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Impact of the National Horticulture Mission (NHM) Scheme in Haryana

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CONTENTS

List of Tables

PREFACE

The present study sponsored by the Ministry of Agriculture, Government of India is aimed at assessing the impact of the National Horticulture Mission (NHM) in Haryana on returns from horticultural crops vis-à-vis other important crops and generation of employment. In order to full fill these objectives, primary as well as secondary sources of data have been used. Primary data were collected through a field survey of 150 beneficiary farmers in the selected three districts (Rohtak, Hissar and Sirsa) of Haryana.

The results of this study reveal (i) status of horticultural crops in terms of area allocation of GCA was found poor in Haryana. However, area and production of horticultural crops especially fruits and vegetables grew at a healthy rate during the past three years. (ii) among districts, Rohtak in case of vegetables and Sirsa in case of fruits performed better in comparison to other districts. (iii) net returns from cultivation of garlic followed by aonla were found higher than traditional crops. (iv) selected horticultural crops generated greater employment as compared to cereals and several traditional crops.

NHM has completed initial phase of its implementation in Haryana but its impact on area, production and yield of selected horticultural crops was limited due to low coverage of farmers. In order to make, Mission more effective, the following policy measures are suggested. (i) promotion of shorter gestation vegetable and fruit crops, medicinal and aromatic plants and commercial flower crops, through research and development.(ii) timely availability of good quality planting material and pasteurized compost/vermin compost. (iii) motivating farmers to adopt latest technology for growing horticultural crops by arranging demonstrations and trainings at regular intervals to update their knowledge on technology. (iv) provision of post-harvest facilities through public private partnerships in rural areas of the potential districts on priority basis and gradually extending these facilities to the entire state. (v) creation of storage and processing facilities at the village level. (vi) Identifying horticultural crops having export potential.

We are grateful to Prof. Kanchan Chopra, Chairperson, GB for encouragement to complete the study. We express our thanks to the Ministry of Agriculture for providing support to complete this study. Thanks are due to the coordinator of the study, Dr. Parmod Kumar, Professor & Head, ADRT Unit, ISEC, Bangalore for providing study design, tabulation scheme and useful comments on the draft report. We are thankful to Dr. Atam Prakash (DHO, Sirsa), Dr. Deepak Dhattarwal (DHO, Rohtak) and Dr. Rajbir Singh (DHO, Hissar) for providing help and cooperation during the field survey. My colleague Dr. Subhash Chandra deserves praise for efficiently processing the secondary and primary data for this study. Thanks are due to Mr. Sri Chand for word processing of the report.

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EXECUTIVE SUMMARY

Impact of the National Horticulture Mission (NHM) Scheme in Haryana

Introduction:

In India, policy makers realized the potential of horticultural sector to diversify agriculture, efficient land use, optimum utilization of natural resources and creating employment opportunities for rural masses during the 1980s. As a result, planned investment for horticultural development increased significantly in the country. The fund allocation for horticultural sector increased from 24.2 crore in the Seventh Five Year Plan to Rs. 1453 crore in the Ninth and to Rs. 5650 crore in the Tenth Five Year Plan. During the Tenth Five Year Plan, centrally sponsored scheme on Technology Mission for Integrated development of horticulture in the North Eastern region was implemented and continued during the Eleventh Five Year Plan. This scheme was further extended to Jammu and Kashmir, Himachal Pradesh and Uttrakhand. The main objective of this Mission was to provide full support for horticultural development in these states. As a result, all India area under horticultural crops grew at the rate of 6.78 per cent per annum between 1991-92 and 2008-09. But, growth in production and productivity was below 2 per cent per year in this period (Table-1). Further, Maharashtra and Andhra Pradesh were leading states in case of fruits production while West Bengal, Uttar Pradesh and Bihar were the major vegetable growing states in India.

During this millennium, problems and constraints of unexploited potential of horticultural sector in the country were pointed out and therefore, National Horticulture Mission (NHM) was launched during 2005-06 covering research, production, post harvest management, processing and marketing of horticultural crops. The Mission envisaged two fold increase in horticulture production by 2011-12 reaching to 300 million tonnes with a growth rate of 6 per cent per annum. Under the Mission, eight North Eastern states, Jammu and Kashmir, Himachal Pradesh Uttrakhand are not covered since these states are receiving benefits under the Technology Mission for Integrated Development of Horticulture. The NHM aims to promote holistic growth of

horticultural sector through area specific strategies to enhance production, nutritional security and to provide income support to farm households.

Objectives:

The NHM has completed initial phase of its implementation in the state of Haryana. Hence, its impact assessment in terms of out-comes and constraints would be useful for the policy makers. This study deals with some of these aspects and it is a departure from earlier literature in terms of its focus on issues related to horticultural crops at the macro as well as micro levels in the state of Haryana. The main objective of this research is to examine economics of selected horticultural crops vis-à-vis other crops grown by the farmers during the year 2008-09 and perceptions of farmers about the Mission. Further, it seeks to highlight the status of horticultural crops at the district and state levels. In addition, we have tried to assess the prospects of increasing employment through cultivation of horticultural crops.

Research Methodology:

The study is based on both macro and micro level data. For the state and district level analysis, relevant information on important indicators was obtained from the Directorate of Horticulture, Ministry of Agriculture, Government of India, New Delhi. The data on main indicators related to agriculture such as GCA for the selected districts and the state were collected from various issues of the Statistical Abstract of Haryana. The micro level data were obtained by conducting a survey of the selected 150 beneficiary farm households growing kinnow, guava, aonla among fruit crops and garlic among vegetable crops. The sample is spread over three districts covered under the Misson namely, Rohtak, Hissar and Sirsa. Further, two villages, one nearby and another far off from the town were chosen for in-depth study. Thus, 25 beneficiary farm households engaged in cultivation of selected horticultural crops were selected from each of the village for detailed analysis. We have used appropriate statistical tools such as coefficient of variations, etc. in the data analysis. The reference year of the study is 2008-09

IV. Main Findings:

Status of Horticultural Crops in Haryana

Although, there has been surge in cultivation of fruits and vegetables in Haryana, an analysis of the status of horticultural crops in the state indicated that these crops covered only 1.4 per cent of GCA during 2009-10 (Table-3). The maximum share of GCA devoted to these crops was around 5 per cent in Ambala. In other districts, area allocated to horticultural crops was around 3 per cent in Kurukshetra and Sonipat. Thus, status of horticultural crops in terms of area devoted does not commensurate with availability of natural resource base.

Vegetables and fruits constituted 82.37 per cent and 11.38 per cent of area under horticultural crops respectively in Haryana. Other crops such as spices, floriculture, medicinal and aromatic plants together occupied around 6 per cent of area cultivated under these crops. Among fruits, mango, guava, citrus and ber were major crops while cucurbits, cauliflower, potato and tomato were main crops among vegetables in terms of area allocation at the state level. Further, Yamunanagar and Sirsa were leading districts in area allocation under fruit crops and together accounted for 37 per cent of the total cultivated area in the state. Cultivation of vegetables was found popular in Karnal, Sonipat, Gurgaon, Ambala and Yamunanagar and these districts together produced around 50 per cent of state's total output. The amount of change in area and production of fruits and vegetables in Haryana has been commendable during the recent years. Progress of fruits and vegetables production in Rohtak and Kurukshetra was appreciable.

Socio-economic Characteristics of Sampled Farmers

For better understanding of the NHM, we have looked into main indicators related to population and workers, educational status of the head of households, farm size, nature of land ownership, cropping pattern and sources of irrigation, area under HYV seeds, farm assets, credit availed by farm households and income of the farmers.

The efficiency and success of farming is influenced to a significant degree by the socio-economic background of the households. In addition, these characteristics influence adoption of improved technology. The average size of the family of selected farm households was 5.91 persons and there was no correlation between farm size and

average size of family. The share of dependents in total population was 7.45 per cent at the overall level. Further, average number of workers per family ranged between 1.54 and 2.14 persons and most of them were engaged in agriculture. Also, literacy rate of the selected families was found to be impressive and large farm households indicated higher level of literacy.

The nature of land ownership influences crop pattern, adoption of technology and innovation. At the aggregate level, average land owned by the farmers was 16.35 acres. The practice of leasing-in land was common but none of them leased out land. Like the state, cropping intensity was found to be higher (224.26 per cent) on sampled farms. The main sources of irrigation were canal tubewell. In kharif season, bajra, paddy and vegetables were the main crops while rabi season was dominated by wheat and mustard. Adoption of HYV seeds is popular for wheat, paddy, mustard and horticultural crops. These farmers owned a variety of farm assets and value of farm assets was Rs. 3,59,030 per family. Tractors followed by milch animals were the major assets owned by these families. As expected, positive relationship emerged between farm size and value of farm assets. Availability of credit has played an important role in transforming traditional agriculture into modern agriculture in Haryana. The selected farmers availed credit of Rs. 2,10,000 per family and large farmers reaped higher benefits in comparison to other categories.

It was observed that sampled farm households earned income from crop cultivation, dairying, wage employment, salary and pensions, etc. The computed per household income was found to be Rs. 2,79,839 during the year 2008-09. Large variations in income have been observed across different classes of farmers. Large farm households earned the highest income due to their large resource base. Thus, farm size and income were found to be positively correlated.

Economics and Employment Generation through Horticultural Crops vis-à-vis other Crops

The impact of the National Horticulture Mission in Haryana on net returns per acre was assessed through comparison of selected horticultural crops with other crops grown by the farmers during 2008-09. Results of sampled survey pointed out that gross returns

per acre from garlic cultivation were found higher than other selected horticultural crops during the reference year and this was true for net returns as well. Wide variations were observed when net returns were calculated at total cost after including fixed costs incurred by the growers of fruit crops. Among fruits crops, viz, kinnow, guava and aonla, net returns from latter were found higher than first two crops.

Farm size variations were common in gross returns and net returns per acre. In case of kinnow, an inverse relationship could be ascertained between farm size and returns. However, a mixed scenario emerged in case of remaining two horticultural crops. Therefore, any relationship between returns and farm size could not be ascertained.

A comparison of net returns from cultivation of selected horticultural crops with other crops during the kharif season has exhibited that flowers followed by sugarcane and cotton were found superior than paddy in terms of net returns per unit of land. The economics of moong, a minor pulse crop grown on sampled farms was also worked out and profitability was compared vis-à-vis other rainfed kharif crop such as bajra. This pulse crop provided higher net returns per acre in comparison to bajra. It was observed that vegetables and summer moong were superior crops than wheat, gram and mustard in terms of returns during rabi season.

An analysis of net returns from kharif, rabi and horticultural crops grown by the beneficiary farmers indicated that flowers followed by garlic, aonla and guava were superior crops in terms of profitability in comparison to traditional crops like wheat and paddy on sampled farms in Haryana (Table-4.5).

Results show that selected horticultural crops generated higher employment in comparison to several traditional crops. In particular, garlic generated highest employment per acre in terms of labour days. Among various categories of farmers, marginal farmers used more than average number of labour days in growing these crops. Further, weeding and inter cultural operations were found most labour intensive and therefore, higher proportion of labour days was used for these activities.

Impact of NHM and Perceptions of Farmers on Important Issues

Response of farmers about area expansion under horticultural crops after adoption of the NHM was positive. But, they did not opt for rejuvenation due to low

level of subsidy. Further, perceptions of farmers about employment generation and increase in household income through cultivation of kinnow, guava, aonla and garlic were positive. Overall, majority of the farmers reported increase in household income after implementation of the NHM, but the major beneficiaries of the Mission were large farmers. Hence, there is an urgent need for strong government intervention to help marginal farmers in raising household income through cultivation of horticultural crops.

Subsidy provision was listed as the most important positive factor by 94.67 per cent farmers. In each farm category, at least 90 per cent farmers gave positive response. Further, response of the farmers' regarding infrastructure and capacity building was found poor.

Performance of different categories of farmers varied in terms of yield rates for kinnow, guava, aonla and garlic. Although, several factors determine yield rates, extension through training plays an important role. Frequency of the training provided by the State Horticulture Department to beneficiaries of the NHM was 1.75 trainings during the year 2008-09. Respondents informed during the discussion that they were not satisfied with the training programmes organized by various institutions to impart knowledge about activities and package of practices for cultivation of horticultural crops under the Mission. Moreover, training was of very short duration and it was not sufficient to provide full details.

Growers of selected horticultural crops i.e. kinnow, guava, aonla and garlic received subsidy from the government for seedling, fertilizer, pesticides, drip irrigation and water tank. The highest percentage of farmers receiving subsidy was noticed for kinnow followed by guava.

There is no government intervention in the marketing process of horticultural crops in Haryana. Respondents during the survey reported that they sold garlic through commission agents. In case of fruit crops such as kinnow, guava and aonla, most of the farmers sold standing crops to pre-harvest contractors. These contractors were responsible for plucking, grading and marketing of the produce. Often, contractors make advance payment to the growers. Their collection centres operate within short distances. The produce harvested is collected here and sold to wholesalers when prices are found attractive.

None of the sampled farmers opted for processing of kinnow, guava and aonla despite understanding the benefits of processing and increase in profits after value addition. This brings out the importance of micro economic policies relating to public investment in processing. In the present circumstances, public policies that encourage private investment in processing can be useful in solving this problem.

Policy Implications

Horticultural crops offer an opportunity to enhance agricultural growth, employment and augment income of the farmers. In Haryana, these crops are getting popular among farmers due to government support under the National Horticulture Mission (NHM). But, full potential could not be tapped due to severe constraints in infrastructural and marketing facilities.

NHM has completed around five years of its implementation in Haryana but its impact on area, production and yield of selected horticultural crops was found limited due to low coverage of farmers and lack of holistic approach in practical. In order to make, Mission more effective, following policy measures are suggested. (i) to promote shorter gestation vegetable and fruit crops, medicinal and aromatic plants and commercial flower crops through research and development.(ii) timely availability of good quality planting material and pasteurized compost/vermi- compost. (iii) motivating farmers to adopt latest technology for growing horticultural crops by arranging demonstrations and trainings at regular intervals to update their knowledge on modern technology. (iv) provision of post-harvest facilities through public private partnership in rural areas of the potential districts on priority basis and gradually extending to the entire state. (v) creation of storage and processing facilities at the village level. (vi) Identifying horticultural crops having export potential.

Table-1

Area, Production and Productivity of Horticultural Crops in India (1991-92 to 2008-09)

Year	Area (million ha)	Production (million mt)	Productivity (mt/ha)
1991-92	12.8	96.6	7.5
1992-93	12.9	107.4	8.3
1993-94	13.0	114.7	8.8
1994-95	13.1	118.4	9.0
1995-96	13.7	125.5	9.2
1996-97	14.4	128.5	8.9
1997-98	14.8	128.6	8.7
1998-99	15.1	146.2	9.7
1999-00	15.3	149.2	9.8
2000-01	15.7	150.2	9.6
2001-02	16.6	145.8	8.8
2002-03	16.3	144.4	8.9
2003-04	19.2	153.3	8.0
2004-05	21.1	170.8	8.1
2005-06	18.7	182.8	9.8
2006-07	19.4	191.8	9.9
2007-08	20.2	211.2	10.5
2008-09	20.7	214.7	10.4
Per annum Growth rate	6.78	1.09	1.60
Coefficient of Variation	17.74	22.85	9.12

Note: Crops = Fruits, vegetables, potato &tuber crops, mushrooms, flowers (loose) plantation crops (coconut, cashewnut, arecanut, &coca), spices and honey
Source: NHB, 2009

Table-2

Percentage of GCA under Horticultural crops in Haryana

District	Percentage of GCA
Ambala	5.07
Panchkula	2.09
Yamunanagar	2.05
Kurukshetra	3.30
Kaithal	0.38
Karnal	1.15
Panipat	2.00
Sonipat	2.56
Rohtak	0.87
Jhajjar	0.42
Faridabad	2.00
Gurgaon	1.77
Rewari	0.33
Mahendragarh	0.59
Bhiwani	0.08
Jind	0.56
Hissar	0.71
Fatehabad	0.57
Sirsa	0.68
Haryana	1.11

Source: Ministry of Agriculture, Government of India, New Delhi

Table- 3
District wise Share in Area under Horticultural crops in Haryana

Sl. No.	District	Fruits and Vegetables
1	Panchkula	2.74
2	Ambala	7.72
3	Yamunanagar	9.85
4	Kurukshetra	5.77
5	Kaithal	1.68
6	Karnal	8.82
7	Panipat	5.73
8	Sonipat	8.68
9	Rohtak	3.73
10	Jhajjar	3.24
11	Faridabad	2.97
12	Narnaul	2.64
13	Rewari	1.31
14	Gurgaon	10.98
15	Bhiwani	3.44
16	Hissar	2.90
17	Fatehabad	3.73
18	Sirsa	4.53
19	Jind	3.40
20	Mewat	4.05
21	Palwal	2.10
	State	100.00

Source: I bid

Table-4

Net returns from Horticultural and non-Horticultural Crops

(Rs. Per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0	12583	10852	12762	12499
Bajra	2750	4109	2649	3083	3063
Vegetable	9665	14267	8972	6631	7476
Cotton	0	15231	13288	14419	14383
Moong	0	0	14000	5303	5352
Flower	19000	0	62500	0	40750
Sugarcane	0	0	0	17250	17250
Rabi crops					
Wheat	7417	6455	7027	5377	5558
Mustard	6000	10075	7022	7068	7086
Vegetable	9250	23013	7141	7190	8011
Moong	0	0	8000	0	8000
Gram	0	0	0	6263	6263
Selected Horticultural crops					
Garlic	36350	29744	43261	41345	40612
Kinnow	0	16519	15367	14246	14327
Guava	34286	22837	27190	16147	19699
Aonla	0	0	10776	30545	29840

Source: Ibid

Chapter-I

Introduction:

Fruits and vegetables are rich source of vitamins, minerals, proteins and carbohydrates that are essential in human diet. Flowers and ornamental crops enhance aesthetic value of our environment while medicinal crops yield pharmaceutical constituents. Thus, horticulture assumes great importance in food and nutritional security, general health and well -being of our population.

Horticulture crops form a vital part of the Indian agricultural production. India is the second largest producer of fruits and vegetables in the world. Cultivation and processing of these crops generate significant employment opportunities for the rural and peri-urban population. In addition, marketing creates employment prospects for the urban poor which in turn ensure better livelihood security.

Horticultural sector including fruits, vegetables, condiments and spices with a share of about 6 per cent in total cropped area contributed maximum (32 per cent) to the total value of crop production in TE 2004-05. Moreover, gross value of fruits and vegetables grew at an annual rate of 5.6 per cent that was higher than growth of any other crop between 1995-96 and 2004-05. This achievement is commendable since growth in their contribution was one of the lowest (2.9 per cent) between 1981-82 and 1995-96 (Birthal *et al*., 2008).

1.1- Literature Survey:

Indian agriculture is dominated by small and marginal farmers. According to the *Agricultural Census*, 2001, 81.9 per cent of holdings were less than or equal to 2 ha and had an average size of 0.59 ha. Although, horticulture has potential of higher returns from land, it is often debated that farmers cultivating tiny pieces of land may not diversify towards these crops due to numerous constraints in production and marketing as well as higher production and price risks associated with these crops. Among horticultural crops, vegetables are more pronounced on small farms, while fruits, condiments and spices occupy a larger share on large farms. These differences are expected. Vegetables generate quick returns, require low capital and relatively higher

labour input, which match resource endowments of the small farmers. Since, fruits, condiments and spices require higher initial capital and have a long gestation period; these do not suit to small farmers who are capital constrained. Therefore, small farmers generally diversify towards vegetables because of surplus labour and liquidity constraint (Birthal *et al*., 2008). Horticulture can be promoted as a means of agro-diversification for the second green revolution in India, providing the much-needed impetus to the growth of agricultural sector, through increase in trade, income and employment. The Indian agriculture is diversifying towards production of high value commodities along with increasing role of small farmers (Surabhi Mittal, 2009). The horticultural crops constituting fruits, nuts, vegetables including potato, tuber and mushroom, ornamental plants including cut flowers, spices, plantation crops have become a key driver for economic development in many states of the country and contribute significantly to the GDP of agriculture. In literature, importance of horticulture in improving productivity of land, economic conditions of the farmers and entrepreneurs, enhancing exports and, above all, providing nutritional security to common masses, is widely acknowledged.

The value productivity per hectare of horticultural crops has been estimated higher than cereals, pulses, oilseeds, sugarcane and cotton. The differential in per hectare value of output was more than 50 thousand rupees. Next two decades witnessed increase in productivity of all crop groups but absolute gains were much larger for horticultural crops. Horticultural crops covered 20.7 million hectares of area and produced 214.71 million tonnes of output in 2008-09, accounting for 8.5 per cent of gross cropped area of the country. The targeted growth rate for horticultural sector during the XI Plan has been envisaged 7-8 per cent. With fruit production at 47.5 million tonnes in 2003-04, India accounted for about 10 per cent of the global production of fruits from an area of 4.0 million hectares. With 90 million tonnes of vegetables production in 2003-04, India ranked as the highest producer of vegetables. In the world, India occupied first position in the production of cauliflower, second in onion and third in cabbage. (Ramesh Chand *et al*. 2008)

Per hectare share of output of horticultural crops is more than 6 times that of cereals. As such, horticultural industry should focus on targeted commodities and raise output to trigger agricultural productivity in leading sub-sectors, which show potential.

Most of horticultural commodities are sold in their raw form at low price, especially when there is a glut. Higher income could be generated through value addition by processing which reduces post-harvest losses and lengthens shelf life. Solution to overcoming challenges and unlocking potential of the horticultural sector lies in forming strong producer groups, producer-marketing alliances and producer–researcher working groups. There is a need for substantive investment in irrigation, biotechnology, plant breeding, post harvest technology, fertilization, pest and disease management and food safety to enhance growth. The horticulture production per unit of area is significantly higher as compared to cereals. Since one or other crop will always remain in field or at maturity, manpower can be judiciously used in the field and even crop failure will not be a serious set back to the growers. The yield of rice or wheat is 3 to 4 tonnes per hectare as compared to 15-20 tonnes yield of cabbage or potato.

Development Trends in Horticulture:

The period of horticulture development in India can be divided into five phases. The first phase comprises a period prior to independence of the country, second phase covers a period from 1948 to1980, third phase from 1980 to1991 and fourth phase from1991 to 2000 and fifth phase from 2000 to 2010. During pre-independence period, horticultural crops were mostly grown around the house that comprised fruits and flowers. Higher technology was not used in growing horticultural crops. In particular, kings, *Jamindars* and *Jagirdars* grew these crops at household level. Specifically, these enterprises were adopted as status symbol during this period. Second phase of horticultural development covered the period, which was influenced by indigenous thinking for sectoral growth of commodities in the regions of importance, which mostly included coconut, areca nut and spices. This phase emphasized on development of fruits in tropical and subtropical regions through establishment of centers. This period also witnessed establishment of research institutions devoted to horticulture. Third phase may be considered as a period of consolidation both for research and development. At centre level, higher-level positions in development and research such as Horticulture Commissioner (Deputy Director General) were created and efforts for development were triggered. Many states provided special attention to horticulture,

recognizing its role in nutritional security, employment generation and enhancing farm income. In Central institutes, Directorates of horticulture were established which benefited farmers in adoption of improved technology. Fourth phase marked technological change and growth. It recorded quantum jump in plan allocation, formation of association by farmers, unprecedented increase in production, enhanced availability of the produce. During this period, there has been a quantum jump in production and exports of flowers and introduction of new crops. This period was termed as transition from traditional horticulture to hi-tech horticulture and precision farming approach. Organic horticulture, quality management and safety assumed special significance. In fifth phase of horticulture development, research and development were characterized by large-scale adoption of innovations like micro-propagation, protected cultivation, use of *in vitro* propagated plants and diagnostics. This enhanced investment through launching of various mission mode programmes. Research results supported by investment and extension helped in achieving quantum jump in production, productivity, availability and exports. In addition, many new crops were introduced. This trend of horticultural development has been marked as “Golden Revolution” recording a growth rate of 6 per cent per annum and their enhanced their contribution to GDP of agriculture

National Scenario of Horticultural Crops:

During the past two decades, area, production, productivity, availability and exports of horticultural crops increased manifolds, which provided ample opportunities for utilization of wasteland, employment generation and effective land use planning. Diversification through horticultural crops has been recognized as one of the options for improving land use planning. Results of the paper by (Ramesh Chand et.al, 2008) on share of horticultural crops and other important crops in total value of crop production at five points of time show that share of horticultural crops has grown much faster than other important crops in India between 1970-71 and 2005-06. Cereals, pulses, oilseeds, sugarcane and cotton constituted 43.14, 5.35, 9.62, 3.91 and 4.01 per cent of total crop production at current prices during 1970-71. In addition, horticultural crops such as fruits vegetables, condiments and spices together formed 17.11 per cent share of all India

production. After almost three decades in the year 2005-06, share of cereals and pulses declined whereas horticultural crops showed a clear-cut improvement of 12 per cent. Thus, increase in share of horticultural crops in the value of crop production was appreciable between 1970-71 and 2005-06 (around 12 per cent). Further, contribution of horticultural crops to GDP of agriculture, which was only 0.58 per cent during 1952-53, increased to 18.0 per cent in 1991-92 and subsequently to 30.4 per cent in 2007-2008. It implies that crop diversification through horticulture crops has improved income of farm households, which increased sharply between 2000 and 2010.

An examination of results presented in Table 1.1 reveals that area under horticultural crops grew at the rate of 6.78 per cent per annum between 1991-92 and 2008-09. The growth of productivity however, was slow (1.60 per cent per annum) and therefore, production grew at a low rate of 1.09 per cent per year during this period. The year to year variations in area and yield were found common and these affected total production.

Table-1.1

Area, Production and Productivity of Horticultural Crops in India (1991-92 to 2008-09)

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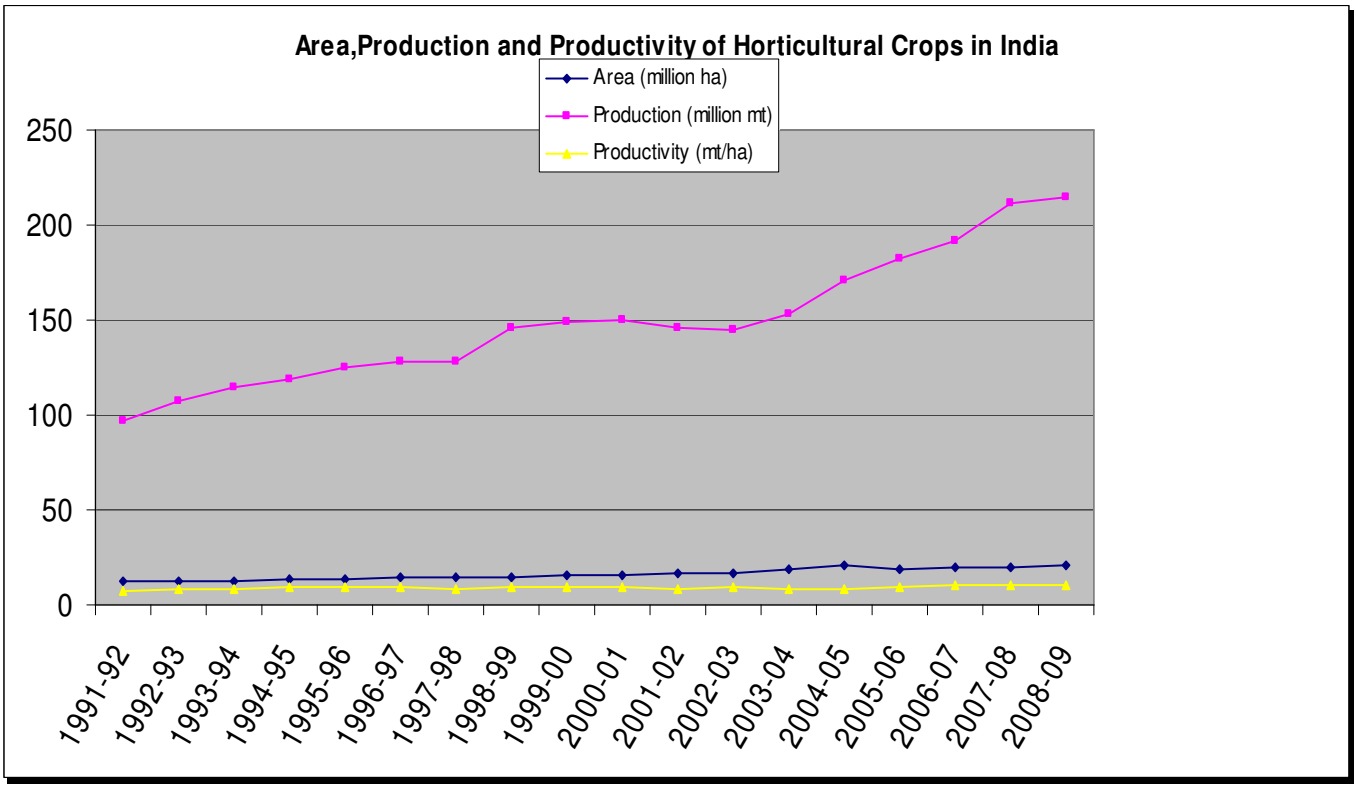
Source: NHB, 2009

Figure:1


Area,Production and Productivity of Horticultural Crops in India
Area (million ha)
Production (million mt)
Productivity (mt/ha)
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2007-08
2008-09

India emerged as second largest producer of fruits (68.5 million tonnes) contributing 11.2 per cent share in global fruit production during this millennium. India occupied first place in production of mango, banana, papaya, pomegranate, sapota and aonla. It is essential to mention that production and productivity of banana and sapota is the highest in the world. Information presented in Table 1.2 reveals importance of major fruits and vegetables grown in India in terms of area and production during 2006-07 and 2008-09. Clearly, mango, citrus and banana together dominated the scenario in acreage (around 65 percent). But, in terms of production banana with around 35 per cent share was ahead of mango and citrus. Almost same pattern was observed during 2008-09.

Among vegetables, potato followed by onion dominated the scenario in terms of area as well as production in India during 2006-07. Other important crops were tomato and brinjal which occupied around 16 per cent of area and contributed almost same share in production during 2006-07. Next year, potato and onion maintained their position in area. However, share of potato in total production of vegetables in India increased from 24.87 per cent to 26.64 per cent. Among other vegetables, cabbage and cauliflower have shown some improvement in area and production during the year 2008-09 over 2006-07.

Table-1.2
Share of Important Fruits and Vegetables in all India Area and Production during 2006-07 and 2008-09

	2006-07				2008-09			
Crop	Area	Percent	Production	Percent	Area	Percent	Production	Percent
I-Fruits								
Mango	2154	38.78	13734	23.06	2309	37.85	12750	18.62
Apple	252	4.54	1624	2.73	271	4.44	1985	2.90
Banana	604	10.88	20998	35.25	709	11.62	26217	38.29
Citrus	798	14.37	7145	12.00	923	15.13	8608	12.57
Guava	176	3.17	1831	3.07	207	3.39	2270	3.32
Grapes	65	1.17	1685	2.83	80	1.31	1878	2.74
Papaya	72	1.30	2482	4.17	98	1.61	3629	5.30
Total*	5554	100.00	59563	100.00	6101	100.00	68465	100.00
II-Vegetables								
Potato	1743	23.00	28599	24.87	1828	22.91	34391	26.64
Onion	768	10.13	10847	9.43	834	10.45	13565	10.51
Tomato	596	7.86	10055	8.74	599	7.51	11149	8.64
Brinjal	568	7.49	9453	8.22	600	7.52	10378	8.04
Cabbage	249	3.29	5584	4.86	310	3.89	6870	5.32
Cauliflower	302	3.98	5538	4.82	349	4.37	6532	5.06
Okra	396	5.22	4070	3.54	432	5.41	4528	3.51
Peas	297	3.92	2402	2.09	348	4.36	2916	2.26
Tapioca	255	3.36	8232	7.16	280	3.51	9623	7.46
Total*	7579	100.00	114993	100.00	7979	100.00	129078	100.00
Grand Total (Fruits+Vegetables)	**19389**		**191814**		**20659**		**214716**	

*Total includes remaining fruits and vegetables
Source: Agricultural Statistics at a Glance, 2010

State Level Scenario and Contribution of Haryana

After analyzing macro scenario of growth of horticultural crops in India, it would be appropriate to gauge their status at the state level. It is cited in literature that share of three states i.e. West Bengal, Uttar Pradesh and Orissa in all India area under horticultural crops was observed higher than 10 per cent during 1990-91. After more

Table-1.3
Share of Important States in all India Production of Fruits and Vegetables during 2008-09

State	Fruits		Vegetables		Others*	
	Area	Production	Area	Production	Area	Production
Andhra Pradesh	15.34	16.66	4.07	4.08	9.96	13.47
Arunachal Pradesh	0.94	0.16	0.30	0.09	0.17	0.25
Assam	1.72	2.30	3.01	2.26	2.04	1.09
Bihar	4.76	5.44	10.36	10.37	0.17	0.09
Chhattisgarh	1.83	1.41	3.79	2.36	0.39	0.46
Gujarat	5.19	8.50	4.95	5.27	5.15	3.35
Haryana	0.62	0.39	3.74	3.02	0.18	0.51
Himachal Pradesh	3.17	0.91	0.94	0.98	0.24	0.18
Jammu & Kashmir	3.36	2.25	0.76	0.79	1.63	0.89
Jharkhand	1.18	0.58	3.03	2.82	0.03	0.13
Karnataka	5.17	7.70	5.61	5.98	14.43	11.49
Kerala	5.26	3.74	2.05	2.72	19.79	24.49
Madhya Pradesh	1.51	3.47	3.65	3.18	3.37	2.24
Maharashtra	23.48	15.96	5.62	4.93	4.92	3.12
Rajasthan	0.50	0.71	1.57	0.57	12.11	3.40
Tamilnadu	5.22	0.70	3.59	6.74	10.39	23.17
Uttar Pradesh	5.68	6.48	12.38	14.68	3.10	1.23
Uttrakhand	2.81	1.06	1.03	0.83	0.33	0.17
West Bengal	3.33	4.05	16.59	17.59	2.55	3.02
Total	100.00	100.00	100.00	100.00	100.00	100.00

*Others include remaining horticultural crops.
Source: Agricultural Statistics at a Glance, 2010

than a decade, share of different states has exhibited positive as well as negative changes. Although, share of Orissa and Uttar Pradesh has declined, it was observed constant in West Bengal. Around 40 per cent states witnessed increase in their share of area under fruits and vegetables in all India area during 1990-91 to 2005-06. In particular, diversification in favour of fruits and vegetables was observed in Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka and Gujarat. At the state level, share of area

in fruits and vegetables increased from 8.12 per cent to 9.61 per cent in Andhra Pradesh, 7.83 per cent to 12.02 per cent in Maharashtra, 2.96 per cent to 4.12 per cent in Gujarat, 4.19 per cent to 5.89 per cent in Karnataka, and 5.52 per cent to 5.96 per cent in Tamil Nadu. On the other hand, fruits and vegetables occupied merely 1.68 per cent in Haryana and less than 1 per cent area in Rajasthan and below 2 per cent in Punjab and Madhya Pradesh. Diversification towards horticulture crops is found very slow in Bihar and Uttar Pradesh.

Owing to very high value of output per unit of area, share of fruits and vegetables in value of output is much higher than their share in area. The most notable achievement was recorded in Andhra Pradesh where share of fruits and vegetables in value of output has increased by more than 2 per cent between 1990-91 and 2005-06. Fruits and vegetables constitute more than half of total value of crop sector in the hill states of Himachal Pradesh and Jammu and Kashmir but achievements in this regard were found poor in West Bengal in share of fruits and vegetables in terms of value of out put increased by around 3 per cent. Fruits and vegetables constituted less than 10 per cent value of crop output in Haryana but it contributed 1.36 per cent in value against 0.64 per cent share in area. It is due to higher yield rates. It is important to mention that despite lot of concern about arid horticulture, share of fruits and vegetables in Rajasthan remains below 1 per cent in area and in value of output. Similarly, efforts to promote horticulture as an alternative to rice-wheat cropping system in northwest India have not made significant progress.

Growth rate in production of fruits and vegetables has experienced significant slowdown at the all India level. In some states, their growth has suffered, while, there is sharp acceleration in other states after 1999-2000. Maharashtra, has exhibited more than 5 per cent growth rate in each period with a declining trend and Andhra Pradesh has seen acceleration in growth rate from 4 to about 5 per cent during this period. Rapid progress in production of fruits and vegetables in Bihar and Haryana was observed between 1990-91 and 2005-06 and crossed 10 per cent mark. Growth rate turned out to be either negative or low in Assam, Karnataka, Rajasthan, and West Bengal. Even after formation of new states, horticulture does not seem to be making significant progress in Uttarakhand.

An examination of recent data presented in Table 1.3 exhibited that Maharashtra and Andhra Pradesh together shared as high as 40 per cent of all India area and 33 per cent of production of fruits during 2008-09. Notwithstanding the large gap, Bihar, Gujarat, Karnataka, Kerala, Tamil Nadu and Uttar Pradesh indicated around 5 per cent contribution at the country level. In case of vegetables, West Bengal followed by Uttar Pradesh and Bihar dominated the scenario and together contributed around 40 per cent to all India area and production. All other states indicated less than 5 per cent contribution in area as well as in production at the all India level. Apart fruits and vegetables, India grows other horticultural crops such as spices and plantation crops, etc. It may be observed that Kerala, Karnataka and Rajasthan were the most important states in this regard. It is essential to mention that Rajasthan contributed only 3.4 per cent share in production of other horticulture crops against around 12 per cent proportion in area while vice versa was true for Tamil Nadu. This is largely due to differentials in productivity of these crops.

National Horticulture Mission

The National Horticulture Mission is being implemented since the year 2005-06 with requisite backward and forward linkages and an end-to-end approach covering research, production, post-harvest management, processing and marketing. The Mission envisages two fold increases in horticulture production by 2011-12 with a production of 300 million tonnes with 6 per cent annual growth. Under the Mission, all the States and three Union Territories except eight north Eastern States, Jammu and Kashmir, Himanchal Pradesh and Uttarakhand, which are benefiting under the Technology Mission for Integrated Development of Horticulture in the North-Eastern States (TMNE) have been covered. The Mission's objectives are to promote the holistic growth of the horticulture sector through area based regionally differentiated strategies; to enhance horticulture production; improve nutritional security and provide 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, specially unemployed youth. The thrust of the Mission is on area based

regionally differentiated cluster approach for development of horticultural crops having comparative advantage. The Mission envisages an end to end approach covering production, post harvest management (PHM), processing and marketing to ensure appropriate returns to growers/producers, enhance coverage of area under horticulture crops and improve productivity potential, adopt a coordinated approach and promote partnership, convergence and synergy among R&D, processing and marketing agencies in public as well as private sector at all levels.

1.2 Objectives:

Haryana has basically food grains based agriculture and rice wheat rotations are prominent. In addition, cotton, mustard and sugarcane are also grown widely. These together contributed 22.7 per cent of gross cropped area in 2005-06. Recently, the government of Haryana has been making concerted efforts to diversify agriculture through popularizing horticultural crops. These crops are being promoted because a variety of fruits and vegetables can be grown in different agro-climatic regions of the state with the assistance of Central Government.

Horticulture Mission was launched in Haryana during 2005-06. Various types of subsidies and assistance are being provided to the farmers. The initial phase of the implementation of the Mission has been completed and therefore, it would be useful to study its impact on important indicators. Keeping in mind this background, specific objectives of this study are as under :

i) to assess the impact of the Misssion in terms of increase in area, production and productivity of identified horticultural crops covered under NHM.
ii) to analyse generation of employment and enhancement of income of the farmers.
iii) to suggest measures in improving the implementation strategy.

1.3 Research Methodology and Sample Design:

Present study is based on both secondary as well as primary data. The secondary data were collected from various issues of the Statistical Abstract of Haryana, Agricultural Statistics at a Glance and Economic Survey, It is essential to mention that district wise data on area, production and yield of horticultural crops in

Haryana are available only for the years - 2007-08,2008-09 and 2009-10. This puts a severe limitation to the detailed analysis and therefore, calculation of growth rates could not be possible. Available data were obtained from the Horticultural Statistics section of the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. The information related to the National Horticulture Mission in the selected districts was provided by the Horticulture Development Officers. Discussions and meetings with district and block level officers' enriched knowledge about horticulture crops grown in the area, related issues and limitations of the farmers.

In order to collect primary data, a field survey was conducted in the three districts of Haryana i.e. Sirsa, Rohtak, and Hissar covered under the National Horticulture Mission. For detailed investigation, 50 beneficiary farmers growing kinnow, guava, aonla and garlic with the assistance provided under the Mission from each selected district were chosen for in-depth analysis. On the whole, 150 beneficiary farmers constituted sample of the study. Further, in each of the selected district, 25 beneficiary farmers from near by villages and 25 beneficiary farmers from far off villages were selected. An effort was made to cover farmers from all categories such as small, marginal, OBC and SC farmers.

Analysis of gross and net returns from selected hort/icultural crops cultivation is based on data collected during the field survey in selected three districts (Sirsa, Hissar and Rohtak). The discussion is confined to kinnow, guava, aonla and garlic among horticultural crops. Further, net returns from these four selected horticultural crops vis-à-vis other crops such as paddy, bajra, vegetables, cotton, moong, flowers and sugarcane in kharif season, wheat, mustard, vegetables, summer moong and gram in rabi season have been compared. The costs considered for selected three fruit crops (kinnow, guava and aonla) included variable as well as fixed costs. Variable costs constituted preparatory tillage, manure and fertilizers, transplanting and gap filling, irrigation, weeding and intercultural operations, topping/pruning, plant protection, harvesting and collection, grading, storage, transport and packing, cost of labour and interest on working capital. Under fixed costs, planting material, initial preparatory tillage cost, supporting material and costs of irrigation setup were considered. These costs incurred at the time of establishing a fruit orchard were amortized over the lifetime of a plant. For

the fourth selected horticultural crop of garlic, only variable costs were considered in view of being a kharif crop. In case of other crops, material and labour costs were considered appropriate for measuring net returns. The net returns for each crop were worked out by subtracting costs from gross returns. Gross returns for horticultural crops were calculated on the basis of value of the main product while by product was added in the case of other crops. It may be mentioned here that net returns and profitability are used interchangeably in this analysis. The reference period for this study is the year 2008-09.

The methodology followed for each aspect is different. For measuring the growth rates of area, production and yield of fruit and vegetable crops at the all India and state level for available period, the semi-log equation of the form log y = a + bt was used where -

y = area/production/yield of the crop

a = intercept

b = slope

t = time

We have also worked out coefficient of variation of time series data by using the following formula

$$CV = \frac{\delta .}{\overline{X}}$$

Where,

CV= coefficient of variation

δ = standard deviation

$\overline{X}$ = mean

For calculating the amortization cost of selected three fruit crops, the following formula (Subrahmanyam, et.al., 1982) was used -

$$P = B \frac{i}{1-(1+i)^{-n}}$$

Where,
P= amount of annual payment

B= initial payment

n= number of years (life period of plantation crop)

i= interest or discount rate (10 per cent in the present case)

1.4 Organization of the Study

The study is organized into six chapters. Chapter-I deals with problem, literature survey, objectives of the study, research methodology including sampling design and organization of the study. Next chapter discusses status of horticultural sector in terms of area, production and productivity of major horticultural crops grown in Haryana. Chapter-3 provides an overview of household characteristics and resource base of sampled farmers. Chapter-4 presents economics of horticultural crops vis-à-vis other important crops. Employment generation through growing selected horticultural crops is also covered in this Chapter. The final chapter presents summary, conclusions and policy implications.

Chapter-2

Area, Production and Productivity of Horticultural Crops in Haryana

Introduction:

Economy of Haryana is largely agricultural based and the state is viewed as grain bowl of India, being one of the largest contributors of food grains to the central pool. Moreover, it ranks first in the country in the export of Basmati rice. Green revolution in the state has been synonymous with farm mechanization, development of irrigation infrastructure and use of fertilizers. Consequently, overall productivity per unit of land has risen significantly.

Dominance of wheat and paddy rotation in the crop pattern of Haryana has started creating problems such as soil degradation. Significantly; water table is receding with each passing year due to over exploitation of water. Both these crops are input intensive and therefore, cause imbalance in nutritional structure of soil and pollute the underground water. To overcome these problems, horticulture can play an important role through diversifying land use pattern.

Diverse agro-climatic conditions of the state are conducive for cultivation of horticultural crops including fruits like citrus, grapes, mango, guava, etc. Since, one third of the state territory falls within the geographical coverage of the National Capital Region, there is a tremendous scope for commercial cultivation of vegetable crops, fruits, flowers, etc. In addition, establishment of agro-processing industries has a good potential. Especially, owing to its proximity to Delhi, there is vast potential for processing of fruits and vegetables.

In view of this background, we first present the status of horticultural crops in Haryana in terms of area, production and yield during 2007-08, 2008-09 and 2009-10. In addition, we present statistics related to horticultural crops at the crop and district level.

2.1 Status of Horticultural Crops in Haryana

Agricultural economy of Haryana is foodgrains based with 66.7 per cent of GCA under their cultivation. Wheat followed by paddy has been observed as the most important cereal crops with 36.7 and 15.9 per cent of GCA in the state during the

Table-2.1
Area under Fruits and Vegetables in Haryana

Year	Fruits		Vegetables		Fruits and vegetables	
	Area (000 ha)	Per cent of all India	Area (000 ha)	Per cent of all India	Area (000 ha)	Per cent of all India
1996-1997	21.8	0.61	94.5	1.71	116.3	1.28
1997-1998	23.9	0.65	96.8	1.73	120.7	1.30
1998-1999	26.2	0.70	120	2.05	146.2	1.52
1999-2000	28.6	0.75	135	2.25	163.6	1.67
2000-2001	30.7	0.79	141.7	2.27	172.4	1.70
2001-2002	31.3	0.78	150.4	2.44	181.7	1.79
2002-2003	31.9	0.84	163.1	2.68	195	1.97
2003-2004	31.6	0.68	203.9	3.23	235.5	2.14
2004-2005	24.1	0.49	207.8	3.08	231.9	1.98
Growth rate	2.91		10.71		9.5	

Source: CMIE, 2008-09

triennium ending 2008-09. In addition, mustard and cotton are also grown on sizeable proportion (10.4 and 8.9 per cent) of GCA. It is essential to mention that area under pulses became as low as 2.7 per cent of GCA during the reference period.

We have presented information on status of Haryana in all India area under fruits and vegetables from 1996-97 to 2004-05 in Table-2.1. It is evident that share of this state in all India area under fruits was less than 1 per cent through out these years despite higher potential. Moreover, it grew at the rate of 2.91 per cent per annum during this period.

A look at the share of Haryana in all India area under vegetables reveals a far better status. It constituted 1.71 per cent of all India area during 1996-97 and reached to 3.08 per cent in 2004-05. The annual growth rate of area under vegetables was commendable and crossed 10 per cent mark. These figures indicate a distinct achievement of the state. When fruits and vegetables are clubbed together, Haryana showed 1.28 per cent share in all India area during 1996-97 which reached to 1.98 per cent during 2004-05. The area expansion appeared to be commendable by indicating a growth rate of 9.5 per cent per year during the above-mentioned period.

Table-2.2
Percentage of GCA under Horticultural crops in Haryana

District	Percentage of GCA
Ambala	5.07
Panchkula	2.09
Yamunanagar	2.05
Kurukshetra	3.30
Kaithal	0.38
Karnal	1.15
Panipat	2.00
Sonipat	2.56
Rohtak	0.87
Jhajjar	0.42
Faridabad	2.00
Gurgaon	1.77
Rewari	0.33
Mahendragarh	0.59
Bhiwani	0.08
Jind	0.56
Hissar	0.71
Fatehabad	0.57
Sirsa	0.68
Haryana	1.11

Source: Ministry of Agriculture, Government of India, New Delhi

Figure:1

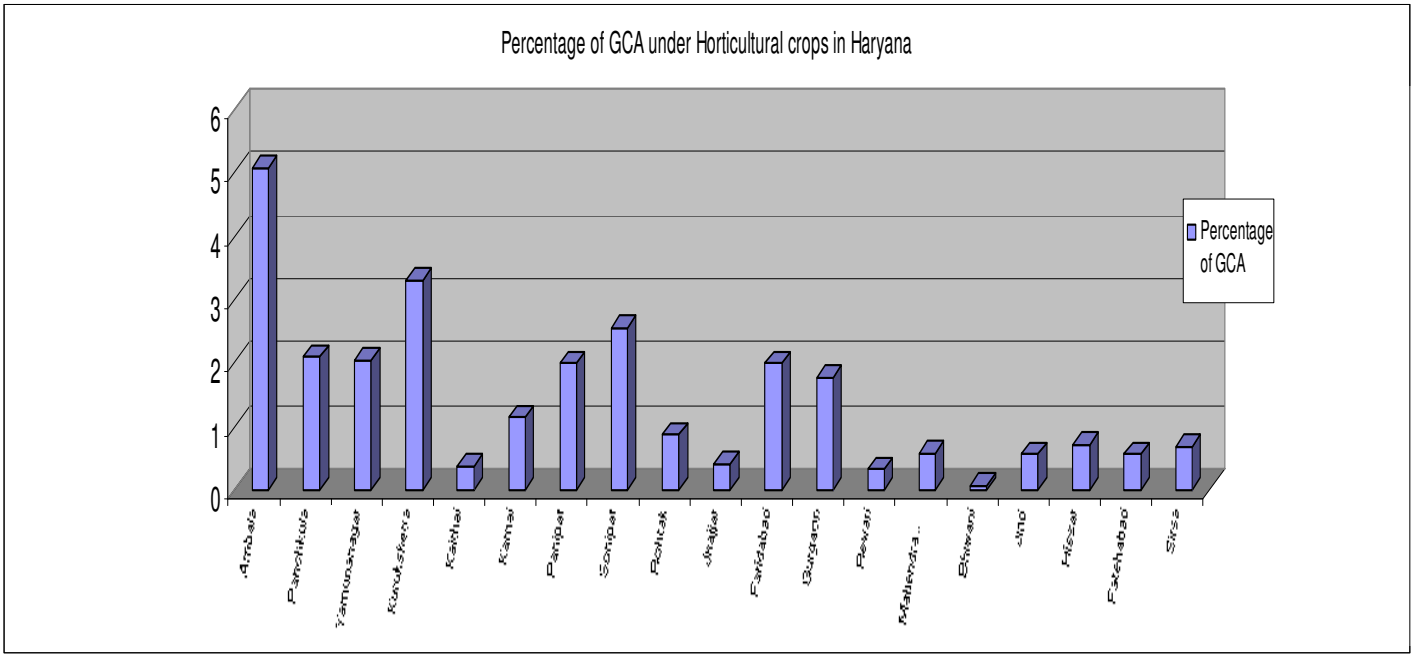
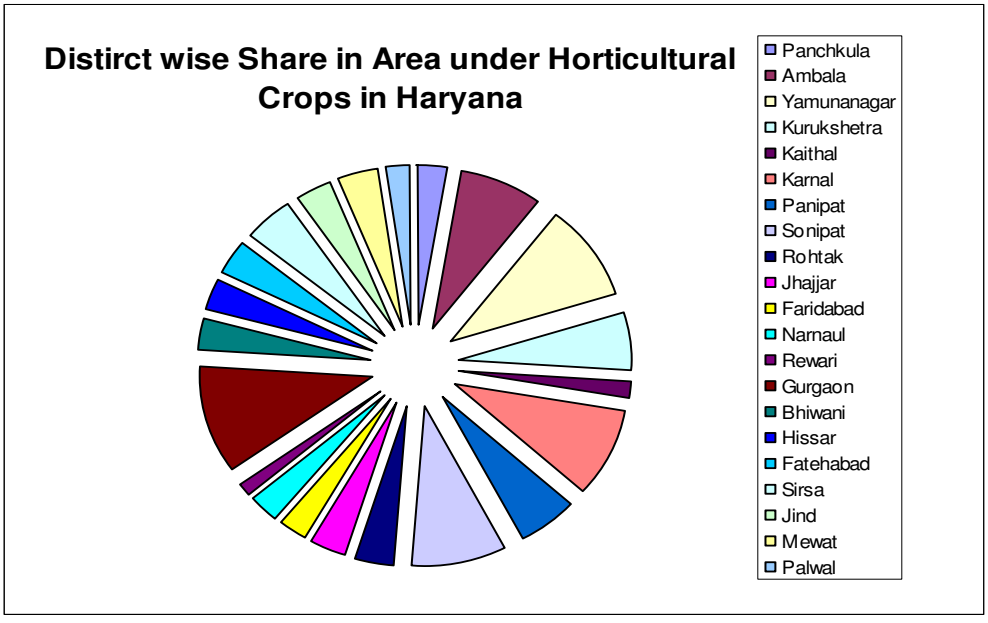

Percentage of GCA under Horticultural crops in Haryana
6
5
4
3
2
1
0
Percentage of GCA
Ambala
Panchkula
Yamunanagar
Kurukshetra
Kaithal
Karnal
Panipat
Sonipat
Rohtak
Jhajjar
Faridabad
Gurgaon
Rewari
Mahendra...
Bhiwani
Jind
Hissar
Fatehabad
Sirsa

Table- 2.3
District wise Share in Area under Horticultural crops in Haryana

Sl. No.	District	Fruits and Vegetables
1	Panchkula	2.74
2	Ambala	7.72
3	Yamunanagar	9.85
4	Kurukshetra	5.77
5	Kaithal	1.68
6	Karnal	8.82
7	Panipat	5.73
8	Sonipat	8.68
9	Rohtak	3.73
10	Jhajjar	3.24
11	Faridabad	2.97
12	Narnaul	2.64
13	Rewari	1.31
14	Gurgaon	10.98
15	Bhiwani	3.44
16	Hissar	2.90
17	Fatehabad	3.73
18	Sirsa	4.53
19	Jind	3.40
20	Mewat	4.05
21	Palwal	2.10
	State	100.00

Source: Ministry of Agriculture, Government of India, New Delhi

Figure:2



Only 1.11 per cent of GCA was devoted to horticultural crops in Haryana during 2007-08. A district-wise scenario presented in Table-2.2 indicates that highest share of total cropped area was devoted to horticultural crops in Ambala followed by Kurukshetra and Sonipat. Gurgaon and Faridabad were lagging behind these districts despite their close proximity to Delhi. In contrast, there are districts such as Rewari which exhibited around 1 per cent of total cropped area under horticultural crops.

Although, agro climatic conditions of Haryana are suitable for growing horticultural crops, progress of horticulture in terms of area devoted has been rather slow and does not commensurate with the availability of excellent natural and efficient human resources. In fact, higher yields and better returns through assured marketing from wheat-rice cropping system has been one of the major reasons for reluctance of the farmers to shift to fruit crops which have a long gestation period. In the past, public policy, at state and central levels has paid inadequate attention to the development of horticultural crops. Now, policy makers have realized growth potential of horticultural crops and proactive steps have been undertaken by the Government through implementation of programmes like the National Horticulture Mission.

Having analysed share of horticultural crops in allocation of acreage at the district level, it would be useful to examine the share of each district in total area under these crops. Table-2.3 suggests that Gurgaon is leading with more than 10 per cent share in the overall area. Further, share of Yamunanagar (9.85 per cent), Karnal (8.82 per cent), Sonipat (8.68 per cent), Ambala (7.72 per cent), Kurukshetra (5.77 per cent) and Panipat (5.73 per cent) was observed more than 5 per cent. These districts together formed more than 60 per cent of the state area under horticultural crops during 2009-10.

2.2 Composition of Horticultural Crops:

Horticultural crops comprise a large variety of crops including fruits, vegetables, spices, flowers, medicinal and aromatic plants. In view of the large genetic base available, crops adapt to diverse conditions of soil and climate Table.-2.4 presents share of individual crops in total area and production of horticultural crops in Haryana. The scenario is dominated by vegetables. The share of vegetables in area and production of horticultural crops was as high as 82.57 and 90.31 per cent respectively.

Fruits occupied second rank with 11.38 per cent share in area and 6.83 per cent share in production. A low contribution in production indicates low productivity of fruit crops in the state. Increase in productivity has to come from crop improvement as well as enhanced cropping intensity.

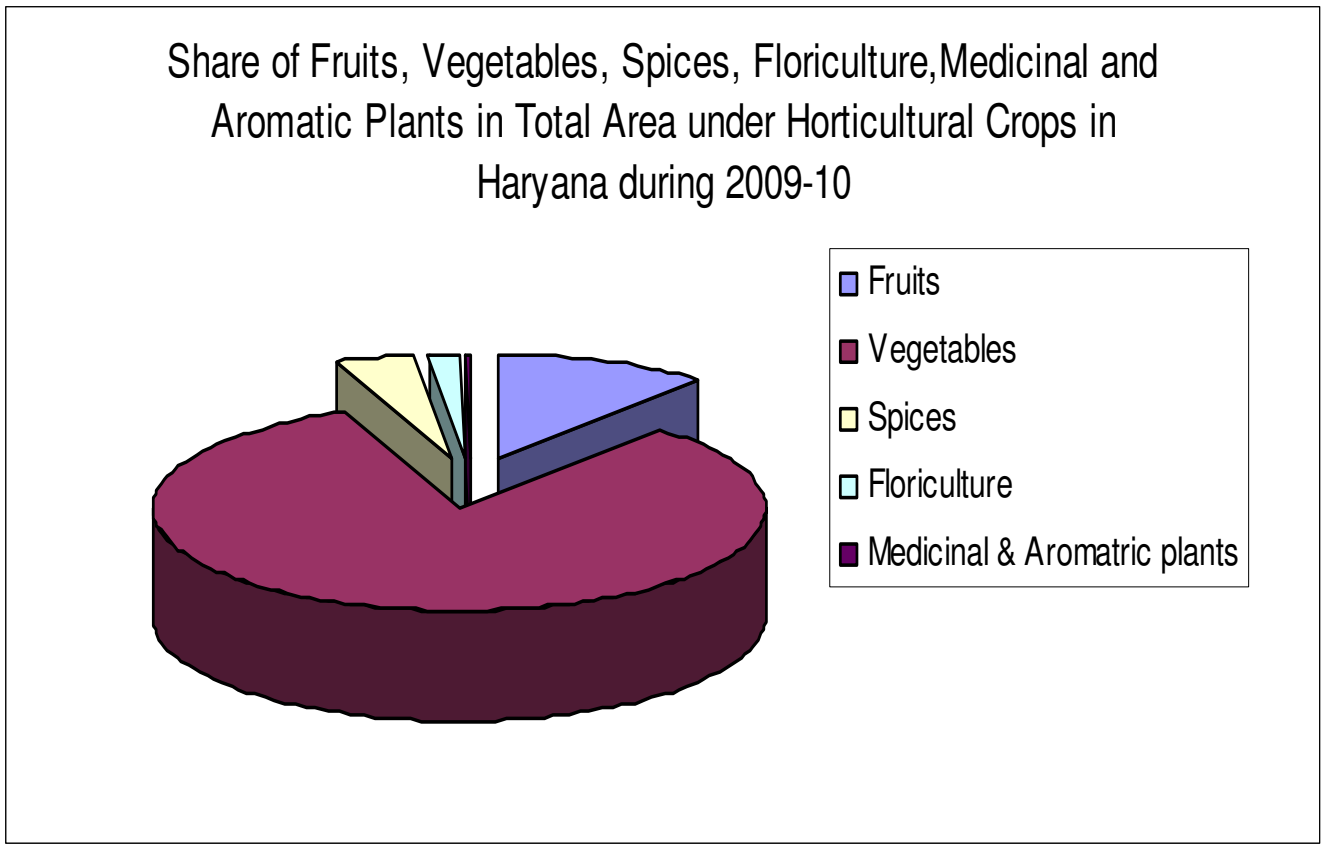
Table-2.4

Share of Fruits, Vegetables, Spices, Floriculture, Medicinal and Aromatic Plants in Total Area under Horticultural Crops in Haryana during 2009-10

Sl. No.	Crop	Share	
		Area	Production
1	Fruits	11.38	6.83
2	Vegetables	82.57	90.31
3	Spices	4.08	1.44
4	Floriculture	1.70	1.36
5	Medicinal & Aromatic plants	0.28	0.06
	Total	100.00	100.00

Source: Ministry of Agriculture, Government of India, New Delhi

Figure:3


Share of Fruits, Vegetables, Spices, Floriculture,Medicinal and Aromatic Plants in Total Area under Horticultural Crops in Haryana during 2009-10
Fruits
Vegetables
Spices
Floriculture
Medicinal & Aromatric plants

Spices are well known as appetizers. These are also considered essential in the culinary art all over the world. Some of the spices possess anti-oxidant properties and others are used as preservatives. India is the largest producer as well as consumer of spices in the world. Even in Haryana, there is no cuisine without addition of one or more spices. Spices formed around 4 per cent of area under horticultural crops and contributed 1.44 per cent to total production. The low contribution in production could be due to low yield.

In Haryana, floriculture is getting popular among the farmers. These are being grown in peri-urban areas and 1.70 per cent of area under horticultural crops was devoted to flowers. Medicinal and aromatic plants are not popular in Haryana and a marginal share of total area under horticultural crops was devoted to them.

2.3 Share of Individual Vegetable and Fruit Crops in Total Area under these Crops:

Since vegetable and fruit crops together constituted around 94 per cent of area and 97 per cent of production of horticultural crops in Haryana, it would be useful to examine share of individual crops in total area allocation. Table-2.5 reveals that citrus (33.38 per cent), mango (22.01 per cent) and guava occupid around 75 per cent of area devoted to fruit crops in the state. Next ranking fruits are mango, ber and aonla. Fruits such as grapes and litchi does not appear to be popular among farmers and therefore, proportion of area under these crops is less than one per cent.

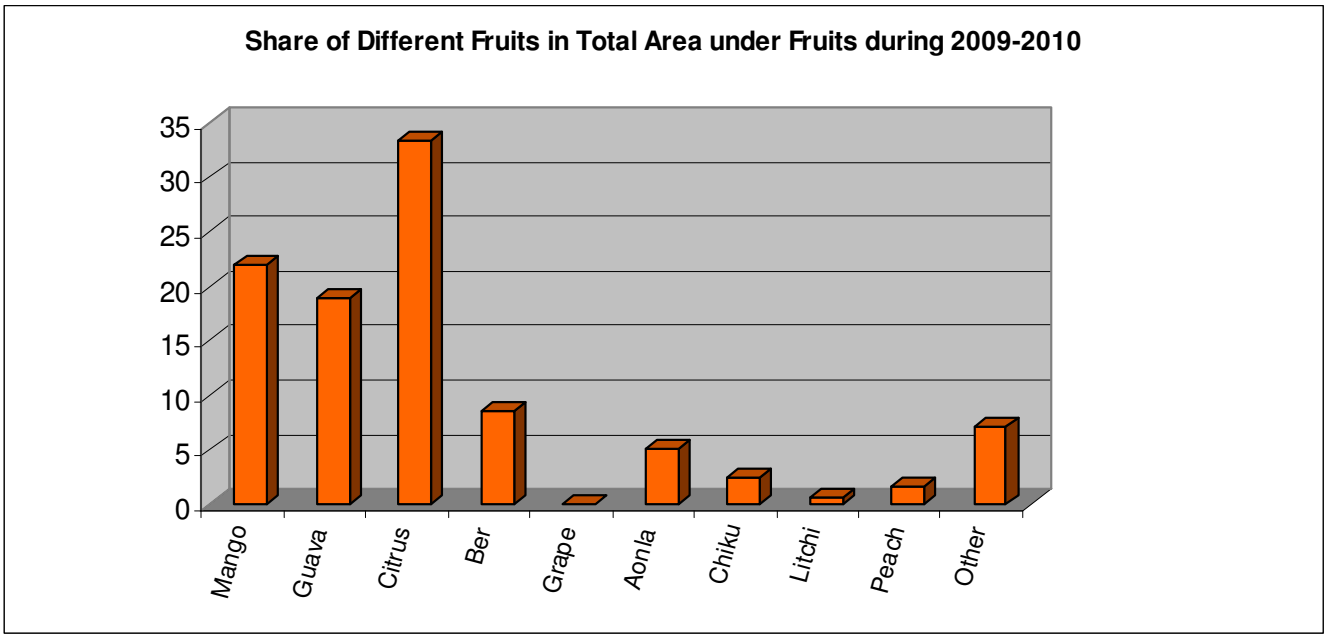
Vegetables form core of the horticultural crops in Haryana. Among vegetables, cucurbits (22.67 per cent), cauliflower (8.54 per cent), leafy vegetables (8.34 per cent), potato (7.66 per cent), tomato (7.51 per cent) and radish (7.25 per cent) are the main crops grown in the state and constituted more than 60 per cent of area under vegetables during 2009-10. On the other hand, arbi among vegetables indicated as low as 0.12 per cent of area under total vegetable crops in Haryana.

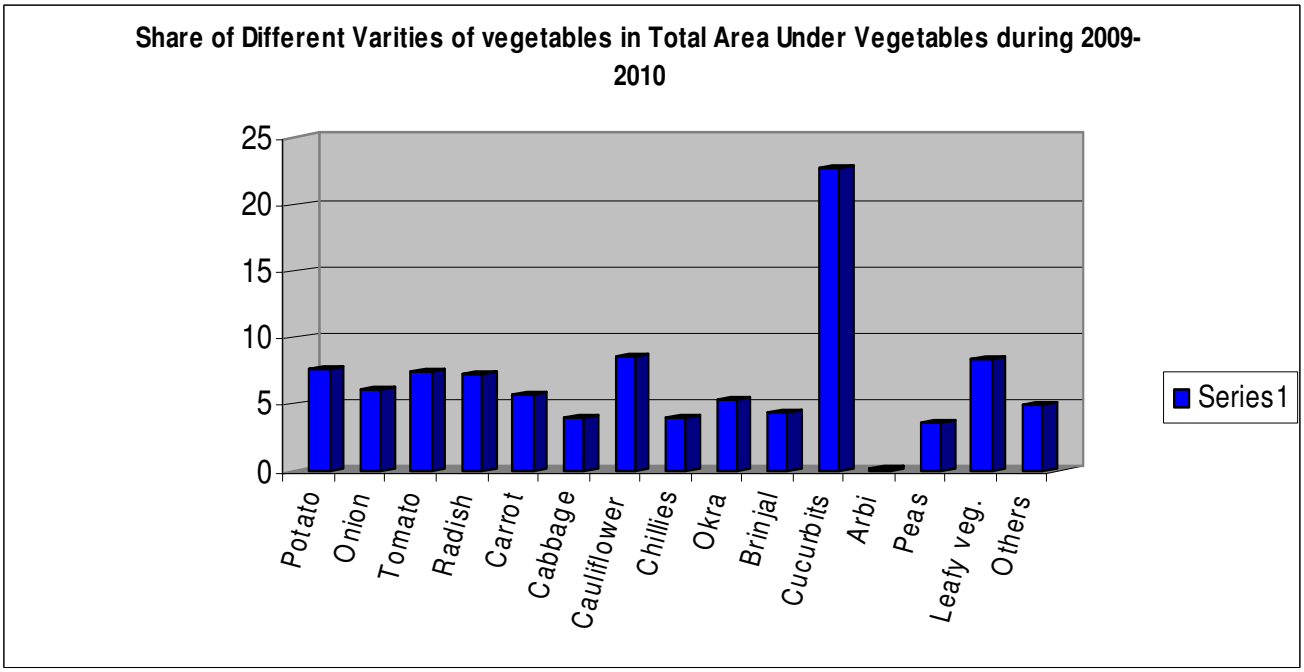
Table-2.5
Share of Different Varieties of Fruits and Vegetables in Total Area under Fruits and Vegetables during 2009-2010

Sl. No.	Particulars	Percentage Share
	Fruits	
1	Mango	22.01
2	Guava	18.86
3	Citrus	33.38
4	Ber	8.62
5	Grape	0.12
6	Aonla	5.05
7	Chiku	2.53
8	Litchi	0.59
9	Peach/Pear/Plum	1.63
10	Other	7.20
	Total	100.00
	Vegetables	
1	Potato	7.66
2	Onion	6.13
3	Tomato	7.51
4	Radish	7.25
5	Carrot	5.78
6	Cabbage	4.07
7	Cauliflower	8.54
8	Chillies	3.96
9	Okra	5.28
10	Brinjal	4.31
11	Cucurbits	22.67
12	Arbi	0.12
13	Peas	3.52
14	Leafy vegetables	8.34
15	Other	4.86
	Total	100.00

Source: Ministry of Agriculture, Government of India, New Delhi

Figure:4


Share of Different Fruits in Total Area under Fruits during 2009-2010
35
30
25
20
15
10
5
0
Mango
Guava
Citrus
Ber
Grape
Aonla
Chiku
Litchi
Peach
Other


Share of Different Varities of vegetables in Total Area Under Vegetables during 2009-2010
25
20
15
10
5
0
Potato
Onion
Tomato
Radish
Carrot
Cabbage
Cauliflower
Chillies
Okra
Brinjal
Cucurbits
Arbi
Peas
Leafy veg.
Others
Series1

2.4 Change in Area and Production of Horticultural Crops:

We have already indicated in Chapter-1 that time series detailed data on individual vegetable and fruit crops are available since 2007-08. Therefore, we are unable to calculate growth rates of area and production. Instead, we have computed percentage change in area and production of individual vegetable and fruit crops between 2007-08 and 2009-10. Results presented in Table-2.6 indicate that citrus fruits are most prominent gainers in area and production (68.46 and 47.11 per cent) during the reference period. Next is chiku which has shown an increase 39.63 per cent in area and 50.82 per cent in production during this period. Guava also gained significantly in area as well as in production. On the other hand, grapes are the biggest losers in area as well as in production. The extent of loss was 42.53 per cent in area and 34.19 per cent in production. In terms of area, another loser crop was aonla despite an increase of 6.89 per cent in production. Litchi and peaches group indicated positive gains in area but production losses were as high as 35.49 and 31.30 per cent, respectively.

Among vegetables, leafy vegetables, tomato and potato indicated more than 15 per cent increase in area and production between 2007-08 and 2009-10. Particularly, increase in production of tomato and potato was impressive by indicating more than double production in case of potato and almost five times in case of tomato. It could be possible due to increase in yield rates. The similar pattern of gains has been noticed in case of cucurbits, cabbage and cauliflower.

Okra emerged as a special case with 7 per cent increase in area and less than 1 per cent gain in production.

Table-2.6
Percentage Change in Area and Production of Horticultural Crops between 2007-2008 and 2009-2010

Sl. No.	Particulars	Percentage Change	
		Area	Production
	Fruits		
1	Mango	5.52	8.20
2	Guava	27.46	32.58
3	Citrus	68.46	47.11
4	Ber	1.74	1.16
5	Grape	-42.53	-34.19
6	Aonla	-14.32	6.89
7	Chiku	39.63	50.82
8	Litchi	4.74	-35.49
9	Peach/Pear/Pulam	3.52	-31.30
10	Other	1.70	124.38
	Total	23.33	26.42
	Vegetables		
1	Potato	15.81	40.49
2	Onion	3.90	5.02
3	Tomato	17.85	87.73
4	Radish	9.13	9.60
5	Carrot	5.50	4.91
6	Cabbage	7.76	42.99
7	Cauliflower	6.06	39.38
8	Chillies	11.54	3.17
9	Okra	7.00	0.70
10	Brinjal	-3.68	-17.56
11	Cucurbits	2.77	30.24
12	Arbi	-2.95	-3.72
13	Peas	5.86	-9.23
14	Leafy vegetable	28.72	13.65
15	Others	39.59	7.49
	Total	9.57	22.69

Source: Ministry of Agriculture, Government of India, New Delhi

2.5 District-wise Scenario of Area, Production and Yield of Fruit Crops:

After analyzing change in area and production of vegetables and fruit crops at the state level, it would be prudent to analyse the scenario at the district level. The information related to area, production and yield of fruit crops in 2007-08 to 2009-10 is presented in Table-2.7 Yamunanagar and Sirsa were the leading districts in area under fruit crops

Table-2.7

District wise Area, Production and Yield of Fruit Crops in Haryana (2007-2008 to 2009-2010)

Sl No.	District	2007-08			2008-09			2009-10		
		Area (ha)	Production (tonnes)	Yield (tonnes/ha)*	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)
1	Panchkula	1533 (4.56)*	6865 (2.86)*	4.48 (19)*	500 (3.85)*	3650 (7.60)*	7.30 (1)*	1629 (3.93)*	9514 (3.13)*	5.84 (16)*
2	Ambala	1940 (5.77)	12498 (5.20)	6.44 (14)	608 (4.68)	1232 (2.56)	2.03 (15)	2193 (5.29)	15551 (5.12)	7.09 (11)
3	Yamunanagar	6862 (20.42)	42240 (17.57)	6.16 (15)	2035 (15.66)	12009 (25.00)	5.90 (2)	7511 (18.12)	49032 (16.13)	6.53 (13)
4	Kurukshetra	980 (2.92)	6618 (2.75)	6.75 (12)	978 (7.53)	3870 (8.06)	3.96 (6)	1065 (2.57)	6774 (2.23)	6.36 (14)
5	Kaithal	337 (1.00)	3557 (1.48)	10.55 (3)	319 (2.46)	894 (1.86)	2.80 (10)	333 (0.80)	4120 (1.36)	12.37 (1)
6	Karnal	1895 (5.64)	12963 (5.39)	6.84 (11)	1551 (11.94)	8091 (16.84)	5.22 (4)	2087 (5.03)	18694 (6.15)	8.96 (9)
7	Panipat	668 (1.99)	7322 (3.05)	10.96 (1)	156 (1.20)	490 (1.02)	3.14 (8)	707 (1.71)	6359 (2.09)	8.99 (7)
8	Sonipat	1262 (3.75)	10185 (4.24)	8.07 (7)	1526 (11.74)	3957 (8.24)	2.59 (11)	1419 (3.42)	14372 (4.73)	10.13 (5)
9	Rohtak	945 (2.81)	4816 (2.00)	5.10 (17)	462 (3.56)	1068 (2.22)	2.31 (13)	1293 (3.12)	9629 (3.17)	7.45 (10)
10	Jhajjar	1154 (3.43)	6667 (2.77)	5.78 (16)	193 (1.49)	330 (0.69)	1.71 (17)	1511 (3.65)	9153 (3.01)	6.06 (15)
11	Faridabad	955 (2.84)	9110 (3.79)	9.54 (4)	312 (2.40)	188 (0.39)	0.60 (20)	687 (1.66)	7807 (2.57)	11.36 (3)
12	Narnaul	420 (1.25)	2934 (1.22)	6.99 (9)	665 (5.12)	1385 (2.88)	2.08 (14)	1485 (3.58)	3484 (1.15)	2.35 (21)
13	Rewari	390 (1.16)	2717 (1.13)	6.97 (10)	170 (1.31)	300 (0.62)	1.76 (16)	490 (1.18)	2781 (0.92)	5.68 (18)
14	Gurgaon	1379 (4.10)	10080 (4.19)	7.31 (8)	449 (3.46)	1063 (2.21)	2.37 (12)	1298 (3.13)	15129 (4.98)	11.66 (2)
15	Bhiwani	1973 (5.87)	10001 (4.16)	5.07 (18)	260 (2.00)	875 (1.82)	3.37 (7)	2622 (6.33)	6321 (2.08)	2.41 (20)
16	Hisar	1812 (5.39)	19225 (8.00)	10.61 (2)	622 (4.79)	946 (1.97)	1.52 (18)	2412 (5.82)	15936 (5.24)	6.61 (12)
17	Fatehabad	1701 (5.06)	14723 (6.12)	8.66 (6)	675 (5.19)	3700 (7.70)	5.48 (3)	1908 (4.60)	20029 (6.59)	10.50 (4)
18	Sirsa	5528 (16.45)	47923 (19.93)	8.67 (5)	433 (3.33)	1817 (3.78)	4.20 (5)	7919 (19.10)	72978 (24.01)	9.22 (6)
19	Jind	973 (2.89)	6441 (2.68)	6.62 (13)	455 (3.50)	1350 (2.81)	2.97 (9	890 (2.15)	7976 (2.62)	8.96 (8)
20	Mewat	903 (2.69)	3515 (1.46)	3.89 (20)	626 (4.82)	825 (1.72)	1.32 (19)	1247 (3.01)	4003 (1.32)	3.21 (19)
21	Palwal	NA	NA	NA	NA	NA	NA	744 (1.79)	4278 (1.41)	5.75 (17)
	Total	33610 (100)	240400 (100)	7.15	12995 (100)	48040 (100)	3.70	41450 (100)	303920 (100)	7.33

*Figures in parenthesis indicate percentage share of the district and rank of the district in yield

Source: Ministry of Agriculture, Government of India, New Delhi

Table-2.8

District wise Area, Production and Yield of Vegetable Crops in Haryana (2007-2008 to 2009-2010)

Sl.No.	District	2007-08			2008-09			2009-10		
		Area (ha)*	Production (tonnes)*	Yield (tonnes/ha)*	Area (ha)*	Production (tonnes)*	Yield (tonnes/ha)*	Area (ha)*	Production (tonnes)*	Yield (tonnes/ha)*
1	Panchkula	7600 (2.77)	112664 (3.44)	14.82 (3)	7000 (2.35)	113683 (2.92)	16.24 (1)	7750 (2.58)	134176 (3.34)	17.31 (2)
2	Ambala	24250 (8.83)	253325 (7.73)	10.45 (16)	25558 (8.58)	278679 (7.16)	10.90 (18)	24225 (8.05)	294878 (7.33)	12.17 (16)
3	Yamunanagar	21503 (7.83)	335882 (10.25)	15.62 (2)	26975 (9.04)	345001 (8.86)	12.79 (13)	26192 (8.71)	362600 (9.02)	13.84 (4)
4	Kurukshetra	13225 (4.82)	188401 (5.75)	14.25 (6)	19865 (6.66)	313042 (8.04)	15.76 (2)	18700 (6.22)	327180 (8.14)	17.50 (1)
5	Kaithal	6588 (2.40)	64091 (1.96)	9.73 (19)	6049 (2.03)	83538 (2.15)	13.81 (7)	5410 (1.80)	71470 (1.78)	13.21 (9)
6	Karnal	26965 (9.82)	271374 (8.28)	10.06 (17)	28337 (9.50)	403041 (10.35)	14.22 (6)	28116 (9.35)	371374 (9.24)	13.21 (10)
7	Panipat	16175 (5.89)	233093 (7.11)	14.41 (4)	15610 (5.23)	214640 (5.51)	13.75 (9)	18900 (6.28)	214451 (5.33)	11.35 (18)
8	Sonipat	26691 (9.72)	313512 (9.57)	11.75 (12)	26800 (8.98)	369949 (9.50)	13.80 (8)	28295 (9.40)	369344 (9.19)	13.05 (12)
9	Rohtak	6250 (2.28)	77168 (2.35)	12.35 (10)	8897 (2.98)	95868 (2.46)	10.78 (20)	11460 (3.81)	113129 (2.81)	9.87 (21)
10	Jhajjar	8425 (3.07)	104025 (3.17)	12.35 (9)	9343 (3.13)	118531 (3.04)	12.69 (14)	9576 (3.18)	126870 (3.16)	13.25 (8)
11	Faridabad	11276 (4.11)	151969 (4.64)	13.48 (7)	13725 (4.60)	186929 (4.80)	13.62 (10)	9482 (3.15)	118166 (2.94)	12.46 (13)
12	Narnaul	5187 (1.89)	83403 (2.55)	16.08 (1)	6396 (2.14)	79120 (2.03)	12.37 (15)	7542 (2.51)	75614 (1.88)	10.03 (20)
13	Rewari	4010 (1.46)	57569 (1.76)	14.36 (5)	4021 (1.35)	57281 (1.47)	14.25 (5)	4002 (1.33)	54354 (1.35)	13.58 (5)
14	Gurgaon	37745 (13.75)	395085 (12.06)	10.47 (15)	37642 (12.61)	413627 (10.62)	10.99 (17)	36294 (12.06)	574302 (14.28)	15.82 (3)
15	Bhiwani	11270 (4.10)	130359 (3.98)	11.57 (13)	9613 (3.22)	117166 (3.01)	12.19 (16)	9145 (3.04)	98514 (2.45)	10.77 (19)
16	Hisar	8520 (3.10)	105464 (3.22)	12.38 (8)	8760 (2.94)	94912 (2.44)	10.83 (19)	7515 (2.50)	90539 (2.25)	12.05 (17)
17	Fatehabad	10050 (3.66)	99568 (3.04)	9.91 (18)	10854 (3.64)	155694 (4.00)	14.34 (4)	10875 (3.61)	146121 (3.63)	13.44 (6)
18	Sirsa	6048 (2.20)	72985 (2.23)	12.07 (11)	7380 (2.47)	97635 (2.51)	13.23 (11)	7575 (2.52)	99433 (2.47)	13.13 (11)
19	Jind	10150 (3.70)	112024 (3.42)	11.04 (14)	10825 (3.63)	159857 (4.11)	14.77 (3)	10745 (3.57)	144066 (3.58)	13.41 (7)
20	Mewat	12652 (4.61)	115139 (3.51)	9.10 (20)	14780 (4.95)	195237 (5.01)	13.21 (12)	12614 (4.19)	154454 (3.84)	12.24 (15)
21	Palwal	NA	NA	NA	NA	NA	NA	6447 (2.14)	79685 (1.98)	12.36 (14)
	Total	274580 (100)	3277100 (100)	11.93	298430 (100)	3893430 (100)	13.05	300860 (100)	4020720 (100)	13.36

*Figures in parenthesis indicate percentage share of the district and rank of the district in yield

Source: Ministry of Agriculture, Government of India, New Delhi

cultivation and together accounted for 37 per cent of total cultivated area. Ambala, Narnaul, Bhiwani and Faridabad showed more than 5 per cent share in overall area under fruit crops during 2007-08. Further, share of Yamunanagar in state acreage under fruit crops has declined from previous level in 2007-08 while it has increased in the case of Sirsa district in 2009-10. As far as, share of these leading districts in production of fruits is concerned, it has declined from 17.57 per cent in 2007-08 to 16.13 per cent in 2009-10 in Yamunanagar. While, it has increased from 19.93 per cent to 24.01 per cent in Sirsa district during the same period due to improvement in productivity. It is interesting to note that yield rate of fruits was observed highest in Panipat district during 2007-08 which is a low ranking district in terms of area allocation. Second rank was attained by Hissar and third by Kaithal. After two years, Kaithal and Gurgaon attained first and second ranks in productivity of fruit crops during 2009-10.

In Table-2.8, we have compared district-wise status of vegetable crops in terms of area, production and productivity during 2007-08, 2008-09 and 2009-10. The spatial pattern of area allocation presented in this Table suggests that Karnal, Sonipat, Gurgaon, Ambala and Yamunanagar together constituted almost 50 per cent of total area under vegetable cultivating in the state during 2007-08. After one year, share of Gurgaon dropped marginally while share of Yamunanagar increased by almost one per cent. Yamunanagar also contributed highest share in production. During 2009-10, share of Gurgaon has increased while vice versa was observed in case of Yamunanagar. It is surprising that yield rates of vegetable crops were observed highest in Narnaul, a lowering ranking district in area and production. Next was Yamunanagar which maintained its rank in area, production and yield. The level of productivity of vegetable crops changed after one year in 2009-10 and Kurukshetra became a leader in terms of yield rates of vegetable crops. Panchkula shifted from third rank to second rank by indicating an increase in productivity from 14.82 to 17.31 tonnes/ha. To conclude, performance of vegetable crops in Haryana in terms of productivity was appreciable which has risen from 11.93 tonnes/ha in 2007-08 to 13.36 tonnes/ha in 2009-10.

2.6 Change in Area and Production of Fruit Crops:

So far, we have analysed area, production and yield of vegetable and fruit crops at the state and district levels. The importance of change in area and production of fruit crops at the district level has overwhelming importance for analyzing development of these crops. When we look at percentage change in area and production of fruit crops between 2007-08 and 2009-10, Narnaul, Sirsa, Rohtak, Hissar, Bhiwani, Mewat and Jhajjar exhibited more than 20 per cent increase in area under fruit crops. The overall,

Table-2.9

Percentage Change in Area and Production of Fruit Crops between 2007-2008 and 2009-2010

Sl No.	District	Percentage Change	
		Area	Production
1	Panchkula	6.26	38.59
2	Ambala	13.04	24.43
3	Yamunanagar	9.46	16.08
4	Kurukshetra	8.67	2.36
5	Kaithal	-1.19	15.83
6	Karnal	10.13	44.21
7	Panipat	5.84	-13.15
8	Sonipat	12.44	41.11
9	Rohtak	36.83	99.94
10	Jhajjar	30.94	37.29
11	Faridabad	-28.06	-14.30
12	Narnaul	253.57	18.75
13	Rewari	25.64	2.36
14	Gurgaon	-5.87	50.09
15	Bhiwani	32.89	-36.80
16	Hissar	33.11	-17.11
17	Fatehabad	12.17	36.04
18	Sirsa	43.25	52.28
19	Jind	-8.53	23.83
20	Mewat	38.10	13.88
21	Palwal	NA	NA
	Total	23.33	26.42

Source: Ministry of Agriculture, Government of India, New Delhi

increase in area in Haryana between 2007-08 and 2009-10 was observed 23.33 per cent. This indicates growing popularity of fruit crops in agriculture in Haryana. Like area, increase in production during the reference period is impressive. Fruit production in Haryana grew by 26.42 per cent in this period. Among the districts, highest increase was observed in Rohtak (99.4 per cent). Other districts with impressive increase were Sirsa, Karnal, Gurgaon, Sonipat, Panchkula, Jhajjar and Ambala (Table-2.9).

2.7 Change in Area and Production of Vegetable Crops:

Table-2.10 illustrates district-wise percentage change in area and production of vegetable crops in Haryana between 2007-08 and 2009-10. This helps us in understanding expansion in area and production of these crops at the district level. There are districts with overwhelming increase and decrease. Area allocation to vegetable crops increased by 83.36 per cent in Rohtak. Other districts with impressive increase were Narnaul, Kurukshetra, Sirsa and Yamunanagar. The overall increase in area under cultivation of vegetable crops was observed 9.75 per cent between 2007-08 and 2009-10. The production of vegetable crops appears to be expanding at more than double rate in the state during this period. This could be possible due to more than 10 per cent increase in twelve districts out of 21 districts. The change in production of vegetable crops was highest in Kurukshetra (73.66 per cent). In addition, significant increase in production was noticed in Rohtak, Gurgaon, Sirsa, Karnal, Jhajjar, Fatehabad and Jind.

Table-2.10
Percentage Change in Area and Production of Vegetable Crops between 2007-2008 and 2009-2010

Sl No.	District	Percentage Change	
		Area	Production
1	Panchkula	1.97	19.09
2	Ambala	-0.10	16.40
3	Yamunanagar	21.81	7.95
4	Kurukshetra	41.40	73.66
5	Kaithal	-17.88	11.51
6	Karnal	4.27	36.85
7	Panipat	16.85	-8.00
8	Sonipat	6.01	17.81
9	Rohtak	83.36	46.60
10	Jhajjar	13.66	21.96
11	Faridabad	-15.91	-22.24
12	Narnaul	45.40	-9.34
13	Rewari	-0.20	-5.58
14	Gurgaon	-3.84	45.36
15	Bhiwani	-18.86	-24.43
16	Hissar	-11.80	-14.15
17	Fatehabad	8.21	46.75
18	Sirsa	25.25	36.24
19	Jind	5.86	28.60
20	Mewat	-0.30	34.15
21	Palwal	NA	NA
	Total	9.57	22.69

Source: Ministry of Agriculture, Government of India, New Delhi

2.8 Area, Production and Yield of Major Vegetables:

Before concluding this chapter, it would be useful to examine district-wise scenario regarding area, production and yield of important vegetables which contribute at least 10 per cent in total area and production of vegetable crops in the state. On the basis of this criterion, we have included five vegetables, namely potato, tomato, cauliflower, cucurbits and leafy vegetables (Table-2.11).

Table 2.11.
Area, Production and Yield of Major Vegetables in Haryana during 2009-10

Sl No.	District	Potato			Tomato			Cauliflower			Cucurbits			Leafy Vegetable		
		Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)
1	Panchkula	900 (3.91)*	22939 (4.64)*	25.49 (2)*	500 (2.21)*	11000 (2.90)*	22.00 (3)*	1000 (3.89)*	22000 (4.51)*	22.00 (4)*	1200 (1.76)*	20000 (2.94)*	16.667 (1)*	1200 (4.78)*	8600 (3.63)*	7.17 (18)*
2	Ambala	4010 (17.41)	62757 (12.68)	15.65 (17)	128 5(5.68)	18275 (4.81)	14.22 (19)	1560 (6.07)	28250 (5.79)	18.10 (15)	2850 (4.18)	29310 (4.31)	10.284 (3)	2050 (8.17)	16970 (7.16)	8.28 (10)
3	Yamunanagar	3040 (13.20)	74961 (15.15)	24.66 (4)	2930 (12.96)	43795 (11.53)	14.95 (17)	2572 (10.01)	48570 (9.96)	18.88 (12)	3217 (4.72)	26960 (3.96)	8.380 (6)	3055 (12.17)	26325 (11.11)	8.62 (9)
4	Kurukshetra	6062 (26.32)	163210 (32.99)	26.92 (1)	1515 (6.70)	38599 (10.16)	25.48 (2)	1280 (4.98)	23950 (4.91)	18.71 (13)	1077 (1.58)	7671 (1.13)	7.123 (10)	2379 (9.48)	23301 (9.84)	9.79 (6)
5	Kaithal	400 (1.74)	8036 (1.62)	20.09 (13)	300 (1.33)	4600 (1.21)	15.33 (14)	400 (1.56)	7800 (1.60)	19.50 (9)	1050 (1.54)	7100 (1.04)	6.762 (13)	450 (1.79)	3500 (1.48)	7.78 (14)
6	Karnal	2416 (10.49)	39692 (8.02)	16.43 (16)	3714 (16.43)	57599 (15.16)	15.51 (13)	2074 (8.07)	57511 (11.79)	27.73 (1)	4970 (7.29)	33426 (4.91)	6.726 (14)	2544 (10.14)	22479 (9.49)	8.84 (8)
7	Panipat	1300 (5.64)	23903 (4.83)	18.39 (15)	450 (1.99)	7500 (1.97)	16.67 (10)	3420 (13.31)	58500 (12.00)	17.11 (16)	4110 (6.02)	25000 (3.67)	6.083 (17)	1650 (6.57)	20900 (8.82)	12.67 (4)
8	Sonipat	1510 (6.56)	34135 (6.90)	22.61 (6)	1255 (5.55)	21034 (5.54)	16.77 (8)	3525 (13.72)	67600 (13.86)	19.18 (10)	5515 (8.08)	39450 (5.80)	7.153 (9)	1967 (7.84)	14655 (6.19)	7.45 (17)
9	Rohtak	645 (2.80)	6753 (1.36)	10.47 (19)	615 (2.72)	8350 (2.20)	13.58 (20)	940 (3.66)	1405 (2.88)	14.95 (19)	1570 (2.30)	8505 (1.25)	5.417 (19)	1220 (4.86)	7580 (3.20)	6.21 (20)
10	Jhajjar	160 (0.69)	3440 (0.70)	21.50 (8)	955 (4.22)	15230 (4.01)	15.95 (12)	460 (1.79)	8420 (1.73)	18.30 (14)	2000 (2.93)	14800 (2.17)	7.400 (8)	865 (3.45)	6950 (2.93)	8.03 (12)
11	Faridabad	270 (1.17)	5997 (1.21)	22.21 (7)	800 (3.54)	12960 (3.41)	16.20 (11)	750 (2.92)	17560 (3.60)	23.41 (2)	2735 (4.01)	13315 (1.96)	4.868 (21)	930 (3.71)	8275 (3.49)	8.90 (7)
12	Narnaul	22 (0.10)	473 (0.10)	21.50 (8)	320 (1.42)	5340 (1.41)	16.69 (9)	820 (3.19)	12400 (2.54)	15.12 (18)	2161 (3.17)	10700 (1.57)	4.951 (20)	450 (1.79)	3220 (1.36)	7.16 (19)
13	Rewari	12 (0.05)	258 (0.05)	21.50 (8)	305 (1.35)	5855 (1.54)	19.20 (5)	203 (0.79)	3005 (0.62)	14.80 (20)	502 (0.74)	4830 (0.71)	9.622 (5)	503 (2.00)	4080 (1.72)	8.11 (11)
14	Gurgaon	70 (0.30)	1504 (0.30)	21.49 (9)	1674 (7.41)	29850 (7.86)	17.83 (6)	1430 (5.56)	28980 (5.94)	20.27 (6)	20871 (30.60)	333185 (48.96)	15.964 (2)	1555 (6.20)	28324 (11.96)	18.21 (2)
15	Bhiwani	85 (0.37)	1826 (0.37)	21.48 (10)	552 (2.44)	16560 (4.36)	30.00 (1)	290 (1.13)	6490 (1.33)	22.38 (3)	2860 (4.19)	27910 (4.10)	9.759 (4)	317 (1.26)	1818 (0.77)	5.74 (21)
16	Hissar	480 (2.08)	8840 (1.79)	18.42 (14)	470 (2.08)	8050 (2.12)	17.13 (7)	1080 (4.20)	10170 (2.09)	9.42 (21)	1180 (1.73)	7100 (1.04)	6.017 (18)	900 (3.59)	9210 (3.89)	10.23 (5)
17	Fatehabad	510 (2.21)	11935 (2.41)	23.40 (5)	490 (2.17)	7500 (1.97)	15.31 (15)	1160 (4.51)	22000 (4.51)	18.97 (11)	1600 (2.35)	12500 (1.84)	7.813 (7)	975 (3.88)	7350 (3.10)	7.54 (16)
18	Sirsa	380 (1.65)	5669 (1.15)	14.92 (18)	586 (2.59)	11356 (2.99)	19.38 (4)	1075 (4.18)	17661 (3.62)	16.43 (17)	1708 (2.50)	12074 (1.77)	7.069 (12)	267 (1.06)	5089 (2.15)	19.06 (1)
19	Jind	610 (2.65)	15200 (3.07)	24.92 (3)	920 (4.07)	13510 (3.56)	14.69 (18)	1100 (4.28)	21555 (4.42)	19.60 (8)	1510 (2.21)	10690 (1.57)	7.079 (11)	710 (2.83)	5675 (2.40)	7.99 (13)
20	Mewat	52 (0.23)	1117 (0.23)	21.48 (11)	2340 (10.35)	35355 (9.31)	15.11 (16)	95 (0.37)	1955 (0.40)	20.58 (5)	3925 (5.75)	25850 (3.80)	6.586 (15)	325 (1.29)	2495 (1.05)	7.68 (15)
21	Palwal	100 (0.43)	2148 (0.43)	21.48 (12)	630 (2.79)	7510 (1.98)	11.92 (21)	465 (1.81)	9262 (1.90)	19.92 (7)	1605 (2.35)	10110 (1.49)	6.299 (16)	785 (3.13)	10120 (4.27)	12.89 (3)
	Total	23034 (100)	494793 (100)	21.48	22606 (100)	379828 (100)	16.802	25699 (100)	487689 (100)	18.98	68216 (100)	680486 (100)	9.975	25097 (100)	236916 (100)	9.44

*Figures in parenthesis indicate percentage share of the district and rank of the district in yield
Source: Ministry of Agriculture, Government of India, New Delhi

Table 2.12.
Area, Production and Yield of Major Fruits in Haryana during 2009-10

Sl No.	District	Mango			Guava			Citrus			Ber		
		Potato			**Tomato**			**Cauliflower**			**Cucurbits**		
		Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)	Area (ha)	Production (tonnes)	Yield (tonnes/ha)
1	Panchkula	900 (3.91)*	22939 (4.64)*	25.49 (2)*	500 (2.21)*	11000 (2.90)*	22.00 (3)*	1000 (3.89)*	22000 (4.51)*	22.00 (4)*	1200 (1.76)*	20000 (2.94)*	16.667 (1)*
1	Panchkula	950 (10.41)*	4090 (6.33)*	4.31 (16)*	196 (2.51)*	1718 (3.08)*	8.77 (7)*	75 (0.54)*	180 (0.18)*	2.40 (19)*	2 (0.06)*	5 (0.01)*	2.50 (20)*
2	Ambala	1257 (13.78)	8416 (13.03)	6.70 (14)	385 (4.93)	2735 (4.90)	7.10 (11)	154 (1.11)	640 (0.65)	4.16 (16)	6 (0.17)	30 (0.08)	5.00 (18)
3	Yamunanagar	5419 (59.39)	36708 (56.85)	6.77 (13)	516 (6.60)	1846 (3.31)	3.58 (20)	52 (0.38)	700 (0.71)	13.46 (5)	0 (0.00)	0 (0.00)	0.00 (0)
4	Kurukshetra	430 (4.71)	2154 (3.34)	5.01 (15)	249 (3.19)	510 (0.91)	2.05 (21)	7 (0.05)	125 (0.13)	17.86 (3)	5 (0.14)	60 (0.17)	12.00 (6)
5	Kaithal	1 (0.01)	9 (0.01)	9.00 (12)	135 (1.73)	2000 (3.58)	14.81 (1)	15 (0.11)	300 (0.31)	20.00 (2)	45 (1.26)	700 (1.97)	15.56 (3)
6	Karnal	629 (6.89)	8853 (13.71)	14.07 (3)	686 (8.78)	4167 (7.46)	6.07 (13)	30 (0.22)	428 (0.44)	14.27 (4)	65 (1.82)	753 (2.12)	11.58 (8)
7	Panipat	181 (1.98)	1810 (2.80)	10.00 (4)	348 (4.45)	1870 (3.35)	5.37 (16)	12 (0.09)	348 (0.35)	29.00 (1)	61 (1.71)	680 (1.91)	11.15 (10)
8	Sonipat	91 (1.00)	894 (1.38)	9.82 (5)	623 (7.97)	7896 (14.14)	12.67 (2)	30 (0.22)	224 (0.23)	7.4 7(9)	417 (11.67)	2235 (6.28)	5.36 (17)
9	Rohtak	32 (0.35)	301 (0.47)	9.41 (9)	481 (6.15)	3705 (6.64)	7.70 (9)	26 7(1.93)	1643 (1.67)	6.15 (11)	321 (8.98)	3055 (8.59)	9.52 (13)
10	Jhajjar	8 (0.09)	75 (0.12)	9.38 (10)	495 (6.33)	2813 (5.04)	5.68 (15)	322 (2.33)	1825 (1.86)	5.67 (14)	277 (7.75)	2400 (6.74)	8.6 6(14)
11	Faridabad	25 (0.27)	376 (0.58)	15.04 (2)	353 (4.52)	3611 (6.47)	10.23 (4)	166 (1.20)	1770 (1.80)	10.66 (7)	76 (2.13)	900 (2.53)	11.84 (7)
12	Narnaul	0 (0.00)	0 (0.00)	0.00 (0)	99 (1.27)	810 (1.45)	8.18 (8)	1186 (8.57)	320 (0.33)	0.27 (20)	97 (2.71)	1414 (3.97)	14.58 (4)
13	Rewari	1 (0.01)	9 (0.01)	9.00 (12)	87 (1.11)	555 (0.99)	6.38 (12)	126 (0.91)	425 (0.43)	3.37 (17)	161 (4.50)	1117 (3.14)	6.94 (15)
14	Gurgaon	2 (0.02)	19 (0.03)	9.50 (7)	539 (6.90)	5630 (10.08)	10.45 (3)	253 (1.83)	1483 (1.51)	5.86 (13)	205 (5.74)	4220 (11.86)	20.59 (1)
15	Bhiwani	24 (0.26)	226 (0.35)	9.42 (8)	26 1(3.34)	1245 (2.23)	4.7 7(17)	1314 (9.50)	350 (0.36)	0.27 (20)	202 (5.65)	3200 (8.99)	15.84 (2)
16	Hissar	34 (0.37)	329 (0.51)	9.68 (6)	614 (7.85)	2300 (4.12)	3.75 (19)	1191 (8.61)	7322 (7.45)	6.15 (12)	302 (8.45)	4000 (11.24)	13.25 (5)
17	Fatehabad	3 (0.03)	47 (0.07)	15.67 (1)	359 (4.59)	2711 (4.85)	7.55 (10)	1048 (7.57)	12821 (13.04)	12.23 (6)	198 (5.54)	1950 (5.48)	9.85 (11)
18	Sirsa	0 (0.00)	0 (0.00)	0.00 (0)	282 (3.61)	2716 (4.86)	9.63 (5)	7064 (51.05)	65114 (66.22)	9.22 (8)	302 (8.45)	3475 (9.77)	11.51 (9)
19	Jind	24 (0.26)	226 (0.35)	9.42 (8)	352 (4.50)	3250 (5.82)	9.23 (6)	182 (1.32)	1140 (1.16)	6.26 (10)	271 (7.58)	2605 (7.32)	9.61 (12)
20	Mewat	3 (0.03)	28 (0.04)	9.33 (11)	431 (5.51)	1815 (3.25)	4.2 1(18)	187 (1.35)	505 (0.51)	2.70 (18)	363 (10.16)	1643 (4.62)	4.53 (19)
21	Palwal	1 1(0.12)	0 (0.00)	0.00 (0)	326 (4.17)	1937 (3.47)	5.94 (14)	156 (1.13)	670 (0.68)	4.29 (15)	198 (5.54)	1140 (3.20)	5.76 (16)
	Total	9125 (100)	64570 (100)	7.08	7817 (100)	55840 (100)	7	13837 (100)	98333 (100)	7.11	3574 (100)	35582 (100)	10

*Figures in parenthesis indicate percentage share of the district and rank of the district in yield

Source: Ministry of Agriculture, Government of India, New Delhi

We begin with potato which is the dominant vegetable crop in Haryana. Kurukshetra followed by Ambala and Yamunanagar are the leading districts and together constituted more than 50 per cent of total area in the state. Gurgaon and Faridabad exhibited marginal share despite having proximity to the Capital city of Delhi. The share of Kurukshetra in total production of potato in the state is around one third due to yield advantage. Among the leading districts, Ambala has shown lower contribution in production in comparison to its share in total acreage because of relatively lower level of yield. It is essential to mention that only seven districts experienced yield rates above the state level. It implies that there is a vast scope of yield improvement in the lagging districts.

In order of importance, tomato is the next vegetable grown in Haryana, Karnal, Yamunanagar, Mewat and Gurgaon districts are leading producers of tomato and formed around 50 per cent of total tomato area in the state. On the other hand, Rewari, Narnaul and Kaithal have shown less than 2 per cent share in the overall area. Again, four districts namely, Karnal, Yamunanagar, Mewat and Gurgaon contributed around 50 per cent to total tomato production in the state. It is may be pointed out that Bhiwani attained first rank in productivity. Other two districts with higher productivity were Kurukshetra and Panchkula.

The pattern of cauliflower area and production is quite different as shown in Table 2.11. There is a clear cut case of geographical concentration. Cauliflower production is found concentrated primarily in Sonipat, Panipat, and Karnal. These districts contributed around 35 per cent in area and 38 per cent in total production of cauliflower in the state Rewari and Mewat reported the lowest share in area and production. Yield rate of cauliflower was observed highest in Karnal during the year 2009-10.

Cucurbits production is concentrated in Gurgaon with 48.96 per cent contribution in the state. It is higher than its share in area allocation due to higher level of productivity. All other districts show relatively lower contribution in area as well as in production.

As shown in Table-2.11, most of the leafy vegetables production is concentrated in Gurgaon, Kurukshetra, Kaithal, Karnal and Panipat. Each one of them contributed around 10 per cent in overall area allocation. Gurgaon emerged as exception by showing almost 6 per cent share in area and around double contribution in

production due to relatively higher yield rates in comparison to other leading districts. Among lower contributing districts, Sirsa is exemplary where contribution in production was double than area allocation due to exceptionally high yield rates.

In a nutshell, geographical pattern of area, production and yield of major vegetable crops grown in Haryana was found quite different. In many cases, contribution of a particular district varied significantly in area allocation and production.

2.9 Pattern of Area, Production and Yield of Major Fruit Crops:

After presenting the pattern of above mentioned indicators for major five vegetable crops grown in Haryana, we will examine the same for fruit crops. The criterion adopted for selection of vegetables i.e. at least 10 per cent contribution in the state in terms of area and production has been also applied in this case. On the basis of this criterion, we have included four fruits namely, mango, guava, citrus and ber in the district-wise analysis. This information is presented in Table-2.12

Mango production is concentrated in Yamunanagar by indicating around 57 per cent contribution in overall production of the state. Other important districts are Ambala and Karnal which contributed around 27 per cent. Thus, these three districts together produced around 84 per cent of mangoes in Haryana. In these cases, share in area allocation was higher than production except Karnal which contributed almost double in production due higher yield rates. But, leading districts in productivity were Fatehabad, Faridabad and Karnal.

Next fruit crop in order of importance in terms of production, guava is largely grown in Karnal, Sonipat, Hissar, Gurgaon, Yamunanagar, Jhajjar and Rohtak. These districts showed around 50 per cent of overall area allocation in the state. Further, Sonipat is leading in production despite being second ranking district in terms of area allocation. It could be possible due to higher level of productivity that is next to Kaithal. Most of the districts in the state showed less than 5 per cent contribution to the production of guava in the state.

The pattern of citrus production is quite different as shown in Table-2.12. It is heavily concentrated in Sirsa district. This district alone contributed 66.22 per cent to the total production in the state with 51.05 per cent share in area allocation. Fatehabad and Hissar are also important and these together exhibited around 20 per cent share in

production of the state during 2009-10. It may be noticed that none of these districts is leading in productivity. Panipat with marginal share in area and production exhibited the highest productivity which is almost three times in comparison to Sirsa, a leading district in production and area allocation under citrus crops during 2009-10

Summing Up:

Results show that there is a growing up surge for cultivation of fruits and vegetables in Haryana. An analysis of the status of horticultural crops in the state indicated that these crops covered only 1.4 per cent of GCA during 2009-10. Highest share of GCA was devoted to these crops in Ambala followed by Kurukshetra and Sonipat. Thus, status of horticultural crops in terms of area devoted does not commensurate with availability of natural resource base.

Vegetables and fruits constituted 82.37 per cent and 41.38 per cent of area under horticultural crops in Haryana. Other crops such as spices, floriculture, medicinal and aromatic plants together occupied around 6 per cent of area cultivated under these crops. Among fruits, mango, guava, citrus and ber were major crops while cucurbits, cauliflower, potato and tomato were main crops among vegetables in terms of area at the state level. Further, Yamunanagar and Sirsa were leading districts in area under fruit crops and together accounted for 37 per cent of the total cultivated area in the state. Cultivation of vegetables was found popular in Karnal, Sonipat, Gurgaon, Ambala and Yamunanagar and these districts together produced around 50 per cent of state's total output. The amount of change in area and production of fruits and vegetables in Haryana has been commendable during the recent years. Progress of fruits and vegetables production in Rohtak was appreciable.

Chapter-3

Characteristics, Crop Pattern and Production Structure of Sampled Farmers

This chapter presents an analysis of the agro-economic characteristics of the sampled farmers. These include population, average size of family, status of workers, educational status of family members, ownership of land, tenancy, average size of holding, cropping pattern, irrigated area and its sources, area under High Yielding Variety seeds, credit availed by farmers and value of farm assets. Section-1 deals with socio-economic features of sampled households while section-2 focuses on agriculture related features.

Section-1

Socio-Economic Characteristics of Sampled Farm Households

The efficiency and success of any economic enterprise including farming is influenced to a significant degree by the socio-economic background of the households. In addition, these characteristics influence the adoption of improved technology in farming.

3.1 Population and Size of Family

Population details presented in Table 3.1 indicate that total population of the sampled farm households was 886 persons. However, size class variations were evident and highest population was found in large category due to higher proportion of these households in the sample for this study.

The average size of family was 5.91 persons in the selected farm households. It was 5.46 persons in small farm size category against 6.24 persons in medium size category. There was no correlation between farm size and average size of family. The male-female ratio in total population was 54.4 and 45.6 per cent at the aggregate level. Among the selected households, it was dominated by male population in each category except for small farm households category where female share was observed marginally higher than male members. It may be mentioned that majority of population i.e. 68.8 per cent were found in the age group of 16-60 years at the overall level. The range of age group of population across farm sizes varied significantly. In particular, share of

Table-3.1
Demographic Profile of the Selected Farm Households

Characteristics		Marginal	Small	Medium	Large	Total
Number of Household		8	13	29	100	150
Household size (number)		45	71	181	589	886
Average number of earners		1.75	1.54	2.14	1.88	1.89
Average size of family		5.63	5.46	6.24	5.89	5.91
Gender (% of members)	Male	51.11	49.3	58.57	53.99	54.4
	Female	48.89	50.7	41.43	46.01	45.6
Age group of family Members (yrs.)	<16	28.89	30.99	24.31	22.24	23.7
	16-60	71.11	61.97	66.3	70.29	68.85
	>60	0	7.04	9.39	7.47	7.45
Identity of the respondent (%)	Head	100	76.92	68.97	77	76.67
	Others	0	23.08	31.03	23	23.33
Educational status of family members(%)	Illiterate	20	12.67	19.34	11.21	13.43
	Up to primary	17.78	19.72	19.34	16.30	17.27
	Up to secondary	57.78	45.07	35.35	38.03	39.05
	Up to graduate	2.22	7.04	8.84	8.15	7.90
	Above graduate	2.22	15.5	17.13	26.32	22.35
Caste (%of the households)	SC	0.00	7.69	0.00	1.00	1.33
	ST	0.00	0.00	0.00	0.00	0.00
	OBC	37.50	38.46	13.79	9.00	14.00
	General	62.50	53.85	86.21	90.00	84.67
Decision maker (% of household)	Male	100.00	100.00	96.55	92.00	94.00
	Female	0.00	0.00	3.45	8.00	6.00
Per cent of workers to total population		31.11	28.17	34.25	31.92	32.05
Main occupation (% of working members)	Farming	57.14	65.00	79.03	75.53	74.65
	Self business	21.43	15.00	12.90	15.96	15.49
	Salaried/Pensioners	7.14	20.00	8.06	5.85	7.39
	Wage earners	14.29	0.00	0.00	2.66	2.46
Involved in migration during year 2009(% of workers)		2.22	1.41	7.73	2.55	3.5

Source: Field Survey

dependents above 60 years was 7.45 per cent at the aggregate level. But, we did not find a single person in this age group in marginal category of farm households.

An enquiry was also made about decision makers in the canvassed household schedule. In marginal and small households, decisions were taken exclusively by male members. However, female also participated in decision making in 3.45 and 8 per cent farm households in medium and large land owning categories. We had also asked a question about the identity of the respondent during the survey. In majority of the households, (76.67 per cent), head of the family was respondent.

Among the selected households, SC, OBC and general category households were 1.33, 14 and 84.67 per cent respectively. The number of SC households was the lowest because they rarely own land in Haryana. Some of them leased in land for cultivation from other category farmers.

3.2 Work Participation

The work participation rate is defined as the percentage of workers to total population. Table 3.1 presents work participation rate (percentage of workers to total population in the age group (15 to 59 years) of population and the proportion of workers to total workers on the sampled farm households. In selected farm households, average number of workers/earners was 1.89 persons. A comparative analysis of various categories indicated that, it ranged between 1.54 persons and 2.14 persons, respectively. Medium farmers had higher number of workers in comparison to other categories. Most of the workers were engaged in agriculture as cultivator or wage earner. This could be a reflection of agriculture being a major source of employment in the selected farm households. Only 3.5 per cent of workers were involved in migration during 2009 and their proportion was observed higher in medium category households in comparison to other categories.

3.3. Educational Level

We have collected information during the survey on educational status of the family members of selected households because it influences farmer's efficiency in farming through the adoption of improved technology. It may be

observed from the data presented in Table 3.1 that proportion of literates among sampled farm households was at least 80 per cent in each category. Out of total literates, 17.27 per cent had education upto primary level, 39.05 per cent upto secondary level. Only 7.90 per cent among them attained education above matriculation and upto graduate level. Unfortunately, 13.43 per cent of family members of selected households were found illiterate. Moreover, proportion of illiterates and literates varied across different categories but no relationship was observed between farm size and educational level of family members. Further, scenario of literacy level of family members in medium and large farm households was found better. Here, proportion of secondary and graduate level education of family members was found higher in comparison to other categories. Around 26 per cent and 35 per cent family members attained higher level of education. It could be possible due to their better financial position which increased affordability of higher education.

In brief, educational status of family members belonging to medium and large land owning farm households was found better than other categories. But, overall scenario indicated backwardness in terms of educational status in the selected farm households by indicating at least 25 per cent family members as illiterate.

Section-2

Ownership of Land, Crop Pattern and Farm Assets

After analyzing socio-economic features in the previous section, agriculture related features of the sampled farm households are presented in this section.

3.4 Farm Size Distribution:

Farm size plays an important role in decision making about the crop pattern, input use and adoption of technology. It may be observed (Table 3.2) that average size of holding on the sampled farm households was 16.92 acres during 2008-09. As expected, net operated area by large farmers was higher than marginal, small and medium farmers. Thus, a positive relationship emerged between farm size and average size of operated area by the sampled farm households.

Table-3.2
Characteristics of Operational Holdings on Sampled Farms (acres per household)

Farm size	Owned land	Cultivable waste	Non cultivable	Leased-in	Leased-out	NOA	GCA	Cropping Intensity
Marginal	1.419	0.000	0.000	0.125	0.000	1.544	3.46	224.26
Small	3.269	0.000	0.000	0.308	0.000	3.578	7.46	208.54
Medium	5.897	0.000	0.000	0.431	0.000	6.328	12.47	196.99
Large	22.280	0.005	0.080	0.680	0.000	22.960	43.06	187.54
Total	16.350	0.003	0.053	0.570	0.000	16.920	31.95	188.82

NOA = Not operated area

Source: Ibid

3.5 Nature of Land Ownership:

The type of ownership of land often influences crop pattern and adoption of technology. Therefore, it is essential to look into the nature of ownership of land before analysing its use. We have classified land details into four categories (i) land owned (ii) land leased in (iii) land leased out (iv) land operated.

The land holding position of the sampled households of various size classes is presented in Table 3.2. Accordingly, selected farm households owned 16.35 acres of land at the aggregated level. It was reported during the survey that scheduled caste farmers acquired land through land reform measures. The land obtained through inheritance was found negligible in their case. The practice of leasing in land was there but sampled farmers did not leased out land. The size of land leased in varied from a minimum of 0.125 acres in marginal category of to a maximum of 0.68 acres in large category.

The analysis of land holding structure of sampled farmers revealed that the practice of leasing in land was wide prevalent but leasing out of land was a rare phenomenon. None of the selected farmers leased-out land. The net operated area per household was 16.92 acres. The minimum of 1.54 acres was operated by marginal category against a maximum of 22.96 acres by large category. The irrigation status of land holdings was commendable, as entire operated area was found irrigated. The main sources of irrigation were the government canals and private tubewells.

Table-3.3
Nature of tenancy on Sampled Farms (per cent)

Farm size	Share cropping	Fixed rent in cash	Fixed rent in kind	Both cash in kind	Against labour	Others
Marginal	-	100	-	-	-	-
Small	-	100	-	-	-	-
Medium	-	100	-	-	-	-
Large	-	83.33	16.67	-	-	-
Total	-	92.31	7.69	-	-	-

Source: Ibid

3.6 Cropping Intensity and Sources of Irrigation:

It was noted (Table 3.2) that area sown more than once on the sampled farm households was significantly high. Marginal farmers indicated exceptionally higher cropping intensity (224.26 per cent). This could be the outcome of increasing irrigational facilities available to them and availability of family labour. On the other hand, cropping intensity was found lowest on large farm households because of uncertain, scanty rainfall and lower availability of canal water. When we compare cropping intensity in individual categories with overall level, it was observed that marginal and small farmers had shown higher cropping intensity than other categories of farmers.

The high cropping intensity on the sampled farms could be possible due to higher irrigated area. The proportion of irrigated area to net sown area was 100 per cent irrespective of farm size category.

The main sources of irrigation on the sampled farms are canal+tubewell which irrigated around 78.37 per cent of area operated by the sampled farm households. The proportion of irrigated area by these sources was higher on large farm households in comparison to other categories. On the other hand, canals irrigated merely 3.57 per cent of operated area and percentage of area irrigated by this source was found highest on small farms. Surprisingly, tanks, wells and other sources as a means of irrigation were almost non-existent on the sampled farms (Table 3.4).

Table-3.4
Sources of irrigation on Sampled Farms (per cent)

Farm size	Only canal	Canal+tubewell	Only electric tubwell	Only diesel tubewell	Tanks and others	Rainfed area	Total operated area
Marginal	8.10	67.61	16.19	0.00	8.10	0.00	100.00
Small	9.68	64.52	17.20	8.60	0.00	0.00	100.00
Medium	8.17	61.04	19.07	11.72	0.00	0.00	100.00
Large	3.05	80.09	15.09	1.76	0.00	0.00	100.00
Total	3.57	78.37	15.43	2.60	0.04	0.00	100.00

Source: Ibid

3.7 Crop Pattern:

Cropping pattern signifies proportion of cultivated area under the different crops in a given year. It normally depends on the soil, water, temperature and status of technological adoption in the region. There are two important harvests (rabi and kharif) in the state of Haryana. The rabi consists mainly wheat, gram, barley and mustard which are sown in October-November and are harvested during April-May. The kharif consists of bajra, jower, moong, cotton, sugarcane and some fodder crops. These crops are generally sown in July and reaped in November-December. Some short duration crops are also taken in zaid.

The data presented in Table 3.5 provide details of percentage of GCA under each crop. It may be noticed that cotton followed by bajra, paddy and vegetables were major crops at the aggregate level during the kharif season in the year 2008-09. Some farmers grew moong and jowar fodder. These together occupied around 60 per cent of the cultivated area. Moreover, marginal and small farmers preferred to grow vegetable crops which are labour intensive, short duration and engage family labour. On the other hand, large farmers opted for cotton and devoted 14.72 per cent of area to this crop due to its relative higher returns. Information on area under HYV seeds on the sampled farms is presented in Table-3.6.

Table-3.5

Cropping pattern of Selected Farmers (% of GCA) during 2008-09

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0.00	6.19	12.17	6.35	6.75
Bajra	5.78	5.67	8.99	9.96	9.78
Vegetables	27.98	15.46	7.88	4.44	5.06
Maize	0.00	0.00	0.55	0.00	0.04
Cotton	0.00	6.70	7.19	14.72	13.91
Moong	0.00	0.00	0.14	2.03	1.84
Gwar	0.00	0.00	0.14	0.93	0.85
Jowar	3.61	2.58	3.73	1.80	1.97
Flower	3.61	0.00	0.28	0.00	0.04
Arhar	0.00	1.03	0.55	0.07	0.13
Sugercane	0.00	0.00	0.00	0.19	0.17
Til	0.00	0.00	0.00	0.02	0.02
Rabi crops					
Wheat	13.00	17.01	26.83	20.94	21.26
Mustard	3.61	4.12	6.22	12.20	11.54
Vegetables	14.44	15.98	7.05	6.10	6.42
Barseem	0.00	1.55	0.69	0.51	0.54
Jowar	0.00	0.00	2.21	0.19	0.33
Moong	0.00	0.00	0.14	0.00	0.01
Gram	0.00	0.00	0.00	0.88	0.79
Sugercane	0.00	0.00	0.00	0.05	0.04
Barley	0.00	0.00	0.00	0.58	0.52
Selected Horticultural crops					
Garlic	3.61	2.06	1.38	0.23	0.38
Kinnow	0.00	9.28	8.30	14.00	13.40
Guava	24.37	12.37	5.12	2.87	3.35
Aonla	0.00	0.00	0.41	0.94	0.88
Gross cropped area	100.00	100.00	100.00	100.00	100.00

Source: Ibid

Crop pattern in rabi season was dominated by wheat (21.26 per cent of GCA) and mustard (11.54 per cent of GCA). More than 90 per cent cultivated area of these crops was irrigated. Further more, 97 per cent area of wheat and 98.55 per cent of mustard was sown under improved variety seeds. The other important crops on the sampled farms were vegetables (6.42 per cent of GCA). Minor crops included fodder, pulses and sugarcane. The area allocated to major

and minor crops by different categories of farmers varied significantly but above mentioned three major crops occupied the larger share of GCA in each case.

The selected horticultural crops were not found popular among the selected farmers except for kinnow which occupied around 13 per cent of GCA at the aggregate level and it was largely due to higher share of area devoted to this crop by large farmers. Although, guava constituted 3.35 per cent of GCA at the overall level, marginal farmers devoted 24.37 per cent of GCA to guava. Garlic formed less than 1 per cent of GCA on sampled farms. Share of GCA under garlic was observed higher on marginal, small and medium farms while vice versa was noticed in case of aonla.

3.8 Area under HYV Seeds:

Table 3.6 presents percentage of area under HYV seeds on the sampled farms during 2008-09. Among kharif crops, maize indicated entire cultivated area under HYV seeds while cotton, paddy and bajra showed at least 90 per cent area covered by HYV seeds. Floriculture is another area where entire area was found under HYV seeds. Traditional seeds still dominated cultivation of pulse crops and gowar.

It appears that adoption of HYV seeds is higher for rabi crops. Sugarcane and summer moong indicated entire cropped area under HYV seeds. It is as high as 98.55 in case of mustard, 96 per cent in case of wheat and vegetables. Jowar fodder among rabi crops has shown the lowest share of cultivated area under HYV seeds.

Among selected horticultural crops such as garlic, kinnow, guava and aonla, each crop is fully covered by improved seeds irrespective of farm size category.

Table-3.6

Percentage of Area under HYV Seeds on Sampled Farms during 2008-09

Crops	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0.00	100.00	88.64	89.76	89.80
Bajra	100.00	36.36	60.00	92.66	89.76
Vegetables	100.00	100.00	71.93	100.00	96.70
Maize	0.00	0.00	100.00	0.00	100.00
Cotton	0.00	100.00	100.00	98.11	98.20
Moong	0.00	0.00	100.00	49.71	50.00
Gwar	0.00	0.00	100.00	15.00	16.05
Jowar	100.00	100.00	40.74	8.39	16.40
Flower	100.00	0.00	100.00	0.00	100.00
Arhar	0.00	100.00	0.00	66.67	50.00
Sugarcane	0.00	0.00	0.00	75.00	75.00
Til	0.00	0.00	0.00	0.00	0.00
Rabi crops					
Wheat	100.00	100.00	96.91	96.62	96.71
Mustard	100.00	100.00	86.67	99.05	98.55
Vegetables	75.00	77.42	70.59	100.00	96.10
Barseem	0.00	33.33	80.00	70.45	69.23
Jowar	0.00	0.00	37.50	25.00	31.25
Moong	0.00	0.00	100.00	0.00	100.00
Gram	0.00	0.00	0.00	78.95	78.95
Sugarcane	0.00	0.00	0.00	100.00	100.00
Barley	0.00	0.00	0.00	88.00	88.00
Selected Horticultural crops					
Garlic	100.00	100.00	100.00	100.00	100.00
Kinnow	0.00	100.00	100.00	100.00	100.00
Guava	100.00	100.00	100.00	100.00	100.00
Aonla	0.00	0.00	100.00	100.00	100.00

Source: Ibid

3.9 Farm Assets:

The efficient and optimal use of agricultural land depends on the availability of appropriate farm assets. In our sampled households, each category of farm households possessed various inventories like milch animals, tractors, pump sets and other minor farm assets. The data on farm assets are presented in Table 3.7. The sampled farm households on an average possessed assets worth Rs.3,59,030 at the overall level. Farm size disparities were very wide. The marginal category of farm households owned farm assets worth Rs.56,088 against Rs.4,55,755 by the large farm category. It may be highlighted that value of farm assets increased with increasing size of holding and indicated a positive relationship. As expected, households in marginal category possessed minimum assets while large category farm households owned maximum by indicating value of assets around Rs.4,55,753 per family. Tractors followed by milch animals were the major assets owned by the households.

The per acre value of farm assets owned by the sampled farm households was Rs. 21,960 at the overall level. Like per family assets, farm size variations were a common phenomenon and medium size category possessed more assets in value terms. Therefore, a positive relationship was not observed between farm size and per acre value of farm assets. Un-expectedly, highest value of farm assets was noticed in medium size category followed by marginal farm category. The small and large category farmers remained disadvantaged among the referred groups. They owned per acre assets worth Rs. 21900 and Rs.20,460 and this value was around half of the medium category households.

Results about ownership of per household assets for the entire sample covering all farm sizes were on the expected lines since large farmers possessed farm assets worth Rs.4,55,755 against Rs.56,088 by marginal farm households. Although, a gap was observed in the case of per acre assets but un-expectedly medium category households showed higher value.

Table-3.7

Ownership of Productive Assets

Assets		Rs. Per household					Rs Per acre				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
Tractor		0	26923	56897	197030	144687	0	8235	9649	8845	8850
Trolley		0	3846	15862	33520	25747	0	1176	2690	1505	1575
Harrow		0	1154	4103	15340	11120	0	353	696	689	680
Tiller		0	0	2800	4660	3648	0	0	475	209	223
Plank		0	0	1897	5113	3775	0	0	322	230	231
Threshing machine		0	0	4310	16710	11973	0	0	731	750	732
Combine harvester		0	0	0	11000	7333	0	0	0	494	449
Other reaper		0	1538	1034	800	867	0	471	175	36	53
Pump-set diesel		2500	8769	7586	13490	11353	1762	2682	1287	606	694
Pump-set electronic	Submersible	0	5462	15352	39080	29495	0	1671	2604	1754	1804
	Non submersible	0	2846	4138	2550	2747	0	871	702	114	168
Bullock cart		3500	923	4103	2890	2987	2467	282	696	130	183
Fodder Chaffer	Manual	188	192	455	365	358	132	59	77	16	22
	Power driven	2000	3462	3966	5084	4563	1410	1059	673	228	279
Spray Pump		213	635	1791	6168	4525	150	194	304	277	277
Storage Bin		0	0	69	720	493	0	0	12	32	30
Poultry Sheds		0	0	0	15000	10000	0	0	0	673	612
Dairy Sheds		0	0	4483	0	867	0	0	760	0	53
Animals	Cows	1875	2538	10931	15230	12587	1322	776	1854	684	770
	Buffaloes	37688	13308	79655	66835	63120	26564	4071	13509	3000	3861
	Calves	8125	0	18483	4170	6787	5727	0	3135	187	415
Total		56088	71596	237916	455755	359030	39533	21900	40348	20460	21960

Source: Ibid

3.10 Credit:

In Haryana, traditional agriculture has been transformed into modern and commercial agriculture after the advent of the green revolution. Availability of credit to farm households through banks, cooperative societies and regional rural banks has played an important role in this transformation. Table 3.8 depicts amount of credit and sources of credit for the sampled farmers. It may be observed that institutional loans from the banks constituted the major share followed by credit received under the government programmes. The amount of per household credit availed was Rs. 2,10,300 at the aggregate level and large farmers reaped higher benefits in comparison to other categories. The disparities across farm sizes were glaring and a positive relationship emerged between farm size and credit availability. In addition to credit received from institutional sources, an amount of Rs. 3800 as credit was availed by the sampled farmers under various government programmes and small farmers received higher benefit in comparison to other categories.

Table-3.8

Details of Sources of Credit by the Selected Households

Farm size	Institutional loan by banks	Commission agents	Traditional/ML/ Landlord	Friends/ relatives	Govt. Programmes	Others
(Rs. per household)						
Marginal	8125	0	0	0	0	0
Small	10769	0	0	0	15385	0
Medium	23276	0	0	0	2414	0
Large	306650	0	0	0	3000	0
Total	210300				3800	
(Rs. per acre)						
Marginal	5702	0	0	0	0	0
Small	3294	0	0	0	4706	0
Medium	3947	0	0	0	409	0
Large	13763	0	0	0	135	0
Total	12860	0	0	0	232	0

Source: Ibid

Results about per acre credit availed by sampled farmers were on the same pattern. The large farmers availed per acre credit worth Rs. 13763 against Rs. 5702 by marginal and Rs. 3294 by small farm categories. However, a positive relationship could not be ascertained between farm size and per acre credit availed since marginal

farmers availed higher amount of credit in comparison to large farm households. Also, a meager amount of Rs. 232 as credit per acre was received by sampled farmers under the government programmes and small farmers were ahead of remaining categories in availing this credit.

Table-3.9
Details of Purpose of Credit by the Selected Farm Households

Farm size	Productive uses		Non productive uses		
	Agriculture	Animal husbandry	Daily consumption	Social ceremonies	Others
	(Rs. Per household)				
Marginal	8125	0	0	0	0
Small	26154	0	0	0	0
Medium	25690	0	0	0	0
Large	265650	44000	0	0	0
Total	184767	29333	0	0	0

Source: Ibid

As shown in Table-3.9, sampled farm households received credit for agriculture and animal husbandry purposes. It may be mentioned that credit for agriculture purpose was availed by all categories of farmers irrespective of farm size but credit for animal husbandry purpose was availed only by large category farmers. As expected, large farm households availed higher amount of credit in comparison to other farm categories. It could be possible due to their higher paying capacity. It may be noticed that none of the sampled farmers availed credit for non-productive uses.

3.11. Household Income

For farm households, crop cultivation is the major source of income. Any income derived by a farmer from raising the crops on land used for agricultural purpose is termed as income from cultivation. In the questionnaire, we had included questions on value of farm output, by product and costs (Material+labour) of crops grown by the farmers during kharif, rabi and zaid seasons. The net returns were computed by deducting cost from value of output. In addition, enquires were also made about non-farm income during the reference year. Results presented in Table 3.10 .indicate that per household net returns from cultivation were Rs. 206499 during this year. Wide variations are noticed across different farm sizes. As expected, per household income of large farmers was almost ten times of the marginal households. This disparity in net returns is largely due to variations in the size of holdings.

Table-3.10
Value of output, cost and net returns for the survey year- aggregate of all crops (Rs)

Farm size	Income from crop production						Non-farm income per household	Total income per household
	Value of output (main+by product		Cost of production per acre		Net returns (Farm business income)			
	Per household	Per acre	Material cost	Labour cost	Per household	Per acre		
Marginal	38338	11072	3368	1458	21625	6245	28438	50063
Small	122954	16478	4682	2262	71138	9534	51385	122523
Medium	153814	12339	3822	1733	84572	6785	84655	169228
Large	498480	11576	3646	1562	274245	6369	76505	350750
Total	374758	11730	3678	1464	206499	6464	73340	279839

Source: Ibid

In addition to net returns from cultivation, sample farmers earned Rs. 73340 during the reference year from non-farm employment which included dairying, wage labour, services and pension, etc.

After clubbing income from crop cultivation and non-farm activities, per household income was Rs. 279839 during 2008-09. Owing to disparities in assets, large farm households earned the highest income. Thus, a positive relationship emerged between farm size and income per farm household.

Summing Up:

For better understanding of the NHM, we have looked into main indicators related to population and workers, educational status of the head of households, farm size, nature of land ownership, cropping pattern and sources of irrigation, area under HYV seeds, farm assets, credit availed by farm households and income of farm households in this chapter.

The average size of the family of selected farm households was 5.91 persons and there was no correlation between farm size and average size of family. The share

of dependents in population was 7.45 per cent at the overall level. Further, average number of workers per family ranged between 1.54 and 2.14 persons and most of them were engaged in agriculture. Also, literacy rate of the selected families was found to beimpressive and large farm households indicated higher level of literacy.

The average size of land owned by sampled households was 16.35 acres. The practice of leasing in land was common but leasing out land is rarely practiced. Like the state, cropping intensity was high (224.26 per cent) on sampled farms. The main sources of irrigation were canal+tubewell. In kharif season, bajra, paddy and vegetables were the main crops while rabi season was dominated by wheat and mustard. Adoption of HYV seeds is popular for wheat, paddy, mustard and horticultural crops. These farmers owned a variety of farm assets and value of farm assets was Rs. 3,59,030 per household. The selected farmers availed credit of Rs. 2,10,000 per family and large farmers reaped higher benefits in comparison to other categories.

It was observed that sampled farm households earned income from crop cultivation, dairying, wage employment, salary and pensions, etc. Per household income was found to be Rs. 2,79,839 during the year 2008-09. Large variations in income have been observed across different classes of farmers and large farm households earned the highest income due to their large resource base. Thus, farm size and income were found positively correlated.

Chapter-4

Economics of Horticultural Crops vis-à-vis other Important Crops

Profitability of various crops is the most important determinant of production of agricultural commodities governing the behaviour of producers. In reality, perceptions of profitability derive crop options. Farmers grow crops, which offer the highest returns per unit of their scarcest resources such as land and dearer inputs. Profitability being a catalytic factor in increased production of agricultural commodities; it is proposed to examine the same for horticultural crops and other important crops grown on the sampled farms in Haryana during 2008-09.

In this chapter, analysis of gross and net returns from selected horticultural crops cultivation is based on data collected during the field survey in selected three districts (Sirsa, Hissar and Rohtak). The discussion is confined to kinnow, guava, aonla and garlic among horticultural crops. Further, net returns from these four selected horticultural crops vis-à-vis other crops such as paddy, bajra, vegetables, cotton, moong, flowers and sugarcane in kharif season, wheat, mustard, vegetables, summer moong and gram in rabi season have been compared. The costs considered for selected three fruit (kinnow, guava and aonla) crops included variable as well as fixed costs. Variable costs constituted preparatory tillage, manure and fertilizers, transplanting and gap filling, irrigation, weeding and intercultural, topping/pruning, plant protection, harvesting and collection, grading, storage, transport and packing, cost of labour and interest on working capital. Under fixed costs, planting material, initial, preparatory tillage cost, supporting material and costs of irrigation setup were considered. These were amortized of over the lifetime of the plant. In case of fourth selected horticultural crop i.e. garlic, only variable costs were considered. In case of other crops, material and labour costs were considered appropriate for measuring net returns. The net returns for each crop were worked out by subtracting costs from gross returns. Gross returns for horticultural crops were calculated on the basis of the value of the main product while by product was added in the case of other crops. It may be mentioned here that net returns and profitability are used interchangeably in this analysis.

Now, results of profitability of kinnow, guava, aonla and garlic vis-à-vis other crops on the sampled farm households are presented for the year 2008-09.

4.1. Kinnow:

The kinnow is a variety of citrus fruit cultivated extensively in India and to some extent in Hayana. With the availability of technology from the Agricultural Universities and the State Departments of Horticulture, farmers are getting incentives to grow kinnow on larger scale and thereby, earning profits better than the traditional crops. The acreage under kinnow has been expanding rapidly in Haryana during the last couple of years.

At the outset, information on gross returns and net returns from Kinnow cultivation on the sampled farms for the year 2008-09 is presented in Table-4.1. It may be noticed that gross returns per acre from kinnow cultivation on these farms during this year were Rs. 22100 at the overall level. Significant differences were observed across various categories of farmers. The yield rate per acre from kinnow cultivation was found highest in small category households and therefore, gross returns were also observed higher in this category in comparison to other categories of farm households. It is expected that assistance received under the NHM has reduced costs of farmers and helped them in reaping higher net returns per acre from kinnow cultivation. The net returns from kinnow cultivation at variable cost were Rs. 14327 at the aggregate level. Class variations were also noticed for net returns per acre and small farmers reaped higher net returns than other categories of farm households. In fact, scenario did not change after including fixed costs.

The cost structure of kinnow cultivation is also given in table-4.1. The cost of manure and fertilizers followed by the plant protection measures were the most important components in this case besides preparatory tillage and irrigation at the aggregate level. The proportion of cost components in variable and fixed costs varied across different farm size categories but manure and fertilizers together dominated in each case.

Table-4.1
Costs and Net Returns from Cultivation of Kinnow on Sample Farms in Haryana

(Rs per acre)

Farm Size	Marginal	Small	Medium	Large	overall
Average Area Planted (acre)	0	1.80	2.80	7.63	6.81
Preparatory tillage	0	1051.67 (11.41)	1134.29 (11.10)	1154.47 (12.78)	1151.80 (12.67)
Manure and fertilizer	0	2141.11 (23.23)	1952.12 (19.10)	1711.76 (18.94)	1728.24 (19.01)
Transplanting and gap filling	0	29.44 (0.32)	8.96 (0.09)	10.68 (0.12)	10.84 (0.12)
Irrigation, canal, electricity and diesel	0	938.89 (10.19)	1122.17 (10.98)	1046.33 (11.58)	1047.91 (11.53)
Weeding and intercultural operation	0	787.78 (8.55)	985.11 (9.64)	553.89 (6.13)	576.10 (6.34)
Topping/ pruning	0	588.89 (6.39)	428.57 (4.19)	378.36 (4.19)	383.52 (4.22)
Plant protection, pesticides etc.	0	1062.78 (11.53)	1943.87 (19.01)	1245.77 (13.79)	1274.12 (14.02)
Harvesting and collection	0	166.67 (1.81)	178.57 (1.75)	74.30 (0.82)	80.16 (0.88)
Grading, storage, transport and packing	0	0.00 (0.00)	69.64 (0.68)	75.70 (0.84)	74.38 (0.82)
Market/mandi fee	0	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous	0	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on working capital	0	562.00 (6.10)	629.00 (6.15)	502.00 (5.56)	508.00 (5.59)
Labour cost	0	1262.78 (13.70)	1163.24 (11.38)	923.00 (10.210	938.21 (10.32)
Variable cost	0	8592.00 (93.22)	9615.54 (94.06)	7676.26 (84.950	7773.27 (85.51)
Fixed cost including planting material, field preparation cost, supporting material and irrigation setup (amortized over the life time)	0	625.15 (6.78)	607.56 (5.94)	1360.34 (15.05)	1317.07 (14.49)
Total Cost (variable + fixed)	0	9217.15 (100.00)	10223.10 (100.00)	9036.60 (100.00)	9090.34 (100.00)
Gross Returns (GR)	0	25111.11	24982.14	21922.06	22100.78
Net Returns (GR-Total cost)	0	15893.96	14759.05	12885.46	13010.44
Net Returns (GR- Variable cost)	0	16519.11	15366.61	14245.80	14327.51
Yield per acre(quintals)	0	22.56	22.21	19.36	19.53

Source: Field Survey

4.2. Guava:

Guava is a tropical fruit and it is grown successfully in tropical and sub-tropical regions. It is a popular fruit and quite similar in shape to pear. It is available throughout the year except summer season. It can tolerate high temperature and draught conditions but it is susceptible to severe frost as it can kill the young plants and also can harm the fruits. Best quality guavas are produced where night temperature is low. The rains during harvesting period, however, deteriorate the quality of fruits. The plants begin bearing at an early age of 2-3 years but they attain full bearing capacity at the age of 8-10 years. The yield of a plant depends on its age and cultural practices.

After analyzing the relative profitability of kinnow on the sampled farms in the selected three districts in Haryana during the study period, the same is examined for guava cultivation. Guava is a minor fruit crop grown in this state. Table-4.2 suggests that gross returns per acre by cultivating guava on sampled farms during 2008-09 were Rs. 27840 at the aggregate level. The corresponding figures for marginal, small, medium and large farmers were Rs. 45333 and Rs. 33000, Rs. 37215 and Rs. 23272, respectively. These were observed lowest on large farms. The same pattern was noticed for net returns per acre at the variable costs and marginal farmers were observed as greater beneficiary in comparison to other categories. After including fixed costs, the pattern did not change. Farm size variations were common in yield per acre and medium farmers followed by marginal farmers reaped higher yield rates in comparison to other categories.

The pattern of costs incurred by the farmers is also presented in table-4.2. Like kinnow, manure and fertilizers together constituted higher share of total costs at the overall level and in individual categories of farmers. In order of importance, second and third components were plant protection measures and preparatory tillage which formed at least 10 per cent of total cost in each category. In addition, labour cost constituted 11.16 per cent of the total costs at the aggregate level. In none of the case, it was less than 10 per cent. Fixed costs were found significant as these were observed more than 10 per cent at the overall level. The highest share of fixed costs was found in small farm size category followed by large category farm households.

Table -4.2

Costs and Net Returns from Cultivation of Guava on Sample Farms in Haryana

(Rs/acre)

Farm Size	Marginal	Small	Medium	Large	overall
Average Area Planted (acre)	0.96	1.83	1.40	3.53	2.35
Preparatory tillage	1229.14 (10.27)	1469.85 (12.76)	1636.19 (14.64)	1031.72 (12.88)	1179.71 (12.94)
Manure and fertilizer	2931.36 (24.49)	2361.52 (20.50)	2306.55 (20.63)	1765.60 (22.04)	1988.35 (21.80)
Transplanting and gap filling	4.69 (0.04)	6.06 (0.05)	6.31 (0.06)	4.85 (0.06)	5.18 (0.06)
Irrigation, canal, electricity and diesel	1061.23 (8.87)	1264.24 (10.98)	1147.38 (10.26)	889.70 (11.11)	979.68 (10.74)
Weeding and intercultural operation	1065.68 (8.90)	749.24 (6.50)	725.24 (6.49)	506.00 (6.32)	602.43 (6.61)
Topping/ pruning	237.04 (1.98)	227.27 (1.97)	321.43 (2.88)	180.60 (2.25)	209.62 (2.30)
Plant protection, pesticides etc.	1378.27 (11.52)	1445.45 (12.55)	1476.67 (13.21)	1221.09 (15.25)	1293.06 (14.18)
Harvesting and collection	459.26 (3.84)	272.73 (2.37)	346.43 (3.10)	157.46 (1.97)	217.72 (2.39)
Grading, storage, transport and packing	367.41 (3.07)	200.00 (1.74)	107.14 (0.96)	79.85 (1.00)	116.76 (1.28)
Market/mandi fee	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on working capital	723.00 (6.04)	665.00 (5.77)	656.00 (5.87)	466.00 (5.82)	532.00 (5.83)
Labour cost	1590.12 (13.29)	1502.12 (13.04)	1296.31 (11.60)	821.87 (10.26)	1017.42 (11.16)
Variable cost	11047.20 (92.31)	10163.48 (88.23)	10025.64 (89.69)	7124.73 (88.96)	8141.94 (89.28)
Fixed cost including planting material, field preparation cost, supporting material and irrigation setup (amortized over the life time)	920.14 (7.69)	1355.40 (11.77)	1152.48 (10.31)	884.50 (11.04)	977.38 (10.72)
Total Cost (variable + fixed)	11967.34 (100.00)	11518.88 (100.00)	11178.12 (100.00)	8009.23 (100.00)	9119.32 (100.00)
Gross Returns (GR)	45333.33	33000.00	37215.71	23272.39	27840.71
Net Returns (GR-Total cost)	33366.00	21481.12	26037.59	15263.16	18721.39
Net Returns (GR- Variable cost)	34286.14	22836.52	27190.07	16147.66	19698.77
Yield per acre(quintals)	29.78	20.64	32.93	20.07	22.62

Source: Ibid

4.3. Aonla:

Aonla is an important fruit crop indigenous to Indian sub-continent, which can be grown successfully in dry and neglected regions. The area under aonla has been expanding rapidly in the last couple of years. The growing popularity for alternate medicines, health foods and herbal products are responsible for enhancing the requirement for aonla fruit. The raw aonla is highly acidic and astringent taste is unacceptable to consumers. This fruit is highly nutritive with a great medicinal value. In addition, it is the richest source of vitamin-C. As aonla fruits are highly perishable in nature, its storage is very important.

The demand for aonla is increasing both internally and externally. Its popularity as anti disease agent would boost demand further. The increasing knowledge about its medicinal qualities would increase demand in future and these developments can benefit farmers if proper strategy to enhance yield, post harvest technology and processing is evolved.

The story of gross returns and net returns from aonla cultivation on sampled farms in selected districts during 2008-09 is different. Its productivity was found higher than kinnow and guava. Gross returns per acre from its cultivation were observed Rs. 36523 at the aggregate level. Unexpectedly, there was a huge gap in gross returns per acre from aonla cultivation on medium and large farms. After subtracting variable costs, farmers reaped Rs. 29839 per acre during 2008-09. After adding the fixed costs, net returns per acre became lesser by around Rs. 1500 per acre. In case of aonla, variable costs constituted around 80 per cent of the total cost and remaining 20 per cent were the fixed costs. Out of variable costs, manure and fertilizers together and preparatory tillage constituted more than 30 per cent in each case (Table 4.3).

Table-4.3

Costs and Net Returns from Cultivation of Aonla on Sample Farms in Haryana

(Rs per acre)

Farm Size	Marginal	Small	Medium	Large	overall
Average area planted (acre)	0	0	0.75	6.75	5.25
Preparatory tillage	0	0	1300.00 (20.82)	1302.47 (15.49)	1302.38 (15.63)
Manure and fertilizer	0	0	1185.00 (18.97)	1469.07 (17.47)	1458.93 (17.51)
Transplanting and gap filling	0	0	5.00 (0.08)	3.46 (0.04)	3.51 (0.04)
Irrigation, canal, electricity and diesel	0	0	1025.00 (16.41)	805.86 (9.59)	813.69 (9.77)
Weeding and intercultural operation	0	0	712.50 (11.41)	472.78 (5.62)	481.34 (5.78)
Topping/ pruning			0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Plant protection, pesticides, etc.	0	0	541.67 (8.67)	866.05 (10.30)	854.46 (10.26)
Harvesting and collection	0	0	0.00 (0.00)	298.77 (3.55)	288.10 (3.46)
Grading, storage, transport and packing	0	0	0.00 (0.00)	197.53 (2.35)	190.48 (2.29)
Market/mandi fee	0	0	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous	0	0	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on working capital			359.00 (5.75)	439.00 (5.22)	436.00 (5.23)
Labour cost	0	0	762.50 (12.21)	858.70 (10.21)	855.27 (10.27)
Variable cost	0	0	5890.67 (94.32)	6713.69 (79.85)	6684.15 (80.24)
Fixed cost including planting material, field preparation cost, supporting material and irrigation setup (amortized over the life time)	0	0	354.50 (5.68)	1693.72 (20.15)	1645.89 (19.76)
Total Cost (variable + fixed)	0	0	6245.17 (100.00)	8407.41 (100.00)	8330.04 (100.00)
Gross Returns (GR)	0	0	16666.67	37259.26	36523.81
Net Returns (GR-Total cost)	0	0	10421.50	28851.85	28193.76
Net Returns (GR- Variable cost)	0	0	10776.00	30545.57	29839.65
Yield per acre(quintals)	0	0	15.33	24.5679	24.24

Source: I bid

4.4. Garlic

Garlic is recognized all over the world as a valuable condiment for food and a remedy for various ailments and physiological disorders. The Unani and Ayurvedic systems state that garlic is carminative and is a gastric stimulant and aids in digestion and in absorption of food. In modern allopathy, it is being used in a number of patented medicines and other preparations. The anti-bacterial action of garlic had been observed from ancient time. In particular, it's healing capacity and effectiveness against cholera having been recorded in literature.

As a condiment, it is used all over the world for flavouring dishes. In USA, nearly half of the entire output of fresh garlic is dehydrated and sold to food processors to use in mayonnaise products, salad dressing, tomato products and in several meat preparations. Raw garlic is also used in manufacturing of garlic powder, garlic salt, garlic vinegar, garlic cheese, potato chips, garlic bread, etc. In Italy, Europe and Latin America, this is popular condiment. In recent years, there has been considerable demand from food industries for garlic in India. Garlic oil is an effective insecticide. Apart from this, it is a valuable flavouring agent, used in all kinds of meat preparations, soups, canned foods and sauces.

Garlic juice is used for various ailments related to stomach disorder, as a ruberfacient in skin diseases and as ear-drop in ear-ache. The juice diluted with water can be used against duodenal ulcers. In Cambodia, the leaves are used in the treatment of asthma.

Garlic has since long been cultivated throughout India as an important minor spice or condiment crop. The total area under galic at present is about 98.5 thousand hectares and production is 464 thousand tonnes while yield is only 4710 kg/hectare. Madhya Pradesh followed by Gujarat, Rajasthan, UP, Orissa, Maharashtra and Karnataka grow most of the garlic produced in India.

Moreover, area under garlic in India has been increasing remarkably over the years with higher fluctuations. Haryana is one of the most prosperous states in the country with one of the highest per capita income. It enjoys the unique distinction of having provided electricity, metalled roads and potable water to all its villages within a record time.

Table-4.4
Costs and Net returns from Cultivation of Garlic on Sample Farms in Haryana

(Rs/acre)

Particulars	Marginal	Small	Medium	Large	Overall
Average area planted (acre)	1.00	0.50	0.63	0.83	0.73
Preparatory tillage	2500.00 (9.56)	2400.00 (7.01)	2080.00 (7.78)	2755.00 (9.97)	2517.14 (9.03)
Manure and fertilizers	1500.00 (5.74)	3467.00 (10.12)	3520.00 (13.16)	3085.00 (11.16)	3151.43 (11.31)
Transplanting and gap filling	6000.00 (22.94)	6667.00 (19.46)	4480.00 (16.75)	5220.00 (18.88)	5177.14 (18.58)
Irrigation, canal, electricity and diesel	3000.00 (11.47)	3667.00 (10.70)	2100.00 (7.85)	1500.00 (5.43)	1942.86 (6.97)
Weeding and intercultural operations	2000.00 (7.65)	1933.00 (5.64)	1840.00 (6.88)	3020.00 (10.92)	2531.43 (9.08)
Plant protection, pesticides etc.	500.00 (1.91)	2333.00 (6.81)	1800.00 (6.73)	1810.00 (6.55)	1777.14 (6.38)
Harvesting and collection	4000.00 (15.30)	6000.00 (17.52)	4800.00 (17.95)	3700.00 (13.38)	4228.57 (15.17)
Grading, storage, transport and packing	1500.00 (5.74)	800.00 (2.34)	1140.00 (4.26)	1510.00 (5.46)	1342.86 (4.82)
Market/mandi fee	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interest on working capital	450.00 (1.72)	589.00 (1.72)	459.00 (1.72)	475.00 (1.72)	479.00 (1.72)
Labour cost	4700.00 (17.97)	6400.00 (18.68)	4520.00 (16.90)	4570.00 (16.53)	4720.00 (16.94)
Variable cost	26150.00 (100.00)	34256.00 (100.00)	26739.00 (100.00)	27645.00 (100.00)	27867.57 (100.00)
Gross Returns (GR)	62500.00	64000.00	70000.00	68990.00	68480.00
Net returns(Variable cost)	36350.00	29744.00	43261.00	41345.00	40612.43
Yield per acre (quintals)	25.00	30.00	28.00	24.70	26.11

Source: I bid

Garlic is a short duration crop and land is occupied only for six months. The gross returns and net returns from garlic cultivation on sampled farms in selected three districts during 2008-09 show that gross returns per acre from garlic cultivation were Rs. 68480 at the aggregate level. It is essential to mention that this is the highest returns reaped by the farmers from growing selected horticultural crops. After subtracting variable costs, from gross returns, net returns per acre from garlic cultivation were computed Rs. 40612 at the overall level. The comparable figures for marginal, small, medium and large farmers were Rs. 36350, Rs. 29744, Rs. 43261 and Rs. 41345, respectively. Clearly, medium farmers reaped higher net returns in comparison to other categories.

The cost structure for garlic cultivation presented in Table 4.4 indicates that transplanting followed harvesting, manure and fertilizers were the major cost components. Moreover, proportion of each cost component varied across the farm categories but these components dominated in each category.

4.5. Net Returns from Selected Horticultural Crops vis-à-vis other Crops

Before summing up the discussion on returns, we have analysed net returns from selected horticultural crops vis-à-vis other crops. This information is presented in Table-4.5.

Results show that net returns from cultivation of flowers followed by garlic cultivation were found higher in comparison to main crops of Haryana such as paddy, cotton and bajra in kharif season and wheat, mustard, vegetables and summer moong in rabi season. Another horticultural crop, aonla also provided net returns worth Rs. 29840 per acre at the aggregate level. Guava indicated Rs. 19699 per acre. Among the selected horticultural crops, kinnow exhibited lowest net returns from its cultivation because these are the initial years of fruit bearing and therefore, yield rates were found lower in comparison to full bearing stage.

Thus, among traditional crops sugarcane, cotton and paddy were found profitable than wheat and mustard. Net returns in each case were noticed lower than selected horticultural crops except kinnow which showed lower profitability due to above cited reason. Farm size variations were found significant in net returns obtained from the cultivation crops. Moreover, any relationship in farm size and net returns could not be ascertained.

Table 4.5

Net returns from Selected Horticultural and Other Crops

(Rs. Per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0	12583	10852	12762	12499
Bajra	2750	4109	2649	3083	3063
Vegetable	9665	14267	8972	6631	7476
Cotton	0	15231	13288	14419	14383
Moong	0	0	14000	5303	5352
Flower	19000	0	62500	0	40750
Sugarcane	0	0	0	17250	17250
Rabi crops					
Wheat	7417	6455	7027	5377	5558
Mustard	6000	10075	7022	7068	7086
Vegetable	9250	23013	7141	7190	8011
Moong	0	0	8000	0	8000
Gram	0	0	0	6263	6263
Horticultural crops					
Garlic	36350	29744	43261	41345	40612
Kinnow	0	16519	15367	14246	14327
Guava	34286	22837	27190	16147	19699
Aonla	0	0	10776	30545	29840

Source: Ibid

4.6. Use of Human Labour

In recent years, there has been a great deal of interest among policy makers in the role of horticultural crops as principal means of agricultural diversification. Conditions for expanding area and production of horticultural crops are favourable in countries like India. This is partly because horticultural crops in general are labour intensive. Countries with abundant labour in comparison to capital enjoy a comparative advantage in labour intensive horticultural crops as against crops like cereals which require more land in relation to labour and other inputs for efficient production.

We have gathered information on labour use for the selected horticultural crops and other crops grown by the farmers in the selected districts of Haryana. This information is presented in Table 4.6. As shown in the table, garlic generated highest employment per acre in terms of labour days. Among traditional crops, cotton, flowers and moong (rabi) generated at least 20 days employment. Vegetables also generated 16 days per acre employment in kharif season and 14 days per acre employment during the rabi season.

It is essential to gauge activity wise use of human labour in cultivation of horticultural crops grown by the sampled farmers. We have included recurring as well as fixed activities under taken by the farmers to arrive at these calculations. Table-4.7 indicates that around seven man days per acre were used for pit making followed by weeding and intercultural operations. Further, around two man days per acre were utilized in each activity related to topping/pruning, plant protection and pesticides application, seedling and wiring at the overall level. The average use of labour was around 29 man days per acre. But, marginal farmers utilized higher number of man days per acre in cultivation of horticultural crops in comparison to other categories of the farmers.

To conclude, horticultural crops such as flowers, vegetable and fruit crops show greater potential of generating employment as compared to cereals and other food grain crops. Commercial crops like cotton too generate relatively higher employment in comparison to several other crops. Among horticultural crops, generation of employment depends on the type of fruit and vegetable crops. An examination of activity wise use of human labour in cultivation of selected horticultural crops revealed that marginal farmers used more than average number of labour days in growing these crops. Major activities consuming higher share of human labour were pit making, seedling, weeding and plant protection measures irrespective of farm size.

Table-4.6

Use of Human Labour in Crop Production (crop wise man days per acre)

Name of the crop	Marginal	Small	Medium	Large	Total
Kharif crops					
Paddy	0	11	18	14	15
Bajra	14	5	10	6	6
Vegetable	13	40	17	14	16
Maize	0	0	13	0	13
Cotton	0	32	24	22	22
Moong	0	0	20	8	8
Gwar	0	0	20	7	7
Jowar	7	4	6	8	7
Flower	27	0	17	0	22
Arhar	0	2	10	27	17
Sugarcane	0	0	0	7	7
Til	0	0	0	3	3
Rabi crops					
Wheat	9	8	11	11	11
Mustard	17	9	13	11	11
Vegetable	16	25	13	14	14
Barseem	0	3	3	7	6
Jowar	0	0	6	8	7
Moong	0	0	20	0	20
Gram	0	0	0	10	10
Sugarcane	0	0	0	7	7
Barley	0	0	0	7	7
Selected Horticultural crops					
Garlic	81	117	88	94	94
Kinnow	0	21	22	16	16
Guava	28	23	22	15	18
Aonla	0	0	13	15	14

Source: Ibid

Table-4.7

Use of human Labour by Activities in Selected Horticultural Crops on Sampled Farms excluding Garlic

(man days per acre)

Farm Size	Marginal	Small	Medium	Large	Overall
(A) Recurring activities undertaken every year					
Preparatory tillage	3.80	3.03	3.52	3.20	3.22
Manure and fertilizer	4.74	4.33	3.12	2.56	2.66
Transplanting and Gap filling	0.00	0.00	0.00	0.01	0.01
Irrigation, electricity and diesel	2.27	2.27	1.57	1.18	1.24
Weeding and interculture operation	6.91	4.97	5.74	3.45	3.65
Topping/ Pruning	1.58	2.60	2.59	2.29	2.31
Plant protection, pesticides etc.	4.30	2.50	2.72	1.92	2.00
Harvesting and collection	3.06	1.50	1.51	0.63	0.72
Grading, storage, transport, packing	1.83	0.53	0.84	0.43	0.47
Miscellaneous	0.00	0.00	0.00	0.00	0.00
(B) Fixed activities undertaken during the plantation year					
(a) Planting material like seedling, nursery etc	0.00	0.00	0.00	0.00	0.00
1. Seedling	3.46	1.83	2.12	2.48	2.45
(b) Field preparation- digging, pit making, fencing etc	0.00	0.00	0.00	0.00	0.00
1. Digging	2.07	2.62	2.08	1.53	1.59
2. Pit making	6.12	6.53	7.04	7.19	7.15
3. Fencing	0.00	0.00	0.00	0.00	0.00
(C) Supporting material-bamboo iron angles etc					
1. Wiring	2.27	1.67	1.83	2.33	2.28
2. Iron angles	0.99	1.00	0.26	0.24	0.27
3. Bamboo	1.19	0.00	0.03	0.02	0.03
(D) Laying down of permanent irrigation					
1. Pipeline	0.00	0.13	0.00	1.48	1.35
2. Instruments	0.00	0.03	0.00	0.58	0.53
Gross Total	44.59	35.55	34.98	31.53	31.93

Source: Ibid

Summing up:

The impact of the National Horticulture Mission in Haryana on net returns per acre was assessed through a comparison of selected horticultural crops with other crops grown by the farmers during 2008-09. Results of sampled survey point out that gross returns per acre from garlic cultivation were found higher than other selected horticultural crops during the reference year and this was true for net returns as well. A wide variation was observed when net returns were calculated at total cost after including fixed costs incurred by the growers. Among selected fruits crops, viz, kinnow, guava and aonla, net returns from latter were found to be higher than first two crops.

Farm size variations were common in gross returns and net returns per acre. In case of kinnow, a inverse relationship could be ascertained between farm size and returns. However, a mixed scenario emerged in case of remaining two horticultural crops. Therefore, any relationship between returns and farm size could not be ascertained.

A comparison of net returns from cultivation of selected horticultural crops with other crops during the kharif season has exhibited that flowers followed by sugarcane and cotton were found superior than paddy in terms of net returns per unit of land. The economics of moong, a minor pulse crop grown on sampled farms was also worked out and profitability was compared vis-à-vis other rainfed kharif crops such as bajra. This pulse crop provided higher net returns per acre in comparison to above mentioned crop. It was observed that vegetables and summer moong were superior crops than wheat, gram and mustard in terms of returns during rabi season.

An analysis of net returns from kharif, rabi and horticultural crops grown by the beneficiary farmers indicated that flowers followed by garlic, aonla and guava were far superior crops in terms of profitability in comparison to traditional crops like wheat and paddy on sampled farms in Haryana.

Results show that selected horticultural crops generated higher employment in comparison to several traditional crops. In particular, garlic generated highest employment per acre in terms of labour days. Among various categories of farmers, marginal farmers used more than average number of labour days in growing these crops. Further, weeding and inter cultural operations were found most labour intensive and therefore, higher proportion of labour days was used for these activities.

Chapter-5

Impact of NHM on the Expansion of Horticultural Crops and Perception of Farmers

Introduction:

In India, policy makers realized the potential of horticultural sector to diversify agriculture, efficient land use, optimum utilization of natural resources and creating employment opportunities for rural masses during the 1980s. As a result, planned investment for horticultural development increased significantly in the country. The fund allocation for horticultural sector increased from 24.2 crore in the Seventh Five Year Plan to Rs. 1453 crore in the Ninth and to Rs. 5650 crore in the Tenth Five Year Plan. During the Tenth Five Year Plan, centrally sponsored scheme on Technology Mission for Integrated development of horticulture in the North Eastern region was implemented and continued during the Eleventh Five Year Plan. This scheme was further extended to Jammu and Kashmir, Himachal Pradesh and Uttrakhand. The main objective of this Mission was to provide full support for horticultural development in these states.

During this millennium, problems and constraints of unexploited potential of horticultural sector in the country were pointed out and therefore, National Horticulture Mission was launched during 2005-06 covering research, production, post harvest management, processing and marketing of horticultural crops. The Mission envisaged two fold increase in horticulture production by 2011-12 reaching to 300 million tonnes with a growth rate of 6 per cent per annum. Under the Mission, eight North Eastern states, Jammu and Kashmir, Himachal Pradesh Uttrakhand are not covered since these states are receiving benefits under the Technology Mission for Integrated Development of Horticulture. The NHM aims to promote holistic growth of horticultural sector through area specific strategies to enhance production, nutritional security and to provide income support to farm households.

The NHM has completed initial phase of its implementation in the state of Haryana. It is expected that farmers by now might have been well acquainted with the activities of the Mission and might be availing benefits of assistance provided under the Mission. Hence, it would be appropriate to analyse the impact of the NHM on important indicators in the light of perceptions of the farmers.

5.1. Area Expansion after the NHM

We have earlier mentioned that government of Haryana implemented the National Horticulture Mission with the assistance of the Central government in 2005-06. Results of secondary data in Chapter-2 indicated that area and production of fruits in the state has expanded by 23.33 and 26.42 per cent, respectively during the past few years. Citrus fruits are most prominent gainers in area and production (68.46 and 41.11 per cent) during the reference period. On the other hand, grapes and aonla lost cultivated area. Among the districts, Sirsa is leading with area expansion under fruit crops by 33 per cent.

Vegetables also gained in terms of area at the state level (9.57 per cent) during the recent period. In particular, leafy vegetables, tomato and potato indicated 15 per cent increase in area. The area expansion under vegetables in Rohtak was found commendable.

Table 5.1 reveals status of area under selected horticultural crops on sampled farms since 2005-06. It indicates that area increase under kinnow was the highest on sampled farms after the implementation of the NHM. Next horticultural crop, guava has also shown an increase of less than one acre per farmer at the aggregate level. The area under aonla remained stagnant. The selected vegetable crop, garlic has shown marginal increase. Farm size variation were found evident in case of all the crops.

We had enquired from sampled farmers whether activities of the NHM helped farm households in increasing area under horticultural crops. The activities ranged from planting material to post harvest management (Table-5.2).

During the field survey, selected farmers were asked questions regarding role of the NHM in area expansion under the horticultural crops. They opined that provision of seedling and material inputs facilitated area expansion under these crops. Response of farmers related to capacity building through training was not encouraging. Moreover, farmers' responses regarding provision of processing facilities, marketing and procurement were found disappointing as none of them expressed positive opinion on implementation of these facilities.

Table-5.1
Per Household Area under Horticultural Crops

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Year	Marginal	Small	Medium	Large	Total
Kinnow					
2005-06	0.00	0.08	0.67	3.03	2.15
2006-07	0.00	0.69	1.03	5.54	3.95
2007-08	0.00	0.69	1.03	5.79	4.12
2008-09	0.00	0.69	1.03	6.01	4.26
Guava					
2005-06	0.19	0.77	0.48	1.01	0.84
2006-07	1.03	0.92	0.59	1.26	1.09
2007-08	1.03	0.92	0.59	1.30	1.11
2008-09	1.03	0.92	0.59	1.33	1.13
Aonla					
2005-06	0.00	0.00	0.05	0.40	0.28
2006-07	0.00	0.00	0.05	0.40	0.28
2007-08	0.00	0.00	0.05	0.41	0.28
2008-09	0.00	0.00	0.05	0.41	0.28
Garlic					
2005-06	0.00	0.00	0.00	0.00	0.00
2006-07	0.00	0.00	0.00	0.00	0.00
2007-08	0.00	0.00	0.00	0.04	0.04
2008-09	0.13	0.15	0.12	0.06	0.08

Source: Field Survey

Table-5.2
Did NHM Help Farm Households to Increase their Area under Horticultural Crops
(Percentage of farmers)

Item	Marginal	Small	Medium	Large	Total
Making available good quality planting material like nursery	100	100	100	100	100
Rejuvenation with improved cultivars	-	-	-	-	-
Upgrading the existing tissue culture unit	-	-	-	-	-
Mother stock block maintenance under poly cover to protect from adverse weather conditions	-	-	-	-	-
Raising root stock seedlings under net house conditions	-	-	-	-	-
Polyhouse with ventilation, insect proof netting, fogging and sprinkler irrigation	-	-	-	-	-
Pump set to provide sufficient irrigation with/without storage tank, community tank	-	-	3.45	1	1.33
Soil sterilization-steam sterilization system with boilers	-	-	3.45	-	0.67
Establishment of new garden or seed production	-	-	-	-	-
Protected cultivation like green house, shade net, plastic tunnel etc	-	-	-	-	-
Precision farming implements, e.g., computer, GPS,GIS, sensors and application control	-	-	3.45	-	0.67
Promotion of integrated nutrient management or integrated pest management	-	-	-	-	-
Help provided for organic farming (vermi-compost unit, certification etc.)	-	-	-	1	0.67
Post harvest management like pack house, storage unit, mobile processing unit, etc	-	-		-	-
Training and capacity building	37.5	23.08	27.59	23	24.67

Source: Field survey

Results highlight importance of providing seedling and material inputs in better outcomes of the Mission. Also, these findings indicate towards partial implementation of the Mission since it does not provide crucial facilities such as marketing and procurement to the beneficiaries. In fact, these facilities to the NHM beneficiaries can play a major role in the development of horticultural sector in Haryana.

Despite these limitations, outcome in expanding area under horticultural crops has been found encouraging at the state level. But, potential could be realized better with area expansion under these crops in districts like Gurgaon and Kaithal. Further, coverage of the Mission in terms of farmers is low as compared to requirement to diversity cropping pattern and to enhance livelihood security of the farmers through adoption of horticultural crops.

We have noticed in literature that (Mahendra Singh and Mathur, 2008) yield rates of horticultural crops in Haryana continue to remain low in comparison to leading states. In order to realize yield potential, government will have to bridge demand supply gap that afflicts the availability of quality seedlings/seeds, remodel agriculture extension services and leverage private sector capabilities to encourage processing of fruits.

With the increase in area under horticultural crops in Haryana, production is continuously increasing. Moreover, horticultural produce is highly perishable and sensitive to temperature. Lack of cold storage facilities deteriorates the quality of the produce. Therefore, the state needs to ramp up the availability of cold storage with a focus on rural areas.

Overcoming infrastructure deficit is imperative for the state to achieve a competitive position to attract farmers to grow horticultural crops. Increasing processing centres should be high on horticultural development agenda in order to increase profits of the growers through value addition.

Admittedly, many of the above policy initiatives require a huge infusion of funds. The state needs to be pro-active. The magnitude of the requirements calls for active support from the Central government. An enabling financial package from the Centre is a must if Haryana has to see flourishing horticultural sector.

5.2. Employment and Income Generation through the NHM

During the course of discussion in earlier chapter, we have analysed generation of employment in the process of cultivating horticultural and other important crops grown in Haryana. Findings suggest that some of the selected horticultural crops specially garlic generated relatively higher employment for the farmers in comparison to traditional crops. Further, operation wise details of labour use in kinnow, guava, aonla and garlic cultivation were analysed and it was highlighted that activities like pit making, weeding and intercultural operations generated higher employment in comparison to other activities. Farmers informed during the survey that intercultural operations, viz. weeding and top dressing required higher number of labour days.

Respondents informed that this is most labour intensive operation in garlic cultivation during the entire crop period of six months. After harvesting the bulbs, they need to be cleaned off the soil and roots, etc and require proper drying before marketing produce. Prior to sowing,

Table-5.3 Perceptions of Farmers about the NHM

(per cent of household)

Item	Marginal	Small	Medium	Large	Total
How NHM has helped you to increase area under horticultural crops					
Provision of seedling/nursery	100.00	100.00	100.00	100.00	100.00
Provision of material inputs	87.50	92.31	79.31	88.00	86.67
Capacity building (through training)	12.50	0.00	13.79	4.00	6.00
Provision of processing facilities	0.00	0.00	0.00	0.00	0.00
Provision of market for our end product	0.00	0.00	0.00	0.00	0.00
Provision of procurement facility	0.00	0.00	0.00	0.00	0.00
What are the good points in the policy towards NHM					
Financial assistance	62.50	38.46	44.83	51.00	49.33
Building infrastructure	0.00	0.00	6.90	3.00	3.33
Capacity Building (awareness camps / training, etc)	0.00	0.00	0.00	2.00	1.33
Subsidy provision	100.00	92.31	93.10	95.00	94.67
Any other	0.00	0.00	0.00	0.00	0.00
Do you think NHM has increased employment opportunities for the farmers and agricultural labourers					
By increasing area under horticultural crops that are manually operated	75.00	61.54	55.17	62.00	61.33
By establishing horticultural processing units in the local areas	0.00	7.69	0.00	0.00	0.67
By providing subsidy to those who have diversified their crops from field to horticultural crops	37.50	46.15	55.17	44.00	46.00
No, NHM has not increased employment in any way	0.00	0.00	0.00	5.00	3.33
Do you think your income has grown after adopting horticultural crops with assistance of NHM. If yes, how much					
less than 20 %	12.50	53.85	41.38	42.00	41.33
20 to 40 %	25.00	38.46	34.48	45.00	41.33
40 to 60 %	12.50	0.00	6.90	7.00	6.67
60 to 100 %	0.00	0.00	0.00	0.00	0.00
No increase at all	50.00	7.69	17.24	6.00	10.67
Are farmers in your village aware about the NHM					
They have benefited from the subsidies provided by the NHM	75.00	76.92	79.31	94.00	88.67
They participated in the training programmes by NHM	12.50	7.69	0.00	1.00	2.00
They have benefited from the infrastructur building through the NHM	12.50	7.69	10.34	0.00	3.33
They have been able to increase their area under horticultural crops with assistance of NHM	12.50	7.69	0.00	5.00	4.67
No, they stand aloof and completely unaware about the activities of NHM	0.00	7.69	6.90	2.00	3.33
What changes do you suggest to make NHM more effective					
Government market	12.50	0.00	17.24	19.00	16.67
More subsidy	0.00	15.38	31.03	18.00	19.33
Training, extension and horticulture news from time to time	50.00	38.46	13.79	5.00	12.00
Establishment of processing plant at village level by the Govt.	0.00	7.69	0.00	10.00	7.33
Plant protection and scientific knowledge	0.00	7.69	0.00	2.00	2.00
Irrigation facilities	12.50	23.08	13.79	5.00	8.67
Timely availability of input material	25.00	15.38	0.00	0.00	2.67
crop insurance	0.00	0.00	0.00	2.00	1.33

Source: Ibid

bulbs of garlic are separated into cloves and it is accomplished manually. Farmers mentioned during the discussion that two to three irrigations are applied in cultivation of garlic to maintain sufficient moisture in the fields. These are essential for proper formation of the bulb size as well as to reduce incidence of diseases.

Like garlic, other horticultural crops also require higher number of labour days for various operations. On the basis of these findings, it can be concluded that horticultural crops generate relatively higher employment. We also asked opinions of the farmers in the questionnaire. Around 61 per cent opined that labour employment is generated more in case of manually operated crops such as garlic. They also pointed out towards urgency of diversifying crop pattern from food grains and other traditional crops to horticultural crops in order to create employment. The possibility of realizing the potential of horticultural crops in the state is low unless subsidies are granted by the government to bear the initial risk.

Questions were also asked about proportionate increase in household income of the beneficiary farmers. They reported that their income has increased after adoption of the National Horticulture Mission but percentage of farmers across the categories reporting levels of income improvement were found widely different. For instance, only 12.50 and 25 per cent marginal farmers reported income increase in first and second levels against 42 and 45 per cent, respectively by the large farmers. Around 50 per cent marginal farmers reported nil increase in income. Overall, majority of the farmers reported increase in household income after implementation of the NHM, but major beneficiary of the Mission were large farmers. This analysis highlights the need for strong government intervention to help marginal farmers in raising household income through cultivation of horticultural crops (Table-5.3).

5.3. Financial Assistance and other Positive Factors of the NHM

Since, there is a provision for financial assistance, infrastructure, capacity building and subsidy under the Mission, opinion of the farmers was sought on these aspects. Subsidy provision was listed as the most important positive factor by 94.67 per cent farmers at the overall level. In each farm category, at least 90 per cent farmers gave positive response. Financial assistance was another positive factor which helped 49.33 per cent farmers in adopting the Mission. Further, response of the farmers' regarding infrastructure and capacity building was found poor. Only 3.33 and 1.33 per cent farmers expressed these factors as positive points in policy initiatives framed for the Mission.

It could be observed from the table that response of farmers regarding planting material was positive and all of them received assistance. Pump-sets for irrigation, storage tanks, soil sterilization and precision farming implements received poor response and around 1 per cent farmers indicated an affirmative role of these factors (Table-5.3). Training and capacity building helped 24.57 per cent farm households in adoption of horticultural crops.

5.4. Awareness about Activities of the Mission

It would be useful to understand whether sampled farmers were fully aware about the NHM. Perusal of Table-5.3 indicated that 88.67 per cent growers of horticultural crops were benefited from the subsidies provided under the Mission. Among various categories of farmers, large farmers were the greatest beneficiaries (94 per cent) and received these benefits. In other categories too, at least 75 per cent received these benefits under the Mission. Findings on the next component that is participation in the training were poor. Only 2 per cent sampled farmers participated in training and marginal farmers were found greater beneficiaries in comparison to other categories. Once again, benefits of infrastructure created under the NHM were found disappointing. Merely, 3 per cent farmers received these benefits. It is discouraging to note that only 4.67 per cent of sampled farmers could increase area under cultivation of horticultural crops. It is essential to mention that share of farmers expanding area under these crops was observed higher in marginal and small size categories.

Results regarding awareness about the activities of the NHM were positive. Only 3.33 per cent of selected farmers were aloof about the activities of the Mission. Moreover, their percentage was lower than 10 per cent in each category.

5.5 Training received under the Mission

We have noticed that performance of different categories of farmers varied in terms of yield rates for kinnow, guava, aonla and garlic. Although, several factors determine yield rates, extension through training plays an important role. Information provided in Table-5.4 reveals that State Horticulture Department and Krishi Vigyan Kendras organized trainings for the growers. Sometimes, training was organized by Research Stations. Results suggest that average number of trainings was less than two during 2008-09. The time of training was less than one day.

Frequency of the training provided by the State Horticulture Department to beneficiaries of the NHM was 1.75 trainings during the year 2008-09. Further, marginal farmers received one training against two reported by other categories of the farmers. In addition, State Agriculture University organized one and two trainings for small and large farmers during the same year. It seems that training was given for a very short duration. There is no evidence of trainings organized by any institution

within the village or near by village. Beneficiaries of the NHM opined that training should be organized frequently to update their knowledge on technology related aspects. Participation of the sample farmers in the NHM training can be seen from Table-5.4. Around 20.67 per cent of the farmers attended training organized by the State Department of Horticulture as these farmers were beneficiaries of the Mission. Respondents informed during the discussion that they were not satisfied with the training programmes organized by various institutions to impart knowledge about activities and package of practices for cultivation of horticultural crops under the Mission. Moreover, training was of very short duration and it was not sufficient to provide full details.

Table-5.4

Source of training/dissemination activity provided to the farmers

Details of training	Marginal	Small	Medium	Large	Total
Frequency of the training provided during the year					
State Horticulture Department	1	2	2	2	1.75
State Agricultural University/ College	0	1	0	2	0.75
Krishi Vigyan Kendras	1	0	1	2	1
Kisan Call Centre	0	0	0	0	0
Cooperatives / Local bodies	0	0	0	0	0
Input Dealers/ Private Company Representatives	0	0	0	0	0
Special research Stations set up by the Government	1	0	0	0	0.25
Non Government Organizations (NGOs)	0	0	0	0	0
Any Other	0	0	0	0	0
Average number of days per household during the year					
State Horticulture Department	0.25	0.31	0.55	0.52	0.49
State Agricultural University/ College	0.00	0.08	0.00	0.05	0.04
Krishi Vigyan Kendras	0.38	0.00	0.07	0.06	0.07
Kisan Call Centre	0.00	0.00	0.00	0.00	0.00
Cooperatives / Local bodies	0.00	0.00	0.00	0.00	0.00
Input Dealers/ Private Company Representatives	0.00	0.00	0.00	0.00	0.00
Special research Stations set up by the Government	0.38	0.00	0.00	0.00	0.02
Non Government Organizations (NGOs)	0.00	0.00	0.00	0.00	0.00
Any Other	0.00	0.00	0.00	0.00	0.00
Training sessions organized within village or nearby village (per cent of household)					
State Horticulture Department	0.00	0.00	0.00	0.00	0.00
State Agricultural University/ College	0.00	0.00	0.00	0.00	0.00
Krishi Vigyan Kendras	0.00	0.00	0.00	0.00	0.00
Kisan Call Centre	0.00	0.00	0.00	0.00	0.00
Cooperatives / Local bodies	0.00	0.00	0.00	0.00	0.00
Input Dealers/ Private Company Representatives	0.00	0.00	0.00	0.00	0.00
Special research Stations set up by the Government	0.00	0.00	0.00	0.00	0.00
Non Government Organizations (NGOs)	0.00	0.00	0.00	0.00	0.00
Any Other	0.00	0.00	0.00	0.00	0.00
Training sessions organized within town/district or state capital (per cent of household)					
State Horticulture Department	12.50	15.38	24.14	21.00	20.67
State Agricultural University/ College	0.00	7.69	0.00	3.00	2.67
Krishi Vigyan Kendras	12.50	0.00	3.45	3.00	3.33
Kisan Call Centre	0.00	0.00	0.00	0.00	0.00
Cooperatives / Local bodies	0.00	0.00	0.00	0.00	0.00
Input Dealers/ Private Company Representatives	0.00	0.00	0.00	0.00	0.00
Special research Stations set up by the Government	12.50	0.00	0.00	0.00	0.67
Non Government Organizations (NGOs)	0.00	0.00	0.00	0.00	0.00
Any Other	0.00	0.00	0.00	0.00	0.00

Source: I bid

5.6 Subsidy Received

Agricultural subsidies played an important role in the growth of agricultural sector in Haryana. Moreover, subsidies have been an integral part of government programmes launched from time to time to increase productivity of the crops and for the development of emerging agricultural sectors such as horticulture. An examination of Table-5.5 reveals that growers of selected horticultural crops i.e. kinnow, guava, aonla and garlic received subsidy from the government. The highest percentage of farmers receiving subsidy was noticed for kinnow followed by guava. Subsidies were provided for seedling, fertilizer, pesticides, drip irrigation and water tank. It seems that every beneficiary received subsidy for seedling. In particular, subsidy for water tank and drip irrigation was availed only by large farmers.

In value terms, Rs. 13, 307 per household were provided for seedling and large farmers were the greatest beneficiary. The average subsidy utilized for creation of water tank was as high as Rs. 1,38,986 per beneficiary. On the other hand, negligible amount of subsidy was utilized for spray pumps. We have also computed share of subsidy in total investment by the beneficiary farmers of the NHM for seedling, fertilizer, pesticides, spray pumps, drip irrigation and water tanks. The highest share was noticed for seedling followed by water tank and drip irrigation. As expected, wide variations were noticed across various classes of farmers and ranged from nil to 100 per cent (Table-5.5).

Table-5.5

Details of subsidy provided under the NHM

Sl No.	Item	Marginal	Small	Medium	Large	Total
	Crops for which subsidy provided (per cent of grower)					
1	Kinnow	0.00	38.46	41.38	76.00	62.00
2	Guava	87.50	53.85	44.83	20.00	31.33
3	Aonla	0.00	0.00	6.90	4.00	4.00
4	Garlic	12.50	30.77	27.59	11.00	16.00
	Details of items for which subsidy was provided (per cent of grower)					
1	Seedling	100.00	100.00	100.00	99.00	99.33
2	Fertilizer	100.00	100.00	65.52	55.00	63.33
3	pesticides	75.00	53.85	48.28	48.00	50.00
4	Maintenance	50.00	30.77	41.38	27.00	31.33
5	Spray pump	12.50	0.00	3.45	3.00	3.33
6	Drip irrigation	0.00	0.00	3.45	33.00	22.67
7	Water tank	0.00	0.00	0.00	39.00	26.00
	Amount of aggregate investment (Rs per grower)					
1	Seedling	1993.75	4156.15	4679.66	19494.76	14363.77
2	Fertilizer	2612.50	2592.31	2962.07	7594.00	5999.33
3	pesticides	1837.50	1307.69	2757.93	6434.50	5019.53
4	Maintenance	2700.00	2123.08	2920.69	3911.50	3500.33
5	Spray pump	112.50	0.00	27.59	34.00	34.00
6	Drip irrigation	0.00	0.00	0.00	16402.00	10934.67
7	Water tank	0.00	0.00	0.00	218100.00	145400.00
	Amount of subsidy provided by NHM (Rs per grower)					
1	Seedling	1993.75	3906.15	4549.31	17974.76	13307.57
2	Fertilizer	2400.00	2166.69	2799.83	5911.95	4798.38
3	pesticides	1837.50	1230.77	2757.93	4896.50	4004.87
4	Maintenance	2700.00	2123.08	2920.69	3911.50	3500.33
5	Spray pump	56.25	0.00	13.79	29.00	25.00
6	Drip irrigation	0.00	0.00	0.00	15237.06	10158.04
7	Water tank	0.00	0.00	0.00	208480.00	138986.67
	Subsidy as a percentage of investment (per cent)					
1	Seedling	100.00	93.98	97.21	92.20	92.65
2	Fertilizer	91.87	83.58	94.52	77.85	79.98
3	pesticides	100.00	94.12	100.50	76.10	79.79
4	Maintenance	100.00	100.00	100.00	100.00	100.00
5	Spray pump	50.00	0.00	50.00	85.29	73.53
6	Drip irrigation	0.00	0.00	0.00	92.90	92.90
7	Water tank	0.00	0.00	0.00	95.59	95.59

Source: Ibid

Table-5.6

Sources of NHM Resource Procurement during 2005-06 to 2009-10 (Percentage of Households)

	Department of horticulture	Private nursery	Fellow farmers	Through contract farming	Others
Marginal	100.00	–	–	–	–
Small	100.00	–	–	–	–
Medium	100.00	–	–	–	–
Large	100.00	–	–	–	–
Total	100.00	–	–	–	–

Source: I bid

5.7 Marketing of Selected Horticultural Crops

In Haryana, marketing of horticultural crops is in the hands of commission agents and traders. There is no government intervention in the marketing process except 9 per cent amount of the total value of produce (5 per cent commission + 4 per cent taxes) are charged from the buyer. Thus, intermediaries are responsible for disparity between price paid by the consumer and price received by the farmer. Studies show that growers get only 50-60 per cent of the retail price (Mittal, 2009).

Normally, farmers dispose their vegetable crops through a commission agent or sell directly to the wholesaler and sometimes to Safal, etc. The choice of marketing channel depends on variety of factors such as financial obligations to an agent, distance from terminal market and prevailing price.

Respondents during the survey reported that they sold garlic through commission agents. In case of fruit crops such as kinnow, guava and aonla, most of the farmers sold standing crops to pre-harvest contractors. These contractors were responsible for plucking, grading and marketing of the produce. Often, contractors make advance payment to the growers. Their collection centres operate within short distances. The produce harvested is collected here and sold to wholesalers when prices are found attractive.

Farmers opined that production of selected horticultural crops is seasonal and like other agricultural commodities, it is influenced by demand and supply

fundamentals. Vagaries in supply and elements of speculation also exert pressure on prices. We have noticed that production of horticultural crops, viz, fruits and vegetables fluctuated from year to year in Haryana. The reasons cited include non availability of quality seedlings, irrigation, credit facilities and lower productivity. In addition, input costs for cultivation of horticultural crops are higher. Also, special care is required throughout the crop season.

Marginal and small farmers sold horticultural produce immediately after the harvest to commission agents or to contractors at pre harvest stage due to lack of financial support and holding capacity. Particularly, low income status of small and marginal farmers forced them to sell the perishable products immediately at a low price. To overcome problem of marketing of horticultural crops, cooperative marketing appears to be a viable solution which is yet to pick up in a big way.

5.8. Rejuvenation through NHM

Demand for fruits such as kinnow, guava and aonla have been increasing due to population growth and rise in income. Prices of fruits are relatively attractive and hence, there is sufficient incentive to grow these crops. It has been cited in literature (Room Singh et. al, 2006) that productivity of orchards declines, over the years, which needs to be restored. In order to increase productivity of old orchards, there is an urgent need to replace low productive trees by high yielding disease resistant varieties. Rejuvenation of old orchards under the Mission is not popular among the farmers. The main reason cited was low rate of subsidy for rejuvenation. Most of beneficiary farmers established orchards after implementation of the NHM during 2005-06.

It is urgent to rejuvenate unproductive gardens by replanting and adopting scientific cultivation methods. Farmers with old orchards need to be motivated to follow improved cultivation methods. Along with this, farmers may be encouraged to adopt latest available technology. It is felt that level of subsidy for rejuvenation of old orchards may be reconsidered and revised without loosing time.

5.9. Processing

Processing of horticultural produce requires a degree of organization and management that is often associated with a high level of investment. The actual

techniques of processing of horticultural products may not require a high level of technology but quality control compliance with strict health standards and efficient packaging are important in order to realize the potential. These are often beyond the reach of farmers and therefore, it is necessary to set up processing plant at village level or cluster level along with incentives for growing horticultural crops.

None of the sampled farmers opted for processing of kinnow, guava and aonla despite understanding the benefits of processing and increase in profits after value addition. This suggests importance of micro economic policies relating to public investment in processing. In the present circumstances, public policies that encourage private investment in processing can be useful in solving this problem.

The processing industry can be subsidized. The prices of selected fruit and vegetable products through deficiency payments and government purchases. Given the perishable nature of horticultural products, farmers need to be given benefit of advance payments, crop insurance programme and irrigation subsidies.

5.10. Suggestions

We have observed that area and production of horticultural crops, specially, vegetable and fruit crops has expanded at a healthy rate in Haryana during the recent period. Producers of these crops however, face a number of problems and constraints. Moreover, dispersed production and poor infrastructure make it expensive to market these crops. This is an extremely important aspect in marketing of perishable produce. Further, rising wage rates in the state are threatening cost competitiveness of horticultural crops, particularly labour intensive crops. The shortage of specialized marketing structure and horticultural experts also pose serious constraints in the development of horticultural crops in Haryana. On the basis of discussion with farmers following suggestions are offered for horticultural development in the state through better implementation of the NHM.

(i) There is a felt need to promote shorter gestation vegetable and fruit crops, medicinal and aromatic plants and commercial flower crops through research and development.

(ii) Timely availability of good quality planting material, mushroom spawn and pasteurized compost/vermin-compost is one of the major bottlenecks. It was suggested that unemployed agricultural graduates may be duly encouraged to set up agri-clinics

and agri-business centres for providing quality planting material and other extension services.

(iii) Motivating farmers to adopt latest technology for growing horticultural crops by arranging demonstrations, Kissan Gosthies, Field days, Seminars, Trainings and Exhibitions on regular basis to up date knowledge of the farmers about available technology.

(iv) Post-harvest facilities like packaging, efficient transportation, cold storage, processing, canning, etc, need to be developed through public private partnership in rural areas of the potential districts on priority basis and gradually extending to the entire state.

(v) Identifying horticultural crops having export potential and declaring those districts as Agri-export Zones (AEZs) could be immediately taken up by state government to help the farmers in enhancing their income levels through cultivation of horticultural crops.

Summing Up:

Analysis in this chapter reveals that response of farmers about area expansion under horticultural crops after adoption of the NHM was positive. Further, perceptions of farmers about employment generation and increase in household income through cultivation of kinnow, guava, aonla and garlic were positive.

Subsidy provision was listed as the most important positive factor by 94.67 per cent farmers. In each farm category, at least 90 per cent farmers gave positive response. Further, response of the farmers' regarding infrastructure and capacity building was found poor. Growers of selected horticultural crops i.e. kinnow, guava, aonla and garlic received subsidy from the government for seedling, fertilizer, pesticides, drip irrigation and water tank. The highest percentage of farmers receiving subsidy was noticed for kinnow followed by guava.

Although, extension through training plays an important role, frequency of the training provided by the State Horticulture Department to beneficiaries of the NHM was only 1.75 trainings during the year 2008-09.

As far as marketing of horticultural crops is concerned, respondents sold garlic through commission agents. In case of fruit crops such as kinnow, guava and aonla, most of the farmers sold standing crops to pre-harvest contractors due to advance payment. These contractors were responsible for plucking, grading and marketing of the

produce. None of the sampled farmers opted for processing of kinnow, guava and aonla despite understanding the benefits of processing and increase in profits after value addition.

Chapter-6

Summary and Conclusions

This chapter aims to present main findings of the study and to draw policy implications in order to develop potential of the horticulture sector through implementation of the National Horticulture Mission (NHM) launched in Haryana during 2005-06. The Mission has completed initial phase of its implementation and hence, its impact assessment in terms of out-comes and constraints would be useful for the policy makers. This study is a departure from earlier literature in terms of its focus on issues related to horticultural crops at the macro as well as micro levels. The main objective of this research is to examine economics of selected horticultural crops vis-à-vis other crops including traditional crops and perceptions of farmers about the Mission. Further, it seeks to highlight the status of horticultural crops at the district and state levels in Haryana. In addition, we have tried to assess the prospects of increasing employment through cultivation of horticultural crops.

The study is based on both macro and micro level data. For the state and district level analysis, relevant information on important indicators was obtained from the Directorate of Horticulture, Ministry of Agriculture, Government of India, New Delhi. The data on main indicators related to agriculture such as GCA for the selected districts and the state were collected from various issues of the Statistical Abstract of Haryana. The micro level data were obtained by conducting a survey of the selected 150 beneficiary farm households growing kinnow, guava, aonla among fruit crops and garlic among vegetable crops. The sample is spread over three districts covered under the Misson namely, Rohtak, Hissar and Sirsa. Further, two villages, one nearby and another far off from the town were chosen for in-depth study. Thus, 25 beneficiary farm households engaged in cultivation of selected horticultural crops were selected from each of the village for detailed analysis. The reference year of the study is 2008-09

Now, we summarise the main findings of the study.

6.1 Status of Horticultural Crops in Haryana

Although, there has been surge in cultivation of fruits and vegetables in Haryana, an analysis of the status of horticultural crops in the state indicated that these crops covered only 1.4 per cent of GCA during 2009-10. The maximum share of GCA devoted to these crops was around 5 per cent in Ambala. In other districts, area allocated to horticultural crops was around 3 per cent in Kurukshetra and Sonipat. Thus, status of horticultural crops in terms of area devoted does not commensurate with availability of natural resource base.

Vegetables and fruits constituted 82.37 per cent and 11.38 per cent of area under horticultural crops respectively in Haryana. Other crops such as spices, floriculture, medicinal and aromatic plants together occupied around 6 per cent of area cultivated under these crops. Among fruits, mango, guava, citrus and ber were major crops while cucurbits, cauliflower, potato and tomato were main crops among vegetables in terms of area allocation at the state level. Further, Yamunanagar and Sirsa were leading districts in area allocation under fruit crops and together accounted for 37 per cent of the total cultivated area in the state. Cultivation of vegetables was found popular in Karnal, Sonipat, Gurgaon, Ambala and Yamunanagar and these districts together produced around 50 per cent of state's total output. The amount of change in area and production of fruits and vegetables in Haryana has been commendable during the recent years. Progress of fruits and vegetables production in Rohtak and Kurukshetra was appreciable.

6.2 Socio-economic Characteristics of Sampled Farmers

For better understanding of the NHM, we have looked into main indicators related to population and workers, educational status of the head of households, farm size, nature of land ownership, cropping pattern and sources of irrigation, area under HYV seeds, farm assets, credit availed by farm households and income of the farmers.

The efficiency and success of farming is influenced to a significant degree by the socio-economic background of the households. In addition, these characteristics influence adoption of improved technology. The average size of the family of selected farm households was 5.91 persons and there was no correlation between farm size and

average size of family. The share of dependents in total population was 7.45 per cent at the overall level. Further, average number of workers per family ranged between 1.54 and 2.14 persons and most of them were engaged in agriculture. Also, literacy rate of the selected families was found to be impressive and large farm households indicated higher level of literacy.

The nature of land ownership influences crop pattern, adoption of technology and innovation. At the aggregate level, average land owned by the farmers was 16.35 acres. The practice of leasing-in land was common but none of them leased out land. Like the state, cropping intensity was found to be higher (224.26 per cent) on sampled farms. The main sources of irrigation were canal and tubewell. In kharif season, bajra, paddy and vegetables were the main crops while rabi season was dominated by wheat and mustard. Adoption of HYV seeds is popular for wheat, paddy, mustard and horticultural crops. These farmers owned a variety of farm assets and value of farm assets was Rs. 3,59,030 per family. Tractors followed by milch animals were the major assets owned by these families. As expected, positive relationship emerged between farm size and value of farm assets. Availability of credit has played an important role in transforming traditional agriculture into modern agriculture in Haryana. The selected farmers availed credit of Rs. 2,10,000 per family and large farmers reaped higher benefits in comparison to other categories.

It was observed that sampled farm households earned income from crop cultivation, dairying, wage employment, salary and pensions, etc. The computed per household income was found to be Rs. 2,79,839 during the year 2008-09. Large variations in income have been observed across different classes of farmers. Large farm households earned the highest income due to their large resource base. Thus, farm size and income were found to be positively correlated.

6.3 Economics of Horticultural Crops vis-à-vis other Crops and Employment Generation

The impact of the National Horticulture Mission in Haryana on net returns per acre was assessed through a comparison of selected horticultural crops with other crops grown by the farmers. during 2008-09. Results of sampled survey pointed out that gross returns per acre from garlic cultivation were found to be higher than other selected horticultural crops

during the reference year and this was true for net returns as well. A wide variation was observed when net returns were calculated at total cost after including fixed costs incurred by the growers of fruit crops. Among fruits crops, viz, kinnow, guava and aonla, net returns from latter were found higher than first two crops.

Farm size variations were common in gross returns and net returns per acre. In case of kinnow, an inverse relationship could be ascertained between farm size and returns. However, a mixed scenario emerged in case of remaining two horticultural crops. Therefore, any relationship between returns and farm size could not be ascertained.

A comparison of net returns from cultivation of selected horticultural crops with other crops grown by farmers during the kharif season has exhibited that flowers followed by sugarcane and cotton were found superior than paddy in terms of net returns per unit of land. The economics of moong, a minor pulse crop grown on sampled farms was also worked out and profitability was compared vis-à-vis other rainfed kharif crop such as bajra. This pulse crop provided higher net returns per acre in comparison to bajra. It was observed that vegetables and summer moong were superior crops than wheat, gram and mustard in terms of returns during rabi season.

An analysis of net returns from kharif, rabi and horticultural crops grown by the beneficiary farmers indicated that flowers followed by garlic, aonla and guava were superior crops in terms of profitability in comparison to traditional crops like wheat and paddy on sampled farms in Haryana.

Results show that selected horticultural crops generated higher employment in comparison to several traditional crops. In particular, garlic generated highest employment per acre in terms of labour days. Among various categories of farmers, marginal farmers used more than average number of labour days in growing these crops. Further, weeding and inter cultural operations were found most labour intensive and therefore, higher proportion of labour days was used for these activities.

6.4 Impact of NHM and Perceptions of Farmers on Important Issues

Response of farmers about area expansion under horticultural crops after adoption of the NHM was positive. But, they did not opt for rejuvenation due to low level of subsidy. Further, perceptions of farmers about employment generation and increase in household income through cultivation of kinnow, guava, aonla and garlic were positive. Overall, majority of the farmers reported increase in household income after implementation of the NHM, but the major beneficiaries of the Mission were large farmers. Hence, there is an urgent need for strong government intervention to help marginal farmers in raising household income through cultivation of horticultural crops.

Subsidy provision was listed as the most important positive factor by 94.67 per cent farmers. In each farm category, at least 90 per cent farmers gave positive response. Further, response of the farmers' regarding infrastructure and capacity building was found poor.

Performance of different categories of farmers varied in terms of yield rates for kinnow, guava, aonla and garlic. Although, several factors determine yield rates, extension through training plays an important role. Frequency of the training provided by the State Horticulture Department to beneficiaries of the NHM was 1.75 trainings during the year 2008-09. Respondents informed during the discussion that they were not satisfied with the training programmes organized by various institutions to impart knowledge about activities and package of practices for cultivation of horticultural crops under the Mission. Moreover, training was of very short duration and it was not sufficient to provide full details.

Growers of selected horticultural crops i.e. kinnow, guava, aonla and garlic received subsidy from the government for seedling, fertilizer, pesticides, drip irrigation and water tank. The highest percentage of farmers receiving subsidy was noticed for kinnow followed by guava.

There is no government intervention in the marketing process of horticultural crops in Haryana. Respondents during the survey reported that they sold garlic through commission agents. In case of fruit crops such as kinnow, guava and aonla, most of the farmers sold standing crops to pre-harvest contractors. These contractors were responsible for plucking, grading and marketing of the produce. Often, contractors make advance payment to the growers. Their collection centres operate within short

distances. The produce harvested is collected here and sold to wholesalers when prices are found attractive.

None of the sampled farmers opted for processing of kinnow, guava and aonla despite understanding the benefits of processing and increase in profits after value addition. This brings out the importance of micro economic policies relating to public investment in processing. In the present circumstances, public policies that encourage private investment in processing can be useful in solving this problem.

6.5 Policy Implications

Horticultural crops offer an opportunity to enhance agricultural growth, employment and augment income of the farmers. In Haryana, these crops are getting popular among farmers due to government support under the National Horticulture Mission (NHM). But, full potential could not be tapped due to severe constraints in infrastructural and marketing facilities.

NHM has completed around five years of its implementation in Haryana but its impact on area, production and yield of selected horticultural crops was found limited due to low coverage of farmers and lack of holistic approach in practical. In order to make, Mission more effective, following policy measures are suggested. (i) to promote shorter gestation vegetable and fruit crops, medicinal and aromatic plants and commercial flower crops through research and development.(ii) timely availability of good quality planting material and pasteurized compost/vermi- compost. (iii) motivating farmers to adopt latest technology for growing horticultural crops by arranging demonstrations and trainings at regular intervals to update their knowledge on modern technology. (iv) provision of post-harvest facilities through public private partnership in rural areas of the potential districts on priority basis and gradually extending to the entire state. (v) creation of storage and processing facilities at the village level. (vi) Identifying horticultural crops having export potential.

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Action Taken on Coordinator's Comments

1. The sample size of 150 beneficiary farmers is according to the study proposal which mentioned four crops (kinnow, guava, aonla and garlic), three districts (Rohtak, Hissar and Sirsa), two villages from each district and 25 beneficiary farmers from each village.
2. The available secondary data on horticultural crops at the district and state level have been presented in chapter-II of the report.

3,4,5. Necessary corrections have been made in suggested tables by using amortization formula.

6. Suggested Tables

We have incorporated Table on state level area, production and yield of horticultural crops. In addition, primary data base table on area expansion after the implementation of the NHM has been added. None of the beneficiary farmers involved in processing of fruits and therefore, information is not available. Tables 30 and 31 were already presented in the report.