs.3186 for small, Rs. 3495 for medium and Rs.3540 for large polyhouse farmers. The input-output ratio (gross return/(PC+MC) were 1:2.19, 1:2.48, 1:2.53 and 1:2.48 on small, medium large and overall polyhouse farms respectively.

Table 6.3.(a) Net Returns Per Box and Input-Output Ratio From Cultivation of Carnation Under Protected Condition

(Rs. /box of 900 spikes)

Cost items	Category			
	Small	Medium	Large	Over all
Total production (boxes)	113	354	806	460
Cost per box	2534	2224	2171	2210
Value per box	5400	5400	5400	5400
Returns per box	2865	3176	3229	3190
Input-output ratio	1:2.13	1:2.42	1:2.48	1:2.44

Table 6.3.(b) Net Returns Per Box and Input-Output Ratio From Cultivation of Rose Under Protected Condition

(Rs. /box of 900 spikes)

Cost items	Category			
	Small	Medium	Large	Over all
Total production (boxes)	114	359	811	464
Cost per box	2662	2355	2309	2346
Value per box	5850	5850	5850	5850
Returns per box	3186	3495	3540	3474
Input-output ratio	1:2.19	1:2.48	1:2.53	1:2.48

Cost of Cultivation of Vegetable Crops

6.12 The cost of cultivation of selected vegetable crops; namely, capsicum and tomato are given in Tables 6.4(a-b).

Cost of Cultivation of Capsicum

6.13 The cost of cultivation of capsicum is presented in Table 6.4(a). The table reveals that the cost of cultivation, at overall level was Rs.54352 per polyhouse. Category-wise this cost was found to be Rs.17155 for small, Rs.42397 for medium and Rs.91821 for large category. The analysis further reveals that stalking of individual plant was the largest cost component accounting for 26 percent of the total cost of cultivation. The second important cost component was the application of manuring/FYM constituting 15 percent of the total cost followed by the cost of harvesting/picking (13%). Fertilizer and insecticides/pesticides application was about 5 percent of the total cost. The cost of

Table 6.4(a). Cost of Cultivation of Capsicum in Polyhouse

(Rs. /polyhouse)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	1150	2835	5400	3347	6.16
Seed/ seedlings	750	1250	2500	1593	2.93
Transplanting	1125	2430	5690	3323	6.11
Manuring/FYM	3550	8775	11250	8225	15.13
Vermicompost	-	-	-	-	-
Fertilizer	1050	2600	4125	2745	5.05
Insecticides/pesticides	450	1985	5235	2807	5.16
Inter culture	900	2292	6484	3523	6.48
Irrigation	850	1780	3240	2080	3.83
Spraying	425	885	1725	1079	1.99
Stalking etc.	3600	9850	25735	14233	26.19
Harvesting/ picking	1455	4270	14362	7390	13.59
Soil sterilization	1850	3445	6075	4008	7.38
Total	17155	42397	91821	54352	100.00

seed/seedlings and irrigation together accounted for about 7 percent of the total cost. The cost of bed formation transplanting the sapling and interculture together was higher than this and was about 19 percent. No farmer was observed to be using vermicompost in this crop. The other details of different categories can also be seen from this table. The analysis also reveals that the cost of different components and the total cost increases with the increase in the size of polyhouse.

Cost of Cultivation of Tomato

6.14 The cost of cultivation of tomato is given in table 6.4(b). It can be seen from the table that the cost of cultivation of tomato, at overall level was Rs.62543 and category-wise, the cost was Rs.21684 for small, Rs.47592 for medium and Rs.105193 for large polyhouse farmers showing increasing trend with the increase in the size of polyhouse. The analysis also reveals that stalking of individual plants

Table 6.4(b). Cost of Cultivation of Tomato in Polyhouse

(Rs. /polyhouse)

Cost items	Category				
	Small	Medium	Large	Over all	
				Rs.	%
Formation of beds	1075	2135	4355	2693	4.31
Seed/ seedlings	785	1525	2720	1776	2.84
Transplanting	1243	3564	8125	4670	7.47
Manuring/FYM	2996	4678	6820	5026	8.03
Vermicompost	-	-	-	-	-
Fertilizer	3780	7580	17135	10204	16.31
Insecticides/pesticides	2480	5345	9230	6029	9.64
Inter culture	1050	2335	6330	3520	5.63
Irrigation	825	1795	3295	2099	3.36
Spraying	435	890	1835	1127	1.80
Stalking etc.	3620	9975	24980	13984	22.36
Harvesting/ picking	1465	4272	14125	7301	11.67
Soil sterilization	1930	3498	6243	4114	6.58
Total	21684	47592	105193	62543	100.0

was the largest cost component accounting for 22 percent of the total cost followed by the cost of fertilizer (16%) and harvesting/picking (12%). Insecticides/pesticides and manuring/FYM application was about 10 and 8 percent of the total cost respectively. The cost of bed formation accounted for 4 percent and transplanting the sapling was higher than this, i.e.7 percent. The cost of seed/seedlings and irrigation accounted for about 3 percent each. The costs incurred on soil sterilization and interculture were about 7 and 6 percent respectively. The cost on spraying was about 2 percent of the total cost.

Net Returns From Cultivation of Vegetable Crops

6.15 The net returns have been calculated by adding the marketing cost to the total cost of production and then subtracting it from the value of output. The net returns from capsicum and tomato cultivation are given in Tables 6.5 (a-b).

Net Returns from Cultivation of Capsicum

6.16 The net returns from capsicum cultivation are presented in Table 6.5(a) wherein it can be seen that at overall level, average net returns from cultivation of capsicum was Rs.149686 per polyhouse, whereas category net returns were Rs.69205, Rs.117623 for and Rs.235839 for small, medium and large polyhouse farmers respectively.

Table 6.5(a). Net Returns From Cultivation of Capsicum in Polyhouse

(Rs. /polyhouse)

Cost items	Category			
	Small	Medium	Large	Over all
Production cost	17155(60.24)	42397(66.90)	91821(68.13)	54352(67.02)
Marketing cost	11322(39.76)	20979(33.10)	42957(31.87)	26750(32.98)
Total cost	28477(100)	63376(100)	134778(100)	81102(100)
Gross Returns	97682	180999	370619	230789
Net returns	69205	117623	235839	149686

Note. Figures in parenthesis denote percentages to total.

Net Returns From Cultivation of Tomato

6.17 The net returns from tomato cultivation for different size categories of polyhouse farmers are presented in Table 6.5(b). The analysis reveals that total cost of tomato cultivation was Rs.40884, Rs.85352, Rs.175992 and Rs. 107806 for small, medium, large and for all polyhouse farmers respectively. It was found that at overall level, average net return from cultivation of tomato was Rs.227142 per polyhouse. However, the net returns were Rs.101196, Rs.194072 and Rs.347928 for small, medium and large polyhouses farmers respectively.

Table 6.5(b). Net Returns From Cultivation of Tomato in Polyhouse

(Rs. /polyhouse)

Cost items	Category			
	Small	**Medium**	**Large**	**Over all**
Production cost	21684(53.04)	47592(55.76)	105193(59.77)	62543(58.01)
Marketing cost	19200(46.96)	37760(44.24)	70800(40.23)	45263(41.99)
Total cost	40884(100)	85352(100)	175992(100)	107806(100)
Gross Returns	142080	279424	523920	334948
Net returns	101196	194072	347928	227142

Note. Figures in parenthesis denote percentages to total.

Net Returns per box From Vegetable Cultivation

The net returns per box from selected vegetables are given in Table 6.6(a-b).

Net Returns per box From Capsicum Cultivation

6.18 The net returns per box of capsicum are presented in Table 6.6(a). It can be seen from this table that on an average total production was 402 boxes per polyhouse in a year. The cost per box was Rs.194 and its value in the market was Rs.574 resulting in net returns of Rs.260 per box at overall level. The net returns per box were Rs.407 for small, Rs.373 for medium and Rs.365 for large polyhouse farmers. The input-output ratios (gross returns/total cost), were 1:2.85 at overall level and 1:3.43, 1:2.86 and 1:2.74 for small, medium and large polyhouse farmers respectively.

Table 6.6(a). Net Returns per box and Input-Output Ratio From Cultivation of Capsicum in Polyhouse

(Rs. /box of 20 Kgs)

Cost items	Category			
	Small	Medium	Large	Over all
Total production (boxes, per polyhouse in a year)	170	315	645	402
Cost per box	167	201	209	194
Value per box	574	574	574	574
Returns per box	407	373	365	260
Input output ratio	1:3.43	1:2.86	1:2.74	1:2.85

Net Returns per box From Tomato Cultivation

6.19 The net returns per box of tomato are presented in Table 6.6(b). The table reveals that on an average total production was 566 boxes per polyhouse in a year. The cost per box was Rs.185 and its value in market was Rs.592 resulting in net return of Rs.407 per box at overall level. The net returns per box were Rs.422 for small, Rs.411 for medium and Rs.393 for large polyhouse farmers. The input-output ratios were 1:3.47, 1:3.27, 1:2.98 and 1:3.11 for small, medium, large and overall polyhouse farmers respectively.

Table 6.6(b). Net Returns per box and Input-Output Ratio From Cultivation of Tomato in Polyhouse

(Rs. /box of 25 Kgs)

Cost items	Category			
	Small	Medium	Large	Over all
Total production (boxes, per polyhouse in a year)	240	472	885	566
Cost per box	170	181	199	185
Value per box	592	592	592	592
Returns per box	422	411	393	407
Input output ratio	1:3.47	1:3.27	1:2.98	1:3.11

Unprotected Cultivation

6.20 Though this study mainly deals with the economics of protected cultivation but the sampled farmers are also growing crops under unprotected conditions. It is therefore the cropping pattern, production pattern and the economics of crops grown in open farms are also studied.

Cropping Pattern

6.21 The cropping pattern (outside polyhouse) of sampled growers of different categories has been presented in Table 6.7. It can be seen from the table that the crops grown in kharif season were maize and paddy by all the sampled farmers except the large farmers who were growing only the maize crop. In Rabi season, wheat was only the crop grown by the sampled farmers. In kharif season, area per farm was more (0.28 ha.) in maize as compared to paddy (0.09 ha.) at overall level. In Rabi season, area under wheat was 0.37 hectare per farm. Thus, the sampled farmers were growing only the traditional crops in open farms.

Table 6.7. Cropping Pattern on Sampled Farms (Unprotected Cultivation)
(Area in Ha/farm)

Crops	Category			Overall
	Small	Medium	Large	
Kharif crops				
Maize	0.28	0.22	0.32	0.28
Paddy	0.24	0.08	-	0.09
Cabbage	-	-	-	-
Tomato	-	-	-	-
Capsicum	-	-	-	-
Rabi crops				
Wheat	0.45	0.31	0.32	0.36
Peas	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Gross Cropped Area	0.99	0.63	0.64	0.74

Cost of Cultivation of Unprotected Crops

6.22 The cost of cultivation of wheat, maize and paddy under unprotected conditions are presented for each size category in Tables 6.8 to 6.11.

6.23 Table 6.8 reveals that the cost of cultivation of wheat, maize and paddy were Rs.30537, Rs.32283 and Rs.33065 per hectare respectively on small farms. The highest cost component in all the crops was human labour followed by manure and hired machinery. The expenditure on human labour was maximum (Rs.20250/ha) in the case of paddy followed by maize (Rs.18775/ha.) and wheat (Rs.17425/ha.) whereas the expenditure incurred by small farmers on manure was more in wheat as compared to other crops. Expenditure on insecticides and pesticides ranged from Rs.800 per hectare in paddy to Rs.1000 per hectare wheat. There was no expenditure on irrigation in any of these crops.

Table 6.8. Cost of Cultivation of Unprotected Crops Grown on Small Farms
(Rs. /Ha.)

Cost items	Crops					
	Wheat	Maize	Paddy	Cabbage	Peas	Beans
Seed	1275	1850	3125	-	-	-
Manure	8000	7000	5000	-	-	-
Fertilizer	1277	1258	1300	-	-	-
Insecticides & pesticides	1000	900	800	-	-	-
Irrigation	-	-	-	-	-	-
Hired machinery	1560	1500	1590	-	-	-
Hired animal labour	-	1000	1000	-	-	-
Human labour	17425	18775	20250	-	-	-
Total cost	30537	32283	33065	-	-	-

6.24 Table 6.9 shows that the cost of cultivation of wheat, maize and paddy were Rs.31202, Rs.34215 and Rs.34425 per hectare respectively on medium farms. Here also human labour was the main cost component followed by manure. There was no cost involved in irrigation in any of these crops and hired animal labour was not used for the crop wheat.

Table 6.9. Cost of Cultivation of Unprotected Crops Grown on Medium Farms

(Rs. /Ha.)

Cost items	Crops					
	Wheat	**Maize**	**Paddy**	**Cabbage**	**Peas**	**Beans**
Seed	1487	2815	3125	-	-	-
Manure	8500	8700	6000	-	-	-
Fertilizer	1265	1325	1250	-	-	-
Insecticides & pesticides	900	800	700	-	-	-
Irrigation	-	-	-	-	-	-
Hired machinery	1550	1575	1600	-	-	-
Hired animal labour	-	1000	1000	-	-	-
Human labour	17500	18000	20750	-	-	-
Total	31202	34215	34425	-	-	-

6.25 It can be seen from the table 6.10 that large farmers were growing only wheat and maize and the cost of cultivation of maize was more (Rs.35990/ha.) as compared to wheat (Rs.32085/ha.). Human labour and manure were the main cost components in these crops for this category also and they incurred Rs.17890 and Rs.18540 per hectare on human labour in wheat and maize respectively. There was no expenditure on irrigation of any of the crops and hired animal labour was used only for the crop maize.

Table 6.10. Cost of Cultivation of Unprotected Crops Grown on Large Farms

(Rs. /Ha.)

Cost items	Crops					
	Wheat	**Maize**	**Paddy**	**Cabbage**	**Peas**	**Beans**
Seed	1500	2900	-	-	-	-
Manure	9000	4500	-	-	-	-
Fertilizer	1275	1350	-	-	-	-
Insecticides & pesticides	850	900	-	-	-	-
Irrigation	-	-	-	-	-	-
Hired machinery	1570	1600	-	-	-	-
Hired animal labour	-	1200	-	-	-	-
Human labour	17890	18540	-	-	-	-
Total	32085	35990	-	-	-	-

6.26 Overall, as in Table 6.11, the cost of cultivation of wheat, maize and paddy were Rs.31267, Rs.34437 and Rs.33448 per hectare respectively. The cost of cultivation was more in maize as compared to other crops.

Table 6.11. Cost of Cultivation of Unprotected Crops Grown on All Farms

(Rs. /Ha.)

Cost items	Crops					
	Wheat	Maize	Paddy	Cabbage	Peas	Beans
Seed	1414	2567	3125	-	-	-
Manure	8481	8554	5282	-	-	-
Fertilizer	1272	1316	1286	-	-	-
Insecticides & pesticides	919	874	772	-	-	-
Irrigation	-	-		-	-	-
Hired machinery	1560	1563	1593	-	-	-
Hired animal labour	-	1089	1000	-	-	-
Human labour	17608	18471	20391	-	-	-
Total cost	31267	34437	33448	-	-	-

Productivity of Crops

6.27 The productivity of crops grown under unprotected conditions has been given in Table 6.12 wherein it can be seen that at overall level the productivity was maximum

Table 6.12. Productivity of Crops on Sampled Farms (Unprotected Cultivation)

(Quintals/Ha.)

Crops	Category			All
	Small	Medium	Large	
Kharif crops				
Maize	24.00	25.00	27.00	26.00
Paddy	37.00	38.00	-	37.50
Cabbage	-	-	-	-
Tomato	-	-	-	-
Capsicum	-	-	-	-
Rabi crops				
Wheat	22.00	24.00	26.00	24.00
Peas	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-

(37.50 qtl./ha) in the case of paddy followed by maize (26 qtls./ha.) and wheat (24 qtls./ha.). The same trend was observed in all the categories also. The productivity of all the crops was highest in large category followed by medium and small category.

Production of Crops

6.28 The production of crops per farm in different size categories under unprotected conditions has been presented in Table 6.13. At overall level, the highest production per farm was that of paddy (7.90 qtls.) followed by wheat (3.54 qtls.) and maize (2.74 qtls.). In kharif crops production per farm was more (13.69 qtls) in large farms as compared to medium (5.19 qtls) and small farms (5.93 qtls.) which was due to the more area devoted to this crop by the large farmers. In the case of wheat, production per farm was maximum on large farms (13.78 qtls.) followed by small farms (10.40 qtls) and medium farms (8.20 qtls.).

Table 6.13. Production of Crops on Sampled Farms (Unprotected Cultivation)

(Quintals/farm)

Crops	Category			Overall
	Small	Medium	Large	
Kharif crops				
Maize	5.93	5.19	13.69	2.74
Paddy	16.84	9.24	-	7.90
Cabbage	-	-	-	-
Tomato	-	-	-	-
Capsicum	-	-	-	-
Rabi crops				
Wheat	10.40	8.20	13.78	3.54
Barley	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-

Value of Output

6.29 The value of output from crops grown under unprotected conditions has been presented in Table 6.14. Among the grown crops highest value per farm was observed in the case of paddy (Rs.11929) followed by wheat (Rs.5310) and maize (Rs.4014) category-wise the value of output from all crops was maximum in large category.

Table 6.14. Value of Output From Crops on Sampled Farms (Unprotected Cultivation)

(Value in Rs/farm)

Crops	Category			Overall
	Small	Medium	Large	
Kharif crops				
Maize	8687	7603	20055	4014
Paddy	25428	13952	-	11929
Cabbage	-	-	-	-
Tomato	-	-	-	-
Capsicum	-	-	-	-
Rabi crops				
Wheat	15600	12300	20670	5310
Barley	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-

6.30 From the above it is clear that returns from protected cultivation are significantly higher than that of unprotected traditional crops.

Table 6.15. Measures to Analyse Project Worth of Protected Cultivation Venture

Particulars	Categories		
	Small 250 m^2	Medium 500 m^2	Large 1000 m^2
Payback period (years)	2	3	2
Net present value (Rs./polyhouse)	253627	679062	3040661
Internal rate of return (%)	32.16	39.5	71
Benefit cost ratio	1.44	1.38	1.86

6.31 Based on the estimated cost and return from the production of flowers (carnation and rose) and two vegetables (capsicum and tomato) in a polyhouse, it was possible to analysis the inflow and outflow under the entire life span of 10 years of a polyhouse in H.P. In small and medium categories, cultivation of vegetables was more, whereas in large category returns were more due to flower cultivation. The analysis of economic viability of protected cultivation using project evaluation methods, like Pay Back Period (PBP), Benefit Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate of Return (IRR) has been carried out under the following assumptions:

(i) The economic life span of a polyhouse in H.P. is 10 years.

(ii) The yield from this cultivation remains same throughout the life span and same is taken for cost and return.

(iii) The total cost of construction of a polyhouse (subsidy + investment made by farmer) is the initial cost inflow.

(iv) Net Present Value (NPV) and Benefit Cost Ratio (BCR) are the functions of discount rate which is taken 12 percent.

6.32 Cultivation of these crops in a polyhouse of large category was found to be highly feasible as reflected in higher values of NPV (Rs. 3040661), BCR (1.86) and IRR (71%) with payback period of two years. The investment in other two categories of polyhouses was also found to be economically sound and quite remunerative as can be seen from the above table.

CHAPTER–7

Marketing System of Protected Crops

7.1 Analysis of the costs and returns of any crop is very important to assess the profitability/economic viability of crops, but at the same time it is equally important to analyse how and how much of the crop is utilized and marketed. In this chapter, an attempt has been made to analyse the production and utilization of selected flowers and vegetables produced in polyhouses and markets where marketable surplus was sold including price spread and market margins.

Production and Utilization of Protected Crops

7.2 The production and utilization pattern of flower and vegetable crops produced in polyhouses of sampled areas has been presented in Table 7.1(a) and 7.1(b).

Production and Utilization of Flower Crops (Carnation and Rose)

7.3 The production and utilization pattern of carnation and rose in sampled area has been presented in Table 7.1(a). The analysis reveals that out of the total production of 467 boxes (per polyhouse in a year) of carnation at overall level, only 1.53 percent were the losses at different stages. Losses were maximum (5.83%) in the case of small category followed by medium (1.67%) and small category (1.10%), showing decreasing trend with the increase in the size of the polyhouse. In the case of the rose, the total production per polyhouse in a year was 472 boxes out of which 1.69 percent were losses. Here also the losses were maximum (6.56%) in small category followed by medium (1.64%) and large category (1.69%). The tendency of retaining flowers for family and kind wages or gifts was not observed in the farming families under study.

Table 7.1.(a) Production and Utilization of Protected Flower Crops on Sampled Farms

Category	Production (Boxes, per polyhouse in a year)	(% of total production)			
		Losses	Retained for		
			Family	Gifts	Wages
Carnation (Box of 900 spikes)					
Small	120	5.83	-	-	-
Medium	360	1.67	-	-	-
Large	815	1.10	-	-	-
Overall	467	1.50			
Rose (Box of 900 spikes)					
Small	122	6.54	-	-	-
Medium	365	1.64	-	-	-
Large	820	1.10	-	-	-
Overall	472	1.69			

Production and Utilization of Vegetable Crops(Capsicum and Tomato)

7.4 The production and utilization pattern of capsicum and tomato in sampled area has been presented in Table 7. 1(b). The analysis reveals that out of the total production of 402 boxes (per polyhouse in a year) of capsicum at overall level only 1.93 percent were the losses at different stages. Family consumption and gifts accounted for 0.73 and 0.48 percent of the total production respectively. In case of tomato, the total production per polyhouse in a year was 566 boxes out of which 1.36 percent were

Table 7.1(b). Production and Utilization of Protected Vegetable Crops on Sampled Farms

Category	Production (Boxes, per polyhouse in a year)	(% of total production)			
		Losses	Retained for		
			Family	Gifts	Wages
Capsicum (Box of 20 Kgs.)					
Small	170	3.53	1.18	0.59	-
Medium	315	2.54	0.95	0.63	-
Large	645	1.40	0.62	0.31	-
Overall	402	2.00	0.75	0.50	-
Tomato (Box of 25 Kgs.)					
Small	240	2.92	0.83	0.42	-
Medium	472	1.91	0.85	0.42	-
Large	885	1.13	0.56	0.23	-
Overall	566	1.41	0.71	0.35	-

losses. Only 0.68 percent boxes were consumed by the farming family and 0.34 percent given as gifts.

Marketing Pattern of Protected Crops

7.5 The flowers produced by the selected farmers under protected conditions were marketed at three places i.e. Delhi market, neighbouring states and local markets. In the case of vegetables the destinations were Chandigarh and local markets. Tables 7.2(a) and 7.2(b) present the details of the markets for flowers and vegetables respectively.

Marketing Pattern of Flower Crops (Carnation and Rose)

7.6 Table 7.2 (a) reveals that at overall level, out of total marketed surplus of 460 boxes of carnation, 377 boxes i.e. 95.65 percent were marketed in Delhi market followed by neighbouring states (3.26%) and local markets (1.09%). In the case of rose, out of total marketed produce of 464 boxes, 445 boxes i.e. 95.91 percent were marketed in Delhi market and rest 19 boxes i.e. 4.09 percent in the other markets. The analysis shows that in case of flowers more than 95 percent of the total produce was sold in Delhi market.

Table 7.2.(a) Marketing Pattern of Protected Flower Crops on Sampled Farms

(Qty. in boxes, rate in Rs.)

Category	Sold at							
	Far off market		Neighbouring States		Local markets		Total	
	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box
Carnation								
Small	105(92.92)	5500	5(4.42)	5000	3(2.66)	2567	113(100)	5400
Medium	340(96.05)	5450	10(2.82)	4950	4(1.13)	2275	354(100)	5400
Large	775(96.15)	5440	25(3.10)	4930	6(0.75)	2191	806(100)	5400
Overall	377(81.96)	5461	15(3.26)	4957	5(1.08)	2327	460(100)	5400
Rose								
Small	104(91.23)	6000	6(5.26)	5800	4(3.51)	2025	114(100)	5850
Medium	345(96.10)	5900	9(2.51)	5750	5(1.39)	2580	359(100)	5850
Large	780(96.18)	5900	22(2.71)	5650	9(1.11)	2005	811(100)	5850
Overall	445(95.91)	5929	13(2.80)	4765	6(1.29)	2195	464(100)	5850

Note. Figures in parenthesis denote percentages. *Boxes, per polyhouse in a year.

Marketing Pattern of Vegetable Crops(Capsicum and Tomato)

7.7 The main destinations for the vegetable produce inside the polyhouses by the selected farmers under study were local markets and the Chandigarh market.

Table 7.2(b). Marketing Pattern of Protected Vegetable Crops on Sampled Farms

(Qty. in boxes; Rate in Rs.)

Category	Sold at							
	Chandigarh		Neighbouring States		Local markets		Total	
	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box
Capsicum								
Small	146(90.68)	592	-	-	15(9.32)	399	161(100)	574
Medium	262(86.75)	599	-	-	40(13.25)	412	302(100)	574
Large	560(88.89)	593	-	-	70(11.11)	422	630(100)	574
Overall	345(88.69)	595	-	-	44(11.31)	412	389(100)	574
Tomato								
Small	200(86.96)	625	-	-	30(13.04)	375	230(100)	592
Medium	395(86.43)	624	-	-	62(13.57)	387	457(100)	592
Large	798(91.94)	609	-	-	70(8.06)	400	868(100)	592
Overall	496(90.02)	618	-	-	56(10.16)	389	551(100)	592

Note. Figures in parenthesis denote percentages. *Boxes, per polyhouse in a year.

Table 7.2(b) presents the details of the markets. The analysis reveals that at overall level, out of total marketed surplus of 389 boxes of capsicum, 345 boxes i.e. 88.69 percent were marketed in Chandigarh market and rest 44 boxes i.e. 11.31 percent in the local markets. In the case of tomato, out of total marketed produce of 552 boxes, 496 boxes i.e. 90 percent were marketed in Chandigarh market and rest 56 boxes i.e. 10 percent in the local market.

Marketing Costs and Price Spread of Carnation in Delhi Market

7.8 The marketing costs incurred by producer and intermediaries for marketing carnation in Delhi, have been presented in Table 7.3(a). On an average, marketing cost per 100 spikes, incurred by producers was Rs.212.85 which was 19.53 percent of the consumer's price of Rs.1090 per 100 spikes. The breakup of marketing costs incurred

by the carnation producer reveals that commission of commission agent was the main component of total marketing cost. The second important component of the marketing cost was the cost of transportation up to road head and then to market. Commission for forwarding agent was Rs.90 per 100 spikes. Wholesale price of 100 spikes of carnation was Rs.600 in Delhi. Market fee was charged at the rate of one percent. Adding to this the other cost of spoilage, telephone charges etc. and margin of commission agent the mashakhor's purchase price was found to be Rs.708 per 100 spikes which was about 65 percent of consumer's price. The margin of mashakhor was about 10 percent of consumer's price. The retailer's purchase price was calculated to be Rs.828 per 100 spikes. Total expenses paid by retailer were Rs.96 and his margin was Rs.166 per 100 spikes i.e. 15.23 percent of the consumer's price.

Table 7.3.(a) Marketing Costs and Price Spread of 100 Spikes of Carnation in Delhi Market

(Rs./100 spikes)

Particulars	Rs.	Per cent
Net price received by grower	387	35.50
Growers expenses on		
(a). Assembling charges up to store	0.50	0.05
(b). Grading& Packing	1.35	0.12
(c). Packing material	15.00	1.38
(d.)Transportation	-	
(i.) up to road head/I.S.B.T.	71.00	6.51
(ii).I.S.B.T .to market	15.00	1.38
(iii). Misc. charges	20.00	1.83
(e). Commission of C.A.@15%	90.00	8.26
Total expenses paid by the grower	212.85	19.53
Wholesale/ Gross price at market	600	55.05
(a).Market fee @ 1%	6.00	0.55
(b).Other cost (spoilage, telephone charges etc.)@ 2%	12.00	1.10
(c).Margin/Commission of C.A.@15%	90.00	8.26
Mashakhors' purchase price	708.00	64.95
Expenses borne by Mashakhor @ 2%	14.00	1.28
Margin of Mashakhor@15%	106.00	9.72
Retailers' purchased. price	828.00	75.96
Expenses borne by the retailer		
(a). Carriage up to retail shop	15.00	1.38
(b). Losses @10%	81.00	7.43
Total expenses paid by retailer	96.00	8.81
Retailers' Margin @20%	166.00	15.23
Consumer price	1090.00	100.00

Marketing Costs and Price Spread of Rose in Delhi Market

7.9 The marketing costs incurred by producer and intermediaries for marketing rose in Delhi, have been presented in Table 7.3(b). The table reveals that on an average, marketing cost per 100 spikes, incurred by producers was Rs.298 which was 19.26 percent of the consumer price of Rs.1184 per 100 spikes. The breakup of marketing costs incurred by the rose producer reveals that commission of commission agent and transportation (including carriage up to road head and then to market) were the major costs borne by the producer. Commission of forwarding agent was Rs.98 per 100 spikes. Wholesale price of 100 spikes of carnation was Rs.650 in Delhi. Market fee was charged at the rate of one percent. Adding to this the other costs of spoilage, telephone charges etc. and margin of commission agent the mashakhore's purchase

Table 7.3. (b) Marketing Costs and Price Spread of 100 Spikes of Rose in Delhi Market

(Rs./100 spikes)

Particulars	Rs.	Per cent
Net price received by grower	422	35.64
Growers expenses on		
(a). Assembling charges up to store	0.60	0.05
(b). Grading& Packing	1.40	0.12
(c). Packing material	15.00	1.27
(d.)Transportation	-	
(i.) up to road head/I.S.B.T.	75.00	6.33
(ii).I.S.B.T .to market	18.00	1.52
(iii). Misc. charges	20.00	1.69
(e). Commission of C.A.@15%	98.00	8.28
Total expenses paid by the grower	228	19.26
Wholesale/ Gross price at market	650.00	54.90
(a).Market fee @ 1%	7.00	0.59
(b).Other cost (spoilage, telephone charges etc.)@2%	13.00	1.10
(c).Margin/Commission of C.A.@15%	98.00	8.28
Mashakhors' purchase price	768.00	64.86
Expenses borne by Mashakhor @ 2%	15.00	1.27
Margin of Mashakhor@15%	115.00	9.71
Retailers' purchased. price	898.00	69.09
Expenses borne by the retailer		
(a). Carriage up to retail shop	16.00	1.35
(b). Losses @10%	90.00	7.60
Total expenses paid by retailer	106.00	8.95
Retailers' Margin @20%	180	15.20
Consumer price	1184.00	100.0

price was found to be Rs.768 per 100 spikes and about 65 percent of consumer's price. The margin of mashakhor was about 10 percent of the consumer's price. The retailers' purchase price was calculated to be Rs.898 per 100 spikes. Total expenses paid by retailer were Rs.106 and his margin was Rs.180 per 100 spikes i.e. about 15 percent of the consumers' price.

Producers' Share in Consumers' Price

7.10 Table 7.3(a) shows that net price received by the producer in marketing of carnation, in Delhi market, was Rs.387 per 100 spikes which was 35.50 percent of consumer price. In the case of rose, the share of producer in consumers' rupee was 35.64 percent and net price received by the producer in marketing of rose, in Delhi market, was Rs.422 per 100 spikes.

Marketing Costs and Margins of Intermediaries in Carnation and Rose Marketing

7.11 The analysis of marketing costs and margins by various intermediaries in marketing of carnation shows that the gross price received by the grower was Rs.600 per 100 spikes which was 55.04 percent of the consumer paid price. The costs paid by the farmers, wholesales, mashakhor and retailers were 19.53, 1.65, 1.28 and 8.80 percent respectively and thus total marketing cost of intermediaries was Rs.128 i.e. 11.74 percent of the consumer paid price. The total margins were found to be 33.21 percent of the consumer price (Table 7.4 (a)).

7.12 In the case of rose, the gross price received by the grower was Rs.650 per 100 spikes which was 54.89 percent of the consumer price. The costs paid by the farmers, wholesalers mashokhars and retailers were 19.25, 1.77, 1.26 and 8.95 percent respectively and thus total marketing cost of intermediaries was Rs.142 i.e. about 12 percent of consumer paid price. The total margins were found to be 33.10 percent of the consumer price (Table 7.4(b).

Table 7.4. (a) Marketing Costs and Margins of Intermediaries in Carnation Marketing

Particulars	Rs. per 100 spikes	Percentage
Gross price received by growers	600	55.05
Cost of farmers	212	19.53
Cost of wholesalers	18	1.65
Cost of Mashakhor	14	1.28
Cost of retailers	96	8.81
Total marketing cost of intermediaries	128	11.74
margin of wholesalers	90	8.26
margin of Mashakhor	106	9.72
margin of retailers	166	15.23
Total marketing margin	362	34.21
Consumer Paid price	1090	100.0

Table 7.4. (b) Marketing Costs and Margins of Intermediaries in Rose Marketing

Particulars	Rs. per 100 spikes	Percentage
Gross price received by growers	650	54.90
Cost of farmers	228	19.26
Cost of wholesalers	20	1.69
Cost of Mashakhor	15	1.27
Cost of retailers	106	8.95
Total marketing cost of intermediaries	141	11.91
margin of wholesalers	98	8.28
margin of Mashakhor	115	9.71
margin of retailers	180	15.20
Total marketing margin	393	33.19
Consumer Paid price	1184	100.0

Marketing Costs and Price spread of Capsicum in Chandigarh Market

7.13 Table 7.5(a) shows the marketing costs and margins for capsicum sold in Chandigarh wholesale market. It can be seen from this table that on an average the cost of marketing borne by the growers for selling capsicum worked out to be Rs.333 per quintal which was 8.46 percent of the consumer's price of Rs.3935 per quintal. The breakup of marketing costs incurred by the capsicum producers reveal that commission of commission agent was Rs.152 per quintal followed by the expenses on transportation Rs.100 per quintal and picking, packing at Rs.65 per quintal. Wholesale price per

quintal of capsicum was Rs.2873 in Chandigarh market. Adding to this the other handling charges and margins of commission agent the mashakhor's purchase price was Rs.3190 per quintal which was 81.07 percent of consumer's price. The expenses paid by mashakhor were Rs.25 and his margin of profit was found to be Rs.44. The retailer's purchase price was Rs.3259 per quintal i.e. 82.82 percent of the consumer's price. Total expenses paid by retailer were Rs.244 and margin was Rs.432 per quintal which was 10.98 percent of the consumer's price

Table 7.5.(a) Marketing Costs and Price Spread of Capsicum In Chandigarh Market

Particulars	**(Rs./Quintal)**	**%**
Net price received by grower	2545	64.68
Growers' expenses on		
Picking, packing, grading and assembling	65	1.65
Packing material	6	0.15
Transportation		
(i.) Carriage up to road head	17	0.43
(ii).Freight up to market	73	1.86
(iii). Loading/unloading charges	10	0.25
Commission of C.A. and market fee	152	3.86
Other charges	10	0.25
Total expenses paid by the grower	333	8.46
Wholesale/ Gross price at market	2873	73.01
Expenses of wholesaler/CA		
Handling charges	50	1.27
Margin/Commission	267	6.79
Sub-total	317	8.06
Mashakhors' purchase price	3190	81.07
Expenses borne by Mashakhor	25	0.64
Margin of Mashakhor	44	1.12
Retailers' purchased. price	3259	82.82
Expenses born by retailer		
Carriage up to retail shop	25	0.64
Losses	199	5.06
Total expenses paid by retailer	244	6.20
Retailers' Margin	432	10.98
Consumer price	3935	100

Marketing Costs and Price Spread of tomato in Chandigarh Market

7.14 The Table 7.5(b) reveals the marketing costs and margins for tomato sold in Chandigarh market. On an average, marketing cost per quintal borne by the growers for selling tomato worked out to be Rs.320 which was 9.12 percent of consumers' price of Rs.3508 per quintal. The commission of commission agent and market fee was Rs.123 per quintal followed by transportation charges (Rs. 101/qtl), transportation and picking, packing, grading and assembling (Rs.80/qtl.). Wholesale price per quintal of tomato was Rs.2370 in Chandigarh market. Adding to this the other handling charges and margins of commission agent the mashakhore's purchase price was Rs.2700 per quintal i.e. about 77 percent of consumer's price. The expenses incurred by mashakhor

Table 7.5. (b) Marketing Costs and Price Spread of Tomato in Chandigarh Market

Particulars	**(Rs./Quintal)**	**%**
Net price received by grower	2050	58.44
Growers' expenses on		
Picking, packing, grading and assembling	80	2.28
Packing material	6	0.17
Transportation		
(i.) Carriage up to road head	18	0.51
(ii).Freight up to market	73	2.08
(iii). Loading/unloading charges	10	0.29
Commission of C.A. and market fee	123	3.51
Other charges	10	0.29
Total expenses paid by the grower	320	9.12
Wholesale/ Gross price at market	2370	67.56
Expenses of wholesaler/CA		
Handling charges	55	1.57
Margin/Commission	275	7.84
Sub-total	330	9.41
Mashakhors' purchase price	2700	76.97
Expenses borne by Mashakhor	25	0.71
Margin of Mashakhor	43	1.23
Retailers' purchased. price	2768	78.91
Expenses born by retailer		
Carriage up to retail shop	27	0.77
Losses	280	7.98
Total expenses paid by retailer	307	8.75
Retailers' Margin	433	12.34
Consumer price	3508	100

were Rs.25 and his margin of profit was found to be Rs.43. The retailers' purchase price was Rs.2768 per quintal i.e. 78.91 percent of the consumers' price. Total expenses paid by retailer were Rs.307 and margin was Rs.433 per quintal which was 12.34 percent of the consumers' price.

Producers' Share in Consumers' Price

7.15 The net price received by capsicum producers was Rs.2545 per quintal which was about 65 percent of consumer price in Chandigarh market whereas in the marketing of tomato the share of producer in consumers' rupee was 58.44 percent and the net price received by tomato producers was Rs.2050 per quintal.

Marketing Costs and Margins of Intermediaries in Capsicum and Tomato Marketing

7.16 The analysis of marketing costs and margins by various intermediaries in marketing of capsicum and tomato are presented in Tables 7.6(a-b). Table 7.6(a) reveals that the gross price received by the grower was Rs.28.73 per quintal in case of capsicum which was 73 percent of the consumer price. The costs paid by the farmers, wholesalers, mashakhor and retailers were 8.46, 1.27, 0.64 and 6.20 percent respectively and thus the total cost of marketing of intermediaries was Rs.2319 i.e. 8.11 percent of the consumer paid price. The total margins were found to be Rs.18.88 percent of the consumer price.

Table 7.6.(a) Marketing Costs and Margin of Intermediaries in Capsicum at Chandigarh Market

(Rs./Quintal)

Particulars	**(Rs./Quintal)**	**%**
Gross price received by growers	2873	73.01
Cost of farmers	333	8.46
Cost of wholesalers	50	1.27
Cost of Mashakhor	25	0.64
Cost of retailers	244	6.20
Total marketing cost of intermediaries	319	8.11
Margin of wholesalers	267	6.78
Margin of Mashakhor	44	1.12
Margin of retailers	432	10.98
Total marketing margin	743	18.88
Consumer Paid price	3935	100.0

Table 7.6.(b) Marketing Costs and Margin of Intermediaries in Tomato at Chandigarh Market

(Rs./Quintal)

Particulars	(Rs./Quintal)	%
Gross price received by growers	2370	67.56
Cost of farmers	320	9.12
Cost of wholesalers	55	1.56
Cost of Mashakhor	25	0.71
Cost of retailers	307	8.75
Total marketing cost of intermediaries	387	11.03
Margin of wholesalers	275	7.84
Margin of Mashakhor	43	1.22
Margin of retailers	433	1.23
Total marketing margin	751	21.41
Consumer Paid price	3508	100.0

7.17 As far as tomato is concerned, the gross price received by the grower was Rs.2370 per quintal which was about 68 percent of the consumer paid price. The costs paid by the farmers, wholesalers, mashakhor and retailers were 9.12, 1.36, 0.71 and 8.75 percent respectively and thus total marketing cost of intermediaries was Rs.387 i.e. 11.03 percent of the consumer price. The total margin were found to be 21.41 percent of the consumer price.

Production Losses

7.18 The production losses have been divided into two parts viz. pre harvest and post harvest losses. Again post harvest losses have been segregated into losses at picking, assembling, grading and packing and transportation stages. The extent of losses at various levels in carnation, rose, capsicum and tomato in different categories of farmers i.e. small, medium, large and all are worked out and presented in Tables 7.7 to 7.10.

Table 7.7. Production Losses at Various Stages on Sampled Small Farms

Crops	Pre harvest losses%	Post harvest losses %			
		Picking	Assembling	Grading & Packing	Transportation
Carnation	3.33	0.42	0.20	0.20	1.67
Rose	4.09	0.32	0.25	0.25	1.63
Capsicum	1.76	0.29	0.29	0.29	0.88
Tomato	1.25	0.31	0.20	0.31	0.83

Tables reveal that pre harvest losses in carnation ranges from 0.36 percent on large polyhouses farms to 3.33 percent on small farms. Similarly in rose, these losses were maximum (4.09%) on small farms and minimum on large farms (0.48%). Overall these losses were 0.42 and 0.84 percent in carnation and rose respectively. In the case of capsicum and tomato also pre harvest losses were observed to be highest i.e. 1.76 and 1.25 percent respectively on small farms and lowest (0.62 and 0.56%) on large farms. Overall, these losses were 0.72 and 0.34 percent in capsicum and tomato respectively. At post harvest stages, highest losses were during transportation in all the selected crops and farms except on large farms where these were highest at the time of grading and packing. Overall, at post harvest stages, transportation losses were 0.42, 0.21, 0.48 and 0.34 percent in carnation, rose, capsicum and tomato respectively.

Table 7.8. Production Losses at Various Stages on Sampled Medium Farms

Crops	Pre harvest losses%	Post harvest losses %			
		Picking	Assembling	Grading & Packing	Transportation
Carnation	0.83	0.20	0.16	0.04	0.42
Rose	0.54	0.27	0.42	0.14	0.55
Capsicum	1.26	0.15	0.15	0.32	0.63
Tomato	0.84	0.21	0.21	0.21	0.42

Table 7.9. Production Losses at Various Stages on Sampled Large Farms

Crops	Pre harvest losses%	Post harvest losses %			
		Picking	Assembling	Grading & Packing	Transportation
Carnation	0.36	0.12	0.12	0.24	0.24
Rose	0.48	0.12	0.12	0.24	0.12
Capsicum	0.62	0.07	0.07	0.31	0.31
Tomato	0.56	0.11	0.11	0.22	0.11

Table 7.10. Production Losses at Various Stages on All Farms

Crops	Pre harvest losses%	Post harvest losses %			
		Picking	Assembling	Grading & Packing	Transportation
Carnation	0.42	0.21	0.21	0.21	0.42
Rose	0.84	0.21	0.21	0.21	0.21
Capsicum	0.72	0.24	0.24	0.24	0.48
Tomato	0.34	0.17	0.17	0.34	0.34

CHAPTER-8

Problems in Cultivation of Protected Crops

8.1 Although the polyhouse farming was found to be profitable, the activity is not free from problems. The farmers are facing many problems related to polyhouse construction, inputs, cropping practices, harvesting and marketing of polyhouse crops. Majority of farmers faced more than one problem in all the aspects and hence, analysis of multiple responses has been used for this purpose.

Problems Faced in Construction of Polyhouse

8.2 The polyhouse growers of the selected areas were asked about the problems they faced related to information, design, loan etc. The analysis indicated that the problems during construction, like delays or use of inferior material, high construction cost were the most important problems faced by 45 percent of the respondents. Forty four percent of the respondents revealed that they were not very happy with the design of polyhouse, though they were not knowing much about the technical specifications. Forty two percent stated that there was a long wait involved in getting clearance of loan and subsidy from the departments and 28 percent were of the view that the information was not provided clearly to them regarding adoption and construction of polyhouse.

Table 8.1. Responses Regarding Problems Faced During Construction of Polyhouses

(Multiple Responses in %)

Type of problem	Category			All
	Small	Medium	Large	
Information	31.03	37.50	17.95	28.00
Design	41.38	46.87	43.58	44.00
Loan/Subsidy	51.72	40.62	35.89	42.00
Construction	34.48	43.75	53.85	45.00

Problems Faced in Input Availability

8.3 Various problems like unavailability, higher prices and low quality of inputs were faced by the growers. Sixty percent complained the problem of higher prices of inputs required for crop production in a polyhouse. About fifty percent reported unavailability of inputs and 58 percent told that the inputs were of poor quality.

Table 8.2. Responses Regarding Problems Faced in Inputs Availability

(Multiple Responses in %)

Type of problem	Category			Overall
	Small	Medium	Large	
Unavailability	48.27	50.00	48.72	49.00
Higher prices	62.06	62.50	56.41	60.00
Low quality	55.17	65.62	53.84	58.00

Problems Faced in Cropping Practices

8.4 The cropping practices of crop production are significantly different in polyhouses than that of in growing crops or vegetables outside the polyhouse. Polyhouse farming requires skill monitoring and care. The main problem stated by the respondents was

Table 8.3. Responses Regarding Problems Faced in Cropping Practices

(Multiple Responses in %)

Type of problem	Category			Overall
	Small	Medium	Large	
Sowing time	82.75	90.62	48.71	72.00
Sowing Intensity	24.14	46.87	12.82	27.00
Cultural practices	68.96	84.37	87.17	81.00
Time and intensity of irrigation	27.58	50.00	15.38	30.00

the cultural practices i.e. raising nursery and crops etc., eighty one percent had little information about these practices. Sowing time was another major problem and 72 percent farmers revealed that they had little idea about the most appropriate sowing time. About 33 percent farmers said that they have no knowledge about the proper time to irrigate the vegetables grown in polyhouse and also of sowing and irrigation intensity.

Problems Faced in Harvesting and Marketing

8.5 The polyhouse growers also faced the problems related to harvesting, packing/processing, storage, marketing etc. In the harvesting of crops the main

Table 8.4. Responses Regarding Problems Faced in Harvesting, Storage etc.

(Multiple Responses in%)

Type of problem	Category			Overall
	Small	Medium	Large	
Time	24.13	50.00	15.38	29.00
Method	24.13	53.12	21.87	31.00
Storage	20.68	56.25	21.87	31.00
Packing/Processing	82.76	93.37	84.62	87.00
Marketing	89.65	87.50	100.0	93.00

Table 8.5. Perception of Farmers on Protected Cultivation

(Multiple Responses in%)

Particulars	Category			All
	Small	Medium	Large	
Protected cultivation has helped to increase production	89.6	87.5	92.3	90
Protected cultivation has increased employment opportunities	69	75	79.5	75
Income has grown up after protected cultivation of crops	79.3	81.3	84.6	82
Protected cultivation facilitated adoption of organic farming	41.4	43.8	41	42

problems were the time and method of harvesting. About 30 percent growers faced problems in deciding time & methods of harvesting and about the storage of the produce each. Most of the respondents (93%) faced the problems of marketing followed by the problems of packing/processing (87%). The farmers do not have a proper nearby market to sell their produce.

8.6 The analysis given in the above table shows that about 90 percent of the respondents are of the opinion that polyhouse cultivation has increased the production of vegetables and flowers. The protected cultivation has significantly increased the production on the farms located cold regions. About 75 percent farmers believed that polyhouse cultivation was able to increase the employment opportunities. Nearly 80 percent polyhouse cultivators admitted that their income has been increased due to this cultivation. Much has to be done yet regarding organic cultivation inside polyhouses.

8.7 Besides the problems mentioned above, the farmers also reported that polyhouses are prone to damage by heavy rain and storms. Such farmers in the region suffered losses and they found difficult to reconstruct these due to lack of funds.

CHAPTER-9

Conclusions and Policy Implications

9.1 The greenhouse technology is still in its developing stage in the country and concerted efforts are required from all concerned agencies to bring it at par with the global standards. Inside polyhouse crops can be grown throughout the year. The quality of flowers produced in open fields is not of international standards. Production of vegetables and flowers crops under protected conditions not only is of high quality, but also increases the productivity and profitability of crops over open field cultivation and give better living standard to farmers.

9.2 Agriculture is the main occupation of the people in Himachal Pradesh and has an important place in the economy of the State. In the state, 89.96 percent population lives in rural areas The economy of the state is highly dependent on agriculture, apart from hydroelectric power and tourism. But most of its farmers have small landholdings on hill slopes, and need to augment their incomes. The government is now promoting protected cultivation by providing subsidy to the farmers for the construction of polyhouses. It makes small holdings more viable by producing more high value crops like vegetables and flowers from limited land with the adoption of all weather technology.

Main Findings

9.3 The area under polyhouses has been increasing continuously in the State. As per latest figures provided by Directorate of Horticulture, there was 140 hectares area under green/polyhouses with a total financial outlay of Rs.5271.94 lakhs under HTM/HMNEH/MIDH. Additional 7.91 hectares area was brought under low poly tunnels and an expenditure of Rs.3.952 lakhs was made on this account. Polyhouse was also an important component of Macro Management Scheme and an area of 6.71 hectares was brought under polyhouses under this scheme. As such the total area of polyhouses in the State stands at 154.62 hectares.

9.4 Though the horticulture department was the main source of authentic and detailed information about the polyhouses, the friends & relatives, awareness camps and mass media were also main sources that inspired the farmers to set up polyhouses. The decision making process of the farmers was influenced by variety of motivational factors and hindrances they encountered before setting up of polyhouses. Most of the polyhouses were supervised by the department officers/officials whose attitude was very supportive towards the farmers. There were not many deviations from the approved design of the polyhouses.

9.5 At overall level, average net return from cultivation of carnation was Rs.1467278 per polyhouse, whereas category-wise net returns were Rs.323830, Rs.1124394, and Rs.2602367 for small, medium and large polyhouse farms respectively. In the case of rose, at overall level, average net return was Rs.1612012 per polyhouse. However, the net returns were Rs.363307, Rs.1254842 and Rs.2871538 for small, medium and large polyhouses farms respectively.

9.6 On an average total production of carnation was 460 boxes per polyhouse in a year. The cost per box was Rs.2210 and its value in the market was Rs.5400 resulting in net returns of Rs.3190 per box at overall level. The net returns per box were Rs.2865 for small, Rs.3176 for medium and Rs.3229 of large polyhouse farmers On an average total production of rose was 464 boxes per polyhouse in a year. The cost per box was Rs.2346 and its value in the market was Rs.5850 resulting in net return of Rs.3474 per box at overall level. The net returns per box were Rs.3186 for small, Rs. 3495 for medium and Rs.3540 for large polyhouse farmers.

9.7 The flowers produced by the selected farmers under protected conditions were marketed mainly at Delhi market. The tendency of retaining flowers for family and kind wages and gifts was not in practice among the sampled growers. In carnation, on an average, marketing cost per 100 spikes, incurred by producers was Rs.212.85 which was 19.5 percent of the consumer's price of Rs.1090 per 100 spikes. In case of rose, on an average, marketing cost per 100 spikes, incurred by producers was Rs.298 which was 19.26 percent of the consumer price of Rs.1184 per 100 spikes.

9.8 The net price received by the producer in marketing of carnation, in Delhi market, was Rs.387 per 100 spikes which was 35.50 percent of consumer price. In the case of rose, the share of producer in consumers' rupee was 35.64 percent and net price received by the producer in marketing of rose, in Delhi market, was Rs.422 per 100 spikes.

9.9 The costs paid in marketing of carnation by the farmers, wholesales, mashakhor and retailers were 19.53, 1.65, 1.28 and 8.80 percent respectively and thus total marketing cost of intermediaries was Rs.128 i.e. 11.74 percent of the consumer paid price. The total margins were 33.21 percent of the consumer price. In case of rose, the costs paid by the farmers, wholesalers mashokhars and retailers were 19.25, 1.77, 1.26 and 8.95 percent respectively and thus total marketing cost of intermediaries was Rs.142 i.e. about 12 percent of consumer paid price. The total margins were 33.10 percent of the consumer price.

9.10 On an average, the net return from capsicum cultivation was Rs.149686 per polyhouse, whereas category wise net returns were Rs.69205, Rs.117623 for and Rs.235839 for small, medium and large polyhouse farmers respectively. In the case of tomato cultivation, net returns were Rs.101196, Rs.194072 and Rs.347928 for small, medium and large polyhouses farmers respectively. At overall level, net return from cultivation of tomato was Rs.227142 per polyhouse.

9.11 On an average, the total production of capsicum and tomato was 402 and 566 boxes per polyhouse in a year having cost per box Rs.194 and Rs.185 respectively. Their value in the market was Rs.574 and Rs.592 per box resulting in net returns of Rs.260 and Rs.407 per box. Out of total marketed surplus of 389 boxes of capsicum, 345 boxes i.e. 88.69 percent were marketed in Chandigarh market and rest 44 boxes i.e. 11.31 percent in the local markets. In the case of tomato, out of total marketed produce of 552 boxes, 496 boxes i.e. 90 percent were marketed in Chandigarh market and rest 56 boxes i.e. 10 percent in the local market.

9.12 On an average the cost of marketing borne by the growers for selling capsicum worked out to be Rs.333 per quintal which was 8.46 percent of the consumer's price of Rs.3935 per quintal. In the case of tomato, on an average, marketing cost per quintal

borne by the growers was Rs.320 which was 9.12 percent of consumers' price of Rs.3508 per quintal.

9.13 The net price received by capsicum producers was Rs.2545 per quintal which was about 65 percent of consumer price in Chandigarh market whereas in the marketing of tomato the share of producer in consumers' rupee was 58.44 percent and the net price received by tomato producers was Rs.2050 per quintal

9.14 The gross price received by the grower was Rs.28.73 per quintal in case of capsicum which was 73 percent of the consumer price. The costs paid by the farmers, wholesalers, mashakhor and retailers were 8.46, 1.27, 0.64 and 6.20 percent respectively and thus the total cost of marketing of intermediaries was Rs.2319 i.e. 8.11 percent of the consumer paid price. The total margins were Rs.18.88 percent of the consumer price. In the case of tomato, the costs paid by the farmers, wholesalers, mashakhor and retailers were 9.12, 1.36, 0.71 and 8.75 percent respectively and thus total marketing cost of intermediaries was Rs.387 i.e. 11.03 percent of the consumer price. The total margins were 21.41 percent of the consumer price.

9.15 The pre-harvest losses in carnation ranges from 0.36 percent on large polyhouses farms to 3.33 percent on small farms. Similarly in rose, these losses were maximum (4.09%) on small farms and minimum on large farms (0.48%). Overall these losses were 0.42 and 0.84 percent in carnation and rose respectively. In the case of capsicum and tomato also pre harvest losses were highest i.e. 1.76 and 1.25 percent respectively on small farms and lowest (0.62 and 0.56%) on large farms. Overall, these losses were 0.72 and 0.34 percent in capsicum and tomato respectively. At post harvest stages, highest losses were during transportation in all the selected crops and farms except on large farms where these were highest at the time of grading and packing. Overall, at post harvest stages, transportation losses were 0.42, 0.21, 0.48 and 0.34 percent in carnation, rose, capsicum and tomato respectively.

9.16 Although the polyhouse farming was found to be profitable regarding income and employment generation, the activity is not free from problems. In most of the cases execution of the polyhouse was delayed due to the long and cumbersome clearance

procedure adopted by various departments for sanctioning polyhouse and clearance of loan & subsidy. The construction was further delayed by the contractor. Delay in technology transfer was another reason due to which the polyhouses could not become operational well in time. Once a polyhouse became operational, unavailability of inputs, higher prices or poor quality of inputs were the problems faced by farmers. Lack of knowledge of most appropriate sowing time and cultural practices i.e. raising nursery and crops etc. was another major problem. The polyhouse growers also faced the problems related to harvesting, packing/processing, storage, marketing etc.

9.17 It can be concluded that overall in polyhouse cultivation, the input output ratio was 1:2.44, 1:2.48, 1: 3.11 and 1:2.85 in case of carnation, rose, tomato and capsicum respectively making the venture profitable as most of the farmers have already recovered the cost of construction of polyhouse. Cultivation of these crops in a polyhouse of large category was found to be highly feasible as reflected in higher values of NPV (Rs. 3040661), BCR (1.86) and IRR (71%) with payback period of two years. The investment in other two categories of polyhouses was also found to be economically sound and quite remunerative.

Policy Implications

9.18 The growing of flowers and vegetables inside a polyhouse in Himachal Pradesh has improved the quality of life of the growers by improving income and employment. However, the profitability of these crops still can be improved by taking the following steps.

- . Low cost technologies, required on small holdings, should be developed. There is a strong need for developing the required minimum infrastructure in major production zones to be used by growers on community/cooperative basis.
- Keeping in view the perishable nature of vegetables and variations in market prices, adequate storage facilities should be developed.
- Arrangements should be made to provide latest information regarding prices and arrivals of the vegetables in the markets.

- The emphasis should be given to expand the market and develop infrastructure by improving packing and transportation facilities.
- In the present marketing system of flowers and vegetables, most of the benefits are reaped by the middlemen. An attempt should be made to strengthen the marketing system by organizing cooperative societies, particularly for small growers. This will help in minimizing the margin of the intermediaries and will ultimately ensure better producers' share in consumer's rupee.
- The cropping practices of crop production are significantly different in polyhouses than that of in growing crops or vegetables outside the polyhouse. Polyhouse farming requires skill monitoring and care. Before polyhouses become operational, the growers should be given proper training related to cultural practices i.e. raising nursery and crops, intensity of irrigation, the most appropriate sowing and harvesting time.
- The polyhouses in H.P. were prone to damage by heavy rain and storms. Such farmers found difficult to reconstruct these polyhouses due to lack of funds. Polyhouses should be insured at the time of construction.

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Reviewer's Comments

Title of the report:

An Economic Analysis of Protected Cultivation under MIDH in Himachal Pradesh

Date of assignment received for review: April 05, 2017

Date of dispatch of the comments: April 17, 2017

Comments on the objectives of the study:

The objectives of the study are properly addressed

Comments on methodology, analysis, organization and presentation *etc*.:

By and large, the study has been undertaken in right perspective. The following suggestions are put forwarded for kind perusal of the authors:

- Somewhere in the report, the rationale behind selecting two flowers (Carnation and Rose) and two vegetables (Capsicum and Tomato) only, may perhaps be mentioned. Presently, it is indicative of the fact that the protected cultivation in HP is restricted to four crops only.
- The figure for material cost (9.81 %) may be corrected as 91.81 % at page no. 38
- The Tables indicating the cost of construction (Rs/Poly-house) may also include item-wise cost in terms of percentage as well, including that of subsidy across different sizes (Table Nos. 5.13, 5.14 and 5.15)
- The net return may be shown across different size of Poly houses in order to intercept the effect of sizes (250/ 500 and 1000 m^2), if any. Also, the tables should indicate figures in percentage terms along with absolute figures {Table Nos. 6.2(a) & 6.2(b) and 6.5(a) & 6.5(b)}
- The figures in Tables 7.1(a) and 7.1(b) are to be checked and corrected. Also, the utilization part is to be spelt out and interpreted accordingly.
- Along with the quantity sold in different markets, percentage figures may also be indicated in Tables 7.2 (a) and 7.2 (b).
- The manuscript may be edited once again to avoid the common mistakes, typographical or otherwise.

Overall view on the acceptability of the report:

The report may be accepted with incorporation of the suggested modifications.

AERC, Jorhat

Action Taken Report

1. **Date of receipt of comments:** 17.04. 2017.

2. **Date of completion of final report:** April 18, 2017.

3. **Action taken on methodology, analysis, organization, presentation *etc*. :**

i. The reason of taking two flower and two vegetable crops for this study is given in para 6.1.
ii. Figure has been corrected.
iii. The percentages have been included.
iv. The net returns across different size of Polyhouses have been given in Tables 6.2(a-b) and 6.5(a- b). The percentages are also included in these tables.
v. The figures in Tables 7.1(a) and 7.1(b) have been checked and corrected. The sampled farmers were not retaining flowers for family use and gifts etc. The same is already separated in case of vegetables.
vi. The percentages have been included.
vii. The editing of the manuscript has been done.