

# **IMPACT OF HIGH DENSITY APPLE PLANTATION UNDER HORTICULTURE IN HIMACHAL PRADESH**

**A Study Sponsored by Directorate of Horticulture, Himachal Pradesh**



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## **EXECUTIVE SUMMARY**

The high density apple plantation is in consonance with the trend of optimum utilization of available space-both horizontal and vertical to achieve maximum level of production per unit of area by way of accommodating maximum number of plants in given area as also harvesting maximum solar energy for photosynthesis. With the existing extensive system of plantation, not only the yield per unit of area is low but the gestation period of the plantation is comparatively long and the plants being vigorous pose problems in management. The fact that high density plantations are entirely different from the traditional orchards in respect of plantation density, productivity, management practices etc, and their cost structure may be significantly different from the present orchards. It becomes therefore, important to study the economics of such orchards in order to substantiate the fact of their economic superiority. The present study has been planned to high light the economic benefits of high density apple plantations and the case of their maintenance. It is with this back ground that the present study was conducted with the following objectives.

- (i) To study the trends in area and production of apple in HP.
- (ii) To study the economics of high density apple orchards,
- (iii) To study the marketing systems for produce from such plantations; and
- (iv) To analyse the production and marketing problems in management of high density apple plantations.

### **Methodology**

Presently, there are small number of orchardists who have high density apple plantation. These plantations have been adopted by generally, progressive and large growers in lower heights in the state. The present study has been conducted in Shimla district and Rohroo, Jubbal-Kotkhai tehsils were selected purposively. The list of semi high density apple orchard located in Jubbal-Kotkhai tehsil was prepared and a sample of 74 orchardists was drawn randomly. The trees in orchard have been grouped in 1-2 years, 2-3 years and 3-4 years of age for non bearing and bearing plant are grouped in 5-6 years, 7-10 years, 10-15 years and 16 years and above age. The high density varieties of apple generally start bearing at the age of 3-4 years. A simple tabular

analysis was used to study the cost of cultivation of apple. The reference period of the study is the agricultural year 2010-11.

## **Main findings**

### **Trends in Area and Production of Apples**

The area and production of fruits has increased by three percent annually. The analysis reveals that among all fruits apple alone accounted for 45 per cent of area and 73 percent of production of all fruits in the state. Further, study indicates that Shimla, Kullu and Kinnaur in terms of production, whereas Shimla, Kullu and Mandi are the leading districts in terms of acreage under the apple. Shimla district alone accounts for 34 per cent of area and 61 per cent of total production in the state. The share of Kinnaur district in total area and production of apple in the state during 2009-10 was 9.88 and 14.38 per cent respectively. The annual compound growth rate of quantity sold outside the state has shown an increase of 3.69 per cent, whereas, the production increased at the rate of 3.05 per cent. This means that the state apples are gaining more popularity and are in greater demand in different parts of the country. This indicates the sustainable market of apple in the country. Because of faster growth in the fruit production, the relative share of horticulture in the total value of agricultural output has been increasing. This is a healthy trend because ecologically sound development of hilly areas requires that more and more land should be diverted away from field crops to tree crops and grasses so that disturbance of the topsoil is reduced.

### **Socio-economic profile of sample orchardists**

It was observed during the course of study that all the high density varieties orchards were located within two km. of road head. Average family size of high density apple orchardist was 4.53 persons and 2.20 persons were workers. Literacy rate was 84.03, 66.98 and 100.00 percent of male, female and children, respectively. The average size of holdings of high density Apple orchardist was 2.13 hectares out of which 97.42 per cent area was under both cultivation and orchard while 2.58 per cent land was barren land. The major standard varieties were Royal Delicious, Red Delicious, Rich a-red, Golden Delicious and Red Golden and major high density varieties are Red Chief,



Vance, Organ Spur, Super Chief and Golden Spur. Traditional varieties occupied 12 percent as against of High density varieties 88 per cent in total orchard area. In traditional varieties Royal Delicious is major variety and Red chief is main High density varieties. Among bearing trees 55 per cent were traditional varieties and rest 45 percent were High density varieties. About 27 percent area of high density apple was under non-bearing and rest about 73 percent was under bearing. Per farm number of standard variety apple trees were 274 and 630 of high density apple.

### **Economics of high density apple plantation**

The gestation period is less in high density apple as compared to seedling rootstock. On an average, in a hectare 600 plants are planted. Initial cost of plantation of sample high density apple was Rs.88129 per hectare. About 35 percent of the total cost was incurred on human labour, 34 percent material and 28 percent cost fixed cost. Annual maintenance cost of non bearing apple was Rs.46896, Rs.51491 and Rs.57741 per hectare respectively for 1-2, 2-3 and 3-4 years of age orchard. Annual maintenance cost of bearing orchard was Rs 108945 per hectare. As far as age of orchards is concerned the total cost varied from Rs 96984 for age of 5-6 years to Rs 122991 per hectare for age of above 16 years. Net returns from high density apple on sampler farms were worked out to be Rs.470017 per hectare. The analysis reveals that medium and large sizes of farms have earned more than overall level. On the other hand, marginal, small and semi-medium categories of farm earned lesser than overall level. The total cost/return increases with the age of trees. The yield of high density apple varieties apple at overall level ranged between 4121 kg to 30302 kg per hectare during 5 to 16 years of age group. The highest yield was recorded 2098 kg/ha on large farms and lowest 9916 kg/ha on small farms. Further, analysis reveals that yield of Red Chief variety was relatively higher than other high density varieties of apple grown on sample farms.

### **Production and marketing of high density apple plantation**

On an average per farm production of apple was 47104 kg out of which 99.66 percent was sold and rest consumed at home and gifted to relatives and friends. The

preparation of apples for market involves grading, packing, transportation, etc. etc. As all these functions are important to determining the returns to the farmer, therefore, great care has to be ensured at each and every stage. The apple is harvested during July to September depending upon elevation of the area. The picking operation is done by hand. The orchardist incurred Rs.13.27 for picking, Rs. 4.66 per box for assembling of the fruit. Grading of apple is done manually. There are generally two qualities and six sizes for the grades. Farmers incurred about Rs. 22.07 per standard box for grading. The farmers used corrugated carton boxes for packing. On an average, farmers incurred Rs.87.02 on packing material including cost of box. The farmers take their produce to nearest road head on human back. Most of the apple is dispatched to Delhi, being the largest fruit market of the country. The producers had incurred Rs. 13.02 per box in bringing an apple box to the nearest road head, while Rs.57.60 was paid as freight up to Delhi market. The average total transportation cost worked out to be Rs.85.62 per box.

The most popular channel followed by villagers of this area in case of table apple was "Producer-forwarding agent-commission agent-wholesaler-retailer-consumer". The price spreads/margins were worked out for Delhi market because most of the marketed surplus of apple was sold through Azadpur Market. The producer's share in consumer's rupee was 52.23 per cent. The marketing margins of Mashakhori was 3.67 per cent, the retailers margin was higher than Mashakhori's margin. The main reason why retailer margin 7.94 per cent is relatively higher as compared to Mashakhori's margin is that he bears the major burden of losses and deterioration of quality. Marketing cost borne by producers, account for 21.41 per cent of the consumer's rupee. Though Delhi market is officially regulated but still the commission and fees are charged at higher rates by intermediaries. The commission fees and taxes account for 5.88 per cent of the consumer's price.

The above analysis shows that the net returns from marketing of apple are quite high at both the levels i.e. at Mashakhori and retailer level. Thus, there is vast scope for creating more competition in this business. This would not only help the marketing of

apples more competitively but would also bring the consumer's price down and would reduce the excess profit & margins.

### **Problems faced by high density apple orchardists**

The area and production of High density apple has increased manifold during last two decades particularly of spur type of variety. The increase in area and production has also brought many problems with regard to production and marketing of fruits. Profit from high density apple production depends upon many factors like productivity, time of picking, care taken in grading and packing, time taken in transportation, type of storage facility available etc. The major problems faced by the high density apple orchardist of Himachal Pradesh were, Problem of lack of root stock, lack of Irrigation, short supply of Fertilizers, Plant protection chemicals, labour shortages for picking, grading and packing, non-availability of packing material, lack of timely availability of trucks, farmers reported that hpmc do not announce prices in time, prices not paid in time and prices given are low. Thus, from the above discussion it may be concluded that the growers should provided timely supply of packing material, better price for culled fruit, proper marketing facilities and recent technical know-how regarding production and marketing. The growers will get better returns for their produce, this will not improve the socio-economic condition only of the apple growers but it will also improve the economy of the state.

### **Suggestions**

It may be concluded from the study that cultivation of apple of high density varieties is more remunerative than the conventional apples. The investment on per unit of land in case of high density variety is more profitable. The profits can further be increased if the growers are provided timely supply of packing material, better prices for culled fruit, proper market intelligence, processing facility for culled fruits. This will not only enhance the producers' share in consumer's rupee but also improve the socio-economic conditions of the apple growers. It is also suggested that for the proper utilization of fruit the government should encourage the orchardist to prepare low alcoholic fruit beverages like apple cider and wines. The dependence on Delhi market

should be reduced and the farmers should be educated to send their produce to other markets (Bombay, Calcutta, Chennai) directly. Presently, there is no adequate storage facility in producing areas. Therefore, the growers send their all marketable surplus to the market. Thus, storage facilities should be increased so as to regulate the supplies keeping in view the demand of the market. It was also observed that the orchardists are not satisfied with the present corrugated fibre board cartons. Therefore, an efficient and lowest package/box is the need of the hour.

**Executive Table**

Indicators	Marginal	Small	Semi-medium	Medium	Large	All
Sample Size	39	21	9	2	3	74
Average family size	4.05	4.86	5.33	5.50	5.34	4.53
Literacy%	82.97	79.77	81.39	77.77	86.66	81.87
Land holding (Ha./farm)	0.64	1.65	2.64	8.68	19.06	2.13
Cultivated land (Ha/farm.)	0.64	1.62	2.56	8.28	18.42	2.09
Area under apple (Ha/farm)	0.64	1.62	2.56	8.28	18.42	2.09
Area under standard apple (Ha/farm)						
Non-bearing	Neg.	0.01	Neg.	-	0.82	0.04
Bearing	0.34	1.08	1.13	3.63	5.73	0.95
Area under high density apple (Ha/farm)						
Non-bearing	0.09	0.15	0.28	1.32	3.22	0.29
Bearing	0.19	0.37	1.13	3.33	8.63	0.78
% area under bearing						
Standard	98.24	98.96	99.23	100.00	87.41	95.90
high density	66.43	71.02	79.20	71.62	72.80	72.64
Standard apple plant/ farm						
Non-bearing	1.53	2.95	2.20	-	245.00	11.85
Bearing	94.20	287.57	312.88	995.50	1613.33	261.62
High density apple plant/ farm						
Non-bearing	55.38	88.47	156.66	761.00	1923.33	170.89
Bearing	1.09.02	209.23	660.00	1847.56	5198.33	457.78
Production of high density apple (Qtls/farm)	27.70	36.68	136.26	550.08	1734.46	126.27
Yield of high density apple (Kg/Ha.)						
5-6 years	3536	3899	4227	4150	4242	4121
7-10 years	12982	12984	14777	13937	16538	14785
11-15 years	19705	15272	18373	19050	22482	20499
16 and above years	28779	27428	30561	27204	31074	30302
Overall	14582	9916	12059	16519	20098	16189
Maintenance cost of non-bearing high density apple (Rs./Ha.)	49305	50577	52204	51775	51706	51323
Maintenance cost of bearing high density apple (Rs./Ha..)	104803	102070	104344	110603	115244	108945
Gross returns from high density apple (Rs./Ha.)	670752	508185	590888	834235	1105391	815152
Marketing cost of high density apple (Rs/ Ha) at Delhi market	204439	142691	170333	244316	300867	236197
Net returns from high density apple(Rs/Ha)	361508	263473	316212	479316	689280	470017
Total cost (Rs/Kg)	7.18	10.29	8.65	6.69	5.73	6.72
Net returns (Rs/Kg)	24.79	26.57	26.22	25.05	34.29	29.03

## Chapter -1

### INTRODUCTION

#### **Preamble**

The hilly areas of Himachal Pradesh have high agro-climatic suitability for production of high value crops like fruit. In such areas, self sufficiency in food grains should not be the goal of the development policy as this would mean under-utilization of resources. Under such situation, maximizing the income from scarce land resource should be the objective. This can be achieved by laying emphasis on cultivation of compatible fruit crops rather than traditional field crops. A policy promoting spatial specialization, therefore, needs to be favoured. It is with this thinking the apple orchards were promoted in the state.

Over the period of these orchards, though these have been able to bring in spectacular transformation in the income level of orchardists, have passed in to the phase of declining productivity and a strong need is being felt to switch over to high density apple plantations having higher income and low gestation period. World over such high density plantations are now being preferred because of the obvious benefits. Not only the productivity levels are significantly higher, these have management requirements easy to be adopted. It is because of these facts that the high density apple plantations are being introduced in the State. Another benefit of high density plantations is that these are highly suitable for the small agricultural holdings in the state.

The high density apple plantations is in consonance with the trend of optimum utilization of available space-both horizontal and vertical to achieve maximum level of production per unit of area by way of accommodating maximum number of plants in given area as also harvesting maximum solar energy for photosynthesis. With the existing extensive system of plantation, not only the yield per unit of area is low but the gestation period of the plantation is comparatively long and the plants being vigorous pose problems in management. For overcoming these problems, high density plantation as followed in Europe and the United States of America is being gradually taken up in Himachal Pradesh. The idea in high density plantation is to raise only such fruits varieties which

have high yield potential on high densifying rootstock to have high productivity and to maintain size of the trees convenient in handling besides reducing cost of cultivation. It is possible to accommodate 2000 to 3000 trees per hectare under this system as against 250-300 trees per hectare under the extensive system presently being followed in Himachal Pradesh. The high density plantation system not only ensures precocity in production but also increases yield substantially with better quality of the produce.

The orchards in Himachal Pradesh are located generally on steep lands, the high and ultra high density plantations being followed in other countries involving very high capital investment may not be suitable here. As such very high densifying root stocks requiring fertile soil, flat lands, assured irrigation and provision of support in the form of stakes will not be suitable except in valley areas. In steep areas, the rootstock should be able to provide support to the main area. In case of apples, semi-intensive plantation densities involving plantation of 600 to 1000 trees per hectare with free standing trees may be suitable. Besides, using semi-high densifying rootstocks, the naturally high density mutants and suitable pruning practices shall be helpful in developing such plantations. In case of apple, 99 per cent plants are presently being raised on seedling rootstocks. Hence, there is no uniformity in plants and they usually take about ten years to come into commercial bearing. Therefore, some of the promising clonally rootstocks like M9, M26, MM106, MM111 etc. are being cultivated in the State. So far, the best indigenous rootstock available in North-Western Himalayan region is the crab apple (*Malus baccata*).

### **Present scenario**

The present scenario of high density apple plantation is not very encouraging in the state. Almost all the orchards are of traditional root stock having very low planting density. The high density plantations are being raised only as gap fillers or a few new orchards. This is also very natural to expect as nobody will cut the existing orchard for growing high density apple plants. The availability of information concerning the benefits of high density plantations and availability of desired root stock is crucial for popularizing these plantations.

## **The need**

The fact that high density plantations are entirely different from the traditional orchards in respect of plantation density, productivity, management practices etc, and their cost structure may be significantly different from the present orchards. It becomes therefore, important to study the economics of such orchards in order to substantiate the fact of their economic superiority.

## **The present study**

The present study is planned to high light the economic benefits of high density apple plantations and the case of their maintenance. It is with this back ground that the present study was conducted with the following objectives.

## **Objectives**

The present study has following objectives:

- i) To study the trends in area and production of apple in HP.
- ii) To study the economics of high density apple orchards,
- iii) To study the marketing systems for produce from such plantations; and
- iv) To analyse the production and marketing problems in management of high density apple plantations.

Recently, more interest has been generated in the cultivation of high density apples in India. The plants grafted on high densitying root stock have given good results due to higher yield as well as the plants coming into bearing stage easily, in addition to the higher production and better graded fruits. The cost of production per unit of fruit is also reduced considerably. The orchards of apple grafted on Malling IX growing under very favourable conditions of growth and management are yielding about 25 to 50 per cent more fruits per unit of area.

Himachal Pradesh is probably the fruit state to have imported clonal root stock on a large scale. That have been further propagated and the apple trees grafted on them are

being made available to orchardist of the state almost complete series of Malling and Malling marten root stock have been collected.

### **High density apple orchard management**

The suitable agro climatic conditions for growing of high density trees (intensive apple culture) requires special management practices and are briefly depicted as below.

**Classification and optimum distance:** The detailed account of classification and other characteristics of these root stock have been presented in Table 1.1. It can be seen from the table that the density of semi high density apple plant on an average is 500 to 600 apple plants per hectare and it generally comes on the bearing stage in the age of 2-3 years where as the economic age is around 30 years.

**Soil and climate:** Rich loamy soils with good drainage throughout the root zone are suitable for semi high densifying root stocks. The site should be free from strong winds, heavy fruit and heavy accumulating sinner slopes with higher gradient should also be avoided. Caplous soil moisture supply throughout the summer is also assented.

**Layout:** In case of fillers one plant is planted in between two trees with complete row of fillers between two rows. This is possible only in case of reasonably flat area and the places where the plantation are on contour strips where the fields are existing without any regard to contour. The fillers are accommodated in between the rows wherever possible, the case should be taken so that the tree should not come near the edge of the field. The planning for compact block plantation will almost the same, the only difference will be that the high density trees will occupy the whole area.

**Preparation of land:** The land should be properly prepared before planting the trees. It would, therefore, be advisable to prepare the land properly by digging pits as is in case of conventional plantation. Pits of the size of 1X1X1 metre should preferably be dug under normal condition.

**Filling of pits:** The pits should be filled with mixture of F.Y.M. and top soil (1:3) fertilizers and soil insecticides may be used. In the rainfed areas, the pits must be dug



and filled up well in advance so that the soil in the pits is stabilized well with the rain water. In case of irrigated areas, the pits should be saturated with water after filling them up.

**Selection of plant material:** As the case with other trees, the plant should be healthy, free from the attack of insect pest or diseases. This should also have a strong stock scion union and a well developed root system. The graft union should be about 20 cm from the ground level.

**Provision of pollinisers:** The high density plants should be provided with independent polliniser even if these are being planted as fillers. In case of regular high density tree plantation, 10 to 15 per cent polliniser plants will serve the purpose.

**Removal of root suckers:** These rootstocks in general and Malling VII in particular have the tendency of producing root suckers. Cutting back at the ground level as in usually does not solve the problem as many more shoots will arise from the cut end. As suck each sucker should be removed from the place of its origin. Soil can be scooped for this purpose. If this is not done a good percentage of the energy of the tree will be wasted in nourishing and rearing these suckers and a time may come when very little nutrients are left for the scion tree.

**Manuring:** The trees under intensive fruit culture grow faster and start bearing early. As such their nutrients requirements are more than the standard trees particularly during the first 8-10 years of their orchard life. The trees on high density rootstocks converse the entire bearing in the field within 6-8 years of their planting as compared to 10 to 12 in case of conventional trees. It is therefore, natural that their mannural requirement at 6 year of age will at least be equal to, if not more than the 10-12 years old standard apple trees. It has to be consumed that all the nutrients are supplied in adequate quantities.

No single rule of thumb can be preserved for the mannural doses of the fruit trees under all the soil and orchard conditions. It would, therefore, be highly advisable that the soils

are tested and the doses fixed accordingly. It would be better to apply manure and fertilizer on the basis of the growth and spread of the trees as the rate of growth of different categories of trees is different and as such the doses based on the age of the trees will not be appropriate. On average 2.5 kg farm yard manure, 20 grams each of nitrogen and, phosphorous and 10 gram of potash should be added to each square meter of the basin or spread of the trees. The composition of some of the commonly used fertilizers and their requirement are given in Table 1.2.

**Table: 1.1 Classification and some other important details of apples grafted on clonal rootstocks.**

Category of rootstocks	Name of the rootstocks	Recommended distance for planting in meters	Approximate number of trees per ha.	Normal age at which bearing starts	Average age at which trees come into full bearing	Average economic bearing age	Remarks
Very high densifying (very weak)	M IX or M IX M IX/48	3x2 3x2.5 or	1700 1350	2 <sup>nd</sup> year		15 to 20 years	Only high densifying and semi-high density plant are suitable as filler plantation
High densifying (weak)	M 26	3x3	1125				
Semi-high densifying (medium weak)	M VII, MM 106	4x3 or 5x3.5 Or	840 650	3 <sup>rd</sup> year	8 to 10 yrs	20 to 25 yrs	The seedling rootstocks being used by us can be categorised into vigorous & very vigorous. These cannot be classified into one definite group because of the lack of uniformity in them.
Semi-vigorous (Medium strong)	M IV, MM III MM 109	5x4	500				
Vigorous (Strong)	M I., M II, M XI, M XI 33, M XI 15, M XIII, MM 104 A 2 Robosto 5.	5x4.5 Or	450	3-4 years if spindle bush method of training is followed other wise 5 to 7 yrs. -do- -do-	10-12 yrs.	30-35 yrs if spindle bush training or grown as small trees and 50 yrs if grown as standard trees -do-	Normal bearing age under col.5 relates to when 1 year old whips are planted as is the normal case now. The bearing time will be reduced if 2 years old well branched trees are planted.
		5x5	400				
		6x5	340				
Very Vigorous (very strong)	M XIII M XVI M XXV Merton 779 Crab French Crab Mounsen 19	6.x5 Or 7x6 Or 8x7	340 240 180	-do- -do- -do-	-do- -do- -do-		

Source: Directorate of Horticulture, H.P. Shimla.

**Table-1.2: Showing composition and doses of fertilizers**

Name of fertilizers	% age composition	Dose per sq. meter in grams N. 20 gms. P-20 Gms K 10 gms. Gms.	Approximate rate per hectare of fertilizer in kgs. (10000 sq. meters) for fully grown orchard
1. Nitrogens (N)			
(i) Calcium ammonium Nitrate	20	100	1000
(ii) Calcium ammonium Nitrate	25	80	800
(iii) Ammonium sulphate	20	100	1000
2. Potassic (K)			
(i) Murat of Potash	62	16	160
(ii) Potassium sulphate	48	21	210
3. Phosphoric (P)			
(i) Superphosphate	16	125	1250
(ii) -do-	32	62	625
(iii) -do-	48	42	415
4. Mixed			
Ammonium Phosphate (or Germen mixture) (20x20) 15x15x15	N.20 P.20 N.20} P.20} K.20}	100  133	1000  1325**

These recommendations are for the soil of average fertility.

These may be increased by 25% to 50% in case of the poor soils.

\*\* The potash in case of 15X15X mixture will be a little more than required. But it should not matter much because this is contained in a single mixture which is on the whole cheaper.

## Chapter -2

### **METHODOLOGY**

The fruit crops are economically more viable than cereals, pulses and off-season vegetables. Due to its profitability, the area under fruits in the state has been increasing at very rapid rate. In the high hills apple is most important fruits crop and account for about 80 per cent of the area under total horticultural crops. But in mid hills stone fruits are more popular while Kinnow and Sangtra in low hills.

The maintenance cost of a standard variety of apple is very high and its expected returns are spread over a longer period of time. The bearing period of standard apple comes to 8-10 years and up to that age maintenance cost is accumulated without any returns. The major investment in orchards generally came in the initial period. Due to its high establishment as well as maintenance cost, the risk involved in production is very high in comparison to other crops, but the comparative profitability is believed to be more.

Thus, the cost of production per kg is very high and this results in low net returns. Considering this aspect, the orchardists have started raising high density varieties of apples to get more profits than the conventional type of orchards. These varieties come into bearing stage at the age of 2-3 years and the density is about more than double than the plantation based on seedling root stocks. To work out the profitability of raising semi high density varieties of apple orchards the study was conducted with the following methodology.

#### **Area and coverage**

Presently there are small numbers of high density varieties of apples orchards in Himachal Pradesh. The high density varieties of root stock plantation have been adopted by generally, progressive and large growers and very popular in lower heights in the state. Thus, such plantation is not concentrated in one area/pocket. Mostly these root stocks were used as filler in standard varieties of apple. The large growers were uprooting their standard variety apple orchards and in lieu of that semi high

density apple plantation is started. Keeping in view the large number of high density plantation in Shimla district the present study has been conducted in Shimla district, Rohroo, Jubbal- Kotkhai tehsils were selected purposely.

### **Sample**

The list of semi-high density apple orchards located in Rohroo and Jubbal- Kotkhai tehsils was prepared and a sample of 74 orchardists was drawn randomly. Further, selected orchardists were classified according to size of holding. The size wise number of farms were 39 marginal having land up to one hectare, 21 small having land 1-2 hectares, 9 semi-medium with 2-4 hectares land, 2 medium farms having land holding 4-10 hectares and 3 were large farmers having land more than 10 hectares.

**Table- 2. 1: Classification of sample orchardists**

<b>Size of Farm</b>	<b>No. of farmers</b>	<b>Percentage</b>
Marginal (0-1 ha)	39	52.70
Small (1-2 ha)	21	28.38
Semi medium (2-4 ha)	9	12.16
Medium (2-10 ha)	2	2.70
Large ( >10 ha)	3	4.06
Total	74	100.00

### **Classification of trees**

The age of fruit plants is a crucial factor in determining the cost and benefits, therefore, in each size of farm the orchard area are classified in various age groups i.e. non-bearing which is 1-2 years, 2-3 years, 3-4 years of age and bearing plant are grouped in 5-6 years, 7-10 years, 10-15 years and 16 and above years age. The high density varieties of apple generally start bearing at the age of 3-4 years. The rationale of this grouping is that the costs and returns vary from orchard to orchard depending upon the age of trees in the orchards.

The inter crop in the orchard is not possible because of per hectare high density of plants and early bearing of high density apple. Each sampled farmer was interviewed personally and the needed information was collected with the help of pretested schedules for the purpose. Detailed information was taken regarding the holding size, land utilization and cropping pattern, cost and returns from apple and other crop and problems faced by the orchardists.

### **Reference period**

The study refers to the agriculture year 2010-11.

### **Analysis**

A simple tabular analysis was used to study the cost of cultivation of apple as well as the field crops. To measure the marketing margin etc. following method was used.

### **Method of measurement of marketing margins**

The price spread is the most important aspect and the most difficult too, as its accurate measurement will depend upon the agency that perform various marketing services. Generally there are three methods for the calculation of marketing margins which are as below:

- a) Following the specific lots of consignment through the marketing system and then assessing the cost involved at each of the different stages,
- b) Submission of average gross margins obtained by dividing money value of sales minus money value of purchase by the number of units transacted for each type of marketing agency, and
- c) Comparison of prices at different levels of marketing over the same period of time.

None of the above listed three methods is regarded as perfect and each has merits and demerits, of its own. However, for this study, the first method was adopted because perishable commodities, and the time-gap between the time at which the commodity enters the marketing system and the time at which it is consumed. It is rather narrow whereas in case of non-perishable commodities like grains, it is not so.

The study of price spread and marketing margins could be a valuable indicator provided comparable and reliable data is available. It is however difficult to measure the price spread in an absolute way. Firstly because the agencies involved in marketing are too many. Accurate prices have to be obtained from specific markets which are never easy to determine and to obtain. Thus, margins can be computed by two ways: (i) cash margins, (ii) percentage margins. The percentage margins indicate to relative cost of marketing and production at a particular time. This can be misleading also, e.g. a rise in the percentage marketing margins may have resulted from a fall in the cash margins if accompanied by a still larger fall in the farm prices. Similarly, high farm prices may make the marketing margins look small even though there has been no cost saving improvement in the marketing efficiency. But, on the other hand, the cash margins are a good indicator of the trend of marketing costs.

**Calculation of variable costs:** The method of calculating variable costs is easy. The price per unit of input is multiplied by the units of inputs used. The sum of the costs of all inputs will give the total variable costs.

**Calculation of fixed costs:** Calculation of fixed cost is very difficult to apportion them among different enterprises. Land and other fixed assets were covered under this cost.

**A. Rental value of land:** The rental value of land is 10 per cent of the market price of land (without orchard).

**B. Depreciation of fixed assets:** Generally fixed assets are like godowns, spray pumps, irrigation equipment, pruning tools etc. It is usual to calculate the annual depreciation on these assets and charge it to the cost of cultivation in the enterprise. There are various methods of calculating annual depreciation on these machinery and equipment etc. The common one being the straight line method and the diminishing balance method. In the straight line method, the total depreciation is divided equally among the years the asset is likely to last. In the diminishing balance method a constant percentage of total depreciation is written off each year and the value accordingly reduced at the end of the year.

**C. Amortization of establishment cost:** Amortisation is a process of liquidating a debt by means of sinking fund. In actual effect, to amortize would mean that the capital investment will be returned during the period of amortisation at a specific rate of interest. It is the annual equated number of years with compound interest on the unpaid balance.

**Concepts and definitions:**

**Bearing tree:** A tree of bearing age was defined as a tree which has attained the specified age irrespective of the fact whether it bore fruit or not, during a particular year. This age was taken to be about three years since planting in case of high density apple.

**Non-bearing tree:** A non-bearing tree was defined as a tree which has not reached the bearing age.

**Orchard:** An area of land having at least ten fruit trees under study and owned by a person was defined as an orchard irrespective of fact whether this area was in geographical contiguity or scattered.

**Orchardists:** Any person owning an orchard was defined to be an orchardist.

**Main occupation:** The main occupation of a person was defined as the one from which he gets the maximum income.

**Subsidiary occupation:** The subsidiary occupation was defined as the occupation from which a person gets his second largest income.

**Picking:** The word 'Picking' means harvesting of the fruits.

**Grading:** Grading means, sorting out of the fruits into various lots according to quality and size of each fruit.

**Productivity:** Average yield per fruit-bearing tree, in terms of weight.

**Standard box:** A standard box of apple means the one containing about 20 kgs of apples. One tonne (1000 kgs) has been taken equivalent to 50 standard boxes of apples.



**Half box:** A half box of apple contains about 10 kgs. of apples i.e. half of a standard box. This type of box is generally used in Kullu.

**Culled fruits:** Those fruits which may not have attained full colour and form typical to the variety, or below 65 mm in diameter or bearing more than 3 box marks due to hail or healed insect damage, or bruised fruits even though they may be sound otherwise, are all known as culls. Drops when the fruits have reached picking maturity are also termed as culled fruits.

**Marketable surplus:** The quantity of product which is available for marketing was called marketable surplus.

**Marketed surplus:** Marketed surplus refers to the actual quantity of the produce marketed.

**Distributing market:** Distributing market has been defined as one where the produce from the producing areas comes first and from where some part of it is distributed to other markets.

**Consuming market:** A market which utilizes most of its supplies for local consumption.

**Assembling point:** Assembling point has been defined a place where the growers assemble their fruit basket for the purpose of transporting to various distributing and consuming markets.

**Pre-harvest contractor:** A pre-harvest contractor is one who buys the standing crop from the growers i.e. they buy the crop before its harvest and undertake to perform all the operations including the picking at their risk and cost.

**Commission agent:** The Commission Agent, also known as 'Kaccha Arhatis' acts as a seller for the goods booked to him by the growers. He charges commission for his services but does not take title to the goods.

**Wholesaler:** A wholesaler is one who buys and sells produce in bulk at his risk. He takes title to the goods.

**Wholesaler-cum-commission agent:** A wholesaler-cum-commission agent also known as 'Pucca Arhatiya' is one who performs both the functions of commission agent as well as wholesaler.

**Mashakhor:** A Mashakhor acts as a sub-wholesaler who buys the produce either through the commission agent or from a wholesaler and sells to the retailers/consumers. He usually sells at least a full box and settles the price by negotiations. This intermediary is very common at Delhi fruit market.

**Retailer:** The retailer is an intermediary in the marketing channel, usually licensed, who undertakes the job of retailing and caters to the needs of consumers. He generally keeps a small establishment such as shop with weighing equipments.

**Forwarding agent:** Forwarding Agents perform the function of forwarding the produce to the destination and to the person for whom the produce has been marked by the consigner. He charges his fee for the services from the consigner.

**Marketing margin or price spread:** Marketing margins refer to the difference between the price received (after deducting all marketing expenses incurred) by the grower and that paid by the consumer. This difference is also often called 'Price spread'.

**Costs:** This is a term used to denote the money value of all the inputs. It is calculated for each input by multiplying the quantity of input with the price of per unit. The total cost is obtained by adding up the costs of all inputs. Like input, costs are also divided into fixed costs and variable costs.

**Fixed cost:** Are those costs which are attributable to fixed inputs. Land revenue and taxes, depreciation on building and machinery, interest on capital, etc. are all fixed costs. Since fixed costs are inevitably incurred irrespective of the quantum of production, it is necessary to improve the productivity of the enterprise.

**Variable costs:** Are those which are attributable to variable inputs. They comprise the money value for inputs which are related to the level of production. Thus funds required

for purchase of fertilizers, plant protection, chemicals, etc. are variable costs. They vary with the variation in production or area brought under short duration crops.

**Establishment cost:** All the costs incurred by the orchardists for preparation of land up to planting of nursery and fencing the orchard are termed as establishment cost.

**Maintenance cost:** The costs subsequently incurred on its maintenance year after year are denoted as operation costs.

### **Assumptions**

For the purpose of analysis a few budget assumptions were taken into account for working out the cost of establishment etc. and these are:

- (i) Tree spacing under normal conditions at the rate of 582 trees including the pollinizers trees per hectare was considered.
- (ii) The trees have an expected 30 years life; three years of establishment and 27 years of production.
- (iii) Present costs (2010) were used for all equipment, machinery and building and the depreciation calculated by straight line method.
- (iv) The interest on working capital is charged at the rate of 10 per cent per annum.
- (v) Rental value of owned land is charged at the rate of ten per cent of the present value of land.
- (vi) In the non-bearing stage the interest of accumulated establishment cost in each year have been charged at 10 per cent per annum.
- (vii) The prorated establishment cost is charged at 10 per cent and is amortized over 27 years i.e. amortized establishment cost represents costs incurred during the establishment years (minus revenue during these years) and that must be recaptured during the productive years.

## Chapter - 3

# **TRENDS IN AREA AND PRODUCTION OF APPLES IN HIMACHAL PRADESH**

### Introduction

The climatic conditions varying from sub-tropical to temperate make the state suitable for growing a wide variety of cash crops such as temperate fruits, potatoes, vegetables, ginger, etc. Since the scope for extension of cultivation to newer areas, is limited due to topography, soil conditions etc, emphasis for increasing the farm incomes and living standards of the rural people, has to be laid on increased production by maximizing output per unit area available for cultivation. This can be best achieved by recognizing the fact that, commercial crops particularly fruits have vast potential for increasing the incomes and provide policy prescription accordingly. Alternatively, the agricultural income could be increased by changing cropping pattern towards commercial crops and ensuring higher resource allocation for such crops. The emphasis has been laid on both in all the Five Year Plans. The result was that not only the productivity of major crops, especially maize increased over a period of time, the most spectacular performance could be seen in the field of commercialization of agriculture. The strategy in this respect has been two pronged depending upon the agro-climatic suitability and availability of infrastructure. In certain areas the horticulture (fruit crops) became popular and in certain others the stress was laid on vegetable cultivation. Major motivating factor has been identified to be the comparative profitability of fruit and vegetables over the traditional field crops.

Switching over to commercial agriculture has been an effective strategy for saving the farmers from the vicious circle of low income and low investment prevalent in case of traditional agriculture. The higher income per unit of land resulted in higher capital formation on the farms and made them more food secure, rather made such farmers so well off that some of the villages in district Shimla have been reported to be enjoying one of the highest per capita incomes in Asia. However, the task of this transformation

has been neither easy nor it could be realized over a short span of time. In fact, it took almost a century to come to present level of fruit production in the state.

### **Niche of the State**

Himachal Pradesh is treated as a model for development for other hilly areas. This is mainly because of the integrated strategy of scientists and planners of the State who successfully undertook the programmes like 'lab-to-land' etc. Most importantly, the development of infrastructure in the form of roads, irrigation, credit provision, telecommunication and effective extension services etc. were the crucial factors. Almost entire state is capable of producing different type of fruits. The sub-temperate areas have been traditionally known for production of quality apples, the lower areas are going in for the production of sub-tropical fruit like different varieties of citrus, mango, litchi etc. The market for apples and other fruit like peach, plum, almond etc. is well established and market practices and standards well formulated, the situation is slightly different for sub-tropical fruits. One of the major limiting factors in this regards is competition from other states adjoining this zone, which have better agro-climatic conditions for production of citrus fruit etc. and are advantageously located with respect to the market.

### **Commercial Horticulture in Himachal Pradesh**

The success of fruit cultivation has been a very slow phenomenon over a long period of time. The apple cultivation started from Kotgarh area of district Shimla, where first apple plantations were done by Mr. Satyanand Stokes, who was a missionary and brought the planting material with him from America. From Kotgarh, the apple cultivation spread to nearby areas and came to village Kiari near Kotkhai during about 1930. At that time the area didn't had any roads and whatsoever little production was there had to be brought to Shimla city, the nearest and the only approachable market at that time. Apples were used to be packed in empty tea cartons and transported by mules. The profitability induced the other farmers gradually to take up this vocation. Slowly, the whole area has been transformed to one of the major apple-growing belt of the state.

## **Apple Cultivation in Himachal Pradesh**

The credit of apple cultivations goes to Alexander Cousts who in 1887 planted an apple orchard in Mashobra (presently the site for Regional Research Station of UHF, Solan). Ivans Stokes is credited with popularizing apple in the state, who in 1918 brought a certain root stock from America. Around 1930s, the farmers in Kiari village near Kotkhai picked up this cultivation in a large scale. Similarly, the English had started to raise apple orchards in Manali and Naggar in Kullu. In early days, apples were packed in empty packing boxes from other businesses such as tea, and transported by mules to Shimla on to the plains. The returns from apple were fast noticed.

## **Commercialization of Crops and other Agricultural Enterprises**

The commercial success of any agricultural activity of an area largely depends upon the agro-climatic compatibility, extension services, availability of credit, technical know-how and location and availability of market etc. Keeping in view these factors it has been observed that the activities like horticulture including fruit farming, vegetable production, floriculture etc and other activities like mushroom production, apiculture, sericulture, pisciculture, rabbit husbandry, small holder dairy farming, seed potato production etc have been successful in different regions /zones. These activities have formed the basis for diversifying the production activities on agricultural farms with inherent objective of commercialization in mind.

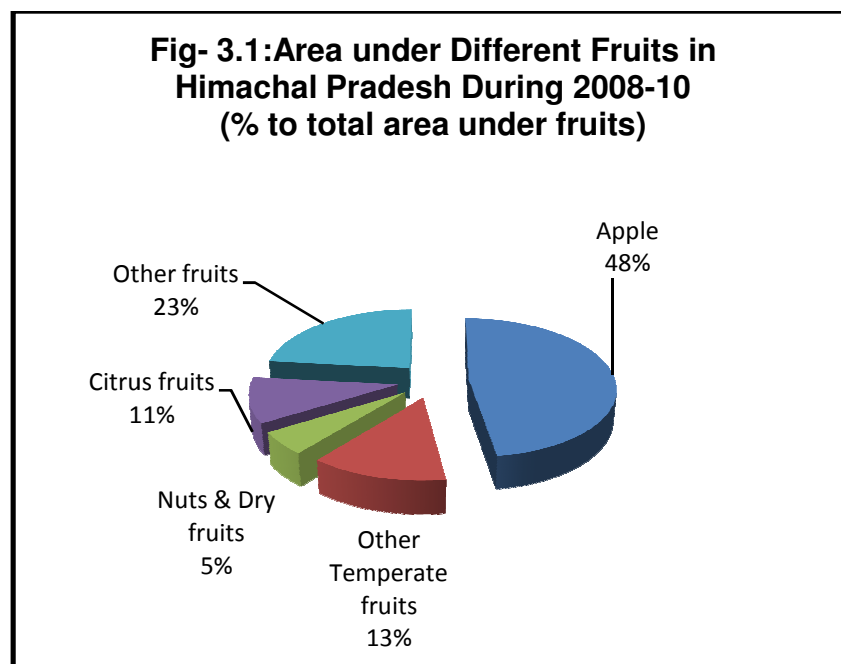
The peculiar topography and agro-climatic conditions in most part of the state limit the scope for production of field crops, but the same offer most suitable conditions for cultivating horticultural crops. Horticulture in the state has now become a business proposition not only for orchardists but also for many others involved with the production and marketing of fruits and vegetables and various other ancillary occupations like transportation, carriage, suppliers of inputs etc. Horticultural industry in the state has developed as a business proposition since long back and has been witnessing continuous rise in area and production.

## **Trends in Cultivation of Fruit v/s Vegetable Crops**

Depending on the suitability and other factors the farmers have taken the initiative, simultaneously suitably assisted and guided by concerned departments of state government that two distinct groups comprising of fruit and vegetable farmers have emerged in the state. Recently, this clear-cut demarcation between the two has been observed to be fading and the farmers who had earlier taken up fruit production have been diversifying into the field of vegetable cultivation. Various factors have been observed to be responsible for this scenario. First and most important has been the risk involved with fruit production. The changing weather pattern has given rise to uncertainty about the agro-climatic requirements like requisite number of chilling days for apple orchards and timely winter rains which are important for flowering and fruit set. The income from the orchards is at a point of time in a year and if this is jeopardized because of any reason whatsoever, the farmers are bound to look out for the alternatives. Fortunately, the agro-climatic requirements are almost the same for both the enterprises and the orchardists are devoting some of the resources for vegetable cultivation, may it be in the form of intercropping of vegetables with the orchard or diversion of some or all land under traditional field crops to vegetable cultivation. The vegetables not only generate income at 3-4 points of time in a year, these also have good demand all the year round. This has provided the orchardists a hedging mechanism against fruit crop failure. The present scenario is that the distinction between orchardists and vegetable cultivators is becoming hazy and a third group of commercial agriculture in the state has emerged which has both fruit and vegetables, may be to a greatly varying extent. All over the state almost 40 per cent of the orchardists have started cultivating vegetables and this phenomenon can be found in Rohru, Tikkar, Nerwa, Chopal, Theog, Mashobra and Sunni area of district Shimla. The areas like Rajgarh, Dadahu, Sarahan, Nohradhar, Haripurdhar and Pachhad etc of district Sirmour and Katrain, Karsog and Drang etc of district Mandi are also witnessing this shift. Under the present conditions simultaneous cultivation of fruit and vegetable is bound to spread to new areas and to larger number of farms. This is welcome change providing financial security, particularly to the marginal and small farmers.

## Trends in Area under Fruit Crops

The unique location and climatic advantage enjoyed by the state have made it an ideal region for growing of various types of fruit crops including temperate, sub-tropical and dry fruits etc. The temperate fruits are grown in the upper areas of the state whereas the sub-tropical fruits are grown in the lower areas. The trends in area under different fruits have been analysed for the last three and half decades and the results are presented in Table 3.1. The Table reveals that the apple occupied about 45 per cent of area under all fruits in the state during 2009-10. The area under apple increased from 35076 hectares in 1975-76 to 99564 hectares in 2009-10 registering an annual growth of 3.1419 per cent during this period. The area under other temperate fruit has also increased from 12078 hectares to 26847 hectares during the period under study. The annual growth in area under other temperate fruits was 1.9061 per cent during this period. Similarly the area under nuts and dry fruits increased from 3543 hectares to 11037 hectares during the period 1975-76 to 2009-10. The area of these fruits has been increasing by 2.7559 per cent per annum during the last three and half decades.





In spite of country wide decline, plantations of orange, Galgal and Kagzi lime are doing well in the lower hills. Now, the plantations of Kinnow have become very popular with the farmers of lower altitudes in Himachal Pradesh. Nearly 11 per cent of total area under all fruits in 2009-10 was devoted to citrus fruits in the state. The area under citrus fruits has increased from 7552 hectares in 1975-76 to 21997 hectares in 2009-10 showing annual growth of 2.3375 per cent during this period. The area under other fruit crops was 5121 hectares in 1975-76 which has increased to 48709 hectares in 2009-10 year. The area under other fruit crops increasing by 6.5356 per cent annually. On the whole, area under all fruit crops increased from 63370 hectares in 1975-76 to 208154 hectares in 2009-10 registering annual growth of 3.4395 per cent during the period under reference.

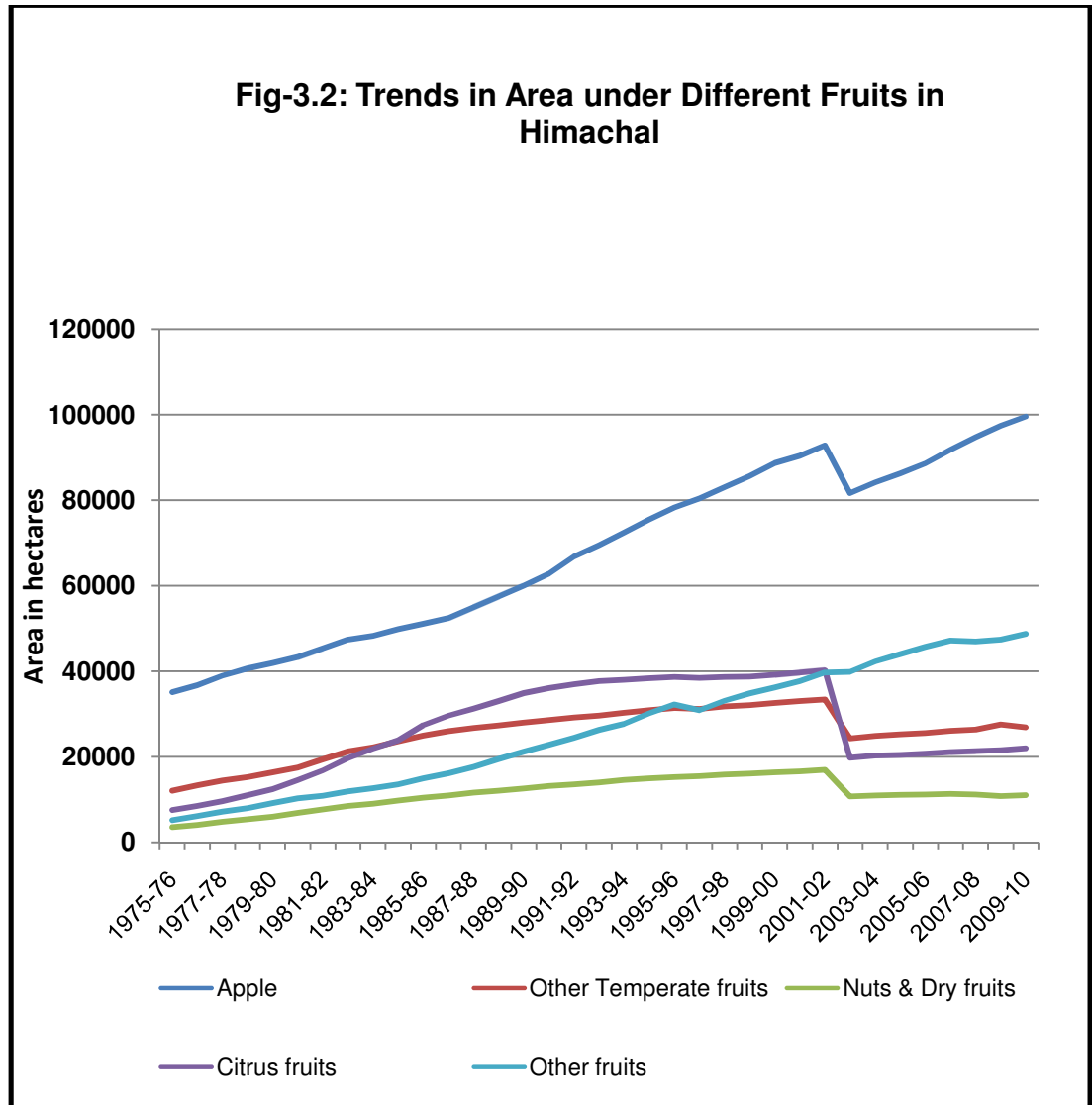
**Table-3.1: Area under Different Fruits in Himachal Pradesh.**

(In hectares)

<b>Triennium Average</b>	<b>Apple</b>	<b>Other Temperate fruits</b>	<b>Nuts &amp; Dry fruits</b>	<b>Citrus fruits</b>	<b>Other fruits</b>	<b>Total fruits</b>
1975-76	35076	12078	3543	7552	5121	63370
1976-77	36709	13332	4027	8528	6112	68708
1977-78	38900	14421	4779	9647	7115	74862
<b>19975-78</b>	<b>36895</b>	<b>13277</b>	<b>4116</b>	<b>8576</b>	<b>6116</b>	<b>68980</b>
1985-86	51103	24944	10455	27365	14903	128770
1986-87	52399	25959	10930	29589	16108	134985
1987-88	54912	26726	11628	31226	17559	142051
<b>1985-88</b>	<b>52805</b>	<b>25876</b>	<b>11004</b>	<b>29393</b>	<b>16190</b>	<b>135269</b>
1995-96	78292	31403	15237	38595	32157	195684
1996-97	80338	31196	15478	38369	30831	196212
1997-98	83056	31768	15832	38635	33071	202362
<b>1995-98</b>	<b>80562</b>	<b>31456</b>	<b>15516</b>	<b>38533</b>	<b>32020</b>	<b>198086</b>
2005-06	88560	25533	11210	20729	45636	191668
2006-07	91804	26074	11328	21062	47177	197445
2007-08	94726	26329	11181	21319	46947	200502
<b>2005-08</b>	<b>91697</b>	<b>25979</b>	<b>11240</b>	<b>21037</b>	<b>46587</b>	<b>196538</b>
2008-09	97438	27518	10796	21534	47343	204629
2009-10	99564	26847	11037	21997	48709	208154
<b>2008-10</b>	<b>98501</b>	<b>27183</b>	<b>10917</b>	<b>21766</b>	<b>48026</b>	<b>206392</b>
b <sub>1</sub>	1.03142	1.01906	1.02756	1.02338	1.06536	1.03440
SE <sub>b1</sub>	0.00117	0.00326	0.00503	0.00711	0.00251	0.00668
<b>ACGR%</b>	<b>3.1419*</b>	<b>1.9061*</b>	<b>2.7559*</b>	<b>2.3375*</b>	<b>6.5356*</b>	<b>3.4395*</b>

\*Significant at 1 per cent level of probability.

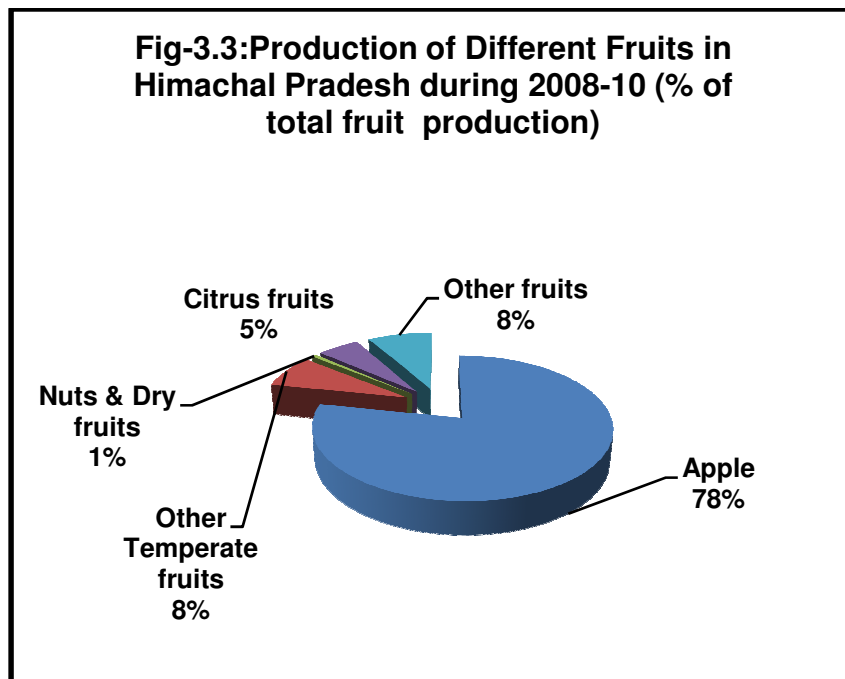
**Fig-3.2: Trends in Area under Different Fruits in Himachal**



### Trends in Production of Different Fruit Crops

Quantity of different fruits produced in the state has been given in Table 3.2. It may be seen from the table that the apple alone accounted for about 73 per cent of total fruit production in the state during 2009-10. The share of other temperate and other fruits, citrus and dry fruits together was 22 per cent of total fruit production during 2009-10. The production of apple increased from 2,00,000 tonnes in 1975-76 to 2,80,105 tonnes in 2009-10. The production of apple increased at CGR of 2.9707 per cent per annum. Similarly production of other temperate fruit increased from 17432 tonnes in 1975-76 to

36854 tonnes in 2009-10 registering CGR of 4.5195 per cent annually. Again production of nuts and dry fruits increased from 1911 tonnes to 2899 tonnes registering CGR of 2.8088 per cent annually during the period under reference. The production of citrus and other fruits increasing by 4.7962 per cent and 7.2971 per cent annually during the period under study. The overall fruit production in Himachal Pradesh during the reference period increased from 245882 tonnes to 382237 tonnes registering a CGR of 3.4306 per cent per annum.

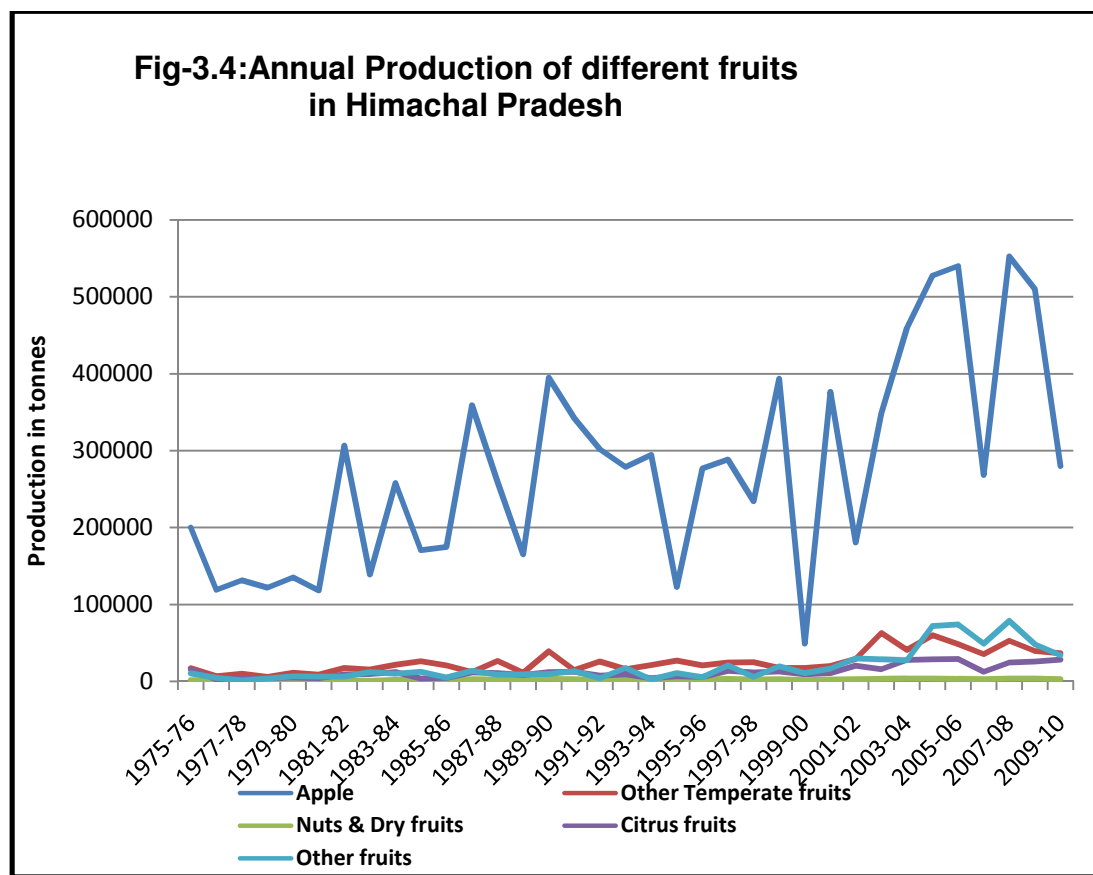


**Table-3.2: Production of Different Fruits in Himachal Pradesh**

(In Tonnes)

Triennium Average	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1975-76	200000	17432	1911	15660	10879	245882
1976-77	119228	6807	1294	2677	4803	134809
1977-78	131617	10299	2832	4203	1602	150553
<b>1975-78</b>	<b>150282</b>	<b>12513</b>	<b>2012</b>	<b>7513</b>	<b>5761</b>	<b>177081</b>
1985-86	174618	21140	1738	4718	5528	207742
1986-87	359321	12432	2800	11915	14040	400508
1987-88	259277	26861	2716	10875	8964	308693
<b>1985-88</b>	<b>264405</b>	<b>20144</b>	<b>2418</b>	<b>9169</b>	<b>9511</b>	<b>305648</b>
1995-96	276681	21074	2474	5839	5821	311889
1996-97	288538	24793	3344	13834	21116	351625
1997-98	234253	25116	2456	11759	6109	279693
<b>1995-98</b>	<b>26641</b>	<b>23661</b>	<b>2758</b>	<b>10477</b>	<b>11015</b>	<b>314402</b>
2005-06	540356	48694	3274	29159	74034	695517
2006-07	268402	35650	2912	12670	49469	369103
2007-08	552678	53152	3626	24694	78699	712849
<b>2005-08</b>	<b>453812</b>	<b>45832</b>	<b>3270</b>	<b>22174</b>	<b>67401</b>	<b>592490</b>
2008-09	510161	39762	3572	26007	48574	628076
2009-10	280105	36854	2899	28143	34336	382237
<b>2008-10</b>	<b>395133</b>	<b>38308</b>	<b>3235</b>	<b>27075</b>	<b>41455</b>	<b>505156</b>
<b>b<sub>1</sub></b>	1.029709	1.045195	1.028088	1.047962	1.072971	1.034306
<b>SE<sub>b1</sub></b>	0.007806	0.006126	0.005056	0.00752	0.010284	0.006671
<b>ACGR%</b>	<b>2.9709*</b>	<b>4.5195*</b>	<b>2.8088*</b>	<b>4.7962*</b>	<b>7.2971*</b>	<b>3.4306*</b>

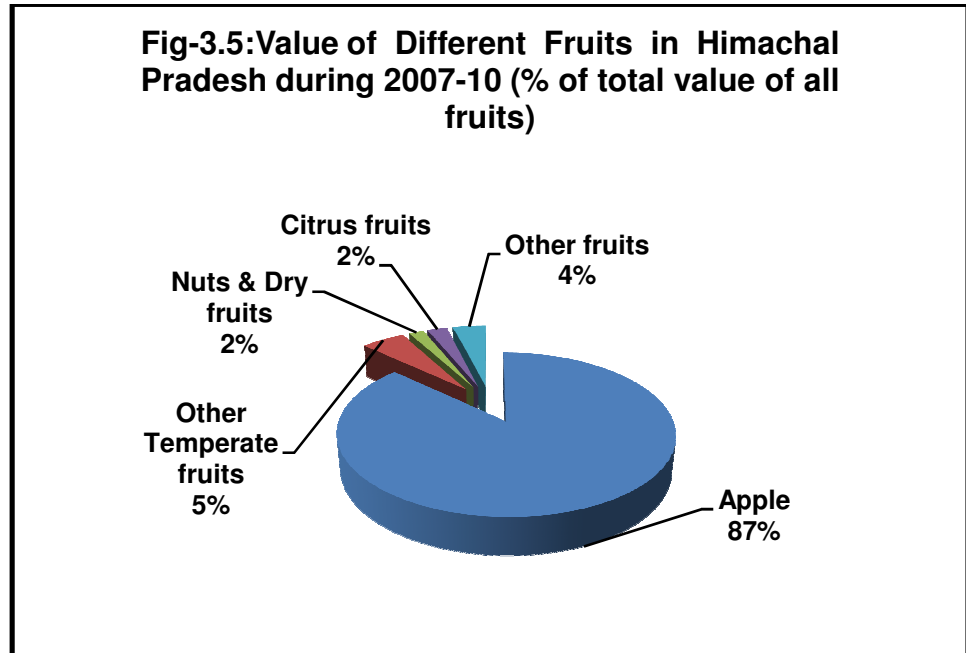
\*Significant at 1 per cent level of probability.



### Trends in Value of Output of Different Fruits

The output value of different fruit produced in the state has been given in Table 3.3. It may be observed from the table that the value of apples produced accounted for 87 per cent of total value of all fruits produced during 2007-10 triennium. Further, analysis reveals that the value of other temperate fruits accounted for 5 per cent of total value of all fruits. Citrus and nuts & dry fruits accounted for 2 per cent each in total value of all fruits produced in the state. The value of apple produced increased from Rs 3610 lakh in 1980-81 to Rs 142776 lakh in 2009-10 registering a CGR of 11.9068 per cent per annum. The value of other temperate fruit, nuts & dry fruits, citrus fruits and other fruits produced in the state increased by 11.9307 per cent, 7.9669 per cent, 11.116 per cent and 14.5313 per cent annually, respectively during 1980-81 to 2009-10. At overall level, value of fruits produced in the state increased from Rs 4574 lakh in 1980-81 to Rs

171827 lakh in 2009-10 registering CGR of 11.9109 per cent annually during the reference period.



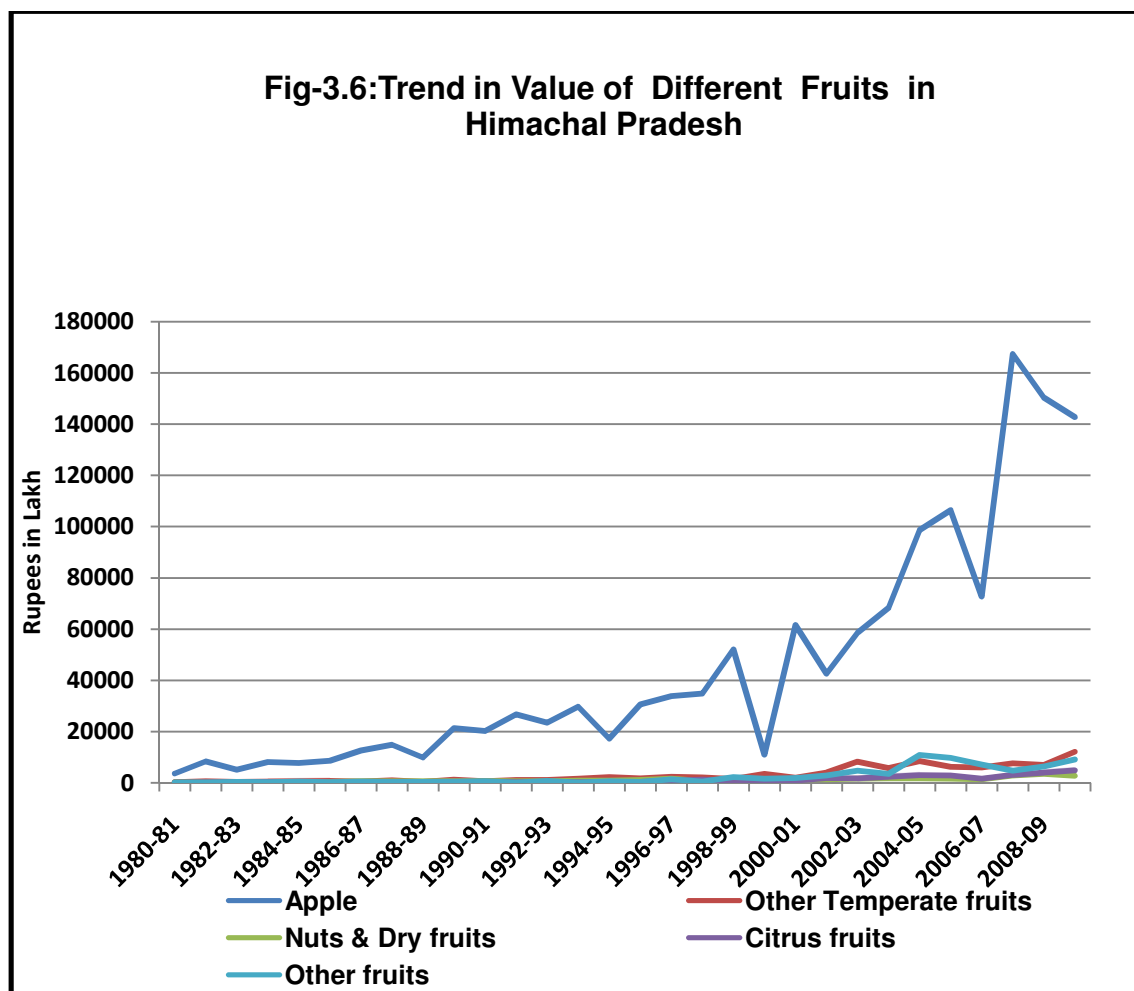
**Table- 3.3: Trends in Value of Output of Different Fruits in Himachal Pradesh.**

(Rs in lakh)

<b>Triennium Average</b>	<b>Apple</b>	<b>Other Temperate fruits</b>	<b>Nuts &amp; Dry fruits</b>	<b>Citrus fruits</b>	<b>Other fruits</b>	<b>Total fruits</b>
1980-81	3610.12	324.24	285.12	132	222.89	4574.37
1981-82	8377.87	689.01	273.34	299.04	196.62	9835.88
1982-83	5116.14	482.5	192.46	316.3	381.98	6489.38
<b>1980-83</b>	<b>5701</b>	<b>499</b>	<b>250</b>	<b>249</b>	<b>267</b>	<b>6967</b>
1990-91	20189.19	745.65	776.25	504	612.18	22827.27
1991-92	26758.05	1138.81	648	293.11	198.05	29036.02
1992-93	23517.44	1228.66	660.75	428.4	819.12	26654.37
<b>1990-93</b>	<b>23488</b>	<b>1038</b>	<b>695</b>	<b>409</b>	<b>543</b>	<b>26173</b>
2000-01	61558.47	2030.68	1377.5	937.34	1888.37	6792.36
2001-02	42585.65	4027.11	1455.5	1887.79	2972.71	52928.76
2002-03	58627.99	8262.08	1628	1816.31	4811.43	75145.81
<b>2000-03</b>	<b>54257</b>	<b>4773</b>	<b>1487</b>	<b>1547</b>	<b>3224</b>	<b>44956</b>
2007-08	167426.42	7610.19	2920	3222.67	4739.02	185918.30
2008-09	150413.32	7043.58	3548	4020.23	6415.72	171440.85
2009-10	142776.17	12154.77	2811	4953.28	9132.27	171827.49
<b>2007-10</b>	<b>153539</b>	<b>8936</b>	<b>3093</b>	<b>4065</b>	<b>6762</b>	<b>176396</b>
b <sub>1</sub>	1.119068	1.119307	1.079669	1.11116	1.145313	1.119109
SE <sub>b1</sub>	0.007646	0.006388	0.005293	0.008353	0.01294	0.006229
<b>ACGR %</b>	<b>11.9068*</b>	<b>11.9307*</b>	<b>07.9669*</b>	<b>11.116*</b>	<b>14.5313*</b>	<b>11.9109*</b>

\*Significant at 1 per cent level of probability.





### District wise Growth in Area under Fruits

The change in proportionate share of different districts in total area under fruits in the State of Himachal is given in Table 3.4. It may be seen from the Table that the share of Shimla, Kullu, Solan and Sirmour in total fruit area has declined indicating that other districts have been registering their increasing presence as far as the area under fruits is concerned. This decrease in Sirmour district was observed to be very marginal during the period 1975-76 to 2009-10. The fruit area in all other districts has increased during this period. However, this increase was observed to be marginal in Lahaul & Spiti and Bilaspur districts. The proportionate area under apples in Shimla and Sirmour has declined indicating the popularity of fruits in other districts. This has remained

almost constant in district Kullu. The area under citrus fruits in Kangra, Mandi, Una and Hamirpur districts increased whereas in Sirmour, major citrus growing district, area under these fruits declined during the period under reference.

### **District wise Production of Different Fruits**

The fruit production is too much dependent upon weather conditions, elevation, age of plant etc. and some fruits have alternative bearing trends. The district-wise production during 1975-76 and 2009-10 has been presented in Table 3.5, which shows that in Chamba and Mandi where the area under fruits has increased the share of productions have declined. The probably reason for this trend is mainly attributed to (i) new plantation has been not reached up to bearing stage (ii) low or no improvement in productivity. In Kullu both proportionate area and production have declined. In majority of districts the proportionate production has registered increasing trend.

### **District wise Growth in Area and Production of Apple**

It is however, 'apple' which occupies the top place among all fruits due to highest per hectare returns. Apple alone accounted for about 45 per cent of the area and 73 per cent of the production of all fruits. Thus, apple is of great importance to the economy of the state. Further, with the development of apple industry in the state, some small-scale allied industries such as cfb cartons manufacturing units, fruit processing units, etc. are coming up and which will ultimately provide employment to local people. The details of the area under apples in different districts have been presented in Table 3.6 and a cursory glance on table reveals that during 1973-74 to 2009-10 the area under apple in the state increased at the rate of 3.2304 per cent per annum. The maximum area under apple is in Shimla district, followed by Kullu and Mandi districts. But, the rate of growth in area over the years is highest in Lahul & Spiti (11.2709%) followed by Chamba (7.4301%) and Kinnaur (6.3491%) districts, respectively. From the point of view of absolute area, these districts have small proportion to total apple area of the state and therefore do not affect the total picture significantly. However, this means that other districts have now also started paying more attention to this crop. Overall, area under apple in the State has increased significantly with an annual compound growth rate of

3.2304 per cent. This growth in area may be attributed to the high profitability of apple orchards relative to other farming possibilities. The production of apple is too much dependent upon the weather conditions, elevation and age of the plant, etc. Also, apple is an alternative-bearing crop; therefore, there can be large fluctuations in its production. Among the apple producing districts the growth in production of apple was highest in Lahoul & Spiti district, CGR 11.6581 per cent per annum (Table 3.7).

**Table-3.4: District-wise Area under Fruit Crops in Himachal Pradesh.**

(Area in Hectares)

Districts/ Fruits	Apple		Other temperate fruits		Nuts & dry fruits		Citrus		Other sub- tropical fruits		All fruits	
	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10
Shimla	16140 (46.0)	33579 (33.73)	2067 (17.1)	3734 (13.08)	462 (13.0)	1846 (16.73)	210 (2.8)	580 (2.63)	51 (1.0)	433 (0.89)	18930 (29.9)	40172 (19.15)
Kullu	8573 (24.4)	23870 (23.97)	1490 (12.3)	3382 (11.84)	331 (9.3)	511 (4.63)	103 (1.4)	89 (0.40)	16 (0.3)	158 (0.32)	10513 (16.6)	28010 (13.35)
Mandi	5354 (15.3)	15531 (15.60)	1662 (13.8)	6049 (21.18)	639 (18.0)	2941 (26.66)	1218 (16.1)	4394 (19.96)	1012 (19.8)	5437 (11.18)	9895 (15.7)	34352 (16.37)
Chamba	920 (2.6)	11490 (12.04)	354 (2.9)	2078 (7.28)	124 (3.5)	1560 (14.14)	232 (3.1)	670 (3.04)	212 (4.2)	650 (1.34)	1842 (2.9)	16948 (8.08)
Kinnaur	1094 (3.1)	9838 (9.88)	222 (1.8)	488 (1.71)	469 (13.2)	1266 (11.48)	-	0	-	28 (0.06)	1785 (2.8)	11620 (5.54)
Lahaul-Spiti	29 (0.1)	959 (0.96)	21 (0.2)	1002 (3.51)	4 (0.1)	8 (0.07)	-	0	-	0	54 (0.1)	1969 (0.94)
Kangra	351 (1.0)	450 (0.45)	2074 (17.2)	1161 (4.07)	583 (16.6)	806 (7.31)	3075 (40.7)	9668 (43.91)	2047 (40.0)	26089 (53.62)	8130 (12.9)	38174 (18.19)
Solan	198 (0.6)	95 (0.09)	2734 (22.6)	3028 (10.60)	298 (8.4)	283 (2.57)	746 (9.9)	893 (4.06)	299 (5.8)	2098 (4.31)	4275 (6.7)	6397 (3.05)
Sirmour	2417 (6.9)	3248 (3.26)	963 (7.9)	5447 (19.07)	411 (11.6)	1318 (11.95)	1050 (13.9)	1496 (6.80)	375 (7.3)	2866 (5.89)	5216 (8.2)	14375 (6.85)
Una	-	-	98 (0.8)	792 (2.77)	64 (1.8)	95 (0.86)	196 (2.6)	1679 (7.63)	243 (4.7)	2621 (5.39)	60 (0.9)	5187 (2.48)
Hamirpur	-	-	101 (0.9)	534 (1.87)	130 (3.7)	306 (2.77)	278 (3.7)	1545 (7.02)	286 (5.6)	3878 (7.97)	795 (1.2)	6263 (2.98)
Bilaspur	-	4 (0.01)	2.92 (2.5)	862 (3.02)	28 (0.8)	92 (0.83)	444 (5.8)	1002 (4.55)	580 (11.2)	4393 (9.03)	1344 (2.1)	6353 (3.02)
H.P.	35076 (100.0)	99564 (100.0)	12078 (100.0)	28557 (100.0)	3543 (100.0)	11032 (100.0)	7552 (100.0)	22016 (100.0)	5121 (100.0)	4865 (100.0)	32268 (100.0)	209820 (100.0)

Note: Figures in the parentheses are percentage to respective totals

Source: Directorate of Horticulture, Government of Himachal Pradesh, Shimla

**Table-3.5: District-wise Production of Fruit Crops in Himachal Pradesh.**

(Qty in Tonnes)

Districts/ fruits	Apple		Other temperate fruits		Nuts & dry fruits		Citrus		Other sub-tropical fruits		All fruits	
	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10	1975-76	2009-10
Shimla	97031 (48.5)	171945 (61.38)	6059 (34.7)	9401 (25.51)	705 (36.9)	445 (15.83)	806 (5.1)	93 (0.31)	126 (1.1)	43 (0.13)	104727 (42.6)	181927 (47.48)
Kullu	62931 (31.5)	54385 (19.42)	3624 (20.8)	11506 (31.23)	-	36 (1.28)	276 (1.8)	18 (0.06)	5 (Neg.)	14 (0.04)	66836 (27.2)	65959 (17.21)
Mandi	18892 (9.4)	8659 (3.09)	2385 (13.7)	2634 (7.15)	60 (3.2)	326 (11.60)	526 (3.3)	795 (2.73)	1275 (11.7)	2483 (7.25)	23138 (9.4)	14897 (3.88)
Chamba	2737 (1.4)	3962 (1.41)	572 (3.3)	346 (0.94)	119 (6.2)	370 (13.16)	562 (3.6)	745 (2.55)	196 (1.8)	327 (0.95)	4186 (1.7)	5750 (1.50)
Kinnaur	6622 (3.3)	40289 (14.38)	53 (3.0)	317 (0.86)	554 (22.0)	544 (19.35)	-	0	-	140 (0.41)	7707 (3.1)	41290 (10.77)
Lahaul- Spiti	-	193 (0.07)	-	16 (0.04)	-	2 (0.08)	-	0	-	0	-	211 (0.05)
Kangra	1568 (0.8)	401 (0.14)	986 (5.6)	3547 (9.63)	25 (1.3)	431 (15.33)	10226 (65.3)	22134 (76.00)	7025 (64.6)	19556 (57.12)	19830 (8.1)	46069 (12.02)
Solan	946 (0.5)	28 (0.01)	1552 (8.9)	2897 (7.86)	178 (9.3)	86 (3.06)	533 (3.4)	1399 (4.80)	202 (1.9)	985 (2.88)	3411 (1.4)	5395 (1.40)
Sirmour	9273 (4.6)	242 (0.09)	1133 (6.6)	5099 (13.84)	232 (12.1)	546 (19.43)	966 (6.2)	666 (2.29)	520 (4.8)	2601 (7.59)	12124 (4.9)	9154 (2.38)
Una	-	0	-	268 (0.73)	-	2 (0.08)	248 (1.6)	2852 (9.80)	250 (2.2)	3045 (8.92)	498 (0.2)	6167 (1.60)
Hamirpur	-	0	275 (1.6)	236 (0.64)	38 (2.0)	12 (0.43)	588 (3.8)	96 (0.34)	727 (6.7)	1298 (3.78)	1628 (0.7)	1642 (0.42)
Bilaspur	-	1 (0)	315 (1.8)	574 (1.56)	-	10 (0.36)	929 (5.9)	3251 (1.11)	553 (5.1)	3743 (10.93)	1797 (0.7)	7579 (1.97)
H.P.	200000 (100.0)	280105 (100.0)	17432 (100.0)	36841 (100.0)	1911 (100.0)	2811 (100.0)	15660 (100.0)	29123 (100.0)	10879 (100.0)	34235 (100.0)	245882 (100.0)	383110 (100.0)

Note: Negligible (area less than 0.1 per cent)

Source: Directorate of Horticulture, Government of Himachal Pradesh, Shimla.

**Table-3.6: District- Wise Area Under Apple in Himachal Pradesh During 1973 to 2010**

(Area in Hectares)

Triennium Average	Shimla	Kullu	Mandi	Chamba	Kinnaur	L&S	Kangra	Solan	Sirmour	Total
1973-74	15519	7536	4616	826	852	-	335	156	2287	32127
1974-75	15944	8101	4946	865	935	-	335	175	2327	33628
1975-76	16140	8573	5354	920	1094	29	351	198	2417	35076
<b>1973-76</b>	<b>15868</b>	<b>8070</b>	<b>4972</b>	<b>870</b>	<b>960</b>	<b>10</b>	<b>340</b>	<b>176</b>	<b>2344</b>	<b>33610</b>
1977-78	17352	9343	6041	1308	1420	32	394	336	2674	38900
1978-79	17855	9669	6290	1458	1703	36	394	438	2787	40630
1979-80	18355	9938	6468	1529	1843	42	401	470	2868	41922
<b>1977-80</b>	<b>17854</b>	<b>9650</b>	<b>6266</b>	<b>1432</b>	<b>1655</b>	<b>37</b>	<b>396</b>	<b>415</b>	<b>2776</b>	<b>40484</b>
1987-88	22453	13109	8318	3031	3572	95	522	512	3300	54912
1988-89	23266	13703	8972	3105	3839	107	540	517	3407	57447
1989-90	23980	14244	9513	3490	4043	112	560	523	3522	59988
<b>1987-90</b>	<b>23233</b>	<b>13685</b>	<b>8934</b>	<b>3209</b>	<b>3818</b>	<b>105</b>	<b>541</b>	<b>517</b>	<b>3410</b>	<b>57449</b>
1997-98	32908	18552	12872	7655	5010	342	600	550	3929	83056
1998-99	33707	19035	13232	8307	5836	407	600	550	3954	85631
1999-00	34465	19383	13727	9207	6249	475	603	552	4008	88673
<b>1997-00</b>	<b>33693</b>	<b>18990</b>	<b>13277</b>	<b>8390</b>	<b>5698</b>	<b>408</b>	<b>601</b>	<b>551</b>	<b>3964</b>	<b>85787</b>
2007-08	31323	23179	15135	7344	8874	734	453	108	3443	94726
2008-09	32195	23663	15353	7592	9671	812	454	100	3344	97435
2009-10	33579	23870	15531	7695	9838	959	450	95	3248	99564
<b>2007-10</b>	<b>32366</b>	<b>23571</b>	<b>15340</b>	<b>7544</b>	<b>9461</b>	<b>835</b>	<b>452</b>	<b>101</b>	<b>3345</b>	<b>97242</b>
<b>b<sub>1</sub></b>	1.022664	1.03156	1.034616	1.074301	1.063491	1.112709	1.006853	0.976701	1.010511	1.032304
<b>SE<sub>b1</sub></b>	0.001535	0.000674	0.001125	0.00373	0.002424	0.002602	0.002742	0.009798	0.001659	0.001101
<b>ACGR %</b>	02.2664*	03.156*	03.4616*	07.4301*	06.3491*	11.2709*	0.6853*	-02.3299*	01.0511*	03.2304*

\*Significant at 1 per cent level of probability.

L & S : Lahaul and Spiti

Source: Directorate of Horticulture, H.P. Shimla.

The apple production in Himachal Pradesh during the period (1973-74 to 2009-10) has increased significantly with annual compound growth rate of 3.5697 per cent, but has shown decreasing trend for Kangra, Solan and Sirmour districts. This may be due to the relatively new plantations and lower productivity due to certain soil and climatic factors. Remaining districts recorded higher growth in apple production, except for Kullu and Mandi districts, as compared to the State as a whole. Shimla district alone accounts for 61 per cent of total production of the State and the same have increased significantly with compound growth rate of 2.2664 per cent per annum. However, the productivity of apple in the state is still much less as compared to the apple growing developed countries of the world.

### **Quantity of Different Fruits sold outside from Himachal Pradesh**

Himachal Pradesh being sparsely populated State having less than 10 per cent of urban population, the internal demand for horticultural produce is insignificant therefore, more than 90 per cent of the produce is sold outside the State. Generally fruits are highly perishable in nature and have low keeping quality thus; they have to be consumed within a short time span after production. These facts give rise to high proportion of market surplus. It is imperative for the producers to dispatch their produce to consuming areas, which usually are located at far off distance from the producing areas. Himachal Pradesh, popularly called a 'Fruit Bowl' of India, produces large quantities of various type of fruits.

The compound growth rates of production and quantity sold outside the state for different fruits from 1977-78 to 2009-10 have been presented in Table 3.8. It may be seen from the table that the quantity of fruits sold outside the state is increasing year after year. The annual growth in export was relatively more in case of apple than other fruits grown in the state. During this period, apple exports from the state to different markets of the country increased from 80 to 90 per cent of the total production. The annual compound growth rate of exports has shown an increase of 3.6864 per cent, whereas, the production increased at the rate of 3.0345 per cent. This means that the state apples are gaining more popularity and are in greater demand in different parts of

the country. This also indicates the sustainable demand of apple in the markets of outside state.

**Table-3.7: Trends in District- Wise Production of Apple in Himachal Pradesh**

(M.T.)

Triennium Average	Shimla	Kullu	Mandi	Chamb a	Kinnaur	L&S	Kangra	Solan	Sirmour	Total
1973-74	50000	30214	31316	1564	2985	-	1215	802	10580	118676
1974-75	23923	10516	2023	583	432	-	968	66	4790	43299
1975-76	97031	62931	18892	2737	6622	-	1568	946	9273	200000
<b>1973-76</b>	<b>56985</b>	<b>34554</b>	<b>17410</b>	<b>1628</b>	<b>3346</b>	<b>-</b>	<b>1250</b>	<b>605</b>	<b>8214</b>	<b>120658</b>
1977-78	72113	46853	6129	1044	3203	-	1214	292	769	131617
1978-79	80410	30741	3003	1375	4602	-	813	351	601	121896
1979-80	76981	42060	7524	2194	4551	-	710	416	1040	135475
<b>1977-80</b>	<b>76501</b>	<b>39885</b>	<b>5552</b>	<b>1538</b>	<b>4119</b>	<b>-</b>	<b>912</b>	<b>353</b>	<b>803</b>	<b>129663</b>
1987-88	171522	69036	6846	3716	7326	26	54	105	646	259277
1988-89	105176	38651	7876	2365	10045	17	48	101	877	165156
1989-90	243938	123690	10123	4061	11582	42	361	121	950	394868
<b>1987-90</b>	<b>173545</b>	<b>77126</b>	<b>8282</b>	<b>3381</b>	<b>9651</b>	<b>28</b>	<b>154</b>	<b>109</b>	<b>824</b>	<b>273100</b>
1997-98	127341	69649	4185	7381	24639	65	213	38	742	239253
1998-99	258621	98219	11255	5685	18509	61	442	416	445	393653
1999-00	20536	7398	3726	1761	15432	56	110	33	77	49129
<b>1997-00</b>	<b>135499</b>	<b>58422</b>	<b>6389</b>	<b>4942</b>	<b>19527</b>	<b>61</b>	<b>255</b>	<b>162</b>	<b>421</b>	<b>16377</b>
2007-08	349262	160124	32283	7744	41550	473	423	27	689	592576
2008-09	336753	77409	30300	8640	55169	577	502	34	776	510161
2009-10	171945	54385	8659	3962	40289	193	401	28	242	280105
<b>2007-10</b>	<b>285987</b>	<b>97306</b>	<b>23747</b>	<b>6782</b>	<b>45670</b>	<b>414</b>	<b>442</b>	<b>30</b>	<b>569</b>	<b>460947</b>
<b>b<sub>1</sub></b>	1.0377	1.0256	1.03069	1.0471	1.0858	1.1166	0.9845	0.93734	0.94822	1.03570
<b>SE<sub>b1</sub></b>	0.00874	0.0094	0.0103	0.0084	0.0064	0.0117	0.0160	0.01026	0.012686	0.00759
<b>ACGR %</b>	03.770*	02.560*	03.069*	04.711*	08.581*	11.658*	-01.55*	-06.266*	-05.178*	03.570*

\*Significant at 1 per cent level of probability.

Further, analysis indicates that the quantity of all other fruits has been increasing with annual growth of 3.8388 percent in case of other temperate fruits, 4.9485 per cent in case of citrus fruits and 6.778 per cent in case of other sub-tropical fruits (see Table 3.8)



**Table-3.8: Trends in Quantity of Different Fruits Sold Out Side from Himachal Pradesh**

(Quantity in MT)

Triennium Average	Apple			Other temperate fruits		
	Total production	Sold out side of H.P.	Proportion sold outside of H.P.	Total production	Sold outside of H.P.	Proportion sold outside of H.P.
1977-78	131617	105294	80.00	10299	9011	87.49
1978-79	121896	87516	79.99	6176	5404	87.50
1979-80	135475	108380	80.00	11714	10250	87.50
<b>1977-80</b>	<b>129663</b>	<b>100397</b>	<b>77.42</b>	<b>9396</b>	<b>8222</b>	<b>87.50</b>
1987-88	259277	207421	80.00	26821	18803	70.00
1988-89	165156	132125	80.00	11521	8065	70.00
1989-90	384864	355190	89.95	39631	27742	70.00
<b>1987-90</b>	<b>269772</b>	<b>231579</b>	<b>85.84</b>	<b>25991</b>	<b>18203</b>	<b>70.03</b>
1997-98	234253	210828	90.00	25116	17581	69.99
1998-99	393653	354287	90.00	17974	12582	70.00
1999-00	49129	44216	89.99	17901	12531	70.00
<b>1997-00</b>	<b>225675</b>	<b>203110</b>	<b>90.00</b>	<b>20330</b>	<b>14231</b>	<b>70.00</b>
2007-08	592576	533318	89.99	53908	37736	70.00
2008-09	510161	459145	90.00	39933	27953	69.99
2009-10	280105	252094	89.99	37082	27957	69.99
<b>2007-10</b>	<b>460947</b>	<b>414852</b>	<b>89.99</b>	<b>43641</b>	<b>31215</b>	<b>71.52</b>
<b>b<sub>1</sub></b>	1.030545	1.036864	1.005644	1.045874	1.038388	0.992095
<b>SE<sub>b1</sub></b>	0.008721	0.008747	0.000944	0.006514	0.00673	0.001173
<b>ACGR%</b>	<b>03.0545*</b>	<b>03.6864*</b>	<b>0.5644*</b>	<b>04.5874*</b>	<b>03.8388*</b>	<b>-0.7905*</b>

\*Significant at 1 per cent level of probability.

Contd....

Table-3.8: Contd....

(Quantity in Tonnes)

Triennium Average	Citrus			Other sub tropical fruits		
	Total production	Sold outside of H.P.	Proportion sold outside of H.P.	Total production	Sold outside of H.P.	Proportion sold outside of H.P.
1977-78	4203	3057	72.37	1602	1189	74.21
1978-79	4184	3043	72.73	4276	3474	81.41
1979-80	5126	3728	72.73	6777	5981	85.72
<b>1977-80</b>	<b>4504</b>	<b>3276</b>	<b>72.73</b>	<b>4218</b>	<b>3548</b>	<b>84.11</b>
1987-88	10875	8700	80.00	8964	7171	80.00
1988-89	8474	6779	80.00	9573	7658	80.00
1989-90	12320	9856	80.00	9762	7810	80.00
<b>1987-90</b>	<b>10556</b>	<b>8445</b>	<b>80.00</b>	<b>9433</b>	<b>7546</b>	<b>80.00</b>
1997-98	11759	8231	69.99	6109	4276	69.99
1998-99	13111	9178	70.00	19871	13910	70.00
1999-00	9257	6480	70.00	11233	7863	69.99
<b>1997-00</b>	<b>11376</b>	<b>7963</b>	<b>70.00</b>	<b>12404</b>	<b>8643</b>	<b>70.00</b>
2007-08	24674	17272	70.00	38765	27135	69.99
2008-09	26007	18205	70.00	48427	33899	70.00
2009-10	28143	19700	69.99	34096	23867	69.99
<b>2007-10</b>	<b>26275</b>	<b>18392</b>	<b>70.00</b>	<b>40429</b>	<b>28300</b>	<b>70.00</b>
b <sub>1</sub>	1.052058	1.049485	0.997592	1.07578	1.06778	0.991637
SE <sub>b1</sub>	0.007165	0.006929	0.000974	0.010812	0.011065	0.001051
<b>ACGR%</b>	<b>05.2058*</b>	<b>04.9485*</b>	<b>-0.2408*</b>	<b>07.578*</b>	<b>06.778*</b>	<b>-0.8363*</b>

\*Significant at 1 per cent level of probability.

Source: Directorate of Horticulture, Government of Himachal Pradesh

### **Yearly Quantity of Apple sold outside Himachal**

A cursory glance on Table 3.9 reveals that Shimla, Kullu and Kinnaur and Mandi were the three leading districts in export of apples from Himachal Pradesh in 1991-92 to 2009-10. Over the years, the share of different districts in the total export of apple from Himachal Pradesh has been fluctuating because of the variation in production in different regions of the state. Except Sirmour and Solan districts, quantity of apple sold outside state has increasing trend in other apple producing districts. The quantity of apples sold outside Himachal from Kinnaur and Lahoul & Spiti has been increasing with annual growth of 8.2069 and 11.4529 per cent. The higher growth in quantity of apples sold outside Himachal from these two districts may be due to good quality apple produced which has great demand out of Himachal.

**Table-3.9: District Wise Quantity of Apple Sold Out Side from Himachal Pradesh During 1991-92 to 2009-10.**  
( boxes)

<b>Triennium Average</b>	Shimla	Kullu	Mandi	Kinnaur	Chamba	Sirmour	Solan	Kangra	L& S	Total
1991-92	10308225	3172979	365717	818216	233267	15646	12679	6443	2481	14935653
1992-93	9502057	3114812	396783	613576	102904	61702	8893	2892	1512	13813046
1993-94	8556148	4195503	405530	1147887	246598	14248	2617	14131	5884	14589346
<b>1991-94</b>	<b>35123810</b>	<b>3494431</b>	<b>389343</b>	<b>859893</b>	<b>194256</b>	<b>30532</b>	<b>8063</b>	<b>7822</b>	<b>3292</b>	<b>14446015</b>
2001-02	5487421	1506433	539798	930996	428175	19899	3020	14850	5544	8936136
2002-03	11345768	4033706	502286	1097756	209791	29300	4289	14120	2003	17239019
2003-04	14572899	4889660	1151420	1637163	436145	18166	3267	29452	6683	22744855
<b>2001-04</b>	<b>10468696</b>	<b>3476600</b>	<b>731168</b>	<b>1221972</b>	<b>358037</b>	<b>22455</b>	<b>3525</b>	<b>19474</b>	<b>4743</b>	<b>16306670</b>
2007-08	15716790	7205580	1452735	1869750	348480	31005	1215	19035	21285	26665920
2008-09	15153885	3483402	1363502	2482608	388800	34920	1530	22600	25965	22957257
2009-10	7737541	2447320	389634	1812997	178290	10890	1260	18045	8685	12604707
<b>2007-10</b>	<b>12869405</b>	<b>4378767</b>	<b>1068624</b>	<b>2055118</b>	<b>305190</b>	<b>25605</b>	<b>1335</b>	<b>19893</b>	<b>18645</b>	<b>20742628</b>
<b>b<sub>1</sub></b>	1.029592	1.029095	1.0798	1.061963	1.046404	0.979503	0.919565	1.082069	1.114529	1.033641
<b>SE<sub>b1</sub></b>	0.027043	0.029583	0.021654	0.008884	0.023308	0.029076	0.025198	0.018771	0.020313	0.022988
<b>ACGR%</b>	<b>02.9592*</b>	<b>02.9095*</b>	<b>07.98*</b>	<b>06.1963*</b>	<b>04.6404*</b>	<b>-02.0497*</b>	<b>-08.0435*</b>	<b>08.2069*</b>	<b>11.4529*</b>	<b>03.3641*</b>

\*Significant at 1 per cent level of probability.

Source: Directorate of Horticulture, Himachal Pradesh, Shimla.

## **Growth in Quantity of other Horticultural Products**

Some new farm products, which have also emerged as rural income boosters and require special attention, are honey, mushrooms, hops and flowers. The details of these activities are presented in Table 3.10. Table reveals that the output of these products has been rising steadily since 1981.

Bee keeping is the important activity for generating farm income and also helps in cross pollination of fruit and other crops grown by the farmers in Himachal Pradesh. Honey production on private units was 1600 kg in 1981-82 which has increased to 1736460 kg in 2009-10 registering an annual growth of 22.5549 per cent. On government farms quantity of honey produced increased from 1105 kg to 7898 kg during the same period. Hence, total honey production in the state increased from 2705 kg in 1981-82 to 1744358 kg in 2009-10 showing 21.2389 per cent annual growth (see Table-3.10).

The state has wide variations in agro-climatic conditions. The state provides ideal situation for cultivation of mushrooms. Any region which is about 2000 ft above MSL, temperature varies between 10 to 30<sup>0</sup> C and has humidity of 75-85 per cent have good potential for cultivation of mushrooms. Many places in the state like Chail, Solan, Shimla, Mandi, Dalhousie etc. and regions around them fulfill these criteria and it is possible to have four harvests per annum at these places. The importance of mushroom cultivation also stems out from following facts.

- Mushroom cultivation generates direct and indirect employment.
- It requires very little land as it is cultivated in closed rooms.
- The used compost can be reused as good manure in other field crops.
- It has capacity of being exported and earning foreign exchange.
- It provides rich diet to vegetarians.
- Being rich in proteins and low in carbohydrates and fat, it is very good for the patients of heart, diabetes and obesity etc.

The upper regions of the state have been identified for the cultivation of white button mushrooms and lower regions for 'Dhingri' (*Plutorus sages kaju*). The production of mushrooms in Himachal Pradesh has been increased from 288 M.T in 1981-82 to 7078 M.T in 2009-10 registering annual growth of 12.7372 per cent (Table-8.10).

Hops is an important crop in high hill cold zone particularly Lahaul and Spiti district of Himachal Pradesh. The hops after processing is used in breweries in making bear. The area under this crop was merely 2 hectares in 1981-82 which has increased to 55 hectares in 1992-93 and presently state has 76.5 hectares land under cultivation of this crop in 2009-10. Similarly production of hops increased from less than one quintal to 47.20 quintals during the last three decades. However, annual growth rate in production was relatively lesser (11.4009%) than the growth in area (13.9307%) during the period under study (Table 3.10).

**Table-3.10: Trends in Production of Honey, Mushrooms and Hops in Himachal Pradesh.**

Triennium Average	Honey production (Kg.)			Mushrooms production (Tonnes)	Area under Hops (ha)	Hops producti on (Tonnes)
	Private Units	Govt. Units	Total			
1981-82	1600	1105	2705	288	2	0.63
1982-83	6758	1917	8675	339	3	2.12
1983-84	11000	3964	14964	405	4.5	3.02
<b>1981-84</b>	<b>6453</b>	<b>2329</b>	<b>8781</b>	<b>344</b>	<b>3</b>	<b>2</b>
1991-92	136692	14889	151581	539	11	12.06
1992-93	132560	14401	146961	685	55	21.90
1993-94	279020	18426	297446	1107	80	44.75
<b>1991-94</b>	<b>182757</b>	<b>15905</b>	<b>198663</b>	<b>777</b>	<b>49</b>	<b>26</b>
2001-02	650380	4620	655000	3227	65	38.09
2002-03	956810	8190	965000	3236	65	38.60
2003-04	822600	6400	829000	4485	67	42.60
<b>2001-04</b>	<b>809930</b>	<b>6403</b>	<b>816333</b>	<b>3649</b>	<b>66</b>	<b>40</b>
2007-08	1372618	2900	1375518	5476	72.5	42.50
2008-09	1473041	2968	1476009	5895	73.5	41.80
2009-10	1736460	7898	1744358	7378	76.5	47.20
<b>2007-10</b>	<b>1527373</b>	<b>4589</b>	<b>1531962</b>	<b>6250</b>	<b>74</b>	<b>44</b>
b <sub>1</sub>	1.2255	1.00747	1.21239	1.12737	1.13931	1.11401
SE <sub>b1</sub>	0.01400	0.01433	0.01242	0.00535	0.01897	0.01709
<b>ACGR %</b>	<b>22.5549*</b>	<b>0.7465*</b>	<b>21.2389*</b>	<b>12.7372*</b>	<b>13.9307*</b>	<b>11.4009*</b>

\*Significant at 1 per cent level of probability.

Source: Directorate of Horticulture, Himachal Pradesh, Shimla-5.

Himachal Pradesh, a unique state bestowed with different types of climate varying sub-tropical to dry-temperature, is conducive for the cultivation of a variety of cut-flowers like, carnation, lilies gladiolus, tulip, rose, etc. and other high value flowers and potted ornamental plants so almost round the year. For the last few years, some progressive and innovative farmers have taken lead in the commercial cultivation of flowers/cut flowers (gladiolus, lilies, carnation, etc. in different areas of the state. The area under different types of flowers increased from 25 hectares (1989) to about 141 ha by the end of century; resulting into 4 times increase in the area with annual turnover of Rs. 4 Crores in flori-business in the state. Needless to mention, to have acceptability of flori-produce in the international market, the said species of flowers should be scientifically grown under protected conditions like, plastic, glass or fibre glass green houses, or at least under partial cover. However, green house cultivations of flowers gives enhanced production and excellent quality flowers. But for green house cultivation cooling is very expensive item and it is much costlier than heating. Under such conditions, Himachal Pradesh has comparative advantage of climate as here mainly heating will be required and occasional cooling. As such, the heating/cooling expenses of greenhouse cultivation in Himachal Pradesh are generally much lower as compared to that of plains. Keeping this in view, there are many farmers in the state who are considering floriculture as a viable alternative to traditional cash crops and field crops, but they are hesitant to incorporate it in their crops-mix, mainly because of non-availability of authentic information on the economics / financial over view and marketing routes of flowers/cut flowers and planting material.

### **Share of Horticulture in Agricultural Output Value**

The relative contribution of horticulture in the total value of agricultural output in Himachal Pradesh has been presented in Table-3.11. Because of faster growth in the fruit production, the relative share of horticulture in the total value of agricultural output has been increasing. The average share of horticulture crops during triennium 1971-74 was 8.0 per cent in the total agricultural output of the State, and this increased to 41.36 per cent by 2004-2007 triennium. This is a healthy trend because ecologically sound development of hilly areas requires that more and more land should be diverted away from field crops to tree crops and grasses so that disturbance of the topsoil is reduced.

**Table-3.11: Per cent Contribution of Horticulture to the value of total Agricultural output in Himachal Pradesh.**

<b>Triennium Average</b>	<b>Horticulture</b>	<b>Value of total Agricultural output (Rs Lakh)</b>
1971-74	8.0	1448.7
1974-77	8.5	1516.9
1977-80	8.4	1625.1
1980-83	10.9	1822.3
1983-86*	10.8	1996.9
1986-89	18.52	6497.9
1989-92	18.40	10260.3
1992-95	15.02	15024.3
1995-98	12.19	21680.7
1998-01**	11.39	30348.3
2001-04***	40.87	479168
2004-07	41.36	602707

\* State Domestic Product of Himachal Pradesh at 1970-71 prices.

\*\* State Domestic Product at 1980-81 prices.

\*\*\* State Domestic Product at 1993-94 prices.

Source: Department of Economics & Statistics, Govt. of Himachal Pradesh.

Annual value of output from horticulture and total agriculture activities during 1993-94 to 2006-07 and annual growth rates are presented in Table 3.12. It may be seen from this table that the Agricultural output from 1993-94 to 2006-07, at constant 1993-94 prices has been increasing at the rate of 11.8532 per cent per annum. Horticulture output registered an annual growth of 27.6619 per cent. The higher rate in growth of horticultural crops may be due to increase in area and production of fruit crops in the state.



**Table-3.12: Trend in Output Value of Horticulture in Himachal Pradesh.**  
(In Rs Lakh)

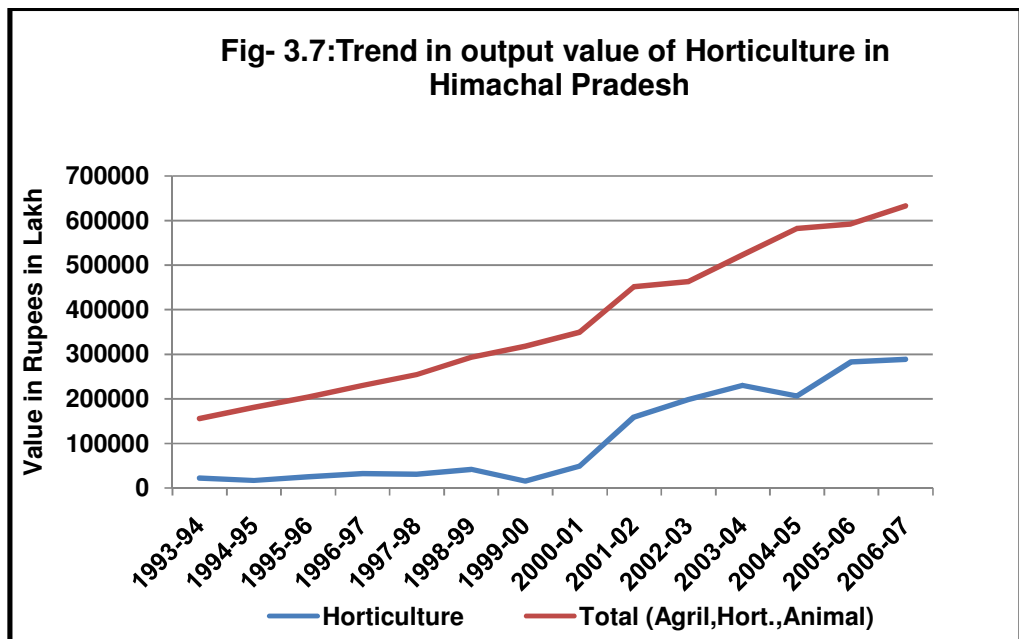
<b>Years</b>	<b>Horticulture</b>	<b>Value of total Agricultural output</b>
1993-94	22542	155407
1994-95	17055	180541
1995-96	25170	203259
1996-97	32434	229682
1997-98	31069	253748
1998-99	42017	293270
1999-00	15543	317423
2000-01	49553	349491
2001-02	159069	451157
2002-03	198522	463195
2003-04	229939	523152
2004-05	206466	582459
2005-06	282630	592453
2006-07	288832	633209
b <sub>1</sub>	1.276619	1.118532
SE <sub>b<sub>1</sub></sub>	0.032765	0.003648
<b>ACGR%</b>	<b>27.6619*</b>	<b>11.8532*</b>

\*Significant at 1 per cent level of probability.

\*\* Significant at 5 per cent level of probability.

State Domestic Product New series 1998-99 to 2000-01

Source: Department of Economics & Statistics, Govt. of Himachal Pradesh.



### Summing Up

Horticultural industry in the state has developed as a business proposition since long back and has been witnessing continuous rise in area and production. The area and production of fruits has increased by three percent annually. The analysis reveals that among all fruits apple alone accounted for 45 per cent of area and 73 percent of production of all fruits in the state. Further, study indicates that Shimla, Kullu and Kinnaur in terms of production, whereas Shimla, Kullu and Mandi are the leading districts in terms of acreage under the apple. Shimla district alone accounts for 34 per cent of area and 61 per cent of total production in the state. The share of Kinnaur district in total area and production of apple in the state during 2009-10 was 9.88 and 14.38 per cent respectively. The annual compound growth rate of quantity sold outside the state has shown an increase of 3.69 per cent, whereas, the production increased at the rate of 3.05 per cent. This means that the state apples are gaining more popularity and are in greater demand in different parts of the country. This indicates the sustainable market of apple in the country. It is also concluded that area and production of all fruits has been continuously increasing in the state and in the opinion of many experts a stage has been reached where horticulture sector is being extended to marginal lands. This is having negative impact on productivity and profitability of horticulture sector. It is being advocated

that policy should increasingly cater to productivity enhancement rather than on increasing area. The production of other horticultural products such as honey, mushrooms, hops and flowers increasing significantly since last three decades. Because of faster growth in the fruit production, the relative share of horticulture in the total value of agricultural output has been increasing. This is a healthy trend because ecologically sound development of hilly areas requires that more and more land should be diverted away from field crops to tree crops and grasses so that disturbance of the topsoil is reduced.

## Chapter –4

### **SOCIO-ECONOMIC PROFILE OF SAMPLE ORCHARDISTS**

Knowledge of socio-economic structure of the study area is important as it helps in understanding the back ground of the area. Such conditions influence the adoption of improved farm technology and other sources of livelihood in a great manner. This will give an idea of the condition under which these growers have been operating. The land utilization pattern, cropping pattern etc. will give an idea how the farmers are making the best use of their limited resources.

#### **Location of the orchards**

The distance of the orchard from road head is an important aspect because this gives an idea as to how much cost is being incurred in bringing the input as well as on disposal of the produce from orchard to road head. It was observed during the course of study that all the high density varieties orchards were located within two km. of road head.

#### **Family size**

The study of family size is important from the labour availability point of views. The population distribution of sampled household is given in Table 4.1 where it may be seen that out of total population of 335 persons, 40.60, 37.61 and 21.79 per cent were male, female and children respectively. The category wise composition of male, female and children of sampled orchardist is also given in Table 3.1. At overall level, the average family size of high density apple orchardist is 4.53 persons comprising of 1.85 males, 1.70 females and 0.98 children. The average family size is comprises 4.05, 4.86, 5.33, 5.50 and 5.34 persons per family on marginal, small, semi-medium, medium and large farm size respectively.

#### **Work force**

At overall level per household 2.20 persons work force is available. In which there are 1.16 males and 1.04 females. This comprises with 62.70 percent male and

61.18 percent female. No children have worked on farms. In different categories of farm 2.10, 2.42, 1.88, 2.0 and 3.00 workers are available for farm work on marginal, small, semi-medium, medium and large farm respectively.

### Literacy level

The proportion of literates in a given population is an important indicator of the quality of the people. The literacy standard of population reflects the efforts of family and of the state to improve mental sphere and economic well being of the people. Literacy is considered to be a basic pre-requisite of modern society. It may be seen from the table 4.1 that at over all level the literacy level of sampled population is 84.03, 66.98 and 100.00 percent of male, female and children respectively. It is also reveals from the table that farm size has no influence on literacy level. It may be further seen from the table that cent- percent children were attending the school on all size of farms.

**Table- 4.1: General characteristics of sample orchardist**

Particulars	Marginal	Small	Semi-medium	Medium	Large	Overall
Male	67	39	21	4	5	136
% total	42.40	38.24	43.75	36.36	31.25	40.60
Per family	1.72	1.86	2.33	2.00	1.67	1.85
Female	62	39	16	3	6	126
% to total	39.25	38.24	33.33	27.28	37.50	37.61
Per family	1.58	1.86	1.78	1.50	2.00	1.70
Children %	29	24	11	4	5	73
Total	18.35	23.52	22.92	36.36	31.25	21.79
Per family	0.75	1.14	1.22	2.00	1.68	0.98
Family size	4.05	4.86	5.33	5.50	5.34	4.53
<b>Workers per family</b>						
Male	1.02	1.33	1.10	1.50	1.67	1.16
Female	1.07	1.09	0.78	0.50	1.33	1.04
Children	-	-	-	-	-	-
Total	2.10	2.42	1.88	2.00	3.00	2.20
<b>Illiteracy (%)</b>						
Male	83.33	81.25	88.88	75.00	100.0	84.03
Female	73.07	63.61	57.04	66.66	60.00	66.98
Children	100.0	100.0	100.0	100.0	100.0	100.0
Total	82.97	79.77	81.39	77.77	86.66	81.87
<b>Dependency rate</b>	1.92	2.00	2.82	2.75	1.78	2.05

## Land utilization

The economic activity of a region or country mainly depends on the quantum of land resources and manner in which they are used. The land utilization deals with the study of problems arising in the process of deciding between alternative major types of land uses and putting all type of land to their respective optimum uses. Himachal Pradesh being hilly region of the country, most of the area falls under mountain and inaccessible region. The optimum use of land resources is therefore of prime importance to planners and other concerned officials/personnels. The major land uses, in Himachal Pradesh are land under field crops, orchards, ghasni, current fellow, other fellow and barren. In the study area land use is slightly different than Himachal Pradesh. At overall level 97.42 per cent area is under both cultivation and orchard while 2.58 per cent land was found as barren. All cultivated holding area is under Apple on all size of farms, means mono culture is practised in the area. The average size of holdings of high density Apple orchardist is 2.13 hectares. Different size of holding it is 0.64 hectare, 1.65 hectares, 2.64 hectares, 8.68 hectares, and 19.06 hectares among marginal, small, semi-medium, medium and large holdings respectively. The average operational holding size is 0.64 hectare, 1.62 hectares, 2.56 hectares, 8.28 hectares, and 18.42 hectares on marginal, small, semi-medium, medium and large size of holding respectively as presented in Table 4.2.

**Table- 4.2: Land utilization pattern and cropping pattern of sample farms**  
(Area in Ha)

Particulars	Marginal	Small	Semi-medium	Medium	Large	Overall
Field Crop						
Orchard	25.04 (100.0)	34.16 (98.39)	23.04 (96.64)	16.56 (95.39)	55.28 (96.64)	154.88 (97.42)
Barren	-	0.56 (1.61)	0.80 (3.36)	0.80 (4.61)	1.92 (3.36)	4.08 (2.58)
Total land	25.04 (100.0)	34.72 (100.0)	23.84 (100.0)	17.36 (100.0)	57.2 (100.0)	158.16 (100.0)
Av. Size of holding	0.64	1.65	2.64	8.68	19.06	2.13
Av. Cultivated land	0.64	1.62	2.56	8.28	18.42	2.09
Av. Orchard size	0.64	1.62	2.56	8.28	18.42	2.09
Av. Area under apple	0.64	1.62	2.56	8.28	18.42	2.09

Note: Figures in parenthesis showing the percentage to total land.

### **Variety wise area under apple**

The reasons that limit the cultivation of particular fruit and variety in particular area are climate, soil type, availability of water and topography etc. In the study area both standard varieties as well as high density varieties are grown. The major standard varieties are Royal Delicious, Red Delicious, Rich a-red, Golden Delicious and Red Golden and major high density varieties are red chief, Vance, organ spur, super chief and golden spur. As far as area is concerned traditional varieties occupied 12 percent as against of High density varieties 88 per cent in total orchard area. In traditional varieties Royal Delicious is major variety which occupied all the area of non-bearing trees. Whereas, among high density varieties, Red Chief has highest area as compared to other varieties. It may be seen from the Table 4.3 that in bearing orchard the area under traditional varieties is 55 per cent and rest 45 percent area is under High density varieties. Further table reveals that Royal Delicious is the major traditional variety which contributes 49 percent of the total orchard area. The details regarding area under different varieties of standard as well as high density varieties on different sizes of farms have given in Table 3.3. Further, it may be observed from the table that proportion of high density apple increased with the size of farms.

Variety wise share of non-bearing and bearing area of standard variety of apple have been given in Table 3.4. Table shows that at overall land about 4 percent area is non-bearing and about 96 percent area is under bearing trees which shows that further plantation of standard variety is stopped in near future. The more details regarding variety, bearing, non-bearing with size class are given in Table 4.4.

**Table- 4.3: Area under standard apple size V.3 high density variety on sampled farm**

(Area in ha)

Particulars	Marginal		Small		Semi-medium		Medium		Large		Overall	
	NB	B	NB	B	NB	B	NB	B	NB	B	NB	B
<b>Traditional variety</b>												
Royal	0.24 (5.88)	11.68 (55.72)	0.24 (6.97)	21.20 (69.01)	0.08 (3.03)	8.97 (43.97)	-	6.80 (48.85)	2.48 (20.39)	14.38 (33.35)	3.04 (12.17)	63.03 (48.81)
Red	-	0.48 (2.29)	-	0.48 (1.56)	-	0.35 (1.71)	-	0.22 (1.58)	-	0.73 (1.69)	-	2.26 (1.75)
Rich-a-Red	-	0.16 (0.77)	-	0.24 (0.78)	-	0.30 (1.47)	-	0.12 (0.86)	-	0.88 (2.05)	-	1.71 (1.32)
Golden	-	0.72 (3.43)	-	0.48 (1.56)	-	0.30 (1.47)	-	0.06 (0.43)	-	0.72 (1.67)	-	2.28 (1.76)
Red Golden	-	0.32 (1.53)	-	0.48 (1.56)	-	0.30 (1.47)	-	0.06 (0.43)	-	0.50 (1.15)	-	1.66 (1.28)
Total	0.24 (5.88)	13.36 (63.74)	0.24 (6.97)	22.88 (74.47)	0.08 (3.03)	10.22 (50.09)	-	7.26 (52.15)	2.48 (20.39)	17.21 (39.91)	3.04 (12.17)	70.93 (54.93)
<b>Area per farm</b>	Neg.	0.34	0.01	1.08	Neg.	1.13	-	3.63	0.82	5.73	0.04	0.95
<b>High density variety</b>												
Red chief	1.20 (29.41)	4.40 (22.99)	1.60 (46.51)	2.00 (6.51)	0.80 (30.30)	5.09 (24.96)	0.40 (15.15)	3.80 (27.29)	3.20 (26.32)	13.21 (30.64)	7.20 (28.85)	28.50 (22.08)
Vance	0.80 (19.61)	0.80 (3.80)	0.40 (11.62)	1.36 (4.42)	0.40 (15.15)	2.55 (12.50)	0.80 (30.30)	1.00 (7.18)	2.40 (19.73)	4.93 (11.43)	4.80 (19.23)	10.64 (8.25)
Organ spur	0.80 (19.61)	2.40 (11.44)	1.20 (34.88)	2.40 (7.81)	0.40 (15.15)	1.02 (5.00)	0.64 (24.24)	0.66 (4.74)	1.60 (13.16)	3.82 (8.86)	4.64 (18.59)	10.30 (7.98)
Super chief	0.40 (9.80)	-	-	1.52 (4.94)	0.40 (15.15)	1.02 (5.00)	0.40 (15.15)	0.60 (4.31)	1.28 (10.53)	2.65 (6.15)	2.64 (10.58)	5.79 (4.45)
Golden spur	0.64 (15.68)	-	-	0.56 (1.82)	0.56 (21.21)	0.50 (2.45)	0.40 (15.15)	0.68 (4.31)	1.20 (9.86)	1.30 (3.01)	2.64 (10.58)	2.96 (2.30)
Total	3.84 (94.11)	7.60 (36.25)	3.20 (93.02)	7.84 (25.52)	2.56 (96.96)	10.18 (49.91)	2.64 (100.0)	6.66 (47.85)	9.68 (79.60)	25.91 (60.09)	21.92 (87.83)	58.19 (45.06)
Area per farm	0.09	0.19	0.15	0.37	0.28	1.13	1.32	3.33	3.22	8.63	0.29	0.78
Grand total	4.08 (100.0)	20.96	3.44 (100.0)	30.72	2.64 (100.0)	20.40	2.64 (100.0)	13.92	12.16 (100.0)	43.12	24.96 (100.0)	129.12 (100.0)
Area per farm	0.10	0.54	0.16	1.46	0.29	2.26	1.32	6.96	4.05	14.37	0.34	1.75



Variety wise proportion of non-bearing and bearing area of high density apple is given in table 3.5. Table shows that about 27 percent area is under non-bearing and rest about 73 percent is under bearing. Variety wise and size class wise area under bearing and non-bearing and their percentages is given in Table 4.5.

**Table- 4.4: Percentage area under non-bearing and bearing of standard apple on sampled farms**

(Area in hectare)

Apple Verities	Marginal		Small		Semi-medium		Medium		Large		Overall	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
<b>1. Royal Delicious</b>												
N.B	0.24	2.01	0.24	1.12	0.08	0.88	-	0.00	2.48	14.70	3.04	4.60
Bearing	11.68	97.99	21.20	98.88	8.97	99.12	6.80	100.0	14.38	85.30	63.03	95.40
Total	11.92	100.0	21.44	100.0	9.05	100.0	6.80	100.0	16.86	100.0	66.07	100.0
<b>2. Red Delicious</b>												
N.B	-	-	-	-	-	-	-	-	-	-	-	-
Bearing	0.48	100.0	0.48	100.0	0.35	100.0	0.22	100.0	0.73	100.0	2.26	100.0
Total	0.48	100.0	0.48	100.0	0.35	100.0	0.22	100.0	0.73	100.0	2.26	100.0
<b>3. Rich-a-Red</b>												
N.B	-	-	-	-	-	-	-	-	-	-	-	-
Bearing	0.16	100.0	0.24	100.0	0.30	100.0	0.12	100.0	0.88	100.0	1.70	100.0
Total	0.16	100.0	0.24	100.0	0.30	100.0	0.12	100.0	0.88	100.0	1.70	100.0
<b>4. Golden</b>												
N.B	-	-	-	-	-	-	-	-	-	-	-	-
Bearing	0.72	100.0	0.48	100.0	0.30	100.0	0.06	100.0	0.72	100.0	2.28	100.0
Total	0.72	100.0	0.48	100.0	0.30	100.0	0.06	100.0	0.72	100.0	2.28	100.0
<b>5. Red Golden</b>												
N.B	-	-	-	-	-	-	-	-	-	-	-	-
Bearing	0.32	100.0	0.48	100.0	0.30	100.0	0.06	100.0	0.50	100.0	1.66	100.0
Total	0.32	100.0	0.48	100.0	0.30	100.0	0.06	100.0	0.50	100.0	1.66	100.0
<b>6. Total Standard</b>												
N.B	0.24	1.76	0.24	1.04	0.08	0.77	-	0.00	2.48	12.59	3.04	4.10
Bearing	13.36	98.24	22.88	98.96	10.22	99.23	7.26	100.0	17.21	87.41	70.93	95.90
Total	13.60	100.0	23.12	100.0	10.30	100.0	7.26	100.0	19.69	100.0	73.97	100.0

**Table-4.5: Percentage area under non-bearing and bearing of high density apple in sampled farms**

(Area in hectare)

Apple Verities	Marginal		Small		Semi-medium		Medium		Large		Overall	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
<b>1.Red Chief</b>												
N- B	1.20	21.42	1.60	44.44	0.80	13.58	0.40	9.52	1.20	8.33	5.20	15.43
Bearing	4.40	78.58	2.00	55.56	5.09	86.42	3.80	90.48	13.21	91.67	28.50	84.57
Total	5.60	100.0	3.60	100.0	5.89	100.0	4.20	100.0	14.41	100.0	33.70	100.0
<b>2. Vance</b>												
N. B	0.80	50.00	0.40	22.73	0.40	13.55	0.80	44.44	2.40	32.74	4.80	31.09
Bearing	0.80	50.00	1.36	77.27	2.55	86.45	1.00	55.56	4.93	67.26	10.64	68.91
Total	1.60	100.0	1.76	100.0	2.95	100.0	1.80	100.0	7.33	100.0	15.44	100.0
<b>3.Orange spur</b>												
N.B	0.80	25.00	1.20	33.34	0.40	28.17	0.64	49.23	1.60	29.52	4.64	31.06
Bearing	2.40	75.00	2.40	66.66	1.02	71.83	0.66	50.77	3.82	70.48	10.30	68.94
Total	3.20	100.0	3.60	100.0	1.42	100.0	1.30	100.0	5.42	100.0	14.94	100.0
<b>4.Super Chief</b>												
N.B	0.40	100.0	-	0.00	0.40	28.17	0.40	40.00	3.20	54.70	4.40	43.40
Bearing	-	0.00	1.52	100.0	1.02	71.83	0.60	60.00	2.65	45.30	5.79	56.60
Total	0.40	100.0	1.52	100.0	1.42	100.0	1.00	100.0	5.85	100.0	10.14	100.0
<b>5.Golden spur</b>												
N.B	0.64	100.0	-	0.00	0.56	52.83	0.40	40.00	1.28	49.61	2.88	49.32
Bearing	-	0.00	0.56	100.0	0.50	47.17	0.60	60.00	1.30	50.39	2.96	50.68
Total	0.64	100.0	0.56	100.0	1.06	100.0	1.00	100.0	2.58	100.0	5.84	100.0
<b>Total Standard</b>												
N.B	3.84	33.57	3.20	28.98	2.56	20.10	2.64	28.38	9.68	27.20	21.92	27.36
Bearing	7.60	66.43	7.84	71.02	10.18	79.90	6.66	71.62	25.91	72.80	58.19	72.64
Total	11.44	100.0	11.04	100.0	12.74	100.0	9.30	100.0	35.59	100.0	80.11	100.0

N.B=Non-bearing

The details of age wise and variety wise area under non-bearing standard apple have been given in Table 4.6. The maintenance cost of standard variety is decided by bearing stage of tree which is divided in the age group of 8<sup>th</sup> year then 9, 10, 11-12, 13-15, 16-20, 21-30 and 31 years and above. The details regarding age wise and variety wise area under different type of farms are given in Table 4.7.

For detailed analysis the sample high density orchardist have been classified into various age groups i.e. initial year, 1-2 year, 2-3 and 3-4 year non-bearing orchard and 5-6, 7-10, 10-15 and 16 and above for bearing orchard. Age wise and variety wise and size class wise area under different age group have been presented in Table 4.8.

### **Record of plants in orchard**

The proportion of bearing and non-bearing trees in the orchard determines the quantum of present and future production. The proportion of non-bearing standard apple tree is very small and most of the potential area was brought under orchard long back and now not much scope is left for fresh plantation. Owners of old plantations also plan to replace the old trees which having low productivities from semi high density varieties. The numbers of bearing and non-bearing trees according variety wise and farm size wise have been presented in Table 4.9. At over all level, number of non-bearing and bearing standard variety apple trees were 12 and 262 respectively. In case of high density variety apple per farm number of non-bearing and bearing tress were 172 and 458, respectively. The farm size had positive relation with number of trees of bearing and non bearing. Analysis of variety wise and farm size wise proportion of non-bearing and bearing trees of standard apple and high density variety has been given in Table 4.10.

The detailed analysis of variety wise and farm size wise proportion of non-bearing and bearing trees of high density apple have been given in Table 4.11.

The details regarding age wise, variety wise and farm size wise number of plants of standard variety of apple have been presented in Table 4.12.

The details regarding age wise, variety wise and farm size wise number of plants of high density apple variety of apple are presented have been Table 4.13. Table further shows that in non- bearing trees red chief is the most popular variety of high density apple.

### **Summing up**

It was observed during the course of study that all the high density varieties orchards were located within two km. of road head. Average family size of high density apple orchardist was 4.53 persons and 2.20 persons were workers. Literacy rate was 84.03, 66.98 and 100.00 percent of male, female and children respectively. The average size of holdings of high density Apple orchardist was 2.13 hectares out of which 97.42 per cent area was under both cultivation and orchard while 2.58 per

cent land was barren land. The major standard varieties were Royal Delicious, Red Delicious, Rich a-red, Golden Delicious and Red Golden and major high density varieties are Red Chief, Vance, Organ Spur, Super Chief and Golden Spur. Traditional varieties occupied 12 percent as against of High density varieties 88 per cent in total orchard area. In traditional varieties Royal is major variety and Red Chief are the main high density varieties. Among bearing trees 55 per cent were traditional varieties and rest 45 percent were High density varieties. About 27 percent area of high density apple was under non-bearing and rest about 73 percent was under bearing. Per farm number of standard variety apple trees were 274 and 630 of high density apple.

**Table- 4.6: Age wise distribution of area under non-bearing standard apple on sample farms**

(Area in ha)

Name of Verities		1	2	3	4	5	6	7	Total	
<b>Marginal</b>										
Royal	-	-	-	-	-	1.08	1.08	1.08	0.24	
Other	-	-	-	-	-					
Total	-	-	-	-	-	1.08	1.08	1.08	0.24	
<b>Small</b>										
Royal	-	-	-	-	-	0.08	0.08	0.08	0.24	
Other	-	-	-	-	-					
Total	-	-	-	-	-	0.08	0.08	0.08	0.24	
<b>Semi-medium</b>										
Royal	-	-	-	-	-	-	-	1.08	0.08	
Other	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	0.08	0.08	
<b>Medium</b>										
Royal	-	-	-	-	-	-	-	-	-	
Other	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	-	-	
<b>Large</b>										
Royal	-	-	-	-	-	1.00	1.00	0.48	2.48	
Other	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	1.00	1.00	0.48	2.48	
<b>Overall</b>										
Royal	-	-	-	-	-	1.16	1.16	0.72	3.04	
Other	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	1.16	1.16	0.72	3.04	

**Table-4.7: Age wise and varieties wise area under different age group of popular standard varieties on sampled farms**

(Area in Ha.)

Name of Verities	8	9	10	11-12	13-15	16-20	21-30	31 above	Total bearing area
<b>Marginal</b>									
Royal	0.48	0.62	0.68	1.02	2.90	3.85	2.10	1.03	11.68
Red	-	-	-	0.06	-	0.12	0.12	0.18	0.48
Rich-a-Red	-	-	-	-	-	0.06	0.10	-	0.16
Golden	-	-	-	0.11	0.15	0.16	0.18	0.12	0.72
Red Golden	-	-	-	-	0.10	0.10	0.10	0.02	0.32
Total	0.48	0.62	0.68	1.19	3.15	3.29	2.60	1.35	13.36
% area in different age	3.59	4.64	5.09	8.91	23.58	24.63	19.46	10.10	100.0
<b>Small</b>									
Royal	0.68	0.72	0.98	2.04	3.24	5.85	6.25	1.44	21.20
Red	-	-	-	0.13	0.15	0.10	0.08	0.02	0.48
Rich-a-Red	-	-	-	-	0.10	0.12	0.02	-	0.24
Golden	-	0.05	0.05	0.05	0.05	0.10	0.10	0.08	0.48
Red Golden	-	0.05	0.05	0.05	0.05	0.10	0.10	0.08	0.48
Total	0.68	0.82	1.08	2.27	3.59	6.27	6.55	1.62	22.88
% area in different age	2.97	3.58	4.72	9.92	15.69	27.41	28.63	7.08	100.0
<b>Semi medium</b>									
Royal	0.35	0.65	0.92	1.25	1.26	2.40	1.60	0.54	8.97
Red	-	-	0.04	0.10	0.06	0.05	0.05	0.05	0.35
Rich-a-Red	-	0.05	0.05	0.05	0.05	0.05	0.05	-	0.30
Golden	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.30
Red Golden	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.30
Total	0.35	0.70	1.11	1.50	1.47	2.60	1.80	0.69	10.22
% area in different age	3.42	6.85	10.86	14.68	14.38	25.44	17.62	6.75	100.0

Contd..

**Table: 4.7 Contd...**

(Area in Ha.)

Name of Verities	8	9	10	11-12	13-15	16-20	21-30	31 above	Total bearing area
<b>Medium</b>									
Royal	0.25	0.45	0.65	0.85	0.90	1.00	1.10	1.60	6.80
Red	-	-	-	-	-	0.02	0.10	0.10	0.22
Rich-a-Red	-	-	-	-	-	0.05	0.05	0.02	0.12
Golden	-	-	-	-	0.01	0.01	0.02	0.02	0.06
Red Golden	-	-	-	-	0.01	0.01	0.02	0.02	0.06
Total	0.25	0.45	0.65	0.85	0.92	1.09	1.29	1.76	7.26
% area in different age	3.44	6.20	8.95	11.72	12.67	15.01	17.77	24.24	100.0
<b>Large</b>									
Royal	0.25	0.35	0.45	1.23	2.45	2.52	3.75	3.38	14.38
Red	-	-	-	0.15	0.15	0.15	0.15	0.13	0.73
Rich-a-Red	-	-	-	-	0.15	0.20	0.25	0.28	0.88
Golden	-	-	-	0.05	0.15	0.15	0.15	0.22	0.72
Red Golden	-	-	-	-	-	0.15	0.15	0.20	0.50
Total	0.25	0.35	0.45	1.43	2.90	3.17	4.45	4.21	17.21
% area in different age	1.45	2.03	2.62	8.31	16.85	18.42	25.86	24.46	100.0
<b>Overall</b>									
Royal	2.01	2.79	3.68	6.39	10.75	14.62	14.80	7.99	63.03
Red	-	-	0.04	0.44	0.36	0.44	0.50	0.48	2.26
Rich-a-Red	-	0.05	0.05	0.05	0.30	0.48	0.47	0.30	1.78
Golden	-	0.05	0.10	0.26	0.41	0.47	0.50	0.49	2.28
Red Golden	-	0.05	0.10	0.10	0.21	0.41	0.42	0.37	1.66
Total	2.01	2.94	3.97	7.24	12.03	16.42	16.69	9.63	70.93
% area in different age	2.83	4.14	5.60	10.21	16.96	23.15	23.53	13.58	100.0

**Table-4.8: Age wise distribution area under high density apple of sample farms**  
(Area in Ha.)

Name of Variety	Initial year	Non-Bearing				Bearing				
		1-2	2-3	3-4	Total	5-6	7-10	10-15	16 & above	Total
<b>Marginal</b>										
Red chief	0.48	0.24	0.24	0.24	1.20	1.20	1.20	1.20	0.80	4.40
Vance	0.24	0.16	0.16	0.24	0.80	0.24	0.24	0.16	0.16	0.80
Orange spur	0.24	0.24	0.16	0.16	0.80	0.80	0.80	0.40	0.40	2.40
Super chief	0.08	0.16	0.16	-	0.40	-	-	-	-	-
Golden spur	0.16	0.16	0.16	0.16	0.64	-	-	-	-	-
Total	1.20	0.96	0.88	0.80	3.84	2.24	2.24	1.76	1.36	7.60
% to total	31.25	25.00	22.92	20.83	100.0	29.47	29.47	23.16	17.89	100.0
<b>Small</b>										
Red chief	0.48	0.40	0.32	0.40	1.60	0.80	0.80	0.24	0.16	2.00
Vance	0.16	0.08	0.08	0.08	0.40	0.80	0.24	0.16	0.16	1.36
Orange spur	0.16	0.40	0.40	0.24	1.20	1.20	0.80	0.24	0.16	2.40
Super chief	-	-	-	-	-	0.80	0.64	0.08	-	1.52
Golden spur	-	-	-	-	-	0.16	0.16	0.16	0.08	0.56
Total	0.80	0.88	0.80	0.72	3.20	3.76	2.64	0.88	0.56	7.84
% to total	25.00	27.50	25.00	22.50	100.0	47.96	33.67	11.22	7.14	100.0
<b>Semi medium</b>										
Red chief	0.16	0.24	0.24	0.16	0.80	2.09	1.00	1.00	1.00	5.09
Vance	0.08	0.16	0.08	0.08	0.40	1.55	0.80	0.20	-	2.55
Orange spur	0.08	0.16	0.08	0.08	0.40	0.50	0.40	0.10	0.02	1.02
Super chief	0.08	0.16	0.16	0.16	0.56	0.50	0.40	0.10	0.02	1.02
Golden spur	-	0.16	0.16	0.08	0.40	0.20	0.10	0.10	0.10	0.50
Total	0.40	0.88	0.72	0.56	2.56	4.84	2.70	1.50	1.14	10.18
% to total	15.62	34.38	28.12	21.88	100.0	47.54	26.52	14.73	11.20	100.0

Contd....

**Table: 4.8 Contd.....**

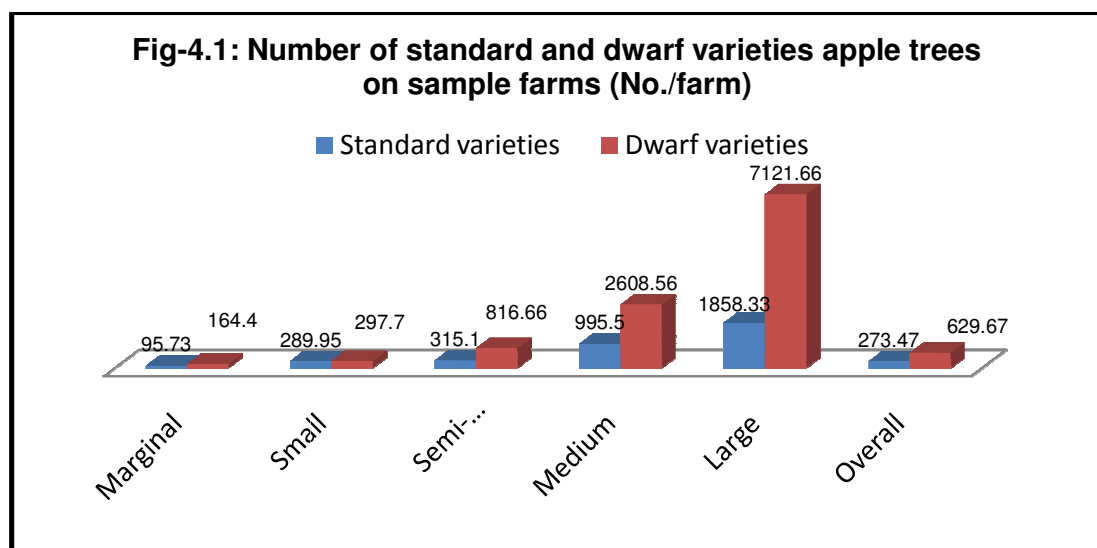
(Area in Ha.)

Name of Variety	Initial year	Non-Bearing				Bearing				
		1-2	2-3	3-4	Total	5-6	7-10	10-15	16 & above	Total
<b>Medium</b>										
Red chief	0.08	0.16	0.08	0.08	0.40	1.00	1.00	1.00	0.80	3.80
Vance	0.08	0.24	0.24	0.24	0.80	0.20	0.20	0.20	0.40	1.00
Orange spur	-	0.24	0.24	0.16	0.64	0.10	0.10	0.10	0.36	0.66
Super chief	-	0.16	0.16	0.08	0.40	0.15	0.15	0.15	0.15	0.60
Golden spur	-	0.16	0.16	0.08	0.40	0.15	0.15	0.15	0.15	0.60
Total	0.16	0.96	0.88	0.64	2.64	1.60	1.60	1.60	1.86	6.66
% to total	6.06	36.37	33.33	24.24	100.0	24.02	24.02	24.02	27.93	100.0
<b>Large</b>										
Red chief	0.80	0.80	0.80	0.80	3.20	3.00	3.00	3.00	4.21	13.21
Vance	0.32	0.80	0.80	0.48	2.40	1.00	1.00	1.00	1.93	4.93
Orange spur	0.16	0.64	0.40	0.40	1.60	0.80	1.00	1.00	1.02	3.82
Super chief	0.16	0.40	0.40	0.32	1.28	0.50	0.50	0.50	1.15	2.65
Golden spur	0.16	0.40	0.40	0.24	1.20	0.30	0.30	0.30	0.40	1.30
Total	1.60	3.04	2.80	2.24	9.68	5.60	5.80	5.80	8.71	25.91
% to total	16.53	31.40	28.93	23.14	100.0	21.61	22.39	22.39	33.61	100.0
<b>Overall</b>										
Red chief	2.00	1.84	1.68	1.68	7.20	8.09	7.00	6.44	6.97	28.50
Vance	0.88	1.44	1.36	1.12	4.80	3.79	2.48	1.72	2.65	10.64
Orange spur	0.64	1.68	1.28	1.04	4.64	3.48	3.10	1.84	1.88	10.30
Super chief	0.32	0.88	0.88	0.56	2.64	1.95	1.69	0.83	1.32	5.79
Golden spur	0.32	0.88	0.88	0.56	2.64	0.81	0.71	0.71	0.73	2.96
Total	4.16	6.72	6.08	4.96	21.92	18.12	14.98	11.54	13.55	58.19
% to total	18.97	30.66	27.74	22.63	100.0	31.14	25.74	19.83	23.28	100.0



**Table- 4.9: Number of plants of standard variety Viz-a- Viz high density variety on sample farms**

Particulars	(No. of plants)											
	Marginal		Small		Semi-medium		Medium		Large		Overall	
	NB	B	NB	B	NB	B	NB	B	NB	B	NB	B
Royal Delicious	60	3212	62	5590	20	2466	-	1870	735	4026	877	17164
Red Delicious	-	120	-	132	-	95	-	57	-	219	-	623
Rich-a-Red	-	42	-	60	-	85	-	30	-	246	-	463
Golden Delicious	-	220	-	132	-	80	-	16	-	199	-	647
Red Golden	-	80	-	125	-	90	-	18	-	150	-	463
Total	60	3674	62	6039	20	2816	-	1991	735	4840	877	19360
<b>Per farm</b>	1.53	94.20	2.95	287.57	2.22	312.88	-	995.50	245.00	1613.33	11.85	261.62
<b>High density Variety</b>												
Red chief	720	2640	920	1100	460	3050	232	2025	1970	8490	4302	17305
Vance Delicious	440	460	236	782	230	1460	450	575	1440	2700	2796	5977
Organ spur	400	1152	702	1296	245	580	370	370	920	2200	2637	5598
Super chief	240	-	-	912	235	600	230	360	740	1490	1445	3362
Golden spur	360	-	-	304	240	250	240	365	700	715	1540	1634
Total	2160	4252	1858	4394	1410	5940	1522	3695	5770	15595	12720	33876
Per farm	55.38	109.02	88.47	209.23	156.66	660.00	761.00	1847.56	1923.33	5198.33	171.89	457.78
Grand total	2220	7926	1920	10433	1430	8756	1522	5686	6505	20435	13597	53236
Per Farm	56.92	203.23	91.42	496.80	158.88	972.88	761.00	2843.00	2168.33	6811.66	183.74	719.40



**Table-4.10: percentage number of plants under non-bearing and bearing of standard variety on sample farms**

(No. of plant)

Apple Verities	Marginal		Small		Semi-medium		Medium		Large		Overall	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
<b>1. Royal Delicious</b>												
N..B	60	1.83.	62	1.10	20	0.80	-	-	73515.43	15.43	877	4.86
Bearing	3212	98.17	5590	98.90	2466	99.20	1870	100.00	4026	84.57	17164	95.14
Total	3272	100.00	5652	100.00	2486	100.00	1870	100.00	4761	100.00	18041	100.00
<b>2. Red Delicious</b>												
N.B	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00
Bearing	120	100.00	132	100.00	95	100.00	57	100.00	219	100.00	623	100.00
Total	120	100.00	132	100.00	95	100.00	57	100.00	219	100.00	623	100.00
<b>3. Rich-a-Red</b>												
N.B	-	0.00	-	.00	-	0.00	-	0.00	-	0.00	-	0.00
Bearing	42	100.00	60	100.00	85	100.00	30	100.00	246	100.00	463	100.00
Total	42	100.00	60	100.00	85	100.00	30	100.00	246	100.00	463	100.00
<b>4. Golden Delicious</b>												
N.B	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00
Bearing	220	100.00	132	100.00	80	100.00	16	100.00	199	100.00	647	100.00
Total	220	100.00	132	100.00	80	100.00	16	100.00	199	100.00	647	100.00
<b>5. Red golden</b>												
N.B	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00
Bearing	80	100.00	125	100.00	90	100.00	18	100.00	150	100.00	463	100.00
Total	80	100.00	125	100.00	90	100.00	18	100.00	150	100.00	463	100.00
<b>6. Total Standard</b>												
N.B	60	1.61	62	1.02	20	0.70	-	0.00	735	13.18	877	4.33
Bearing	3674	98.39	6039	98.98	2816	99.30	1991	100.00	4840	86.82	19360	95.67
Total	3734	100.00	6101	100.00	2836	100.00	1991	100.00	5575	100.00	20237	100.00

**Table-4.11: Percentage number of plants under non-bearing and bearing on sample farms**

(No. of plant)

Name of Verities	Marginal		Small		Semi-medium		Medium		Large		Overall	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
<b>Red chief</b>												
N.B	720	21.43	920	45.54	460	13.10	232	10.28	1970	18.83	4302	19.91
Bearing	2640	78.57	1100	54.46	3050	86.90	2025	89.72	8490	81.17	17305	80.09
Total	3360	100.00	2020	100.0	3510	100.0	2257	100.0	10460	100.0	21607	100.0
<b>Vance</b>												
N.B	440	48.89	236	23.18	230	13.60	450	43.90	1440	34.78	2796	31.87
Bearing	460	51.11	784	76.84	1460	86.40	575	56.10	2700	65.22	5977	68.13
Total	900	100.00	1018	100.0	1690	100.0	1025	100.0	4140	100.0	8773	100.0
<b>Orange spur</b>												
N.B	400	25.77	702	35.13	245	29.70	370	50.00	920	29.49	2637	32.02
Bearing	1152	74.23	1296	64.87	580	70.30	370	50.00	2200	70.51	5598	67.98
Total	1552	100.00	1998	100.0	825	100.0	740	100.0	3120	100.0	8235	100.0
<b>Super chief</b>												
N.B	240	100.00	-	0.00	235	28.14	230	38.98	740	33.18	1445	30.06
Bearing	-	0.00	912	100.0	600	71.86	360	61.02	1490	66.82	3362	69.94
Total	240	100.00	912	100.0	835	100.0	590	100.0	2230	100.0	4807	100.0
<b>Golden spur</b>												
N.B	360	100.00	-	0.00	240	48.97	240	39.67	700	49.47	1540	48.51
Bearing	-	0.00	304	100.0	250	51.02	365	60.33	715	50.53	1634	51.48
Total	360	100.00	304	100.0	490	100.0	605	100.0	1415	100.0	3174	100.0
<b>Total Standard</b>												
N.B	2160	33.69	1858	29.72	1510	20.27	1522	29.17	5770	27.00	12720	27.29
Bearing	4252	66.31	4394	70.28	5940	79.73	3695	70.83	15595	73.00	33876	72.70
Total	6412	100.00	6252	100.0	7350	100.0	5217	100.0	21365	100.0	46596	100.0

**Table- 4.12: Age wise variety wise number of plants of standard variety on sample farms**

(No. of plants)

Name variety	Age in Years								Total
	8	9	10	11-12	13-15	16-20	21-30	31 & above	
<b>Marginal</b>									
Royal Delicious	131	170	186	280	797	786	577	285	3212
Red Delicious	-	-	-	15	-	30	30	45	120
Rich-a- red	-	-	-	-	-	16	26	-	42
Golden Delicious	-	-	-	33	46	48	55	38	220
Red golden	-	-	-	-	25	25	25	5	80
<b>Total</b>	<b>131</b>	<b>170</b>	<b>186</b>	<b>328</b>	<b>868</b>	<b>905</b>	<b>713</b>	<b>373</b>	<b>3674</b>
<b>Small</b>									
Royal Delicious	179	190	258	538	855	1542	1648	380	5590
Red Delicious	-	-	-	36	41	27	22	6	132
Rich-a- red	-	-	-	-	25	30	5	-	60
Golden Delicious	-	14	14	14	14	28	28	20	132
Red golden	-	13	13	14	13	27	27	18	125
<b>Total</b>	<b>179</b>	<b>217</b>	<b>285</b>	<b>602</b>	<b>948</b>	<b>1654</b>	<b>1730</b>	<b>424</b>	<b>6039</b>
<b>Semi-medium</b>									
Royal Delicious	96	178	254	344	346	660	440	148	2466
Red Delicious	-	-	11	26	16	14	14	14	95
Rich-a- red	-	14	14	15	14	14	14	-	85
Golden Delicious	-	-	14	13	14	13	13	13	80
Red golden	-	-	15	15	15	15	15	15	90
<b>Total</b>	<b>96</b>	<b>192</b>	<b>308</b>	<b>413</b>	<b>405</b>	<b>716</b>	<b>496</b>	<b>190</b>	<b>2816</b>

Contd....

**Table: 4.12 Contd.....**

Name variety	Age in Years								Total
	8	9	10	11-12	13-15	16-20	21-30	31 & above	
<b>Medium</b>									
Royal Delicious	69	124	178	234	247	275	303	440	1870
Red Delicious	-	-	-	-	-	5	26	26	57
Rich-a- red	-	-	-	-	-	12	12	6	30
Golden Delicious	-	-	-	-	3	3	5	5	16
Red golden	-	-	-	-	4	4	5	5	18
Total	69	124	178	234	254	299	351	482	1991
<b>Large</b>									
Royal Delicious	70	98	127	344	686	705	1050	946	4026
Red Delicious	-	-	-	45	45	45	45	39	219
Rich-a- red	-	-	-	-	42	56	70	78	246
Golden Delicious	-	-	-	14	41	41	41	62	199
Red golden	-	-	-	-	-	45	45	60	150
Total	70	98	127	403	814	892	1251	1185	4840
<b>Overall</b>									
Royal Delicious	545	760	1003	1740	2931	3968	4018	2199	17164
Red Delicious	-	-	11	122	102	121	137	130	623
Rich-a- red	-	14	14	15	81	128	127	84	463
Golden Delicious	-	14	28	74	118	133	142	138	647
Red golden	-	13	28	29	57	116	117	103	463
Total	545	801	1084	1980	3289	4466	4541	2654	19360

**Table-4.13: Age wise variety wise number of plants of high density apple on sample farms**

(No. of trees/farm)

Name of variety	Non-bearing						Bearing					
	Initial year	1-2	2-3	3-4	Total	%	5-6	7-10	10-15	16 & above	Total	%
<b>Marginal</b>												
Red chief	288	144	144	144	720	33.33	720	720	720	480	2640	62.08
Vance	132	88	88	132	440	20.37	138	138	92	92	460	10.83
Oregon spur	120	120	80	80	400	18.51	384	384	192	192	1152	27.09
Super chief	48	96	96	-	240	0.12	-	-	-	-	-	-
Gold spur	90	90	90	90	360	16.67	-	-	-	-	-	-
Total	678		498	446	2160	100.0	1242	1242	1004	764	4252	100.0
<b>Small</b>												
Red chief	2.76	230	184	230	920	49.51	440	440	132	88	1100	25.04
Vance	94	48	47	47	236	12.70	460	138	92	92	782	17.80
Oregon spur	94	234	234	140	702	37.78	648	432	129	87	1296	29.49
Super chief	-	-	-	-	-	-	480	384	48	-	912	20.75
Gold spur	-	-	-	-	-	-	87	87	87	43	304	6.92
Total	464	512	465	417	1858	100.0	2115	1481	488	310	4394	100.0
<b>Semi-medium</b>												
Red chief	92	138	138	92	460	32.62	1252	599	599	600	3050	51.35
Vance	46	92	46	46	230	16.31	887	458	115	-	1460	24.58
Oregon spur	49	98	49	49	245	17.37	284	227	56	13	580	9.76
Super chief	34	67	67	67	235	16.68	294	235	58	13	600	10.10
Gold spur	-	96	96	48	240	17.02	100	50	50	50	250	4.21
Total	221	491	396	302	1410	100.0	2817	1569	878	676	5940	100.0

**Table: 4.13 Contd...**

Name of variety	Non- bearing						Bearing					
	Initial year	1-2	2-3	3-4	Total	%	5-6	7-10	10-15	16 & above	Total	%
<b>Medium</b>												
Red chief	46	93	47	46	232	15.24	532	532	532	429	2025	54.80
Vance	45	135	135	135	450	29.56	115	115	115	230	575	15.56
Oregon spur	-	138	138	94	370	24.31	56	56	56	202	370	10.02
Super chief	-	92	92	46	230	15.12	90	90	90	90	360	9.74
Gold spur	-	96	96	48	240	15.76	91	91	91	92	365	9.87
Total	91	554	508	369	1522	100	884	884	884	1043	3695	100
<b>-Large</b>												
Red chief	492	492	493	493	1970	34.14	1928	1928	1928	2706	8490	54.44
Vance	192	480	480	288	1440	24.95	548	548	548	1056	2700	17.32
Oregon spur	92	368	230	230	920	15.94	460	575	575	590	2200	14.10
Super chief	92	231	231	186	740	12.83	281	281	281	647	1490	9.55
Gold spur	93	233	234	140	700	12.13	165	165	165	220	715	4.58
Total	961	1804	1668	1337	5770	100	3382	3497	3497	5219	15595	100
<b>Overall</b>												
Red chief	1194	1097	1006	1005	4302	33.82	4872	4219	3911	4303	17305	51.08
Vance	509	843	796	648	2796	21.98	2148	1397	962	1470	5977	17.64
Oregon spur	355	958	731	593	2637	20.73	1832	1664	1008	1084	5598	16.52
Super chief	174	486	486	299	1445	11.36	1145	990	477	750	3362	9.92
Gold spur	183	515	516	326	1540	12.10	443	393	393	405	1634	4.83
Total	2415	3899	3535	2871	12720	100.0	10440	8673	6751	8012	33876	100

## Chapter – 5

### **ECONOMICS OF HIGH DENSITY APPLE PLANTATION**

In this chapter an attempt has been made to estimate the various costs incurred on establishment and maintenance of apple orchards by different categories of sample orchardist in district Shimla.

The importance of horticulture in state economy hardly needs any emphasis as the area and production has increased manifold during the last about 4 decades. This is mainly because of the higher returns per unit of area from horticultural crops in general and apples in particular. The cost of production of apple orchard is continuously increasing whereas sale price is not sharing appreciable trend. This has resulted comparatively, lesser net return to the apple orchardists of the state. The orchardist of Himachal Pradesh have started cultivating high density apple varieties, which come into bearing stage at a very early age as compared to traditional varieties. And the number of plants per hectare is more (two and half time) as compared to traditional varieties.

Besides higher production, the other advantages of high density varieties are that the size of the fruit is uniform. In addition to this cost of production also reduced. At present reliable information from any source on costs and returns from high density apple cultivation is not available. An attempt has been made in this chapter to work out the economics of high density orchard plantation.

#### **Initial cost of plantation**

The gestation period is less in high density apple as compared to seedling rootstock. Thus, the annual budget structure would be entirely different than the traditional ones. In working out total cost of apple orchard, the cost C has been taken into account. The concept of cost C has been used because it would be unrealistic if the cost incurred on family labour is not considered.

The initial investment of establishing the high density apple orchard is very high as compared to the traditional apple orchard because of very high density of apple trees



per unit of area (for reason of the cost involved in digging pits, putting manure and fertilizer, cost of plant and transplanting etc.). On an average, in a hectare 600 plants are planted. In case of high density apples the growers have to incur cost of maintenance about four years. The main costs of maintenance are cost of manure, fertilizer insecticide and pesticide, pruning, preparation of basin. The inter crops could not be taken from the high density orchards because of early bearing and per hectare high density of plants.

For the detailed analysis the orchard area on different size of farm have been classified into various age groups i.e. initial year, 1-2, 2-3 and 3-4 for non-bearing and 5-6, 7-10, 11-15 and 16 and above for bearing orchard. None of the orchard was in the age of more than 17 years. Bearing maintenance cost on different size of farm has been presented in Table 5.7 to 5.12. In the analysis the initial cost and maintenance cost in non-bearing stage of investment has been spread over into the whole of the economic life of the orchard.

At overall level the initial cost of plantation of sample high density apple orchardist is worked out to be Rs.88129 per hectare. This cost is slightly differ on different size of farm as it is presented in Tables 4.1 to 4.6 .On different size of farm initial cost per hectare is worked out to be Rs.80422, Rs. 85983, Rs. 87301, Rs.78954, and Rs. 96110 on marginal, small, semi-medium, medium and large farms respectively. As table 4.6 shows that, about 35 percent of the total cost was incurred on labour or on layout which includes land clearing, digging and filling of pits, F.Y.M., fertilizer and irrigation etc. The total material cost accounted for about 34 percent of the total investment. The total fixed cost accounts for 28 percent which include the rental value of land, land revenue and depreciation on fixed assets.

### **Maintenance cost of non-bearing orchard**

Commercial production of High density apple start since 4 years up to this stage orchardist has to bear the maintenance (non-bearing) cost of their orchards. The orchardist has to bear the loss till the age of bearing stage. Across the land holding size and age of plant per hectare maintenance costs of non-bearing orchards have been presented in Table 5.1 to 5.6. The maintenance cost worked out to be

Rs.46896, Rs.51491 and Rs.57741 respectively for 1-2, 2-3 and 3-4 years of age orchard which differs on different size of farm.

#### **Maintenance cost of non fruit bearing high density apple on marginal farms**

The analysis indicates that the initial cost of high density apple plantation on marginal farms was Rs 80422 per ha of which Rs 56385 was the variable cost incurred on labour and different inputs (Table-5.1) whereas the fixed cost was Rs 24037 incurred mainly on rental value of own land. The maintenance cost of apple orchard depends on the age of orchard, having direct relation, as is evident from the total maintenance cost increasing from Rs 44562 per ha on 1-2 year old orchard to Rs 54816 for 3-4 year old orchard. At overall level the maintenance cost was Rs 49305 per ha accounted for by fixed cost of Rs 24037 and variable cost of Rs 25268 per ha.

#### **Maintenance cost of non fruit bearing high density apple on small farms**

It was found that the initial cost of high density apple plantation on small farms was Rs. 85983 per ha accounted for by Rs 61921 as variable cost (Table-5.2) and the fixed cost of Rs 24062 incurred mainly on rental value of own land (Rs 23750/ha). In small farms also the maintenance cost of apple orchard was observed to have direct relation with the age of orchard. This is evident from the fact that total maintenance cost increased from Rs 46649 per ha on 1-2 year old orchard to Rs 58148 for 3-4 year old orchard. The average level of maintenance cost was Rs 50577 per ha accounted for by fixed cost of Rs 24062 and variable cost of Rs 26515 per ha.

#### **Maintenance cost of non fruit bearing high density apple on semi-medium farms**

In case of semi-medium farms, the initial cost of high density apple plantation was Rs. 87301 per ha. The main component of initial cost of high density apple plantation was the variable cost (Rs 62989) whereas the fixed cost was Rs 24312 incurred mainly on rental value of own land (Rs 23750/ha), Table-5.3 presents the details. The total maintenance cost increased varied between Rs 46783 per ha on 1-2 year old orchard and Rs 59354 for 3-4 year old orchard. The average level of maintenance cost was Rs 52204 per ha accounted for by fixed cost of Rs 24312 and variable cost of Rs 27892 per ha.

**Table-5.1: Maintenance cost of non- bearing high density apple on marginal farms**

(Rs/Ha)

Cost component	Initial Year	1-2 Year	2-3 Year	3-4 Year	Over all
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2000	0	0	0	0
Preparation & maintenance of basin	0	2969	3750	4500	3693
Interculture	0	2813	3750	4688	3693
Digging of pits	11300	0	0	0	0
Filling of pits	2825	0	0	0	0
FYM, fertilizers application	2250	1875	2216	2438	2159
Plant protection	625	781	1193	1500	1136
Planting of plant	2825	0	0	0	0
Pruning of plant	0	1875	2045	2625	2159
Irrigation	2825	0	0	0	0
Other watch & ward etc.	400	1563	1875	2250	1875
Total labour used	25050	11876	14829	18000	14715
B. Material cost					
Plant material	22600	0	0	0	0
F Y M	1695	2283	2830	3345	2787
Fertilizers	1130	1401	1698	2230	1751
Plant protection	2825	3363	3961	4739	3979
Other sticks wire rope etc.	400	625	909	1000	833
Total Material Cost	28650	7672	9398	11314	9350
C. Interest on working capital	2685	977	1211	1465	1203
<b>Total variable cost</b>	<b>56385</b>	<b>20525</b>	<b>25438</b>	<b>30779</b>	<b>25268</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery & Farm building	275	275	275	275	275
Rented value of owned land	23750	23750	23750	23750	23750
<b>Total Fixed Cost</b>	<b>24037</b>	<b>24037</b>	<b>24037</b>	<b>24037</b>	<b>24037</b>
<b>Total costs</b>	<b>80422</b>	<b>44562</b>	<b>49475</b>	<b>54816</b>	<b>49305</b>

**Table-5.2: Maintenance cost of non bearing high density apple on small farms**

(Rs/ha)

<b>Cost component</b>	<b>Initial Year</b>	<b>1-2 Year</b>	<b>2-3 Year</b>	<b>3-4 Year</b>	<b>Over all</b>
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2063	0	0	0	0
Preparation & maintenance of basin	0	3409	3938	4792	4000
Interculture	0	3239	3750	5208	4000
Digging of pits	12760	0	0	0	0
Filling of pits	3190	0	0	0	0
FYM, fertilizers application	3000	2131	2625	2708	2469
Plant protection	1040	852	1313	2083	1375
Planting of plant	3190	0	0	0	0
Pruning of plant	0	2045	2625	2917	1250
Irrigation	3480	0	0	0	0
Other watch & ward etc.	625	1705	2063	2500	2063
Total labour used	29348	13381	16314	20208	15157
B. Material cost					
Plant material	23200	0	0	0	0
F Y M	1740	2327	2906	3475	2865
Fertilizers	1160	1455	2034	2896	2080
Plant protection	2900	3782	4069	4633	4133
Other sticks wire rope etc.	625	568	1133	1250	958
Total Material Cost	29625	8132	10142	12254	10036
C. Interest on working capital	2948	1074	1335	1624	1322
<b>Total variable cost</b>	<b>61921</b>	<b>22587</b>	<b>27791</b>	<b>34086</b>	<b>26515</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery & Farm building	300	300	300	300	300
Rented value of owned land	23750	23750	2375	23750	23750
<b>Total Fixed Cost</b>	<b>24062</b>	<b>24062</b>	<b>24062</b>	<b>24062</b>	<b>24062</b>
<b>Total costs</b>	<b>85983</b>	<b>46649</b>	<b>51853</b>	<b>58148</b>	<b>50577</b>

**Table-5.3: Maintenance cost of non bearing high density apple  
on semi-medium farms**

(Rs./ha)

<b>Cost component</b>	<b>Initial Year</b>	<b>1-2 Year</b>	<b>2-3 Year</b>	<b>3-4 Year</b>	<b>Over all</b>
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2250	0	0	0	0
Preparation & maintenance of basin	0	3580	4167	4821	4097
Interculture	0	3409	4167	5357	4167
Digging of pits	13260	0	0	0	0
Filling of pits	2900	0	0	0	0
FYM, fertilizers application	3375	2216	3125	2411	2569
Plant protection	2250	852	1458	2679	1528
Planting of plant	3315	0	0	0	0
Pruning of plant	0	2045	2917	3750	2778
Irrigation	2763	0	0	0	0
Other watch & ward etc.	1250	1364	2083	2679	1944
Total labour used	31363	13466	17917	21696	17083
B. Material cost					
Plant material	22100	0	0	0	0
F Y M	1658	2232	2750	3236	2665
Fertilizers	1105	1395	1925	2696	1909
Plant protection	2763	3626	3850	4314	3888
Other sticks wire rope etc.	1000	682	1111	1429	1019
Total Material Cost	28626	7935	9636	11675	9481
C. Interest on working capital	3000	1070	1378	1670	1328
<b>Total variable cost</b>	<b>62989</b>	<b>22471</b>	<b>28931</b>	<b>35042</b>	<b>27892</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	11	12	12	12
Depreciation on implements , machinery & Farm building	550	550	550	550	550
Rented value of owned land	23750	23750	23750	23750	23750
<b>Total Fixed Cost</b>	<b>24312</b>	<b>24312</b>	<b>24312</b>	<b>24312</b>	<b>24312</b>
<b>Total costs</b>	<b>87301</b>	<b>46783</b>	<b>53243</b>	<b>59354</b>	<b>52204</b>

### **Maintenance cost of non fruit bearing high density apple on medium farms**

On medium farms, the initial cost of high density apple plantation was Rs 78954 per ha, the main component of which was variable cost of Rs 54352 (Table-5.4) and the fixed cost of Rs 24062 per ha. Like other categories, in medium farms also, the maintenance cost of apple orchard was directly correlated with the age of orchard. Total maintenance cost increased from Rs 47250 per ha on 1-2 year old orchard to Rs 58637 for 3-4 year old orchard. The average level of maintenance cost was Rs 51775 per ha accounted for by fixed cost of Rs 24062 and variable cost of Rs 27173 per ha.

### **Maintenance cost of non fruit bearing high density apple on large farms**

In case of large farms, the initial cost of high density apple plantation was Rs 96110 per ha, having variable cost as main component. The total variable cost in this case was of Rs 70368 per ha (Table-5.5). The maintenance cost of apple orchard was observed to vary from Rs 47614 per ha on 1-2 year old orchard to Rs 57550 for 3-4 year old orchard. The average level of maintenance cost was Rs 51706 per ha accounted for by fixed cost of Rs 25742 and variable cost of Rs 25964 per ha.

### **Maintenance cost of non fruit bearing high density apple on all farms**

Under the situation, considering all the farms together, the initial cost of high density apple plantation was Rs. 88129 per ha accounted for by Rs 63383 as variable cost and remaining Rs 24746 by fixed cost (Table-5.6). The main component of fixed cost was the rental value of own land (Rs 23750/ha). At overall level also, the maintenance cost of apple orchard was having direct relation with the age of orchard as the total maintenance cost increased from Rs 46894 per ha on 1-2 year old orchard to Rs 57741 on 3-4 year old orchard. The average level of maintenance cost was Rs 51323 per ha accounted for by fixed cost of Rs 24984 and variable cost of Rs 26339 per ha.

**Table-5.4: Maintenance cost of non bearing high density apple on medium farms.**

(Rs./ha)

Cost component	Initial Year	1-2 Year	2-3 Year	3-4 Year	Over all
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2813	0	0	0	0
Preparation & maintenance of basin	0	3438	3920	5391	4113
Interculture	0	3125	4091	5156	3992
Digging of pits	11094	0	0	0	0
Filling of pits	2781	0	0	0	0
FYM, fertilizers application	3750	1875	2216	2578	2177
Plant protection	1875	938	1364	1641	1270
Planting of plant	3106	0	0	0	0
Pruning of plant	0	1875	2386	2813	2298
Irrigation	2219	0	0	0	0
Other watch & ward etc.	938	1563	1705	2344	1815
Total labour used	28576	12814	15682	19923	15665
B. Material cost					
Plant material	17750	0	0	0	0
F Y M	1331	2885	3464	4036	3388
Fertilizers	888	1731	1732	2306	1880
Plant protection	2219	3463	4041	4900	4039
Other sticks wire rope etc.	1000	677	909	1250	907
Total Material Cost	23188	8756	10146	12492	10214
C. Interest on working capital	2588	1078	1291	1620	1294
<b>Total variable cost</b>	<b>54352</b>	<b>22648</b>	<b>27119</b>	<b>34035</b>	<b>27173</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	8
Depreciation on implements , machinery & Farm building	840	840	840	840	840
Rented value of owned land	23750	23750	23750	23750	23750
<b>Total Fixed Cost</b>	<b>24602</b>	<b>24602</b>	<b>24602</b>	<b>24602</b>	<b>24602</b>
<b>Total costs</b>	<b>78954</b>	<b>47250</b>	<b>51721</b>	<b>58637</b>	<b>51775</b>

**Table-5.5: Maintenance cost of non-bearing high density apple on large farms**

(Rs./ha)

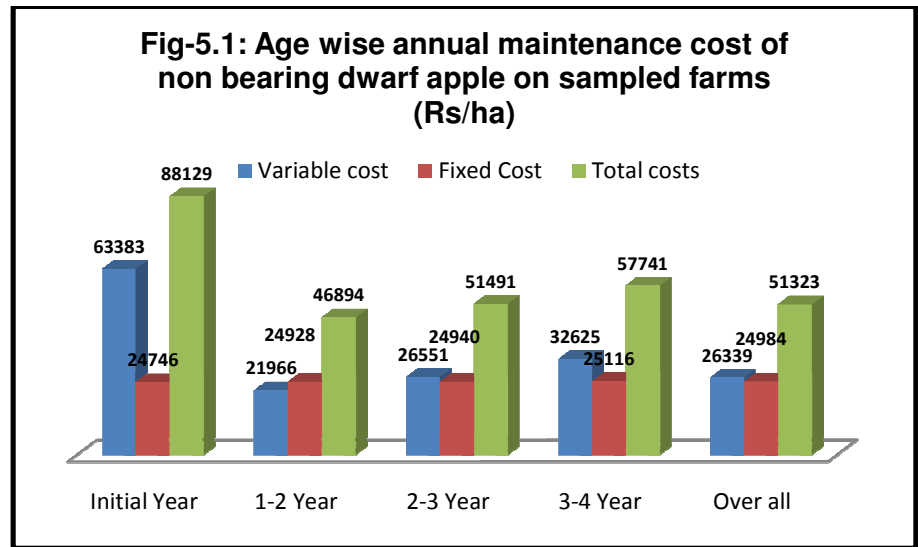
<b>Cost component</b>	<b>Initial Year</b>	<b>1-2 Year</b>	<b>2-3 Year</b>	<b>3-4 Year</b>	<b>Over all</b>
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2250	0	0	0	0
Preparation & maintenance of basin	0	3059	3857	4821	3824
Interculture	0	2714	3482	4554	3490
Digging of pits	18018	0	0	0	0
Filling of pits	3003	0	0	0	0
FYM, fertilizers application	3006	1826	2411	3013	2358
Plant protection	1201	987	1071	1339	1114
Planting of plant	3904	0	0	0	0
Pruning of plant	0	1776	1929	2411	2005
Irrigation	3003	0	0	0	0
Other watch & ward etc.	1000	1480	1607	2009	1671
<b>Total labour used</b>	<b>35385</b>	<b>11842</b>	<b>14357</b>	<b>18147</b>	<b>14462</b>
B. Material cost					
Plant material	24025	0	0	0	0
F Y M	1802	3000	3574	4178	3513
Fertilizers	1802	1780	1787	2388	1951
Plant protection	3003	3561	4170	4775	4108
Other sticks wire rope etc.	1000	658	643	804	693
<b>Total Material Cost</b>	<b>31632</b>	<b>8999</b>	<b>10174</b>	<b>12145</b>	<b>10265</b>
C. Interest on working capital	3351	1041	1227	1516	1237
<b>Total variable cost</b>	<b>70368</b>	<b>21882</b>	<b>25758</b>	<b>31808</b>	<b>25964</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery & Farm building	1980	1980	1980	1980	1980
Rented value of owned land	23750	23750	23750	23750	23750
<b>Total Fixed Cost</b>	<b>25742</b>	<b>25732</b>	<b>25742</b>	<b>25742</b>	<b>25742</b>
<b>Total costs</b>	<b>96110</b>	<b>47614</b>	<b>51500</b>	<b>57550</b>	<b>51706</b>



**Table- 5.6: Maintenance cost of non bearing high density apple on all farms.**

(Rs./ha)

<b>Cost component</b>	<b>Initial Year</b>	<b>1-2 Year</b>	<b>2-3 Year</b>	<b>3-4 Year</b>	<b>Over all</b>
<b>1.Variable cost</b>					
A. Labour used					
Layout, cleaning of land	2163	0	0	0	0
Preparation & maintenance of basin	0	3214	3898	4839	3902
Interculture	0	2946	3725	4839	3742
Digging of pits	14345	0	0	0	0
Filling of pits	2969	0	0	0	0
FYM, fertilizers application	2851	1931	2467	2752	2344
Plant protection	1131	915	1209	1663	1225
Planting of plant	3368	0	0	0	0
Pruning of plant	0	1875	2220	2722	2061
Irrigation	2990	0	0	0	0
Other watch & ward etc.	776	1518	1776	2238	1807
Total labour used	30593	12399	15295	19053	15081
B. Material cost					
Plant material	23029	0	0	0	0
F Y M	1727	2693	3265	3817	3197
Fertilizers	1382	1626	1815	2460	1924
Plant protection	2879	3556	4070	4713	4056
Other sticks wire rope etc.	755	647	840	1028	819
Total Material Cost	29772	8522	9990	12018	9996
C. Interest on working capital	3018	1045	1266	1554	1262
<b>Total variable cost</b>	<b>63383</b>	<b>21966</b>	<b>26551</b>	<b>32625</b>	<b>26339</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	11
Depreciation on implements , machinery & Farm building	984	1166	1178	1354	1223
Rented value of owned land	23750	23750	23750	23750	23750
<b>Total Fixed Cost</b>	<b>24746</b>	<b>24928</b>	<b>24940</b>	<b>25116</b>	<b>24984</b>
<b>Total costs</b>	<b>88129</b>	<b>46894</b>	<b>51491</b>	<b>57741</b>	<b>51323</b>



### **Maintenance cost of bearing apple orchard**

Orchardist started receiving some returns from their orchards from the age of 5<sup>th</sup> year of plants. It is observed during the study that the yield goes increasing till 30 years of age and after that it is start to decline. Across the land holding size and age of plant, per hectare maintenance cost is presented in Table 5.7 to 5.12. The apple trees of high density variety come into bearing stage during about 5<sup>th</sup> year. Keeping in view the fact that the maintenance cost remains almost constant during certain age groups, five groups were formed and maintenance cost analyzed. The following text presents details.

### **Maintenance cost of fruit bearing high density apple on marginal farms**

The maintenance cost of apple orchard was found to be increasing from Rs 92737 per ha on 5-6 year old orchard to Rs 120555 for 16 and above years old orchard (Table-5.7). At overall level the maintenance cost was Rs 104803 per ha accounted for by fixed cost of Rs 56527 and variable cost of Rs 48276 per ha.

### **Maintenance cost of fruit bearing high density apple on small farms**

The maintenance cost of small apple orchards was found to be increasing from Rs 96393 per ha on 5-6 year old orchard to Rs 118630 for 16 and above years old orchard (Table-5.8). At overall level the maintenance cost was Rs 102070 per ha accounted for by fixed cost of Rs 56527 and variable cost of Rs 45493 per ha.

**Table- 5.7: Maintenance cost of bearing high density apple on marginal farms**

(Rs./ha)

<b>Cost component</b>	<b>5-6Year</b>	<b>7-10Year</b>	<b>10-15 Year</b>	<b>16&amp; above</b>	<b>All</b>
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	5692	6696	7500	8272	6868
Interculture	3013	4487	5199	6066	4500
FYM fertilizers application	2679	3348	3750	4522	3454
Plant protection	1808	2210	2557	3309	2368
Pruning of plant	3616	4500	5966	7500	5116
Other watch& ward etc.	670	670	739	735	697
Total labour used	17478	21911	25711	30404	23003
B. Material cost					
F Y M	4158	4713	5419	5899	4925
Fertilizer	5545	6654	9127	11235	7719
Plant protection	6654	8317	9698	10112	8468
Other sticks wire rope etc.	400	400	682	588	499
Total Material Cost	16757	20084	24926	27834	21611
D. Interest on working capital	1975	3398	4502	5790	3662
<b>Total variable cost</b>	<b>36210</b>	<b>45393</b>	<b>55139</b>	<b>64028</b>	<b>48276</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	275	275	275	275	275
Interest on fixed assets	275	275	275	275	275
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>56527</b>	<b>56527</b>	<b>56527</b>	<b>56527</b>	<b>56527</b>
<b>Total costs (1+2)</b>	<b>92737</b>	<b>101920</b>	<b>111666</b>	<b>120555</b>	<b>104803</b>

**Table -5.8: Maintenance cost of bearing high density apple on small farms**

(Rs./ha)

<b>Cost component</b>	<b>5-6Year</b>	<b>7-10Year</b>	<b>10-15 Year</b>	<b>16&amp; above</b>	<b>All</b>
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	6303	6875	7670	8571	6811
Interculture	3750	4830	5455	6161	4477
FYM fertilizers application	3910	3409	3750	4554	3769
Plant protection	1915	2273	2727	3482	2239
Pruning of plant	3830	4545	6136	7500	4592
Other watch& ward etc.	500	606	700	700	572
Total labour used	20208	22538	26438	30968	22460
B. Material cost					
F Y M	4275	4881	5324	5923	4714
Fertilizer	5738	7012	8873	8857	6741
Plant protection	6863	8527	9539	10075	7953
Other sticks wire rope etc.	465	500	682	700	518
Total Material Cost	17341	20920	24418	25555	19926
D. Interest on working capital	2267	3468	4070	5530	3107
<b>Total variable cost</b>	<b>39816</b>	<b>46926</b>	<b>54926</b>	<b>62053</b>	<b>45493</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	300	300	300	300	300
Interest on fixed assets	300	300	300	300	300
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>56577</b>	<b>56577</b>	<b>56577</b>	<b>56577</b>	<b>56577</b>
<b>Total costs (1+2)</b>	<b>96393</b>	<b>103503</b>	<b>111503</b>	<b>118630</b>	<b>102070</b>

### **Maintenance cost of fruit bearing high density apple on semi-medium farms**

In case of semi-medium apple orchards, the maintenance cost was increasing from Rs 96151 per ha (Rs 57077 as fixed cost and Rs 39074 as variable cost) on 5-6 year old orchard to Rs 120555 (Rs 57077 as fixed cost and Rs 64759 as variable cost) for 16 and above years old orchard (Table-5.9). At overall level the maintenance cost was Rs 104344 per ha accounted for by fixed cost of Rs 57077 and variable cost of Rs 47267 per ha.

### **Maintenance cost of fruit bearing high density apple on medium farms**

On medium apple orchards, the maintenance cost increased from Rs 96984 per ha (Rs 57657 as fixed cost and Rs 39327 as variable cost) on 5-6 year old orchard to Rs 126468 (Rs 57657 as fixed cost and Rs 68811 as variable cost) for 16 and above years old orchard (Table-5.10). At overall level the maintenance cost was Rs 110603 per ha accounted for by fixed cost of Rs 57657 and variable cost of Rs 52946 per ha.

### **Maintenance cost of fruit bearing high density apple on large farms**

The maintenance cost, in case of large apple orchards, increased from Rs 100729 per ha (Rs 59937 as fixed cost and Rs 40792 as variable cost) on 5-6 year old orchard to Rs 126032 (Rs 59937 as fixed cost and Rs 66095 as variable cost) for 16 and above years old orchard (Table-5.11). At overall level the maintenance cost was Rs 115244 per ha of which fixed cost was Rs 59937 and variable cost was Rs 55307 per ha.

### **Maintenance cost of fruit bearing high density apple on all farms**

The maintenance costs for different age groups, in case of all high density apple orchards considered together have been presented in Table-5.12. It may be seen from the table that maintenance costs, increased from Rs 96984 per ha on 5-6 year old orchard (Rs 57555 as fixed cost and Rs 39429 as variable cost) to Rs 122991 for 16 and above years old orchard (Rs 57555 as fixed cost and Rs 51390 as variable cost). This scenario depicts direct relation of maintenance cost with the age of orchard and this happens due larger size of trees of older age groups requiring higher doses of inputs and labour. At overall level the maintenance cost was Rs 108945 per ha of which fixed cost was Rs 57555 and variable cost was Rs 51390 per ha.

**Table -5.9: Maintenance cost of bearing high density apple on semi-medium farms**

(Rs./ha)

<b>Cost component</b>	<b>5-6Year</b>	<b>7-10Year</b>	<b>10-15 Year</b>	<b>16&amp; above</b>	<b>All</b>
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	6291	7056	8000	8553	6999
Interculture	3285	4778	5400	5921	4288
FYM fertilizers application	3099	3167	3700	4474	3360
Plant protection	1952	2389	2700	3421	2343
Pruning of plant	3719	4667	6000	7895	4774
Other watch& ward etc.	500	600	700	700	578
<b>Total labour used</b>	<b>18846</b>	<b>22657</b>	<b>26500</b>	<b>30964</b>	<b>22342</b>
B. Material cost					
F Y M	4482	5114	5561	6345	5017
Fertilizer	5820	7554	10536	10081	7452
Plant protection	7275	9007	10243	10674	8553
Other sticks wire rope etc.	388	556	633	700	504
<b>Total Material Cost</b>	<b>17965</b>	<b>22231</b>	<b>26973</b>	<b>27800</b>	<b>21526</b>
D. Interest on working capital	2263	3722	4511	5995	3399
<b>Total variable cost</b>	<b>39074</b>	<b>48610</b>	<b>57984</b>	<b>64759</b>	<b>47267</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	550	550	550	550	550
Interest on fixed assets	550	550	550	550	550
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>57077</b>	<b>57077</b>	<b>57077</b>	<b>57077</b>	<b>57077</b>
<b>Total costs (1+2)</b>	<b>96151</b>	<b>105687</b>	<b>115061</b>	<b>121836</b>	<b>104344</b>

**Table -5.10: Maintenance cost of bearing high density apple on medium farms**

(Rs./ha)

Cost component	5-6Year	7-10Year	10-15 Year	16& above	All
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	6375	7219	8063	8871	7680
Interculture	3750	4875	5156	6613	5158
FYM fertilizers application	3281	3656	3938	8597	3896
Plant protection	2063	2438	2813	3387	2703
Pruning of plant	3750	4688	6188	7742	5676
Other watch& ward etc.	600	600	700	700	652
Total labour used	19819	23476	26858	35910	25765
B. Material cost					
F Y M	4309	4862	5414	6056	5195
Fertilizer	5525	7459	10498	10094	8460
Plant protection	6906	8288	9503	10374	8830
Other sticks wire rope etc.	500	500	688	700	601
Total Material Cost	17240	21109	26103	27224	23086
D. Interest on working capital	2268	3623	4553	5677	4095
<b>Total variable cost</b>	<b>39327</b>	<b>48208</b>	<b>57514</b>	<b>68811</b>	<b>52946</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	840	840	840	840	840
Interest on fixed assets	840	840	840	840	840
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>57657</b>	<b>57657</b>	<b>57657</b>	<b>57657</b>	<b>57657</b>
<b>Total costs (1+2)</b>	<b>96984</b>	<b>105865</b>	<b>115171</b>	<b>126468</b>	<b>110603</b>

**Table-5.11: Maintenance cost of bearing high density apple on large farms**

(Rs./ha)

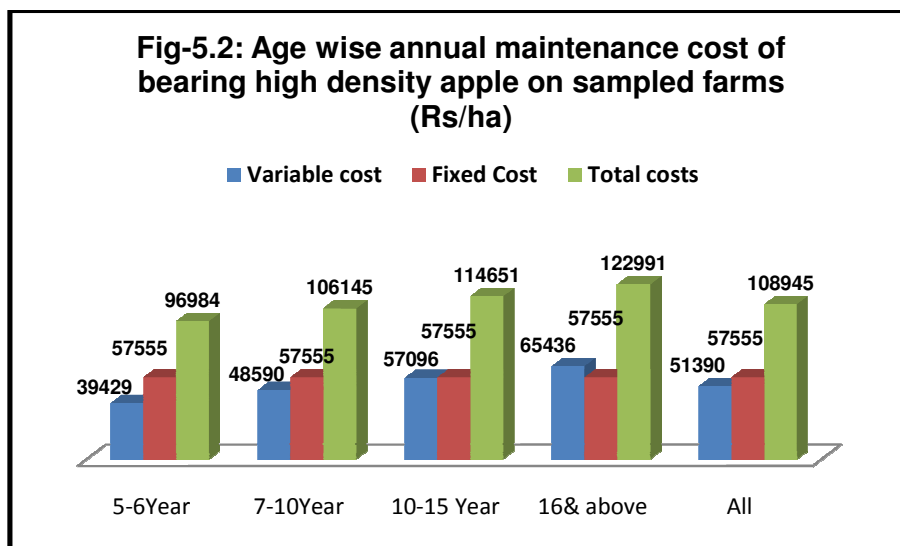
<b>Cost component</b>	<b>5-6Year</b>	<b>7-10Year</b>	<b>10-15 Year</b>	<b>16&amp; above</b>	<b>All</b>
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	6589	7345	8095	8852	7856
Interculture	3884	5095	5845	6596	5506
FYM fertilizers application	3321	3595	3750	4478	3867
Plant protection	2250	2534	2845	3289	2796
Pruning of plant	3589	4500	6000	7509	5650
Other watch& ward etc.	500	600	700	700	634
Total labour used	20133	23669	27235	31424	26309
B. Material cost					
F Y M	4650	5125	5728	6292	5550
Fertilizer	6039	8441	9044	10786	8845
Plant protection	7247	9044	10250	10786	9511
Other sticks wire rope etc.	400	414	600	700	549
Total Material Cost	18336	23024	25622	28564	24455
D. Interest on working capital	2323	3988	4891	6107	4543
<b>Total variable cost</b>	<b>40792</b>	<b>50681</b>	<b>57748</b>	<b>66095</b>	<b>55307</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	1980	1980	1980	1980	1980
Interest on fixed assets	1980	1980	1980	1980	1980
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>59937</b>	<b>59937</b>	<b>59937</b>	<b>59937</b>	<b>59937</b>
<b>Total costs (1+2)</b>	<b>100729</b>	<b>110618</b>	<b>117685</b>	<b>126032</b>	<b>115244</b>



**Table -5.12: Maintenance cost of bearing high density apple on overall farms**

(Rs./ha)

<b>Cost component</b>	<b>5-6Year</b>	<b>7-10Year</b>	<b>10-15 Year</b>	<b>16&amp; above</b>	<b>All</b>
<b>1.Variable cost</b>					
A. Labour used					
Preparation & maintenance of basin	6319	7099	7955	8760	7416
Interculture	3575	4877	5563	6471	4983
FYM fertilizers application	3301	3455	3769	4501	3715
Plant protection	2029	2403	2769	3324	2575
Pruning of plant	3692	4558	6031	7572	5288
Other watch& ward etc.	530	611	706	704	626
Total labour used	19446	23003	26793	31332	24603
B. Material cost					
F Y M	4435	4990	5585	6210	5222
Fertilizer	5811	7657	9439	10598	8127
Plant protection	7071	8757	10007	10624	8919
Other sticks wire rope etc.	419	462	635	689	536
Total Material Cost	17736	21866	25630	28121	22804
D. Interest on working capital	2247	3721	4673	5983	3983
<b>Total variable cost</b>	<b>39429</b>	<b>48590</b>	<b>57096</b>	<b>65436</b>	<b>51390</b>
<b>2. Fixed Cost</b>					
Land revenue tax etc.	12	12	12	12	12
Depreciation on implements , machinery& Farm building	789	789	789	789	789
Interest on fixed assets	789	789	789	789	789
Rented value of owned land	23750	23750	23750	23750	23750
Pro- establishment cost	32215	32215	32215	32215	32215
<b>Total Fixed Cost</b>	<b>57555</b>	<b>57555</b>	<b>57555</b>	<b>57555</b>	<b>57555</b>
<b>Total costs (1+2)</b>	<b>96984</b>	<b>106145</b>	<b>114651</b>	<b>122991</b>	<b>108945</b>



### Cost and returns from high density apple

Apple is the most important fruit crop of the state and it takes about 4 years to reach bearing stage. Since early seventies, the farmers have been shifting to apple growing because it gives more returns than the field crop. At that time standard varieties were grown and these varieties takes longer time in coming to bearing stage now about from two decades High density apple varieties imported and cultivation is started. Presently semi high density spur types of varieties are very popular and grown in low height very successfully.

The age wise maintenance cost, gross returns, return over maintenance cost, marketing cost, net returns of different age of high density apple was worked out and presented in Table 5.13 for different size of farms. The high density apple started economic bearing at the age of five years. The bearing stage has been classified into 5-6, 7-10, 11-15 and above 16 years. The category wise cost and returns are described below:-

**Marginal Farms:** The marginal farmers have also grown high density apple varieties successfully. As the age of plant increases the maintenance cost, gross returns, and returns over maintenance cost, marketing cost and net returns also increases at over all level. The maintenance cost worked out to be Rs.104805, gross returns to be Rs.670752, marketing cost to be Rs. 204439. The returns over maintenance cost (Rs.565947) and net returns per hectare worked out to be Rs.361508 as presented

in Table 5.13. At over all level marginal farmers spent about Rs. 20423 on apple cultivation and produce apple worth Rs.130710 and earn net income from high density apple a sum of Rs.70448. The net return varies from Rs.20331 at the age of 5-6 years to Rs 799816 at the age of 16 & above years.

**Small farmers:** On small farms per hectare net returns varies from Rs.47322 at the age of 5-6 years to Rs.892913 at the age of 16 and above years. The maintenance cost, gross returns, returns over maintenance cost, marketing cost and net returns increases as age of plant increases. At over all level, per hectare maintenance cost of high density apple worked out to be Rs.102021, marketing cost Rs.142691, gross returns Rs.508185. Per hectare return over maintenance cost and total costs worked out to be Rs. 406164 and Rs.263473, respectively. Per farm maintenance cost, marketing cost, gross returns, return over maintenance cost, and net returns over total costs worked out to be Rs.38087, Rs 53271, Rs 189722, Rs.151635 and Rs.98364 respectively (Table 5.13).

**Semi-medium farms:** On semi-medium farms per hectare net return varies from Rs. 51277 to Rs.943991 across different age groups. The maintenance cost, gross returns, returns over maintenance cost, marketing cost and net returns per hectare increases as increase the age of tree. At overall level, per hectare maintenance cost, marketing cost, gross returns, return over maintenance cost and net return worked out to be Rs.104343, Rs.170333, Rs.590888, Rs.486545 and Rs.316212 respectively. The per farm maintenance cost, marketing cost, gross returns, returns over maintenance cost, and net returns worked out to be Rs.118023, Rs.192665, Rs.668360, Rs.550337 and Rs.353672, respectively (Table-5.13).

**Medium farms:** It may be seen from the Table 5.13 that on different age groups per hectare net returns varies from Rs.51212 to Rs.849003. The maintenance cost, gross returns, returns over maintenance cost, marketing cost and net returns increases substantially as age of plant increases. At over all level per hectare maintenance cost, marketing cost, gross returns, returns over maintenance cost, and net returns worked out to Rs.110603, Rs.244316, Rs.834235, Rs.723632 and Rs.479316, respectively. Per farm maintenance cost, marketing cost, gross returns,

returns over maintenance cost, and net returns worked out to be Rs.368307, Rs.813572, Rs.2778005, Rs.2409698 and Rs.1596126 respectively.

**Large farms:** In Himachal Pradesh large farmers have 0.43 percent of the total holding. In case of horticulture crop large farmers uses the full package of practices to grow the fruit and they also harvested more than other type/category of farms. On large farms per hectare net returns varies from Rs.69125 on 5-6 years age group to Rs.1117896 at 16 and above years age group. The maintenance cost, marketing cost, gross returns, returns over maintenance cost, and net returns increases as age of trees increases. The per hectare maintenance cost, marketing cost, gross returns, returns over maintenance cost, and net returns have been worked out to be Rs.115244, Rs.300867, Rs.1105391, Rs.990147, and Rs.689280, respectively. At per farm level the expenditure/income was worked out to Rs.995324, Rs.2598487, Rs.9546900, Rs.8551676, and Rs.5953089 for maintenance cost, marketing cost, gross return, returns over maintenance cost and net returns, respectively.

**Overall farm:** On an average, high density apple grower per hectare received Rs.50394 to Rs.618364 from apple crop. At overall, net returns were worked out to be Rs.470017 per hectare. It may be seen from the Table 5.13 that medium and large sizes of farms have earned more than overall level. On the other hand, marginal, small, and semi-medium categories of farm earned lesser than overall level. The total cost/return increases with the age of trees. At overall level, per hectare maintenance cost, marketing cost, gross returns, returns over maintenance cost and net returns worked out to be Rs.108938, Rs.706214, Rs.236197, Rs.815152 and Rs.470017, respectively.

**Table- 5.13: Age- wise and category wise per hectare costs and returns from high density apple on sample farms**

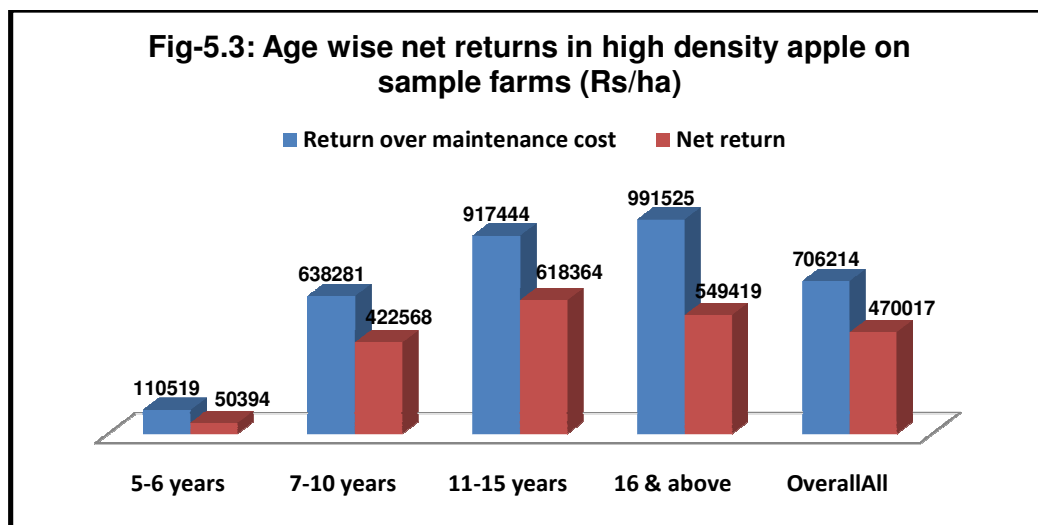
(Value in Rupees/ha)

Age in years	Maintenance cost	Gross returns	Return over maintenance cost	Marketing cost	Net return
<b>Marginal</b>					
5-6	92737	162642	69905	49574	20331
7-10	101919	597178	495259	182007	313252
10-15	111666	906409	794743	276264	518479
16 & above	120555	1323852	1203297	403481	799816
All	104805	670752	565947	204439	361508
Per farm	20423	130710	110287	39839	70448
<b>Small</b>					
5-6	96392	199820	103428	56106	47322
7-10	103503	665473	561970	186839	375131
10-15	111500	782727	671227	219764	451463
16 & above	118112	1405714	1287602	394689	892913
All	102021	508185	406164	142691	263473
Per farm	38087	189722	151635	53271	98364
<b>Semi medium</b>					
5-6	96153	207136	110983	59706	51277
7-10	105685	724111	618426	208725	409701
10-15	115061	900293	785232	259518	525714
16 & above	121843	1497508	1375665	431674	943991
All	104343	590888	486545	170333	316212
Per farm	118023	668360	550337	192665	357672

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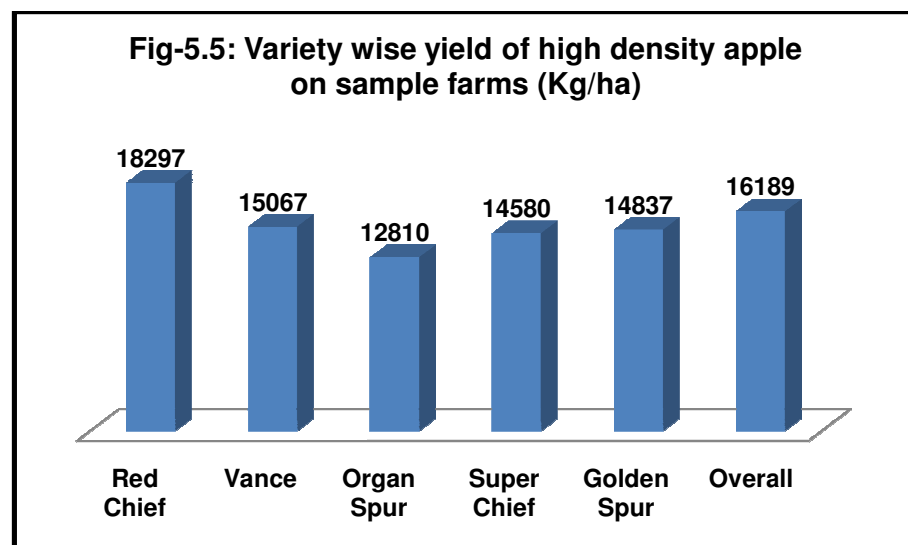
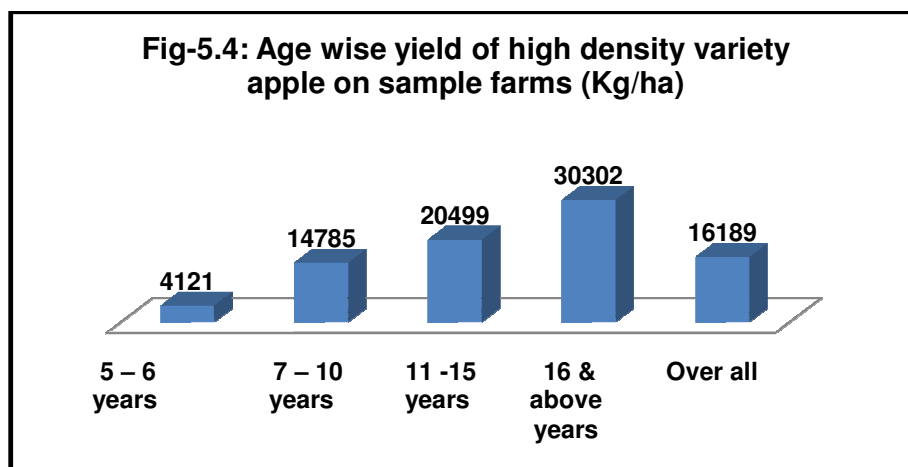
Table: 5.13 Contd...

Age in years	Maintenance cost	Gross returns	Return over maintenance cost	Marketing cost	Net return
<b>Medium</b>					
5-6	96985	209575	112590	61378	51212
7-10	105863	703843	597980	206128	391852
10-15	115168	962025	846857	281749	565108
16 & above	122467	1373817	1251350	402347	849003
All	110603	834235	723632	244316	479316
Per farm	368307	2778005	2409698	813572	1596126
<b>Large</b>					
5-6	100730	233357	132627	63502	69125
7-10	110618	909586	798968	247573	551395
10-15	117884	1236551	1118867	336555	782312
16 & above	126030	1709104	1583074	465178	1117896
All	115244	1105391	990147	300867	689280
Per farm	995324	9546900	8551576	2598487	5953089
<b>Overall</b>					
5-6	96984	207503	110519	60125	50394
7-10	106146	744427	638281	215713	422568
10-15	114687	1032131	917444	299080	618364
16 & above	122960	1114485	991525	442106	549419
All	108938	815152	706214	236197	470017
Per farm	85589	640996	555407	185733	369674



### Productivity of high density apple

It may be seen from Table 5.14 that the production of high density apple varieties apple at overall level ranged between 4121 kg to 30302 kg per hectare during 5 to 16 years of age group. The highest yield was recorded 2098 kg/ha on large farms and lowest 9916 kg/ha on small farms. Further, analysis reveals that yield of Red Chief variety was relatively higher than other high density varieties of apple grown on sample farms.



**Table- 5.14: Age-wise and variety-wise productivity of high density apple on sampled farms**

(kg/ha)

Name of variety	5 – 6 years	7 – 10 years	11 -15 years	16 & above years	Over all
<b>Marginal</b>					
Red Chief	4200	15000	21000	30000	16418
Vance	3167	12667	18500	30625	14575
Organ Spur	2650	10050	16300	42666	11217
Super Chief	-	-	-	-	-
Golden Spur	-	-	-	-	-
Total	3536	12982	19705	28779	14582
<b>Small</b>					
Red Chief	4125	14750	19750	28500	12200
Vance	3750	12333	13750	29375	9455
Organ Spur	3783	12425	12500	26250	9033
Super Chief	3900	12125	17500	-	8080
Golden Spur	4375	11375	13125	23750	11642
Total	3899	12984	15272	27428	9916
<b>Semi-medium</b>					
Red Chief	4784	16160	20960	31600	15595
Vance	4000	14875	13500	-	8156
Organ Spur	3680	12500	14000	25000	8569
Super Chief	3520	14100	15000	27000	9255
Golden Spur	3300	12000	10000	22000	10120
Total	4227	14777	18373	30561	12059

Contd...

**Table-5.14: Contd...**

(kg/ha)

Name of variety	5 – 6 years	7 – 10 years	11 -15 years	16 & above years	Over all
<b>Medium</b>					
Red Chief	4240	13600	19680	27500	15663
Vance	4300	14500	20000	30000	19760
Organ Spur	3000	13000	14000	23333	17273
Super Chief	4667	15333	17333	26666	16000
Golden Spur	3600	14666	18666	28000	16233
Total	4150	13937	19050	27204	16519
<b>Large</b>					
Red Chief	4800	19280	24666	33320	21695
Vance	4100	13140	20000	30052	19318
Organ Spur	2875	14400	22000	24020	16544
Super Chief	3920	13480	16800	31304	20037
Golden Spur	3333	12666	20000	29500	17384
Total	4242	16538	22482	31074	20098
<b>Over All</b>					
Red Chief	4571	16788	22450	31925	18297
Vance	3936	13685	18523	30038	15067
Organ Spur	3189	12477	18652	25447	12810
Super Chief	4308	13278	16746	30712	14580
Golden Spur	3580	12704	16761	27534	14837
Total	4121	14785	20499	30302	16189



### **Summing up**

The gestation period is less in high density apple as compared to seedling rootstock. On an average, in a hectare 600 plants are planted. Initial cost of plantation of sample high density apple was Rs.88129 per hectare. About 35 percent of the total cost was incurred on human labour, 34 percent material and 28 percent cost fixed cost. Annual maintenance cost of non bearing apple was Rs.46896, Rs.51491 and Rs.57741 per hectare, respectively for 1-2, 2-3 and 3-4 years of age orchard. Annual maintenance cost of bearing orchard was Rs 108945 per hectare. As far as age of orchards is concerned the total cost varied from Rs 96984 for age of 5-6 years to Rs 122991 per hectare for age of above 16 years. Net returns from high density apple on sampler farms were worked out to be Rs.470017 per hectare. The analysis reveals that medium and large sizes of farms have earned more than overall level. On the other hand, marginal, small, and semi-medium categories of farm earned lesser than overall level. The total cost/return increases with the age of trees. The yield of high density apple varieties apple at overall level ranged between 4121 kg to 30302 kg per hectare during 5 to 16 years of age group. The highest yield was recorded 2098 kg/ha on large farms and lowest 9916 kg/ha on small farms. Further, analysis reveals that yield of Red Chief variety was relatively higher than other high density varieties of apple grown on sample farms.

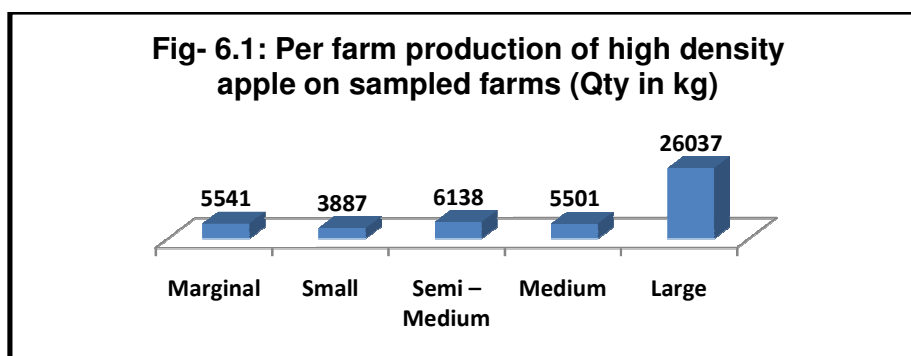
## PRODUCTION AND MARKETING OF HIGH DENSITY APPLE PLANTATION

### Production and utilization of high density apple

Per farm production of high density apple was 5541 kg on marginal farms, 3887 kg on small farms, 6138 kg on semi-medium farms, 5501 kg on medium farms and 26037 kg on large farms. At overall level production of apple was 47104 kg out of which 99.66 percent was sold and rest consumed at home and gifted to relatives and friends. The details of utilization pattern of high density apple produced on various categories of farms have been presented in Table 6.1.

**Table- 6.1: Utilization pattern of high density apple on sampled farms**  
(Qty in kg/farm)

Category Of Farm	Total Production	House Hold Consumption	Gifted	Sold
Marginal	5541	41	-	5500
%	100.00	0.73	-	99.27
Small	3887	50	-	3837
%	100.00	1.29	-	98.71
Semi –Medium	6138	25	-	6113
%	100.00	0.40	-	99.60
Medium	5501	10	-	5491
%	100.00	0.18	-	99.82
Large	26037	12	25	26000
%	100.00	0.40	0.09	99.87
Total	47104	138	25	46941
%	(100.00)	(0.29)	(0.05)	(99.66)



## **Marketing**

The marketing is a complex procedure as the meaning of the marketing varies with the persons involved in the trade. For example, producer may consider marketing as just selling while middleman thinks it is a way of a earning of livelihood whereas the consumer may consider the marketing as a little more than the frequent trips to the markets to buy fruits, etc. But the fact is that marketing is primarily concerned with meeting the needs of the ultimate consumer through the basic products involved and the services added thereto.

Marketing of horticultural produce depends mainly on the decision on where, when, how and how much to market. The most important one is that the horticultural produce is perishable in nature and quick transportation is a pre-requisite for the efficient marketing.

## **Marketing functions**

Any single activity performed in carrying a product from the point of production to the ultimate point of consumption may be termed as marketing function and this provides time, space and form utility. The preparation of apples for market involves grading, packing, transportation, etc. etc. As all these functions are important to determining the returns to the farmer, therefore, great care has to be ensured at each and every stage. Thus, any carelessness at any stage in the marketing channel will result in lower prices/returns.

**Picking:** In the study area, the fruit is harvested during July to September depending upon elevation of the area. The picking operation is done by hand. After the fruit has been picked up, it is carefully placed in a picking basket and later on shifted to a bigger basket called Kilta. Which can be strapped to the shoulders and carried on the back to a place where grading and packing is to be done. It is observed that the orchardist on an average incurred Rs.13.27 for picking Rs. 4.66 per box for assembling of the fruit. It is also observed from the Table 5.3 that the size of holding has marginal difference in charges paid for picking and assembling but generally picking and assembling has inverse relation with farm size (Table 6.2).

**Grading:** Grading of apples, a crucial operation, determines the price of the produce. In the study area, mechanical grading is totally absent. The orchardist follow the same standard in grading as the other parts of the state follows, i.e. apple is graded for size and quality. There are generally two quality and six size grades. Thus, each lot of a particular variety of apple is mostly divided into 12 different grades.

Factors determining the quality of apple include shape, stage of maturity, colour, free from injuries, blemishes, disease spot, bruises etc. There are three recognized quality grades of apple commonly known as A, B and C. The first two grades are marketable while the C grade apple are not considered fit for table purposes and classified as 'culled' apple to be sold for processing purposes only. Each fruit has been individually graded for quality, size and grading is done by hand. The operation consists of holding each fruit in left hand at the broadest point and placing right hand fingers between the tips of thumb and middle finger. The size grade is then determined on the basis of the number of fingers to cover the gap between thumb and the middle fingers (Table 6.2). It is estimated that the farmers on an average incurred about Rs. 22.07 per standard box for grading. The expenses incurred on grading have negative relation with farm size because of the economics of scales (Table 6.3).

**Table- 6.2: Various size of apple grades in Himachal Pradesh**

<b>Grade</b>	<b>Diameter of fruit (in mm)</b>	<b>No. of fingers placed between left hand thumb and middle finger</b>
1. Super large	85	4 fingers and thumb
2. Extra large	80	4 fingers and some extra space
3. Large	75	3-4 fingers
4. Medium	70	2-3 fingers
5. Small	65	2-3 fingers
6. Extra small	60	0-1 finger
7. Pittoo*	55	None

\* This is mixed with C grade apples and sold as culled for processing.

**Table-6.3: Charges paid by orchardists regarding picking, assembling and grading of high density apple on sampled farms.**

(Rs/box)

Size of Holding	Picking	Assembling	Grading	Total
Marginal	14.78	4.95	24.54	44.27
Small	14.23	4.60	23.40	42.23
Semi-Medium	13.96	5.00	21.54	40.50
Medium	11.84	4.44	20.72	37.00
Large	11.52	4.32	20.16	36.00
Overall Total	13.27	4.66	22.07	40.00

**Packing of apple:** Packing means arranging of fruit in suitable containers in such a way that the produce is not damage en-route on its journey and the consumers get good quality fruit at his place. Packing, therefore, deserve to be done meticulously. It is to be compact so that fruit do not shake inside the box and thus bruises are avoided. On the other hand, too tightly packed fruits have equal chances of getting damaged.

The farmers used corrugated fibre board carton for packing of apples and four layers of trays for super large and extra large grades whereas five layers of trays for other grades are used in the box and one tray is used as topper to cover the fruit. On an average, farmers incurred Rs.87.02 on packing material including cost of box. The major share of the cost of packing material is on box and trays (Table 6.4). As the farm size increase the cost of packaging marginally decreases because of economics of scale.

**Table- 6.4: Costs incurred by high density apple orchardist for packing material on sampled farms**

Particulars	Marginal	Small	Semi – Medium	Medium	Large	Overall
Cost of box	40.00	40.00	40.00	40.00	40.00	40.00
Cost of tray	30.00	30.00	30.00	30.00	30.00	30.00
Charges of Assembling and closing of Box	6.70	6.50	6.00	5.90	5.50	6.12
Leveling, Stapling and other Charges	12.40	11,40	10.50	10.20	10.00	10.90
Total	89.10	87.90	86.50	86.10	85.50	87.02

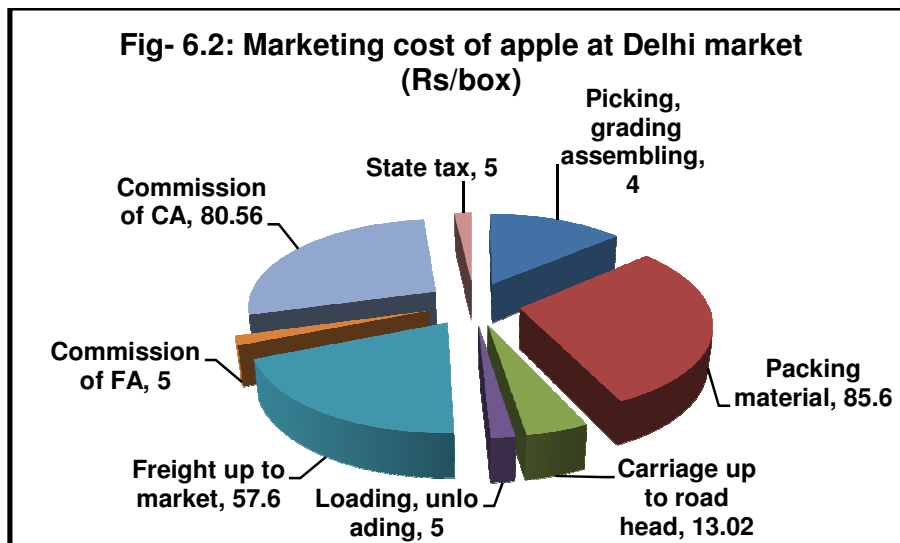
**Transportation:** Transportation is the means of providing place utility to the produce. Apple like all other fruits and vegetables, are not consumed in the area where they are produced because of very high marketable surplus. In such a situation-adding place utility to the produce is essential to ensure better returns to growers. Apple is highly perishable, calling for efficient transportation for quick disposed so that the consumer gets fresh fruit in good condition. The farmers reported that they take their produce to nearest road head on human back. Most of the farmers have small quantity of produce. They do not produce enough to justify a full truck load in a single lot. Such producers join together so that a full truck load is formed and then a truck is hired for transportation. But most of the orchardist reported that they sell their produce through forwarding agent who arrange for the transport. Most of the apple is dispatched to Delhi, being the largest fruit market of the country. The details of transportation cost have been given in (Table 6.5). It may be observed from this table that the producers had incurred Rs. 13.02 per box in bringing an apple box to the nearest road head, while Rs.57.60 was paid as freight up to Delhi market. The average total transportation cost worked out to be Rs.85.62 per box.

**Table- 6.5: Average transportation cost in marketing of apple on sampled farms**

Transportation cost	(Rs/box)					
	Marginal	Small	Semi-Medium	Medium	Large	Overall
Orchard To Road Head	11.30	11.80	12.30	14.00	15.70	13.02
Forwarding Charges [Producing Area]	5.00	5.00	5.00	5.00	5.00	5.00
Freight From Road Head To Delhi	55.00	55.00	58.00	60.00	60.00	57.60
State Tax	5.00	5.00	5.00	5.00	5.00	5.00
Loading Typing Counting & unloading at Destination	5.00	5.00	5.00	5.00	5.00	5.00
Total	81.30	81.80	85.30	89.00	90.70	85.62

**Table- 6.6: Marketing cost borne by producer for high density apple marketing**  
(Rs/box)

Particulars	Marginal	Small	Semi-Medium	Medium	Large	Overall
Picking Assembling &Grading	44.27 (15.78)	42.23 (14.68)	40.50 (13.98)	37.00 (12.51)	36.00 (11.79)	40.00 (13.71)
Packing Material & Assembling	81.30 (28.98)	81.80 (28.42)	85.30 (29.46)	89.00 (30.09)	90.70 (29.70)	85.62 (29.34)
Carriage Upto Road Head	11.30 (4.02)	11.80 (4.09)	12.30 (4.25)	14.00 (4.73)	15.70 (5.15)	13.02 (4.46)
Loading &unloading Charges	5.00 (1.78)	5.00 (1.74)	5.00 (1.73)	5.00 (1.69)	5.00 (1.64)	5.00 (1.71)
Transportation Cost Upto Market	55.00 (19.60)	55.00 (19.10)	58.00 (20.03)	60.00 (20.28)	60.00 (19.19)	57.60 (19.74)
Charges Of Forwarding Agent	5.00 (1.78)	5.00 (1.74)	5.00 (1.73)	5.00 (1.69)	5.00 (1.64)	5.00 (1.71)
Commission of Commission Agent	73.60 (26.24)	82.00 (28.48)	78.40 (27.08)	80.80 (27.31)	88.00 (28.81)	80.56 (27.61)
State Tax	5.00 (1.78)	5.00 (1.74)	5.00 (1.73)	5.00 (1.69)	5.00 (1.64)	5.00 (1.71)
Total	280.47 (100.00)	287.83 (100.00)	289.50 (100.00)	295.80 (100.00)	305.40 (100.00)	291.80 (100.00)
Whole sale price	920	1025	980	1010	1100	1007



### **Distribution and marketing channels**

Distribution comprises movement of apples from producer to ultimate consumer. In this process, the fruit has to pass through more than one hand except when it is directly sold to the consumer by the producer which is a rare phenomenon. In this chain, various agencies like growers, pre-harvest contractors, commission agents, wholesalers, retailers etc. are engaged. This chain of intermediaries/functionaries is called marketing channel. The following are the channels generally used by Himachal growers:-

1. Producer- consumer
2. Producer-forwarding agent-commission agent-wholesaler-retailer-consumer.
3. Producer-pre-harvest contractor-commission agent/wholesaler-retailer-consumer.
4. Producer-commission agent-wholesaler (self of F.A.)-retailer-consumer.
5. Producer-H.P.M.C.-wholesaler-retailer-consumer.
6. Producer-retailer-consumer.
7. Producer-processing unit-consumer.

The most popular channel followed by villagers of this area in case of table apple is channel No.2 while in case of culled apple, they generally sell the fruit to H.P.M.C and HIMFED.

### **Price spread and marketing margins**

Effective marketing strategy, especially for such a commodity depends upon mainly on the decision of where, when, how and how much to market? For this the services of a chain of middlemen and functionaries became inevitable. Each of the functionaries and service has to be paid for. The share of consumer's rupee received by the producer depends upon several factors including the channel used. The difference between the price paid by the consumer and that received by the producer consists of marketing costs and marketing margins. As the product moves closer and closer to the ultimate consumer, the price per unit increases in order to provide for margins to the various intermediaries and functionaries and provide auxiliary service as well. Therefore, to protect the interest of producers and consumers it is essential to integrate the role of intermediaries. Thus, price spread is



a good yard stick for measuring marketing efficiency i.e. minimum input of various economic resources which will result in satisfaction of goods and services as desired by the consumers.

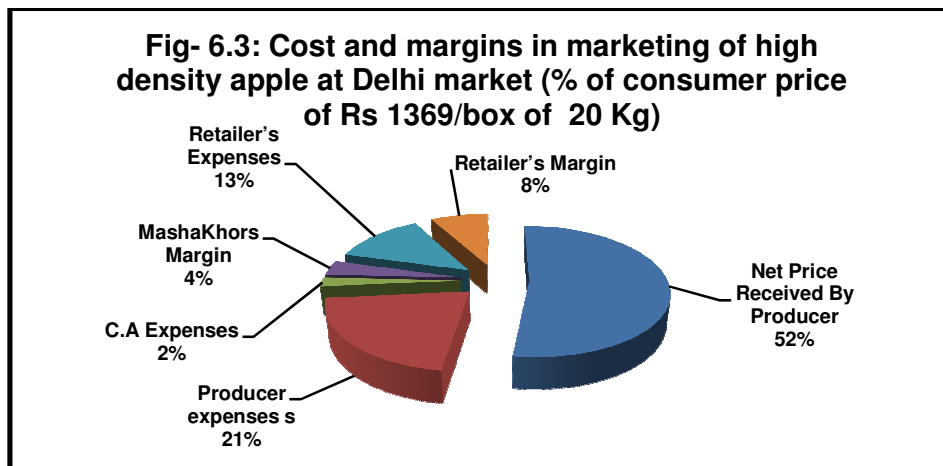
Marketing margins include all costs of assembling, grading, packing, transportation, handling, processing, storage, wholesaling and retailing in the entire process of marketing. The study of marketing margins is very essential in the formulation of an appropriate marketing policy. On the one hand, producers deserve a legitimate share in the consumer's rupee, and on the other, consumer have to be safeguarded against excessive prices. These twin objectives can best be achieved by ensuring the services of intermediaries and functionaries at reasonable costs.

The price spreads/margins were worked out for Delhi market because most of the marketed surplus of apple was sold through Azadpur Market. The details of the costs and margins are presented in Table 6.7. The table shows that the producer's share in consumer's rupee was 52.23 per cent. The marketing margins of Mashakhor was 3.67 per cent, the retailers margin was higher than Mashakhor's margin. The main reason why retailer margin 7.94 per cent is relatively higher as compared to Mashakhor's margin is that he bears the major burden of losses and deterioration of quality.

The table further reveals that marketing costs borne by producers account for 21.41 per cent of the consumer rupee. Since apple fruits are fragile and need proper packing, the packing cost of apple is high i.e. 6.35 per cent of the consumer's price. The carriage and transportation cost account for 5.51 per cent. Though Delhi market is officially regulated but still the commission and fees are charged at higher rates by intermediaries. The commission fees and taxes account for 5.88 per cent of the consumer's price. All the intermediaries provide some service, bear costs and make profit.

**Table- 6.7: Producer's share and marketing margins of high density apple on sampled farms (when produce is marketed at Delhi)**

<b>Particulars</b>	<b>Rs Per Box of 20 Kg</b>	<b>Percentage</b>
Net Price Received By Producer	715.20	52.23
Expenses Incurred By Orchardist		
(I )Picking Assembling And Grading	40.00	2.92
(ii )Packing Material &Assembling	85.62	6.35
(iii )Carriage Up To road Head	13.02	0.95
(iv )Loading &Unloading	5.00	0.36
( v )Transportation Cost Up To Market	57.60	4.20
(Vi )Commission Of Forwarding Agent	5.00	0.36
(vii ) Commission Of Commission Agent	80.56	5.88
(viii )State Tax Octroi Postage Etc	5.00	0.36
Sub Total	291.80	21.41
3. Whole Sale Price	1007.00	73.54
4. Expenses Incurred By C.A, Or Mashakhori		
(I ) Carriage &Handling Charges	10.00	0.73
(ii )Market Fee, Commission & Other Charges	20.14	1.47
Sub Total	30.14	2.20
5.MashaKhori's Margin	50.35	3.67
6.Mashakhori's sale price	1087.49	79.42
7. Retailer's Expenses		
(I ) Carriage &handling Charges	10.00	0.73
(ii )Retailer's Losses @ 15 %	163.12	11.91
(iii )Retailer's Margin	108.74	7.94
Sub Total	281.81	20.58
Consumers Price	1369.35	100.00



### Summing up

On an average per farm production of apple was 47104 kg out of which 99.66 percent was sold and rest was either consumed at home or gifted to relatives and friends. The preparation of apples for market involves grading, packing, transportation, etc. etc. As all these functions are important to determining the returns to the farmer, therefore, great care has to be ensured at each and every stage. The apple is harvested during July to September depending upon elevation of the area. The picking operation is done by hand. The orchardist incurred Rs.13.27 for picking, Rs. 4.66 per box for assembling of the fruit. Grading of apple is done manually. There are generally two quality and six size for the grades. Farmers incurred about Rs. 22.07 per standard box for grading. The farmers used corrugated fibre board cartons and four layers for large and extra large grade apples whereas five layers of fruit for other grades are used in the box. On an average, farmers incurred Rs.87.02 on packing material including cost of box. The farmers take their produce to nearest road head on human back. Most of the apple is dispatched to Delhi, being the largest fruit market of the country. The producers had incurred Rs. 13.02 per box in bringing an apple box to the nearest road head, while Rs.57.60 was paid as freight up to Delhi market. The average total transportation cost worked out to be Rs.85.62 per box.

The most popular channel followed by villagers of this area in case of table apple was "Producer-forwarding agent-commission agent-wholesaler-retailer-consumer".

The price spreads/margins were worked out for Delhi market because most of the marketed surplus of apple was sold through Azadpur Market. The producer's share in consumer's rupee was 52.23 per cent. The marketing margins of Mashakhori was 3.67 per cent, the retailers margin was higher than Mashakhori's margin. The main reason why retailer margin 7.94 per cent is relatively higher as compared to Mashakhori's margin is that he bears the major burden of losses and deterioration of quality. Marketing costs borne by producers account for 21.41 per cent of the consumer rupee. Though Delhi market is officially regulated but still the commission and fees are charged at higher rates by intermediaries. The commission fees and taxes account for 5.88 per cent of the consumer's price.

The above analysis shows that the net returns from marketing of apple are quite high at both the levels i.e. at Mashakhori and retailer level. Thus, there is vast scope for creating more competition in this business. This would not only help the marketing of apples more competitively but would also bring the consumer's price down and would reduce the excess profit & margins.

## Chapter –7

### **PROBLEMS OF HIGH DENSITY APPLE ORCHARDISTS**

The area and production of High density apple has increased manifold during last two decades particularly of spur type of variety. The increase in area and production has also brought many problems with regard to production and marketing of fruits. Profit from high density apple production depends upon many factors like productivity, time of packing, care taken in grading and packing, time taken in transportation, type of storage facility available etc. The following major problems of high density apple orchardist of Himachal Pradesh have been discussed in this chapter.

1. Problem of root stock
2. Irrigation
3. Fertilizer
4. Plant protection chemicals
5. Picking, grading and packing
6. Packing material
7. Transportation
8. Support/procurement price (culled apple)
9. Technical know- how.

#### **Problem of root stock**

It was observed during course of investigation that most of the orchards of lower elevation are not in good condition because of poor varieties and of low productivity. And majority of farmers have planned to uproot these orchards (standard varieties) and plan to establish the high density/semi high density apple orchard in this process. They faces the main problems i.e. not availability of root stock, lack of timely availability of root stock, poor quality of root stock, high cost and high incidence of diseases. The problems were asked by all type of orchardist and response have been presented in Table 7.1 to 7.6, respectively from marginal, small, semi medium, medium, large and overall farms. Table 7.6 shows that at over all

level 47 per cent farmers says that rootstock is not available most often, 35 farmers tells root stock not available some time and 18 per cent farmers reported that they never feel the problem in root stock availability. The lack of timely availability 50 percent respond that not available in time and about 72 per cent farmers reported that root stock is not of good quality and most of the farmers tells that root stock is costly and about 73 per cent farmers reported that it is resistance to diseases.

### **Irrigation problem**

Due to lack of irrigation the fruit setting and growth are badly damaged and this affects both quality and quantity of fruit. Irrigation is the major problems of large farmers. Thus the problem of irrigation is aggravated with the increase of farm size. The responses regarding lack of irrigation facilities have been given in Table 7.1 to 7.6 respectively on marginal, small, semi medium, medium, large and overall farms.

### **Problem of fertilizers**

Fertilizer plays a very important role in both quality and quantity of production of fruit. Lack of fertilizer availability badly affects the plant growth as well as quality and quantity of fruit. Lack of timely availability, high cost and lack of the availability of micronutrient are also the major problems faced by all farmers.

### **Problem of plant protection chemicals**

Plants of fruit are delicate and so many types of diseases affect them from root to leaves. The production of fruit particularly apple is not possible without plant protection chemical. In case of plant protection chemicals high cost, timely availability and poor quality of plant protection chemicals are the main problems faced by all cultivators see more details in Table 7.1 to Table 7.6.

### **Picking, grading and packing**

In the study area, the fruit is harvested during July to September depending upon the elevation of area. The picking, packing and grading operation is done by hand so the shortage of skilled labour, higher wages and non availability of labour are the main problems faced by all cultivators. Without proper packing it is not possible to maintain the quality of apples.

### **Packing material**

Another important function in the process of marketing is that of packing. Once the commodity reaches the market in well packed form the buyers offer better prices viz-a-viz other lots which are not well packed. Apple being delicate in nature needs proper packing which may ensure least damage during transportation from apple producing area to distant markets. This in turn may fetch better prices and high returns to the orchardist. In Himachal Pradesh, the apple is generally packed in cfb cartons with a capacity of about 20 kg and 10 kg. The apple orchardists were asked about the problems faced by them regarding packing boxes, packing material. The problems revealed by them were shortage of cfb cartons, high prices, non availability in time and not available at desired place. The problems are presented in Tables 7.1 to 6.6. Out of 74 per cent sampled orchardists only 40 (54.05%) reported that shortage most often and 15 (20%) tells problem raised some time and 19 (25.67%) told that no shortage is face in availability of cfb cartons. About 74 per cent farmers told about high prices most often and about 12 per cent reported high prices are some time and about 14 per cent told that they never feel higher prices (Table 7.6).

### **Problems of transportation**

Transportation is one of the important functions in the marketing of apples. Apples are carried from orchard to road head/forwarding point and from there transported to consuming markets. Thus, for efficient marketing, mode of transportation is very important. About transportation the orchardist were asked to reveal the problem which they face during transporting the apple. The main problems identified by the growers were lack of timely availability of vehicles; village is not linked with road, high transportation charges and lack of all weather roads.

Table 6.6 reveals that lack of all weather road and high transportation charges were more acute problems and more than half farmers faced these problems. The shortage of vehicle and not availability in time was not reported by 47 and 81 per cent farmers respectively. They never feel these problems.

### **Problems of support/procurement price**

Apples which are not fit for table purposes are sold to the processors. In Himachal Pradesh, horticultural produce marketing and processing corporation (hpmc) and

HIMFED generally procure all such culled apples. Table 7.6 reveals that about 100 percent farmers reported that hpmc do not pay value of procured apples in time. Thus they were of the view that the Government's policy is not proper in this regard.

### **Technical know-how**

Package of practices of high density apple is different from standard varieties. The density of apple is more than double because semi high density varieties are more suitable than high density high density because of the uneven topography of the region. For this the orchardist were asked to reveal the problems which they face during the production of high density apple. The main problems identified by the growers with regard to technical know-how regarding orchard establishment, lack of knowledge about variety polynizer, training of plant, pruning of plant, spray schedule, fertilizer and micro nutrient, identification of diseases and identification of insect and pest Table 7.6 reveals that more than 50 per cent of orchardist face these problems.

### **Summing up**

The area and production of High density apple has increased manifold during last two decades particularly of spur type of variety. The increase in area and production has also brought many problems with regard to production and marketing of fruits. Profit from high density apple production depends upon many factors like productivity, time of packing, care taken in grading and packing, time taken in transportation, type of storage facility available etc. The major problems faced by the high density apple orchardist of Himachal Pradesh were, Problem of lack of root stock, lack of Irrigation, short supply of Fertilizers, Plant protection chemicals, labour shortages for picking, grading and packing, non-availability of packing material, lack of timely availability of trucks, farmers reported that hpmc does not pay value of procured apples in time. Thus, from the above discussion it may be concluded that the growers should provided timely supply of packing material, better price for culled fruit, proper marketing facilities and recent technical know-how regarding production and marketing. The growers will get better returns for their produce, this will not improve the socio-economic condition only of the apple growers but it will also improve the economy of the state.



**Table- 7.1: Problems faced by marginal sample orchardists**

(Sample size-39 ) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1. Root stock	Non-availability	41	38	21
	Lack of timely availability	36	31	33
	Poor quality	13	18	69
	High cost	64	21	15
	High incidence of diseases	8	13	79
2. Irrigation	Inadequate facilities	77	13	10
3. Fertilizers	Lack of timely availability	51	13	23
	Poor quality	25	52	23
	High cost	51	21	28
	Lack of availability of micro-nutrient fertilizers	21	51	28
4.Plant protection chemicals	Lack of timely availability	26	64	10
	Poor quality	51	31	18
	High cost	72	13	10
5.Picking,Grading & Packing	Shortage of skilled labour	64	26	10
	Higher wages	77	10	13
	Non-availability of labour	38	51	11
6. Packing material	Shortage of CFB cartons	38	26	26
	Shortage of other material	13	21	67
	High prices	64	13	23
	Non-availability in time	13	18	69
	Non availability at desired place	8	5	87
7. Transportation	Lack of timely availability	13	18	69
	Shortage of vehicles	5	8	87
	Villages are not linked with roads	13	10	77
	High transportation charges	77	13	10
	Lack of all weather roads	51	26	23
8.Support/Procurement Price (culled apple)	Prices not announced in time	90	5	5
	Prices not paid in time	100	000	000
	Low prices	100	000	000
9. Technical know-how	Orchard establishment	27	51	23
	Lack of knowledge about variety/polynizer	90	5	5
	Training of plants	51	26	23
	Pruning of plants	26	51	23
	Spray schedule	21	38	41
	Fertilizer and Micronutrients	38	31	31
	Identification of disease	51	26	23
	Identification of insect & pest	64	26	10

**Table- 7.2: Problems faced by small sample orchardists**

(Sample size- 21) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1. Root stock	Non-availability	48	38	14
	Lack of timely availability	57	24	12
	Poor quality	10	14	76
	High cost	71	14	15
	High incidence of diseases	10	14	76
2. Irrigation	Inadequate facilities	71	14	14
3. Fertilizers	Lack of timely availability	57	24	19
	Poor quality	24	57	19
	High cost	67	14	19
	Lack of availability of micro-nutrient fertilizers	24	19	57
4.Plant protection chemicals	Lack of timely availability	14	86	00
	Poor quality	57	19	24
	High cost	76	14	10
5.Picking,Grading & Packing	Shortage of skilled labour	86	10	5
	Higher wages	90	5	5
	Non-availability of labour	48	31	14
6. Packing material	Shortage of CFB cartons	71	14	14
	Shortage of other material	24	33	43
	High prices	86	3	5
	Non-availability in time	19	24	57
	Non availability at desired place	10	14	76
7. Transportation	Lack of timely availability	47	24	29
	Shortage of vehicles	10	15	75
	Villages are not linked with roads	24	33	43
	High transportation charges	85	15	00
	Lack of all weather roads	71	24	5
8.Support/Procurement Price (culled apple)	Prices not announced in time	100	000	000
	Prices not paid in time	100	000	000
	Low prices	100	000	000
9. Technical know-how	Orchard establishment	39	48	14
	Lack of knowledge about variety/polynizer	71	19	10
	Training of plants	85	10	5
	Pruning of plants	47	47	6
	Spray schedule	71	24	5
	Fertilizer and Micronutrients	85	5	10
	Identification of disease	71	19	10
Identification of insect & pest	85	5	10	

**Table- 7.3: Problems faced by semi-medium sample orchardists**

(Sample size-3) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1.Root stock	Non-availability	67	22	11
	Lack of timely availability	78	11	11
	Poor quality	11	22	67
	High cost	66	22	11
	High incidence of diseases	11	11	78
2. Irrigation	Inadequate facilities	78	22	00
3. Fertilizers	Lack of timely availability	56	33	11
	Poor quality	22	56	22
	High cost	67	11	22
	Lack of availability of micro-nutrient fertilizers	22	22	56
4.Plant protection chemicals	Lack of timely availability	22	78	00
	Poor quality	78	22	00
	High cost	89	00	11
5.Picking,Grading & Packing	Shortage of skilled labour	78	11	11
	Higher wages	78	22	00
	Non-availability of labour	56	22	22
6. Packing material	Shortage of CFB cartons	89	11	00
	Shortage of other material	22	67	11
	High prices	89	11	00
	Non-availability in time	11	11	78
	Non availability at desired place	22	22	56
7. Transportation	Lack of timely availability	56	22	22
	Shortage of vehicles	11	11	78
	Villages are not linked with roads	22	22	56
	High transportation charges	67	11	22
	Lack of all weather roads	22	11	67
8.Support/Procurement Price (culled apple)	Prices not announced in time	100	00	00
	Prices not paid in time	100	00	00
	Low prices	100	00	0
9. Technical know-how	Orchard establishment	44	44	12
	Lack of knowledge about variety/polynizer	78	11	11
	Training of plants	56	22	22
	Pruning of plants	22	56	22
	Spray schedule	44	33	22
	Fertilizer and Micronutrients	55	33	11
	Identification of disease	66	11	22
Identification of insect & pest	56	22	22	

**Table- 7.4: Problems faced by medium sample orchardists**

(Sample size- 2) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1. Root stock	Non-availability	50	00	50
	Lack of timely availability	100	00	00
	Poor quality	00	50	50
	High cost	100	00	00
	High incidence of diseases	100	00	00
2. Irrigation	Inadequate facilities	100	00	00
3. Fertilizers	Lack of timely availability	50	50	00
	Poor quality	100	00	00
	High cost	100	00	00
	Lack of availability of micro-nutrient fertilizers	00	100	00
4.Plant protection chemicals	Lack of timely availability	00	100	00
	Poor quality	00	50	50
	High cost	100	00	00
5.Picking,Grading & Packing	Shortage of skilled labour	100	00	00
	Higher wages	100	00	00
	Non-availability of labour	00	50	50
6. Packing material	Shortage of CFB cartons	100	00	00
	Shortage of other material	00	50	50
	High prices	100	00	00
	Non-availability in time	00	50	50
	Non availability at desired place	00	50	50
7. Transportation	Lack of timely availability	100	00	00
	Shortage of vehicles	100	00	00
	Villages are not linked with roads	100	00	00
	High transportation charges	00	50	50
	Lack of all weather roads	00	50	50
8.Support/Procurement Price (culled apple)	Prices not announced in time	100	00	00
	Prices not paid in time	100	00	00
	Low prices	100	00	00
9. Technical know-how	Orchard establishment	00	50	50
	Lack of knowledge about variety/polynizer	00	100	00
	Training of plants	50	50	00
	Pruning of plants	00	50	50
	Spray schedule	100	00	00
	Fertilizer and Micronutrients	00	100	00
	Identification of disease	100	00	00
Identification of insect & pest	00	50	50	

**Table- 7.5: Problems faced by large sample orchardists**

(Sample size- 3) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1. Root stock	Non-availability	67	33	00
	Lack of timely availability	67	00	33
	Poor quality	00	00	100
	High cost	33	33	34
	High incidence of diseases	100	00	00
2. Irrigation	Inadequate facilities	67	33	00
3. Fertilizers	Lack of timely availability	33	67	00
	Poor quality	67	33	00
	High cost	33	67	00
	Lack of availability of micro-nutrient fertilizers	00	67	33
	Lack of timely availability	00	67	33
4.Plant protection chemicals	Poor quality	67	33	00
	High cost	100	00	00
	Shortage of skilled labour	33	67	00
5.Picking,Grading & Packing	Higher wages	100	00	00
	Non-availability of labour	33	67	00
	Shortage of CFB cartons	00	33	67
6. Packing material	Shortage of other material	33	33	34
	High prices	67	33	00
	Non-availability in time	00	00	100
	Non availability at desired place	00	33	67
	Lack of timely availability	100	00	00
7. Transportation	Shortage of vehicles	00	00	100
	Villages are not linked with roads	00	00	100
	High transportation charges	100	00	00
	Lack of all weather roads	00	33	67
	Prices not announced in time	100	00	00
8.Support/Procurement Price (culled apple)	Prices not paid in time	100	00	00
	Low prices	100	00	00
	Orchard establishment	00	00	100
9. Technical know-how	Lack of knowledge about variety/polynizer	33	67	00
	Training of plants	00	33	67
	Pruning of plants	33	33	34
	Spray schedule	67	33	00
	Fertilizer and Micronutrients	00	33	67
	Identification of disease	33	33	34
	Identification of insect & pest	67	33	00

**Table- 7.6: Problems faced by overall sample orchardists**

(Sample size- 74) (Percentage to total sample)

Particulars	Problem	Responses		
		Most often	Sometimes	Never
1.Root stock	Non-availability	47	35	18
	Lack of timely availability	50	24	26
	Poor quality	11	18	71
	High cost	66	19	16
	High incidence of diseases	15	12	73
2. Irrigation	Inadequate facilities	76	15	9
3. Fertilizers	Lack of timely availability	53	22	19
	Poor quality	28	51	21
	High cost	58	18	23
	Lack of availability of micro-nutrient fertilizers	20	41	39
	Lack of timely availability	20	73	7
4.Plant protection chemicals	Poor quality	55	27	18
	High cost	77	11	12
	Shortage of skilled labour	73	19	9
5.Picking,Grading & Packing	Higher wages	82	9	9
	Non-availability of labour	42	45	14
	Shortage of CFB cartons	54	20	26
6. Packing material	Shortage of other material	18	71	51
	High prices	74	12	14
	Non-availability in time	14	19	67
	Non availability at desired place	10	12	78
	Lack of timely availability	34	19	47
7. Transportation	Shortage of vehicles	9	9	82
	Villages are not linked with roads	19	18	63
	High transportation charges	77	13	10
	Lack of all weather roads	50	24	26
	Prices not announced in time	95	3	2
8.Support/Procurement Price (culled apple)	Prices not paid in time	100	00	00
	Low prices	100	00	00
	Orchard establishment	30	47	23
9. Technical know-how	Lack of knowledge about variety/polynizer	78	15	7
	Training of plants	59	22	19
	Pruning of plants	31	50	19
	Spray schedule	42	32	26
	Fertilizer and Micronutrients	51	26	23
	Identification of disease	59	15	26
	Identification of insect & pest	68	21	11