AERC Report

Study No. 162

An Economic Analysis of Protected Cultivation under MIDH in Himalayan States

(Consolidated Report)

Meenakshi, AERC, Shimla

Kali Sankar Chattopadhyay
AERC, Visva-Bharti, Santiniketan

Study Sponsored by Ministry of Agriculture and Farmers Welfare
Government of India, New Delhi

Agro-Economic Research Centre
Himachal Pradesh University, Shimla

November - 2017

Contents

Chapter	Title	Page No.
	Executive Summary	i-xi
1	Introduction	1-15
2	Methodology	16-22
3	Present Scenario of Polyhouse Development	23-35
4	Socio-Economic Features of Polyhouse Owners	36-42
5	Motivations/Hindrances and Costs Involved in Polyhouse Construction	43-58
6	Costs and Returns from Protected Crops	59-76
7	Marketing System of Protected Crops	77-92
8	Problems in Cultivation of Protected Crops	93-97
9	Conclusions and Policy Implications	98-107
	Bibliography	108-109

List of Tables

Table No.	**Title**	**Page No.**
2.1	Areas selection of the sample	17
2.2	Classification of Sampled Polyhouse Owners under MIDH	19
2.3	Social Classification of Sampled Polyhouse Owners	20
3.1	General Horticulture Scenario in Himachal Pradesh	24
3.2	Cost Norms and Pattern of Assistance under MIDH during XII for NHM and HMNEH Sub Schemes	26
3.3	Cost Norms and Pattern of Assistance under MIDH for Protected Cultivation in Himachal Pradesh during 2015-16	27
3.4	Physical and financial progress under –MIDH Feb. 2015 in J&K	29
3.5	Proposed Action Plan 2015-16 under MIDH in J&K	30
3.6	Cost Norms and Pattern of Assistance for Polyhouses in Sikkim	32
4.1	Average Family Size	36
4.2	Educational Level of Family Members of Sampled Households	37
4.3	Occupational Pattern of Sampled Households (Main Occupation)	38
4.4	Occupational Pattern of Sampled Households (Subsidiary Occupation)	39
4.5	Land Resources of Selected Protected Cultivators	40
4.6	Land Resources of Selected Protected Cultivators	40
4.7	Per Farm Annual Income From Other Sources	41
4.8	Per Farm Annual Income From Other Sources	41
5.1	Type of Polyhouses	44
5.2	Sources of Information about Polyhouse	45
5.3	Sources of Information about Scheme/Subsidy/Technical Details	45
5.4	Motivational Factors for Adoption of Polyhouse	46

5.5	Hindrances Encountered for adoption of Polyhouse	48
5.6	Supervision of Polyhouse Construction by Officials	49
5.7	Suggestions for Improvement of Polyhouses	50
5.8	Delays in No Objection Certificates (NOC)	51
5.9	Action by Contractor in Case of Delay in NOC	51
5.10	Equipments Installed in Polyhouses	52
5.11	Reasons for Deviation from Recommended Design of Polyhouse	52
5.12	Sources of Training/Dissemination Provided to Farmers for Protected Cultivation	53
5.13	Cost of Construction of Polyhouse (250m^2) in H.P.	54
5.14	Cost of Construction of Polyhouse (500m^2) in H.P.	55
5.15	Cost of Construction of Polyhouse (1000m^2) in H.P.	56
5.16	Cost of Construction of Polyhouse (250m^2) in J&K	57
5.17	Details of Loans for Construction of Polyhouses	58
6.1(a)	Cost of Cultivation of Carnation under Protected Condition	60
6.1(b)	Cost of Cultivation of Rose under Protected Condition	61
6.1(c)	Cost of Cultivation of Gerbera under Protected Condition	62
6.2(a)	Net Returns from Cultivation of Carnation under Protected Condition	63
6.2(b)	Net Returns from Cultivation of Rose under Protected Condition	63
6.2(c)	Net Returns from Cultivation of Gerbera under Protected Condition	64
6.3(a)	Net Returns per Box and Input-Output Ratio from Cultivation of Carnation under Protected Condition	64
6.3(b)	Net Returns per Box and Input-Output Ratio from Cultivation of Rose under Protected Condition	65
6.4(a)	Cost of Cultivation of Capsicum in Polyhouse	65
6.4(b)	Cost of Cultivation of Tomato in Polyhouse	66
6.5(a)	Net Returns from Cultivation of Capsicum in Polyhouse	67
6.5(b)	Net Returns from Cultivation of Tomato in Polyhouse	68
6.6(a)	Net Returns per box and Input-Output Ratio from Cultivation of Capsicum in Polyhouse	68
6.6(b)	Net Returns per box and Input-Output Ratio from Cultivation of Tomato in Polyhouse	69
6.7	Cropping Pattern on Sampled Farms (Unprotected Cultivation)	70
6.8	Cost of Cultivation of Unprotected Crops Grown in Himachal Pradesh	71
6.9	Cost of Cultivation of Unprotected Crops Grown Jammu & Kashmir	71
6.10	Cost of Cultivation of Unprotected Crops Grown in Sikkim	72
6.11	Productivity of Crops on Sampled Farms (Unprotected Cultivation)	73
6.12	Production of Crops on Sampled Farms (Unprotected Cultivation)	74
6.13	Value of Output from Crops on Sampled Farms (Unprotected Cultivation)	75
6.14	Measures to Analyse Project Worth of Protected Cultivation Venture	76
7.1(a)	Production and Utilization of Protected Flower Crops on Sampled Farms	77
7.1(b)	Production and Utilization of Protected Vegetable Crops on Sampled Farms	78

7.2(a)	Marketing Pattern of Protected Flower Crops on Sampled Farms	80
7.2(b)	Marketing Pattern of Protected Vegetable Crops on Sampled Farms	81
7.3	Marketing Costs and Price Spread of 100 Spikes of Carnation and Rose in Delhi Market	82
7.4	Marketing Costs and Margins of Intermediaries in Carnation and Rose Marketing	84
7.5	Marketing Costs and Price Spread of Carnation and Gerbera in the Market	85
7.6	Marketing Costs and Margins of Intermediaries in Carnation and Gerbera Marketing	86
7.7	Marketing Costs and Price Spread of Capsicum and Tomato in Chandigarh Market	87
7.8	Marketing Costs and Margin of Intermediaries in Capsicum and Tomato at Chandigarh Market	88
7.9	Marketing Costs and Price Spread of Capsicum and Tomato in the Market	89
7.10	Marketing Costs and Margin of Intermediaries in Capsicum and Tomato at the Market	90
7.11	Production Losses at Various Stages on All Farms in Himachal Pradesh	91
7.12	Production Losses at Various Stages on All Farms in Sikkim	92
8.1	Responses Regarding Problems Faced During Construction of Polyhouses	93
8.2	Responses Regarding Problems Faced in Inputs Availability	94
8.3	Responses Regarding Problems Faced in Cropping Practices	95
8.4	Responses Regarding Problems Faced in Harvesting, Storage etc.	96
8.5	Perception of Farmers on Protected Cultivation	96

Executive Summary

The present study **"**An Economic Analysis of Protected Cultivation under MIDH in Himalayan States" was conducted by two Agro –Economic Research Centres namely, Shimla and Santiniketan with the guidelines of Directorate of Economics and Statistics, Ministry of Agriculture and Farmers welfare, Government of India during the year 2016-17. The Agro – Economic Research Centre, Shimla was the coordinator of the studies conducted in the States of Himachal Pradesh, J&K by AERC, Shimla, and in Sikkim by AERC, Santiniketan. The studies were consolidated by AERC, Shimla with the assistance of AERC, Santiniketan.

Protected cultivation is a unique and specialized form of agriculture. 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. It is the technique of providing favourable conditions for plant growth and enhances the production level. 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. 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. Leading states in protected cultivation in India are Maharashtra, Gujrat, Karnatka, Haryana, J&K, Himachal Pradesh, Uttarakhand and Sikkim.

The state and central governments are encouraging construction of polyhouses by giving subsidies to the farmers. Farmers are being motivated toward cultivation using the scheme of subsidies. Protected conditions for vegetables and flowers are created by using different type of structures as per the season and location specific, among them most common and widely used as modern greenhouses called polyhouses.The present study was 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 and to analyze the worth of protected cultivation venture.

- To analyze the systems adopted for marketing the produce under protected conditions.
- To examine the problems faced by the farmers in production and marketing of Flowers and vegetables under protected conditions.

Methodology

To fulfill the above objectives, two districts in Himachal Pradesh 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 State of J&K has three regions; namely, Jammu, Kashmir and Ladakh. The topography and climate of two regions, Kashmir and Ladakh is the same as that of other hilly states under the study like Himachal Pradesh. Therefore, these two regions, comprising of twelve districts, were purposively selected for the study from Jammu and Kashmir and two districts were selected on the basis of highest number of polyhouses. A total sample of 100 vegetable growers (50 from each district) was selected for detailed study.

In Sikkim two districts viz. East Sikkim & South were selected on the basis of highest number of poly-houses. Following the same criteria, two development blocks i.e. Gangtok from East Sikkim and Namchi block from South Sikkim were selected. In the next stage, all the registered poly-houses and a sample of 25 vegetable growers and 25 farmers cultivating flowers were selected randomly from each block. Thus, the study is based on 100 farmers cultivating in poly-houses in two districts.

The study refers to the agriculture year 2015-16.

Main Findings

Present Scenario of Poly house Development under MIDH

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. The area under polyhouses has been increasing continuously in the State. Polyhouse was also an important component of Macro Management Scheme and an area of 6.71 hectares was brought under polyhouses under this scheme.

The Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) is being implemented in J&K since 2001-02. From April 2014 onwards, HMNEH has been subsumed under MIDH and is being implemented in the State covering important horticulture crops. Under the scheme Centre had approved to cover 19.33 ha. area under protected cultivation with an assistance of 477 lakhs during the year 2015-16.

In case of polyhouse development under MIDH in Sikkim, the Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) has been implemented in all the districts of Sikkim. An area of 415.96 ha has been covered under protected cultivation, while 48835 farmers have been trained under various horticulture activities.

Socio-Economic Features among the Sampled Households

In Jammu & Kashmir the average family size is comparatively larger than Himachal Pradesh and Sikkim, whereas literacy percentage among the sampled household in Sikkim is found to be higher than Himachal Pradesh and Jammu & Kashmir.

Average land holdings among the sampled households is comparatively high in Sikkim i.e. 1.06 hectares as compared to Himachal (0.68 hectares) and Jammu & Kashmir (0.37 hectares).

In Himachal Pradesh the income from salary was maximum (32.98%) followed by pension (32.10%), wage labour (28.47%) and animal husbandry (6.45%) respectively. In Jammu & Kashmir the income from wages was maximum (57.88%) followed by from animal husbandry i.e. 32.98 percent. In Sikkim the income from salary was maximum (71.60%) followed by animal husbandry (13.4%), business (12.6%) and other sources i.e. 2.5 percent.

Motivations/Hindrances and Costs Involved in Polyhouse Construction

Out of total polyhouses, 54 percent polyhouses in Himachal Pradesh were simple and 46 percent Hi-Tech. Further all the polyhouses were of single tier cultivation polyhouses. While in Jammu & Kashmir and Sikkim all the polyhouses were simple and single tier cultivation polyhouses. The Department of Horticulture in these states plays a crucial role in disseminating the ideas of polyhouse cultivation.

In Himachal Pradesh among the polyhouse farmers the possibility of high income play the largest motivating factor whereas in Jammu & Kashmir demonstrations are considered to be the largest motivating factor. In Sikkim the possibility of high income was the largest motivating factor respondents followed by availability of subsidy, and availability of technology.

There were many hindrances which the farmers faced during the adoption process. In Himachal Pradesh most of the respondents (93%) reported about the marketing problems. While in Jammu & Kashmir most of the respondents (49%) reported that there was long wait involved in getting clearance of loan and subsidy from the departments. In Sikkim sixty eight percent of the respondents reported about the procrastinated process and delayed tactics by the contractors during execution.

In Himachal Pradesh 76 percent of the polyhouses were supervised by the officials. While in Jammu & Kashmir 75 percent of the polyhouses were supervised by the officials. It is encouraging to note that the attitude of the officials during the supervision, in addition to ensure the quality and design aspect, was supportive to the farmers. In Sikkim the extension activities by the government officials in poly-house construction play a crucial role.

In Himachal Pradesh, majority of the farmers (76%) wanted the design of the polyhouses to be according to the 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 costs 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.

In Jammu & Kashmir majority of the farmers suggested that inputs used in the polyhouses to raise the nursery should be provided to them through the department on subsidized rates. They

should be provided best quality seeds at cheaper rates. Forty five percent respondents said that organic farming should be introduced and promoted in the polyhouses for healthy crop. According to 38 percent of the respondents, information and training on cropping practices under protected conditions should be provided and forty three percent of them suggested that cost saving techniques should be applied or made available. Only 15 percent were of the view that crops should also be grown in the polyhouses.

In Sikkim 80 percent of the respondents had some suggestions for the improvement of polyhouses that organic farming with more technological know-how could make a dent in horticultural production in this State. Sixty eight per cent of them have responded for change or modification of existing cropping practices while 16 per cent opined for better supply procedure or emphasized on availability of inputs in a more convenient way. All of the respondents stated that storage facilities should be enhanced.

Returns from Flower Crops

In Himachal Pradesh, the net returns from carnation cultivation was Rs. 1467278 per polyhouse whereas in Sikkim it was Rs. 46004.32 .In Himachal Pradesh the average net return from cultivation of rose was Rs.1612012 per polyhouse. In Sikkim the average net return from cultivation of gerbera was Rs. 39671.82 per polyhouse.

Returns from Vegetable Crops

In Himachal Pradesh the average net returns from cultivation of capsicum was Rs. 149686 per polyhouse, whereas in Sikkim it was Rs. 23619.04, and for tomato the corresponding figure for these two states is Rs. 227142, Rs. 17158.14 respectively.

Production and Utilization of Flower Crops

In Himachal Pradesh and Sikkim total production of carnation is 467 boxes and 258 (per polyhouse in a year) respectively out of which 1.50 percent and 4.54 percent was found to be damaged at different stages.

In Himachal Pradesh the total production of rose was 472 boxes and out of which 1.69 percent were treated as losses at different stages. In Sikkim the total production of gerbera was estimated to be 454.80 boxes and out of which only 4.25 percent were found as losses at different stages. About 0.20 per cent production kept for family uses and 0.32 percent given as gifts to friends and relatives.

Production and Utilization of Vegetable Crops

In Himachal Pradesh and Sikkim total production of capsicum was 402 and 975.55 boxes (per polyhouse in a year), out of which only 2.03 percent in HP and 2.70 percent in Sikkim were treated as losses at different stages. Family consumption and gifts in HP and Sikkim are accounted for 0.75, 0.50 percent and 1.46 percent respectively. In Himachal Pradesh and Sikkim total production of tomato was estimated to be 566 boxes and 513.08 boxes (per polyhouse in a year) and out of which losses at different stages found to be only 1.41 percent and 2.55 percent. Family consumption and gifts accounted for 0.71 and 0.35 percent for HP and family consumption for Sikkim accounted for 4.64 percent respectively.

Marketing Pattern of Flower Crops

In Himachal Pradesh carnation, 95.65 percent were marketed in Delhi followed by neighbouring states and the local markets while in Sikkim 64.63 percent were marketed in neighbouring states followed by the local markets and for rose 95.91 percent of total production were marketed in Delhi and rest 19 4.09 percent in the other markets. In Sikkim 61.24 percent of total gerbera production were marketed in neighbouring states followed by the local markets (38.75%).

Marketing Pattern of Vegetable Crops

In Himachal Pradesh, 88.69 percent of capsicum was marketed in Chandigarh market and 11.31 percent in the local markets. In case of tomato, 90 percent was marketed in Chandigarh and the rest 10 percent in the local markets. While in Sikkim 71.12 percent of total capsicum production was marketed in neighbouring states and rest 28.88 percent in the local markets. 62.24 percent of tomato was marketed in the neighbouring states and rest 37.76 percent in the local markets.

Marketing Costs and Price Spread of Flowers in Delhi for Himachal Growers

For Himachal Growers, marketing cost for carnation incurred by producers 19.53 percent of the consumer's price of Rs.1090 per 100 spikes and for rose marketing cost incurred by producers was estimated to be as 19.26 percent of the consumer price.

Producers' Share in Consumers' Price

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

Marketing Costs and Margins of Intermediaries in Carnation and Rose Marketing

The gross price received by the grower was Rs.600 per 100 spikes which were 55.04 percent of the consumers' 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 11.74 percent of the consumers' price. The total margins were found to be 33.21 percent of the consumers' price. In case of rose, the gross price received by the grower was Rs.650 per 100 spikes which were 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 12 percent of the consumer's paid price. The total margins were found to be 33.10 percent of the consumer's price.

Marketing Costs and Price Spread of Carnation Gerbera for Sikkim Growers

In case of marketing costs and price-spread of protected crops, it needs to be noted that as the marketing of crops is done either by the farmers themselves (directly to the consumers) and (or) through the FPOs in nearby towns, there is complete absence of middlemen, commission agents, etc. Neither the farmers have to bear any market fee and other such charges. The only costs involved in marketing are on the part of the farmers for assembling, packing, grading and transportation. It can be observed here that total expenses borne by the farmers for marketing of carnation stands at 8.18 per cent, while that for gerbera stands at 7.66 per cent of net price received by the grower, which in turn equals to consumer price in the absence of middlemen or market intermediaries.

Marketing Costs and Price spread of Vegetables in Chandigarh for Himachal Growers

On an average the cost of marketing borne by the growers for selling capsicum worked out to be 8.46 percent of the consumer's price of Rs.3935 per quintal and for tomato marketing cost per quintal borne by the growers for selling tomato reported to be 9.12 percent of the consumers' price of Rs.3508 per quintal.

Producers' Share in Consumers' Price

The net price received by capsicum producers was Rs.2545 per quintal, i.e. about 65 percent of consumer price in Chandigarh market. For tomato 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

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 at different stages of marketing are found to be 8.46, 1.27, 0.64 and 6.20 percent respectively and thus the total cost of marketing of intermediaries was estimated as Rs.2319 i.e. 8.11 percent of the consumers' price. The total margins were found to be Rs.18.88 percent of the consumers' price. As far as tomato is concerned, the gross price received by the grower was Rs.2370 per quintal i.e. 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 was found to be 21.41 percent of the consumer price.

Marketing Costs and Price Spread of Vegetables in the Market for Sikkim Growers

In case of capsicum, the total expenses borne by the grower on account of marketing stands at 7.82 per cent, while that for tomato stands at 7.81 per cent of net price received by the grower, which in turn equals to consumer price. The case for price-spread of these protected crops does not arise in the absence in market intermediaries.

Production Losses in Flower Crops

In Himachal Pradesh pre harvest losses in carnation was found to be 0.42 per cent. Whereas in post harvest losses, the losses during transportation was maximum followed by picking, assembling and grading/packing. In Sikkim pre harvest losses in carnation found to be 0.92per cent only. Losses during picking was maximum followed by grading & packing, transportation and assembling .In Himachal Pradesh the pre harvest losses in rose production were 0.84 per cent. While in post harvest losses, the losses during picking, assembling, grading & packing and transportation were 0.21 per cent each. In Sikkim pre harvest losses in gerbera production were 0.69 per cent. While, in post harvest losses, the losses during picking was maximum followed by grading & packing, transportation and assembling.

Production Losses in Vegetable Crops

In Himachal Pradesh pre harvest losses in capsicum production were found to be 0.72 per cent but the losses during transportation were estimated to be maximum followed by losses during picking, assembling and grading & packing. In Sikkim the pre harvest losses in capsicum production were 0.71 percent. Losses during transportation were highest followed by losses during picking, assembling, grading & packing.

In Himachal Pradesh pre harvest losses in production of tomato are found to be 0.34 per cent. Losses during transportation and grading & packing were found maximum followed by the losses of picking & assembling. In Sikkim pre harvest losses for production tomato were found to be 0.76 per cent. Losses during transportation were reported to be highest followed by losses during picking, assembling and grading.

Problems in Cultivation of Protected Crops

In Himachal Pradesh the problems during construction, like delays or use of inferior material, high construction cost were reported as the most important problems faced by the respondents. In Jammu & Kashmir most of them complained about the obscure nature of clearance procedure of subsidy and long wait for sanctioning of loan. Among other problems unavailability of inputs including higher prices and low quality were reported to be important by the growers. In Jammu & Kashmir seventy six percent complained about the problem of higher prices of inputs required for rising of seedling in a polyhouse. In Sikkim seventy six percent polyhouse grower farmers complained about the low quality of inputs.

In Himachal Pradesh the problems related to cultural practices i.e. raising nursery and crops, sowing time etc.were also reported by the respondents. In Sikkim 44 percent of the farmers reported that they had no knowledge about the proper time to irrigate the vegetables grown in polyhouse and frequency of irrigation.

In Himachal Pradesh about 30 percent of the growers faced problems in deciding time & methods of harvesting and about storage of the produce. Most of the respondents faced the problems of marketing followed by the problems of packing/processing. In Sikkim fifty two percent growers faced problems in deciding time of harvesting. Most of the respondents faced the problems of storage followed by the problem of marketing facilities and scientific way of packing and processing.

Perception of Farmers on Protected Cultivation

In Himachal Pradesh 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 in 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 polyhouse cultivation. In Sikkim all the farmers are of the opinion that polyhouse cultivation has increased the production of vegetables, flowers, employment opportunities, income and facilitated adoption of organic farming to a significant extent.

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 difficulty in reconstructing these dilapidated polyhouses due to lack of funds.

Policy Implications

The growing of flowers and vegetables inside a polyhouse 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.
- 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.

- 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 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.
- Inputs used in the polyhouses to raise the nursery should be provided to farmers through the department on subsidized rates. They should be provided best quality seeds at cheaper rates.
- Organic farming should be introduced and promoted in the polyhouses for healthy crop..

As in Sikkim, formation of Farmer Producers' Organizations should be encouraged so that the hurdles in post-harvest management and marketing are reduced to the minimum for the marginal and small vegetable producers.

CHAPTER–1

Introduction

1.1 The present study "An Economic Analysis of Protected Cultivation under MIDH in Himalayan States" was conducted by two Agro –Economic Research Centres namely, Shimla and Santiniketan with the guidelines of Directorate of Economics and Statistics, Ministry of Agriculture and Farmers welfare, Government of India during the year 2016-17. The Agro –Economic Research Centre, Shimla was the coordinator of the studies conducted in the States of Himachal Pradesh, J&K by AERC, Shimla, and in Sikkim by AERC, Santiniketan. The studies were consolidated by AERC, Shimla with the assistance of AERC, Santiniketan.

1.2 Over the years a paradigm shift of agricultural activities in the form of protected cultivation is visible in various parts of India. 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. Owing to the robust increase in population, climate change, decreasing land holdings, increasing pressure on natural resources i.e. land and water and high demand of quality horticultural fresh produce, cultivators and policy makers both felt necessary towards modern technologies of crop production like protected cultivation.

1.3 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 vegetable cultivation is about 2 thousand hectares. Leading states in

protected cultivation in India are Maharashtra, Gujrat, Karnatka, Haryana, J&K, Himachal Pradesh, Uttarakhand and Sikkim.

1.4 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 types 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

1.5 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.

Mission for Integrated Development of Horticulture

1.6 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.

Protected Cultivation in H.P

1.7 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.

1.8 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

1.9 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.

Protected Cultivation in J&K

1.10 Agriculture plays a very prominent role for the development of economy of J & K State. The state has a cultivable area of 8.58 lacs hectares. Around 70 per cent of the population in the State gets livelihood directly or indirectly from agriculture and allied sectors. As per census 2011, 41 percent (out of main and marginal workers taken together) are engaged in agricultural activities. The State comprises of three regions; namely, Jammu, Kashmir and Ladakh having distinct geographical outlook and agro-climatic zones. Each zone having its own characteristics that largely determines the cropping pattern and productivity of crops. Seed replacement ratio is very low in J & K, still those varieties are used which were developed 30 years ago affecting yield parameters adversely. The production of three major crops paddy, maize and wheat in J & K state is more than 90 percent of the total food-grain production of all crops and rest is shared by other cereals and pulses. Commercial crops are the cash crops and help for invigorating agriculture sector. The State has a cultivable area of 8.58 lacs hectares around 12 percent of gross area sown. The net area sown during 2013-14 was 741 hectares. About 89 percent of the net irrigated area is irrigated through canals irrigation facility is presently available only to 43 percent of the net area sown. A major constraint to the development of agriculture in J & K is the fact that only 50 percent of the ultimate irrigation potential of the State is harnessed. The share of agriculture and allied activities to GSDP is 17.49 percent as per advanced estimates for 2014-15. The share of the horticulture sector in the agriculture GSDP is about 45 percent. About 94 percent of the operational holders fall in the category of marginal and small farmers, 5 percent in the semi-medium farmers, one percent in the medium farmers and 0.04 percent in the large farmers. The average size of holding size is 0.67 hectares.

1.11 The state is endowed with ample natural resources including soil, water diversity in topography, climatic conditions, and rich natural flora facilitating the cultivation of a wide range of flowers. The valley of Kashmir is famous for its beauty and bounty across the length and breadth of the globe is blessed with the richness in bio-diversity of mighty Himalayas. The nature has been kind enough in providing unique / congenial agro-climatic conditions, owing to which the valley is best, suitable for flower production. Commercial cut flower production of Tulip crop is now done under controlled conditions from Mid December in Kashmir Division on a modest scale. But in the selected areas, the flowers were not grown under protected conditions.

1.12 Vegetable nursery raising under protected cultivation/ poly houses is very popular in J&K. Generally in Kashmir region, in polyhouses only seedlings are raised and by planting these seedlings in the field, the yield is taken in advance than the normal method of direct sowing. Raising of vegetable nursery in polyhouses has many folds benefits such as easy management, early nursery and protection from biotic and abiotic stress. This technology fetches the higher prices due to marketing of produce in off season. Such production system has extended the growing season of vegetables and also their availability whole the year. The seedlings of cucurbits, tomato, chilli, capsicum, brinjal, cucumber, cabbage, cauliflower and broccoli are grown under plastic cover in the polyhouses.

1.13 The government in Kashmir has taken an initiative to provide polyhouses at subsidized rates to farmers to help them increase vegetable production and also protect their crops from vagaries of fluctuating weather. The initiative has benefited farmers of several villages of Budgam district and the government is expanding it to other districts as well. Using polyhouse facilities by the farmers in Kashmir, the early sapling production is leading to a surge in sales of vegetables. Farmers grow saplings in their polyhouses for their kitchen gardens and large acres of land used for commercial purposes. The main off season vegetables grown in the open fields in J&K are knolkhol, peas, tomato, French beans, radish, cauliflower, cabbage and capsicum. However, the off-season vegetable/seed industry in Kashmir received a serious setback due to the turmoil in Kashmir valley over the past few years. As a result of disturbed conditions in the valley the vegetable seed industry is facing number of difficulties.

Protected Cultivation in Sikkim

1.14 Sikkim is basically an agrarian State with 64 per cent people dependent on agriculture and allied activities, and about 15 per cent of the Gross State Domestic Product (GSDP) comes from agricultural and horticultural sector. Therefore, for attaining a higher standard of rural livelihood, the State Government has accorded priority to these sectors. At the same time the Government of Sikkim has the concern for preserving primary agro-resources like soil, water and bio-diversity. Hence, strict norms of organic farming are being enforced for protecting the environment as well as the flora and fauna in the state. In Sikkim, however, the climatic conditions and rich bio-diversity give ample opportunity for such cultivation under protected conditions. Presently area under protected cultivation of horticultural crops is only around 40,000 ha and out of which large portion mostly in northern parts of India is not successfully being utilized for protected cultivation. Promotion of protected cultivation in addition helps in creation of huge self-employments for unemployed educated youths. At the same time also raises the national economy by sale of high quality produce in domestic and international markets. In a situation when global trade scenario is changing rapidly there exist high potential for enhancing the income of farmers opting for quality and offseason vegetable and cut flower cultivation under protected conditions.

1.15 Sikkim produces about 0.24 m MT of horticulture produce from an area of 0.07 m ha. The major horticulture production constitutes vegetables (54.5%), spices (24.7%) and fruits (9.9%). Large cardamom, ginger and turmeric are the major spice crops, while mandarin orange, guava, mango, banana are the principal fruits grown in the state. Flowers like gladioli, anthuriums, lilliums, primulas, rhododendrons and different kinds of orchids thrive here. The Department of Horticulture and Cash Crop Development (HCCDD) is involved in motivating and providing technical guidance to local farmers and taking forward the mission of the Government towards Horticulture Development in Sikkim. In the process, the Department has initiated steps to strengthen existing horticulture infrastructure, availability of inputs and technological know-how to the farmers.

Review of Literature

1.16 **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.

1.17 **Ganesan, 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.

1.18 **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.

1.19 **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.

1.20 **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),

1.21 **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.

1.22 **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 cost 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.

1.23 **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.

1.24 **Kouser Parveen Wani et. al. (2011)** studied the protected cultivation of tomato, capsicum and cucumber under kashmir valley conditions. The study revealed that the seedlings of tomato, chilli, capsicum, brinjal, cucumber, cabbage, cauliflower and broccoli can be grown under plastic cover protecting them against frost, severe cold and heavy rains. The environmental conditions particularly increase in temperature inside polyhouse hastens the germination and early growth of warm season vegetable seedlings for raising early crops in spring summer. Vegetable nursery raising under protected conditions is becoming popular throughout the country especially in hilly regions. Management of vegetable nursery in protected structure is easier and early nursery can be raised. Needless to emphasize, this practice eliminates danger of destruction of nurseries by hail storms and heavy rains because world highest rains occur in this region and the period of rainy season is also wide (April to October). Protection against biotic and abiotic stresses becomes easier.

1.25 **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 by rental 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.

1.26 **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.

1.27 **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.

1.28 **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.

1.29 **Yogesh Tiwari (2014)** founded that total cost in gerbera production grown on an average 1200 m^2 were Rs 757672 out of which share of operational and fixed cost was 35:65. In rose production total cost incurred was also at par with gerbera (Rs 735431) and more than two - third contribution was of fixed cost. The annual gerbera and rose production on sample poly house 409288 and 342000 flowers respectively which is 108 and 76% higher than the break- even level, Net profit was to the extent of Rs 529868 and Rs 345288 and benefit- cost ratio was 1:70 and 1:46 respectively. Thus, existing production technology yields sufficient profit to the cut flowers growers. Major portion of produce was disposed off through channel III because producer gets maximum of gerbera and rose price per bag in channel III i.e. Rs 680 and Rs 710. Price spread ranged between Rs 190 to Rs 300 in gerbera and Rs 180 to 340 in rose. Producer share in consumer price was 76.2, 66.6 and 69.3% in respectively channel I to channel III. Huge investment requirement, Shortage of trained manpower, Price fluctuation, cold storage facilities were the important production and marketing constraints reported by sample respondents. These constraints should be minimized to augment production and profit of cut flower growers in the study area.

1.30 **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) crop. 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.

1.31 **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.

1.32 **Harmanjeet Singh (2015)** pointed out that the hilly region limits the possibility of increasing cropping area and intensification of cropping systems. Therefore, poly houses can make small holdings viable by producing maximum from limited land, overcoming vagaries of nature and diversification to high value vegetable crops. It can also stabilize production system in addition to quality improvement through utilization of vertical space and precision farming. Further, these structures can facilitate crop production in areas where vegetable production during extreme weather conditions is not possible.

1.33 **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.

1.34 **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.

1.35 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.

1.36 With this background, the present study was 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

1.37 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. But in the case of J&K, costs and returns from protected crops in chapter-6 and marketing of these crops in Chapter-7 could not be studied due to reasons mentioned in **Limitations of the Study"** (Chapter-2). However, a brief analysis of vegetables grown outside the polyhouse was carried out in Chapter-6. The problems in production and marketing of polyhouse growers in the case of H.P and Sikkim and the problems in raising vegetable nursery in polyhouses in the case of J&K are discussed in eighth chapter and chapter nine concludes the study with policy implications.

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. The evaluation study of the impact of protected cultivation under "Mission for Integrated Development of Horticulture (MIDH)" scheme envisages considering as a wholesome approach to find out proper impact of the scheme at the ground level. Keeping in view the scope of work, with the understanding of the objectives, the approach and methodologies adopted have been summarized in the following paragraphs.

Approach

2.2 The approach adopted for the present impact evaluation study is based on use of both the secondary data as well as primary data collected from Himachal Pradesh, Jammu & Kashmir and Sikkim through conducting interviews of various stakeholders.

The study comprised primarily adopting the following steps:

- Selected Beneficiaries who availed the assistance to install Playhouses.
- Collection and review of reports, documents, government policies, plans and programs.
- Field survey in the selected areas.
- Analysis of secondary and primary data using appropriate tools.

Methodology

2.3 Based on above approach, following methodology is adopted to carry out the evaluation study.

Selection of Study Districts and Blocks

Himachal Pradesh

2.4 In Himachal Pradesh 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 Areas selection of the sample

States	Districts	Blocks	Villages
Himachal Pradesh	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
Jammu & Kashmir	Budgam	Budgam Chadoora	Narkara, Budgam Dooniwara, Kralpora Zimipora, B.K. Pora
	Srinagar	Srinagar	Maloora, Zainkote Rawlpora, Lal Bazzar Gund Hassi, Nowgam Newtheed, Rambigrah Shungdipora, Hondamohal Harwan
Sikkim	East Sikkim	Gangtok, Assamlinzey	Basi Elakha (26)
			Sazong Rumtek (24)
	South Sikkim	Namchi, Gumpa Ghurpisey	Gumpa Gurpisi (22)
			Jaubari (11)
			Upper Ghurpise (17)

Jammu & Kashmir

2.5 The State of J&K has three regions; namely, Jammu, Kashmir and Ladakh. The topography and climate of two regions, Kashmir and Ladakh is the same as that of other hilly states under the study like Himachal Pradesh. Therefore, these two regions, comprising of twelve districts, were purposively selected for the study from Jammu and Kashmir and two districts were selected on the basis of highest number of polyhouses. From the selected districts, three 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 was randomly selected. Thus a total sample of 100 vegetable growers (50 from each district) was selected for detailed study.

Sikkim

2.6 In Sikkim, two districts viz; East Sikkim (Gangtok) and South Sikkim (Namchi) are purposely selected on the basis of highest number of poly-houses. From the selected districts, two development blocks each from one District have been selected as per the highest incidence of poly houses. For East Sikkim the seleced Development Blocks are Gangtok and Assamlinzey. The corresponding selected Development Blocks in South Sikkim are Namchi and Gumpa Ghurpisey. In each District the registered poly houses are being listed accordingly and from this list a sample of 25 vegetable growers and 25 flower growers scattered in these two selected Blocks are randomly selected. Thus, the study is based on 100 farmers cultivating in poly-houses in two districts. The farmers are selected from the cluster of villages with due consultation with the appropriate extension personnel of the Department of Horticulture, Government of Sikkim.

Classification of Sample

Himachal Pradesh

2.7 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).

Jammu & Kashmir

2.8 It was observed during the survey in Jammu & Kashmir that the polyhouses were generally less than 100 m^2 and as per the study format they all have fallen in the small category, i.e (upto 250m^2). The study, based on 100 small polyhouse cultivators (50 from each district), was assigned by the Ministry of Agriculture and Farmers Welfare, GOI to this centre. The classification of sampled poly house owners has been presented in Table 2.2.

Table 2.2 Classification of Sampled Polyhouse Owners under MIDH

(No.)

States	Districts	Size class			Total
		Small (250 M^2)	Medium (500 M^2)	Large (1000 M^2)	
Himachal Pradesh	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)
Jammu & Kashmir	Budgam	50 (100)	-	-	50 (100)
	Srinagar	50 (100)	-	-	50 (100)
	All	100 (100)	-	-	100 (100)
Sikkim	East Sikkim	50 (100.0)	0.00 (0.0)	0.00 (0.0)	50 (100.0)
	South Sikkim	50 (100.0)	0.00 (0.0)	0.00 (0.0)	50 (100.0)
	All	100 (100.0)	0.00 (0.0)	0.00 (0.0)	100 (100.0)

Note. *Figures in parentheses denote percentages.*

Sikkim

2.9 The sample is classified into three size classes on the basis of the size of the poly houses. The preliminary enquiries have indicated that there are predominantly three sizes of poly houses in the State. These are poly houses covering an area of about 100 square meters and 200 square meters in sharp contrast of existing of 250 mts^2, 500mts^2 and 1000mts^2 in other states for the small, medium and large farming categories. In view of the availability of sizes of poly houses in Sikkim all the selected farmers starting from 100 mts^2 to 200 mts^2 are clubbed into one category and classified as small farmers.

Social Classification

2.10 The caste-wise distribution of sampled polyhouse farmers is given in Table 2.3. In Himachal Pradesh most of the households (98%) fall in the general category and very few households belong to scheduled caste and other backward class each (1%). All the households of Jammu & Kashmir fall in the general category. In Sikkim 78 percent of households belongs to the Scheduled Tribes (ST) and remaining 22 percent to Other Backward Classes (OBC).

Table 2.3 Social Classification of Sampled Polyhouse Owners

(No.)

Particulars	Himachal Pradesh	Jammu & Kashmir	Uttarakhand	Sikkim
SC	1(1.00)	-	-	-
ST	-	-	-	78 (78.00)
OBC	1(1.00)	-	-	22 (22.00)
General	98(98.00)	100 (100)	-	-
Total	100 (100)	100 (100)	-	100 (100.00)

Note. *Figures in parentheses denote percentages.*

The Data

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

Analytical Tools

2.12 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 payback 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.

2.13 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.

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

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

2.15 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:

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

2.16 On the basis of the criterion 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

Himachal Pradesh

2.17 In Himachal Pradesh 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.

Jammu & Kashmir

2.18 The limitations of the study in Jammu & Kashmir are given below:

- As observed during the field survey and supported by data provided by Directorate of Agriculture, Kashmir, Govt. of J&K, the sampled polyhouse farmers were raising only nursery of vegetables inside polyhouses. Further, the farmers of selected area were neither raising nursery of flowers nor growing flowers inside polyhouse. Thus the report confined to study the present scenario of polyhouse development under MIDH in the State, socio-economic features of polyhouse owners in the State, motivations/hindrances and costs involved in polyhouse construction, the cropping pattern, production, productivity and the economics of crops grown in open farms and problems in raising nursery inside polyhouse.
- The data and information reported in this study was gathered from various sources and the findings of the study are based on unrecorded data from growers who knowingly or unknowingly do not come out with actual facts.

Sikkim

2.19 There is apprehension that it will be difficult for the farmers to segregate the quantity and costs of farm inputs used in various farm operations in the protected and open cultivation.

Reference Period

2.20 The study refers to the agriculture year 2015-16.

CHAPTER-3

Present Scenario of Polyhouse Development

Mission for Integrated Development of Horticulture (MIDH)

3.1 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 here under.

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

NHM

3.2 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

3.3 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

3.4 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

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

CDB

3.6 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) towards 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.

Himachal Pradesh

3.7 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.

Table 3.1 General Horticulture Scenario in Himachal Pradesh

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%

Source: Directorate of Horticulture Department Govt. of HP

Horticulture Mission for North East and Himalayan States (HMNEH) in Himachal Pradesh

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 Tables 3.2 & 3.3. 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 3.2 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 3.3 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					
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
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

Source: Directorate of Horticulture Department Govt. of HP

Jammu & Kashmir

3.12 J&K State is well known for its horticultural produce both in India and abroad. The state offers good scope for cultivation of horticultural crops, covering a variety of temperate fruits like apple, pear, peach, plum, apricot, almond, cherry and sub tropical fruits like mango, guava, citrus litchi, phalsa and Berete. Besides, medicinal and aromatic plants, floriculture, mushroom, plantation crops and vegetables are cultivated in the state. Apart from this, well known spices like saffron and black Zeera are also cultivated in some pockets of the state. As a result, there is a perceptible change in the concept of horticulture development in the state. In Jammu and Kashmir especially in Kashmir Division, horticulture plays a significant role in contributing to the development of the economy of the state. As per estimates, over 6 lac families are actively involved in horticulture sector. This sector is one of the most important employment generating sectors in the state. The growth of horticulture sector can be attributed to various initiatives taken by the Government of India and the State Government towards market interventions viz. establishment of fruit mandies, technological support, awareness options, publicity inputs, research extension etc. The area under vegetables and fruits in J&K has increased from 76.50 thousand hectares in the year 2005--06 to 100.7 thousand hectares in the year 2012-13.The state government has initiated protected farming through mission for integrated development of horticulture.

Horticulture Mission for North East and Himalayan States (HMNEH) in Jammu & Kashmir

3.13 The Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) are being implemented in J&K since 2001-02. From April 2014 onwards, HMNEH has been subsumed under MIDH and is being implemented in the State covering important horticulture crops. Under the scheme Centre had approved to cover 19.33 ha. area under protected cultivation with an assistance of 477 lakhs during the year 2015-16.The physical and financial progress under MIDH (Feb. 2015) in J&K are given in the following table.

Table 3.4 Physical and financial progress under –MIDH Feb. 2015 in J&K

(Rs. in Lacs)

Activity/Component	Unit	Rate of Asstt.(Rs. In lacs/unit	Phy Targets*	Achs*	Fin. Outlay	Expdt.
Protected Cultivation						
A.Green House Structure	-	-	-	-	-	-
a.Fan and Pad System (50%) cost for a maximum area of 4000 sq. Mtr per beneficiary	Sq.M	0.0094875	500	0	4.7438	0.0000
B.Naturally Ventilated System				0	0.0000	0.0000
i.Tubular Structure (50% cost for a maximum area of 4000 sq. Mtr per beneficiary	Sq.M	0.005300	45205	15300 (33.85)	239.5865	63.7850
ii.Wooden Structure (200 Sq. Mtr per beneficiary)	Sq.M	0.003105	62550	22779 (36.42)	194.2178	66.2800
iii)Bamboo Structure (200 Sq. Mtr per beneficiary)	Sq.M	0.002590	3820	107 (2.80)	9.8938	0.2770
C.Plastic Mulching (50% of the total cost limited to 2 ha per beneficiary	Ha	0.18400	17	0	1.8400	0.0000
D.Shade Net House				0	0.0000	0.0000
a.Tubular Structure (50% cost for a maximum area of 4000 sq. Mtr per beneficiary)	Sq.M	0.00408	14350	3842 (26.77)	58.5480	9.2800
b.Wooden structure (50% of cost limited to 20 units each unit not to exceed 200 sq. mtr	Sq.M	0.00283	3000	0	8.4900	0.0000
c.Bamboo Structure 50% of cost limited to 20 units each unit not to exceed 200 sq. mtr	Sq.M	0.00207	3145	0	6.5102	0.0000
E.Anti Bird/Anti hail nets (50% cost limited to 5000 sq. mtr per beneficiary)	Sq.M	0.000175	89000	4925 (5.53)	15.5750	2.3200
F.Cost of planting material and cultivation of Carnation/Gerbera under poly house/shade net house. (50% of cost limited to 4000 sq.mtr per beneficiary)	Sq.M	0.00305	3000	1995 (66.5)	9.1500	2.7680
G.Cost of planting material and cultivation of Rose and Lilum under poly house/shade net house. (50% of cost limited to 4000 sq. mtr per beneficiary)	Sq.M	0.00213	8000	980 (12.25)	17.0400	0.0000

Source: Directorate of Horticulture Department Govt. of J & K

*Note.1. Figures in parenthesis denote percentages. 2. * unit is given in second column.*

3.14 It can be seen from Table 3.4, that under green house structure, no amount was spent on fan and pad system. But in case of naturally ventilated system – Tubular Structure –an amount of Rs 63.78 lakhs was spent where maximum permissible amount to be spent was Rs.239.58 lakhs. On Wooden Structure (200 Sq. Mtr per beneficiary), a total sum of Rs. 66.28 lakhs was spent from the maximum permissible amount of Rs.194.21 lakhs. Other details of physical and

financial progress under this scheme on different components can be seen from the table. The proposed action plan for the year 2015-16 is also given below:

Table 3.5 Proposed Action Plan 2015-16 under MIDH in J&K

Activity/Component	Unit	Rate of Asstt. (Rs. In Lacs)	Phy*	Fin (Rs. In Lacs)
Protected Cultivation				
A.Green House Structure –Fan and Pad system (50% cost for a maxi area of 4000 sq. Mtr.	Sq.M	0.009	0	0.0000
B.Naturally Ventilated System				
i)Tubular Structure (50% cost for a maximum area of 4000 sq. Mtr per beneficiary)	Sq.M	0.006	50252	306.2870
ii)Wooden Structure(200 Sq. Mtr per beneficiary)	Sq.M	0.003	13310	41.3276
iii)Bamboo Structure (200 Sq. Mtr per beneficiary)	Sq.M	0.003	1000	2.5900
C. Plastic Mulching (50% of the total cost limited to 2 ha per beneficiary	Ha	0.184	110	20.2400
D.Shade Net House				
a.Tubular Structure (50% cost for a maximum area of 4000 sq. Mtr per beneficiary)	Sq.M	0.004	9500	38.7600
b.Wooden structure (50% of cost limited to 200 units	Sq.M	0.003	2000	5.6600
c.Bamboo Structure 50% of cost limited to 20 units	Sq.M	0.002	1000	2.0700
E.Anti Bird/Anti hail nets (50% cost limited to 5000 sq. mtr per beneficiary)	Sq.M	0.000	34223	5.9890
f.Cost of planting material and cultivation of high value veg. in poly house etc	Sq.M	0.001	10000	7.0000
g.Cost of planting material and cultivation of Carnation/Gerbera under poly house/shade net house	Sq.M	0.003	8400	25.6200
i.Cost of planting material and cultivation of Rose and Lilum under poly house/shade net house	Sq.M	0.002	7000	14.9100
j. Promotion of Integrated Nutrient Management (INM) Integrated pest Management (IPM)				
a.Promotion of IPM/INM (30% of cost subject to a max Rs.1200/ha limited to 4.00 ha/beneficiary)	Ha	0.012	3000	36.0000
b. Disease forecasting unit (PSUs) Public sector)	Nos	6.000	0	0.0000
c.Bio-Control Lab (100% Public/50% Private) Public sector	Nos	90.000	1	35.0000
d.Plant Health Clinics (100% Public/50% Private) private sector	Nos	25.000	0	0.0000
e.Leaf/Tissue analysis labs (100% Public/50% Private) public sector	Nos	25.000	0	0.0000

Source: Directorate of Horticulture Department Govt. of J & K

** Unit is given in second column.*

Sikkim

3.15 The Horticulture and Cash Crop Development Department was mandated for development of horticulture in the State. The Department mainly implemented (i) Horticulture Mission for North Eastern and Himalayan States, (ii) National bamboo Mission, (iii) National Mission for Micro Irrigation and (iv) National Mission for Medicinal plants. Performance Audit for the period 2010-15 disclosed that the Department had achieved the target in full except during 2014-15. In overall terms, area under cultivation, production and productivity of various crops registered marginal improvement. The Department had to its credit a number of success stories in establishing the livelihood of some of the farmers in floriculture, vegetable, etc. paving way for economic uplift of the farmers. The beneficiary survey of the farmers disclosed that the farmers were satisfied by the support and assistance extended by the Department. The farmers however, were dependent upon the Department for continuance in farming. Programme implementation of Horticulture Mission for North East and Himalayan States (HMNEH) revealed that three Centers of Excellences (COEs), with the objective to grow more from less area, were established in farmers' field instead of being set up on Government farm as envisaged. The Department had neither maintained details of seedling grown and supplied by each of the nurseries nor initiated adequate measures to ensure end to end approach, especially post-harvest management to enable the farmers to sell their produce. Audit Report for the year ended 31 March, 2015 mentioned that 30 Integrated Floriculture Pack House constructed at a cost of 1.52 crore in May 2008 which was not yielding value for money towards the project objective of collecting, sorting, grading, preserving, weighing and packing cut flowers for export. In the process, the Department had initiated steps to strengthen existing horticulture infrastructure, availability of inputs and technological know-how to the farmers.

Table 3.6 Cost Norms and Pattern of Assistance for Polyhouses in Sikkim

Particulars	Total No. given Till 2015-16	Maximum permissible cost	Pattern of assistance
Green House Structure			
Fan and pad system	Nil	NA	NA
Naturally ventilated system			
Tubular Structure	419000 Sq.m	Rs.1219 /Sq.m	50%
Wooden Structure			
Bamboo Structure	97800 Sq.m	Rs.518 /Sq.m	50%
Shade Net House			
Tubular Structure			
Wooden Structure			
Bamboo Structure	62000 Sq.m	Rs.414 /Sq.m	50%
Plastic Tunnels	63000 Sq.m	Rs.75 /Sq.m	50%
Walk in Tunnels	7200 Sq.m	Rs.600 /Sq.m	50%
Anti Bird/Anti Hail Nets	134000 Sq.m	Rs.35 /Sq.m	50%
Cost of planting material & cultivation of high value vegetables grown in polyhouse	NA	NA	NA
Cost of planting material & cultivation of Orchid and Anthurium under polyhouse /shade net house	NA	NA	NA
Cost of planting material & cultivation of Rose and Lilum under polyhouse /shade net house	NA	NA	NA
Plastic Mulching	575 ha	Rs.36800 /ha	50%

Source: Directorate of Horticulture, Government of Sikkim.

3.16 Cost Norms and Pattern of Assistance for Polyhouses in Sikkimis depicted in Table-3.6. From the above table it is found that regarding green house structure, in case of fan and pad system, total number given by the Horticulture Department till 2015-16 was nil. But in case of Naturally ventilated system – Tubular Structure -419000 Sq. m. where maximum permissible cost Rs.1219 per sq,m, and Bamboo Structure-97800 sq.m, where maximum permissible cost Rs.518 per sq,m, was given. In case of Shade Net House Bamboo Structure (62000 sq. m), where maximum permissible cost Rs.414 per sq m. In case of Plastic Tunnels- 63000 Sq. m. where maximum permissible cost Rs.75 per sq,m,in case of Walk in Tunnels -7200 Sq. m., where maximum permissible cost Rs.600 per sq,m, in case of, Anti Bird/Anti Hail Nets -134000 Sq. m., where maximum permissible cost Rs.35 per sq,m and in case of Plastic Mulching -575 ha, where maximum permissible cost Rs.36800 per ha , was given by the Horticulture Department till 2015-16 . In all the cases, the pattern of assistance is 50%.

3.17 The Department undertook various activities under different schemes to expand the area under coverage enhance production and improve upon productivity. Adequate planning was therefore a prerequisite for achievement of scheme objectives.

3.18 The budgetary allocation and expenditure during 2010-15 reflected that HCCDD implemented four major schemes, which included Horticulture Mission for North East and Himalayan States (HMNEH), National Bamboo Mission (NBM), National Mission for Medicinal Plants (NMMP) and National Mission for Micro-Irrigation (NMMI).

3.19 Horticulture Mission for North East and Himalayan States is the back bone of horticulture development initiatives in the State. The SFAC Sikkim took up execution of three Centres of Excellence (CoE) in Horticulture in South, West and East districts at a cost of Rs 5 crore each (total Rs15 crore) fully funded by GOI with the primary goal of growing more from less area. The major component of the CoE included establishment of mother block of improved varieties of fruit, flower and vegetable in open field conditions, rootstock block of citrus and apple (under open conditions), high-tech green houses, naturally ventilated green houses, net houses, low tunnel poly houses, various types of irrigation facilities, support systems for fruits grown in vines/climbers, vermin compost/farm yard manure unit, tissue culture units, training centre

3.20 Mother block of improved variety of tomatoes, capsicum and cucumber was established. Hi-tech green house with fitted with cooling, misting heating system alongwith humidity and temperature control system and raised platform were constructed. Tubular structure green houses were constructed in the farmers' field instead of high tech green houses. Automation fertigation/irrigation unit established. Overhead sprinkling and fogging system installed for Fertigation. The Department took up construction of Integrated Floriculture Pack House (IFPH) for fresh cut flowers, flower bulbs and allied products at Rangpo and Melli at a total project cost of ` 299.30 lakh under the financial assistance (280 lakh) of Agriculture and Processed Food Export Development Authority (APEDA). The project was taken up with the objective of collecting, sorting, grading, packing, preservation and export of cut flowers to earn maximum foreign exchange. The project was handed over only in April 2011 to SIMFED for operation. However, the project was returned back (May 2012) by SIMFED as they could not use the facility for reasons not on record.

3.21 Protected cultivation HMNEH guidelines envisaged promotion of activities like construction of shade net house, green houses, mulching and plastic tunnels, anti-bird/hail nets to increase the productivity. State Horticulture Mission constructed a number of structures in the farmers field at an aggregated cost of ` 65.64 crore during 2010-15.. The State Horticulture Mission,

however, had neither collected the production particulars from the beneficiaries to establish that there was proper utilisation of subsidy and increase in production and productivity after implementation nor realised 50 per cent beneficiary contribution of ` 32.82 crore as envisaged in the guidelines. The Department stated that farmer's contribution was not taken in financial terms but they had contributed towards land leveling including stone walls, arrangement of required organic manure, water for irrigation, labour for cultivation, etc.

3.22 Thus the present scenario of Poly house development under MIDH in Sikkim can be described in such a manner in which one can see that The Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) is being implemented in all the districts of the state thereby covering important horticulture crops.

Progress till 2014-15 in State of Sikkim

Salient physical progress 2014-15 is as follows:-

- An additional area of 78204 ha of identified horticulture crops have been covered.
- In all, 157 nurseries have been established for production of quality planting material.
- An area of 2700 ha has been covered under rejuvenation of old and senile orchards.
- Setting up of 4 IPM/INM infrastructure facilities such as Leaf tissue analysis labs, disease forecasting units.
- Organic farming has been adopted in an area of 35418 ha for promotion of organic cultivation of horticultural crops. Besides, 997 vermi compost units have been set up.
- An area of 415.96 ha has been covered under protected cultivation.
- 48835 farmers have been trained under various horticulture activities.
- Establishment of 3 Centers of Excellence (CoEs) has been reported.

An amount of Rs. 373.47 crore was released to the State till 2014-15 and the State Government has reported an expenditure of 328.97 crore.

Progress during 2014-15 in the State of Sikkim

- An outlay of Rs. 49.00 crore has been approved for the State to implement HMNEH related activities of NHM during 2014-15. Funds to the tune of Rs. 44.50 crore have been released. An expenditure of Rs. 0.60 crore has been reported.

- Outlay of Rs. 0.19 crore earmarked for PHM and Market during 2014-15. In this regard, progress is awaited.

Programme during 2015-16

An outlay of Rs. 69.00 crore including GOI share of Rs. 34.50 crore (50% of total outlay) has been earmarked for Sikkim during 2015-16. Funds to the tune of Rs. 17.25 crore have been released. (***Source: www.midh.gov.in*****)**

CHAPTER-4

Socio-Economic Features of Polyhouse Owners

4.1 It is not mere the invention but innovation and adoption of modern techniques of cultivation entirely depends upon the socio-psychological factors of the region where the new innovative measures are being meant to be introduced. It is often told that innovation of modern techniques and scientific method of farming to a significant extent depends upon the economic viability of the farmers. Simultaneously, to break the inertia of long running rituals and traditional wisdom and custom to a newer innovative way for betterment of livelihood depends upon the socio-psychological factors and receptive acumen of the demographic characteristics of the people of that particular region too. 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 also in the marketing to a great extent. In this chapter, an attempt has been made to study the socio-economic characteristics viz. family size, education occupation and economic factors like land utilization, income etc. of all the sampled polyhouse farmers of Himachal Pradesh, Jammu & Kashmir and Sikkim respectively.

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 in Himachal Pradesh the average family size among the sampled polyhouse farmers was 4.58 persons, whereas in Jammu & Kashmir and Sikkim it was 10.38 and 4.21persons respectively.

Table 4.1 Average Family Size

Family Size	Himachal Pradesh	Jammu & Kashmir	Sikkim
No. of Persons	4.58	10.38	4.21

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 and hence knowledge about modern inputs and techniques of production is considered to be important one. During adoption of modern technology level of education among farming family members

play a crucial role. Keeping in view the importance of education, the educational level of members of the sampled polyhouse farmers is given in Table 4.2.

4.4 The data in the Table 4.2 reveals that in Himachal Pradesh only 3.08 percent population of sampled households was illiterate and remaining 96.92 percent was literate. Among the literates, the most prevailing standard of education was secondary level (42.52%) followed by graduate level (23.28%), middle (10.68%), above graduation (10.27%) and primary level (10.22%) respectively. In Jammu & Kashmir 22.23 percent population of sampled households was illiterate and remaining 77.77 percent was literate. Among the literates, the most prevailing standard of education was primary

Table 4.2 Educational Level of Family Members of Sampled Households

(Percentages)

Family Size	Himachal Pradesh	Jammu & Kashmir	Sikkim
Illiterate	3.08	22.23	5.7
Primary	10.22	48.36	24.9
Middle	10.68	19.06	25.2
Secondary	42.52	9.52	25.7
Graduates	23.28	0.62	16.4
Above Graduation	10.27	0.21	2.1
Total	100	100	100

level (48.36%) followed by middle level (19.06%), secondary level (9.52%), graduation level (0.62%) and above graduation level (0.21%) and in Sikkim, 5.7 percent population of sampled households was illiterate and remaining 94.30 percent was literate. Among the literates, the most prevailing standard of education was secondary level (25.70%)

followed by middle level (25.20%), primary level (24.90%), graduation level (16.40%) and above graduation level (2.10%) respectively.

Occupational Structure

4.5 The main as well as subsidiary occupation among the sampled polyhouse farmers was analyzed and presented in Tables 4.3 and 4.4 respectively.

Main Occupation

4.6 It is evident from Table 4.3 that in Himachal Pradesh agriculture is the main occupation for the 42.36 percent of the farmers, followed by students (20.52%),

Table 4.3 Occupational Pattern of Sampled Households (Main Occupation)

(No)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Farming	194 (42.36)	423 (40.75)	236 (56.1)
Self Employed Non-farming	-	-	33 (7.8)
Service	56 (12.23)	-	22 (5.2)
Agri. Labour	-	186 (17.92)	0 (0.0)
Non-agri. Labour	-	-	0 (0.0)
Retired	18 (3.93)	-	0 (0.0)
Dependents	92 (20.09)	110 (10.60)	0 (0.0)
Household Workers	4 (0.87)	-	51 (12.1)
Students	94 (20.52)	319 (30.73)	78 (18.5)
Others	-	-	1 (0.2)
Total Population	458 (100)	1038 (100)	421 (100.0)

Note: Figures in parenthesis denote the percentages

dependents (20.09%), services (12.23%), retired persons (3.93%) and households works (0.87%) respectively. In Jammu & Kashmir also agriculture was the main occupation of the majority of the sampled polyhouse farmers i.e. 40.75 percent followed by students (30.73%), agricultural labour (17.92%) and dependents (10.60%) and in Sikkim majority of the sampled polyhouse farmers i.e. 56.10 percent are involved in agriculture and treated this sector as their main occupation followed by household works (12.10%), self employed non-farming (7.8%) and dependents (0.20%) respectively.

Subsidiary Occupation

4.7 The secondary occupational structure of the sampled ployhouse farmers was also studied along with the main occupational structure and presented in Table 4.4.

Table 4.4 Occupational Pattern of Sampled Households (Subsidiary Occupation)

(No)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Farming	218 (47.60)	274 (26.39)	23 (12.1)
Self Employed Non-farming	-	-	150 (78.9)
Service	-	-	0 (0.0)
Agri. Labour	-	186 (17.92)	7 (3.7)
Non-agri. Labour	-	-	7 (3.7)
Retired	18 (3.93)	-	0 (0.0)
Dependents	92 (20.08)	110 (10.60)	0 (0.0)
Household Workers	36 (7.86)	149 (14.35)	3 (1.9)
Students	94 (20.53)	319 (30.74)	0 (0.0)
Others	-	-	0 (0.0)
Total Population	458 (100)	1038 (100)	190 (100.0)

Note: Figures in parenthesis denote the percentages

4.8 Table 4.4 reveals that in Himachal Pradesh farming was the most common subsidiary occupation of the sampled ployhouse farmers (47.60%) and 7.86 percent reported household work to be their subsidiary occupation. In Jammu & Kashmir about 26 percent of the total population reported farming as their subsidiary occupation and 17.92 percent stated that agricultural labour was their subsidiary occupation. About 31 and 11 percent of the total population comprised of students and dependents and 14.35 percent reported household work to be their subsidiary occupation. In Sikkim 78.9 percent of the households are associated with self employed non-farming. Among sampled farmers almost 12.10 percent of the households are engaged in self farming activities and the remaining 1.9 percent in household works and 3.7 percent work forces are engaged as agricultural labour.

Land Resources

4.9 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 and 4.6 in absolute terms and in percentage terms accordingly.

Table 4.5 Land Resources of Selected Protected Cultivators

(Ha./Farm)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
1. Total land owned	0.68	0.37	1.06
a. Cultivated land			1.05
-Irrigated	0.25	0.37	0.40
-Un-irrigated	0.27	-	0.65
b. Cultivable waste land			0.03
c. Non-cultivable	0.15		0.00
2. Leased in land			0.11
-Irrigated			0.02
-Un-irrigated			0.10
3.Leased out land			0.01
Irrigated			0.01
Un-Irrigated			0.00
4. Net operated area	0.52	0.37	1.05
-Irrigated	0.25	0.37	0.40
-Un-irrigated	0.27	-	0.65
Total	0.52	0.37	1.05

Table 4.6 Land Resources of Selected Protected Cultivators

(Percentages)

Particulars	Himachal Pradesh	Jammu & Kashmir	Uttarakhand	Sikkim
1. Total land owned	100	100		100
a. Cultivated land	78.01	-		98.9
-Irrigated	37.35	100		37.9
-Un-irrigated	40.66	-		61.0
b. Cultivable waste land	-	-		3.0
c. Non-cultivable	21.99	-		0.0

4.10 The average size of land holding among the sampled polyhouse farmers in Himachal Pradesh was 0.68 hectares, out of which 78.01 percent was cultivated land .and 21.99 percent of land reported to be non-cultivable (Ghasni or grass land).. The average size of land holding in Jammu & Kashmir among the sampled polyhouse farmers was 0.37 hectares, and all land

was cultivated. The average size of land holding among the polyhouse farmers in Sikkim was 1.06 hectares, out which 98.09 and 3 percent land was reported to be cultivated and cultivable waste land respectively.

Income from Sources Other than Crop Farming

4.11 In addition to income from farming, the farming households derive income from various other sources like animal husbandry, salary 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 whereas the percentage of income from various sources is presented in Table 4.8.

Table 4.7 Per Farm Annual Income from Other Sources

(Rs.)

Sources of Income	Himachal Pradesh	Jammu & Kashmir	Sikkim
Animal Husbandry	69900	63950	3706
Income From Salary	357117	-	19780
Business	-	-	3470
Income from wages	308333	87890	-
Pension	347700	-	-
Other	-	-	688
Total	1083110	151840	27644

Table 4.8 Per Farm Annual Income from Other Sources

(Percentages)

Sources of Income	Himachal Pradesh	Jammu & Kashmir	Sikkim
Animal Husbandry	6.45	42.12	13.4
Income From Salary	32.98	-	71.6
Business	-	-	12.6
Income from wages	28.47	57.88	-
Pension	32.10	-	-
Other	-	-	2.5
Total	100	100	100.0

4.12 It can be seen from Table 4.7 that in Himachal Pradesh 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 the total income, the income from salary was maximum (32.98%) followed by pension (32.10%), wage labour (28.47%) and animal husbandry (6.45%) respectively. In Jammu & Kashmir annual income per farm from animal husbandry and wages was Rs. 63950 and Rs. 87890 respectively. In percentage terms, out of the total income, the income from wages was maximum (57.88%) followed by from animal husbandry i.e. 42.12

percent. In Sikkim annual income per farm from animal husbandry, salary, business and other source was Rs. 3706, Rs. 19780, Rs. 3470 and Rs. 688 respectively. In percentage terms, the income from salary was maximum (71.6%) followed by income generated from animal husbandry (13.4%), business (12.6%) and other sources i.e. 2.5 percent.

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 scheme "Mission for Integrated Development of Horticulture" wherein protected cultivation through polyhouse farming plays an important role introduced during Twelfth Plan period considering the holistic development approach in many states including Himachal Pradesh, Jammu & Kashmir and Sikkim. For effective implementation of the scheme a continuous and well-concerted move starting from the government level to the implementing agencies including the farmers are well solicited. The guiding principles in its effective execution solely depend upon the motivational factors of the people and removing the hindrances faced in different segments of implementation of this scheme. The hindrances may be attributed as institutional or technical or financial but whatever it may be facilitating the scheme through dealing with these obstacles in various forms should be the ultimate object for reaping the benefits arising out the effective implementation for much talked holistic development for all corners.

5.2 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.

5.3 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.

Type of Polyhouse

5.4 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.

5.5 Table 5.1 depicts that out of total polyhouses 54 percent polyhouses in Himachal Pradesh are simple and rest 46 percent are of 'Hi-Tech' categories. The data in the table further depicts that all the polyhouses are of single tier cultivation polyhouses. In Jammu & Kashmir all the polyhouses are simple and under single tier cultivation, the same is true for Sikkim also.

Table 5.1 Type of Polyhouses

(No.)

Type	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Simple	54	100	100
Hi.Tech.	46	-	-
- Single Tier Cultivation	100	100	100
- Multi Tier Cultivation	-	-	-

Sources of Information about Polyhouse

5.6 There are various sources of information from which the farmers get information about the benefits of polyhouses. Majority of the respondents received information from more than one sources and hence analysis in this respect is based on multiple responses.

5.7 It can be seen from the Table 5.2 that in Himachal Pradesh, 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%). In Jammu & Kashmir also, horticulture department was the main source of information as revealed by 62 percent of polyhouse farmers followed by the source awareness camps and mass media each 56 percent, friends and relatives (43%) and seen in other villages (41%).

In case of Sikkim 100 percent of the farmers obtained information relating to polyhouse farming from the State Horticulture Department. Thirty two per cent of them got information from the

friends and relatives and 36 per cent of the farmers motivated from the awareness camps. Awareness camps played an important role in demonstrating the ideas though according to the respondents that reporting or disseminating of news of TV/Radio/Newspapers hardly played a key role in accepting this scheme.

Table 5.2 Sources of Information about Polyhouse

(Multiple Responses in %)

Sources	Himachal Pradesh	Jammu & Kashmir	Sikkim
Horticulture Department	94.00	62.00	100.0
Friends/relatives	69.00	43.00	32.0
Seen in other villages	45.00	41.00	0.0
Awareness camps	45.00	56.00	36.0
Radio/News Paper etc.	36.00	56.00	0.0

Sources of Information about Scheme/Subsidy/Technical Details

5.8 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.

5.9 The Table 5.3 depicts that in Himachal Pradesh, 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%). In Jammu & Kashmir also, horticulture department was the main source of information for most of the

Table 5.3 Sources of Information about Scheme/Subsidy/Technical Details

(Multiple Responses in %)

Sources	Himachal Pradesh	Jammu & Kashmir	Sikkim
Horticulture department	87.00	79	100.0
Friends/relatives	45.00	35	0.0
Seen in other villages	46.00	32	0.0
Awareness camps	59.00	45	0.0
Radio/News Paper etc.	60.00	35	0.0

farmers (79%) followed by the information from awareness camps (45%) friends and relatives, radio, newspaper etc. each (35%) and seen in other villages (32%). In the state of Sikkim, horticulture department played a crucial role in motivating the farmers for adopting the scheme. Almost in all of the cases, the farmers unanimously reported that they got ample information from the said Department as well as help and cooperation for introducing the same.

Motivational Factors

5.10 There are various guiding forces for motivating the farmers for adopting poly-houses for horticultural production. Time immemorial farmers in these three states are accustomed in cultivating horticultural crops and the cultivation was done mainly for the home consumption only. It is reported that a continuous efforts of the Government Officials along with an enterprising zeal for commercial production of horticultural crops play a role behind this motivation. Possibility of earning higher income through commercialization of their products and an easy access of technology further added a fuel in that motivation. Besides all, availability of subsidy in monetary form induced them a lot. 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.

5.11 The Table 5.4 shows that in Himachal Pradesh, Jammu & Kashmir and Sikkim demonstration effect along with possibility of higher income among the sampled polyhouse farmers played a decisive role for adopting the polyhouse cultivation. In Himachal Pradesh the

Table 5.4 Motivational Factors for Adoption of Polyhouse

(Multiple Responses in %)

Sources	Himachal Pradesh	Jammu & Kashmir	Sikkim
Having less land	50	37	27.0
Suitable land is available	33	36	0.0
Availability of manpower	25	56	0.0
Possibility of high income	65	61	59.0
Availability of subsidy	50	45	57.0
Availability of easy loan	41	25	0.0
Long crop duration	60	-	0.0
Easy control of insects/pests	52	25	0.0
Ready market for products	27	-	0.0
New crops can be grown	55	-	0.0
Enough financial resources	27	25	0.0
Availability of technology	20	-	24.0
Demonstration effect	62	65	0.0
Low availability of water for irrigation	61	10	0.0

possibility of high income was the largest motivating factor followed by demonstration effect .Low availability of water for irrigation ,long crop duration , interest of sowing new crops ,easy controls on insects/pests , availability of subsidy, availability of easy loan, suitability of land ,ready market for products availability of manpower and availability of technology also lead them for accessing this new technology and acted as key motivating factors.

Hindrances in Adoption of Polyhouse

5.12 Besides motivational factors, removing the hindrances in an efficient manner play a crucial role for its effective execution of any policy matter and fulfilling its basic objectives. In this case, various hindrances are classified as cumbersome clearance from department, delays in technology transfer, long wait for loan clearance or subsidy, availability of construction materials, cost of construction, unavailability of skilled labour, marketing problem etc. Analysis of such factors is important from the point of view of streamlining and refining the programme for higher adoption rates. The 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.

5.13 In Himachal Pradesh, most of the farmers (93%) reported about the marketing related problems. 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 three percent respondents complained about the unavailability of skilled labour. Forty two percent stated that there was long wait involved in getting clearance of loan and subsidy from the departments. Forty percent stated about the unsuitable farm location and 35 percent were of the view that they took time to adjust new crops growing technology.

In Jammu & Kashmir, most of the respondents (49%) reported that there was long wait involved in getting clearance of loan and subsidy from the departments and 46 percent stated that clearance procedure adopted by various departments was long and cumbersome. Forty five percent respondents said that execution was delayed by the contractor and 25 percent complained about the unsuitable farm location. A majority of them were of the view that construction materials not locally available and high construction cost including unavailability of skilled labour were the hindrances to adopt this technology. In Sikkim, the selection of location,

beneficiaries and building contractors are being executed by the Government officials and in this case most of the respondents reported that contractor delayed the execution and 48 percent of them have stated that adjustment with new crops growing technology take more time.

Table 5.5 Hindrances Encountered for adoption of Polyhouse

(Multiple Responses in %)

Hindrances	Himachal Pradesh	Jammu & Kashmir	Sikkim
Cum Cumbersome clearance from department	50	46	0.0
Delays in technology transfer	50	-	0.0
Long wait for loan clearance/subsidy	42	49	0.0
Construction materials not locally available	46	33	0.0
Contractor delayed the execution	51	45	68.0
High construction cost	45	15	0.0
Unavailability of skilled labour	43	10	0.0
Unsuitable farm location	40	25	0.0
Marketing problems of crops	93	-	0.0
Took time to adjust new crops growing technology	35	8	48.0

Departmental Supervision

5.14 The department supervises the construction of polyhouses to ensure that these are constructed according to the approved design and quality control in the construction. The results in the Table 5.6 reveal that in Himachal Pradesh 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. Only 34 percent respondents felt that the attitude of the officials was neutral at overall level. But the positive point about the attitude of the officials is that none of the respondents found it to be discouraging.

5.15 In Jammu & Kashmir 75 percent of the polyhouses were supervised by the officials. The attitude of the officials during the supervision, in addition to ensure the quality and design aspect, was supportive to farmers. Fifty seven percent respondents were of the view that the attitude of officials was very supportive. Only 33 percent respondents felt the attitude to be neutral. None of the respondents found the attitude to be discouraging. This fact can go a long way in making not only this scheme a success but the future endeavours of the department as well.

5.16 In Sikkim the extension activities by the government officials in poly-house construction in the sampled area play a crucial role. It was reported that in all cases, the government officials were supervising the poly-houses in the sampled area. In 56 per cent of the cases, they took a supportive role. It is reported that only in 44 per cent of cases, their attitude was neutral. The farmers in the study area consider procrastinated approach or the method as the most hindrance factor.

Table 5.6 Supervision of Polyhouse Construction by Officials

(%)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Cases supervised	76	75	100.0
Attitude of Officials			
- Supportive	66	57	56.0
-Neutral	34	33	44.0
-Discouraging	-	-	0.0

Farmer's Suggestions for Improvement of Ployhouses

5.17 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.

5.18 In Himachal Pradesh, at overall level 76 percent of the respondents had some suggestions for the improvement of polyhouses. Majority of the farmers(76%) wanted the design of the polyhouses best suited according to the 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 costs 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

5.19 In Jammu & Kashmir 75 percent of the respondents had some suggestions for the improvement of polyhouses. Majority (55%) of the farmers suggested that inputs used in the polyhouses to raise the nursery should be provided to them through the department on subsidized rates. They should be provided best quality seeds at cheaper rates. Forty five percent respondents said that organic farming should be introduced and promoted in the

polyhouses for healthy crop. According to 38 percent respondents information and training on cropping practices under protected conditions should be provided and forty three percent respondents suggested that cost saving techniques should be applied or made available. Only 15 percent were of the view that crops should also be grown in the polyhouses.

5.20 The data in the Table 5.7 further depicts that in Sikkim, 80 percent of the respondents had some suggestions for the improvement of polyhouses. Sixty eight per cent of the farmers have responded for change or modification of existing cropping practices while 16 per cent opined for better supply procedure or emphasized on availability of inputs in a more convenient way. All the respondents stated that storage facilities should be given and 56 percent were in favour of organic farming.

Table 5.7 Suggestions for Improvement of Polyhouses

(%)

Particulars	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Farmers with suggestions	76	75	80.0
Suggestions (Multiple Responses in %)			
Adaptation of design to local conditions	76	74	0.0
Cost saving measures	57	43	0.0
Crops to be grown	42	15	0.0
Cropping practices	56	38	68.0
Sources of inputs	43	55	16.0
Organic farming	60	45	56.0
Product processing and packing	58	-	0.0
Storage techniques	55	-	100.0
Marketing assistance	52	-	0.0

Delays in No Objection Certificate

5.21 In Himachal Pradesh, many respondents felt that there were delays in granting of No Objection Certificate (NOC) from the department 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. In Jammu and Kashmir, 57 percent respondents revealed that they had to face some delay in granting NOC from the

department, due to which they had to face the financial hardships. For Sikkemese farmers quick availing of no objection certificate (NOC) for the plucked flowers or harvested vegetables seems to be an important point. NOC is required for exporting these harvested commodities through APEDA or other exporting agencies, and delaying the process might cause harm to the farmers of the product. Prompt availability of the NOC plays a positive contributing factor in helping the cultivation in protected condition no doubt (Table5.8).

Table 5.8 Delays in No Objection Certificates (NOC)

(%)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Farmers reporting delay	76	57	0
Farmers reporting No delay	24	43	100

Action by Contractor in Case of Delay in NOC

5.22 Only three percent respondents both in Himachal Pradesh and Jammu & Kashmir reported some action was taken by contractor in case of delay in NOC (Table5.9).

Table 5.9 Action by Contractor in Case of Delay in NOC

(%)

Particulars	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Action reported	3	3	NA*
No action reported	97	97	NA

**NA= Not Applicable as farmers reported no delay.*

Equipments Installed in Polyhouses

5.23 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 responses 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. In Jammu & Kashmir, there were only simple type of polyhouses and only vermin-compost pit was installed in these polyhouses .

Table 5.10 Equipments Installed in Polyhouses

(% of Farmers)

Equipments installed	Himachal Pradesh	Jammu & Kashmir	Sikkim
Heater	-	-	0.0
Cooler	26	-	0.0
Humidifier	29	-	0.0
Sun shade	99	-	100.0
Drip irrigation	100	-	60.0
Fogger	55	-	0.0
Water tank	98	-	79.0
Vermi-compost pit	91	45	52.0

5.24 In Sikkim many of the technical equipments like heater, cooler, humidifier, and fogger are quite absent in all of the poly-houses. Only 60 per cent of them are provided with drip irrigation facilities, almost 80 per cent of them have built near farm and 52 per cent have built vermin-compost pits. Availability of other equipments could enhance production and method of cultivation more scientifically to a greater extent.

Deviations from Recommended Design

5.25 In Himachal Pradesh 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. For J&K the figure is 33 percent. The deviation was due to financial problems as reported by 45 percent of polyhouse owners in HP and 73 percent in J&K. Twenty six respondents in HP 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.

Table 5.11 Reasons for Deviation from Recommended Design of Polyhouse

(%)

Equipments installed	Himachal Pradesh	Jammu & Kashmir	Sikkim
Farmers reporting deviation	39	33	0.0
Reasons (Multiple Responses in %)			
Financial problems	45	73	NA*
Contractors' recommendations	26	25	NA
Followed others	22	11	NA

**NA= Not Applicable as no deviations were reported*

Sources of Training/Dissemination

5.26 Imparting training and dissemination of ideas and experiences could play a crucial role in motivating farmers adopting horticulture crops through protected condition. As all we know, demonstration effect in agricultural sector has an important role to contribute and in this case also sharing of ideas and experiences from the government officials and also from the neighboring farmers play a crucial role in adopting protected cultivation through poly-house operation method. There are various sources from where the farmers could take the training related to protected cultivation. Table 5.12 reveals that in all these three states farmers reported horticulture department was the main source of training and among other sources of training krishi vigyan kendras and state agricultural/horticultural Universities played an important role.

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

(Multiple Responses in %)

Sources	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
1.State Horticulture Department	50	75	59.00
2.State Agricultural/Horticulture University	24	35	0.0
3.Krishi Vigyan Kendras	30	15	39.0
4.Kisan Call Centre	-	20	0.0
5.Cooperatives/Local Bodies	-	-	0.0
6.Input Dealers/Private Company Representatives	-	18	0.0
7.Spcial Research Stations set up by the Government	-	10	0.0
8.Non Government Organisations (NGOs)	-	-	0.0
9. Any Other	-	-	0.0

Cost of Construction of Polyhouse

5.27 The cost of construction of polyhouse basically depends upon the size and shape of polyhouse structure and type of polyhouse. Recently the polyhouse structure has been made possible on subsidized cost for growing off-season vegetables and raising nursery successfully in abnormal weather conditions.

Himachal Pradesh

5.28 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)

5.29 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 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 (16.75%), followed by installation of drip irrigation (11.11%), erection of structure (8.37%) provision of sunshades (3.72%) and land levelling (3.69%).

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

(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.*

Cost of Construction of Polyhouse (500m^2)

5.30 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 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 (17.54%), installation of drip irrigation (11.64%), erection of structure (7.80%), provision of sunshades (3.90%) and land levelling (1.93%).

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

(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.*

Cost of Construction of Polyhouse (1000m^2)

5.31 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 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 (18.08%), installation of drip irrigation (12.02%), erection of structure (6.53%), provision of sunshades (4.02%) and land leveling (1.49%).

Table 5.15 Cost of Construction of Polyhouse (1000m^2) in H.P.

(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.*

5.32 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.

Jammu & Kashmir

5.33 The J&K government gives 80 percent subsidy to farmers for the construction of polyhouse and the farmers have to pay only 20 percent of the project cost. All the polyhouses in the sampled farmers were of simple type of polyhouse. The cost of construction of sampled polyhouses falling in the category of polyhouses of the size 250 sq.meter is given in Table 5.16.

It can be seen from the Table that the total cost of polyhouse construction was Rs.15000 in which Rs.3000 was the net cost paid by the farmer and the rest Rs.12000 was the subsidy amount. In total cost, value of hired labour was Rs.3500 (23.33%) and material cost Rs.11500 (76.67%). The most important component of total cost of construction was covering of polyhouse by polythene (Rs.13000) which is 86.67 percent of the total cost followed by land levelling and layout each (6.7%)

Table 5.16 Cost of Construction of Polyhouse (250m^2) in J&K

(Rs.)

Particulars	Imputed value of family labour	Value of hired labour	Material cost	Total Cost
Land levelling	-	1000	-	1000(6.67)
Lay out	-	1000	-	1000(6.67)
Erection of structure	-	1500	11500	13000(86.67)
Covering by polythene	-	-	-	-
Provision of sun shades	-	-	-	-
Erection of Trellis	-	-	-	-
Provision of shelves	-	-	-	-
Heaters	-	-	-	-
Coolers	-	-	-	-
Humidifiers	-	-	-	-
Drip irrigation system	-	-	-	-
Drip irrigation	-	-	-	-
Fogger	-	-	-	-
Other	-	-	-	-
Total cost	-	3500(23.33)	11500(76.67)	15000(100)
Amount of subsidy	-	-	-	12000(80.00)
Net cost paid by farmer	-	-	-	3000(20.00)

Note. *Figures in parenthesis denote percentages to total.*

Sikkim

5.34 The information regarding cost of construction of poly house structures & other equipments is not available as these are sponsored by the State Government in Sikkim and hence farmers did not avail any loan for construction of poly houses.

Loan for Construction of Polyhouses

5.35 The details of loans taken for the construction of polyhouses by the sampled polyhouse farmers are given in Table 5.17. It is seen that in case of HP and J&K the average amount of loan was taken by the farmers as Rs.178000 and Rs 15000. The outstanding amount of loan in these two states was left to the tune of Rs. 73000 and Rs 3961 respectively.

Table 5.17 Details of Loans for Construction of Polyhouses

(No.)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Total number of farmers who took loan	100	65	-
1.Source of loan	0	-	-
Commercial bank	100	65	-
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)	178000	15000	-
3.Out standing amount (Rs./person)	73000	3961	-

Note. *Figures in parenthesis denote percentages to total.*

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, Jammu & Kashmir and Sikkim. 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.

Protected Conditions

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	Himachal Pradesh		Jammu & Kashmir		Sikkim	
	Rs.	%	Rs.	%	Rs.	%
Formation of beds	3344	2.40	-	-	872.00	3.0
Value of sapling	35158	25.28	-	-	25548.72	87.0
Sowing/ Transplanting	1419	10.20	-	-	168.00	0.6
Manuring/FYM	21277	15.30	-	-	215.19	0.7
Vermicompost	14936	10.74	-	-	0.00	0.0
Fertilizer	15176	10.91	-	-	812.96	2.8
Insecticides/pesticides	7361	5.29	-	-	1065.92	3.6
Interculture	9697	6.97	-	-	52.00	0.2
Irrigation	3225	2.31	-	-	220.04	0.7
Spraying	5592	4.02	-	-	0.00	0.0
Stalking etc.	5335	3.83	-	-	0.00	0.0
Harvesting/ picking	12259	8.82	-	-	260.00	0.9
Soil sterilization	4266	3.06	-	-	140.00	0.5
Total production cost	139042	100.00	-	-	29354.83	100.0

6.5 The table reveals that the cost of cultivation of carnation in Himachal Pradesh was Rs.139042 per polyhouse. 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%), vermin compost (10.74%), making the manures and fertilizers, considered together are 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.

6.6 The value of sapling alone eats up the major chunk of costs involved in carnation production in Sikkim. From the cultivation it is found that almost 87 per cent of the total costs are spent for purchasing sapling for producing carnation flower followed by costs of insecticides/pesticides (36%), formation of beds (3.0%), application of fertilizer (2.8%), harvesting/picking (0.9%),

manuring and irrigation (0.7%), sowing/transplanting (0.6%), soil sterilization (0.5%) and interculture cost (0.2%).

Cost of Cultivation of Rose

6.7 Rose is one of the most beautiful flowers grown in polyhouses/greenhouses in Himachal Pradesh. The cost of cultivation of rose is presented in Table 6.1(b).

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

(Rs. /polyhouse)

Cost items	Himachal Pradesh		Jammu & Kashmir		Sikkim	
	Rs.	%	Rs.	%	Rs.	%
Formation of beds	3118	2.29	-	-	-	-
Value of sapling	34395	25.23	-	-	-	-
Sowing/ Transplanting	1336	0.98	-	-	-	-
Manuring/FYM	20599	15.11	-	-	-	-
Vermicompost	14309	10.49	-	-	-	-
Fertilizer	14758	10.82	-	-	-	-
Insecticides/pesticides	7330	5.38	-	-	-	-
Interculture	10115	7.42	-	-	-	-
Irrigation	3120	2.29	-	-	-	-
Spraying	5512	4.04	-	-	-	-
Stalking etc.	5289	3.88	-	-	-	-
Harvesting/ picking	12424	9.11	-	-	-	-
Soil sterilization	4035	2.96	-	-	-	-
Total production cost	136340	100.00	-	-	-	-

6.8 It can be seen from the table that the cost of cultivation of rose, at overall level was Rs.136340. 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 vermin-compost (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.

Cost of Cultivation of Gerbera under Protected Condition

6.9 It is worth mentioning that Sikkim is fully an organic state and hence insecticides/pesticides means organic or bio-insecticides and pesticides. Application of fertilizer emphasized an application of bio-fertilizer only.

6.10 The data in the Table 6.1(c) reveals that in case of Gerbera cultivation value of sapling was the largest cost component accounted for 89.7 percent followed by cost of insecticides/pesticides (4.3%), formation of beds (2.3%), fertilizer (1.7%), manuring, irrigation and harvesting/picking (0.5% each), sterilization (0.3%) sowing/transplanting (0.2%) and intercultural (0.1%) respectively.

Table 6.1(c). Cost of Cultivation of Gerbera under Protected Condition

(Rs. /polyhouse)

Cost items	Himachal Pradesh		Jammu & Kashmir		Sikkim	
	Rs.	%	Rs.	%	Rs.	%
Formation of beds	-	-	-	-	1060.00	2.3
Value of sapling	-	-	-	-	42161.40	89.7
Sowing/ Transplanting	-	-	-	-	74.40	0.2
Manuring/FYM	-	-	-	-	216.37	0.5
Vermicompost	-	-	-	-	0.00	0.0
Fertilizer	-	-	-	-	789.60	1.7
Insecticides/pesticides	-	-	-	-	2035.14	4.3
Interculture	-	-	-	-	52.00	0.1
Irrigation	-	-	-	-	231.48	0.5
Spraying	-	-	-	-	0.00	0.0
Stalking etc.	-	-	-	-	0.00	0.0
Harvesting/ picking	-	-	-	-	256.00	0.5
Soil sterilization	-	-	-	-	132.00	0.3
Total production cost	-	-	-	-	47008.39	100.0

Net Returns from Cultivation of Flower Crops

6.11 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

6.12 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 in Himachal Pradesh and Sikkim was Rs. 1467278 and Rs. 46004.32 per polyhouse respectively.

Table 6.2(a). Net Returns from Cultivation of Carnation under Protected Condition

(Rs. /polyhouse)

Cost Items	Himachal Pradesh	Jammu & Kashmir	Sikkim
Production cost	139042 (13.68)	-	29354.83 (81.90)
Marketing cost	877680 (86.32)	-	6487.60 (18.10)
Total cost	1016722 (100)	-	35842.43 (100)
Value of output	2484000	-	81846.76
Net returns	1467278	-	46004.32

Note. *Figures in parenthesis denote percentages to total.*

Net Returns from Cultivation of Rose

6.13 The analysis reveals that in Himachal Pradesh, cost of rose cultivation was Rs.1088468 per polyhouse. It was further found that the average net return from cultivation of rose was Rs.1612012 per polyhouse.

Net Returns from Cultivation of Gerbera

6.14 The analysis reveals from the Table 6.2(c) that cost of Gerbera cultivation was Rs.54197.99 per polyhouse. It was further found that the average net return from cultivation of Gerbera was Rs.39671.82 per polyhouse.

Table 6.2(b). Net Returns from Cultivation of Rose under Protected Condition

(Rs. /polyhouse)

Cost Items	Himachal Pradesh	Jammu & Kashmir	Sikkim
Production cost	136340(12.53)	-	-
Marketing cost	952128(87.47)	-	-
Total cost	1088468(100)	-	-
Value of output	2700480	-	-
Net returns	1612012	-	-

Note. *Figures in parenthesis denote percentages to total.*

Table 6.2(c). Net Returns from Cultivation of Gerbera under Protected Condition

(Rs. /polyhouse)

Cost Items	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Production cost	-	-	47008.39 (86.73)
Marketing cost	-	-	7189.60 (13.27)
Total cost	-	-	54197.99 (100)
Value of output*	-	-	93869.81
Net returns	-	-	39671.82

** value of total quantity marketed excluding loss*
Figures in parenthesis indicate percentages

Net Returns per box from Carnation Cultivation

6.15 The net returns per box of carnation cultivation are presented in Table 6.3(a). It can be seen from this table that in H.P, 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. The input output ratio (gross returns/ (PC+MC) was 1:2.44.

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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Total production (boxes)	460		NA*
Cost per box	2210		NA
Value per box	5400		NA
Returns per box	3190		NA
Input-output ratio	1:2.44		NA

NA: Not Applicable
** As FPO shoulders the responsibility of marketing the output in local markets, question of packing in boxes does not arise.*

Net Returns per box from Rose Cultivation

6.16 The net returns per box of rose cultivation are presented in Table 6.3(b). The table reveals that in H.P, on an average the 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. The input-output ratio (gross return/(PC+MC) was 1:2.48.

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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Total production (boxes)	464	-	-
Cost per box	2346	-	-
Value per box	5850	-	-
Returns per box	3474	-	-
Input-output ratio	1:2.48	-	-

Cost of Cultivation of Vegetable Crops

Cost of Cultivation of Capsicum

6.17 The cost of cultivation of capsicum is presented in Table 6.4(a). The table reveals that the cost of cultivation in Himachal Pradesh was Rs. 54352 per polyhouse. The analysis reveals that

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

(Rs. /polyhouse)

	HP		Jammu & Kashmir		Sikkim	
	Rs.	%	Rs.	%	Rs.	%
Formation of beds	3347	6.16			160.00	6.4
Seed/ seedlings	1593	2.93			394.00	15.9
Transplanting	3323	6.11			128.00	5.2
Manuring/FYM	8225	15.13			173.90	7.0
Vermicompost	-	-			0.00	0.0
Fertilizer	2745	5.05			0.00	0.0
Insecticides/pesticides	2807	5.16			0.00	0.0
Inter culture	3523	6.48			512.00	20.6
Irrigation	2080	3.83			76.40	3.1
Spraying	1079	1.99			0.00	0.0
Stalking etc.	14233	26.19			128.00	5.2
Harvesting/ picking	7390	13.59			784.00	31.6
Soil sterilization	4008	7.38			128.00	5.2
Total	54352	100.00			2484.30	100.0

stalking of individual plant was the largest cost component accounting for 26 percent. 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 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.

6.18 In the state of Sikkim the cost of harvesting/picking was the largest (31.6%) cost component followed by interculture (20.6%), seed/seedlings (15.9%), manuring (7.0%), formation of beds (6.4%), transplanting and soil sterilization (5.2% each) and irrigation .

Cost of Cultivation of Tomato

6.19 The cost of cultivation of tomato is given in Table 6.4(b). The table reveals that in Himachal Pradesh the cost of cultivation of tomato was Rs. 62543 per polyhouse. The analysis further

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

(Rs. /polyhouse)

	HP		Jammu & Kashmir		Sikkim	
	Rs.	%	Rs.	%	Rs.	%
Formation of beds	2693	4.31			256.00	11.1
Seed/ seedlings	1776	2.84			283.76	12.3
Transplanting	4670	7.47			128.00	5.5
Manuring/FYM	5026	8.03			142.31	6.1
Vermicompost	-	-			0.00	0.0
Fertilizer	10204	16.31			0.00	0.0
Insecticides/pesticides	6029	9.64			0.00	0.0
Inter culture	3520	5.63			312.00	13.5
Irrigation	2099	3.36			6.00	0.3
Spraying	1127	1.80			0.00	0.0
Stalking etc.	13984	22.36			128.00	5.5
Harvesting/ picking	7301	11.67			932.00	40.2
Soil sterilization	4114	6.58			128.00	5.5
Total	62543	100.0			2316.07	100.0

reveals that stalking of individual plants 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.

6.20 In Sikkim, the cost of harvesting/picking was the largest cost component followed by interculture (13.5%), seed/seedlings (12.3%), formation of beds (11.1%), manuring/fym (6.1%), transplanting and soil sterilization (5.5% each) and irrigation .

Net Returns from Cultivation of Vegetable Crops

6.21 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.

Net Returns from Cultivation of Capsicum

6.22 The net returns from capsicum cultivation are presented in Table 6.5(a) wherein it can be seen that the average net returns from cultivation of capsicum in the state of Himachal Pradesh was Rs. 149686 per polyhouse. In case of Sikkim production cost for a farmer amounts to Rs. 2484.30 and the marketing cost amounts to Rs. 2215.80 which gave the total cost of Rs. 4700.10. The gross return from capsicum cultivation was Rs. 28319.14 and hence the net return was Rs. 23619.04.

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

(Rs. /polyhouse)

	Himachal Pradesh	Jammu & Kashmir	Sikkim
Production cost	54352 (67.02)		2484.30 (52.86)
Marketing cost	26750 (32.98)		2215.80 (47.14)
Total cost	81102 (100)		4700.10 (100)
Gross Returns	230789		28319.14
Net returns	149686		23619.04

Net Returns from Cultivation of Tomato

6.23 It can be seen from the Table 6.5(b) that the production cost for a farmer in Himachal Pradesh amounts to Rs. 62543 and the marketing cost amounts to Rs. 45263 which gave the total cost of Rs. 107806. The gross return from tomato cultivation was Rs. 33948 and hence the net return was Rs. 227142.

6.24 Production cost for cultivation of tomato in the state of Sikkim was Rs. 2316.07 and the marketing cost was Rs. 1649.88 which resulted in a total cost of Rs. 3965.95. Since the gross return or the selling price received by the farmer was Rs. 21214.09, the net returns were obtained as Rs. 17158.14.

Table6.5(b). Net Returns from Cultivation of Tomato in Polyhouse

(Rs. /polyhouse)

	Himachal Pradesh	Jammu & Kashmir	Sikkim
Production cost	62543 (58.01)		2316.07
Marketing cost	45263 (41.99)		1649.88
Total cost	107806 (100)		3965.95
Gross Returns	334948		21124.09
Net returns	227142		17158.14

Net Returns per box from Vegetable Cultivation

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

Net Returns per box from Capsicum Cultivation

6.26 The net returns per box of capsicum in Himachal Pradesh are presented in Table 6.6(a).

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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Total production (boxes, per polyhouse in a year)	402	N.A.	NA*
Cost per box	194	N.A.	NA
Value per box	574	N.A.	NA
Returns per box	260	N.A.	NA
Input output ratio	1:2.85	N.A.	NA

** As FPO shoulders the responsibility of marketing the output in local markets, question of packing in boxes does not arise.*

The table reveals 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. The input-output ratio (gross returns/total cost) was 1:2.85.

Net Returns per box from Tomato Cultivation

6.27 The net returns per box of tomato are presented in Table 6.6(b). The table reveals that on an average the total production in Himachal Pradesh 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. The input-output ratio (gross returns/total cost) was 1:3.11.

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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Total production (boxes, per polyhouse in a year)	566		NA*
Cost per box	185		NA
Value per box	592		NA
Returns per box	407		NA
Input output ratio	1:3.11		NA

NA: Not Applicable
** As FPO shoulders the responsibility of marketing the output in local markets, question of packing in boxes does not arise.*

Unprotected Cultivation

6.28 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

6.29 The cropping pattern (outside polyhouse) of sampled growers has been presented in Table 6.7.

6.30 Table 6.7 indicates that the crops grown in kharif season in Himachal Pradesh were maize and paddy. In Rabi season, wheat was the only crop grown by the sampled farmers. In kharif season, per farm area was more in maize as compared to paddy cultivation. In J&K, the crops

grown in kharif season were cabbage, cauliflower and capsicum whereas in Rabi season cabbage, cauliflower and knolkhol were the crops grown by the sampled farmers. In kharif season, the area per farm was more (0.18 ha.) in cabbage followed by cauliflower (0.16 ha.) and capsicum (0.02 ha.). In Rabi season area per farm was maximum (0.17 ha.) in cauliflower followed by cabbage (0.15 ha.) and knolkhol (0.04 ha.)

6.31 In Sikkim during Kharif season per farm area under paddy was more as compared to maize, whereas in Rabi season per farm area under cauliflower was more compared to cabbage cultivation.

Table 6.7. Cropping Pattern on Sampled Farms (Unprotected Cultivation)

(Area in Ha/farm)

Crops	Himachal Pradesh	Jammu & Kashmir	Sikkim
Kharif Crops			
Maize	0.28		0.08
Paddy	0.09		0.27
Cabbage	-	0.18	-
Tomato	-		-
Cauliflower		0.16	-
Capsicum	-	0.02	
Rabi Crops			
Wheat	0.36		-
Peas	-		-
Cabbage	-	0.15	0.04
Cauliflower	-	0.17	0.05
Knolkhol		0.04	
Gross Cropped Area	0.74		0.44

Cost of Cultivation of Unprotected Crops

6.32 The cost of cultivation of wheat, maize and paddy in Himachal Pradesh under unprotected conditions are presented in Table 6.8.

6.33 Table 6.8 shows that the cost of cultivation of wheat, maize and paddy in Himachal Pradesh were Rs.31267, Rs.34437 and Rs.33448 per hectare respectively. The cost of cultivation was more in maize as compared to other crops viz., wheat and paddy.

Table 6.8. Cost of Cultivation of Unprotected Crops Grown in Himachal Pradesh

(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	-	-	-

6.34 The cost of cultivation of important crops grown by the sampled farmers in Jammu & Kashmir are presented in Table 6.9, wherein it can be seen that the cost of cultivation of cabbage, cauliflower, capsicum and knolkhol were Rs.49559, Rs.56156, Rs.46480 and Rs.48490 per hectare respectively. The cost of cultivation was maximum for cauliflower and minimum in capsicum. The highest cost component in all the crops was application of manure followed by human labour, only in case of capsicum the growers incurred maximum expenditure on human labour. The Table also shows that there was no expenditure on irrigation and hired machinery in any of the crops.

Table 6.9. Cost of Cultivation of Unprotected Crops Grown in Jammu & Kashmir

(Rs. /Ha.)

Cost Items	**Crops**			
	Cabbage	**Cauliflower**	**Capsicum**	**Knolkhol**
Seed	5797	7301	4750	6478
Manure	15398	19337	9000	12602
Fertilizer	5642	6732	5970	5654
Insecticides & pesticides	5630	6597	5530	6457
Irrigation	-	-	-	-
Hired machinery	-	-	-	-
Hired animal labour	5083	4550	4200	4934
Human labour	12009	11639	11500	12365
Total cost	49559	56156	46480	48490

6.35 The data in the Table 6.10 illustrates that the per hectare cost of cultivation of paddy, maize, cauliflower and cabbage in the state of Sikkim was Rs. 40150.03, Rs. 46385.20, Rs. 151750.10 and Rs. 152974.15 respectively.

Table 6.10. Cost of Cultivation of Unprotected Crops Grown in Sikkim

(Rs. /Ha.)

Cost items	**Crops**					
	Paddy	**Maize**	**Cauliflower**	**Cabbage**	**Peas**	**Beans**
Seed	616.13	721.55	12860.65	27571.38	-	-
Manure	1743.33	2208.38	16172.13	15049.30	-	-
Fertilizer	1595.85	1864.43	6614.45	7459.85	-	-
Insecticides & pesticides	1457.35	1666.45	1359.65	2019.40	-	-
Irrigation	2749.63	3158.63	4093.58	3334.08	-	-
Hired machinery	1806.80	1665.80	19220.58	7270.30	-	-
Hired animal labour	5715.85	6136.60	1200.65	4226.13	-	-
Hired labour	2955.85	4228.60	34758.78	16770.75	-	-
Family Labour	20686.43	23722.45	51348.68	64388.95	-	-
Other Cost	822.83	1012.30	4120.98	4884.03	-	-
Total	40150.03	46385.20	151750.10	152974.15	-	-

Productivity of Crops

6.36 The productivity of crops grown under unprotected conditions has been given in Table 6.11 wherein it can be seen that in Himachal Pradesh, the productivity was maximum in paddy followed by maize and wheat.

Table 6.11. Productivity of Crops on Sampled Farms (Unprotected Cultivation)

(Quintals/Ha.)

Crops	Himachal Pradesh	Jammu & Kashmir	Sikkim
Kharif crops			
Maize	26.00		32.728
Paddy	37.50		54.363
Cabbage	-	265.00	-
Tomato	-		-
Cauliflower		255.00	-
Capsicum	-	245.00	
Rabi crops			
Wheat	24.00		-
Peas	-		-
Cabbage	-	250.00	218.130
Cauliflower	-	239.00	236.448
Knolkhol		260.00	-

6.37 In the state of Jammu & Kashmir, during Kharif season per hectare productivity of cabbage was maximum followed by cauliflower and capsicum. In Rabi season per hectare productivity of knolkhol was maximum followed by cabbage and cauliflower .

6.38 In Sikkim, during Kharif season per hectare productivity of paddy was maximum followed by maize, whereas in Rabi season per hectare productivity of cauliflower was maximum followed by cabbage.

Production of Crops

6.39 The production of crops per farm under unprotected conditions has been presented in Table 6.12 .

6.40 The data reveals that in Himachal Pradesh the highest production per farm was that of paddy(7.90qtls.) followed by wheat (3.54qtls.) and maize (2.74qtls.) .In Jammu & Kashmir, in kharif season the production of cabbage per farm was maximum (48.99qtls.) followed by

cauliflower (41.69qtls.) and capsicum (6.19qtls.).Whereas in Rabi season the production of cauliflower per farm was maximum (41qtls.) followed by cabbage (38qtls.) and knolkhol(12qtls.). In the state of Sikkim in kharif season the average production of maize was maximum i.e. 8.0505 quintals followed by paddy, while in Rabi season per farm average production of cauliflower was maximum followed by cabbage.

Table 6.12 Production of Crops on Sampled Farms (Unprotected Cultivation)

(Quintals/farm)

Crops	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Kharif crops			
Maize	2.74		8.0505
Paddy	7.90		3.9145
Cabbage	-	48.99	-
Tomato	-		-
Cauliflower		41.69	-
Capsicum	-	6.19	
Rabi crops			
Wheat	3.54		-
Peas	-		-
Cabbage	-	38.41	9.0505
Cauliflower	-	41.00	10.5880
Knolkhol		12.00	-

Value of Output

6.41 The value of output from crops grown under unprotected conditions has been presented in Table 6.13 and it reveals that in Himachal Pradesh among the grown crops the highest value per farm was observed in paddy followed by wheat and maize.

6.42 In the state of Jammu & Kashmir, during the Kharif season per farm highest value was observed in cauliflower followed by cabbage and capsicum. While in Rabi season per farm highest value was observed in cauliflower followed by cabbage and knolkhol .

6.43 In Sikkim, per farm highest value during Kharif season was observed in maize followed by paddy .While in Rabi season per farm highest value was observed in cauliflower followed by cabbage.

Table 6.13. Value of Output from Crops on Sampled Farms (Unprotected Cultivation)

(*Value in Rs/farm)*

Crops	**Himachal Pradesh**	**Jammu & Kashmir**	**Sikkim**
Kharif crops			
Maize	4014		14276.59
Paddy	11929		7110.82
Cabbage	-	73485	-
Tomato	-		-
Cauliflower		83380	-
Capsicum	-	13618	
Rabi crops			
Wheat	5310		
Peas	-		
Cabbage	-	57000	12751.60
Cauliflower	-	82000	30024.59
Knolkhol		24000	

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

Measures to Analyse Project Worth of Protected Cultivation Venture

6.45 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.(Table6.14). In the 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

Table 6.14 Measures to Analyse Project Worth of Protected Cultivation Venture in H.P.

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

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.

6.46 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.

6.47 In case of Sikkim, as all costs relating to the construction of polyhouse has been borne by the Government, calculations relating to PBP (Pay Back Period), NPV (Net Present Value), IRR (Internal Rate of Return) and BCR (Benefit-Cost Ratio) do not arise to analyze project worth of cultivation under polyhouse cover.

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 being utilized and marketed. In this chapter, an attempt has been made to analyse the production and utilization pattern 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 have been presented in Table 7.1(a) and 7.1(b).

Production and Utilization of Flower Crops

Production and Utilization of Carnation

7.3 The analysis reveals that in Himachal Pradesh out of the total production of 467 boxes (per polyhouse in a year) of carnation, only 1.50 percent are accounted as losses at

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)					
Himachal Pradesh	467	1.50	-	-	-
Jammu & Kashmir					
Sikkim	257.96	4.54	0.32	0.29	-
Rose (Box of 900 spikes)					
Himachal Pradesh	472	1.69	-	-	-
Jammu & Kashmir					
Sikkim					
Gerbera (Box of 900 spikes)					
Himachal Pradesh					
Jammu & Kashmir					
Sikkim	454.80	4.25	0.20	0.32	-

different stages whereas in case of Sikkim the total production of carnation was 467 boxes (per polyhouse in a year) and out of which only 4.54 percent are accounted for losses at different

stages. About 0.32 per cent production is kept for family uses and 0.29 percent given as gifts to friends and relatives.

Production and Utilization of Rose and Gerbera

7.4 Table 7.1(a) reveals that in Himachal Pradesh the total production of rose was 472 boxes and out of which 1.69 percent are the losses at different stages. Total production of Gerbera in the state of Sikkim was 454.80 boxes and out of which only 4.25 percent are losses at different stages and about 0.20 per cent production is being kept for family uses and 0.32 percent given as gifts to friends and relatives.

Production and Utilization of Vegetable Crops

7.5 The production and utilization pattern of capsicum and tomato in sampled area has been presented in Table 7.1(b).

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.)					
Himachal Pradesh	402	2.00	0.75	0.50	-
Jammu & Kashmir					
Sikkim	975.55	2.70	1.46	-	-
Tomato (Box of 25 Kgs.)					
Himachal Pradesh	566	1.41	0.71	0.35	-
Jammu & Kashmir					
Sikkim	513.08	2.55	4.64	-	-

7.6 Table7.1(b) reveals that in Himachal Pradesh, total production of capsicum was 402 boxes (per polyhouse in a year) and out of which only 2.03 percent are the losses at different stages. Family consumption and gifts accounted for 0.75 and 0.50 percent of the total production respectively.

7.7 In Sikkim the total production of capsicum was 975.55 boxes (per polyhouse in a year) and out of which only 2.70 percent are accounted for losses at different stages. Family consumption accounted for 1.46 percent of the total production.

7.8 In Himachal Pradesh total production of tomato was 566 boxes (per polyhouse in a year) and out of which only 1.41 percent were estimated to be as losses at different stages. Family consumption and gifts accounted for 0.71 and 0.35 percent of the total production respectively.

7.9 In Sikkim total production of tomato was 513.08 boxes (per polyhouse in a year) and out of which only 2.5 percent accounted as losses and family consumption accounted for 4.64 percent of the total production respectively.

Marketing Pattern of Protected Crops

7.10 The flowers produced by the selected farmers of Himachal Pradesh under protected conditions were marketed at three places i.e. Delhi market, neighbouring states and in the local markets. Whereas in case of Sikkim, these were marketed in neighbouring states and in the local markets. As far as the marketing of vegetables under protected conditions are concerned, in Himachal Pradesh the destinations were Chandgarh and local markets and in Sikkim these were marketed in neighbouring states and in the local markets.

Marketing Pattern of Flower Crops

7.11 Table 7.2(a) reveals that, out of total marketed surplus of 460 boxes of carnation in Himachal Pradesh, 95.65 percent are marketed in Delhi followed by neighbouring states and local markets .In case of Sikkim, out of total marketed surplus of 236.92 boxes of carnation, 64.63 percent are marketed in neighbouring states followed by local markets.

7.12 In case of rose, out of total marketed produce of 464 boxes in Himachal Pradesh, 95.91 percent in were marketed in Delhi and the rest 4.09 percent in the other markets. The analysis shows that in case of flowers more than 95 percent of the total produce is being sold in Delhi market.

7.13 In case of Gerbera, out of total marketed produce of 433.09 boxes in Sikkim, 61.24 percent are being marketed in neighbouring states followed by the local markets.

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 (Box of 900 spikes)								
Himachal Pradesh	377(81.96)	5461	15(3.26)	4957	5(1.08)	2327	460(100)	5400
Jammu & Kashmir								
Sikkim	0.00 (0.00)	0.00	153.13 (64.63)	9.23	83.79 (35.37)	9.41	236.92 (100.00)	9.29
Rose (Box of 900 spikes)								
Himachal Pradesh	445(95.91)	5929	13(2.80)	4765	6(1.29)	2195	464(100)	5850
Jammu & Kashmir								
Sikkim								
Gerbera (Box of 900 spikes)								
Himachal Pradesh								
Jammu & Kashmir								
Sikkim	0.00 (0.00)	0.00	265.24 (61.24)	5.97	167.84 (38.75)	6.10	433.09 (100.00)	6.02

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

Marketing Pattern of Vegetable Crops

7.14 The main destinations for the vegetable produce inside the polyhouses by the selected farmers in Himachal Pradesh are local markets and the Chandigarh market. Tables 7.2(b) reveals that at overall level, out of total marketed surplus of 389 boxes of capsicum, 88.69 percent were marketed in Chandigarh and the rest 11.31 percent in the local markets. In case of tomato, out of total marketed produce of 552 boxes, 90 percent were marketed in Chandigarh and rest 10 percent in the local markets.

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

(Qty. in boxes; Rate in Rs.)

Category	Sold at							
	Chandigarh/far off market		Neighbouring States		Local markets		Total	
	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box	Qty*	Rate/box
Capsicum								
Himachal Pradesh	345 (88.69)	595	-	-	44 (11.31)	412	389 (100)	574
Jammu & Kashmir								
Sikkim	0.00	0.00	665.00 (71.12)	684.16	270.00 (28.88)	4686.33	935.00 (100.00)	725.25
Tomato								
Himachal Pradesh	496 (90.02)	618	-	-	56 (10.16)	389	551 (100)	592
Jammu & Kashmir								
Sikkim	0.00	0.00	295.40 (62.24)	896.08	179.20 (37.76)	4405.16	474.60 (100.00)	890.40

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

7.15 In Sikkim out of total marketed surplus of 935 boxes of capsicum, 71.12 percent are marketed in the markets of neighbouring states and 28.88 percent in the local markets. In case of tomato, out of total marketed produce of 474.60 boxes, i.e. 62.24 percent were marketed in neighbouring states markets and rest the 37.76 percent in the local markets.

Marketing Costs and Price Spread of Flowers in Delhi Market

7.16 The marketing costs incurred by producer and intermediaries in Himachal Pradesh for carnation in Delhi, have been presented in Table 7.3. 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 charges 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

Table 7.3 Marketing Costs and Price Spread of 100 Spikes of Carnation and Rose in Delhi Market

(Rs. /100 spikes)

Particulars	Carnation		Rose	
	Rs.	Per cent	Rs.	Per cent
Net price received by grower	387	35.50	422	35.64
Growers expenses on				
(a). Assembling charges up to store	0.50	0.05	0.60	0.05
(b). Grading& Packing	1.35	0.12	1.40	0.12
(c). Packing material	15.00	1.38	15.00	1.27
(d.)Transportation	-		-	
(i.) up to road head/I.S.B.T.	71.00	6.51	75.00	6.33
(ii).I.S.B.T .to market	15.00	1.38	18.00	1.52
(iii). Misc. charges	20.00	1.83	20.00	1.69
(e). Commission of C.A.@15%	90.00	8.26	98.00	8.28
Total expenses paid by the grower	212.85	19.53	228	19.26
Wholesale/ Gross price at market	600	55.05	650.00	54.90
(a).Market fee @ 1%	6.00	0.55	7.00	0.59
(b).Other cost (spoilage, telephone charges etc.)@ 2%	12.00	1.10	13.00	1.10
(c).Margin/Commission of C.A.@15%	90.00	8.26	98.00	8.28
Mashakhors' purchase price	708.00	64.95	768.00	64.86
Expenses borne by Mashakhor @ 2%	14.00	1.28	15.00	1.27
Margin of Mashakhor@15%	106.00	9.72	115.00	9.71
Retailers' purchased. price	828.00	75.96	898.00	69.09
Expenses borne by the retailer				
(a). Carriage up to retail shop	15.00	1.38	16.00	1.35
(b). Losses @10%	81.00	7.43	90.00	7.60
Total expenses paid by retailer	96.00	8.81	106.00	8.95
Retailers' Margin @20%	166.00	15.23	180	15.20
Consumer price	1090.00	100.00	1184.00	100.0

margin of commission agent of 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.

7.17 The marketing costs incurred by producer and intermediaries for marketing of rose in Delhi, have been presented in Table 7.3. 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 the charges 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 of the mashakhore's purchase 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

7.18 Table 7.3 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 case of rose, the share of producer in consumers' rupee was 35.64 percent. It is estimated that 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

7.19 The analysis of marketing costs and margins by various intermediaries in marketing of carnation shows(Table7.4) that the gross price received by the grower was Rs.600 per 100 spikes i.e. 55.04 percent of the consumer price. The costs paid by the farmers, wholesales, mashakhor and retailers were 19.53, 1.65, 1.28 and 8.80 percent thus total marketing cost of intermediaries was Rs.128 i.e. 11.74 percent of the consumer price. The total margins were found to be 33.21 percent of the consumer price.

7.20 In case of rose, the gross price received by the grower was Rs.650 per 100 spikes which were 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 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(Table7.4).

Table 7.4. Marketing Costs and Margins of Intermediaries in Carnation and Rose Marketing

Particulars	**Carnation**		**Rose**	
	Rs. per 100 spikes	Percentage	Rs. per 100 spikes	Percentage
Gross price received by growers	600	55.05	650	54.90
Cost of farmers	212	19.53	228	19.26
Cost of wholesalers	18	1.65	20	1.69
Cost of Mashakhor	14	1.28	15	1.27
Cost of retailers	96	8.81	106	8.95
Total marketing cost of intermediaries	128	11.74	141	11.91
margin of wholesalers	90	8.26	98	8.28
margin of Mashakhor	106	9.72	115	9.71
margin of retailers	166	15.23	180	15.20
Total marketing margin	362	34.21	393	33.19
Consumer Paid price	1090	100.0	1184	100.0

7.21 In case of marketing costs and price-spread of protected crops in Sikkim, it needs to be noted that as the marketing of crops is done either by the farmers themselves (directly to the consumers) and (or) through the FPOs in nearby towns, there is complete absence of middlemen, commission agents, etc. Neither the farmers have to bear any market fee and other such charges. The only costs involved in marketing are on the part of the farmers for assembling, packing, grading and transportation.

7.22 It can be seen from Table7.5 that total expenses borne by the farmers for marketing of carnation stands at 8.18 per cent, while that for Gerbera stands at 7.66 per cent of net price received by the grower, which in turn equals to consumer price in the absence of middlemen or market intermediaries.

Table 7.5. Marketing Costs and Price Spread of Carnation and Gerbera in the Market

Particulars	**Carnation**		**Gerbera**	
	Rs.	Percent	Rs.	Percent
Net price received by grower	1981897.70	100.00	2346745.22	100.00
Growers expenses on				
(a). Assembling charges up to store	47950.00	2.42	54800.00	2.34
(b). Grading& Packing	22900.00	1.16	26820.00	1.14
(c). Packing material	25650.00	1.29	28720.00	1.22
(d.)Transportation	65690.00	3.31	69400.00	2.96
(i.) up to road head	0.00	0.00	0.00	0.00
(ii).I.S.B.T .to market	0.00	0.00	0.00	0.00
(iii). Misc. charges	0.00	0.00	0.00	0.00
(e). Commission of C.A.@.... %	0.00	0.00	0.00	0.00
Total expenses paid by the grower	162190.00	8.18	179740.00	7.66
Wholesale/ Gross price at market	-	-	-	-
(a).Market fee @ ...%	-	-	-	-
(b).Other cost (spoilage, telephone charges etc.)@ ...%	-	-	-	-
(c).Margin/Commission of C.A.@.....%	-	-	-	-
Mashakhors' purchase price	-	-	-	-
Expenses borne by Mashakhor @ ....%	-	-	-	-
Margin of Mashakhor@....%	-	-	-	-
Retailers' purchased. price	-	-	-	-
Expenses borne by the retailer				
(a). Carriage up to retail shop	-	-	-	-
(b). Losses @.....%	-	-	-	-
Total expenses paid by retailer	-	-	-	-
Retailers' Margin @...%	-	-	-	-
Consumer price	1981897.70	100.00	2346745.22	100.00

7.23 In absence of market intermediaries of any kind, gross price received by the growers are synonymous to consumer paid price, at least as in case of protected crops grown by the sample farmers in Sikkim (Table 7.6).

Table 7.6. Marketing Costs and Margins of Intermediaries in Carnation and Gerbera Marketing

Particulars	**Carnation**		**Gerbera**	
	Rs.	Percentage	Rs.	Percentage
Gross price received by growers	1981897.70	100.00	2346745.22	100.00
Cost of farmers	162190.00	8.18	179740.00	7.66
Cost of wholesalers	-	-	-	-
Cost of Mashakhor	-	-	-	-
Cost of retailers	-	-	-	-
Total marketing cost of intermediaries	-	-	-	-
margin of wholesalers	-	-	-	-
margin of Mashakhor	-	-	-	-
margin of retailers	-	-	-	-
Total marketing margin	-	-	-	-
Consumer Paid price	1981897.70	100.00	2346745.22	100.00

Marketing Costs and Price spread of Vegetables in Chandigarh Market for Himachal Pradesh Growers

7.24 Table 7.7 shows the marketing costs and margins for capsicum sold in Chandigarh wholesale market. It can is seen that the cost of marketing borne by the growers in Himachal Pradesh 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 producers reveal that the charges of the 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 of capsicum was Rs.2873 per quintal in Chandigarh market. Adding to this the other handling charges and margins of commission agent of 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 7.7. Marketing Costs and Price Spread of Capsicum and Tomato in Chandigarh Market

Particulars	Capsicum		Tomato	
	(Rs./Quintal)	%	(Rs./Quintal)	%
Net price received by grower	2545	64.68	2050	58.44
Growers' expenses on				
Picking, packing, grading and assembling	65	1.65	80	2.28
Packing material	6	0.15	6	0.17
Transportation				
(i.) Carriage up to road head	17	0.43	18	0.51
(ii).Freight up to market	73	1.86	73	2.08
(iii). Loading/unloading charges	10	0.25	10	0.29
Commission of C.A. and market fee	152	3.86	123	3.51
Other charges	10	0.25	10	0.29
Total expenses paid by the grower	333	8.46	320	9.12
Wholesale/ Gross price at market	2873	73.01	2370	67.56
Expenses of wholesaler/CA				
Handling charges	50	1.27	55	1.57
Margin/Commission	267	6.79	275	7.84
Sub-total	317	8.06	330	9.41
Mashakhors' purchase price	3190	81.07	2700	76.97
Expenses borne by Mashakhor	25	0.64	25	0.71
Margin of Mashakhor	44	1.12	43	1.23
Retailers' purchased. price	3259	82.82	2768	78.91
Expenses born by retailer				
Carriage up to retail shop	25	0.64	27	0.77
Losses	199	5.06	280	7.98
Total expenses paid by retailer	244	6.20	307	8.75
Retailers' Margin	432	10.98	433	12.34
Consumer price	3935	100	3508	100

7.25 The Table 7.7 reveals the marketing costs and margins for tomato sold in Chandigarh market. On an average, marketing costs are generally borne by the growers in HP for selling tomato and that estimated to be Rs.320 which was 9.12 percent of consumers' price of Rs.3508 per quintal. The charges of the commission agent and market fee were 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 other handling charges and margins of commission agent of the

mashakhore's purchase price was Rs.2700 per quintal i.e. about 77 percent of consumer's price. The expenses incurred by mashakhor 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

7.26 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

7.27 The analysis of marketing costs and margins by various intermediaries in marketing of capsicum and tomato are presented in Table 7.8 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 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 7.8. Marketing Costs and Margin of Intermediaries in Capsicum and Tomato at Chandigarh Market

(Rs./Quintal)

Particulars	Capsicum		Tomato	
	(Rs./Quintal)	%	(Rs./Quintal)	%
Gross price received by growers	2873	73.01	2370	67.56
Cost of farmers	333	8.46	320	9.12
Cost of wholesalers	50	1.27	55	1.56
Cost of Mashakhor	25	0.64	25	0.71
Cost of retailers	244	6.20	307	8.75
Total marketing cost of intermediaries	319	8.11	387	11.03
Margin of wholesalers	267	6.78	275	7.84
Margin of Mashakhor	44	1.12	43	1.22
Margin of retailers	432	10.98	433	1.23
Total marketing margin	743	18.88	751	21.41
Consumer Paid price	3935	100.0	3508	100.0

7.28 As far price margin in 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.

Marketing Costs and Price Spread of Vegetables in the Market for Sikkim Growers

7.29. As in the case of protected flowers, the protected vegetables are also either marketed

Table7.9. Marketing Costs and Price Spread of Capsicum and Tomato in the Market

Particulars	**Capsicum**		**Tomato**	
	(Rs.)	%	(Rs.)	%
Net price received by grower	708026.75	100.00	528231.25	100.00
Growers' expenses on				
Picking, packing, grading and assembling	25015.00	3.53	18282.00	3.46
Packing material	8330.00	1.18	6415.00	1.21
Transportation	22050.00	3.11	16550.00	3.13
(i.) Carriage up to road head	0.00	0.00	0.00	0.00
(ii).Freight up to market	0.00	0.00	0.00	0.00
(iii). Loading/unloading charges	0.00	0.00	0.00	0.00
Commission of C.A. and market fee	0.00	0.00	0.00	0.00
Other charges	0.00	0.00	0.00	0.00
Total expenses paid by the grower	55395.00	7.82	41247.00	7.81
Wholesale/ Gross price at market	-	-	-	-
Expenses of wholesaler/CA				
Handling charges	-	-	-	-
Margin/Commission	-	-	-	-
Sub-total	-	-	-	-
Mashakhors' purchase price	-	-	-	-
Expenses borne by Mashakhor	-	-	-	-
Margin of Mashakhor	-	-	-	-
Retailers' purchased. price	-	-	-	-
Expenses born by retailer				
Carriage up to retail shop	-	-	-	-
Losses	-	-	-	-
Total expenses paid by retailer	-	-	-	-
Retailers' Margin	-	-	-	-
Consumer price	708026.75	100.00	528231.25	100.00

directly to the consumers and(or) through the FPOs in nearby towns. As the entire marketing process is set up by the state government, there is complete absence of middlemen and other intermediaries in case of vegetable marketing also.

7.30 In particular, in case of capsicum, the total expenses borne by the grower on account of marketing stands at 7.82 per cent, while that for tomato stands at 7.81 per cent of net price received by the grower, which in turn equals to consumer price (Table 7.9). The case for price-spread of these protected crops does not arise in the absence in market intermediaries.

7.31 Table 7.9 reflects that the same observations made earlier in case of marketing of protected vegetable crops is found to be in tomato as well. It shows that the consumer paid price equals the price received by the growers in the absence of intermediaries.

Marketing Costs and Margin of Intermediaries in Capsicum and Tomato at the Market

Marketing costs and margin of intermediaries in capsicum and tomato at the market is presented in Table 7.10.

Table 7.10. Marketing Costs and Margin of Intermediaries in Capsicum and Tomato at the Market

Particulars	Capsicum		Tomato	
	Rs.	%	Rs.	%
Gross price received by growers	708026.75	100.00	528231.25	100.00
Cost of farmers	55395.00	7.82	41247.00	7.81
Cost of wholesalers	-	-	-	-
Cost of Mashakhor	-	-	-	-
Cost of retailers	-	-	-	-
Total marketing cost of intermediaries	-	-	-	-
Margin of wholesalers	-	-	-	-
Margin of Mashakhor	-	-	-	-
Margin of retailers	-	-	-	-
Total marketing margin	-	-	-	-
Consumer Paid price	708026.75	100.00	528231.25	100.00

Production Losses in Flower and Vegetable Crops

7.32 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 &packing and transportation stages.

7.33 The extent of losses at various levels in carnation, rose, capsicum and tomato in Himachal Pradesh are presented in Table 7.11.

7.34 The table7.11 reveals that 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. At post harvest stages, highest losses were during transportation in all the selected crops and transportation losses were 0.42, 0.21, 0.48 and 0.34 percent in carnation, rose, capsicum and tomato respectively.

Table 7.11. Production Losses at Various Stages on All Farms in Himachal Pradesh

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

7.35 The extent of losses at various levels in carnation, Gerbera, capsicum and tomato in Sikkim are presented in Table 7.12.

7.36 The data in table7.12 reveals that the pre harvest losses in carnation production were 0.92 percent only. At post harvest stages, the losses during picking was maximum (1.44%)) followed by, grading & packing (0.75%), transportation (0.73%) and assembling (0.70%). In case of Gerbera production pre harvest losses were 0.69 per cent. While, in post harvest losses, the losses during picking was maximum (1.60%) followed by grading & packing (0.72%), transportation (0.69%) and assembling (0.55%).

Table 7.12. Production Losses at Various Stages on All Farms in Sikkim

Crops	Pre harvest losses%	Post harvest losses %			
		Picking	Assembling	Grading & Packing	Transportation
Carnation	0.92	1.44	0.70	0.75	0.73
Gerbera	0.69	1.60	0.55	0.72	0.69
Capsicum	0.71	0.46	0.42	0.34	0.84
Tomato	0.76	0.53	0.48	0.37	0.79

7.37 The pre harvest losses in capsicum production were 0.71%.While estimation of post harvest losses, the losses during transportation were maximum followed by losses during picking, assembling and grading & packing. In case of tomato production, pre harvest losses were estimated to be 0.76 per cent. At post harvest stages, the losses during transportation were found to be maximum followed by losses during picking assembling and grading & packing respectively.

CHAPTER-8

Problems in Cultivation of Protected Crops

8.1 Novelty of cultivation of horticultural crops in protected condition lies mainly on its structure and the scientific method and appliances are used for these purposes. A very general and common view of growing horticulture crops under protected condition is to exploit the natural moisture and sunlight along with recommended doses of organic manure and nourishing and treating the sapling in an appropriate manner. In this perspective, construction of poly-houses, its sizes and nature of structure seem to play a very crucial role. 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 in Himachal Pradesh. Forty four percent of the respondents revealed that they were not very happy with the design of polyhouse, though they did not know 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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Information	28.00	60.00	NA
Design	44.00	44.00	NA
Loan/Subsidy	42.00	30.00	NA
Long wait for subsidy	-	64.00	NA
Construction	45.00	56.00	NA

8.3 Sixty four percent of the respondents in J&K. complained about the clearance procedure of subsidy and thirty percent about the long wait for sanctioning of loan. Sixty percent farmers stated the problems in obtaining information about the time and cost schedule etc. of polyhouse construction. Forty four percent farmers were not happy with design of the polyhouse. Fifty six percent complained about use of inferior material in construction.

Problems Faced in Input Availability

8.4 Various problems like unavailability, higher prices and low quality of inputs were faced by the growers (Table 8.2). Sixty percent of the respondents in Himachal Pradesh 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	Himachal Pradesh	Jammu & Kashmir	Sikkim
Unavailability	49.00	56.00	0.0
Higher prices	60.00	76.00	64.0
Low quality	58.00	74.00	76.0

8.5 Seventy six percent of the respondents in J&K. complained the problem of higher prices of inputs required for raising of seedling in a polyhouse. About fifty six percent reported unavailability of inputs and 74 percent told that the inputs were of low quality.

8.6 In Sikkim, seventy six percent of polyhouse farmers complained about the low quality of inputs. About sixty six percent reported the problem of higher prices of inputs required for raising of seedling in a polyhouse.

Problems Faced in Cropping Practices

8.7 The cropping practices of crop production are significantly different in polyhouses than that of growing crops or vegetables outside the polyhouse. Polyhouse farming requires skill monitoring and care.

8.8 In Himachal Pradesh, the main problem stated by the respondents was 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 30 percent farmers said that they have no knowledge about the proper time to irrigate the vegetables grown in polyhouse and also irrigation intensity. The data further reveals that about 27 per cent farmers have no knowledge about the sowing intensity.

Table 8.3 Responses Regarding Problems Faced in Cropping Practices

(Multiple Responses in %)

Type of problem	Himachal Pradesh	Jammu & Kashmir	Sikkim
Sowing time	72.00	-	0.0
Sowing Intensity	27.00	-	32.0
Cultural practices	81.00	-	0.0
Time and intensity of irrigation	30.00	-	44.0

8.9 In Sikkim, 44 percent farmers said that they have no knowledge about the proper time to irrigate the vegetables grown in polyhouse and also irrigation intensity. The data further reveals that about 32 per cent farmers have no knowledge about the sowing intensity.

Problems Faced in Harvesting and Marketing

8.10 The polyhouse growers also faced the problems related to harvesting, packing/processing, storage, marketing etc. In the harvesting of crops the main problems were the time and method of harvesting.

8.11 Table 8.4 reveals that in Himachal Pradesh about 30 percent growers faced problems in deciding time & methods of harvesting and about the storage of the produce. 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 market to sell their produce.

8.12 In Sikkim fifty two percent growers faced problems in deciding time of harvesting. Most of the respondents (93%) faced the problems of storage followed by the problem of marketing facilities (48%), and packing/processing.

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

(Multiple Responses in %)

Type of problem	Himachal Pradesh	Jammu & Kashmir	Sikkim
Harvesting			
Time	29.00		52.0
Method	31.00		0.0
Storage	31.00		72.0
Packing/Processing	87.00		32.0
Marketing	93.00		48.0

Perception of Farmers on Protected Cultivation

8.13 Table 8.5 shows that about 90 percent of the respondents in Himachal Pradesh are of the opinion that polyhouse cultivation has increased the production of vegetables and flowers in these regions. 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 increased due to this cultivation.

Table 8.5 Perception of Farmers on Protected Cultivation

(Multiple Responses in %)

Particulars	Himachal Pradesh	Jammu & Kashmir	Sikkim
Protected cultivation has helped to increase production	90		100.0
Protected cultivation has increased employment opportunities	75		100.0
Income has grown up after protected cultivation of crops	82		100.0
Protected cultivation facilitated adoption of organic farming	42		100.0

8.14 Table 8.5 further shows that all the sampled farmers in Sikkim are of the opinion that polyhouse cultivation has increased the production of vegetables, flowers, and contributed much in enhancing employment opportunities, income and facilitated adoption of organic farming respectively.

8.15 Besides the problems mentioned above, the farmers also reported that polyhouses are prone to damage by heavy rain and storms which are the recurrent phenomena there. Such farmers in the region suffered losses and they found difficulty in reconstructing these dilapidated polyhouses due to lack of funds.

Chapter-9

Conclusions and Policy Implications

9.1 Protected cultivation is a unique and specialized form of agriculture. 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. It is the technique of providing favourable conditions for plant growth and enhances the production level. 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. 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. The state and central governments are encouraging construction of polyhouses by giving subsidies to the farmers.

Main Findings

Present Scenario of Poly house Development under MIDH

9.2 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. The area under polyhouses has been increasing continuously in the State. Polyhouse was also an important component of Macro Management Scheme and an area of 6.71 hectares was brought under polyhouses under this scheme.

9.3 The Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) is being implemented in J&K since 2001-02. From April 2014 onwards, HMNEH has been subsumed under MIDH and is being implemented in the State covering important horticulture crops. Under the scheme Centre had approved to cover 19.33 ha. area under protected cultivation with an assistance of 477 lakhs during the year 2015-16.

9.4 In case of polyhouse development under MIDH in Sikkim, the Centrally Sponsored Scheme of Horticulture Mission for North East and Himalayan States (HMNEH) has been implemented in all the districts of Sikkim. An area of 415.96 ha has been covered under protected cultivation, while 48835 farmers have been trained under various horticulture activities.

Socio-Economic Features among the Sampled Households

9.5 In Jammu & Kashmir the average family size is comparatively larger than Himachal Pradesh and Sikkim, whereas literacy percentage among the sampled household in Sikkim is found to be higher than Himachal Pradesh and Jammu & Kashmir.

9.6 Average land holdings among the sampled households is comparatively high in Sikkim i.e. 1.06 hectares as compared to Himachal (0.68 hectares) and Jammu & Kashmir (0.37 hectares).

9.7 In Himachal Pradesh the income from salary was maximum (32.98%) followed by pension (32.10%), wage labour (28.47%) and animal husbandry (6.45%) respectively. In Jammu & Kashmir the income from wages was maximum (57.88%) followed by from animal husbandry i.e. 32.98 percent. In Sikkim the income from salary was maximum (71.60%) followed by animal husbandry (13.4%), business (12.6%) and other sources i.e. 2.5 percent.

Motivations/Hindrances and Costs Involved in Polyhouse Construction

9.8 Out of total polyhouses, 54 percent polyhouses in Himachal Pradesh were simple and 46 percent Hi-Tech. Further all the polyhouses were of single tier cultivation polyhouses. While in Jammu & Kashmir and Sikkim all the polyhouses were simple and single tier cultivation polyhouses. The Department of Horticulture in these states plays a crucial role in disseminating the ideas of polyhouse cultivation.

9.9 In Himachal Pradesh among the polyhouse farmers the possibility of high income play the largest motivating factor whereas in Jammu & Kashmir demonstrations are considered to be the largest motivating factor. In Sikkim the possibility of high income was the largest motivating factor respondents followed by availability of subsidy, and availability of technology.

9.10 There were many hindrances which the farmers faced during the adoption process. In Himachal Pradesh most of the respondents (93%) reported about the marketing problems. While in Jammu & Kashmir most of the respondents (49%) reported that there was long wait involved in getting clearance of loan and subsidy from the departments. In Sikkim sixty eight percent of the respondents reported about the procrastinated process and delayed tactics by the contractors during execution.

9.11 In Himachal Pradesh 76 percent of the polyhouses were supervised by the officials. While in Jammu & Kashmir 75 percent of the polyhouses were supervised by the officials. It is encouraging to note that the attitude of the officials during the supervision, in addition to ensure the quality and design aspect, was supportive to the farmers. In Sikkim the extension activities by the government officials in poly-house construction play a crucial role.

9.12 In Himachal Pradesh, majority of the farmers (76%) wanted the design of the polyhouses to be according to the 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 costs 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.

9.13 In Jammu & Kashmir majority of the farmers suggested that inputs used in the polyhouses to raise the nursery should be provided to them through the department on subsidized rates. They should be provided best quality seeds at cheaper rates. Forty five percent respondents said that organic farming should be introduced and promoted in the polyhouses for healthy crop. According to 38 percent of the respondents, information and training on cropping practices under protected conditions should be provided and forty three percent of them suggested that cost saving techniques should be applied or made available. Only 15 percent were of the view that crops should also be grown in the polyhouses.

9.14 In Sikkim 80 percent of the respondents had some suggestions for the improvement of polyhouses that organic farming with more technological know-how could make a dent in horticultural production in this State. Sixty eight per cent of them have responded for change or modification of existing cropping practices while 16 per cent opined for better supply procedure or emphasized on availability of inputs in a more convenient way. All of the respondents stated that storage facilities should be enhanced.

Returns from Flower Crops

9.15 In Himachal Pradesh, the net returns from carnation cultivation was Rs. 1467278 per polyhouse whereas in Sikkim it was Rs. 46004.32 .In Himachal Pradesh the average net return

from cultivation of rose was Rs.1612012 per polyhouse. In Sikkim the average net return from cultivation of gerbera was Rs. 39671.82 per polyhouse.

Returns from Vegetable Crops

9.16 In Himachal Pradesh the average net returns from cultivation of capsicum was Rs. 149686 per polyhouse, whereas in Sikkim it was Rs. 23619.04, and for tomato the corresponding figure for these two states is Rs. 227142, Rs. 17158.14 respectively.

Production and Utilization of Flower Crops

9.17 In Himachal Pradesh and Sikkim total production of carnation is 467 boxes and 258 (per polyhouse in a year) respectively out of which 1.50 percent and 4.54 percent was found to be damaged at different stages.

9.18 In Himachal Pradesh the total production of rose was 472 boxes and out of which 1.69 percent were treated as losses at different stages. In Sikkim the total production of gerbera was estimated to be 454.80 boxes and out of which only 4.25 percent were found as losses at different stages. About 0.20 per cent production kept for family uses and 0.32 percent given as gifts to friends and relatives.

Production and Utilization of Vegetable Crops

9.19 In Himachal Pradesh and Sikkim total production of capsicum was 402 and 975.55 boxes (per polyhouse in a year), out of which only 2.03 percent in HP and 2.70 percent in Sikkim were treated as losses at different stages. Family consumption and gifts in HP and Sikkim are accounted for 0.75, 0.50 percent and 1.46 percent respectively. In Himachal Pradesh and Sikkim total production of tomato was estimated to be 566 boxes and 513.08 boxes (per polyhouse in a year) and out of which losses at different stages found to be only 1.41 percent and 2.55 percent. Family consumption and gifts accounted for 0.71 and 0.35 percent for HP and family consumption for Sikkim accounted for 4.64 percent respectively.

Marketing Pattern of Flower Crops

9.20 In Himachal Pradesh carnation, 95.65 percent were marketed in Delhi followed by neighbouring states and the local markets while in Sikkim 64.63 percent were marketed in neighbouring states followed by the local markets and for rose 95.91 percent of total production were marketed in Delhi and rest 19 4.09 percent in the other markets. In Sikkim 61.24 percent

of total gerbera production were marketed in neighbouring states followed by the local markets (38.75%).

Marketing Pattern of Vegetable Crops

9.21 In Himachal Pradesh, 88.69 percent of capsicum was marketed in Chandigarh market and 11.31 percent in the local markets. In case of tomato, 90 percent was marketed in Chandigarh and the rest 10 percent in the local markets. While in Sikkim 71.12 percent of total capsicum production was marketed in neighbouring states and rest 28.88 percent in the local markets. 62.24 percent of tomato was marketed in the neighbouring states and rest 37.76 percent in the local markets.

Marketing Costs and Price Spread of Flowers in Delhi for Himachal Growers

9.22 For Himachal Growers, marketing cost for carnation incurred by producers 19.53 percent of the consumer's price of Rs.1090 per 100 spikes and for rose marketing cost incurred by producers was estimated to be as 19.26 percent of the consumer price. **Producers' Share in Consumers' Price:** Net price received by the producer in marketing of carnation, in Delhi market, was 35.50 percent of consumer price. In case of rose, the share of producer in consumers' rupee was 35.64 percent and net price received by the producer in Delhi market, was Rs.422 per 100 spikes.

Marketing Costs and Margins of Intermediaries in Carnation and Rose Marketing

9.23 The gross price received by the grower was Rs.600 per 100 spikes which were 55.04 percent of the consumers' 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 11.74 percent of the consumers' price. The total margins were found to be 33.21 percent of the consumers' price. In case of rose, the gross price received by the grower was Rs.650 per 100 spikes which were 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 12 percent of the consumer's paid price. The total margins were found to be 33.10 percent of the consumer's price.

Marketing Costs and Price Spread of Carnation Gerbera for Sikkim Growers

9.24 In case of marketing costs and price-spread of protected crops, it needs to be noted that as the marketing of crops is done either by the farmers themselves (directly to the consumers) and (or) through the FPOs in nearby towns, there is complete absence of middlemen, commission agents, etc. Neither the farmers have to bear any market fee and other such charges. The only costs involved in marketing are on the part of the farmers for assembling, packing, grading and transportation. It can be observed here that total expenses borne by the farmers for marketing of carnation stands at 8.18 per cent, while that for gerbera stands at 7.66 per cent of net price received by the grower, which in turn equals to consumer price in the absence of middlemen or market intermediaries.

Marketing Costs and Price spread of Vegetables in Chandigarh for Himachal Growers

9.25 On an average the cost of marketing borne by the growers for selling capsicum worked out to be 8.46 percent of the consumer's price of Rs.3935 per quintal and for tomato marketing cost per quintal borne by the growers for selling tomato reported to be 9.12 percent of the consumers' price of Rs.3508 per quintal.

Producers' Share in Consumers' Price

9.26 The net price received by capsicum producers was Rs.2545 per quintal, i.e. about 65 percent of consumer price in Chandigarh market. For tomato 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:

9.27 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 at different stages of marketing are found to be 8.46, 1.27, 0.64 and 6.20 percent respectively and thus the total cost of marketing of intermediaries was estimated as Rs.2319 i.e. 8.11 percent of the consumers' price. The total margins were found to be Rs.18.88 percent of the consumers' price. As far as tomato is concerned, the gross price received by the grower was Rs.2370 per quintal i.e. 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 was found to be 21.41 percent of the consumer price.

Marketing Costs and Price Spread of Vegetables in the Market for Sikkim Growers

9.28 **I**n case of capsicum, the total expenses borne by the grower on account of marketing stands at 7.82 per cent, while that for tomato stands at 7.81 per cent of net price received by the grower, which in turn equals to consumer price. The case for price-spread of these protected crops does not arise in the absence in market intermediaries.

Production Losses in Flower Crops

9.29 In Himachal Pradesh pre harvest losses in carnation was found to be 0.42 per cent. Whereas in post harvest losses, the losses during transportation was maximum followed by picking, assembling and grading/packing. In Sikkim pre harvest losses in carnation found to be 0.92per cent only. Losses during picking was maximum followed by grading & packing, transportation and assembling .In Himachal Pradesh the pre harvest losses in rose production were 0.84 per cent. While in post harvest losses, the losses during picking, assembling, grading & packing and transportation were 0.21 per cent each. In Sikkim pre harvest losses in gerbera production were 0.69 per cent. While, in post harvest losses, the losses during picking was maximum followed by grading & packing, transportation and assembling.

Production Losses in Vegetable Crops

9.30 In Himachal Pradesh pre harvest losses in capsicum production were found to be 0.72 per cent but the losses during transportation were estimated to be maximum followed by losses during picking, assembling and grading & packing. In Sikkim the pre harvest losses in capsicum production were 0.71 percent. Losses during transportation were highest followed by losses during picking, assembling, grading & packing.

9.31 In Himachal Pradesh pre harvest losses in production of tomato are found to be 0.34 per cent. Losses during transportation and grading & packing were found maximum followed by the losses of picking & assembling. In Sikkim pre harvest losses for production tomato were found to be 0.76 per cent. Losses during transportation were reported to be highest followed by losses during picking, assembling and grading.

Problems in Cultivation of Protected Crops

9.32 In Himachal Pradesh the problems during construction, like delays or use of inferior material, high construction cost were reported as the most important problems faced by the respondents. In Jammu & Kashmir most of them complained about the obscure nature of clearance procedure of subsidy and long wait for sanctioning of loan. Among other problems unavailability of inputs including higher prices and low quality were reported to be important by the growers. In Jammu & Kashmir seventy six percent complained about the problem of higher prices of inputs required for rising of seedling in a polyhouse. In Sikkim seventy six percent polyhouse grower farmers complained about the low quality of inputs.

9.33 In Himachal Pradesh the problems related to cultural practices i.e. raising nursery and crops, sowing time etc.were also reported by the respondents. In Sikkim 44 percent of the farmers reported that they had no knowledge about the proper time to irrigate the vegetables grown in polyhouse and frequency of irrigation.

9.34 In Himachal Pradesh about 30 percent of the growers faced problems in deciding time & methods of harvesting and about storage of the produce. Most of the respondents faced the problems of marketing followed by the problems of packing/processing. In Sikkim fifty two percent growers faced problems in deciding time of harvesting. Most of the respondents faced the problems of storage followed by the problem of marketing facilities and scientific way of packing and processing.

Perception of Farmers on Protected Cultivation

9.35 In Himachal Pradesh 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 in 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 polyhouse cultivation. In Sikkim all the farmers are of the opinion that polyhouse cultivation has increased the production of vegetables, flowers, employment opportunities, income and facilitated adoption of organic farming to a significant extent.

9.36 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 difficulty in reconstructing these dilapidated polyhouses due to lack of funds.

Policy Implications

9.37 The growing of flowers and vegetables inside a polyhouse 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.
- 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.
- 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 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.
- Inputs used in the polyhouses to raise the nursery should be provided to farmers through the department on subsidized rates. They should be provided best quality seeds at cheaper rates.

- Organic farming should be introduced and promoted in the polyhouses for healthy crop.

As in Sikkim, formation of Farmer Producers' Organizations should be encouraged so that the hurdles in post-harvest management and marketing are reduced to the minimum for the marginal and small vegetable producers.

Bibliography

Bahirat, J.B. and Jadhav, H.G. (2011). To study the cost, Returns and Profitability of Rose Production in Satara District, The Asian Journal of Horticulture, Vol. 6, Issue 2, 311-315.

Bhatnagar, P.R. (2015). Strategies for Protected Cultivation for Small and Marginal Farmers in India, Article available on http://www.krishisanskriti.org/vol_image/

Brij Bala (2013). Up liftment of Rural Economy Through Protected Cultivation, Global Research Analysis, Vol. 2, Issue 2, 42-43.

Chandra,P, Sirohi PS, Behera TK, Singh, AK, (2000). Cultivating vegetables in Poly house: Indian Hort. 45 : 17-25.

Chaudhary, A.K. (2016). Scaling up of Protected Cultivation in Himachal Pradesh, India", Current Science, Vol.3, No.2, 272

Cheema, D.S., Kaur P. And Kaur S. (2004). Off Season Cultivation of Tomato under Net House Conditions", Acta Hort. (ISHS) 659: 177

Choudhuri Anil K (2016). Scaling- up of Protected Cultivation in Himachal Pradesh, India.

Choudhury, AK, Yadav, D.S, Thakur, S.K, Shood, P, Rahi, S and Charbu, K (2011). Protected Cultivation in Mandi– In Engineering Future Farming, ICAR Publication, New Delhi, pp. 49-59.

Dixit, A. (2007). Performance of Leaf Vegetables Under Protected Environment and Open Field Condition, Asian J. Hort., 2 (1): 197

Duhan Kumar Pardeep (2016). Cost Benefit Analysis of Tomato Production in Protected and Open Farm" International Journal of Advanced Research in Management and Social Sciences (IJARMSS), Vol.5, No.12, 140

Ghanghas, B.S. and Mukteshwar, Rati (2015). Protected Cultivation (Polyhouse) in Haryana. Problems and Prospects, Indian Journal of Applied Research, Vol. 5, Issue 8, 684

Gharge, C.P., Angadi, S.G., Basavraj, N, Patil, A.A, Biradar, M.S and Mummy Batti, U.V. (2013). Performance of standard Carnation varieties under naturally ventilated Poly house- Dept. of Horticulture, University of Agriculture, Semi, Dharwad.

Gurav, S.B, Nagare, P.K, Katwate, S.M, Sable, R.N, Singh, B.R and Dhane, A.V, (2004). Standardization of package of practices for Carnation under partially modified green-house condition- J. ori. Hort. 7 (3-4): 221-225.

htp.//www.hillagric.ac.in (accessed on 21st Sept., 2015)

Kouser Parveen Wani, Singh, P. Amin, A. Mushtaq F. And Dhar Z.A. (2011). Protected Cultivation of Tomato, Capsicum and Cucumber Under Kashmir Valley Condition", Asian Journal of Science and Technology, Vol. 1., Issue 4, 56

Kumar Ramesh and Singh, Kartar, (2003). Growth and flowering of Carnation as influenced by growing investment, J.Orn. Hort. 6(1): 66-68.

Kumar, Parveen, Chauhan, R.S. and Grover, R.K. (2016). Economic Analysis of tomato Cultivation Under Polyhouse and open Field Conditions in Haryana, Indian Journal of Applied and Natural Science 8 (2): 846

Mahesh, K (1996). Variability studies in Karnataka, M.Sc.(Agril.) Thesis, Univ. Agric. Sc., Bangalore (India).

MIDH Update – Quarterly Bulletin (2015-16), April- June, 2015, Dept. of Agriculture & Co-operation,

MOA,GOI, New Delhi.

Murthy, D. S.; Prabhakar, B. S.; Hebbar, S. S.; Srinivas, V.; Prabhakar, M., (2009). Economic feasibility of vegetable production under polyhouse: a case study of capsicum and tomato, Journal of Horticultural Sciences 2009 Vol.4 No.2 pp.148

Reddy, B. S., Patil, R.T., Jholgikar, P and Kulkarni,B.S.(2004). Studies on vegetative growth, flower yield and quality of shaded Carnation under low cost Poly house condition- J. Orn. Hort., 7(3-4): 217-220.

Shuba Rabecca Isaac (2015). F.S.R.S, Sadanapurum, Kerala Agriculture University, performance evaluation of leafy vegetables in naturally ventilate playhouses – International Journal of research studies in agriculture sciences (IJRSAS, Vol. 1July, 2015, PP-1-4)

Sing, B and Kalia, P (2005). Produced cultivation of vegetable crops – problem, potential and prospect in India, Indian Journal of fertilizers, 1 (4), 93-97.

Sing, B, Sing, A.K. and Tomar, B.S (2010). Pn Pri-urban : Protected cultivation technology to Bring prosperity – Indian Horticulture 55(4), 31-32.

Singh, B and Sirohi NPS (2006), "Protected Cultivation of Vegetables in India: Problems and Future Prospects, Acta Hort. (ISHS) 15 (2): 710: 339

Singh, B, Tomar, B.S. & Kumar, M (2004). Plastic low tunnel – a profitable and sustainable technology for Peri- urban areas, Incentive Agriculture, 42(7-8), 18-20.

Singh, B., Kumar, M. And Sirohi, N.P.S. (2007). Protected Cultivation of Cucurbits Under Low Cost Protected Structures: a Sustainable Technology for Peri

Singh, R., Asray, R. (2005). Performance of Tomato and Sweet Pepper Under Unheated Green house", Haryana J. Hort. Sci. 34 (182): 174

Spehia, R.S (2015). Status and impact of producted cultivation Himachalprodesh, India, CURR.SCI, 2015, 108 (12), 2254-2257

Sreedhara, D.S, Kerutagi, M.G, Basavaraja, H, Kunal. L.B and dodamoni, M.T (2013). Economics of capsicum production under protected condition in northern Karnataka – Karnataka J.Agric. SCI, 26 (2): (217 – 222).

Sreenivese murthy, D, Prabhakar, B.S, Hebbar, SS, Sreenives, V and provakar, M (2009). Economic feasibility of vegetable production under playhouse: a case study of capsicum and tomato – J. Hort. Sci, Vol. 4 (2):148-152.

Sudhagar, S. (2013). Production and Marketing of Cut Flower (Rose and Gerbera) in Hosur Taluk, International Journal of Business and Management Invention, Vol.1, Issue 5, 15-25.

Tiwary, Yogeses (2014). Economic of production of marketing of flower under protected condition in Jabbalpur district of MP, URL: HTTP//Krishikosh.egranth.ac.in/handle/1/68788

Vaidya, C.S. and Singh Ranveer (2011). Production and Marketing of Flowers and Vegetables under Protected Cultivation in Himachal Pradesh, Agro-Economic Research Centre, H.P. University, Shimla (Mimeo).

www.midh.govt.in