

**Evaluation Study on ‘Impact of Higher Allocation of Horticulture Budget from 2014-15 to 2016-17 on its Activities/ Achievement in Haryana’**

**Report**

Submitted to

**Department of Planning  
(Government of Haryana)**

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October, 2017**

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## ACKNOWLEDGEMENT

We are grateful to the Government of Haryana for providing endowment fund under the scheme 'Institute for Research & Development' to conduct research studies on various issues related to Haryana. The present evaluation study entitled 'Impact of Higher Allocation of Horticulture Budget from 2014-15 to 2016-17 on its Activities/ Achievement in Haryana' has been sponsored by the Department of Planning, Government of Haryana.

I am grateful to Dr. Rashpal Malhotra, Executive Vice-Chairman, CRRID, for his consistent encouragement and inspiration. I am very thankful to Professor Sucha Singh Gill, Research Coordinator & Senior Professor and Former Director General, CRRID for encouragement, stimulating deliberations & constructive comments on various drafts of the study. I am very thankful to Professor Sukhpal Singh, Director General, CRRID for his consistent support and encouragement to complete this study.

I am obliged to Dr. Satish Verma, RBI Chair Professor, CRRID for his consistent support and co-operation in the conduct of this study.

My sincere thanks are due to Dr. Ashwani K Nanda, Professor and Dr. Krishan Chand, Associate Professor, CRRID, for their consistent guidance, support and critical views on various crucial issues relevant to the study.

My special thanks are due to Professor Surinder Kumar, Director, Giri Institute of Development Studies (GIDS), Lucknow (Uttar Pradesh) for his consistent encouragement, guidance and critical comments at various stages of the study.

I am grateful to Dr. R.S. Malhan, Director, Department of Economic & Statistical Analysis (DESA), Government of Haryana, Yojana Bhawan, Panchkula for his consistent support. I am also thankful to Mr. Jagbir Dalal, Former Director, Department of Economic & Statistical Analysis (DESA), Government of Haryana, Yojana Bhawan, Panchkula for giving useful inputs for the study. I also put on record my appreciation to Dr. Sumant Aggarwal, Deputy Director Planning and Mr. Surjit Singh, Research Officer, for their consistent support.

My thanks are due to Dr. Arjun Singh Saini, Director General, Directorate of Horticulture, Panchkula for his valuable inputs for the study. I am also thankful to the District Horticulture Officers of the districts Yamunanagar, Sonapat, Gurgaon (Gurugram) and Sirsa as well as the village functionaries for extending co-operation to the field investigators in collection of data. I am also thankful to Mr. Joginder Singh, Fieldman, Rai Block, Sonapat for his kind support during the field survey. I also put on record my

appreciation for the co-operation of the respondents who provided requisite information to our field investigators.

My thanks are due to Mr. Sandeep, Mr. Dharmender and Mr. Sandip Loyal, all field investigators, for their help in data collection and compilation for the study.

I am also thankful to entire staff of computer section, especially Mrs. Anita Gupta, Mr. Jagtar Singh and Mr. Ashwani Sharma, for their help in data entry in computer for the study.

I am thankful to the entire staff of Administration, Library and Account Section, CRRID for their co-operation and sincere help during the study. My thanks are due to Mr. Gurjot Singh, Office Assistant, RBI Chair, CRRID, Chandigarh for his support at various stages of the study.

I am also thankful to Mr. Satish Machra, Mr. Randhir Punia and Mr. Sahadev for their valuable inputs for the study.

Needless to say, any error or emissions that remain are my sole responsibility.

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# **Impact of Higher Allocation of Horticulture Budget from 2014-16 to 2016-17 on its Activities/ Achievement**

## **Executive Summary**

Indian economy is reeling under agrarian crisis. The major issues leading to agrarian crisis are consistent rising inputs costs, inadequate infrastructure for produce marketing, lack of alternative region wise crops and lack of ensured minimum support prices (MSP) for less water intensive crops. The economic and ecological sustainability of rice-wheat cropping system (RWCS) of the states is being questioned. There are serious concerns about the depletion of ground water table, degradation in soil fertility, rising problems of insect-pest and disease complexity, decline in bio-diversity, rising costs and diminishing economic returns, decline in factor productivity, fragmented small land holdings etc.

Diversification of crops in agriculture sector has been considered as an urgent requirement for sustainable agricultural development in the country. The significance of horticulture cultivation as an alternate for crop diversification has been well accepted proposition in the literature. It is also significant for creation of additional employment opportunities in rural areas. Economic opportunities have been considered as an adequate justification/ rationale for the shift away from cereals to fruits and vegetables.

At this juncture, horticulture appears as an alternative to change the prevailing unsustainable cropping pattern in the state/region. Presently both the governments at national and state levels have been focussing to promote horticulture through various centrally sponsored and state sponsored schemes. A perceptible amount of funds in plan outlay has been allotted for horticulture sector. Consequently, the area under horticulture cultivation has gone up at all India level as well as in Haryana over the period.

With this background, the study on impact of higher allocation of horticulture budget on its activities/achievements in Haryana is timely as it tends to examine various aspects pertaining to the horticulture cultivation in Haryana. The study has broadly focussed on the perception of the households regarding adoption of horticulture cultivation and major factors responsible for demotivation among the farmers for horticulture cultivation despite the efforts made by the government for growth of the same in the state of Haryana. The major findings and policy recommendations of the study are given below as:

- A vast inequality exists in the distribution of landholdings. A major chunk of landholdings is owned by big farmers, landlords and moneylenders whereas most of the cultivators are tenants who own very small share of landholdings.

- Due to price fluctuations along with weather vagaries tenant farmers have less capacity to bear risks, therefore they stick to the existing cropping pattern and avoid applying latest technologies in the fields for horticulture cultivation.
- Wheat paddy rotation is dominantly prevailing in the state, except the southern districts. Interestingly, paddy is not a traditional crop of this region. Despite that a perceptible area has been under paddy cultivation.
- The share of area under cultivation of paddy and cotton in total area sown in Kharif season has decreased from 56.36 per cent to 50.37 per cent whereas the corresponding share under horticulture crops tended to increase from 17.82 per cent to 21.94 per cent during the period 2014-15 to 2016-17.
- The share of area under wheat and sugarcane has decreased from 69.44 per cent to 61.88 per cent in total area sown whereas the corresponding share under horticulture crops increased from 19.44 per cent to 23.87 per cent in Rabi season during the period 2014-15 to 2016-17.
- The area under these two crops (Wheat & Paddy) has a tendency to decrease whereas the area under horticulture crops has increased over the period of time in the study area. The households have shown their interest in horticulture crops instead of traditional wheat paddy mono cropping pattern in the study area.
- More than 60 per cent area of the total area under horticulture crops has been covered under vegetable crops in the study area.
- Medicinal and aromatic plants have a great potential in the state. Despite that farmers have not shown much interest in cultivation of medicinal plants in the study area.
- The pace of infrastructure development in terms of cold storage facilities, transportation connectivity and assured marketing for horticulture produce has been below expectations in the state of Haryana.
- During Kharif season, more than 78 per cent was under traditional agriculture crops and rest of the area, about 22 per cent, was used for horticulture crops by the sample households in the study area. Interestingly, the share of area only under paddy cultivation in total area under traditional crops comes out to be more than 45 per cent irrespective of the categories of the households. But it needs to be noted that the area under horticulture crops was about 40 per cent in the category of horticulturist households.



- Per acre productivity of horticulture crops during both the cropping seasons, Kharif and Rabi, was much higher than that of traditional crops for the sample households. Some households were also engaged in mushroom cultivation, which is one of the remunerative crops.
- During the Kharif season, the production of horticulture crops for the sampled households, excluding mushroom, has increased with a growth rate of 31.21 per cent whereas the area under horticulture crops increased by 22.15 per cent. Correspondingly, the productivity per acre of horticulture crops, excluding mushroom, has also increased with a growth rate of 7.33 per cent during the period from 2014-15 to 2016-17.
- During the Rabi season, the production of horticulture crops for the sampled households, excluding mushroom, has increased with a growth rate of 28.17 per cent whereas the area under horticulture crops increased by 33.57 per cent. The productivity per acre of horticulture crops, excluding mushroom, has slightly decreased with a growth rate of 4.13 per cent during the same period.
- Due to lack of post harvest infrastructure and effective marketing mechanism for the horticulture produce, the farmers hesitate to divert towards horticulture cultivation.
- Electric tube well was the major source of irrigation that irrigated 70.88 per cent of the total irrigation land of the sample households.
- Flooding irrigation technique has been dominantly used for irrigation in the study area. This technique leads to wastage of a heavy quantum of scarce irrigation water.
- The state government provides subsidy in micro irrigation system for horticulture crops. But the farmers, particularly in Sirsa district, pointed out that private firms made available a set of sprinkle irrigation system for at least four acres of land and forced the farmers to purchase it. The respondents suggested that the firms must be regulated to make available a sprinkle set for less than four acres of land at reasonable prices.
- Initial high cost, lack of awareness and lack of operational skill & training were the major constraints in adoption of the latest irrigation technologies in horticulture cultivation in the study area.
- Main reason for non adoption of horticulture cultivation by non horticulturist sample households was inadequate marketing mechanism to dispose-off the horticulture produce at reasonable prices in the study area.

- Inadequate irrigation facilities have also been considered as one of the major hurdles in crop diversification particularly in favour of horticulture crops.
- Government support in terms of subsidies and other kinds of support and expected high income from horticulture cultivation were the major factors which motivated the farmers for horticulture cultivation in the study area.
- Lack of cold storage facility and inadequate marketing mechanism for the horticulture produce, which is highly perishable in nature, appeared as major problems across the categories of the households in the study area.
- Scarcity of trained manpower was the second major problem in horticulture cultivation in the study area.
- Lack of transportation facilities for horticulture produce was also appeared as one of the problems in horticulture cultivation particularly to marginal and small farmers in the study area.
- There was lack of awareness among the sample households about latest technologies for harvesting and handling the horticulture produce that resulted in a substantial wastage of horticultural produce.
- The frequency and quality of the awareness generation programmes was below expectations in the study area.
- Out of the total 220 horticulturist sample households only 83 households availed the subsidy for various purposes in the study area during the period 2014-15 to 2016-17.
- Out of the total horticulturist sample households, 51.82 per cent households reported an increase in their income levels with horticulture cultivation.
- During the period under consideration, average net income of the horticulturist households has slightly increased by Rs. 1835 per acre in absolute terms from Rs. 8,713 to Rs. 10,548, with a growth rate of 21.06 per cent, from horticulture cultivation in the study area.
- Majority of the sample households who reported increase in their income after adoption of horticulture crops/activities were big farm households as major beneficiaries.
- A majority of the big farm households were the main beneficiaries of the credit from banks and cooperative societies. It might happen due to their better loan repayment capacity as compared to the farmers with small land holdings.

## **Policy Recommendations**

- The state government should promote cooperative farming/ Farmers Producer Organisation to solve the problem of fragmented land holdings so that small farmers may be motivated to adopt horticulture cultivation as a leading profession and to yield benefits of the latest technologies.
- The state government should formulate rules regarding land tenancy and the compensation policy in favour of tenant farmers to enhance confidence and motivation for horticulture cultivation in the state.
- To enhance awareness among the farmers about horticulture cultivation, the state government should increase frequency of awareness generation and capacity building programmes at village levels. The quality of these programmes should also be improved. In order to ensure frequency and quality of the awareness and capacity building programmes at grass root level an effective monitoring mechanism is required. A good quality printing material in simple language about horticulture cultivation should be supplied to the farmers.
- The Kisan Melas should be organised regularly at local levels to demonstrate latest technologies for horticulture cultivation. The farmers visiting the melas may themselves judge the performance of the different technologies. These melas will also provide a common platform to the farmers to exchange their views/ experiences with the other farmers and the experts/ scientists.
- The Panchayati Raj Institutions should be empowered to generate awareness among the farmers about various government schemes for the promotion of horticulture cultivation. In this context, PRIs may play a very effective and leading role.
- Medicinal and aromatic plants have a great potential in the state. The state government should promote the production of medicinal and aromatic plants. There is huge potential for cultivation of Aloe vera, Lemon, Ber, Rose and Tulsi that needs to be explored.
- To deal with the problem of seasonal variations (climate change) there is an urgent need to breed area specific new varieties of horticulture crops that resist climatic stress with higher yield potentials.
- The state government should take focussed initiatives to motivate farmers to adopt drip/ sprinkle irrigation techniques in their fields through adequate awareness generation programmes at grass root levels.

- There is an urgent need to develop low cost structure for poly houses, net houses, drip irrigations system etc. to make available new technologies at affordable prices to the small farm households.
- Serious efforts are required to ensure availability of assured and good quality irrigation water that is foremost requirement for the growth of horticulture cultivation in the state.
- Insufficient cold storage and inadequate marketing mechanism are the major problems in horticulture cultivation in the state. The state government should encourage the establishment of agro processing units in clusters. The processed products may be sold with the brand name of HAFED. This proposition is desirable not only for strengthening marketing system but also the farmer could get reasonable prices for their produce.
- In order to deal with the problem of transportation of horticulture produce, the state government should establish procurement and retail counters at village levels with the help of village panchayats.
- To increase confidence and motivation of the farmers for horticulture cultivation, the state government should appoint sufficient number of trained manpower even at block levels.
- The state government should make serious efforts for strengthening of government nurseries equipped with modern facilities to ensure sufficient & timely supply of quality seedlings/ plants etc. to the farmers.
- There is an urgent need to ensure sufficient availability of mobile van equipped with soil and ground water testing facilities particularly in sowing seasons. The report of the tests should be made available at the earliest at the doorstep of the farmer. The reports should be in simple language so that a farmer could understand it easily.
- There is an urgent need for policy interventions from the state government to motivate the farmers particularly marginal and small, for intercropping cultivation which may ensure a reasonable income to them along with traditional crops.
- There is an urgent need for effective insurance policy and its implementation, in a transparent manner, for horticulture crops in the state.
- The state government should ensure reasonable access of small farm households to institutional credit for horticulture cultivation through appropriate policy intervention.

# **Chapter I**

## **Introduction**

### **I.1: Background**

Indian economy is reeling under agrarian crisis. The major issues leading to agrarian crisis are consistent rising inputs costs, inadequate infrastructure for produce marketing, lack of alternative region wise crops and lack of ensured minimum support prices (MSP) for less water intensive crops. The economic and ecological sustainability of rice-wheat cropping system (RWCS) of the states is being questioned. There are serious concerns about the depletion of ground water table, degradation in soil fertility, rising problems of insect-pest and disease complexity, decline in bio-diversity, rising costs and diminishing economic returns, decline in factor productivity, fragmented small land holdings etc.

For any agricultural production system the soil health is the key factor. Due to the over exploitation of land particularly in paddy wheat crop rotation, the soil has become deficient in required nutrients which are reflected in terms of stagnation/ decline in crop productivity. The problem of soil degradation has aroused mainly due to excess use of chemical fertilisers, pesticides and inefficient use of ground water. Such practices poses threats to the health of human beings, livestock and environment. It has serious implications for agricultural sustainability.

Diversification of crops in agriculture sector has been considered as an urgent requirement for sustainable agricultural development in the country. The significance of horticulture cultivation as an alternate for crop diversification has been well accepted proposition in the literature. It is also significant for creation of additional employment opportunities in rural areas. Economic opportunities have been considered as an adequate justification/ rationale for the shift away from cereals to fruits and vegetables. In other words, growth of horticulture cultivation would help to promote the development of agro based industries with value addition in the rural areas.

Taking into account the importance & significance of horticulture cultivation in India, a centrally sponsored scheme namely “National Horticulture Mission” (NHM) was launched in 2005-06 for the development of horticulture sector duly ensuring horizontal and vertical linkages, with the active participation of all the stake-holders.

The main objectives of the scheme is to promote a holistic growth of the horticulture sector through area/regionally differentiated strategies; to enhance horticulture production, improve nutritional security and income support to farm households and others; to establish

convergence and synergy among multiple ongoing and planned programmes for horticulture development; to promote, develop and disseminate technologies; to generate employment for skilled and unskilled persons, especially unemployed youth. It also focuses on an end-to-end approach covering production, post harvest management, processing and marketing to assure appropriate returns to growers/producers; promote research and development(R&D) technologies for production, post harvest management and processing; enhance acreage, coverage, and productivity in potential belts/clusters; adopt a coordinated approach and promote partnerships, convergence and synergy among R & D, processing and marketing agencies in public as well as private sectors. Broadly, it tries to ensure support and adequate returns to farmers and promote capacity building and Human Resource Development at all levels.

Over the period, horticulture has appeared as a potential enterprise of the agriculture sector which plays a significant role in accelerating the development of the society. It is also becoming popular and addressing crucial aspects of the economy like employment generation, income enhancement and poverty issues. It also involves huge crop diversification potentials which provide ample opportunities/ choices to the farmers.

In other words, horticulture cultivation plays a significant role in rural economy through increasing income levels of the farmers. Horticulture crops cultivation includes the fruits, vegetables, medicinal and aromatic plants, flowers and their management and marketing. Moreover, horticulture cultivation is highly labour intensive activity which generates/provides abundant employment opportunities to the rural population. Moreover, horticulture cultivation contributes in the prosperity of the economy and is also directly related to the health improvement of the people. Fruits and vegetables are not only used for domestic consumption but also in food processing units.

It needs to be noted that substantial changes in socio-economic as well as environmental condition lead to increase in demand for horticulture crops. It is possible to enhance the production of horticulture crops and efficient utilisation of natural resources with latest technologies.

Haryana Horticulture Vision Document (2016) highlights that “Haryana is moving towards Golden Revolution and emerged in the forefront in the fruit and vegetable production and ranked 7<sup>th</sup> to 11<sup>th</sup> position in potato, pea, cauliflower, onion, brinjal, cabbage and tomato”.

The Department has estimated the growth in production of horticulture crops on the basis of expected population and food requirements in the next 15 years as follows in Table 1.

**Table 1: Expected Population and Food Requirements in the next 15 years**

Particular	2001	2011	2021**	2031***
Population (Million)				
India	1028.74	1210.85	1453.02	1743.62
Expected Food Requirements for Fruits and Vegetables* (Million Metric Tonnes)			212.14	254.57
Population in Haryana, Delhi and Chandigarh	35.90	43.38	51.95	62.33
Expected Food Requirements for Fruits and Vegetables* (Million Metric Tonnes)	-	-	7.58	18.20
Production Targets (Million Metric Tonnes)	2.49	5.14	11.08	20.74

Source: Haryana Vision Document, 2016

Note: \*- As per the WHO study measuring intake of fruits and vegetables 2005, the advice was 400 gms per day of fruits and vegetables.

\*\* expected population increase @ 20% (increase was 21.54% from 1991-2001 and 17.70% from 2001-2011).

\*\*\*In 2031, the estimated food requirement is calculated on the basis of dietary requirement of 800 gms per day of fruits and vegetables.

The Department identified some broad objectives to be achieved over the period of time are as follows:

- To develop farmer socio economic security model in the villages – farm sustainability.
- To achieve nutritional security and deliver safe food to the consumers.
- Transparent Institutional Delivery Mechanism.

To achieve these broad objectives the Department has to focus on:

1. To increase area and productivity and thereby production of all horticultural crops.
2. To develop sustained organized marketing of all horticultural products and thereby achieving the goal of quality, quantity and seamless delivery as per global standards.
3. Strengthening farmer capacity through agricultural best practices for enhanced productivity.
4. Ensuring access to and usage of quality inputs and services for intensive agriculture production and enhancing cluster competitiveness and also to have access of post harvesting management infrastructures in a collective mode.
5. Facilitating access to fair and remunerative markets including linking of producer groups to marketing opportunities through market aggregators.

At this juncture, horticulture appears as an alternative to change the prevailing unsustainable cropping pattern in the state/region. Presently both the governments at national

and state levels have been focussing to promote horticulture through various centrally sponsored schemes and state sponsored schemes. Therefore, a perceptible amount of fund in plan outlay has been allotted by the governments at centre as well as state for the growth of horticulture sector.

**Table 2: Plan Outlay and Area under Horticulture**

Years	Plan Outlay (Rs. in crore)		Area under Horticulture (000 ha)	
	India	Haryana	India	Haryana
2012-13	1954.25	72.10	23,700	436.54
2013-14	2997.88	95.11	24,200	450.60
2014-15	3880.83	189.10	2,34,100	439.60
2015-16	3864.66	223.55	2,37,900	490.70
2016-17	4142.20	378.44	-	-

Source: 1. Horticultural Statistics at a Glance, Government of India  
2. Department of Horticulture, Government of Haryana

The Table 2 presents the data on the plan outlay and area under horticulture. The data reveals that the total plan outlay for horticulture sector has increased from Rs. 1954.25 crore in 2012-13 to Rs. 4142.20 crore in 2016-17 at all India level. Similarly, plan outlay of Haryana for horticulture has increased perceptibly from Rs. 72.10 crore to Rs. 378.44 crore during the same period. Consequently, the area under horticulture crops has increased from 23,700 thousand hectare to 2, 37,900 thousand hectares at all India level and from 436.54 thousand hectare to 490.70 thousand hectare in Haryana during the period 2012-13 to 2015-16. It indicates that governments at centre as well Haryana are making efforts for the growth of horticulture.

The available literature reveals that more than 80 per cent area is under vegetable cultivation out of total horticulture area in the state of Haryana. In the present scenario, the major focus of the state government has been on production aspects of horticulture crops. The issues regarding harvesting techniques, post harvest management and marketing of horticulture produce are not adequately focussed. The only infrastructure available for marketing is wholesale mandies. These mandies are heavily congested. Inadequate post harvest Infrastructures like sorting & grading facilities, inappropriate packaging material, lack of rapid transport systems and inadequate cold storage facilities, for the horticultural crops results in deterioration of perishable horticulture produce.

## **I.2: Objectives of the Study**

With this background, it becomes pertinent to evaluate the impact of higher allocation of horticulture budget on its activities/achievements in Haryana.

The main objectives of the study are to examine:



- Change in production and productivity of horticulture crops;
- Change in allied activities of the households;
- Change in socio economic status of the households;
- Change in post-harvest management, processing and marketing infrastructure;
- Awareness level of the households regarding good agricultural practices, latest innovative technology etc. in horticulture.

### **I.3: Research Methodology and Data Base**

The study is based on primary as well as secondary data. For primary data collection, we adopted multi-stage random sampling technique for selection of agriculture households. The primary data has been collected from a survey with the help of well designed perception questionnaire while the secondary data was obtained from the relevant government departments/ offices /other organisations.

The Horticulture Department has divided the state into four clusters. Cluster I includes the districts along with National Highways (NH) 1 namely Ambala, Karnal, Kurukshetra, Sonapat and Panipat. The main crops under cluster I are all type of vegetables, Mushroom & Flowers. Cluster II includes five districts namely Hisar, Sirsa, Fatehabad, Jind and Kaithal. This cluster mainly has fruits crops like Kinnow, Guawa and other crops. Cluster III covers three districts namely Panchkula, Ambala and Yamunanagar. The main crops in this cluster are both vegetables and fruits like Mango, Guava, Sapota, Lichi and Pear etc. Cluster IV includes five districts namely Gurgaon, Jhajjar, Rohtak, Rewari and Mahendergarh (Narnaul). In this region dry region type vegetables and fruits are grown.

For this study, we have selected four districts one from each cluster, namely Sonipat from cluster I, Sirsa from cluster II, Yamuna Nagar from cluster III and Gurgaon from cluster IV taking into account district wise the highest share of area in total area under horticulture crops. On the basis of the highest concentration of horticulture activities, we have selected one block from each selected districts in consultation with the District Horticulture Officials. The selected blocks are Rai from Sonipat, Ellenabad from Sirsa, Sadhora from Yamuna Nagar and Pataudi from Gurgoan district. Further, on the similar lines we have selected five villages from each selected blocks consisting 22 households from each village. Hence, the total number of villages comes out to be 20 from all four selected districts for the study. From block Pataudi, the selected villages are namely as Bhora Kalan, Bhora Khurd, Ucha Majra, Narehera and Ichapuri. The selected villages from block Ellenabad are Bhuratwala, Berwala, Dhani Shera, Porka and Khari Surera. The selected villages from block Rai are Palra, Palri

Kalan, Janti Kalan, Manouli and Aterna. From block Sadhora, the selected villages are Sadhora, Ismailpur, Saleempur, Rajpura and Paharipur.

Total sample size for the study has been 440 (20x22) households covering both categories of households who are engaged in Horticulture cultivation fully and/or partially and who are not engaged in horticulture cultivation in the same selected village giving them equal representation i.e., 11 households each from both the categories. Appropriate statistical techniques have been adopted for analysis.

## Chapter II

### Perceptions of the Households regarding Cropping Pattern, Production and Productivity

In this chapter, based on primary survey we attempted to capture household category wise cropping pattern, major crop wise area, production and productivity during Kharif & Rabi seasons. To make a comparative analysis, we divided the sample households in two broad categories i.e., horticulturist households and non horticulturist households. Horticulturist households are those households who cultivated horticultural crops fully and/or partially whereas non horticulturist households are engaged in cultivation of traditional crops.

#### II.1: Distribution of the Households

Initially, we divided the households in different categories on the basis of operational land holdings.

**Table 3: Classification of the Households on the basis of Operational Land Holdings**

S. No	Categories	Horticulturist Households	Non Horticulturist Households	Total
01	Marginal Farmers	17 (7.73)	17 (7.73)	34 (7.73)
02	Small Farmers	50 (22.73)	55 (25.00)	105 (23.86)
03	Semi- Medium Farmers	67 (30.45)	83 (37.73)	150 (34.09)
04	Medium Farmers	67 (30.45)	55 (25.00)	122 (27.79)
05	Large Farmers	19 (8.64)	10 (4.55)	29 (6.59)
06	Total	220 (100)	220 (100)	440 (100)

Source: Field Survey, 2017

Note: Figures in bracket indicate per cent to Total

The Table 3 presents the classification of the sample households on the basis of operational land holdings. In our total sample size of 440 households, there are 7.73 per cent marginal farmers (having operational land holdings up to 2.5 acres). The share of small farmers (having land holdings 2.51 to 5.0 acres) in the total households is 23.86 per cent. The representation of semi- medium (5.1 to 10.0 acres), medium (10.1 to 25.0 acres) and large (above 25 acres) farmers in total households is 34.09 per cent, 27.79 per cent and 6.59 per cent respectively.

The Table 3 further shows that out of the total (440) sample households, 220 households each are horticulturist and non horticulturist. Different categories of the sample

households, classified on the basis of operational land holdings, have also been divided between horticulturist and non horticulturist households. Out of the total (220) horticulturist households, 7.73 per cent, 22.73 per cent, 30.45 per cent, 30.45 per cent and 8.64 per cent are marginal, small, semi- medium, medium and large farmers respectively. Similarly, the share of marginal, small, semi- medium, medium and large farm households in total non horticulturist households is 7.73 per cent, 25 per cent, 37.73 per cent, 25 per cent and 4.55 per cent respectively.

It may be pointed out that out of the total (440) sample households about 31 per cent households belong to the category of marginal and small farm households whereas majority of the households (69 per cent) are big farm households.

## II.2: Classification of the Households on the basis of Ownership of the Land Holdings

The ownership of the land holdings plays a significant role in determination of cropping pattern. We have classified the sample households in two categories, own cultivation and tenant cultivation, on the basis of ownership of the land holdings. A household, having ownership of land holdings and engaged in cultivation is regarded as own cultivation households while a household engaged in cultivation without any ownership of land holdings is defined as tenant cultivator.

**Table 4: Classification of the Households Cultivation on the basis of Ownership of Operational Land Holdings**

S. No	Categories	Horticulturist Households		Non Horticulturist Households		Total	
		Own Cultivation	Tenant Cultivation	Own Cultivation	Tenant Cultivation	Own Cultivation	Tenant Cultivation
01	Marginal Farmers	13 (10.00)	04 (4.44)	15 (10.00)	2 (2.86)	28 (10.00)	6 (3.75)
02	Small Farmers	28 (21.54)	22 (24.44)	44 (29.33)	11 (15.71)	72 (25.71)	33 (20.63)
03	Semi-Medium Farmers	39 (30.00)	28 (31.11)	51 (34.00)	32 (45.71)	90 (32.14)	60 (37.50)
04	Medium Farmers	40 (30.77)	27 (30.00)	32 (21.33)	23 (32.86)	72 (25.71)	50 (31.25)
05	Large Farmers	10 (7.69)	9 (10.00)	8 (5.33)	2 (2.86)	18 (6.44)	11 (6.87)
06	Total	130 (100)	90 (100)	150 (100)	70 (100)	280 (100)	160 (100)

Source: Field Survey, 2017

Note: Figures in brackets indicate per cent to total

The Table 4 shows that out of the total (440) sample households, 280 (63.63 per cent) households have own cultivation and rest of the 160 (36.37 per cent) households are engaged in tenant cultivation. Further, out of the total own cultivation, the share of marginal, small,

semi-medium, medium and large farm households has been 10 per cent, 25.71 per cent, 32.14 per cent, 25.71 per cent and 6.44 per cent respectively. In case of tenant cultivation, the relative share comes out to be 3.75 per cent for marginal, 20.63 per cent for small, 37.50 per cent for semi-medium, 31.25 per cent for medium and 6.87 per cent for large farm households.

A vast inequality exists in the distribution of landholdings. A major chunk of landholdings is owned by big farmers, landlords and moneylenders whereas most of the cultivators are tenants who have very small share of landholdings. Such inequality has serious implications for the development of horticulture sector on the one hand and for crop diversification on the other. Adequate motivation is required for adoption of new crops/ latest technologies. It has been observed that inequality in landholdings demotivated the tenants to adopt new technologies/ strategies in horticulture cultivation. Some of the respondents pointed out their willingness to adopt new technologies in horticulture but due to uncertainty about the tenure of tenancy from the land owner, they found unable to do so. The land owners frequently change the tenants on one pretext or the other. So the tenants have less interest to invest in land improvement and to adopt latest technologies in horticulture cultivation. Sometimes the land owners demand higher rents (Thekka) if tenant shows interest to adopt intercropping in the field. This phenomenon is one of the barriers in crop diversification and growth of horticulture as well. It may be highlighted that the terms & conditions of tenancy between land owner and tenant are oral in nature, consequently there is no legal compulsion/ obligation on any party to adhere to it. Another crucial issue about inequality in landholdings is that if crop failure happens due to natural calamities or pest attacks and the state government announces some compensation to the farmers. The amount of compensation goes to the owners of the land instead of tenants who are the actual cultivator. In most of the cases, the land owners refused to pay the amount of compensation to the tenants. There is an urgent need to modify compensation policies in favour of tenants instead of land owner to enhance interest and motivation of the tenants towards horticulture activities.

Moreover, due to price fluctuations along with weather vagaries tenant farmers have less capacity to bear risks, therefore, they stick to the existing cropping pattern and avoid applying latest technologies in the fields.

### **II.3: Cropping Pattern**

The agricultural farmers are usually motivated for growing some crops which are determined by various factors like crops' productivity, higher profits, easy to grow, etc.,. The

farmers generally grow those crops which have high potential, higher productivity, higher market value and cost effective with assured availability of quality seeds and planting materials. Farmer's access to government facilities under various missions/schemes can have tendency of crop diversification towards horticulture cultivation, including high value crops.

In other words, cropping pattern depends mainly on quality & availability of irrigation water soil condition, traditional agricultural practices, availability of quality seeds & fertilisers etc. The cropping pattern for the sample households during Kharif season has been presented in Table 5. During Kharif season the major crops were Bajra, Cotton, Paddy, Gawar, Oilseeds, Vegetables, Fruits, Flowers, Mushroom. The main vegetable crops were Tomato, Cauliflower (Gobhi), Kakri, Cucumber (Kheera), Ridged Gourd (Turai), Bottle Guard (Ghiya), Bitter Melon (Karela), Ladyfinger (Bhindi), Brinjal (Baigan), Potato, Chillies (Mirch), Radish (Mooli), Capsicum (Simala Mirch), Coriander Leaf (Dhaniya), Peas (Matar), Spinach (Palak), Mushroom, Sweetcorn, Babycorn, Onion etc.

**Table 5: Cropping Pattern during Kharif Season**

S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)			Area (acre)			Area (acre)		
		2016-17	2015-16	2014-15	2016-17	2015-16	2014-15	2016-17	2015-16	2014-15
01	Bajra	176.5 (8.60)	163.5 (7.99)	167.5 (8.40)	289 (17.54)	307 (18.57)	295.5 (17.03)	465.5 (12.58)	470.5 (12.71)	463 (12.41)
02	Cotton	273 (13.30)	272 (13.28)	271 (13.59)	291 (17.66)	302.5 (18.30)	329 (18.96)	564 (15.24)	574.5 (15.52)	600 (16.09)
03	Paddy	527.5 (25.70)	632.5 (30.89)	617.5 (30.96)	772.5 (46.89)	763.5 (46.19)	884.5 (50.98)	1300 (35.13)	1396 (37.72)	1502 (40.27)
04	Gawar	206.5 (10.06)	227 (11.09)	224 (11.23)	210 (12.75)	230.5 (13.94)	179 (10.32)	416.5 (11.26)	457.5 (12.36)	403 (10.81)
05	Oilseeds	45.5 (2.22)	50 (2.44)	45 (2.26)	31.5 (1.91)	20.5 (1.24)	26 (1.50)	77 (2.08)	70.5 (1.91)	71 (1.90)
06	Others	11.5 (0.56)	10 (0.49)	5.5 (0.28)	53.5 (3.25)	29 (1.75)	21 (1.21)	65 (1.76)	39 (1.05)	26.5 (0.71)
07	Sub Total	1240.75 (60.44)	1355 (66.18)	1330.5 (66.71)	1647.5 (100)	1653 (100)	1735 (100)	2888 (78.05)	3008 (81.29)	3065.5 (82.90)
08	Vegetables	779.5 (37.97)	676 (33.02)	638.5 (32.01)	0 (0.00)	0 (0.00)	0 (0.00)	779.5 (21.07)	676 (18.26)	638.5 (17.12)
09	Fruits	2.5 (0.12)	2.5 (0.12)	2.5 (0.13)	0 (0.00)	0 (0.00)	0 (0.00)	2.5 (0.07)	2.5 (0.07)	2.5 (0.07)
10	Flowers	30 (1.46)	14 (0.68)	23 (1.15)	0 (0.00)	0 (0.00)	0 (0.00)	30 (0.81)	14 (0.38)	23 (0.62)
11	Sub Total	812 (39.56)	692.5 (33.82)	664 (33.29)	0 (0.00)	0 (0.00)	0 (0.00)	812 (21.94)	692.5 (18.71)	664 (17.82)
12	<b>Grand Total</b>	<b>2052.75 (100)</b>	<b>2047.5 (100)</b>	<b>1994.5 (100)</b>	<b>1647.5 (100)</b>	<b>1653 (100)</b>	<b>1735 (100)</b>	<b>3700.25 (100)</b>	<b>3700.5 (100)</b>	<b>3729.5 (100)</b>

Source: Field Survey, 2017

Note: Figures in brackets indicate per cent to total.

The data reveals that total area under cultivation of Kharif crops has slightly decreased from 3729.5 acres to 3700 acres during the period 2014-15 to 2016-2017. Similarly, the area under cultivation of Kharif crops in the category of non horticulturist has declined from 1735 acres to 1647.5 acres but interestingly it increased from 1994.5 acres to 2052.75 acres for horticulturist households during the period under consideration.

It may be noted that the share of area under paddy and cotton cultivation in total area cultivated area in Kharif season has decreased from 56.36 per cent in 2014-15 to 50.37 per cent in 2016-17 whereas the corresponding share for horticulture crops increased from 17.82 per cent to 21.94 per cent during the same period.

Further, in absolute terms total area under cultivation of paddy and cotton has perceptibly decreased by 11.32 per cent from 2102 acres in 2014-15 to 1864 acres in 2016-17 whereas the area under horticulture crops tended to increase with a growth rate of 22.29 per cent from 664 to 812 acres during the same period. It indicates that the cropping pattern during Kharif season is diverting towards horticulture crops and it may be considered as a health proposition for sustainability & viability in agriculture.

**Table 6: Cropping Pattern during Rabi Season**

S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)			Area (acre)			Area (acre)		
		2016-17	2015-16	2014-15	2016-17	2015-16	2014-15	2016-17	2015-16	2014-15
01	Wheat	1210.5 (47.21)	1269 (53.69)	1208.5 (53.73)	1393 (71.51)	1394 (76.24)	1480.5 (77.59)	2603.5 (57.70)	2663 (63.53)	2689 (64.69)
02	Mustard	190 (7.41)	152.5 (6.45)	139 (6.18)	372 (19.10)	292.5 (16.00)	267.5 (14.02)	562 (12.45)	445 (10.62)	406.5 (9.78)
03	Sugarcane	52.5 (2.05)	56 (2.37)	60.5 (2.69)	136 (6.98)	112 (6.13)	137 (7.18)	188.5 (4.18)	168 (4.01)	197.5 (4.75)
04	Millet	8 (0.31)	2 (0.08)	26 (1.16)	27 (1.39)	9 (0.49)	11 (0.58)	35 (0.78)	11 (0.26)	37 (0.89)
05	Others	26 (1.01)	7 (0.30)	7 (0.31)	20 (1.03)	21 (1.15)	12 (1.15)	46 (0.63)	28 (1.02)	19 (0.89)
06	Sub Total	1487 (57.99)	1486.5 (62.89)	1441 (64.07)	1948 (100)	1828.5 (100)	1908 (100)	3435 (76.13)	3315 (79.08)	3349 (80.56)
07	Vegetables	752.75 (29.36)	560.5 (23.71)	497 (22.10)	0 (0.00)	0 (0.00)	0 (0.00)	752.75 (16.68)	560.5 (13.37)	497 (11.96)
07	Fruits	313.5 (12.23)	316 (13.37)	311 (13.83)	0 (0.00)	0 (0.00)	0 (0.00)	313.5 (6.95)	316 (7.54)	311 (7.48)
08	Flowers	11 (0.43)	0.5 (0.02)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (0.24)	0.5 (0.01)	0 (0.00)
09	Sub Total	1077.25 (42.01)	877 (37.11)	808 (35.93)	0 (0.00)	0 (0.00)	0 (0.00)	1077.25 (23.87)	877 (20.92)	808 (19.44)
10	<b>Grand Total</b>	<b>2564.25 (100)</b>	<b>2363.5 (100)</b>	<b>2249 (100)</b>	<b>1948 (100)</b>	<b>1828.5 (100)</b>	<b>1908 (100)</b>	<b>4512.25 (100)</b>	<b>4192 (100)</b>	<b>4157 (100)</b>

Source: Field Survey, 2017

Note: Figures in brackets indicate per cent to total.

The cropping pattern of Rabi season has been presented in Table 6. The major crops were wheat, mustard, sugarcane, millet and horticulture crops (vegetables, flowers, fruits). The data shows that total area under Rabi crops has increased from 4157 acres in 2014-15 to 4512.25 acres in 2016-17 with a growth rate of 8.55 per cent. The share of area under wheat and sugarcane in total area cultivated in Rabi season has decreased from 69.44 per cent to 61.88 per cent whereas that of under horticulture crops increased from 19.44 per cent to 23.87 per cent during the period 2014-15 to 2016-17. In absolute terms, the area under wheat and sugarcane has decreased by 3.27 per cent from 2886.5 acres to 2792 acres during the period under consideration. But the area under horticulture crops has perceptibly increased with a growth rate of 33.32 per cent from 808 acres in 2014-15 to 1077.25 acres in 2016-17.

It has been observed that wheat paddy rotation is dominantly prevailing in the state. Interestingly, paddy is not a traditional crop of this region. Despite that a perceptible area has been under paddy cultivation. It has been observed that paddy cultivation is profitable proposition only because of highly subsidized supply of electricity and irrigation water. Subsidised power supply motivates farmers to utilise the scarce resources, particularly ground water and electricity, in an inefficient manner. Consequently, the crisis for sustainable development of agriculture as well as power sector becomes inevitable.

The data reveals that the area under these two crops (Wheat & Paddy) has a tendency to decrease whereas the area under horticulture crops has increased over the period of time in the study area. It clearly points out towards crops diversification in favour of horticulture crops. This was probably due to adoption of commercial farming approach by the farmer and the appreciable efforts that have been made by the government. It may be highlighted that the households have shown their interest in horticulture crops instead of traditional wheat paddy mono cropping pattern in the study area.

The Table 7 presents the distribution of area under horticulture crops. The data reveals that the area under horticulture crops during Kharif season has increased with a growth rate of 22.29 per cent from 664 acres to 812 acres during the period 2014-15 to 2016-17 in the study area. It needs to be noted that about 96 per cent of the total area under horticulture crops has been used for vegetable cultivation by the horticulturist sample households. The share of total area under flowers and fruits comes out to be 3.69 per cent and 0.31 per cent respectively during the same period. Moreover, it may be highlighted that more than 68 per cent of the total area under horticulture cultivation was covered under five vegetable crops i.e., Tomato, Cauliflower, Bottle Gourd, Sweetcorn and Babycorn in the study area during the year 2016-17.



It has been observed that the area under paddy cultivation has decreased by 13.45 per cent but the area under horticulture crops increased by 22.29 per cent during the Kharif season in the study area. In absolute terms, the area under paddy cultivation decreased by 202 acres while that of under horticulture crops increased by 148 acres during the period 2014-15 to 2016-17.

**Table 7: Distribution of Area under Horticulture Crops during Kharif Season**

S. No	Crop	2016-17	2015-16	2014-15
		Area (acre)		
1	Tomato	184.5 (22.71)	136.75 (19.75)	152 (22.89)
2	Cauliflower (Gobhi)	201.5 (24.81)	206 (29.75)	180.5 (27.18)
3	Bottle Gourd (Ghiya)	70.5 (8.68)	64.5 (9.31)	48 (7.23)
4	Sweetcorn	55.5 (6.83)	45.5 (6.57)	32 (4.82)
5	Babycorn	42 (5.17)	51 (7.36)	46 (6.93)
6	Lady Finger (Bhindi)	35.5 (4.37)	21.25 (3.07)	19 (2.86)
7	Cucumber (Kheera)	27.5 (3.39)	24 (3.47)	21 (3.16)
8	Ridge Gourd (Tori)	18.5 (2.28)	4.5 (0.65)	4.5 (0.68)
9	Capsicum (Simla Mirch)	23 (2.83)	18.5 (2.67)	20.5 (3.09)
10	Kakri	19 (2.34)	12.5 (1.81)	20.5 (3.09)
11	Brinjal (Bangan)	15.5 (1.91)	14.5 (2.09)	15 (2.26)
12	Potato	15.5 (1.91)	19 (2.74)	15 (2.26)
13	Chilli	14.5 (1.82)	12 (1.73)	13.5 (2.03)
14	Mushroom	14.5 (1.79)	12.5 (1.81)	12 (1.81)
15	Radish (Muli)	13.5 (1.66)	21 (3.03)	23 (3.46)
16	Coriander (Dhania)	12 (1.48)	3 (0.43)	4.5 (0.68)
17	Bitter Gourd (Karela)	6.5 (0.80)	4 (0.58)	4.5 (0.68)
18	Onion	5 (0.62)	4 (0.58)	4 (0.60)
19	Ash Gourd (Petha)	4 (0.49)	0 (0.00)	0 (0.00)
20	Peas	1 (0.12)	0 (0.00)	2 (0.30)
21	Tinda	0 (0.00)	1.5 (0.22)	1 (0.15)
22	<b>Sub Total Vegetables</b>	<b>779.75 (96.00)</b>	<b>676 (97.62)</b>	<b>638.5 (96.16)</b>
23	Marigold (Gainda)	30 (3.69)	14 (2.02)	23 (3.46)
24	<b>Sub Total Flowers</b>	<b>30 (3.69)</b>	<b>14 (2.02)</b>	<b>23 (3.46)</b>
25	Amla	0.5 (0.06)	0.5 (0.07)	0.5 (0.08)
26	Belgiri	2 (0.25)	2 (0.29)	2 (0.30)
27	<b>Sub Total Fruits</b>	<b>2.5 (0.31)</b>	<b>2.5 (0.36)</b>	<b>2.5 (0.38)</b>
28	<b>Grand Total</b>	<b>812 (100)</b>	<b>692.5 (100)</b>	<b>664 (100)</b>

Source: Field Survey, 2017

Note: Values in brackets indicate per cent to total

The Table 8 presents the distribution of area under horticulture crops during Rabi season. The data reveals that the area under horticulture crops has increased by 33.32 per cent from 808 acres in 2014-15 to 1077.25 acres in 2016-17. The area cultivated under vegetable crops in Rabi season comes out to be more than 60 per cent of the total area under horticulture cultivation in the study area. It has also been observed that the share of area under fruits works out to be about 30 per cent of the total area under horticulture crops during Rabi season.

**Table 8: Distribution of Area under Horticulture Crops during Rabi Season**

S. No	Crop	2016-17	2015-16	2014-15
		Area (acre)		
1	Tomato	112 (10.40)	99.5 (11.35)	98 (12.13)
2	Cauliflower (Gobhi)	192.5 (17.87)	139 (15.85)	154.5 (19.12)
3	Sweetcorn	67 (6.22)	35 (3.99)	33 (4.08)
4	Babycorn	66 (6.13)	68 (7.75)	51 (6.31)
5	Cucumber (Kheera)	42 (3.90)	41.5 (4.73)	22.5 (2.78)
6	Onion	38 (3.53)	32 (3.65)	17 (2.10)
7	Kakri	34 (3.16)	18 (2.05)	10 (1.24)
8	Chilli	32 (2.97)	23 (2.62)	30.5 (3.77)
9	Capsicum (Simla Mirch)	29 (2.69)	8 (0.91)	9 (1.11)
10	Bottle Gourd (Ghiya)	27 (2.51)	13 (1.48)	6 (0.74)
11	Bitter Gourd (Karela)	20 (1.86)	11.5 (1.31)	13 (1.61)
12	Lady Finger (Bhindi)	16.5 (1.53)	15.5 (1.77)	15 (1.86)
13	Coriander (Dhania)	16.5 (1.53)	5 (0.57)	4.5 (0.56)
14	Radish (Muli)	16 (1.49)	14.5 (1.65)	9 (1.11)
15	Potato	9.5 (0.88)	10.5 (1.20)	0 (0.00)
16	Spinach (Palak)	7.25 (0.67)	1 (0.11)	10 (1.24)
17	Peas	7 (0.65)	13 (1.48)	5 (0.62)
18	Mushroom	6 (0.56)	7.5 (0.86)	6 (0.74)
19	Ash Gourd (Petha)	5 (0.46)	1 (0.11)	0 (0.00)
20	Tinda	3.5 (0.32)	0 (0.00)	0 (0.00)
21	Brinjal (Bangan)	3 (0.28)	0 (0.00)	0 (0.00)
22	Radish	2 (0.19)	1 (0.11)	0 (0.00)
23	Ridge Gourd (Tori)	1 (0.09)	2 (0.23)	2 (0.25)
24	Mint (Pudina)	0 (0.00)	1 (0.11)	1 (0.12)
25	<b>Sub Total</b>	<b>752.75 (69.88)</b>	<b>560.5 (63.19)</b>	<b>497 (61.51)</b>
26	Marigold (Gainda)	11 (1.02)	0.5 (0.06)	0 (0.00)
27	<b>Sub Total</b>	<b>11 (1.02)</b>	<b>0.5 (0.06)</b>	<b>0 (0.00)</b>
28	Kinoo	277 (25.71)	277 (31.58)	277 (34.28)
29	Malta	34 (3.16)	34 (3.88)	34 (4.21)
30	Water Melon (Turbuj)	2.5 (0.23)	5 (0.57)	0 (0.00)
31	<b>Sub Total</b>	<b>313.5 (29.10)</b>	<b>316 (36.03)</b>	<b>311 (38.49)</b>
32	<b>Grand Total</b>	<b>1077.25 (100)</b>	<b>877 (100)</b>	<b>808 (100)</b>

Source: Field Survey, 2017

Note: Values in brackets indicate per cent to total

The available literature highlights that Haryana has varying climatic conditions which are conducive for cultivation of several medicinal plants and some of them require very less care. Medicinal and aromatic plants have a great potential in the state. The pharmaceutical and herbal industries/ units have a vast requirement of medicinal and aromatic plants. In spite of having potentials, farmers have not shown much interest in cultivation of medicinal plants in the study area. It might be due to lack of adequate awareness among the farmers.

There is an urgent need to motivate farmers through awareness generation programmes regarding horticulture crops at the grass root levels with the help of Panchayati Raj Institutions. The state government is engaged in awareness generation programmes but more focussed efforts for horticulture cultivation are required to break down two crops mono

cropping pattern to ensure agricultural sustainability. There is huge potential for cultivation of Alovera, Rose, Tulsi, Lemon and Ber in the state that needs to be explored.

#### **II.4: Area, Production and Productivity**

It needs to be noted that most of the horticulture crops are short-termed and are either perishable or non-durable commodities. Consequently adequate post harvest infrastructure with respect to cold storage, transportation and sound marketing system is a very challenging task. Broadly, post harvest infrastructure includes creation of suitable infrastructure for efficient post harvest management and marketing of horticultural produce (handling, grading, transport, storage and marketing), besides taking up market promotional activities such as dissemination of market information to the farmers, processors, traders, and consumers.

In other words, the existence of infrastructure such as, access to market, road connectivity, availability of communication facilities, etc, facilitate a better post harvest management of the horticulture produces and also help the farmers in receiving a better price for their produce. However, the pace of infrastructure development in terms of storage facilities, transportation connectivity and assured marketing has been below expectations in the state of Haryana. These factors together also have negative impact on crops yield and expected income of the farmers that in turn influence their decision for selection of crops in cropping seasons for horticulture cultivation.

The production and productivity of agriculture crops depends on many factors like availability of reliable irrigation facilities, utilisation of High Yielding Varieties (HYVs) seeds, pesticides and chemical fertilisers, weather conditions etc. The irrigation water supply becomes a critical input in the agricultural production process. Timely availability of irrigation water motivates the farmers to invest in other inputs like HYV seeds, fertilizers etc., all of which are helpful to increase crops productivity and production.

It needs to be noted that climate change, reflected in terms of high temperature stress, drought, excess rainfall, untimely rainfall, incidence of insect and pests incidence, has great influence on the production and productivity of horticulture crops. The changes in seasonal temperature may lead to shift agro climatic regions. Therefore, there is an urgent need to breed new varieties of horticulture crops that resist climatic stress with higher yield potentials.

The Table 9 presents the data about area, production and productivity of major crops in Kharif seasons for the years 2014-15 to 2016-17. The data shows that out of the area sown during Kharif season, more than 78 per cent was under traditional agriculture crops and rest

of the area, about 22 per cent, was used for horticulture crops by the sample households in the study area.

**Table 9: Area, Production and Productivity of Major Crops during Kharif Season**

S. No	Crop	2016-17								
		Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Bajra	176.5	1257	7.12	289	2028.5	7.02	465.5	3285.5	7.06
02	Cotton	273	1006	3.68	291	1452.5	4.99	564	2458.5	4.36
03	Paddy	527.5	11724	22.23	772.5	16423.5	21.26	1300	28147.5	21.65
04	Gawar	206.5	644	3.12	210	692	3.30	416.5	1336	3.21
05	Oilseeds	45.5	148.5	3.26	31.5	68	2.16	77	216.5	2.81
06	Others	11.5	154	13.39	53.5	678	12.67	65	832	12.80
07	<b>Sub Total</b>	<b>1240.5</b>	<b>14933.5</b>	<b>12.04</b>	<b>1647.5</b>	<b>21342.5</b>	<b>12.95</b>	<b>2888</b>	<b>36276</b>	<b>12.56</b>
08	Vegetables	765	62365.5	81.50	0	0	0.00	765	62365.5	81.50
09	Fruits	2.5	430	172.00	0	0	0.00	2.5	430	172.00
10	Flowers	30	176.5	5.88	0	0	0.00	30	176.5	5.88
11	<b>Sub Total</b>	<b>797.5</b>	<b>62972</b>	<b>78.94</b>	<b>0</b>	<b>0</b>	<b>0.00</b>	<b>797.5</b>	<b>62972</b>	<b>78.94</b>
12	Mushroom#	14.5	3250	224.14	0	0	0.00	14.5	3250	224.14
13	<b>Total</b>	<b>2052.5</b>	<b>77905.5*</b>	<b>38.22*</b>	<b>1647.5</b>	<b>21342.5</b>	<b>12.95</b>	<b>3700</b>	<b>99248*</b>	<b>26.93*</b>
2015-16										
S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Bajra	163.5	1294	7.91	307	2661.5	8.67	470.5	3955.5	8.41
02	Cotton	272	1062	3.90	302.5	2260.5	7.47	574.5	3322.5	5.78
03	Paddy	632.5	13486	21.32	763.5	15390.5	20.16	1396	28876.5	20.69
04	Gawar	227	757	3.33	230.5	689	2.99	457.5	1446	3.16
05	Oilseeds	50	154	3.08	20.5	47.5	2.32	70.5	201.5	2.86
06	Others	10	114	11.40	29	506	17.45	39	620	15.90
07	<b>Sub Total</b>	<b>1355</b>	<b>16867</b>	<b>12.45</b>	<b>1653</b>	<b>21555</b>	<b>13.04</b>	<b>3008</b>	<b>39922</b>	<b>13.27</b>
08	Vegetables	663.5	53222.5	80.21	0	0	0.00	663.5	53222.5	80.21
09	Fruits	2.5	235	94.00	0	0	0.00	2.5	235	94.00
10	Flowers	14	113	8.07	0	0	0.00	14	113	8.07
11	<b>Sub Total</b>	<b>680</b>	<b>53570.5</b>	<b>78.78</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>680</b>	<b>53570.5</b>	<b>78.78</b>
12	Mushroom#	12.5	610	48.80	0	0	0.00	12.5	610	48.80
13	<b>Grand Total</b>	<b>2047.5</b>	<b>71937.5*</b>	<b>35.35*</b>	<b>1653</b>	<b>21555</b>	<b>13.04</b>	<b>3700.5</b>	<b>93492.5*</b>	<b>25.35*</b>
2014-15										
S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Bajra	167.5	1826	10.90	295.5	2936	9.94	463	3262	7.05
02	Cotton	271	2068	7.63	329	2302	7.00	600	2370	3.95
03	Paddy	617.5	12528.5	20.29	884.5	16963.5	19.18	1502	29492	19.64
04	Gawar	224	796	3.55	179	494	2.76	403	1290	3.20
05	Oilseeds	45	145.5	3.23	26	69	2.65	71	214.5	3.02
06	Others	5.5	48	8.73	21	322	15.33	26.5	370	13.96
07	<b>Sub Total</b>	<b>1330.5</b>	<b>15712</b>	<b>11.81</b>	<b>1735</b>	<b>21286.5</b>	<b>12.27</b>	<b>3065.5</b>	<b>36998.5</b>	<b>12.07</b>
08	Vegetables	627	47516	75.78	0	0	0.00	627	47516	75.78
09	Fruits	2.5	290	116.00	0	0	0.00	2.5	290	116.00
10	Flowers	23	187	8.13	0	0	0.00	23	187	8.13
11	<b>Sub Total</b>	<b>652.5</b>	<b>47993</b>	<b>73.55</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>652.5</b>	<b>47993</b>	<b>73.55</b>
12	Mushroom#	11.5	2210	192.17	0	0	0.00	11.5	2210	192.17
13	<b>Grand Total</b>	<b>1994.5</b>	<b>65405*</b>	<b>32.98*</b>	<b>1735</b>	<b>23086.5</b>	<b>13.31</b>	<b>3718</b>	<b>88491.5*</b>	<b>23.80*</b>

Source: Field Survey, 2017

Note: #- Production in terms of Trays; \*- excluding mushroom; TP- Total Production; Prod- Productivity; Qtls- Quintals; Q/A- Quintals per acre

It is interesting to highlight that the share of area under only paddy cultivation in total area under traditional crops comes out to be more than 45 per cent irrespective of the categories of the households. But it needs to be noted that the area under horticulture crops was about 40 per cent in the category of horticulturist households. Per acre productivity, excluding mushroom, for the sample households comes out to be 26.93 quintals. Moreover, per acre productivity for traditional crops happens to be 12.56 quintals. It may be noted that per acre productivity for horticulture crops turns out to be 83.01 quintals which is significantly high than that of traditional crops. Similarly, per acre productivity works out to be 12.04 quintals for traditional crops and 78.94 quintals for horticulture crops, excluding mushroom in the category of horticulturist households. In other words, per acre productivity of horticulture crops was perceptibly high as compared to traditional crops.

It may be noted that per acre productivity for horticulture and traditional crops have more or less similar pattern in Kharif seasons for the sample households during the years 2014-15 to 2016-17. Moreover, per acre productivity of horticulture crops in Kharif season has slightly improved over the period of time. It may be considered as a positive indication for crop diversification in favour of horticulture crops.

During the Kharif season, the production of horticulture crops, excluding mushroom, has increased from 47,993 quintals in 2014-15 to 62,972 quintals in 2016-17 with a growth rate of 31.21 per cent whereas the area under horticulture crops increased with a growth rate of 22.15 per cent (from 652.5 acres to 797.5 acres). Correspondingly, the productivity of horticulture crops, excluding mushroom, has also increased with a growth rate of 7.33 per cent from 73.55 quintals to 78.94 quintals per acre during the same period.

Further, we also tried to examine the pattern of production and productivity of major crops during Rabi season for the sample households. The Table 10 presents the area, production and productivity of major crops in Rabi seasons for the years 2014-15 to 2016-17.

The data reveals that out of the total area sown in Rabi seasons, more than 75 per cent area has been used for cultivation of traditional crops and rest of the area about 25 per cent for horticulture crops in the study area. But the share of area under horticulture crops comes out to be about 42 per cent in the category of horticulturist households. It needs to be noted that the area under wheat and sugarcane cultivation comes out to be more than 65 per cent of the total area sown in Rabi season for the sample households. Further, it has been observed

that per acre productivity of horticulture crops was much higher than that of traditional crops in study area.

**Table 10: Area, Production and Productivity of Major Crops during Rabi Seasons**

S. No	Crop	2016-17								
		Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Wheat	1210.5	23481.5	19.40	1393	26409	18.96	2603.5	49890.5	19.16
02	Mustard	190	1703	8.96	372	2712.5	7.29	562	4415.5	7.86
03	Sugarcane	52.5	17045	324.67	136	44075	324.08	188.5	61120	324.24
04	Millet	8	121	15.13	27	514	19.04	35	635	18.14
05	Others	26	100	3.85	20	90	4.50	46	190	4.13
06	<b>Sub Total</b>	<b>1487</b>	<b>42450.5</b>	<b>28.55</b>	<b>1948</b>	<b>73800.5</b>	<b>37.89</b>	<b>3435</b>	<b>116251</b>	<b>33.84</b>
07	Vegetables	746.75	57768	77.36	0	0	0.00	746.75	57768	77.36
08	Fruits	313.5	31710	101.15	0	0	0.00	313.5	31710	101.15
09	Flowers	11	65	5.91	0	0	0.00	11	65	5.91
10	<b>Sub Total</b>	<b>1071.25</b>	<b>89543</b>	<b>83.59</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1071.25</b>	<b>89543</b>	<b>83.59</b>
11	Mushroom#	6	1030	171.67	0	0	0.00	6	1030	171.67
12	<b>Grand Total</b>	<b>2564.25</b>	<b>131993.5*</b>	<b>51.60*</b>	<b>1948</b>	<b>73800.5</b>	<b>37.89</b>	<b>4512.25</b>	<b>205794*</b>	<b>45.67*</b>
2015-16										
S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Wheat	1269	22707.5	17.89	1394	24356	17.47	2663	47063.5	17.67
02	Mustard	152.5	1297	8.50	292.5	2117	7.24	445	3414	7.67
03	Sugarcane	56	17750	316.96	112	38090	340.09	168	55840	332.38
04	Millet	2	40	20.00	9	128	14.22	11	168	15.27
05	Others	7	22	3.14	21	84	4.00	28	106	3.79
06	<b>Sub Total</b>	<b>1486.5</b>	<b>41816.5</b>	<b>28.13</b>	<b>1828.5</b>	<b>64775</b>	<b>35.43</b>	<b>3315</b>	<b>106591.5</b>	<b>32.15</b>
07	Vegetables	553	50582.5	91.47	0	0	0.00	553	50582.5	91.47
08	Fruits	316	27370	86.61	0	0	0.00	316	27370	86.61
09	Flowers	0.5	5	10.00	0	0	0.00	0.5	5	10.00
10	<b>Sub Total</b>	<b>869.5</b>	<b>77957.5</b>	<b>89.66</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>869.5</b>	<b>77957.5</b>	<b>89.66</b>
11	Mushroom#	7.5	1390	185.33	0	0	0.00	7.5	1390	185.33
12	<b>Total</b>	<b>2363.5</b>	<b>119774*</b>	<b>50.84*</b>	<b>1828.5</b>	<b>64775</b>	<b>35.43</b>	<b>4192</b>	<b>184549*</b>	<b>44.44*</b>
2014-15										
S. No	Crop	Horticulturist Households			Non Agriculturist Households			Total		
		Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)	Area (acre)	TP (Qtls)	Prod (Q/A)
01	Wheat	1208.5	20474	16.94	1480.5	24937.5	16.84	2689	45411.5	16.89
02	Mustard	139	1236.5	8.90	267.5	1914.5	7.16	406.5	3151	7.75
03	Sugarcane	60.5	19390	320.50	137	47100	343.80	197.5	66490	336.66
04	Millet	26	604	23.23	11	155	14.09	37	759	20.51
05	Others	7	45	6.43	12	48	4.00	19	93	4.89
06	<b>Sub Total</b>	<b>1441</b>	<b>41749.5</b>	<b>28.97</b>	<b>1908</b>	<b>74155</b>	<b>38.87</b>	<b>3349</b>	<b>115904.5</b>	<b>34.61</b>
07	Vegetables	491	42479	86.52	0	0	0.00	491	42479	86.52
08	Fruits	311	27448	88.26	0	0	0.00	311	27448	88.26
09	Flowers	0	0	0.00	0	0	0.00	0	0	0.00
10	<b>Sub Total</b>	<b>802</b>	<b>69927</b>	<b>87.19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>802</b>	<b>69927</b>	<b>87.19</b>
11	Mushroom#	6	1020	170.00	0	0	0.00	6	1020	170.00
12	<b>GrandTotal</b>	<b>2249</b>	<b>111676.5*</b>	<b>49.79*</b>	<b>1908</b>	<b>74155</b>	<b>38.87</b>	<b>4157</b>	<b>185831.5*</b>	<b>44.77*</b>

Source: Field Survey, 2017

Note: #- Production in terms of Trays; \*- excluding mushroom; TP- Total Production; Prod- Productivity; Qtls- Quintals; Q/A- Quintals per acre

During the Rabi season, the production of horticulture crops, excluding mushroom, has increased from 69,927 quintals in 2014-15 to 89,543 quintals in 2016-17 with a growth rate of 28.17 per cent whereas the area under horticulture crops increased with a growth rate of 33.57 per cent (from 802 acres to 1071.25 acres). Correspondingly, the productivity of horticulture crops, excluding mushroom, has slightly decreased with a growth rate of 4.13 per cent from 87.19 quintals to 83.59 quintals per acre during the same period.

It may be pointed out that per acre productivity of horticulture crops during both the cropping seasons, Kharif and Rabi, was much higher than that of traditional crops for the sample households. Some households were also engaged in mushroom cultivation, which is also one of the remunerative crops. But the pace of growth of horticulture crops in the study area was slow that needs to be enhanced through effective policy interventions at the ground levels.

Success of horticultural crop production depends mainly on the availability of the right type of planting material, which also governs productivity and quality. Any improvement in technological base and other strategies will not have the desired impact on productivity unless quality planting material is made available. If proper measures are not adopted in selection of the planting material, it can cause permanent damage to the land productivity and the income of the farmers.

It has been observed that the farmers are not following best practices specified by the agricultural experts or the state government but they trust on the private shopkeepers. This happens mainly due to inaccessibility of concerned officials even at block level and lack of awareness among the farmers on the one hand and easy accessibility of private shopkeepers on the other. There is huge shortage of trained manpower that needs to be enhanced urgently. The private shopkeepers provide unnecessary and unreliable seeds and pesticides for their own sake. There should be a proper regulation or mechanism to hold private seeds & pesticide companies accountable for false claims because such companies ultimately blame innocent farmers in case of crops failure.

Due to lack of post harvest infrastructure and effective marketing mechanism for the horticulture produce, the farmers hesitate to divert towards horticulture cultivation. Consequently, they generally prefer the existing wheat paddy dominated cropping pattern that is not ecologically sustainable. There is an urgent need to look into the issue on priority basis.

In this context, the role of Panchayati Raj Institutions becomes very pertinent because these institutions may play very crucial role to generate awareness among the farmers for crop diversification in favour of horticulture crops.

Instead of growing a large number of crops, the state must focus on few selected crops, in which it has strength and which are bound to show impact in very near future and positively benefit to the farmers. This would motivate the farmers for horticulture cultivation. The state government should develop area specific varieties of the horticulture crops like lemon, rose, ber, spices, jasmine, Tulsi, Alovera etc., to achieve maximum yield and higher returns.

## **II. 5: Sources of Irrigations**

The significance of quality irrigation water in agriculture has been well recognised in the literature. There are two sources of irrigation, apart from rainfall, in Haryana i.e., canal irrigation and tubewell irrigation. Presently, about 70 per cent of irrigated area depends on tubewell irrigations in the state of Haryana (Statistical Abstract of Haryana 2015-16).

The Table 11 highlights category wise sources of irrigation for the sample households. The data reveals that there are three sources, apart from rainfall, of irrigation i.e., canal, electric tube well and diesel pump sets. Out of the total irrigated area of 4591.25 acres, 20.90 per cent (959.5 acres) is irrigated by canal; 70.88 per cent (3254.25 acres) by electric tube wells and 8.22 per cent (377.50 acres) by diesel pump sets in the study area. It is clear from the available information that electric tube well is the major source of irrigation that irrigates 70.88 per cent of the total irrigation land of the sample households.

The data, further, shows that out of the total irrigated area (4591.25 acres), 68.84 per cent (2911.25 acres) is irrigated with good quality of irrigation water. The area irrigated with average quality of irrigation water comes out to be 1183 acres (25.77 per cent) while 497 acres (10.82 per cent) is irrigated with bad quality of irrigation water. Bad quality of irrigation water is not conducive for cultivation still it is used by the sample households in wake of inadequate irrigation facilities. It has serious implications for the fertility of land.



**Table 11: Category wise Sources of Irrigation for the year 2016-17**

Category	Source	Quality of Irrigation Water Applied (acre)				Irrigation Techniques Adopted (acre)			
		Area (acre)	Good	Average	Bad	Flooding	Drip	Sprinkles	Mixed
Marginal	Canal	19	9	10	0	19	0	0	0
	Electric Tubewell	29.25	26.25	3	0	29.25	0	0	0
	Diesel Pump set	13.00	5	8	0	13.00	0	0	0
	<b>Total</b>	<b>61.25</b>	<b>40.25</b>	<b>21.00</b>	<b>0</b>	<b>61.25</b>	<b>0</b>	<b>0</b>	<b>0</b>
Small	Canal	108	78.5	29.5	0	108	0	0	0
	Electric Tubewell	266.5	153.5	108	5	141	57.5	13	55
	Diesel Pump set	21.5	11.5	10	0	21.5	0	0	0
	<b>Total</b>	<b>396.00</b>	<b>243.5</b>	<b>147.5</b>	<b>5.0</b>	<b>270.5</b>	<b>57.5</b>	<b>13</b>	<b>55</b>
Semi-Medium	Canal	243.5	179.5	64	0	243.5	0	0	0
	Electric Tubewell	765.5	550	194.5	21	551.5	54	4	156
	Diesel Pump set	153	37	81	35	153	0	0	0
	<b>Total</b>	<b>1162</b>	<b>766.5</b>	<b>339.5</b>	<b>56</b>	<b>948</b>	<b>54</b>	<b>4</b>	<b>156</b>
Medium	Canal	373	328	35	10	277	0	0	96
	Electric Tubewell	1421	1070	248	103	932	70	37.5	381.5
	Diesel Pump set	176	57	70	49	176	0	0	0
	<b>Total</b>	<b>1970</b>	<b>1455</b>	<b>353</b>	<b>162</b>	<b>1385</b>	<b>70</b>	<b>37.5</b>	<b>477.5</b>
Large	Canal	216	115	101	0	145	0	0	71
	Electric Tubewell	772	291	207	274	337	148	0	287
	Diesel Pump set	14	0	14	0	14	0	0	0
	<b>Total</b>	<b>1002</b>	<b>406</b>	<b>322</b>	<b>274</b>	<b>496</b>	<b>148</b>	<b>0</b>	<b>358</b>
Total	Canal	959.5 (20.90)	710	239.5	10	792.5	0	0	167
	Electric Tubewell	3254.25 (70.88)	2090.75	760.5	403	1990.75	329.5	54.5	879.5
	Diesel Pump set	377.5 (8.22)	110.5	183	84	377.5	0	0	0
	<b>Total</b>	<b>4591.25 (100)</b>	<b>2911.25 (63.41)</b>	<b>1183 (25.77)</b>	<b>497 (10.82)</b>	<b>3160.75 (68.84)</b>	<b>329.5 (7.18)</b>	<b>54.5 (1.19)</b>	<b>1046.5 (22.79)</b>

Source: Field Survey, 2017

As far as application of irrigation techniques is concerned, flooding irrigation method has been used in a majority of the irrigated land (68.84 per cent) of the sample households. Drip and sprinkles irrigation methods have been used in 329.5 acres and 54.5 acres

respectively that constitute 7.18 per cent and 1.19 per cent of the total irrigated land. The farmers have also adopted mixed techniques of irrigation. The area irrigated with the help of mixed techniques of irrigation by the sample households comes out to be 1046.5 acres that constitutes 22.79 per cent of the total irrigated area.

It may be pointed out that flooding irrigation technique has been dominantly used for irrigation in the study area. This technique leads to wastage of a heavy quantum of scarce irrigation water. The state government should take focussed initiatives to motivate the farmers to adopt drip and/ or sprinkle irrigation techniques in their fields through adequate awareness generation programmes at grass root levels to minimise wastage of irrigation water.

The state government provides subsidy in micro irrigation system for horticulture crops. But the farmers, particularly in Sirsa district, pointed out that private firms made available a set of sprinkle irrigation system for at least four acres of land and forced the farmers to purchase it. There are ten sprinkles per set of sprinkle irrigation system for four acres of land that are insufficient because a farmer is required to change lane frequently and it consumes a lot of energy and time. The respondents suggested that the private firms must be regulated to make available a sprinkle set, with more number of sprinkles, for less than four acres of land at reasonable prices so that the farmers with small land holdings may also be motivated to apply micro irrigation system in their fields.

Micro irrigation technology is very effective for efficient use of irrigation water. It also increases fertilizer use efficiency, limits weed growth and reduces incidence of pests and diseases. It has been observed that initial high cost, lack of awareness and lack of operational skill & training were the major constraints in adoption of the latest micro irrigation technologies in horticulture cultivation in the study area.

Some progressive big farmers have also adopted different schemes and started growing horticultural crops along with micro irrigation system in the study area. There is an urgent need to develop low cost structure for poly house, nets, shades etc. to make available new technologies at affordable prices to the small farm households also.

### Chapter III

#### Perception Regarding Motivational Factors and Hindrances in Horticulture Cultivation

This chapter deals with the perceptions of the sample households regarding various factors prevailing in horticulture cultivation.

##### III.1: Reasons of Non Adoption of Horticulture Cultivation

The information regarding major reasons responsible for non adoption of horticulture cultivation has been presented in Table 12.

**Table 12: Category wise Major Reasons for non adoption of Horticulture Cultivation**  
(multiple response)

Particulars	Marginal (17)	Small (55)	Semi Medium (83)	Medium (55)	Large (10)	Total (220)
Small Land Holdings	14	17	0	0	0	31
Lack of Awareness about horticulture activities	3	8	24	11	5	51
Financial Hardship	5	9	10	9	9	42
Lack of adequate Marketing Facilities	1	13	37	24	23	98
Transportation	1	1	7	7	7	23
High cost of cultivation	2	9	30	21	21	82
Lack of adequate irrigation facilities	2	19	37	20	18	96
Any other (including no response)	1	4	10	6	5	26

Source: Field Survey, 2017

The data reveals that main reason for non adoption of horticulture cultivation by non horticulturist sample households in the study area was inadequate marketing mechanism to dispose-off the horticulture produce at reasonable prices. Being a perishable in nature the horticulture produce, farmers cannot hold it up to fetch higher prices at some later stages. In this context, the grievances being faced, on this account, by the fellow farmers, who are engaged in horticulture activities, have also demotivated the sample households to adopt horticulture cultivation.

Second most important reason for the same issue was inadequate irrigation facilities. It is also considered as one of the major hurdles in crop diversification particularly in favour of horticulture crops. Availability of assured and good quality irrigation water is foremost requirement for horticulture cultivation.

The households pointed out that high cost of cultivation is also one of the reasons responsible for non adoption of horticulture cultivation in the study area. They argued that horticulture has become a high cost bearing proposition. In horticulture cultivation, being

labour intensive activity, a high quantum of labour is required and there is persistent shortage of labour in the present scenario. Due to shortage of labour, particularly after implementation of MGNREGA, the cost of labour hiring has tremendously increased as labour demands high wages.

Further, lack of awareness about horticulture activities, financial hardship, small land holdings and inadequate transportation have also appeared as crucial factors responsible for non adoption of horticulture cultivation by the sample households in the study area.

In order to enhance horticulture cultivation in the state, the government should prepare appropriate policies and implement it efficiently at field level in a transparent manner with active participation of various stakeholders.

### III.2: Motivational Factors for Adoption of Horticulture Cultivation

We have also tried to find out the main motivational factors for horticulture cultivation.

**Table 13: Major Motivating Factors for Horticulture Cultivation** (multiple response)

Particulars	Marginal (17)	Small (50)	Semi Medium (67)	Medium (67)	Large (19)	Total (220)
Closeness to Market	11	29	37	31	8	116
Easy to Grow	11	16	38	10	6	81
Easy & Timely Availability of quality seeds/ planting Material	8	23	37	38	12	118
Good Price	5	16	31	30	13	94
Low Cultivation Cost	9	15	26	21	6	77
High Expected Income	12	38	41	36	14	141
Off Season Employment	9	27	51	40	9	136
Government Support	11	30	48	46	14	149
Influence of Neighbour	10	18	27	16	6	77
New Sources of Market	0	9	16	14	3	42
Any other	0	0	0	0	0	0

Source: Field Survey, 2017

The Table 13 presents the main motivational factors for horticulture cultivation in the study area. The data shows that government support in terms of subsidies and other kinds of support was one of the major factors which motivated the farmers for horticulture cultivation in the study area. A perceptible number of households pointed out that high expected income from horticulture cultivation was the main factor for them to adopt horticulture. Another important factor in favour of horticulture cultivation in the study area was off season employment opportunities. Horticulture being labour intensive activity helps to generate adequate employment opportunities in rural area. The factors like closeness to market and

easy availability of quality seeds and planting material have also motivated the sample households for horticulture cultivation in the study area. The other factors that motivated the households in favour of horticulture cultivation in the study area were good price, low cost of cultivation, easy to grow, influence of fellow farmers and new sources of market.

### III.3: Major Problems in Adoption of Horticulture Cultivation

It has been observed from the field survey that certain major problems were prevailing in horticulture cultivation in the study area. The Table 14 presents major problems in horticulture cultivation.

**Table 14: Major Problems in Horticulture Cultivation** (multiple response)

Particulars	Marginal (17)	Small (50)	Semi Medium (67)	Medium (67)	Large (19)	Total (220)
Access to Market	10	27	27	22	10	96
Transport Connectivity to Market	11	14	17	13	8	63
Availability of Communication Facilities	2	4	10	3	2	21
Availability of Quality Irrigation Water	6	17	26	23	12	84
Availability of Seeds and other Inputs at your village	11	21	26	32	10	100
Application of Improved Technology in Horticulture	16	28	36	32	9	121
Getting Sufficient Government Support	13	17	30	44	10	114
Lack of awareness in Post Harvest Activities	10	33	41	44	11	139
Getting Packing Material on time	6	23	20	15	5	69
Shortage of Labour	9	33	40	46	12	140
Scarcity of Trained Manpower	12	33	43	17	12	147
Lack of Storage Facility and marketing mechanism	15	43	57	63	16	194

Source: Field Survey, 2017

The data reveals that lack of cold storage facility and inadequate marketing mechanism for the horticulture produce, which is highly perishable in nature, appeared as major problems across the categories of the households in the study area. It also affected the future prospects of horticulture cultivation negatively. Due to lack of adequate cold storage infrastructure, the farmers are forced to dispose-off the produce at the earliest even at the cheapest prices on the one hand and consequently they yield low income from the produce on the other. The state government should solve the problems regarding insufficient cold storage infrastructure and inadequate marketing mechanism on priority basis to enhance confidence of farmers in horticulture cultivation.

The major constraints in marketing of horticultural crops include lack of adequate market to absorb the production, low price for the products, large number of middlemen in marketing system, lack of marketing institutions to safeguard the farmers' interest and rights over their marketing (e.g. cooperatives), lack of coordination among producers to increase their bargaining power, poor product handling and packaging, imperfect pricing system and lack of transparency in market information system. It has been observed that prices of the fruits and vegetable remain high in the retail market but the farmer do not get the adequate price for their produce due to multiplicity of intermediaries. It happens mainly due to lack of proper regulations to control marketing practices. The presence of intermediaries forced the farmers to mass destruction of the produce on account of very cheap selling prices offered to them.

Strategies to enhance marketing efficiency of fruits and vegetables vary according to nature of produce and kind of marketing facilities in a particular region. The state government should encourage the establishment of agro processing units in the clusters. This proposition is desirable not only for strengthening marketing system but also the farmers could get reasonable prices for their produce.

It needs to be noted that agricultural crops diversification requires effective marketing linkages, supported by modern marketing practices including introduction of grading, post-harvest management, cold chains etc. Currently, horticulture development is constrained by poor marketing arrangements. The gap between prices received by the farmers and those paid by the consumers is very high that reflects operational inefficient marketing mechanism.

Losses of agricultural produce particularly horticultural crops occur after harvesting due to inefficient handling and transportation system. It has been observed that a perceptible amount as well as the quality of produce tends to deteriorate by the time it reaches to the consumers which adversely affects the competitiveness in the market and the profits earned by farmers. Efficient management of the produce during harvesting, grading, packaging, transportation, storage and marketing can reduce these losses. At present, post-harvest management of horticultural produce is far from expectations.

Further, scarcity of trained manpower is the second major problem in horticulture cultivation in the study area. The respondents pointed out that most often they could not access the trained person timely even at block levels to sort out their immediate problems related to horticulture cultivation and consequently they lose in terms of fall in crops yield. The state government should appoint sufficient number of the trained persons even at block levels at least to solve the immediate problems in horticulture cultivation and it would also

help to increase confidence and motivation among farmers in favour of horticulture cultivation.

Horticultural crops are very labour intensive so it has a great potential for generating additional employment. It will help to solve the problem of unemployment and underemployment. It may be noted that the inclusion of horticultural crops in crop rotations will not only give additional employment but also help to realize higher net returns to the farmers. It may also help to uplift farmers' economic position. Therefore, the government should make all efforts to increase the area under horticulture crops by bringing cultivable waste land. Besides, the government should ensure efficient marketing mechanism for horticulture crops at local level and encourage the investors to establish small scale processing units in rural area though generating awareness and enhancing updated technologies and its knowhow.

Shortage of labour was also one of the major problems in horticulture cultivation. Horticulture cultivation is a labour intensive activity. Due to shortage of labour, horticulture cultivation has become a very costly proposition.

Lack of awareness about latest horticulture practices, post harvest activities and application of latest technology was also appeared as one of the main problems in the study area. The respondents highlighted that awareness generation programmes were not regularly conducted at village levels and they could not spare time for attending these programmes at some distant places. Some of the respondents have also pointed out that sometimes the programmes happened to be just formalities and consequently, they could not enhance their stock of knowledge about horticulture cultivation. The state government should focus on this crucial issue on priority basis through effective monitoring mechanism. For effective awareness generation about horticulture cultivation among the farmers, village panchayats may play a leading role. Moreover, a good quality printing materials in simple language should be supplied to the farmers. That is missing part in the awareness generation and capacity building programmes.

Other problems in horticulture cultivation were inadequate availability of quality irrigation water, seeds and other inputs. The respondents pointed out that the quality of irrigation water has been consistently deteriorating. It might be due to use of ground water in a very inefficient manner along with excess application of chemical fertilisers and pesticides in the fields. Some of the respondent in district Sirsa highlighted that due to inadequate availability of quality irrigation water they have uprooted their Kinoo bagichhas (orchards). Moreover, unavailability of quality seeds and other inputs for horticulture cultivation at

village levels was also a major problem for the sample households. They argued that they had to visit nearby cities to purchase required seeds and other inputs from private shops. Most of the times, the supply of seeds and other inputs at government shops and/ or horticulture offices even at block levels was found irregular, untimely and insufficient. Moreover, sometimes seeds and other inputs were made timely available at the horticulture offices but these were distributed to the influential farmers only. Consequently, they were compelled to visit again nearby cities to purchase required inputs from the private shops.

The proper harvesting and efficient utilization of water is of great significance. The method, frequency and duration of irrigations have also significant impact on crop yield and farm productivity. The scarce water resources are required to be used efficiently. Drip irrigation with economical and judicious use of water not only saves scarce resource of water but also adds to the productivity of the crop.

Planting material plays an important role in the production of horticultural crops. Inadequate availability of quality planting material is one of the important deterring factors in development of a sound horticulture industry. At present 30-40 per cent demand for planting material is being met by the existing infrastructure. Farmers do not have access to certified disease free material as a result of which production, productivity and quality of the produce suffers. Much of the dependence is on the unregulated and unmonitored private sector. The existing nurseries lack modern infrastructure such as greenhouses, mist chambers, efficient nursery tools and gadgets, implements, machinery and manpower.

Some suitable mechanism for certification, registration and accreditation of nurseries with a concerned agency should be put in place to ensure quality control. Standards for production of planting material need to be worked out. Nurseries should be located at a place convenient & easily accessible to the farmers.

A perceptible number of the respondents pointed out that they were not getting the adequate amount of subsidies timely. It has also been observed during the field survey that there was a lack of awareness about the schemes of the state government among the farmers. In some villages few farmers' groups exist, but the main beneficiaries of the government schemes were found only active members in the groups. There is an urgent need to ensure delivery of benefits of the government schemes to the targeted groups in a transparent manner.

Lack of transportation facilities for horticulture produce was also appeared as one of the problems in horticulture cultivation particularly to marginal and small farmers in the study area. It has been observed that transportation of horticulture produce is a time



consuming process. In order to deal with this problem, the state government should establish procurement and retail counters at village levels. It has been found that a large proportion of the sample households depend upon the private/state transport to carry their produce to the market. Farmers face transportation problems in terms of non-availability of transport facilities at a nearby point of their field, uncertainty in its availability and costly transport. This discouraged them to access the market timely. A good network of the markets and collection centres at nearby points will have to solve their problem to a great extent.

It has been observed that there was lack of awareness among the sample households about latest technologies for harvesting and handling the horticulture produce. Lack of awareness about harvesting and handling techniques results in a substantial wastage of horticultural produce. Some horticulture crops like kinoo, malta are individually hand plucked after giving twists. Some others like aomla are harvested by shaking the trees and fruits falling on the ground are collected. These methods damage the fruits which thus become prone to post harvest losses.

It may be pointed out that handling and timely transportation are important components which come just right after harvesting. Multi-hand handling of fresh produce is also the main cause of qualitative and quantitative deterioration. Mostly the handling and transportation is done by tractor trollies /trucks/ tampoo which make produce vulnerable to speedy loss either by physical or biological means. There is lack of technical knowhow at farmers' level regarding handling and transportation techniques.

It may be argued that serious efforts are urgently required to solve some of the major problems which are prevailing in horticulture cultivation through appropriate policy interventions. So, the farmers might be motivated to adopt horticulture cultivation.

## Chapter IV

### Perception Regarding Awareness about Horticulture Cultivation/ Activities

Awareness is one of the critical ingredients for sustainable development. It affects the understanding and actions of the human beings. In this chapter, we attempted to analyse the awareness level among the sample households pertaining to horticulture cultivation.

#### IV.1: Awareness about Procurement of Seedlings/ Planting Materials

The Table 15 presents category wise information regarding procurement of seedlings and planting Materials. The data reveals that out of the total horticulturist households 36.36 per cent (80) households procured seedlings/ planting materials from private nurseries in the study area. The share of households who procured seedlings/ planting materials from government nurseries comes out to be 20.91 per cent of the total horticulturist sample households. Some of the households pointed out that government nurseries were not properly maintained due to lack of the required infrastructure and manpower. Therefore, they have no option rather to procure seedlings/ planting materials from private nurseries and other sources.

**Table 15: Category wise Information regarding Procurement of Seedlings/ Planting Materials**

Particular	Own Preparation	Government Nursery	Private Nursery	Other Farmers	Mix	Total
Marginal	4 (23.53)	3 (17.65)	2 (11.76)	2 (11.76)	6 (35.29)	17 (100)
Small	11 (22.00)	14 (28.00)	13 (26.00)	4 (8.00)	8 (16.00)	50 (100)
Semi-Medium	18 (26.87)	10 (14.93)	32 (47.76)	3 (4.48)	4 (5.97)	67 (100)
Medium	10 (14.93)	12 (17.91)	26 (38.81)	2 (2.99)	17 (25.37)	67 (100)
Large	2 (10.53)	7 (36.84)	7 (36.84)	1 (5.26)	2 (10.53)	19 (100)
<b>Total</b>	<b>45</b> <b>(20.46)</b>	<b>46</b> <b>(20.91)</b>	<b>80</b> <b>(36.36)</b>	<b>12</b> <b>(5.45)</b>	<b>37</b> <b>(16.82)</b>	<b>220</b> <b>(100)</b>

Source: Field Survey, 2017

Further, it needs to be noted that 20.46 per cent households have prepared seedlings/ planting materials themselves. Only 5.45 per cent households procured seedlings/ planting materials from other farmers within the village or outside the village, whereas 16.82 per cent households procured seedlings/ planting materials from various mix sources.

It may be argued that the government must focus to provide basic required infrastructure to the government nurseries so that seedlings/ planting materials requirement of the farmers could be meet easily. The shortage of workforce at government nurseries was

also observed during the field survey that must be solved through hiring adequate number of the required manpower on priority basis.

Nursery activities should be concentrated in the vegetables/fruits belts to avoid distant transportation. While establishing new nurseries, it should be ensured that plants are raised in suitable containers (root trainers) using only sterilised potting mixture. These nurseries should have modern facilities to follow standard nursery practices for plant propagation along with rootstock and scion blocks and facilities for maintenance and sale of plants. Seed trays must be kept above the ground to avoid soil-borne diseases. The seeds of those hybrids which give high yield with minimum cost should be supplied to farmers at a reasonable rate.

#### **IV.2: Perception about Awareness Generation Programmes**

The data presented in Table 16 reveals that out of the total (220) horticulturist households only 144 households were aware about the training & capacity building programmes for horticulture cultivation conducted by the state government in the study area. It implies that a significant proportion, about 49 per cent, of the total horticulturist households were not aware about the training and capacity building programmes. It reveals that the awareness generation programmes about horticulture cultivation are not adequate.

**Table 16: Category wise Awareness level regarding Training Programme conducted by the State Government for Horticulture Crops/ Activities**

Particular	Awareness about Training & Capacity Building Programmes	Participation in Training & Capacity Building Programmes	Quality of Programme	
			Satisfactory	Not Satisfactory
Marginal 17	10	4	3	1
Small 50	23	11	4	7
Semi- Medium 67	38	16	9	7
Medium 67	32	13	5	8
Large 19	11	5	4	1
Total 220	114	49	25	24

Source: Field Survey, 2017

Moreover, out of the total 114 households having awareness only 49 households (42.98 per cent) participated in these programmes and 25 households (21.93 per cent) were satisfied with these programmes in the study area. The respondents highlighted that awareness generation programmes were not regularly conducted at village levels and they could not spare time for attending these programmes at some distant places.

Some of the respondents have also pointed out that sometimes the programmes happened to be just formalities and consequently, they could not enhance their stock of knowledge about horticulture cultivation. It clearly indicates that the frequency and quality of the awareness generation programmes is below expectations. The state government should

focus on this crucial issue on priority basis through effective monitoring mechanism. Moreover, a good quality printing materials in simple language should be supplied to the farmers. That was missing part in the awareness generation and capacity building programmes.

There is an urgent need to focus more rigorously on aware generation programmes on priority basis. Panchayati Raj Institutions (PRIs) may be very useful instruments in awareness generation programmes for horticulture cultivation.

### **IV.3: Awareness about Soil and Groundwater Testing Facilities**

The Table 17 presents category wise awareness level about soil and ground water testing facilities for horticulture cultivation in the study area. The data highlights that out of the total (220) horticulturist sample households, only 88 households (40 per cent) had some awareness about the soil and ground water testing facilities provided by the state government. Surprisingly, out of the 88 households, only 21 households (23.86 per cent) availed testing facilities for horticulture cultivation. But only 8 households (9.09 per cent) reported satisfaction for the available soil and ground water testing facilities.

**Table 17: Category wise Awareness level about Soil and Ground Water Testing Facilities in Horticulture Cultivation**

Particular	Awareness about Soil and Ground Water Testing Facilities	Availed the Testing Facilities	Quality of Testing Facilities	
			Satisfactory	Not Satisfactory
Marginal (17)	4	0	0	0
Small (50)	18	6	2	4
Semi- Medium (67)	24	4	3	1
Medium (67)	32	8	2	6
Large (19)	11	3	1	2
Total (220)	89	21	8	13

Source: Field Survey, 2017

Some of the households reported during the field survey that they collected samples of sand and ground water from their land for testing as per requirement of the concerned officials and submitted the same in government laboratories for testing. Even after one year, the reports were still awaited. It indicates the seriousness of the concerned officials at the ground level.

It may be argued that the state government should ensure sufficient availability of mobile van equipped with soil and ground water testing facilities particularly during crops sowing period at village level. The reports of the tests should be made available at the earliest and in simple language so that a farmer could understand it easily. Generally the farmers use

DAP and Urea in agriculture. But with the help of soil and ground water testing they could be made aware about the deficient nutrient components in the land. Thereafter, they can apply the required ingredients in land to get high crops yield.

#### **IV.4: Awareness about Government Subsidies**

The Table 18 shows category wise purposes of availing subsidies from the state government. The data reveals that out of the total 220 horticulturist sample households only 83 households (37.73 per cent) availed subsidies for various purposes from the state government during the period 2014-15 to 2016-17 in the study area.

**Table 18: Category wise Purpose of Availing Subsidies in Horticulture Cultivation from the State Government**

<b>Particular</b>	<b>Post- harvest Infrastructure</b>	<b>Micro Irrigation</b>	<b>Poly Houses</b>	<b>Net Houses</b>	<b>Agro Processing Unit</b>	<b>Others including Seeds/ Pesticides</b>	<b>Total</b>
Marginal (17)	0	0	0	0	0	6	6
Small (50)	0	2	0	0	0	8	10
Semi- Medium (67)	0	8	3	0	0	12	23
Medium (67)	0	14	4	0	3	14	35
Large (19)	0	3	0	0	0	6	9
<b>Total (220)</b>	<b>0</b>	<b>27</b>	<b>7</b>	<b>0</b>	<b>3</b>	<b>46</b>	<b>83</b>

Source: Field Survey, 2017

It needs to be noted that the maximum number of 46 households (20.21 per cent) availed the subsidy for seeds, pesticides and other purposes. For the purpose of micro irrigation only 27 households (12.27 per cent) availed the subsidy from the state government during the same period. It is pertinent to be noted that 7 households (3.18 per cent) availed the subsidies for the purpose of poly houses and only 3 households (1.36 per cent) for agro processing units in the study area during the period under consideration. All the beneficiaries of subsidy for the purposes of poly houses and processing units were from the categories of semi medium and medium farm households in the study area. Most of the sample households reported lack of awareness & technical knowhow and high initial costs as the major reasons for non adoption of poly houses and agro processing units in the study area.

It may be pointed out that the poly houses and processing units were found in block Rai of the district Sonipat during the field survey. It has been observed that due to existence of agro processing units the horticulturist households in this block were relatively better off in terms of marketing and prices of their produce.

It may be argued that the state government should motivate the investor to establish small agro processing units in vegetable and fruit hubs to deal with the problems of marketing gluts and low prices for horticulture produce on priority basis.

#### **IV.5: Perception about Increase in Income from Horticulture Cultivation**

The Table 19 shows the information regarding increase in income levels of the sample households with horticulture cultivation. The data reveals that out of the total horticulturist households, 51.82 per cent households of the total horticulturist households reported an increase in their income levels with horticulture cultivation whereas rest of the 48.18 per cent households rejected this proposition.

**Table 19: Category wise Information regarding Increase in Income with Horticulture Cultivation**

<b>Particular</b>	<b>Yes</b>	<b>No</b>	<b>Total</b>
Marginal (17)	6 (35.29)	11 (64.71)	17 (100)
Small (50)	14 (28.00)	36 (72.00)	50 (100)
Semi- Medium (67)	44 (65.67)	23 (34.33)	67 (100)
Medium (67)	40 (59.70)	27 (40.30)	67 (100)
Large (19)	10 (52.63)	9 (47.37)	19 (100)
<b>Total (220)</b>	<b>114 (51.82)</b>	<b>106 (48.18)</b>	<b>220 (100)</b>

Source: Field Survey, 2017

Note: Figures in brackets indicate per cent to total

It may, further, be highlighted that majority of the sample households who reported increase in their income after adoption of horticulture crops/activities were big farm households as major beneficiaries. Most of the small and marginal farmers were stuck to cultivation of traditional crops due to small land holdings on the one hand and low risk bearing capacity on the other.

During the period under consideration, average net income of the horticulturist households has slightly increased in absolute terms by Rs. 1835 per acre from Rs. 8,713 to Rs. 10,548 with a growth rate of 21.06 per cent from horticulture cultivation.

There is an urgent need for policy intervention from the state government to motivate the farmers particularly small and marginal for intercropping cultivation which may provide them reasonable income along with traditions crops.

#### **IV.6: Perception regarding Sources of Borrowings**

The Table 20 presents category wise sources of borrowings to meet extra expenditure by the sample households. The data shows that out of the total 220 horticulturist households, 133 (60.45 per cent) households were dependent on borrowings to meet their extra household expenditure over and above the income from horticulture cultivation.

It has been noted from the data that a majority of the big farm households were the main beneficiaries of the credit from banks and cooperative societies. It might happen due to their better loan repayment capacity as compared to the farmers with small land holdings.

**Table 20: Category wise Sources of Borrowings to meet extra Household Expenditure**

Particular	Banks	Co operative Societies	Income from Services	Money Lenders	Commission Agents	Friends/ Relatives	Total
Marginal (17)	0 (0.00)	2 (25.00)	0 (0.00)	1 (12.5)	2 (25.00)	3 (37.50)	8 (100)
Small (50)	2 (6.30)	9 (28.10)	3 (9.40)	5 (15.60)	6 (18.80)	7 (21.90)	32 (100)
Semi-Medium (67)	10 (27.00)	18 (48.60)	0 (0.00)	3 (8.10)	2 (5.40)	4 (10.80)	37 (100)
Medium (67)	13 (38.20)	10 (29.40)	0 (0.00)	2 (5.90)	3 (8.80)	6 (17.60)	34 (100)
Large (19)	8 (36.40)	3 (13.60)	0 (0.00)	0 (0.00)	5 (22.70)	6 (27.30)	22 (100)
<b>Total (220)</b>	<b>33 (24.80)</b>	<b>42 (31.60)</b>	<b>3 (2.30)</b>	<b>11 (8.30)</b>	<b>18 (13.50)</b>	<b>26 (19.50)</b>	<b>133 (100)</b>

Source: Field Survey, 2017

Note: Figures in brackets indicate per cent to total

The data, further, highlights that out of the total 133 households, who borrowed from various sources, 19.50 per cent (26) households borrowed from relatives & friends to meet their household expenditure in excess of income from horticulture cultivation. Moreover, the share of households who borrowed from money lenders & commission agents comes out to be 21.80 per cent in total number of borrowers. But interestingly majority of them were marginal and small farm households.

It may be argued that big farm households have relatively more access to institutional sources of credit as compared to small farm households in the study area. The state government should ensure reasonable access of small farm households to institutional credit for horticulture cultivation through appropriate policy interventions.

## **Chapter 5**

### **Summary, Conclusions and Policy Recommendations**

Indian economy is reeling under agrarian crisis. The major issues leading to agrarian crisis are consistent rising inputs costs, inadequate infrastructure for produce marketing, lack of alternative region wise crops and lack of ensured minimum support prices (MSP) for less water intensive crops. The economic and ecological sustainability of rice-wheat cropping system (RWCS) of the states is being questioned. There are serious concerns about the depletion of ground water table, degradation in soil fertility, rising problems of insect-pest and disease complexity, decline in bio-diversity, rising costs and diminishing economic returns, decline in factor productivity, fragmented small holdings etc.

Diversification of crops in agriculture sector has been considered as an urgent requirement for sustainable agricultural development in the country. The significance of horticulture cultivation as an alternate for crop diversification has been well accepted proposition in the literature. It is also significant for creation of additional employment opportunities in rural areas. Economic opportunities have been considered as an adequate justification/ rationale for the shift away from cereals to fruits and vegetables.

At this juncture, horticulture appears as an alternative to break down the prevailing unsustainable cropping pattern in the state/region. Presently both the governments at national and state levels have been focussing to promote horticulture through various centrally sponsored schemes and state sponsored schemes. A perceptible amount of funds in plan outlay has been allotted to horticulture sector by both the governments at the centre as well as the state. Consequently, the area under horticulture cultivation has increased significantly over the period.

#### **V.1: Major Findings of the Study**

A vast inequality exists in the distribution of landholdings. A major chunk of landholdings is owned by big farmers, landlords and moneylenders whereas most of the cultivators are tenants who have very small share of landholdings. Such inequality has serious implications for the development of horticulture sector on the one hand and for crop diversification on the other. Adequate motivation is required for adoption of new crops/ latest technologies. It has been observed that inequality in landholdings demotivated the tenants to adopt new technologies/ strategies in cultivation. Some of the respondents pointed out their willingness to adopt new technologies in horticulture but due to uncertainty about the tenure



of tenancy from the land owner, they found unable to do so. It may be highlighted that the terms & conditions of tenancy between land owners and tenants are oral in nature, consequently there is no legal obligation/ compulsion on any party to adhere to it. The land owners frequently change the tenants on one pretext or the other. So the tenants have less interest to invest in land improvement and to adopt latest technologies in horticulture cultivation. Sometimes the land owner demands higher rents (Thekka) if a tenant shows interest to adopt intercropping in the field. This phenomenon is one of the barriers in crop diversification and growth of horticulture as well. Another crucial issue about inequality in landholdings is that if crop failure happens due to natural calamities or pest attacks and the state government announces some compensation to the farmers. The amount of compensation goes to the owners of the land instead of tenants who are the actual cultivators. In most of the cases, the land owners refused to pay the amount of compensation to the tenants.

Due to price fluctuations along with weather vagaries tenant farmers have less capacity to bear risks, therefore they stick to the existing cropping pattern and avoid applying latest technologies in the fields for horticulture cultivation.

During Kharif season the major crops were Bajra, Cotton, Paddy, Gawar, Oilseeds, Vegetables, Fruits, Flowers, Mushroom. The main vegetable crops were Tomato, Cauliflower (Gobhi), Kakri, Cucumber (Kheera), Ridged Gourd (Turai), Bottle Gourd (Ghiya), Bitter Melon (Karela), Ladyfinger (Bhindi), Brinjal (Baigan), Potato, Chillies (Mirch), Radish (Mooli), Capsicum (Simala Mirch), Coriander Leaf (Dhaniya), Peas (Matar), Spinach (Palak), Mushroom, Sweetcorn, Babycorn, Onion etc.

The share of area under cultivation of paddy and cotton in total area sown in Kharif season has decreased from 56.36 per cent to 50.37 per cent whereas the corresponding share under horticulture crops tended to increase from 17.82 per cent to 21.94 per cent during the period 2014-15 to 2016-17.

The major Rabi crops in the study area were wheat, mustard, sugarcane, millet and horticulture crops (vegetables, flowers, fruits).

The share of area under wheat and sugarcane has decreased from 69.44 per cent to 61.88 per cent in total area sown in Rabi season during the period 2014-15 to 2016-17. But the share of area under horticulture crops has perceptibly increased from 19.44 per cent to 23.87 per cent during the same period.

Wheat paddy rotation is dominantly prevailing in the state. Interestingly, paddy is not a traditional crop of this region. Despite that a perceptible area has been under paddy

cultivation. It has been observed that paddy cultivation is profitable proposition only because of highly subsidized supply of electricity and irrigation water.

The area under these two crops (Wheat & Paddy) has a tendency to decrease whereas the area under horticulture crops has increased over the period of time in the study area. The households have shown their interest in horticulture crops instead of traditional wheat paddy mono cropping pattern in the study area.

Out of the total area under horticulture crops more than 60 per cent area has been covered under vegetable crops.

Medicinal and aromatic plants have a great potential in the state. Despite that farmers have not shown much interest in cultivation of medicinal plants in the study area. It might be happened due to lack of adequate awareness among the farmers. There is huge potential for cultivation of Alovera, Lemon, Rose, Ber and Tulsi in the state that needs to be explored.

Most of the horticulture crops are short-termed and are either perishable or non-durable commodities. Consequently, adequate post harvest infrastructure with respect to cold storage, transportation and sound marketing system is a very challenging task. The pace of infrastructure development in terms of cold storage facilities, transportation connectivity and assured marketing for horticulture produce has been below expectations in the state of Haryana. These factors together also have negative impact on crops yield and expected income of the farmers that in turn influence their decision for selection of crops in cropping seasons for horticulture cultivation.

During Kharif season, more than 78 per cent of the total area sown was under traditional agriculture crops and rest of the area, about 22 per cent, was used for horticulture crops by the sample households in the study area. Interestingly, the share of area under only paddy cultivation in total area under traditional crops comes out to be more than 45 per cent irrespective of the categories of the households. But it needs to be noted that the area under horticulture crops was about 40 per cent in the category of horticulturist households.

During the Kharif season, the production of horticulture crops, excluding mushroom, has increased from 47,993 quintals in 2014-15 to 62,972 quintals in 2016-17 with a growth rate of 31.21 per cent whereas the area under horticulture crops increased with a growth rate of 22.15 per cent (from 652.5 acres to 797.5 acres). Correspondingly, the productivity of horticulture crops, excluding mushroom, has also increased with a growth rate of 7.33 per cent from 73.55 quintals to 78.94 quintals per acre during the same period.

During the Rabi season, the production of horticulture crops, excluding mushroom, has increased from 69,927 quintals in 2014-15 to 89,543 quintals in 2016-17 with a growth

rate of 28.17 per cent whereas the area under horticulture crops increased with a growth rate of 33.57 per cent (from 802 acres to 1071.25 acres). Correspondingly, the productivity of horticulture crops, excluding mushroom, has slightly decreased with a growth rate of 4.13 per cent from 87.19 quintals to 83.59 quintals per acre during the same period.

Per acre productivity of horticulture crops during both the cropping seasons, Kharif and Rabi, was much higher than that of traditional crops for the sample households. Some households were also engaged in mushroom cultivation, which is also one of the remunerative crops. But the pace of growth of horticulture crops in the study area was slow that needs to be enhanced through effective policy interventions at the ground levels.

The farmers are not following best practices specified by the agricultural experts or the state government but they trust more on the private shopkeepers. This happens mainly due to inaccessibility of concerned officials even at block level and lack of awareness among the farmers on the one hand and easy accessibility of private shopkeepers on the other. The private shopkeepers provide unnecessary and unreliable seeds and pesticides to the farmers for their own sake.

Due to lack of post harvest infrastructure and effective marketing mechanism for the horticulture produce, the farmers hesitate to divert towards horticulture cultivation.

There are two sources of irrigation, apart from rainfall, in Haryana i.e., canal irrigation and tubewell irrigation. Presently, about 70 per cent of irrigated area depends on tube well irrigations in the state of Haryana.

Electric tube well was the major source of irrigation that irrigated 70.88 per cent of the total irrigation land of the sample households.

Out of the total irrigated area of 4591.25 acres, 68.84 per cent (2911.25 acres) is irrigated with good quality of irrigation water. The area irrigated with average quality of irrigation water comes out to be 1183 acres (25.77 per cent) while 497 acres (10.82 per cent) was irrigated with bad quality of irrigation water. Bad quality of irrigation water is not conducive for cultivation still it is used by the sample households in wake of inadequate irrigation facilities. It has serious implications for the fertility of land.

Flooding irrigation technique has been dominantly used for irrigation in the study area. This technique leads to wastage of a heavy quantum of scarce irrigation water.

The state government provides subsidy in micro irrigation system for horticulture crops. But the farmers, particularly in Sirsa district, pointed out that private firms made available a set of sprinkle irrigation system for at least four acres of land and forced the farmers to purchase it. There are ten sprinkles per set for four acres of land that are

insufficient because farmer is required to change lane frequently and it consumes a lot of energy and time. The respondents suggested that the firms must be regulated to make available a sprinkle set for less than four acres of land at reasonable prices.

Initial high cost, lack of awareness and lack of operational skill & training were the major constraints in adoption of the latest irrigation technologies in horticulture cultivation in the study area.

Main reason for non adoption of horticulture cultivation by non horticulturist sample households was inadequate marketing mechanism to dispose-off the horticulture produce at reasonable prices in the study area. Being a perishable nature of the horticulture produce, farmers cannot hold it up to fetch higher prices at some later stages.

Second most important reason for the same issue was inadequate irrigation facilities. It has also been considered as one of the major hurdles in crop diversification particularly in favour of horticulture crops. Availability of assured and good quality irrigation water is foremost requirement for horticulture cultivation.

High cost of cultivation was also one of the reasons responsible for non adoption of horticulture cultivation in the study area. In horticulture cultivation, being labour intensive activity, a high quantum of labour is required and there is persistent shortage of labour in the present scenario. Due to shortage of labour, particularly after implementation of MGNREGA, the cost of labour hiring has tremendously increased as labour demands high wages.

Lack of awareness about horticulture activities, financial hardship, small land holdings and inadequate transportation have also appeared as crucial factors responsible for non adoption of horticulture cultivation by the sample households in the study area.

Government support in terms of subsidies and other kinds of support was one of the major factors which motivated the farmers for horticulture cultivation in the study area.

High expected income from horticulture cultivation was also one of the major factors for the respondents to adopt horticulture cultivation. Another important factor in favour of horticulture cultivation in the study area was off season employment opportunities.

The factors like closeness to market and availability of quality seeds and planting material easily have also motivated the sample households for horticulture cultivation in the study area.

Lack of cold storage facility and inadequate marketing mechanism for the horticulture produce, which is highly perishable in nature, appeared as major problems across the categories of the households in the study area. Due to lack of adequate cold storage infrastructure, the farmers were forced to dispose-off the produce at the earliest even at the

cheapest prices on the one hand and consequently they yield low income from the produce on the other.

The major constraints in marketing of horticultural crops include lack of adequate market to absorb the production, low price for the products, large number of middlemen in marketing system, lack of marketing institutions to safeguard the farmers' interest, lack of coordination among producers to increase their bargaining power. The presence of intermediaries forced the farmers to mass destruction of the produce on account of very cheap selling prices offered to them.

Scarcity of trained manpower was the second major problem in horticulture cultivation in the study area. The respondents pointed out that most often they could not access the trained person timely even at block levels to sort out their immediate problems related to horticulture cultivation and consequently they lose in terms of fall in crops yield.

Lack of awareness about latest horticulture practices, post harvest activities and application of latest technology was also appeared as one of the main problems in the study area. The respondents highlighted that awareness generation programmes were not regularly conducted at village levels and they could not spare time for attending these programmes at some distant places. Some of the respondents have also pointed out that sometimes the programmes happened to be just formalities and consequently, they could not enhance their stock of knowledge.

Other problems in horticulture cultivation were inadequate availability of quality irrigation water, seeds and other inputs. The respondents pointed out that the quality of irrigation water has been consistently deteriorating. It might be due to use of ground water in a very inefficient manner along with excess application of chemical fertilisers and pesticides in the fields. Some of the respondent in district Sirsa highlighted that due to inadequate availability of quality irrigation water they have uprooted their Kinoo bagichhas (orchards).

Non availability of quality seeds and other inputs for horticulture cultivation at village levels was also a major problem for the sample households. They argued that they had to visit nearby cities to purchase required seeds and other inputs from private shops. Most of the times, the supply of seeds and other inputs at government shops and/ or horticulture offices even at block levels was found irregular, untimely and insufficient. Moreover, sometimes seeds and other inputs were made timely available at the horticulture offices but these were distributed to the influential farmers only.

A perceptible number of the respondents pointed out that they were not getting the adequate amount of subsidies timely. It has also been observed during the field survey that

there was a lack of awareness about the schemes of the state government among the farmers. In some villages few farmers' groups exist, but the main beneficiaries of the government schemes were found only active members in the groups.

Lack of transportation facilities for horticulture produce was also appeared as one of the problems in horticulture cultivation particularly to marginal and small farmers in the study area. It has been observed that transportation of horticulture produce is a time consuming process.

There was lack of awareness among the sample households about latest technologies for harvesting and handling the horticulture produce that resulted in a substantial wastage of horticultural produce. Some horticulture crops like kinoo, malta are individually hand plucked after giving twists. Some others like aomla are harvested by shaking the trees and fruits falling on the ground are collected. These methods damage the fruits which thus become prone to post harvest losses.

Out of the total horticulturist households 36.36 per cent (80) households procured seedlings from private nurseries in the study area. The share of households who procured seedlings from government nurseries comes out to be 20.91 per cent of the total horticulturist sample households. Some of the households pointed out that government nurseries were not properly maintained due to lack of the required infrastructure and manpower.

Out of the total (220) horticulturist households only 144 households were aware about the training & capacity building programmes for horticulture cultivation conducted by the state government in the study area. Moreover, out of the total 114 households having awareness only 49 households (42.98 per cent) participated in these programmes and 25 households (21.93 per cent) were satisfied with these programmes in the study area. It clearly indicates that the frequency and quality of the awareness generation programmes is below expectations.

Out of the total (220) horticulturist sample households, only 88 households (40 per cent) had some awareness about the soil and ground water testing facilities provided by the state government. Surprisingly, out of the 88 households, only 21 households (23.86 per cent) availed testing facilities for horticulture cultivation. But only 8 households (9.09 per cent) reported satisfaction for the available soil and ground water testing facilities. Some of the respondents reported during the field survey that they collected samples of soil and ground water from their land for testing as per requirement of the concerned officials and submitted the same in government laboratories for testing. Even after one year, the reports were still awaited.

Out of the total horticulturist sample households only 83 households availed the subsidy for various purposes in the study area during the period 2014-15 to 2016-17. Surprisingly, out of the 83 beneficiary households only 7 households (8.43 per cent) availed the subsidy for poly houses. It needs to be noted that only 3 progressive households (3.61 per cent) availed the subsidy for agro processing units. Due to existence of agro processing units the horticulturist sample households in Rai block were relatively comfortable in terms of marketing and prices of their produce.

Out of the total horticulturist households, 51.82 per cent households of the total horticulturist households reported an increase in their income levels with horticulture cultivation. Majority of the sample households who reported increase in their income after adoption of horticulture crops/activities were big farm households as major beneficiaries. Most of the small and marginal farmers were stick to cultivation of traditional crops also due to small land holdings on the one hand and low risk bearing capacity on the other.

During the period under consideration, average net income of the horticulturist households has slightly increased by Rs. 1835 per acre in absolute terms from Rs. 8,713 to Rs. 10,548 with a growth rate of 21.06 per cent from horticulture cultivation.

Out of the total 220 horticulturist households, 133 households (60.45 per cent) were dependent on borrowings to meet their extra household expenditure over and above the income from horticulture cultivation.

A majority of the big farm households were the main beneficiaries of the credit from banks and cooperative societies. It might happen due to their better loan repayment capacity as compared to the farmers with small land holdings. In other words, big farm households have relatively more access to institutional sources of credit as compared to small farm households in the study area.

### **Concluding Remarks**

There are huge potentials for horticulture cultivation in the state of Haryana. The Horticulture Department is making efforts to promote horticulture cultivation in the state. During the period 2014-15 to 2016-17, the plan outlay of the government of Haryana for horticulture cultivation has been doubled. The area under horticulture crops for the sampled households has increased by 22.15 per cent and 33.57 per cent in Kharif and Rabi seasons respectively during the same period. The production of the horticulture crops has also been increased with a growth rate of 31.21 per cent and 28.17 per cent in Kharif and Rabi seasons respectively for the sampled households during the period under consideration. But the pace of growth in productivity of horticulture crops was not found very exciting. The productivity

of horticulture crops in Rabi season has even decreased during the period from 2014-15 to 2016-17. There was slight increase in the post harvest infrastructure in the study area. Moreover, there was nominal enhancement in average net income of the sampled households from horticulture cultivation. However, majority of the horticulturist households, who reported increase in their income level, were big farm households.

In nutshell, it may be argued that due to persistence of certain major problems like lack of awareness, insufficient post harvest infrastructure including cold storage, inadequate marketing mechanism, price fluctuations, shortage of trained manpower etc. the pace of growth of horticulture cultivation in the state has been below expectations. With effective policy interventions, the vast untapped potentials for horticulture cultivation may be easily realised.

### **Policy Recommendations**

- The state government should promote cooperative farming/ Farmers Producer Organisations to solve the problem of fragmented land holdings so that small farmers may be motivated to adopt horticulture cultivation as a leading profession and to yield benefits of the latest technologies.
- The state government should formulate rules regarding land tenancy and the compensation policy in case of crop failure in favour of tenant farmers to enhance confidence and motivation for horticulture cultivation in the state.
- To enhance awareness among the farmers about horticulture cultivation, the state government should increase frequency of awareness generation and capacity building programmes at village levels. The quality of these programmes should also be improved. In order to ensure frequency and quality of the awareness and capacity building programmes at grass root level an effective monitoring mechanism is required. A good quality printed materials in simple language about horticulture cultivation should be supplied to the farmers.
- The Panchayati Raj Institutions should be empowered to generate awareness among the farmers about various government schemes for the promotion of horticulture cultivation. In this context, PRIs may play a very effective and leading role.
- The Kisan Melas should be organised regularly at local levels to demonstrate latest technologies for horticulture cultivation. The farmers visiting the melas may themselves judge the performance of the different technologies. These melas will also provide a



common platform to the farmers to exchange their views/ experiences with the other farmers and the experts/ scientists.

- Medicinal and aromatic plants have a great potential in the state. The state government should promote the production of medicinal and aromatic plants. There is huge potential for cultivation of Aloe vera, Lemon, Ber, Rose and Tulsi that needs to be explored.
- To deal with the problem of seasonal variations (climate change) there is an urgent need to breed area specific new varieties of horticulture crops that resist climatic stress with higher yield potentials.
- The state government should take focussed initiatives to motivate farmers to adopt drip/ sprinkle irrigation techniques in their fields through adequate awareness generation programmes at grass root levels.
- There is an urgent need to develop low cost structure for poly houses, net houses, drip irrigations system etc. to make available new technologies at affordable prices to the small farm households.
- Serious efforts are required to ensure availability of assured and good quality irrigation water that is foremost requirement for the growth of horticulture cultivation in the state.
- Insufficient cold storage and inadequate marketing mechanism are the major problems in horticulture cultivation in the state. The state government should encourage the establishment of agro processing units in clusters. The processed products may be sold with the brand name of HAFED. This proposition is desirable not only for strengthening marketing system but also the farmer could get reasonable prices for their produce.
- In order to deal with the problem of transportation of horticulture produce, the state government should establish procurement and retail counters at village levels with the help of village panchayats.
- To increase confidence and motivation of the farmers for horticulture cultivation, the state government should appoint sufficient number of trained manpower even at block levels. The scarcity of such staff can be reduced by recruitment of qualified staff at block level.
- The state government should make serious efforts for strengthening of government nurseries equipped with modern facilities to ensure sufficient & timely supply of quality seedlings/ plants etc. to the farmers.
- There is an urgent need to ensure sufficient availability of mobile van equipped with soil and ground water testing facilities particularly in sowing seasons. The report of the tests

should be made available at the earliest at the doorstep of the farmer. The reports should be in simple language so that a farmer could understand it easily.

- There is an urgent need for policy interventions from the state government to motivate the farmers particularly marginal and small, for intercropping cultivation which may ensure a reasonable income to them along with traditional crops.
- There is an urgent need for effective insurance policy and its implementation, in a transparent manner, for horticulture crops in the state.
- The state government should ensure reasonable access of small farm households to institutional credit for horticulture cultivation through appropriate policy intervention.

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