Establishment of Hydroelectric Projects: Impact on Production of Fruit Crops Especially Apples in Kinnaur and Kullu Districts of Himachal Pradesh

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Abstract: The State of Himachal Pradesh is endowed with large potential of hydroelectric power generation. Consequently, the efforts of State as well as the Central Governments are focused on harnessing this potential. These projects on one hand are important from the point of view of increasing demand for power, on the other hand there are apprehensions that, these projects have detrimental impact on the environment of the project affected areas. Keeping in view these facts, the present study on impact of hydroelectric projects on production of fruit crops especially apple crop has been proposed to be undertaken in Kinnaur and Kullu Districts of the state. In the study areas of these districts, initial years of project implementation have been crucial. Both project affected families and non-affected families have revealed that due to deforestation and pollution in the area, there has been 2 to 4 percent reduction in the yield of apple crop during project implementation years. Now they have got some relief, but the production of apple crop still fluctuating. Though their area under apple crop is increasing, and now they are shifting their cultivated lands to orchards. Besides negative effects of hydroelectric projects, there are other climatic/weather conditions, the age of plants, a dearth of pollinating varieties and less intensity of pollinating agents, which also affects the production of apple crop. There is a need of an integrated approach from all the stokeholds to solve this problem. Transmission lines are also the cause of worry. The situation is rather sensitive in the study area of District Kullu, where transmission line overcast the fields and orchards. Here approximately one bigha (0.097 hectare) of land per household and thirty seven apple plants per household is affected by transmission line. Households express that there are adverse impacts of this transmission line on their apple crop. However, 36.66 per cent respondents observed that their production of apple crop has reduced to 2 to 4 percent, while 16.67 per cent respondents observed a reduction of 4 to 6 per cent in apple crop production. Only 6.67 per cent respondents believed that they have received more than 6 per cent reduction in the production of their apple crop. In the study areas increasing dryness in land is a matter of worry to households. It is also affecting the apple crop production. Households find elected panchayat body in their respective areas, an effective platform to express their grievances, it could also be a place to hydroelectric project authorities to interact with local people continuously. After the implementation of projects the occupation structure of the households gets diversified. Households in the study areas are getting employment opportunities in projects, running their business, getting opportunities in transport sector etc., but agriculture/ horticulture is still their main source of employment. Diversified off-farm income and employment opportunities after implantation of projects have increased their off-farm income from 10 to 20 percent. As per the Keynesian “psychological law of consumption”, they have utilized this enhanced off farm income mostly on consumption purposes initially. To assess the long term impact of hydroelectric projects on apple crop production and human environment, there should be collective

studies on Geography, Hydraulic study, Terrestrial environment, Ground water status and a socio-economic study of the area etc. This would help in the reduction of grievances and future policy planning.

With this background the present study has been conducted with the following objectives.

Objectives

1. To profile the hydroelectric projects in the State with special reference to Districts Kinnaur and Kullu.
2. To study the trends in area and production of fruit emphasizing project affected families in the Districts under study.
3. To analyse the farmers' project authorities' interactions and policy analysis to work out the impact of hydroelectric power projects on fruit production.
4. To study the problems faced by apple growers due to hydroelectric power projects and suggest corrective measures to overcome these problems.

Methodology

Area and Coverage

The study has been conducted in the Districts of Kinnaur and Kullu due the fact that there is large number of small, medium and large projects in these Districts and both these Districts represent diverse agro climatic conditions. The study has been based on secondary as well as primary data. The required secondary data has been collected from the relevant sources.

Sampling procedure

From the project affected areas a random sample of 30 orchardists has been drawn and delineated to each project in proportion to extent of project affected area under these projects. In addition to these, a sample of 20 orchardists has been selected from the nearby areas to work as control sample for working out the impact of the project on selected parameters. Thus, the study is based on a total sample of 100 orchardists.

Profile of Hydroelectric Projects selected under study area

Kullu District: Allain Duhangan Hydroelectric Project of 192 MW is started in year 2005 and competed in year 2010. The estimate cost of this project has been Rs. 922.00 crores. This project is in Manali Tehsil of District Kullu.

Kinnaur District: Karcham-Wangtoo Hydroelectric Project of 1000 MW is started in year 2005 and gets completed in August 2011. The project has been commissioned in August, 2011. The estimated cost of project is Rs. 7080.00 crore. This project is in Nichar Tehsil of District Kinnaur.

Main findings

Trends in Area and Production of Apple and other Fruits in Districts under Study

Area as well as production of Apple has increased in Himachal Pradesh during the years 1987-88 to 2010-11. The same thing is observed in Kullu and Kinnaur Districts as well. The data of Manali Tehsil of District Kullu and Nichar Tehsil of Distirct Kinnaur is looked into separately. It is seen that area under apple crop has shown an upward trend in Manali Tehsil, and fluctuation is observed in production, the same is happening in Nichar Tehsil also where area under apple crop has shown an upward trend, and fluctuation in production of apple is observed there. Besides hydroelectric projects affects, there are several other reasons provided by district officials for this fluctuation in the production, such as; climatic/weather conditions, maintenance of orchards, availability of pollinizing varieties, pollinating insects, age of trees etc., among which abiotic factors (climatic conditions) play a major role. People are shifting cultivated lands to orchards in lieu of getting more profits in recent years in the study areas of both the Districts.

Farmers and Project Authorities Interaction analysis in Area under Study

It is observed in the chapter that maximum respondents in study area have stated that project authorities used to visit for getting cooperation in the implementation of the project and giving benefits out of that. Addressing problems of local people such as; crakes in the houses due to blasting also have been the main purpose of the visits of the project authorities. The problems are generally related with whole community, and households urge that project authorities should continuously address the grievances of affected families. Project affected families are also anxious about the depleting ground water status in the study area. The demand of full time employment opportunities in projects is still among the respondents. Through elected panchyat body households would raise their demands to the settlements of all their grievances as a plan in case their problems are not solved.

Problems Faced by Apple Growers in Hydroelectric Project areas under Study

As the households reveal, during the project implementation period, due to dust and pollution, households of project affected families have received less production of Apple crop. This is now improving, but not satisfactorily. Pollination problem is one of the problems in the study area of District Kullu, while depleting ground water status add to fluctuation in the production of apple crop in the study area of District Kinnaur. As it is seen maximum respondents revealed that their spoilage of apple produce have increased less than twenty percent, which is the sign of some hope that there is chance to improve the local environment, so that apple production again gets the momentum. Nevertheless, maximum respondents in the study area of District Kullu have stated that projects have provided them casual and contractual employment. Projects should have scope for full time employment opportunities

to local youth. It is seen that increase in off-farm employment opportunities mostly in transport and local business activities have increased off-farm income 10 to 20 percent in the study areas of both the Districts. Households are spending off-farm income mostly on consumption purposes.

People seem sceptical about the negative effects of transmission line on Apple crop and their lives. Sample households have expressed their views regarding the impact of transmission line on their orchard and their life. The situation is rather sensitive in the study area of District Kullu, where the transmission line overcast the fields and orchards. Here on an average one bigha (0.097 hectare) of land per household is covered by transmission line and on an average affecting thirty seven apple plants per household. Households express that there are adverse impacts of these transmission line on their apple crop. The 36.66 per cent respondents observed that their production of apple crop has reduced to 2 to 4 percent, while 16.67 per cent respondents observed a reduction of 4 to 6 per cent in apple crop production. Only 6.67 per cent respondents believed that they have received more than 6 per cent reduction in the production of their apple crop. There are 40 per cent respondents, who observed no reduction in production, because their land is not affected by transmission line, but they too believe the fall in production due to the dearth of pollination plants. In other impacts the fear of mishap under the transmission line and continuous noise in transmission line disturb honey bees and other pollinating agents in the area, are also expressed by households

There are short term and long term impact of hydroelectric power projects, in the affected areas. Short term impact are quit visible, as households of the study areas have revealed, but for long term impact there need to be an integrated approach from all the disciplines of science including social science, so that a conducive solution of all the grievances can be found.

Conclusions, Suggestions and Policy Implications

Horticulture is the main source of income in the study areas of District Kinnaur and District Kullu. Commencements of hydroelectricity projects in these areas have directly and indirectly affected the income, employment, apple crop area and production of the sample households. No problem is solved at one time, and no solution is the final solution of all the grievances. There is always been scope for proper utilization of resources as well as capacities to channelize the development process.

People participation is inevitable for the success of any projects and plans. In Himachal Pradesh the area under Apple crop as well as the production of Apple has increased in recent years. The same is true for Kullu and Kinnaur Districts. The data of Manali Tehsil of Kullu District and Nichar Tehsil of Kinnaur District is also taken into consideration. Here, it is also found that the area and production of Apple crop has increased since last eight to ten years. People are shifting cultivated lands to orchards in lieu of getting more profits in recent years in both the Districts.

Some suggestions are given by households for the improvement in the production of apple crop. In the study area of District Kullu households emphasized on the solution of the problem of pollination, pollution and negative effects if any of transmission line on apple & other fruits. However, reducing ground water status in apple orchard, training and better farm management techniques, preservation of local biotic resources and afforestation work is also in consideration among the sampled households. While, in the study area of District Kinnaur, the emphasis is on the improvement of transportation network surrounding the apple orchards. Here, the depleting ground water status is also in main consideration for project affected families. Providing Training and Inputs for better farm Management and required seriousness in the afforestation work are too in the consideration of the sample households.

After analysing all the relevant information from the sample households, considering their suggestions and observing the local conditions surrounding the project affected areas, some **recommendations** emerge for the improvement in interaction between the project authorities and the households. Besides, State Government initiatives, project authorities can take some policy initiatives to solve all the grievances of project affected families. Some of these kinds of policy initiatives are given below. It would help households in many ways, and they could get good benefits from their orchards:

(a) Horticulture Development:

(i) Project authorities should organise Training and New farm management technique camps in the local areas in regular time interval, and local people participation should be ensured in them.

(ii) Project authorities should help in the marketing of apple crop in project affected areas, and the involvement of local progressive and enterprising orchardist can be taken for this.

(iii) Value addition in the apple fruit crop can be encouraged in the area by Project authorities.

(iv) A regular check up of depleting ground water status, if it is there in orchards, should be done by project authorities. They could conduct studies or coordinate such studies related to such problems. It will improve their interaction with affected families.

(v) Project authorities should help the affected families in the preservation of local biotic resources, especially forests. This will have direct as well as indirect effect on the production of apple crop in the area.

(b) Income and Employment Generation

(i) A good way of fruitful interaction is, if projects provide technical and employment oriented education to the local youth of project affected area. This will help them to get high income employment opportunities in projects as well as other areas also.

(ii) Projects should make plans provide full time employment opportunities to local unemployed youth. Preference can be given to educated and technically sound candidates. This will improve their income as well as their involvement in the project activities.

(iii) Projects authorities can help the local enterprising people to develop the self employment opportunities in their area.

In general, project authorities should regularly interact with affected families through their elected panchyat body. It will help them to listen the grievances of these families due to projects, and on this platform with the involvement of gram shaba a satisfactory solution of all their problems can be found. This will improve the participation, coordination, cooperation and interaction of local community with project authorities.

Executive Table

Name of project	**District**	**Tehsil**	**Household Schedules**		**Total**
			Project affected families	**Non-affected families**	
Allain Duhangan	1	1	30	20	50
Karcham Wangtu	1	1	30	20	50
Total	2	2	60	40	100
CGR % (1987-88 to 2010-11)	**Himachal Pradesh**	**District Kullu**	**Manali Tehsil***	**District Kinnaur**	**Nichar Tehsil****
Area under apple crop	2.38	2.56	2.19	4.49	4.43
Production of apple crop	3.42	2.52	2.53	7.95	6.87
Particulars	**District Kullu**			**District Kinnaur**	
	Project affected families		Non-affected families	Project affected families	Non-affected families
Average family size	5.53		4.50	5.77	5.25
% Working age population (15-60 year)	75.30		75.22	72.99	62.86
% worker in Agriculture/ Horticulture	88.98		91.02	81.57	68.33
Dependency rate	0.40		0.44	0.52	0.75
Literacy rate	69.27		62.83	79.31	80.00
Lower production due to pollution problem (% respondents expressed)	100.00		100.00	80.00	80.00
Lower intensity of honey bees (% of respondents expressed)	86.67		85.00	73.33	80.00
Problems in fruit size (% of respondents expressed)	63.33		60.00	60.00	65.00
Area affected under transmission line (Area Ha.)/ household	0.097		0	0.037	0
Apple plants affected under transmission line/household	37		0	0	0

*Data related to Manali Tehsil is collected since 2001-02 to 2011-12
**Data related to Nichar Tehsil is collected since 2003-04 to 2011-12

Chapter 1

INTRODUCTION

1.1 Energy and Development

'Development' means the social and economic improvement in a broad sense. It is needed to create opportunities, prosperity and choices for all inhabitants of the world and it must proceed in a way that leaves choices available for future generations also. Nature provides human societies and economies with a complex life support system, air, water, food and suitable climate for survival. There are limits to nature's capacity to absorb impacts. Once alteration of nature's initial State occurs, it cannot quickly revert back to the initial State.

The main sources of energy available on the Earth are solar and nuclear energy. Energy from other sources is being negligible in comparison. All practical sources of mechanical energy found on the Earth derive their energy originally from sunlight. These sources of energy are: hydro energy, wind energy, tidal energy, seismic energy, geothermal energy, etc. while most of the carbon in an ecosystem is recycled, there can be a small rate of deposition of detritus in a reducing environment that can accumulate over the ages to form large fossil deposits. These are: oil, coal, natural gas, oil shale and peat. Two sources of nuclear energy are: nuclear fission and nuclear fusion.

The economics of energy is closely linked with developmental issues. The current approaches to energy planning aim at providing energy services to the society at lowest cost and with the least negative social and environmental impacts. There is a critical relationship between supply and demand, land use, bio resource issues, environmental sustainability, economic development and resources sharing.

1.2 The Need

The State of Himachal Pradesh is endowed with large potential of hydroelectric power generation. Consequently, the efforts of State as well as the Central Government are focussed on harnessing this potential. As a result, large number of hydroelectric power projects has come up in different parts of State and many of these are in different stages of execution. These projects on one hand are important from the point of view of increasing demand for power, on the other hand there are apprehensions that, these projects have detrimental impact

on the environment of the project affected areas. This has direct link with the livelihood of the rural population, which predominantly has agriculture based livelihood strategies. In the light of these facts the study of impact of hydroelectric power projects becomes relevant for the vast majority of the project affected families, whose number are increasing continuously with new projects coming up in public and private sectors.

These development projects have both direct and indirect impacts on the people living in the projects area. Some of these effects may be beneficial to the people, like creation of job and business opportunities, while some others have adverse impacts on the socio-economic and environmental conditions of the people. The project activities such as construction of dam, water tunnels, roads and other infrastructure affect the environment which may impact growth of plants and human health adversely.

Another dimension of the whole scenario is the fact that usually the land acquired from the farmers for the project activities is generally more than the land allotted in lieu of this. Obviously, there is a decline in the size of land holdings of the project-affected families leading to smaller cultivated area in project-affected villages. As a result, the production and quality of agriculture output in the affected villages may also decline. Keeping in view these facts, the present study on impact of hydroelectric projects on production of fruit crops especially apple crop has been proposed to be undertaken in Kinnaur and Kullu Districts of the State, with the following objectives:

1.3 Objectives

5. To profile the hydroelectric projects in the State with special reference to Districts Kinnaur and Kullu.

6. To study the trends in area and production of fruit emphasizing project affected families in the Districts under study.

7. To analyse the farmers' project authorities' interactions and policy analysis to work out the impact of hydroelectric power projects on fruit production.

8. To study the problems faced by apple growers due to hydroelectric power projects and suggest corrective measures to overcome these problems.

Chapter 2

METHODOLOGY

2.1 Area and Coverage

The study has been conducted in the Districts of Kinnaur and Kullu due the fact that there is large number of small, medium and large projects in these Districts and both these Districts represent diverse agro climatic conditions. The study is based on secondary as well as primary data. The required secondary data has been collected from the relevant sources.

2.2 Sampling procedure

The main thrust of the study has been on the primary data to be collected from the project affected orchardists. For this purpose, a list of hydroelectric power projects in both the Districts was drawn and two such projects, one small and other medium or large were randomly selected in each District. The project affected areas under each selected project was identified. From the project affected areas a random sample of 30 orchardists has been drawn and delineated to each project in proportion to extent of project affected area under these projects. In addition to these, a sample of 20 orchardists was selected from the nearby areas to work as control sample for working out the impact of the project on selected parameters. These orchardists were operating under identical conditions. Hence, 'with and without' approach was followed for working out the impact. Thus, the study is based on a total sample of 100 orchardists.

2.3 Data analysis

The data has been analysed with simple tabular analysis for arriving at the results of study.

TABLE 2.1: Project wise Number of Households Surveyed

Name of Project	Households		Total
	Project affected families	Non-affected families	
Allain Duhangan	30	20	50
Karcham Wangtu	30	20	50
Total	60	40	100

2.4 Limitations of the study

There have been some limitations which have occurred during the study, these are as follows:

i) In the selected area mostly the farmers fall under marginal (≤ 1 hectare) land class category, so they have not further fragmented into different land class holdings.

ii) The relevant data regarding the environment impact and other problems during project implementation is not complied during the study. Study is based on the information given by households. There may be a chance of memory biasness.

iii) The systematic record of secondary data regarding apple and other fruit crops at Tehsil level is not properly attained, during the time of study.

Chapter 3

PROFILE OF HYDROELECTRIC PROJECTS IN THE DISTRICTS UNDER STUDY

Power is considered as the most important input for economic development. It is widely recognized for its role in different sectors of economy. The power sector makes a direct and significant contribution to economy in terms of revenue generation, employment opportunities and enhancing the quality of life. Himachal Pradesh has been blessed with vast hydroelectric potential in its five river basins, namely Yamuna, Satluj, Beas, Ravi and Chenab. Through preliminary hydrological, topographical and geological investigations, it has been estimated that about 23,000 MW of hydel potential can be exploited in the State by constructing various major, medium, small and mini/micro hydel projects on these five river basins. Out of this hydel potential only 7,913 MW has been harnessed by various agencies. (Economic Survey of Himachal Pradesh, 2011-12). The Himachal State Government has adopted multi prolonged strategy for power development through State sector, central sector and joint venture and independent power producers. There are two private sector projects, Allain Duhangan in Kullu District and Karchham Wangtoo in Kinnaur District is selected for present study in the study area.

3.1 Profile of Hydroelectric Projects in Kinnaur and Kullu Districts

Table-3.1 presents a brief profile of some hydroelectric projects in Kinnaur and Kullu Districts. The table shows that there are diverse type of small, medium and large hydro projects in Kinnaur and Kullu Districts. Many other projects which are not mentioned in this table are also in progress. State agency, central/joint agencies and private sector, all are doing efforts to harness the hydroelectric potential in the State, so are in these two Districts. The river Beas and Satluj and the streams / Nullah, which join these rivers, are the main source of hydroelectric power.

3.2 Profile of Hydroelectric Projects selected under study area

Kullu District: Allain Duhangan Hydroelectric Project of 192 MW is started in year 2005 and competed in year 2010. The estimate cost of this project has been Rs. 922.00 crores. This project is in Manali Tehsil of District Kullu. The project area site is surrounded by the village

Prini, Aleo and Jagatsukh. Horticulture is the main source of income in these villages. Apple is the main fruit crop.

Kinnaur District: Karcham-Wangtoo Hydroelectric Project of 1000 MW is started in year 2005 and gets completed in August 2011. The project has been commissioned in August, 2011. The estimated cost of project is Rs. 7080.00 crore. This project is in Nichar Tehsil of District Kinnaur. The project area site is surrounded by many villages such as, Changaon, Urni, Tappanu, Jani-Ramni etc.; here also horticulture is the main source of income of the people. Apple crop is the main fruit crop in the area.

TABLE 3.1: Profile of Hydroelectric Projects in Kinnaur and Kullu Districts

Sr. No.	Name of Project	Capacity in MWs	Sector	Agency	District / Location	River / Basin	Status	Actual Date of COD
1.	Malana-I	86.00	Private	Malana Power Company Ltd.	Kullu	Beas	Commissioned	5/Jul/01
2.	Toss	10.00	Private	Sai Engineering Foundation	Kullu	Beas	Commissioned	26/Dec/08
3.	Allain Duhangan	192.00	Private	AD hydro Power Corporation Ltd.	Kullu	Beas	Commissioned	25/Jul/10
4.	Sarbari-II	5.40	Private	DSL Hydrowatt Ltd.	Kullu	Beas	Commissioned	25/Aug/10
5.	Beas Kund	9.00	Private	Kapil Mohan & Associates Hydro Power Pvt. Ltd.	Kullu	Beas	Commissioned	19/Jun/12
6.	Malana-II	100.00	Private	Everest Power Pvt. Ltd.	Kullu	Beas	Commissioned	12/Jul/12
7.	Larji	126.00	State	HPSEBL	Kullu	Beas	Commissioned	2006-07
8.	Baspa-II	300.00	Private	Jaiprakash Hydro Power Ltd.	Kinnaur	Satluj	Commissioned	24/May/03
9.	Karchham Wangtoo	1000.00	Private	Jaypee Karcham Hydro Corporation Ltd.	Kinnaur	Satluj	Commissioned	25/Jun/11
10.	Nathpa Jhakri	1500.00	Central/ joint	SJVNL	Kinnaur	Satluj	Commissioned	2003-04
11.	SVP-Bhaba	120.00	State	HPSEBL	Kinnaur	Satluj	Commissioned	1989
12.	Rongtong	2.00	State	HPSEBL	Kinnaur	Satluj	Commissioned	1986-87
13.	Rukti	1.50	State	HPSEBL	Kinnaur	Satluj	Commissioned	1979-80

Source: Directorate of Energy, Govt. of H.P., Shimla.

Chapter 4

TRENDS IN AREA AND PRODUCTION OF APPLE AND OTHER FRUITS IN DISTRICTS UNDER STUDY

The rich diversity of agro-climatic conditions, topographical variations and altitudinal differences coupled with fertile, deep and well drained soils favour the cultivation of temperate to sub-tropical fruits in Himachal Pradesh. This particular suitability of Himachal has resulted in shifting of land use pattern from agriculture to fruit crops in the past few decades. In this chapter, while discussing the area and production of apple and other fruits in Districts under study, a brief review of area and production of apple and other fruits in Himachal Pradesh and other Districts is also given in subsequent tables.

4.1 Trends in Area under Different fruits in Himachal Pradesh

A trend in area under different fruits is presented in Table-4.1, wherein, it is seen that area under apple is larger than the other types of fruits. It has increased with the compound growth rate of 2.38 per cent over the years. Though there has been observed a negative growth in the areas of temperate fruits, nuts & dry fruits and citrus fruits, yet the overall area of fruit crops has increased with the compound growth rate of 1.22 per cent over the years. There is a graphical presentation of this table in Figure 1, where it is seen that there is an upward trend in area under apple and overall area under all fruit crops in Himachal Pradesh.

4.2 Trends in Production of Different fruits in Himachal Pradesh

Table-4.2 shows the trend in production of apple and other fruits in Himachal Pradesh. It is observed from the table that, there has been positive growth in the production of apple and other fruits in Himachal Pradesh over the years. Apple production has observed 3.42 per cent growth over the years. Citrus fruits have attained maximum growth in production among the other fruit crops. The total fruit production has increased from 308693 (M.T.) to 1027821 (M.T.) during 1987-88 to 2010-11. A compound growth rate of 3.93 per cent is observed during these years. This is a positive sign from the income point of view of orchardists. In Figure 2, a fluctuation is observed in production of apple and other fruits during two decades.

4.3 District-Wise Area under Different fruits in Himachal Pradesh

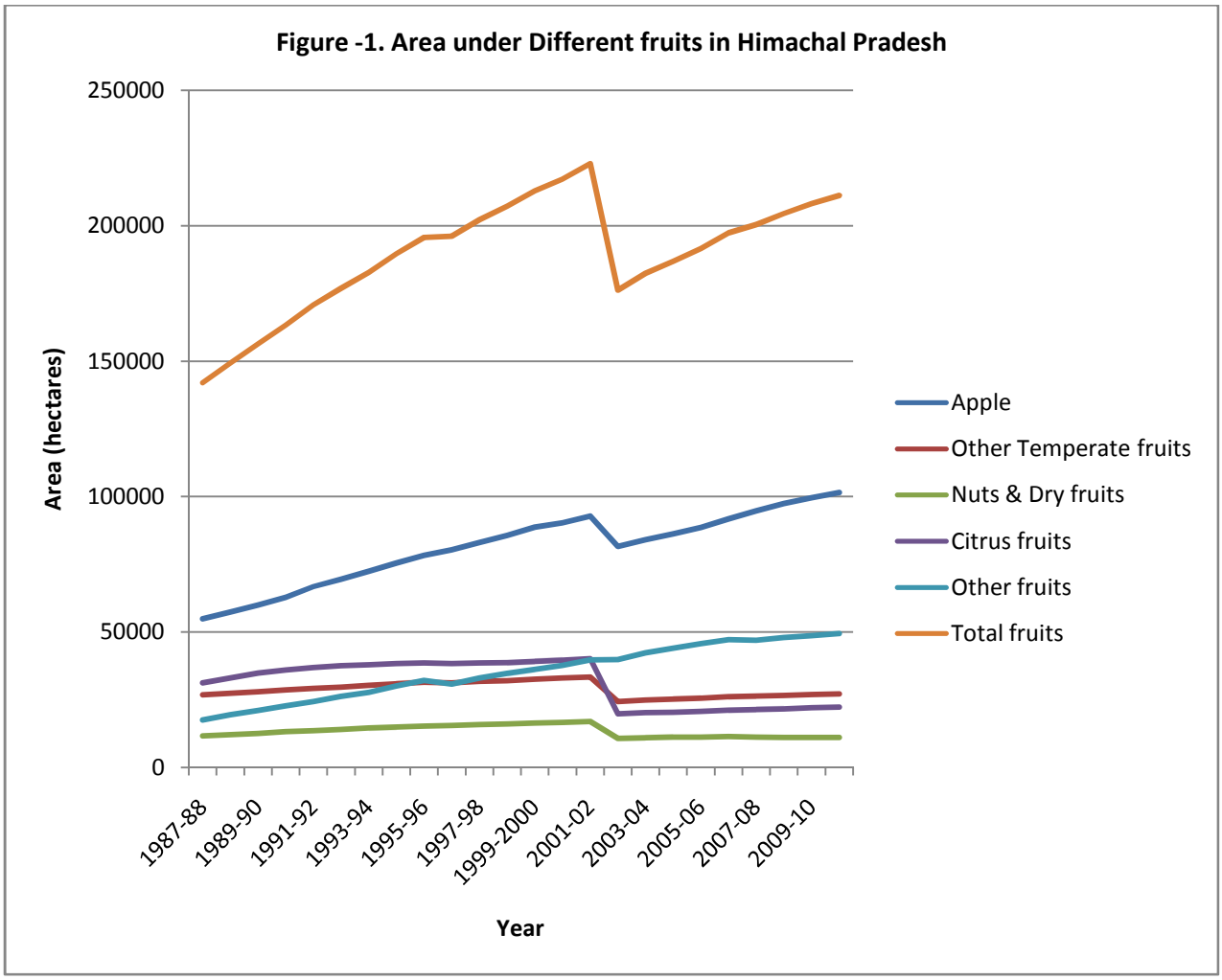
District-wise area under different fruits in Himachal Pradesh is presented in Table-4.3. A pie chart in Figure 3 is also attached to this table only to understand the area under apple. It is observed from the table and the pie chart that District Shimla in percentage term leads in the area under apple, and followed by Kullu, Mandi and Chamba, respectively during the year 2010-11. District Kangra has larger area under Citrus fruits. Its area has increased from 42.01 percent to 43.71 percent between the years 1987-88 to 2010-11. Area under apple and other fruit crops has increased in percentage term in District Kinnaur between the years1987-88 to 2010-11.

TABLE 4.1: Area under Different Fruits in Himachal Pradesh

(In hectares)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	54912	26726	11628	31226	17559	142051
1988-89	57447	27328	12061	32995	19453	149284
1989-90	59988	27956	12559	34863	21103	156469
1990-91	62828	28563	13154	36007	22778	163330
1991-92	66767	29153	13581	36887	24380	170768
1992-93	69439	29582	14008	37623	26239	176891
1993-94	72406	30275	14553	37961	27671	182866
1994-95	75469	30884	14935	38323	30078	189689
1995-96	78292	31403	15237	38595	32157	195684
1996-97	80338	31196	15478	38369	30831	196212
1997-98	83056	31768	15832	38635	33071	202362
1998-99	85631	32051	16061	38711	34786	207240
1999-2000	88673	32557	16396	39138	36187	212951
2000-01	90347	32996	16619	39627	37637	217226
2001-02	92820	33385	16956	40174	39700	223035
2002-03	81630	24271	10700	19784	39821	176206
2003-04	84112	24885	10939	20261	42244	182441
2004-05	86202	25235	11100	20402	43964	186903
2005-06	88560	25533	11210	20729	45636	191668
2006-07	91804	26086	11328	21118	47109	197445
2007-08	94726	26341	11181	21373	46881	200502
2008-09	97438	26547	11096	21588	47960	204629
2009-10	99564	26847	11037	22052	48654	208154
2010-11	101485	27063	11022	22308	49417	211295
b_0	*59529.64*	*30370.50*	*14728.62*	*43292.79*	*19646.87*	*161625.98*
b_1	*1.0238*	*0.995096*	*0.990712*	*0.971200*	*1.044134*	*1.012228*
SE_{b1}	*0.0018*	*0.0027*	*0.0045*	*0.0060*	*0.0019*	*0.0024*
CGR^{*} %	*2.38*	*-0.49*	*-0.92*	*-2.9*	*4.44*	*1.22*

Source: Directorate of Horticulture, Govt. of H.P., Shimla
*Significant at 1% level of significance



4.4 District-Wise Production of Different fruits in Himachal Pradesh

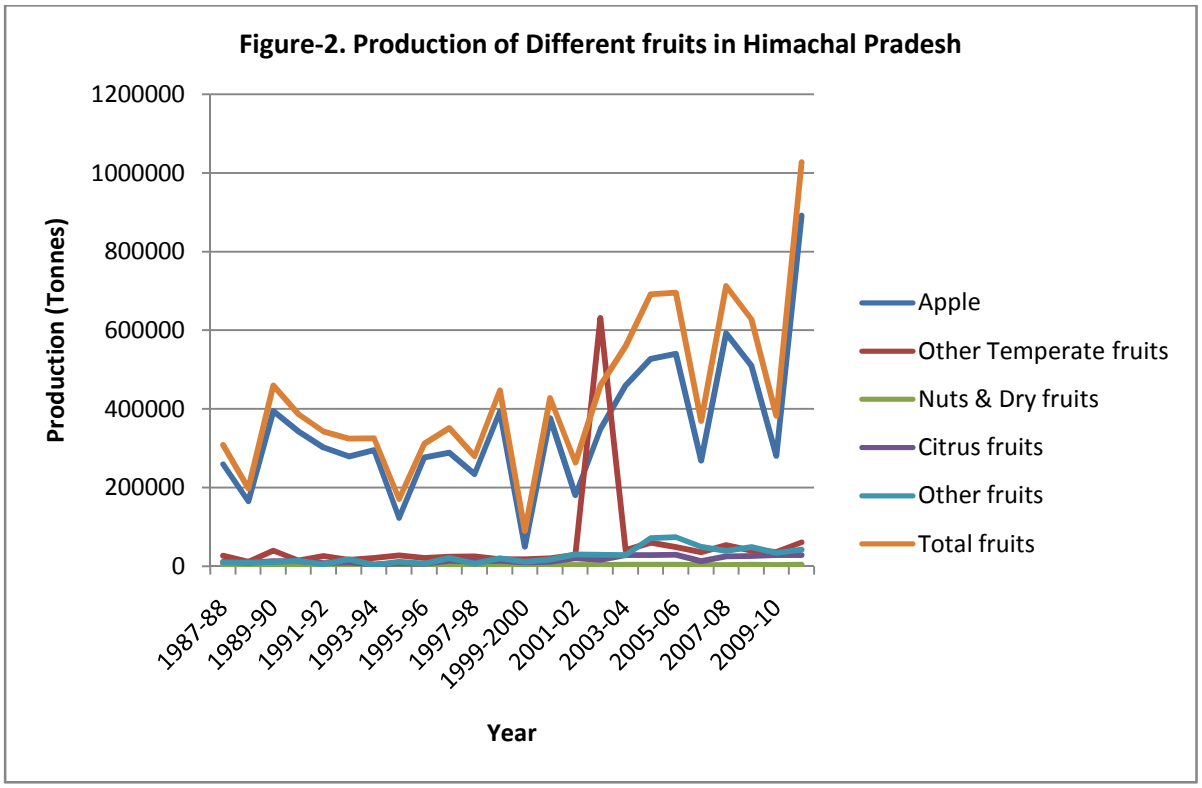
District wise production of apple and other fruits is presented in Table-4.4, and a subsequent pie chart in Figure 4 is attached to this table only to draw conclusions regarding apple production. It is observed from the table and the pie chart that again in percentage term District Shimla leads in the apple production which is followed by District Kullu, Kinnaur and Mandi respectively during year 2010-11. In citrus fruits production, District Kangra leads the production; here the production has increased from 57.50 per cent to 75.68 per cent between the years 1987-88 to 2010-11. District Kullu has maximum production under temperate fruit production, which has increased from 41.40 per cent to 42.32 per cent between the years 1987-88 to 2010-11. Increased production of fruit crops can be translated into higher income to farmers.

TABLE 4.2: Production of Different Fruits in Himachal Pradesh

(In Tons)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	259277	26861	2716	10875	8964	308693
1988-89	165156	11521	2631	8474	9573	197355
1989-90	394868	39631	3409	12320	9762	459990
1990-91	342071	14934	3105	12600	13604	386314
1991-92	301730	26030	2400	7742	4401	342303
1992-93	279051	16041	2643	9313	17807	324855
1993-94	294734	21397	2206	4409	2731	325477
1994-95	122782	27495	2375	6665	11224	170541
1995-96	276681	21074	2474	5839	5821	311889
1996-97	288538	24793	3344	13834	21116	351625
1997-98	234253	25116	2456	11759	6109	279693
1998-99	393653	17974	3075	13111	19871	447684
1999-2000	49129	17901	1895	9257	11233	89415
2000-01	376736	20450	2755	11068	17040	428049
2001-02	180528	29420	2911	20465	30122	263446
2002-03	348263	63131	3256	16027	28946	459623
2003-04	459492	40934	3570	28121	27860	559977
2004-05	527601	60202	3726	28554	71928	692011
2005-06	540356	48694	3274	29159	74034	695517
2006-07	268402	35650	2912	12670	49469	369103
2007-08	592576	53908	2920	24674	38765	712843
2008-09	510161	39933	3548	26007	48427	628076
2009-10	280105	36854	2899	28143	34236	382237
2010-11	892112	61243	3683	28676	42107	1027821
b_0	*199828.60*	*16438.69*	*2517.51*	*6499.36*	*5299.87*	*233503.88*
b_1	*1.034248*	*1.055158*	*1.010913*	*1.061539*	*1.102802*	*1.039382*
SE_{b1}	*0.016*	*0.020*	*0.0047*	*0.011*	*0.0167*	*0.0132*
CGR %*	*3.42*	*5.51*	*1.09*	*6.15*	*1.02*	*3.93*

Source: Directorate of Horticulture, Govt. of H.P. Shimla
*Significant at 1 % level of significance



4.5 Trends in Area under Apple and other fruits in Kullu District

Area under apple and other fruits in Kullu District is presented in Table-4.5 wherein, it is seen that area under apple has increased with the compound growth rate of 2.56 per cent over the years under consideration. The area under temperate fruits has slightly reduced. It is observed that area under nuts and dry fruits and citrus fruits have accounted negative growth also. But in overall sense the area under all the fruit crops in District Kullu has accounted the positive growth of 1.73 percent during last two decades. A graphical presentation of the table is given in Figure 5, wherein, trends in area under apple and other fruits in Kullu District are given. The graph shows the upward trend in area of apple and all fruit crops.

4.6 Trends in Production of Apple and other fruits in Kullu District

Trends in production of apple and other fruits in Kullu District are presented in Table-4.6 and a subsequent graphical presentation is given in Figure 6. It is observed from the table and the graphical presentation that in Kullu District apple production has shown a positive compound growth of 2.52 per cent during the years. The growth in all fruit crops has shown a positive compound growth rate 2.85 per cent, except the growth the negative growth is observed in nuts and dry fruits and citrus fruits. Production of temperate fruits has increased with the maximum positive growth of 6.11 during the years under time series. Graphical presentation under Figure 6 shows the upward trend in apple production in recent years.

TABLE 4.3: District-Wise Area under Different Fruits in Himachal Pradesh

(In hectares)

Districts / Fruits	Apple		Other temperate fruits		Nuts & dry fruits		Citrus Fruits		Other sub-tropical fruits		All fruits	
	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11
Shimla	22453 (40.88)	34612 (34.10)	2826 (10.57)	3832 (14.15)	1392 (11.97)	1849 (16.77)	689 (2.20)	577 (2.58)	87 (0.49)	498 (1.00)	27447 (19.32)	41328 (19.55)
Kullu	13109 (23.87)	24002 (23.65)	3667 (13.71)	3387 (12.51)	895 (7.69)	509 (4.61)	325 (1.04)	86 (0.38)	35 (0.19)	156 (0.31)	18031 (12.69)	28140 (13.31)
Mandi	8318 (15.14)	15687 (15.45)	4788 (17.91)	6103 (22.55)	2109 (18.13)	3462 (31.40)	4202 (13.45)	4461 (19.99)	2160 (12.30)	5647 (11.42)	21577 (15.18)	34851 (16.49)
Chamba	3031 (55.19)	12196 (12.01)	1290 (4.82)	1322 (4.88)	1113 (9.57)	1580 (14.33)	979 (3.13)	668 (2.99)	410 (2.33)	653 (1.32)	6823 (4.80)	16419 (7.77)
Kinnaur	3572 (6.50)	9999 (9.85)	320 (1.19)	488 (1.80)	1084 (9.32)	1261 (11.44)	0 (00.00)	0 (00.00)	0 (00.00)	28 (0.0056)	4976 (3.50)	11776 (5.57)
Lahaul-Spiti	95 (0.17)	1320 (1.30)	49 (0.18)	44 (0.16)	13 (0.11)	8 (0.07)	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)	157 (0.11)	1372 (0.64)
Kangra	522 (0.95)	431 (0.42)	4279 (16.00)	1182 (4.36)	1850 (15.90)	817 (7.41)	13120 (42.01)	9753 (43.71)	9138 (52.05)	26079 (52.77)	28909 (20.35)	38262 (18.10)
Solan	512 (0.93)	87 (0.085)	4748 (17.76)	3047 (11.25)	763 (6.56)	273 (2.47)	2872 (9.19)	911 (4.08)	1059 (6.03)	2155 (4.36)	9954 (7.00)	6473 (3.06)
Sirmour	3300 (6.00)	3144 (3.09)	2949 (11.03)	5462 (20.18)	1788 (15.37)	1301 (11.80)	2719 (8.70)	1509 (6.76)	1044 (5.94)	2886 (5.84)	11800 (8.30)	14302 (6.76)
Una	0 (00.00)	1 (0.0009)	678 (2.51)	769 (2.84)	113 (0.97)	80 (0.72)	1581 (5.06)	1651 (7.40)	806 (4.59)	2711 (5.48)	3178 (2.23)	5212 (2.46)
Hamirpur	0 (00.00)	0 (00.00)	314 (1.17)	569 (2.10)	383 (3.29)	310 (2.81)	1989 (6.36)	1669 (7.48)	996 (5.67)	4078 (8.25)	3682 (2.59)	6626 (3.13)
Bilaspur	0 (00.00)	6 (0.005)	821 (3.07)	858 (3.17)	125 (1.07)	81 (0.73)	2750 (8.80)	1023 (4.58)	1821 (10.37)	4566 (9.23)	5517 (3.88)	6534 (3.09)
H.P.	54912 (100.00)	101485 (100.00)	26729 (100.00)	27063 (100.00)	11628 (100.00)	11022 (100.00)	31226 (100.00)	22308 (100.00)	17556 (100.00)	49417 (100.00)	142051 (100.00)	211295 (100.00)

Source: Directorate of Horticulture, Govt. of Himachal Pradesh, Shimla
Note: Figures in the parenthesis are percentages of respective totals

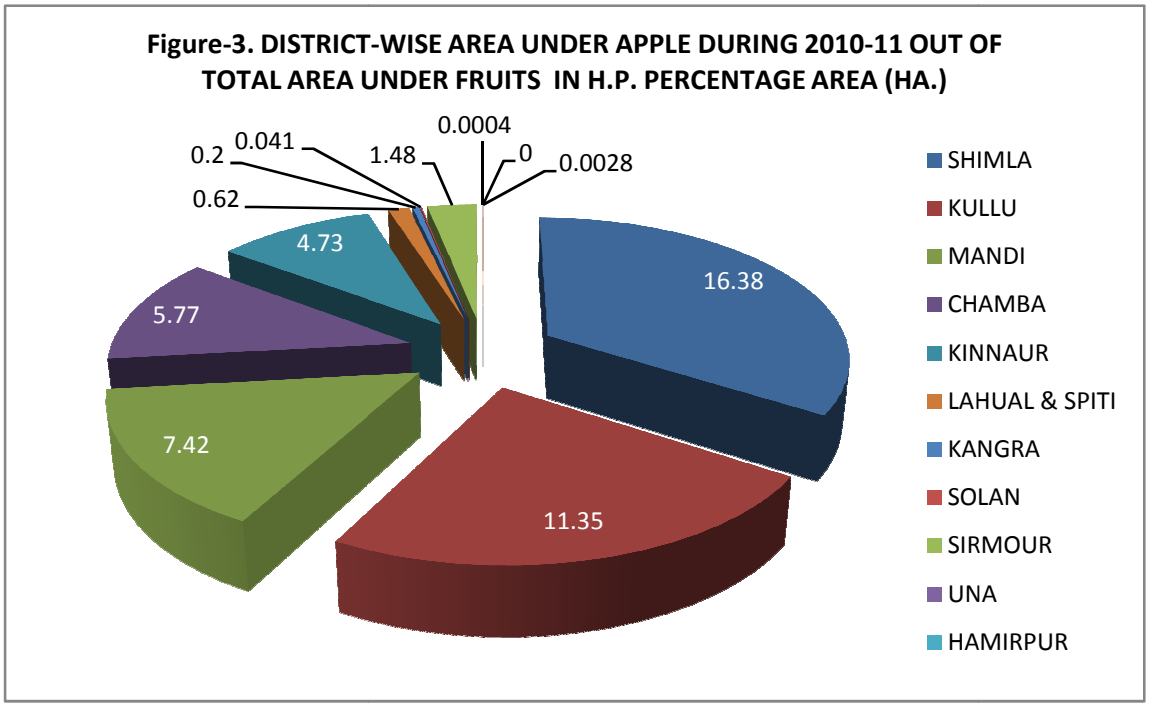


TABLE 4.4: District-Wise Production of Different Fruits in Himachal Pradesh

(In Tons)

Districts / Fruits	Apple		Other temperate fruits		Nuts & dry fruits		Citrus Fruits		Other sub-tropical fruits		All fruits	
	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11	1987-88	2010-11
Shimla	171522 (66.15)	602684 (67.55)	1806 (6.72)	11430 (18.66)	265 (9.75)	1199 (32.55)	232 (2.13)	131 (0.45)	50 (0.55)	77 (0.18)	173875 (56.32)	615521 (59.88)
Kullu	69036 (26.62)	191212 (21.43)	11121 (41.40)	25922 (42.32)	190 (6.99)	195 (5.29)	31 (0.28)	48 (0.16)	45 (0.50)	28 (0.066)	80423 (26.05)	217405 (21.15)
Mandi	6846 (26.40)	22315 (2.50)	4071 (15.15)	3182 (5.19)	351 (12.92)	365 (9.91)	455 (4.18)	704 (2.45)	411 (4.58)	3358 (7.97)	12134 (3.93)	29924 (2.91)
Chamba	3716 (1.43)	10789 (1.20)	617 (2.29)	667 (1.08)	240 (8.83)	327 (8.87)	220 (2.02)	932 (3.25)	169 (1.88)	157 (0.37)	4962 (1.60)	12872 (1.25)
Kinnaur	7326 (2.82)	63781 (7.14)	90 (0.33)	157 (0.25)	692 (25.47)	163 (4.42)	0 (00.00)	0 (00.00)	0 (00.00)	72 (0.17)	8108 (2.62)	64173 (6.24)
Lahaul-Spiti	26 (0.01)	194 (0.02)	16 (0.05)	16 (0.026)	6 (0.22)	2 (0.054)	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)	48 (0.01)	212 (0.020)
Kangra	54 (0.02)	425 (0.04)	1411 (5.25)	3746 (6.11)	394 (14.50)	425 (11.53)	6254 (57.50)	21704 (75.68)	4889 (54.54)	20629 (48.99)	13002 (4.21)	46929 (4.56)
Solan	105 (0.04)	38 (0.004)	5046 (18.78)	4253 (6.94)	61 (2.24)	90 (2.44)	321 (2.95)	492 (1.71)	155 (1.72)	1189 (2.82)	5688 (1.84)	6062 (0.58)
Sirmour	646 (0.24)	673 (0.07)	1896 (7.05)	10513 (17.16)	356 (13.10)	893 (24.24)	1575 (14.48)	1006 (3.50)	926 (10.33)	3265 (7.75)	5399 (1.74)	16350 (1.59)
Una	0 (00.00)	0 (00.00)	427 (1.58)	982 (1.60)	42 (1.54)	0 (00.00)	763 (7.01)	2805 (9.78)	1087 (12.12)	8219 (19.51)	2319 (0.75)	12009 (1.16)
Hamirpur	0 (00.00)	0 (00.00)	177 (0.65)	261 (0.42)	109 (4.01)	16 (0.43)	401 (3.68)	709 (2.47)	634 (7.07)	3311 (7.86)	1321 (0.42)	4297 (0.41)
Bilaspur	0 (00.00)	1 (0.0001)	183 (0.68)	114 (0.18)	10 (0.36)	5 (0.13)	623 (5.72)	145 (0.50)	598 (6.67)	1802 (4.27)	1414 (0.45)	2067 (0.20)
H.P.	259277 (100.00)	892112 (100.00)	26861 (100.00)	61243 (100.00)	2716 (100.00)	3683 (100.00)	10875 (100.00)	28676 (100.00)	8964 (100.00)	42107 (100.00)	308693 (100.00)	1027821 (100.00)

Source: Directorate of Horticulture, Govt. of Himachal Pradesh, Shimla. Note: Figures in the parenthesis are percentage of respective totals

Figure-4. DISTRICT-WISE PRODUCTION OF APPLE DURING 2010-11 (%)

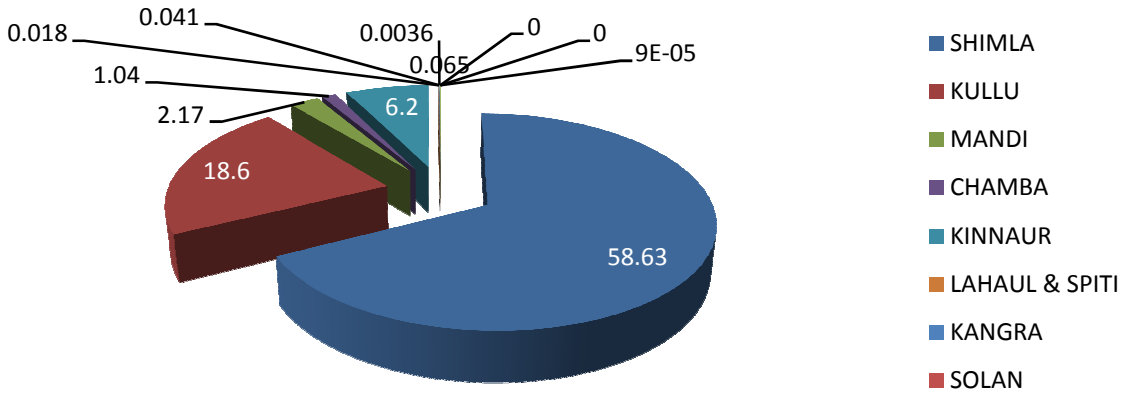


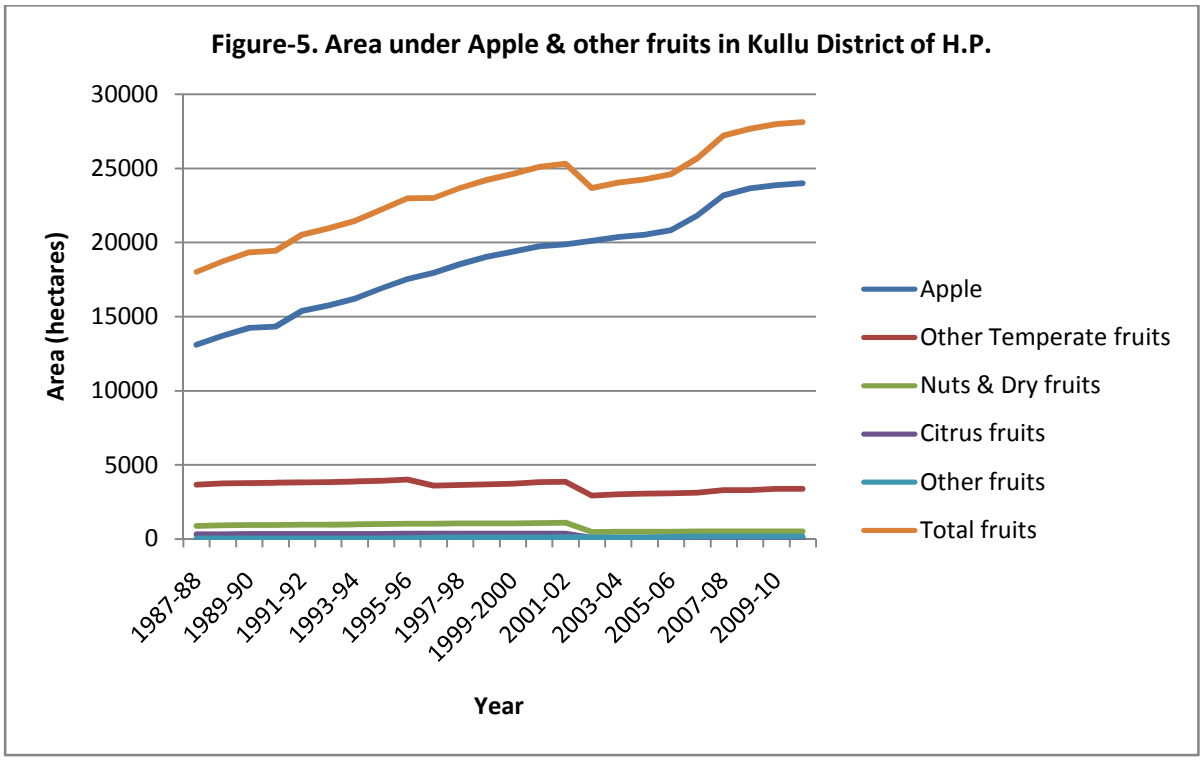
TABLE 4.5: Area under Apple & Other Fruits in Kullu District

(In hectares)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	13109	3667	895	325	35	18031
1988-89	13703	3742	931	334	35	18745
1989-90	14244	3773	947	340	36	19340
1990-91	14342	3778	952	341	36	19449
1991-92	15386	3818	963	341	36	20544
1992-93	15770	3835	971	346	36	20958
1993-94	16211	3870	997	350	40	21468
1994-95	16897	3924	1014	352	43	22230
1995-96	17541	4001	1044	357	61	23004
1996-97	17952	3590	1049	358	77	23026
1997-98	18552	3632	1054	361	91	23690
1998-99	19035	3679	1059	361	95	24229
1999-2000	19383	3721	1072	361	101	24638
2000-01	19756	3823	1077	361	106	25123
2001-02	19886	3846	1106	368	120	25326
2002-03	20116	2935	463	79	87	23680
2003-04	20383	3018	486	85	95	24067
2004-05	20524	3061	493	85	100	24263
2005-06	20821	3077	494	85	148	24625
2006-07	21824	3134	502	86	159	25705
2007-08	23179	3300	517	86	159	27241
2008-09	23663	3292	502	80	152	27689
2009-10	23870	3382	511	89	158	28010
2010-11	24002	3387	509	86	156	28140
b_0	*13462.00*	*3972.19*	*1235.18*	*567.58*	*28.82*	*18778.40*
b_1	*1.025621*	*0.990796*	*0.963178*	*0.921933*	*1.082223*	*1.017370*
SE_{b1}	*0.0008*	*0.0020*	*0.0070*	*0.0122*	*0.0053*	*0.0011*
CGR^{*} %	*2.56*	*-0.92*	*-3.68*	*-7.80*	*8.22*	*1.73*

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

*Significant at 1 % level of significance



4.7 Trends in Area under Apple & other fruits in Kinnaur District

Table-4.7 presents the area under apple and other fruits in Kinnaur District. A graphical presentation of this table is seen in Figure 7. The time series analysis of the data regarding the area under fruit crops in Kinnaur District reveals that in the District area under apple and other fruits have a positive compound growth rate. Overall area under all fruits has increased 3.71 per cent over the years. Area under apple has increased 4.49 per cent during last two decade. It is observed that the area under nuts and dry fruits has slightly increased during the years. Figure 7 shows the upward trend in the area under apple and all fruit crops since 1987 to 2010.

4.8 Trends in Production of Apple & other fruits in Kinnaur District

Production of apple and other fruits in Kinnaur District is presented in Table-4.8. A graphical presentation of this table is seen in Figure 8. A positive trend is observed in the production of apple and other temperate fruits in the District, it is also seen for all fruit crops, except nuts and dry fruits over the period under time series analysis. There is a positive compound growth rate of 7.95 per cent in apple production, while 9.72 per cent growth is observed in temperate fruits. Overall fruit production in the District has a compound growth of 7.77 per cent. Kinnaur District is gaining importance in area as well as in the production of fruit crops especially in apple. This is good to farmers to generate high income from orchards.

TABLE 4.6: Production of Apple & Other Fruits in Kullu District

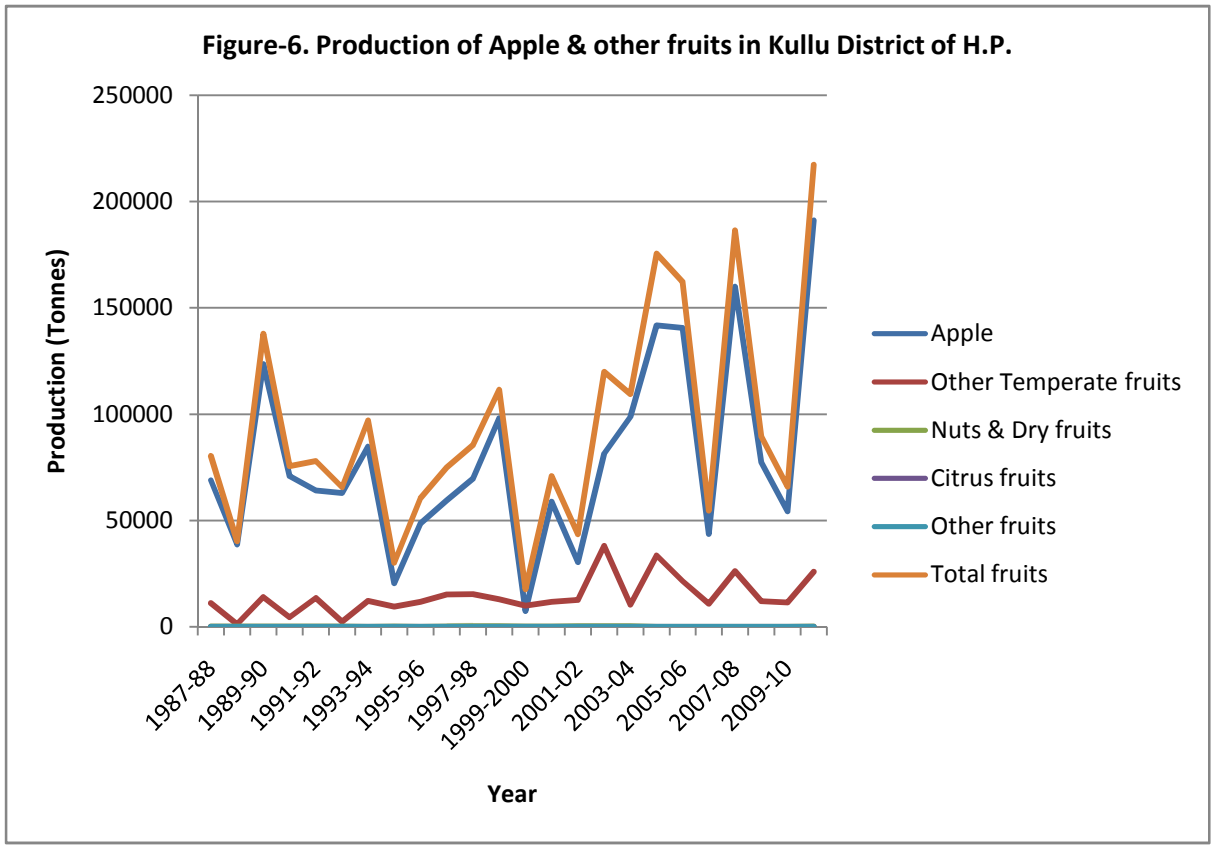
(In Tons)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	69036	11121	190	31	45	80423
1988-89	38651	1232	241	38	31	40193
1989-90	123690	14033	202	31	32	137988
1990-91	70857	4522	230	45	2	75656
1991-92	64101	13617	213	21	0	77952
1992-93	62925	2483	170	23	0	65601
1993-94	84758	12203	85	7	0	97053
1994-95	20476	9450	134	5	0	30065
1995-96	48604	11756	99	10	9	60478
1996-97	59429	15294	242	26	24	75015
1997-98	69649	15451	313	20	23	85456
1998-99	98219	13006	272	22	25	111544
1999-2000	7398	10032	176	5	20	17631
2000-01	58926	11723	158	29	23	70859
2001-02	30433	12657	305	142	41	43578
2002-03	81489	38174	323	21	14	120021
2003-04	98781	10457	256	10	2	109506
2004-05	141844	33659	102	13	7	175625
2005-06	140633	21606	71	12	6	162328
2006-07	43730	10819	47	7	4	54607
2007-08	160124	26240	111	9	7	186491
2008-09	77409	12112	52	9	11	89593
2009-10	54385	11515	53	18	14	65985
2010-11	191212	25922	195	48	28	217405
b_0	*47974.06*	*5626.33*	*247.02*	*24.036*	**	*56777.093*
b_1	*1.025220*	*1.061122*	*0.962205*	*0.976342*	**	*1.028524*
SE_{b1}	*0.020*	*0.018*	*0.015*	*0.023*	**	*0.0167*
CGR^{*} %	*2.52*	*6.11*	*-3.77*	*-2.36*	**	*2.85*

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

*Significant at 1% level of significance

**Dependent variable has non-positive values, no equation estimated



4.9 Trends in Area under Apple & other fruits in Manali Tehsil of Kullu District

Area under apple and other fruits in Manali Tehsil of Kullu District is presented in Table-4.9, wherein, it is seen that since 2001-02 to 2011-12, there has been a positive compound growth rate of 2.19 per cent is observed in area under apple crop in Manali tehsil. While overall area under all fruit crops has shown the similar trend of positive growth of 2.62 percent during the years. A graphical presentation of this table is given in Figure 9. It is seen in the figure that total area under fruits production as well as area under apple and other fruits has shown an upward trend.

4.10 Trends in Production of Apple & other Fruits in Manali Tehsil of Kullu District

Production of apple and other fruits in Manali Tehsil of Kullu District is presented in Table-4.10. It is seen from the table that production of apple has shown a positive growth trend during the years 2001-02 to 2011-12, while production of other fruits have shown a negative growth of 2.79 per cent during these years. But overall production of fruit crops has a positive compound growth rate of 1.20 per cent during the years under time series analysis. A graphical

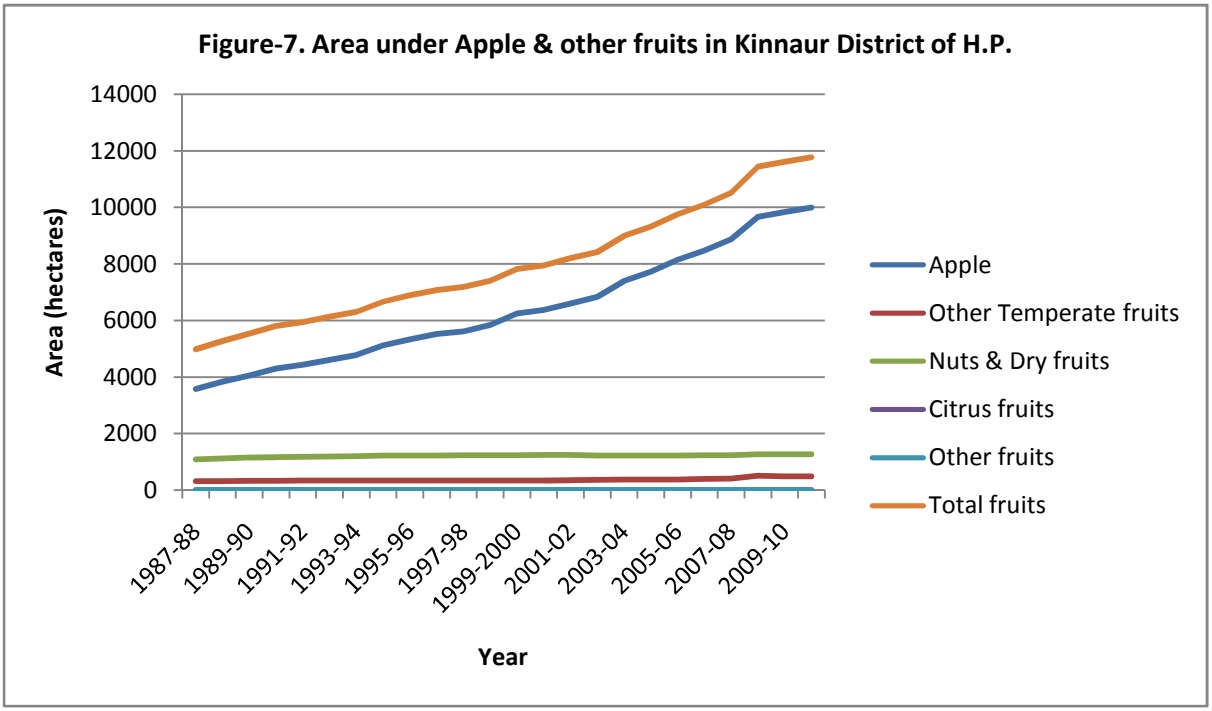
presentation table-4.10 is given in Figure-10, wherein, it is seen that there have been fluctuation in apple and other fruits since last ten years.

TABLE 4.7: Area under Apple & Other Fruits in Kinnaur District

(In hectares)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	3572	320	1084	--	--	4976
1988-89	3829	325	1118	--	--	5272
1989-90	4043	331	1154	--	--	5528
1990-91	4302	333	1164	--	--	5799
1991-92	4431	337	1176	--	--	5944
1992-93	4608	337	1182	--	--	6127
1993-94	4770	337	1197	--	--	6304
1994-95	5116	337	1215	--	--	6668
1995-96	5332	337	1223	--	--	6892
1996-97	5516	337	1223	--	--	7076
1997-98	5616	338	1227	--	--	7181
1998-99	5836	338	1227	--	--	7401
1999-2000	6249	338	1235	--	--	7822
2000-01	6369	338	1239	--	--	7946
2001-02	6604	350	1248	--	--	8202
2002-03	6840	363	1219	--	--	8422
2003-04	7392	372	1221	--	--	8985
2004-05	7720	373	1223	--	--	9316
2005-06	8151	378	1226	--	--	9755
2006-07	8473	395	1229	--	--	10097
2007-08	8874	411	1234	--	--	10519
2008-09	9671	508	1266	--	--	11445
2009-10	9838	488	1266	--	--	11620
2010-11	9999	488	1261	--	--	11776
b_0	*3514.79*	*298.28*	*1143.56*	--	--	*4888.44*
b_1	*1.044986*	*1.015941*	*1.004520*	--	--	*1.037122*
SE_{b1}	*0.0058*	*0.0022*	*0.0006*	--	--	*0.0006*
CGR^{*} %	*4.49*	*1.59*	*0.45*	--	--	*3.71*

Source: Directorate of Horticulture, Govt. of H.P. Shimla
*Significant at 1% level of significance



4.11 Trends in Area under Apple crop in Nichar Tehsil of District Kinnaur

Area under Apple crop in Nichar Tehsil of District Kinnaur is presented in Table-4.11, wherein, it is seen that a positive compound growth rate of 4.43 percent, in area under Apple crop is observed in the Nichar Tehsil, since 2003-04 to 2011-12. Besides, the table, a diagram is also presented in Figure-11, which shows an upward trend in the area under apple crop in Nichar Tehsil during this period. Apple is the dominant fruit crop in the Nichar Tehsil, the area under other fruit crops is negligible, so the data regarding other fruit crops is not presented in the table.

4.12 Trends in Production of Apple crop in Nichar Tehsil of District Kinnaur

Production of Apple crop in Nichar Tehsil of District Kinnaur is presented in Table-4.12, and the graphical presentation of this table is also given in Figure-12. It is seen from the table that a positive compound growth rate of 6.87 percent is observed in Nichar Tehsil, during the year 2003-04 to 2011-12, even if, Figure-12 shows a fluctuation in the production of apple in the Nichar tehsil during these years. There are several reasons provided by District officials for this fluctuation in the production, such as; climatic/weather conditions, maintenance of orchards, availability of pollinizing varieties, pollinating insects, age of trees etc., among which abiotic factors (climatic conditions) play a major role.

TABLE 4.8: Production of Apple & Other Fruits in Kinnaur District

(In Tons)

Year	Apple	Other Temperate fruits	Nuts & Dry fruits	Citrus fruits	Other fruits	Total fruits
1987-88	7326	90	692	--	--	8108
1988-89	10045	63	587	--	--	10695
1989-90	11582	164	602	--	--	12348
1990-91	9159	79	525	--	--	9763
1991-92	16530	37	312	--	--	15879
1992-93	12395	50	575	--	--	13020
1993-94	23190	30	352	--	--	23572
1994-95	16345	29	327	--	--	16701
1995-96	18219	43	192	--	--	18454
1996-97	17901	57	263	--	--	18221
1997-98	24639	74	325	--	--	25038
1998-99	18509	63	482	--	--	19054
1999-2000	15432	96	364	--	--	15892
2000-01	21793	125	512	--	--	22430
2001-02	18808	67	759	--	--	19634
2002-03	22177	657	572	--	--	23406
2003-04	33074	866	570	--	--	34510
2004-05	38066	595	357	--	--	39018
2005-06	41101	269	262	--	--	41632
2006-07	40277	268	246	--	--	40791
2007-08	41550	273	224	--	--	42047
2008-09	55169	258	240	--	--	55667
2009-10	40289	320	545	--	--	41294
2010-11	63781	157	163	--	--	64173
b_0	*8425.73*	*37.864*	*536.14*	--	--	*8864.52*
b_1	*1.079581*	*1.097276*	*0.973670*	--	--	*1.077767*
SE_{b1}	*0.0063*	*0.0222*	*0.011*	--	--	*0.0058*
CGR^{*} %	*7.95*	*9.72*	*-2.63*	--	--	*7.77*

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

*Significant at 1% level of significance

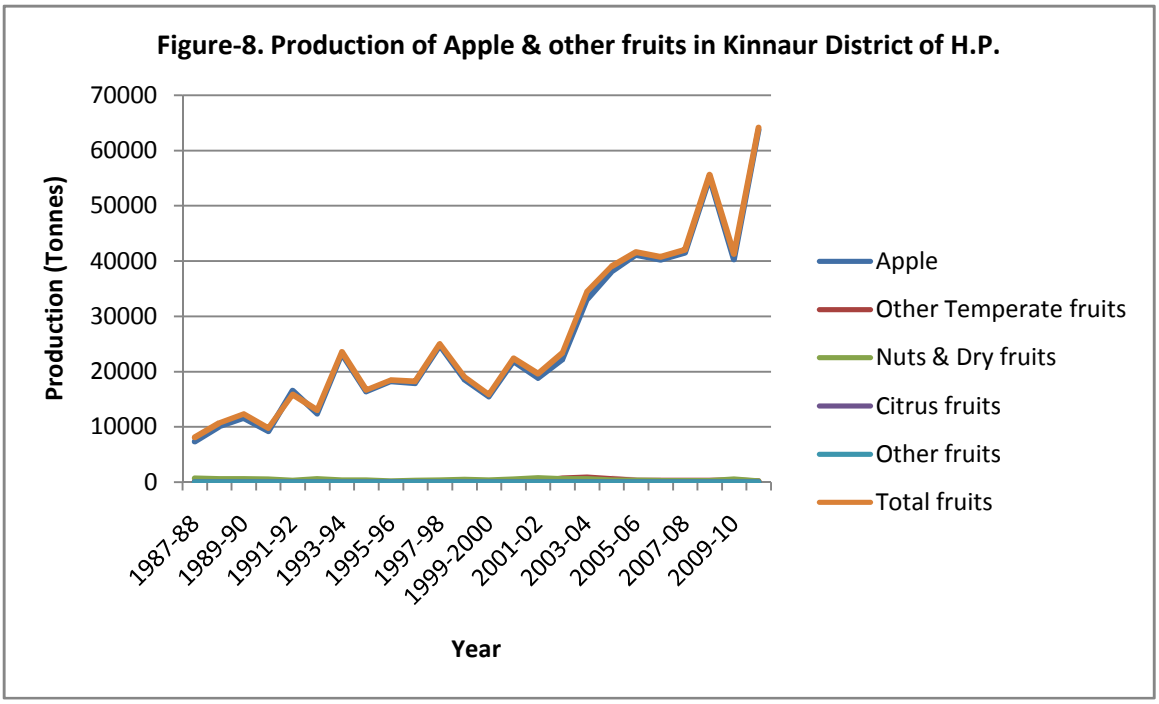


TABLE 4.9: Area under Apple & Other Temperate & Stone Fruits in Manali Tehsil of Kullu District

(In hectares)

Year	Area under Apple	Area under other temperate fruits	Total Fruits
2001-02	7945	1011	8956
2002-03	8012	1031	9043
2003-04	8154	1073	9227
2004-05	8328	1504	9832
2005-06	8584	1517	10101
2006-07	8870	1581	10451
2007-08	9245	1638	10883
2008-09	9272	1626	10898
2009-10	9481	1649	11130
2010-11	9548	1656	11204
2011-12	9600	1678	11278
b_0	*7725.14*	*1030.10*	*8761.73*
b_1	*1.021955*	*1.055587*	*1.026273*
SE_{b1}	*0.0013*	*0.010*	*0.0021*
CGR^{*} %	*2.19*	*5.55*	*2.62*

Source: District Horticulture Office, Govt. of H.P., District Kullu
*Significant at 1% level of significance

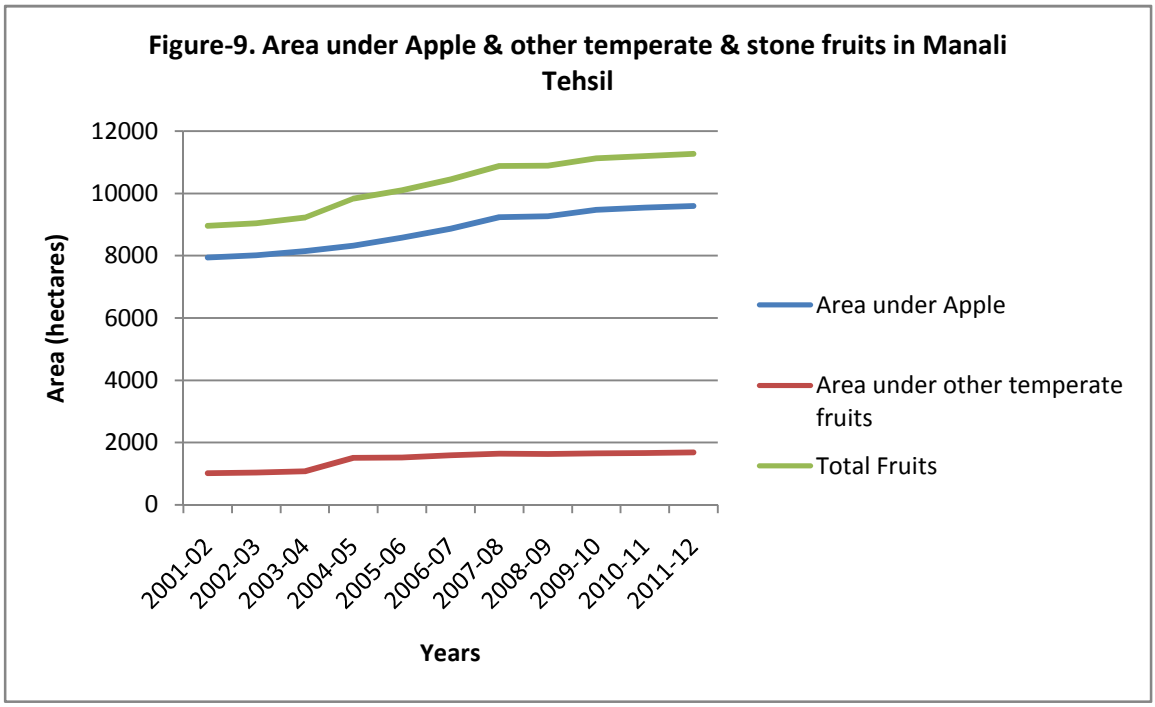


TABLE 4.10: Production of Apple & Other Fruits in Manali Tehsil of Kullu District
(In Tons)

Year	Apple	Other Fruits	Total Fruits
2001-02	15537	5413	20950
2002-03	23844	11218	35062
2003-04	44353	5064	49417
2004-05	67197	4336	71533
2005-06	53868	6631	60499
2006-07	27565	3854	31419
2007-08	53812	8328	62140
2008-09	30964	4874	35838
2009-10	26151	4642	30793
2010-11	19568	3848	23416
2011-12	59048	6561	65609
b_0	*29699.33*	*6609.82*	*37958.59*
b_1	*1.025311*	*0.972058*	*1.012059*
SE_{b1}	*0.048*	*0.032*	*0.043*
CGR^* %	*2.53*	*-2.79*	*1.20*

Source: District Horticulture Office, Govt. of H.P., District Kullu
*Significant at 1% level of significance

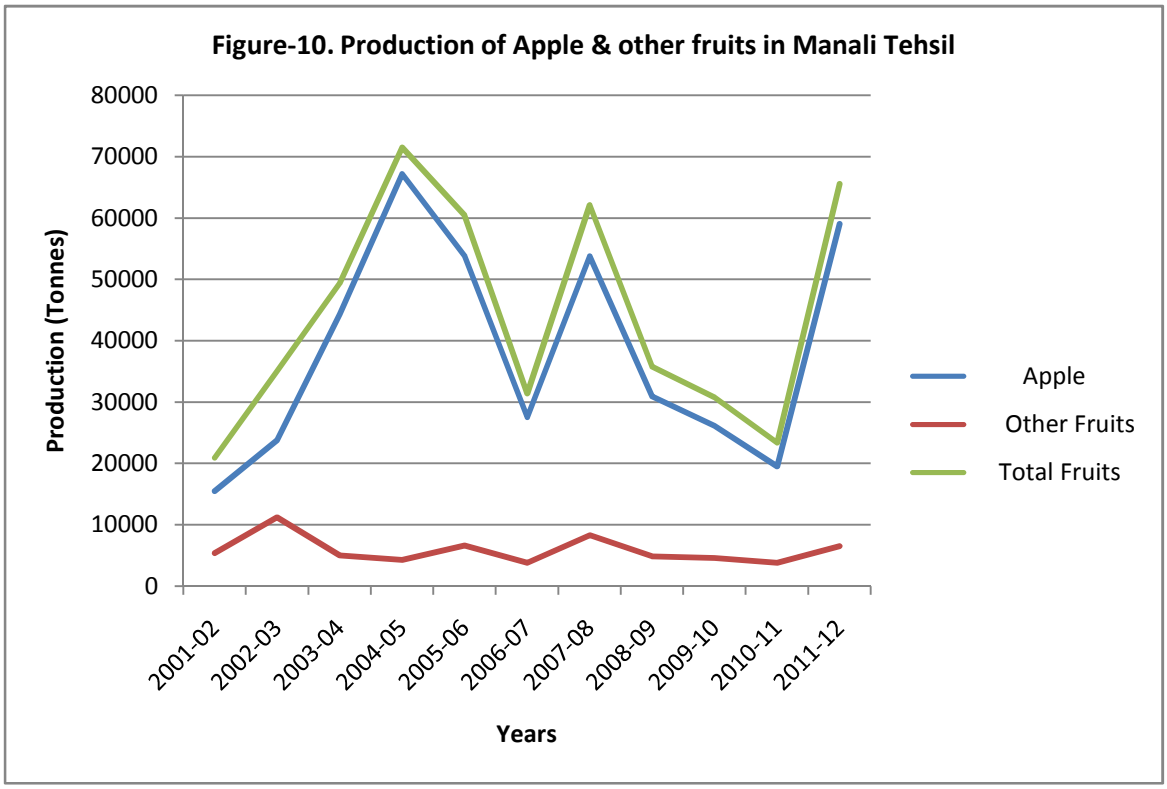


TABLE-4.11: Area under Apple Crop in Nichar Tehsil of District Kinnaur

(Hectares)

Year	Area under Apple
2003-04	2212.00
2004-05	2314.00
2005-06	2528.14
2006-07	2736.05
2007-08	2864.12
2008-09	2972.18
2009-10	3021.13
2010-11	3069.85
2011-12	3075.522
b_0	*2202.21*
b_1	*1.044379*
SE_{b1}	*0.0053*
CGR^{*} %	*4.43*

Source: District Horticulture Office, Reckong Peo, District Kinnaur
*Significant at 1% level of significance

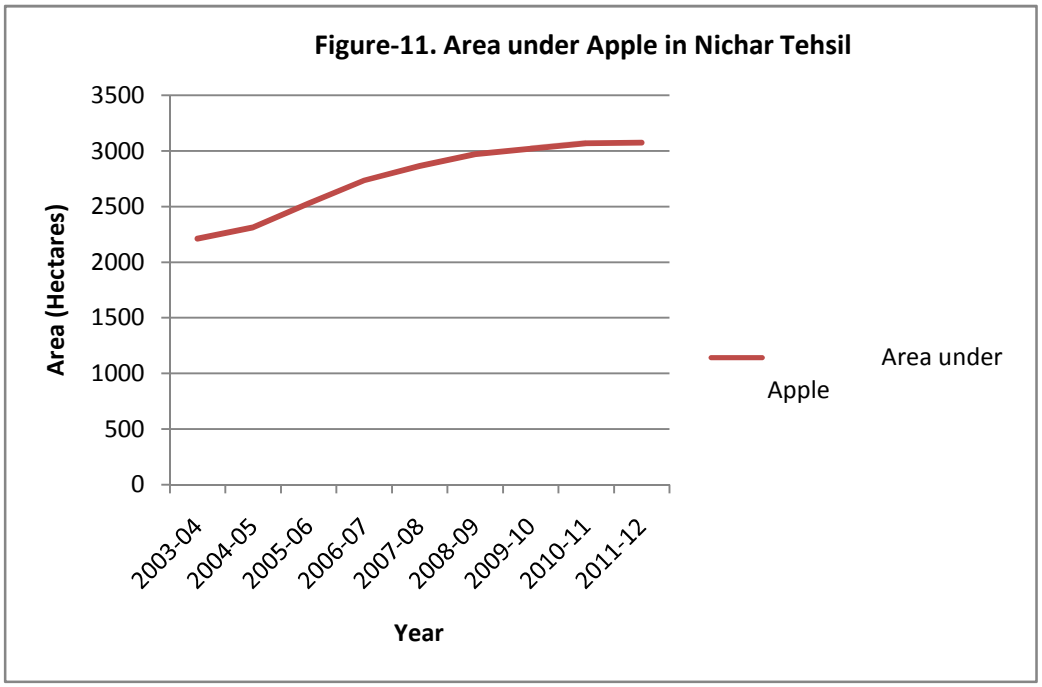
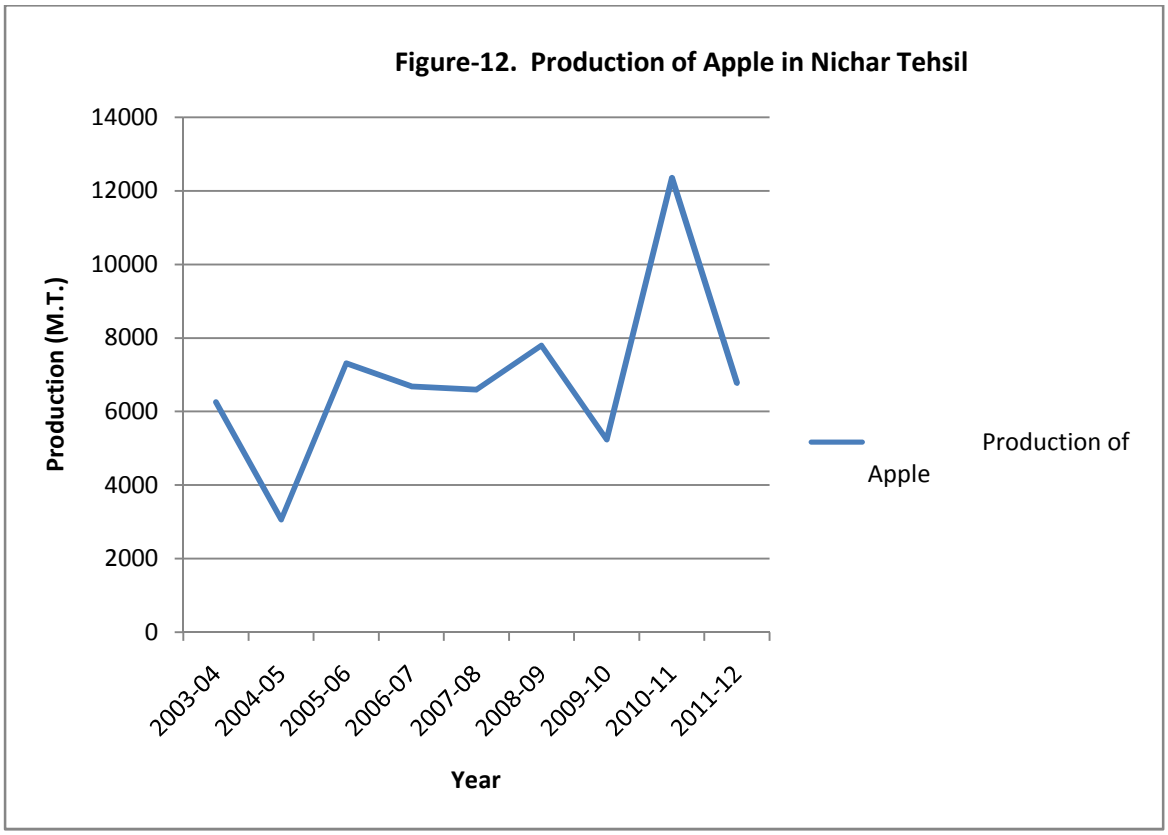


TABLE-4.12: Production of Apple Crop in Nichar Tehsil of District Kinnaur

(M.T.)

Year	Production of Apple
2003-04	6254.08
2004-05	3065.38
2005-06	7306.40
2006-07	6686.52
2007-08	6598.68
2008-09	7796.28
2009-10	5235.00
2010-11	12352.30
2011-12	6780.40
b_0	*4671.20*
b_1	*1.068779*
SE_{b1}	*0.043*
CGR^{*} %	*6.87*

Source: District Horticulture Office, Reckong Peo, District Kinnaur
*Significant at 1% level of significance



4.13 Summing up

After observing tables and diagrams in this chapter it can be Stated that, area as well as production of Apple has increased in Himachal Pradesh during the years 1987-88 to 2010-11. The same thing is observed in Kinnaur and Kullu Districts as well. The data of Manali Tehsil of District Kullu and Nichar Tehsil of District Kinnaur is looked into separately. It is seen that area under apple crop has shown an upward trend in Manali Tehsil, and fluctuation is observed in production, the same is happing in Nichar Tehsil also where area under apple crop has shown an upward trend, and fluctuation in production of apple is observed there. Besides hydroelectric projects affects, there are several other reasons provided by District officials for this fluctuation in the production, such as; climatic/weather conditions, maintenance of orchards, availability of pollinizing varieties, pollinating insects, age of trees etc., among which abiotic factors (climatic conditions) play a major role. People are shifting cultivated lands to orchards in lieu of getting more profits in recent years in both the Districts. The same thing is observed in Manali and Nichar Tehsil and the area under study in both these tehsils.

Chapter 5

SOCIO-ECONOMIC PROFILE OF SAMPLE HOUSEHOLDS UNDER STUDY

The people of hill areas are not immune to changes and economic development. Hydroelectric projects have both direct and indirect effects on the socio-economic condition of the project affected areas. Socio-economic structure helps in understanding the beneficial as well as adverse impacts of these projects on the people of project affected areas. It helps in understanding the background of the area and conditions under which orchardists have been operating. In this chapter an attempt has been made to draw the general socio-economic features of project affected families viz-a-viz non-affected families of the study area of District Kullu and District Kinnaur.

5.1 Family size of Sample Households

Average family size is presented in Table-5.1, wherein it may be seen that the family size of project affected families is larger than the non-affected families, in both the Districts. There is not much difference in the family size of project affected families of Kullu District and Kinnaur District. So is not with the non-affected families of both the Districts. The average family size of project affected families viz-a-viz non-affected families in both the Districts, hover around 4 to 5 persons per family. This is a sign of awareness and development. Small is beautiful, small is the size of family, more is the socio-economic prosperity.

TABLE-5.1: Average Family Size of Sample Households

Persons	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Male	3.03	2.50	3.47	3.10
Female	2.50	2.00	2.30	2.15
Total	5.53	4.50	5.77	5.25

5.2 Demographic Profile of Sample Households

Demographic profile of the sample households is presented in Table-5.2 wherein, maximum percentage of population belongs to 15 to 60 year age group in the study area of both the Districts. It means more people are in the age group of working population. The population group which descends next comprises aged population, population 5 to 15 year and population

up to 5 year, respectively, in District Kullu. The same is not true in District Kinnaur, here young population change the dice, the population 5 to 15 year comes up, followed by aged population and population up to 5 year. The demographic dividend is clearly visible in District Kinnaur, as working age population and young population both have slack capacities for the socio-economic development of the people; it is not meagre in District Kullu too. Much has to do to channelize the working potential of the people for participation and development.

TABLE-5.2: Demographic Profile of Sample Households

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Up to 5 year	8 (4.81)	8 (7.08)	12 (6.90)	6 (5.71)
5 to 15 year	13 (7.83)	8 (7.08)	21 (12.07)	24 (22.86)
15 to 60 year	125 (75.30)	85 (75.22)	127 (72.99)	66 (62.86)
Above 60 year	20 (12.05)	12 (10.62)	14 (8.04)	9 (8.57)
Total Population	166 (100.00)	113 (100.00)	174 (100.00)	105 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

5.3 Educational status of Sample Households in the Study area

Education is inevitable to human resource development. It may be considered an essential component for the socio-economic advancement of the people. So, the educational status of Sample Households are presented in Table-5.3, wherein, it may be seen that in District Kullu, for project affected families, a few percentages of people have attained education after matriculation standard. The same condition may be seen for non-affected families in the District. As far as the technical education is concerned, only 1.20 percent of the people have this education, while there is no candidate among non-affected families in District Kullu. The Table-5.3, have some relief, for District Kinnaur, here educational attainment after matriculation standard is not so bad, for project affected families as well as non-affected families. In technical education 2.87 and 2.85 percent people have attained this education, respectively among the project affected families and non-affected families in District Kinnaur.

There is more scope to provide opportunities of higher and technical education to local young population of the study area, as maximum population falls under the working age group, clear from the previous Table-5.2.

5.4 Main as well as Subsidiary Occupation of Sample Households

Occupation structure is important aspect to know the socio economic conditions and societal hierarchy of the people. As is clear from the Table-5.4 and Table-5.5, the main and subsidiary occupation of the people in both the Districts, between projects affected families vis-a-vis non-affected families is dominated by the agriculture and agriculture related activities. It may be infer that though the new avenues have come into the place, yet people have primitive ways of occupation in the study area. There is much scope for the technological development in agriculture and allied activities, so that people can get accountable economic benefits out of that. Both the tables reflect the need to channelize the potential of the people from agriculture to other non-agriculture employment opportunities, so that dependence on agriculture can be reduced. As it is observed from the previous Table-5.3, lack of technical and higher education is halting the path of people to search diversified income generating opportunities of employment. Agriculture and Horticulture is the basic source of employment and income of the people of study area.

5.5 Dependency Rate of Sample Households

Average number of workers and dependency rate is presented in Table-5.6, it may be seen that on an average four people per family are working and percentage of workers is above 60 percent in both the Districts. There is slight change in the outcome on all count in non-affected families of District Kinnaur. Hear even dependency rate is 0.75 which is more than project affected families and non-affected families of District Kullu and project affected families of District Kinnaur. According to Table-5.6, dependency rate in District Kullu is lower than District Kinnaur for both the families, project affected as well as non-affected. Female participation in working population is also good in District Kullu than in District Kinnaur in area under study. Female involvement in economic activities is a welcome sign. It will reduce the dependence rate and improve the condition of women in the society.

TABLE-5.3: Educational Status of Sample Households

Educational status	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Primary	25 (15.06)	20 (17.70)	22 (12.64)	24 (22.85)
Middle	41 (24.70)	10 (8.84)	26 (14.94)	18 (17.14)
Matriculation	25 (15.06)	16 (14.15)	27 (15.51)	19 (18.09)
Sr. Secondary	12 (7.22)	18 (15.92)	31 (17.81)	12 (11.42)
Graduate	10 (6.02)	5 (4.42)	20 (11.49)	6 (5.71)
Post-Graduate	2 (1.20)	2 (1.76)	7 (4.02)	2 (1.90)
Technical	2 (1.20)	0 (00.00)	5 (2.87)	3 (2.85)
Illiterate	36 (21.70)	29 (25.66)	13 (7.47)	3 (2.85)
Not going to School	13 (7.83)	13 (11.50)	23 (13.21)	18 (17.14)
Total Population	166 (100.00)	113 (100.00)	174 (100.00)	105 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

TABLE-5.4: Main Occupation Status of Sample Households

Occupation status	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Agriculture	105 (88.98)	71 (91.02)	93 (81.57)	41 (68.33)
Salaried service	6 (5.08)	4 (5.12)	21 (18.42)	19 (31.67)
Business/Trade	3 (2.54)	3 (3.84)	0 (00.00)	0 (00.00)
Dairy	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Forestry	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Wage labour				
(i) Agri. Labour	3 (2.54)	0 (0.00)	0 (00.00)	0 (00.00)
(ii) Non-Agri. Labour	0 (00.00)	0 (0.00)	0 (00.00)	0 (00.00)
Others	1 (0.84)	0 (00.00)	0 (00.00)	0 (00.00)
Total worker Population	118 (100.00)	78 (100.00)	114 (100.00)	60 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

5.6 Average Annual Income of Sample Households

Average Annual Income of Sample Households is presented in Table-5.6, it is observed for the previous tables 5.4 & 5.5, respectively, that the main occupation of the people of study are in both the District is agriculture and horticulture and related activities. A very few percentage of people are involved in non-farm income activities. According to Table-5.6, it is seen that there is not much difference in the total of average annual income of both the Districts. They have more or less same circumstances to grow in diverse agro-climatic conditions. However, in District Kullu non-affected families are relatively in good conditions, while in District Kinnaur project affected families have upper hand in income. Proper farm management and utilization of potential is the key to more income.

TABLE-5.5: Subsidiary Occupation Status of Sample Households.

Occupation status	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Agriculture	2 (3.50)	3 (7.89)	9 (31.03)	13 (72.22)
Salaried service	1 (1.75)	0 (00.00)	0 (00.00)	1 (5.55)
Business/Trade	1 (1.75)	1 (2.63)	2 (6.89)	1 (5.55)
Dairy	40 (70.17)	28 (73.68)	0 (00.00)	0 (00.00)
Forestry	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Wage labour				
(i) Agri. Labour	2 (3.50)	4 (10.52)	10 (34.48)	2 (11.11)
(ii) Non-Agri. Labour	11 (19.30)	2 (5.26)	8 (27.58)	1 (5.55)
Others	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total worker Population	57 (100.00)	38 (100.00)	29 (100.00)	18 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

TABLE-5.6: Number of Workers and Dependency rate of Sample Households

Persons	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Workers/Family Male	2.30	2.55	2.53	1.80
Female	1.86	1.70	1.70	1.50
Total	4.16	4.25	4.23	3.30
% of workers	71.08	69.02	65.51	57.14
Dependency rate	0.40	0.44	0.52	0.75

TABLE-5.7: Average Annual Income of Sample Households

Particulars	District Kullu	District Kinnaur
Project Affected Families	1,23,667	1,36,667
Non-affected families	1,14,500	96,000
Total	1,20,000	1,20,400

5.7 Land use and Cropping Pattern of Sample Households

Land, Land use and Cropping Pattern is an important aspect of socio-economic condition of the people. Under the standard classification, a particular household is termed as landless if it owns less than 5 bighas of total land. Such households form the vulnerable section of the society, the welfare of whom should be prime consideration of developmental programmes. Land use and cropping pattern tells us about the way, how people are intensively or extensively using their land resource, and diversify their cropping system. Land use pattern is presented in Table-5.8, wherein, it is seen that most of the land is used for Orchard in both the Districts of study area. It is observed that, area under field crops is reducing and it is competed by Apple cultivation in both the Districts of study area. In District Kullu, according to the Table-5.8, it is observed that all the cultivated area under irrigation, while in District Kinnaur, there is meagre facilities of irrigation in cultivated area under study. Cropping Pattern of Sample Households is presented in Table-5.9, wherein, it is seen that a large area is under intercropping in both the Districts of study area. Paddy has been the main crop in Kharif season in study area of District Kullu, but now the area under paddy is diverted to Apple cultivation. In future, it is observed that, maximum area would be under Apple cultivation. The same would be true in study area of District Kinnaur.

5.8 Infrastructure for Production & Marketing of Apple with Sample Households

Infrastructure for Production & Marketing of Apple with Sample Households is presented in Table-5.10 (a), (b), (c), (d). It is important to know the basic assets, households have, which give them some confidence in the production & marketing of Apple. According to Table-5.10(a), it is seen that in study area of District Kullu, for both project affected families and non-affected families, 43 and 50 percent of dwelling houses are constructed less than twenty years back, wherein, in District Kinnaur for project affected families and non-affected families in the study area, 37 and 55 per cent, respectively dwelling houses are constructed between twenty to forty years back. It shows maximum people in both the Districts have dwelling houses not more than fifty years old. Over the period of time households have constructed houses as per their requirements. According to subsequent sub-tables of 5.10, it is seen that in study area of District Kinnaur there maximum households have storage and tent facility, while the sample households of study area of District Kullu is lacking on both these count. Post harvest losses can be reduced if; households have proper storage and tent facilities.

TABLE-5.8: Land Use Pattern of Sample Households

(Hectares)

Land Use Pattern	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
Field Crops	0.64 (3.44)	0.24 (2.25)	4.88 (14.84)	0 (00.00)
Irrigated	0.64 (3.44)	0.24 (2.25)	0 (00.00)	0 (00.00)
Un-irrigated	0 (00.00)	0 (00.00)	4.88 (14.84)	0 (00.00)
Orchard	18 (96.56)	10.40 (97.74)	21.44 (65.20)	8.88 (100.00)
Irrigated	18 (96.56)	10.40 (97.74)	0 (00.00)	0 (00.00)
Un-irrigated	0 (00.00)	0 (00.00)	21.44 (65.20)	8.88 (100.00)
Intercrop	8.04 (43.13)	4.64 (43.60)	6.72 (20.43)	3.84 (43.24)
Fallow Land	0 (00.00)	0 (00.00)	5.12 (15.57)	0 (00.00)
Ghasni	0 (00.00)	0 (00.00)	1.44 (4.37)	0 (00.00)
Total Land	18.64 (100.00)	10.64 (100.00)	32.88 (100.00)	8.88 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

5.9 Establishment / Acquisition of Orchard by Sample Households

Establishment/ Acquisition of Orchard by Sample Households is presented in Table-5.11, wherein, it is seen that all the sample households in both Districts have self established Apple orchard. Bearing plants are more than non-bearing plants in study areas of both the Districts. In the study area of District Kinnaur, total area as well as area under bearing apple plants is larger than the study area of District Kullu. This reflects a thin line of observation that in the study area of District Kullu, households have shifted to apple orchard in recent past. But this not shows any comparative advantage of any kind. Both the Districts have more or less same problems in apple crop production.

TABLE-5.9: Cropping Pattern of Sample Households

(Area in Hectares)

Crops grown & Seasons	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
KHARIF				
(i) Sole Crops				
• Paddy	0.64 (3.44)	0.08 (0.75)	0 (00.00)	0 (00.00)
• Maize	0 (00.00)	0 (00.00)	1.52 (5.77)	0 (00.00)
• Pulses	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Potato	0 (00.00)	0.16 (1.50)	0.60 (2.27)	0 (00.00)
• Small Millet	0 (00.00)	0 (00.00)	0.94 (3.57)	0 (00.00)
(ii) Mixed Crops				
• Maize+ Rajmah	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Maize+ Potato	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Maize+ Rajmah+ Mash	0 (00.00)	0 (00.00)	0.4 (1.51)	0 (00.00)
• Small Millet	0 (00.00)	0 (00.00)	0.64 (2.43)	0 (00.00)
(iii) Intercrop				
• Apple+ Maize	0.32 (1.71)	0.32 (3.01)	0.4 (1.51)	0.08 0.90)
• Apple+ Rajmah	0.28 (1.50)	0.48 (4.51)	0.56 (2.12)	0.32 (3.60)

• Apple+ Potato	1.64 (8.79)	0.96 (9.02)	0 (00.00)	0 (00.00)
• Apple+ Maize+ Rajmah	1.2 (6.43)	0.72 (6.76)	1.28 (4.86)	0.32 (3.60)
• Apple+Maize+ Rajmah+Potato	4.48 (24.03)	1.84 (17.29)	0 (00.00)	0 (00.00)
• Apple+ Small Millet	0 (00.00)	0 (00.00)	0.64 (2.43)	0.24 (2.70)
• Apple+ Maize+ Rajmah+ Small Millet+ Mash+ Potato	0 (00.00)	0 (00.00)	3.84 (14.58)	2.88 (32.43)
(iv) Orchard				
• Apple	18 (96.56)	10.24 (96.24)	21.44 (81.45)	8.88 (100.00)
• Other fruits	0 (00.00)	0.16 (1.50)	0.72 (2.73)	0 (00.00)
GROSS CROPED AREA	18.64 (100.00)	10.64 (100.00)	26.32 (100.00)	8.88 (100.00)
<u>RABI</u>				
(i) Sole crops				
• Wheat	0 (00.00)	0 (00.00)	1.2 (4.55)	0 (00.00)
• Barley	0 (00.00)	0.08 (0.75)	1.28 (4.86)	0 (00.00)
• Mustered	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Peas	0 (00.00)	0 (00.00)	0.72 (2.73)	0 (00.00)
• Masur	0 (00.00)	0 (00.00)	0.72 (2.73)	0 (00.00)
(ii) Mixed Crops				
• Wheat+ Mustered	0.16 (0.85)	0 (00.00)	0 (00.00)	0 (00.00)
• Barley+ Mustered	0.32 (1.71)	0.16 (1.50)	0 (00.00)	0 (00.00)
• Peas+ Mustered	0.16 (0.85)	0 (00.00)	0 (00.00)	0 (00.00)
• Wheat+ Mustered+ Maser	0 (00.00)	0 (00.00)	0.24 (0.91)	0 (00.00)
• Barley+ Mustered+ Maser	0 (00.00)	0 (00.00)	0.32 (1.21)	0 (00.00)
• Peas+ Mustered+ Maser	0 (00.00)	0 (00.00)	0.16 (0.60)	0 (00.00)
(iii) Intercrop				
• Apple+ Wheat	0.16 (0.85)	0.16 (1.50)	0.64 (2.43)	0.24 (2.70)

• Apple+ Barley	0.72 (3.86)	0.16 (1.50)	0.8 (3.03)	0.32 (3.60)
• Apple+ Mustered	0.88 (4.72)	0.32 (3.01)	0 (00.00)	0 (00.00)
• Apple+ Peas	1.2 (6.43)	0.72 (6.76)	1.52 (5.77)	0.72 (8.10)
• Apple+ Garlic	0.16 (0.85)	0.08 (0.75)	0 (00.00)	0 (00.00)
• Apple+ Wheat+ Barley+ Mustered+ Garlic	4.32 (23.17)	2.8 (26.31)	0 (00.00)	0 (00.00)
• Apple+ Mustered+ Peas	0.48 (2.57)	0.24 (2.25)	0 (00.00)	0 (00.00)
• Apple+ Wheat+ Barley	0 (00.00)	0 (00.00)	1.2 (4.55)	0.8 (9.00))
• Apple+ Wheat+ Barley+ Mustered+ Masur	0 (00.00)	0 (00.00)	2.56 (9.72)	1.76 (19.81)
(iv) Orchard				
• Apple	18 (96.56)	10.24 (96.24)	21.44 (81.45)	8.88 (100.00)
• Other fruits	0 (00.00)	0.16 (1.50)	0.72 (2.73)	0 (00.00)
GROSS CROPED AREA	18.64 (100.00)	10.64 (100.00)	26.32 (100.00)	8.88 (100.00)

Note: Figures in the parenthesis are the percentages of the total.

5.10 Distance & Height of Orchard of Sample Households

Distance of orchard from main road and height of orchard form sea level, both have important place in production and marketing of apple and other fruits. Distance & Height of Orchard of Sample Households is presented in Table-5.12; it is observed from the table that study area of District Kullu has comparative advantage in the marketing of apple as maximum respondents have less than 100 mts.; of distance from main road. Wherein, in the study area of District Kinnaur, households still have maximum distance to cover to reach main road. Study area of District Kullu and District Kinnaur is situated in different agro-climatic zones, therefore the height of orchards vary.

TABLE-5.10(a): Infrastructure for Production & Marketing of Apple with Sample Households (Dwelling house)

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
1. Dwelling House:	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(i) Year of Construction				
• > 80 years	2 (6.00)	3 (15.00)	2 (6.00)	0 (00.00)
• 60 to 80 years	5 (17.00)	2 (10.00)	3 (10.00)	1 (15.00)
• 40 to 60 years	5 (17.00)	2 (10.00)	5 (17.00)	2 (10.00)
• 20 to 40 years	5 (17.00)	3 (15.00)	11 (37.00)	11 (55.00)
• <20 years	13 (43.00)	10 (50.00)	9 (30.00)	6 (30.00)
(ii) Dimensions (Sq. Mts.)/No				
• > 80 Sq. Mts.	3 (10.00)	1 (5.00)	10 (33.00)	7 (35.00)
• 60 to 80 Sq. Mts.	21 (70.00)	14 (70.00)	17 (57.00)	12 (60.00)
• 40 to 60 Sq. Mts.	6 (20.00)	5 (25.00)	3 (10.00)	1 (5.00)
• < 40 Sq. Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iii) Construction Value				
• > 5 Lakh	15 (50.00)	9 (45.00)	3 (10.00)	2 (10.00)
• 3 to 5 Lakh	10 (33.33)	7 (35.00)	12 (40.00)	6 (30.00)
• 1 to 3 Lakh	4 (13.33)	4 (20.00)	11 (37.00)	9 (45.00)
• < 1 Lakh	1 (3.33)	0 (00.00)	4 (13.00)	3 (15.00)
(iv) Present Value				
• > 10 Lakh	17 (56.67)	11 (55.00)	13 (43.33)	8 (40.00)
• 5 to 10 Lakh	13 (43.33)	9 (45.00)	16 (53.33)	10 (50.00)
• 1 to 5 Lakh	0 (00.00)	0 (00.00)	1 (3.33)	2 (10.00)
• < 1 Lakh	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(v) Expected Life (Years)				
• > 50 years	17 (56.67)	5 (25.00)	1 (3.33)	1 (5.00)
• 30 to 50 years	12 (40.00)	14 (70.00)	19 (63.33)	13 (65.00)
• < 30 years	1 (3.33)	1 (5.00)	10 (33.33)	6 (30.00)
(vi) Capacity (No. of Boxes)				
• > 200 Box	1 (3.33)	0 (00.00)	0 (00.00)	0 (00.00)
• 100 to 200 Box	0 (00.00)	0 (00.00)	2 (6.67)	1 (5.00)
• < 100 Box	12 (40.00)	8 (40.00)	14 (46.67)	12 (60.00)

Note: Figures in the parenthesis are the percentages of the total respondents.

TABLE-5.10(b): Infrastructure for Production & Marketing of Apple with Sample Households (Storage shed)

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
2. Storage Shed	9 (30.00)	4 (20.00)	24 (80.00)	10 (50.00)
(i) Year of Construction				
• Before 1990	0 (00.00)	0 (00.00)	8 (26.67)	2 (10.00)
• 1990 to 2000	0 (00.00)	0 (00.00)	14 (46.67)	7 (35.00)
• 2000 to 2010	9 (30.00)	4 (20.00)	2 (6.66)	1 (5.00)
(ii) Dimensions (Sq. Mts.)/No				
• > 20 Sq. Mts.	9 (30.00)	4 (20.00)	17 (56.67)	8 (40.00)
• 10 to 20 Sq. Mts.	0 (00.00)	0 (00.00)	7 (23.33)	2 (10.00)
• < 10 Sq. Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iii) Construction value				
• > 1 Lakh	9 (30.00)	4 (20.00)	5 (16.67)	2 (10.00)
• 50,000 to 1 Lakh	0 (00.00)	0 (00.00)	8 (26.67)	2 (10.00)
• < 50,000	0 (00.00)	0 (00.00)	11 (36.66)	6 (30.00)
(iv) Present Value				
• > 2 Lakh	9 (30.00)	4 (20.00)	11 (36.67)	5 (25.00)
• 1 to 2 Lakh	0 (00.00)	0 (00.00)	13 (43.33)	5 (25.00)
• < 1 La.kh	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(v) Expected Life (Years)				
• > 20 years	8 (26.67)	3 (15.00)	4 (13.33)	2 (10.00)
• 10 to 20 years	1 (3.33)	1 (5.00)	20 (66.67)	8 (40.00)
• <10 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(vi) Capacity (No. of Boxes)				
• > 200 Box	9 (30.00)	4 (20.00)	11 (36.67)	5 (25.00)
• 100 to 200 Box	0 (00.00)	0 (00.00)	13 (43.33)	5 (25.00)
• < 100 Box	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)

Note: Figures in the parenthesis are the percentages of the total respondents.

TABLE-5.10(c): Infrastructure for Production & Marketing of Apple with Sample Households (Tent).

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
3. Tent	29 (96.66)	19 (95.00)	26 (86.00)	19 (95.00)
(i) Year of Purchase				
• > 3 years	11 (36.67)	10 (50.00)	3 (10.00)	3 (15.00)
• Last 2 to 3 years	13 (43.33)	7 (35.00)	14 (46.67)	11 (55.00)
• Last one year	5 (16.66)	2 (10.00)	9 (30.00)	5 (25.00)
(ii) Dimensions (Sq. Mts.)/No				
• > 20 Sq. Mts.	23 (76.66)	14 (70.00)	22 (73.33)	15 (75.00)
• 10 to 20 Sq. Mts.	6 (20.00)	5 (25.00)	4 (13.33)	4 (20.00)
• < 10 Sq. Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iii) Purchase value (in Rs.)				
• > 3000	22 (73.33)	14 (70.00)	15 (50.00)	10 (50.00)
• 2000 to 3000	7 (23.33)	5 (25.00)	11 (36.66)	9 (45.00)
• < 2000	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iv) Present Value (in Rs.)				
• > 4000	22 (73.33)	14 (70.00)	17 (56.66)	11 (55.00)
• 3000 to 4000	7 (23.33)	5 (25.00)	9 (30.00)	8 (40.00)
• < 3000	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(v) Expected Life (Years)				
• > 3 years	0 (00.00)	0 (00.00)	1 (3.33)	0 (00.00)
• 2 to 3 years	22 (73.33)	14 (70.00)	13 (43.33)	9 (45.00)
• < 2 years	7 (23.33)	5 (25.00)	12 (40.00)	10 (50.00)
(vi) Capacity (No. of Boxes)				
• > 150 Box	20 (66.67)	12 (60.00)	10 (33.33)	5 (25.00)
• 100 to 150 Box	8 (26.66)	7 (35.00)	16 (53.33)	14 (70.00)
• < 100 Box	1 (3.33)	0 (00.00)	0 (00.00)	0 (00.00)

Note: Figures in the parenthesis are the percentages of the total respondents.

5.11 Record of Apple Plantation of Sample Households

Record of apple plantation of sample households is presented in Table-5.13, wherein four standard varieties of apple are presented. All the four standard varieties of apple plants in the study area of District Kinnaur are older than the study area of District Kullu. Maximum plantation of Royal Delicious is observed in the study areas of both the Districts. According to the table it is seen that in the study area of District Kullu, before the plantation of apple, households totally used to cultivate the land for field crops, such as paddy, wherein, in the study area of District Kinnaur land used to be distributed between cultivation of field crops and fallow land. Golden Delicious as a pollinator comprises larger area and more preference among new plantation after 2010 than Red Gold in the study areas of both the Districts.

5.12 General Condition of Apple Orchard of Sample Households

General Condition of Apple Orchard of Sample Households is presented in Table-5.14, wherein, it is seen that maximum respondents in study areas of both the Districts, whether project affected families or non-affected families have asserted that the general health of the apple plants are good. They follow proper method of pruning as well as plants are properly trained. Damage rate of plants in District Kullu is lower than the damage rate observed in District Kinnaur. Orchard is properly laid out in the study areas of both the Districts.

TABLE-5.10(d): Infrastructure for Production & Marketing of Apple with Sample Households (Pick-up Van)

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
4. Pick-up Van	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(i) Year of Purchase				
• Before 2000	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• After 2000	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(ii) Number				
• One	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
• Two	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• > Two	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iii) Purchase value				
• > Rs. 5 Lakh	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Rs. 2 to 5 Lakh	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(iv) Present Value				
• > Rs. 7 Lakh	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Rs. 4 to 7 Lakh	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(v) Expected Life (Years)				
• > 10 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 5 to 10 years	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(vi) Capacity (No. of Boxes)				
• > 100 Box	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 80 to 100 Box	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)

Note: Figures in the parenthesis are the percentages of the total respondents.

TABLE-5.11: Establishment / Acquisition of Orchard by Sample Households

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Self established	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(B) Purchased	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(C) Area under Apple Orchard (Ha.)	18 (100.00)	10.48 (100.00)	21.44 (100.00)	8.88 (100.00)
• Bearing (ha.)	10.20 (56.57)	6.48 (62.30)	16.72 (77.99)	6.4 (72.00)
• Non-Bearing (ha.)	7.8 (43.33)	3.92 (37.70)	4.72 (22.01)	2.48 (28.00)

Note: Figures in the parenthesis are the percentages of the total

TABLE-5.12: Distance & Height of Orchard of Sample Households

Distance & Height	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Distance of Orchard from Road Head (Mts.)				
• > 3000 Mts.	0 (00.00)	0 (00.00)	11 (36.67)	6 (30.00)
• 2000 to 3000 Mts.	0 (00.00)	0 (00.00)	17 (56.66)	12 (60.00)
• 1000 to 2000 Mts.	9 (30.00)	5 (25.00)	2 (6.67)	2 (10.00)
• 500 to 1000 Mts.	2 (6.67)	4 (20.00)	0 (00.00)	0 (00.00)
• 100 to 500 Mts.	6 (20.00)	5 (25.00)	0 (00.00)	0 (00.00)
• < 100 Mts.	13 (43.33)	6 (30.00)	0 (00.00)	0 (00.00)
(B) Height of Orchard (Mts.)				
• > 8000 Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 5000 to 8000 Mts.	0 (00.00)	0 (00.00)	30 (100.00)	20 (100.00)
• 3000 to 5000 Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 2000 to 3000 Mts.	2 (6.67)	1 (5.00)	0 (00.00)	0 (00.00)
• 1000 to 2000 Mts.	28 (93.33)	19 (95.00)	0 (00.00)	0 (00.00)
• < 1000 Mts.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in Parenthesis are the percentages of the total respondents

TABLE-5.13: Record of Apple Plantations of Sample Households

Districts	Area (Ha.) / Household	Previous Use of Land (%)		No. of Plants / Household	Year of Plantation (%)				
		Cultivation	Fallow		Before 1990	1990 to 2000	2000 to 2005	2005 to 2010	After 2010
Royal Delicious									
Kullu									
Project affected families	0.50	100.00	00.00	195.17	20.00	90.00	90.00	93.00	93.00
Non-affected families	0.43	100.00	00.00	164	25.00	95.00	95.00	95.00	95.00
Kinnaur									
Project affected families	0.60	76.67	23.33	231	90.00	100.00	100.00	90.00	86.67
Non-affected families	0.34	40.00	60.00	141	80.00	100.00	100.00	85.00	80.00
Red Delicious									
Kullu									
Project affected families	0.04	100.00	00.00	16.90	3.33	30.00	83.33	73.00	33.00
Non-affected families	0.04	100.00	00.00	18.25	00.00	45.00	95.00	85.00	15.00
Kinnaur									
Project affected families	0.02	43.33	56.67	9.5	26.67	33.33	40.00	16.67	6.66
Non-affected families	0.01	65.00	35.00	8.5	20.00	30.00	35.00	15.00	5.00
Rich-a-red									
Kullu									
Project affected families	0.004	16.00	84.00	1.06	00.00	6.67	16.67	13.33	3.33
Non-affected families	0.004	15.00	85.00	0.85	00.00	5.00	15.00	1.00	00.00
Kinnaur									
Project affected families	0.008	86.67	13.33	3.16	6.67	13.33	13.33	3.33	00.00
Non-affected families	0.002	95.00	5.00	1	00.00	5.00	5.00	00.00	00.00

Golden Delicious									
Kullu									
Project affected families	0.031	80.00	20.00	9.17	00.00	23.33	83.33	76.66	56.66
Non-affected families	0.024	70.00	30.00	6.30	00.00	20.00	95.00	85.00	60.00
Kinnaur									
Project affected families	0.066	30.00	70.00	31.16	70.00	93.33	100.00	90.00	83.33
Non-affected families	0.062	20.00	80.00	28.70	50.00	85.00	100.00	75.00	65.00
Red Gold									
Kullu									
Project affected families	0.018	30.00	70.00	4.83	3.33	46.67	53.33	53.33	30.00
Non-affected families	0.021	20.00	80.00	5.10	00.00	65.00	75.00	65.00	30.00
Kinnaur									
Project affected families	0.028	30.00	70.00	12.33	46.66	56.66	53.33	3.33	3.33
Non-affected families	0.014	20.00	80.00	6.75	25.00	35.00	35.00	00.00	00.00

TABLE-5.14: General Condition of Apple Orchard of Sample Households

Particulars	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Is the Orchard Properly Laid Out:				
• Yes	23	14	25	16
	(76.67)	(70.00)	(83.33)	(80.00)
• No	7	6	5	4
	(23.33)	(30.00)	(16.67)	(20.00)
(B) Are the Plants Properly Trained:				
• Yes	26	17	25	16
	(86.67)	(85.00)	(83.33)	(80.00)
• No	4	3	5	4
	(13.33)	(15.00)	(16.67)	(20.00)
(C) Is Proper method of Pruning followed:				
• Yes	25	15	24	14
	(83.33)	(75.00)	(80.00)	(70.00)
• No	5	5	6	6
	(16.67)	(25.00)	(20.00)	(30.00)
(D) General Health of Plants:				
• Good	22	14	17	11
	(73.33)	(70.00)	(56.67)	(55.00)
• Not so good	8	6	13	9
	(26.67)	(30.00)	(43.33)	(45.00)
• Bad	0	0	0	0
	(00.00)	(00.00)	(00.00)	(00.00)
(E) Number of Plants Damaged:				
• > 3	5	3	3	3
	(16.67)	(15.00)	(10.00)	(15.00)
• 2 to 3	10	8	18	11
	(33.33)	(40.00)	(60.00)	(55.00)
• < 2	15	9	9	6
	(50.00)	(45.00)	(30.00)	(30.00)
Total Respondents	30	20	30	20
	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures in the parenthesis are the percentages of the total respondents.

5.13 Summing Up

Socio-economic profile of the households comprises many aspects in this chapter. After analysing and observing the tables, it can be infer that, households in the study areas are also experiencing changes over the time. Projects have directly as well as indirectly affected their lives. Their land use and cropping pattern is also changing. Households in the study areas are shifting their cultivated land towards Apple orchards. It is observed that in the study area of District Kullu, the age of the orchard is relatively new than District Kinnaur. Households in both the Districts are growing Apple in different agro-climatic conditions, but their problems and requirements are more or less the same. Their socio-economic development requires improvement in educational status, especially technical education among the youth of the area so that they could also get good employment opportunities in projects as well as in other areas. This will certainly add in their income and their upliftment.

Chapter-6

RECORD OF APPLE PRODUCTION AND UTILIZATION

The present chapter has cumulative features regarding record of production and utilization of apple in the study area. Four standard apple varieties are discussed in subsequent tables, with diverse vectors, such as, average record of age of number of plants, there average area, production of boxes per households and apple boxes of different grades per households. The second aspect joins in with average utilization pattern of apple production among households. There is along with total production, marketed quantity of apple and its value is also presented.

6.1 Record of Apple Production of Sample Households

Record of Apple Production of Sample Households is presented in Table-6.1, wherein, all the four standard apple varieties are discussed. Take the view of sample households in District Kullu first; it reveals that on an average 0.50 hectare, 0.43 hectare, area is under Royal Delicious with project affected families and non-affected families respectively. Table also shows that maximum numbers of Royal plants are not more than 15 years old at both the place in District Kullu. In District Kinnaur, on an average 0.60 hectare, 0.34 hectare, area is under Royal Delicious with project affected families and non-affected families respectively. Here the situation is different with the age of the plants, the age of Royal Delicious plants oscillate around 15 to 25 years with both types of families. Maximum numbers of boxes fall in small grade in the study areas of both the Districts. The production of Royal Delicious for project affected families is 339.67 boxes per households in District Kullu, and in District Kinnaur it is 394.66 boxes per households. The record of Red Delicious and Rich-a-Red is also presented in Table-6.1; it shows that 24.63 and 2.13 boxes per households, respectively are produced by project affected families in District Kullu. While, 17.23 and 7 boxes per households, respectively, are produced by project affected families in District Kinnaur. In apple plants, Golden Delicious and Red Gold have their importance for the pollination. There is not so much considerable area under these varieties of apple plants among the households of study areas. Golden Delicious contributes with production of 13.1 boxes per households for project affected families in District Kullu, while, in District Kinnaur it shares with the production of 57.33 boxes per household for project affected families. As far as, the Red Gold is concerned, there is production of 8.26 and 25.60 boxes per households for project affected families, in District Kullu and District Kinnaur, respectively. The orchard of District Kinnaur is

older than the orchard of District Kullu under the study area. There is maximum numbers of small grade apple boxes per household, for all four varieties of apple in both the Districts. There is a need of more work to do in the study area for the improvement of size as well as the production of the apple.

6.2 Average Utilization Pattern of Apple Production of Sample Households

Average utilization pattern of Apple Production of Sample Households is presented in Table-6.2, wherein, total production, market quantity and value of the production are given. According to the table, in District Kullu for project affected families the total market quantity of apple boxes are 369.50 per households and total value is Rs. 2, 14,223.00 in all the four varieties of apple. Whereas, in District Kinnaur for project affected families the total market quantity of apple boxes are 477 per households and total value is Rs. 2, 75,950.00 in all the four varieties of apple. In all this the production and marketing of Royal Delicious is dominating the stance.

TABLE-6.1: Record of Apple Production of Sample Households.

Districts	Record of Age (years) of Number of Plants/Households					Area (Ha.)/Households	Production(Boxes/Households)	Grades of Apple (Boxes)/ Households					
	>25 years	15 to 25 years	10 to 15 years	5 to 10 years	< 5 years			Extra Large	Large	Medium	Small	Extra Small	Pittoo
Royal Delicious (Standard Varieties)													
Kullu Project affected families	3.17	52.33	44.16	54.33	41.16	0.50	339.67	1.67	12.90	62.70	136.33	116.67	9.4
Non-affected families	6	42	41.5	40.25	34.25	0.43	308	1.65	10.1	1.55	125.5	102	7.2
Kinnaur Project affected families	45.33	93	45	27	21	0.60	394.66	5.4	15.1	93.16	152.80	119.6	8.6
Non-affected families	18.5	58.5	31.75	18	14.25	0.34	237.50	4.4	11.9	67.25	97.75	52.70	3.5
Red Delicious (Standard Varieties)													
Kullu Project affected families	0.17	1	9.03	5.4	1.47	0.04	24.63	0	0.17	3.8	10.46	8.9	1.3
Non-affected families	0.2	1.65	8.85	5.7	1.60	0.04	31.65	0	0.25	5.25	13.8	11	1.35
Kinnaur Project affected families	1.7	3.23	4.03	0.4	0.13	0.02	17.23	0.43	2.23	5.5	6.77	2.3	0

Non-affected families	1.4	4.1	2.7	0.25	0.05	0.01	16	0.45	2.1	4.75	6.85	1.85	0
Rich-a-Red (Standard Varieties)													
Kullu Project affected families	0	0.17	0.7	0.47	0.06	0.004	2.13	0	0.06	0.26	0.72	0.96	0.13
Non-affected families	0	0.30	0.25	0.30	0	0.004	1.7	0	0	0.23	1	0.55	0.1
Kinnaur Project affected families	0.46	1.23	1.33	0	0	0.02	7	0.2	0.46	1.43	2.75	1.83	0.33
Non-affected families	0	0.5	0.5	0	0	0.01	2	0	0	0.75	1	0.25	0
Golden Delicious (Standard Varieties)													
Kullu Project affected families	0	0.76	4.6	2.3	1.46	0.031	13.1	0	0.13	1.19	4.9	5.73	1.06
Non-affected families	0	0.85	2.15	2.15	1.2	0.024	11.2	0	0.2	1.5	5.2	3.65	0.65
Kinnaur Project affected families	5.33	10.76	7.3	4.06	3.7	0.066	57.33	2.2	6.3	15.2	20.04	11.9	1.33
Non-affected families	4.3	11.3	7.55	3.55	3	0.062	51	1.5	6	14	18.1	10.4	1
Red Gold (Standard Varieties)													
Kullu Project affected families	0	1.03	2.03	1.23	0.53	0.018	8.26	0	0	0.56	2.57	3.8	1.33
Non-affected families	0	1.1	1.9	1.4	0.7	0.021	10.45	0	0	0.35	2.75	5.3	2.05
Kinnaur Project affected families	3.26	3.6	4.96	0.4	0.1	0.028	25.60	0	1.1	6.53	8.45	7.46	2.06
Non-affected families	1.8	2.55	2.4	0	0	0.014	15	0	0	3.4	5	5	1.6

TABLE-6.2: Average Utilization Pattern of Apple Production of Sample Households

Standard Varieties	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Royal Delicious				
• Total Production (Boxes)	339.67	308	394.66	237.50
• Home Consumption (Boxes)	6.53	6.25	7	6.75
• Gift (Boxes)	2.63	2.4	2.46	1.85
• Loss (Boxes)	1.8	1.75	2.46	2.1
• Market Quantity (Boxes)	328.71	297.60	382.74	226.80
• Value (Rs.)	1,97,220.00	1,78,560.00	2,29,307.00	1,37,455.00
• Adani Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
• Processing Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
(B) Red Delicious				
• Total Production (Boxes)	24.63	31.65	17.23	16
• Home Consumption (Boxes)	2.26	2.45	1.56	1.5
• Gift (Boxes)	0.73	0.90	0.06	0.10
• Loss (Boxes)	0.50	0.75	0.06	0.10
• Market Quantity (Boxes)	21.14	27.55	15.55	14.30
• Value (Rs.)	8,453.33	11,020.00	6,213.00	5,720.00
• Adani Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A	N.A.
• Processing Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
(C) Rich-a-Red				
• Total Production (Boxes)	2.13	1.7	7	2
• Home Consumption (Boxes)	0.33	0.30	0	0
• Gift (Boxes)	0.26	0.30	0.2	0
• Loss (Boxes)	0.20	0.30	0.23	0

• Market Quantity (Boxes)	1.93	1.7	6.56	2
• Value (Rs.)	826.66	710	2,626.66	800.00
• Adani Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
• Processing Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
(D) <u>Golden Delicious</u> • Total Production (Boxes)	13.1	11.2	57.33	51
• Home Consumption (Boxes)	1.6	1.9	4.53	4.65
• Gift (Boxes)	0.1	0.15	0.86	0.30
• Loss (Boxes)	0.03	0.1	0.90	0.85
• Market Quantity (Boxes)	11.36	9.05	51.03	45.2
• Value (Rs.)	5,617.00	4,475.00	26,017.00	23,350.00
• Adani Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
• Processing Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
(E) <u>Red Gold</u> • Total Production (Boxes)	8.26	10.45	25.6	15
• Home Consumption (Boxes)	1.6	1.95	2.83	1.65
• Gift (Boxes)	0.53	0.30	0.96	0.50
• Loss (Boxes)	0.23	0.35	0.63	0.35
• Market Quantity (Boxes)	5.93	7.90	21.13	12.45
• Value (Rs.)	2,373.00	3,160.00	8,453.33	4,980.00
• Adani Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
• Processing Quantity (Boxes)	N.A.	N.A.	N.A.	N.A.
• Value (Rs.)	N.A.	N.A.	N.A.	N.A.
Total Marketed Quantity (Boxes)	369.05	344.4	477	300.75
Total Value (Rs.)	2,14,223.00	1,97,975.00	2,75,950.00	1,68,930.00

6.3 Summing Up

There is maximum area under Royal Delicious varieties of apple in the study areas of both the Districts. In the study area of District Kullu the age of the plants is rather less. There is a need to work more in the study areas for the improvement in the size as well as the production of the apple. In all the varieties of apple crop, the production and marketing of Royal delicious is dominating the stance. In initial years of project implementation people of surrounding areas of project both project affected families and non-affected families have faced fall in production of apple crops. It is due to dust and pollution in the area and scantly wondering of pollinating agents during this time. Now they have get some relief, but their production still needs more efforts to come on their initial level.

Chapter-7

FARMERS AND PROJECT AUTHORITIES INTERACTION ANALYSIS IN AREA UNDER STUDY

Discussions and dialogs have an important role in human life. Development requires participation of people at every level. Commencement of hydro-electric projects cannot be a one way process. Besides, project implementation, the hydro-electricity projects authorities need continuous interaction with the project affected families, so that problems and opportunities can be addressed. The present chapter is based on this abode assumption that, whatever, the local people and project authorities have gained or lost during the years, it has been the regular communication which have made these projects successful and local affected people somewhere something positive to adopt new changes.

7.1 Project Authorities and Project affected Sample Households Interaction Analysis

Table-7.1(a) and (b) show the responses given by sample households, while interacting with project authorities. Maximum respondents have stated that getting cooperation and giving benefits and addressing local problems such as crakes in the houses due to blasting have been the main purpose of the visits of project authorities. The problems are generally related with whole community, therefore, the move to mitigate grievances concern with whole community.

7.2 Suggestions of alternatives by Project affected Sample Households

Project affected families have been vociferous, while giving suggestions of alternative to solve their problems. The Table-7.2, deals with such alternatives. However only few respondents have no alternatives, but maximum have expressed their opinion. Project authorities should continuously address the grievances of affected families' leads the count with 80 and 70 percent respectively in both the Districts under study area. Their anxiety on, depleting ground water status cannot be lightly taken also in project affected area. It is observed while interacting, the demand of full time employment opportunities in projects still haunt the respondents of District Kullu in study area.

TABLE-7.1(a): Project Authorities and Project Affected Sample Households Interaction Analysis (purpose of visits etc.)

Particulars	District Kullu	District Kinnaur
	Project affected families	Project affected families
(A) No. of Visits		
• 2 to 3 times	0 (00.00)	3 (10.00)
• 3 to 4 times	23 (76.67)	20 (66.67)
• 4 to 5 times	7 (23.33)	7 (23.33)
(B) Type of Visits		
• Individual	0 (00.00)	0 (00.00)
• Group	30 (100.00)	30 (100.00)
(C) Purpose of Visits		
• Getting cooperation and giving benefits	30 (100.00)	26 (86.67)
• Addressing Problems such as crakes in houses	23 (76.67)	22 (73.33)
(D) The Problem Concerned		
• Only You	0 (00.00)	0 (00.00)
• Whole Community	30 (100.00)	30 (100.00)
(E) Authorities Visited		
• A D Hydro Electric Project Officials	30 (100.00)	0 (00.00)
• J P Karcham Wangtu Hydro Electric Project Officials	0 (00.00)	30 (100.00)
• Others	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	30 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-7.1(b): Project Authorities and Project Affected Sample Households Interaction Analysis (quality of visits etc.)

Particulars	District Kullu	District Kinnaur
	Project affected families	Project affected families
(F) Were you ever refused to meet the authorities		
• Yes	0 (00.00)	0 (00.00)
• No	30 (100.00)	30 (100.00)
(G) Quality of Interaction		
• Very Good	0 (00.00)	1 (3.33)
• Good	16 (53.33)	9 (30.00)
• Average	14 (46.67)	19 (63.33)
• Poor	0 (00.00)	1 (3.33)
• Very Poor	0 (00.00)	0 (00.00)
(H) Outcome of the Meetings		
• Problem solved	5 (16.67)	5 (16.67)
• Assurance of solution in near future	25 (83.33)	19 (63.33)
• Unable to solve Problem	0 (00.00)	6 (20.00)
• Refused to consider the Problem	0 (00.00)	0 (00.00)
(I) What is your Plan in Case the Problem is not solved		
• Agitate and make pressure through Panchayat Body	19 (63.33)	20 (66.67)
• No Plan	11 (36.67)	10 (33.33)
(J) What is Your rating of Attitude of Authorities		
• Very Good	0 (00.00)	1 (3.33)
• Good	16 (53.33)	9 (30.00)
• Average	14 (46.67)	17 (56.67)
• Poor	0 (00.00)	3 (10.00)
• Very Poor	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	30 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-7.2: Suggestions of Alternatives to Solve Problems by Project Affected Sample Households

Particulars	District Kullu	District Kinnaur
	Project affected families	Non-affected families
(K) What alternative do you suggest to improve the grievances		
• No alternative	3 (10.00)	7 (23.33)
• Project authorities must continuously address the problems and solve them	24 (80.00)	21 (70.00)
• Make Plans to Study the effect of Tunnel on ground water status	18 (60.00)	21 (70.00)
• Reduce the rates of electricity bills of affected area	9 (30.00)	0 (00.00)
• Provide Full Time employment in the Projects	22 (73.33)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents**.**

7.3 Summing Up

It is observed in the chapter that maximum respondents in study area have Stated that project authorities used to visit for getting cooperation in the implementation of the project and giving benefits out of that addressing problems of local people such as; crakes in the houses due to blasting also have been the main purpose of the visits of the project authorities. The problems are generally related with whole community, and households urge that project authorities should continuously address the grievances of affected families. Project affected families are also anxious about the depleting ground water status in the study area. The demand of full time employment opportunities in projects is still among the respondents. They have elected panchayat body to raise all demands to the settlement of all their grievances, as a plan in case their problems are not solved.

Chapter-8

PROBLEMS FACED BY APPLE GROWERS IN HYDROELECTRIC PROJECT AREAS UNDER STUDY

Smoke of deadly dust, a mist of impassive dusty clouds, heart tearing underground blasts for tunnels, increasing unknown faces in the area with tools and machinery, have been the characteristics of hydroelectric project area site. All these features during project implementation impair the production of apple as well as health of the plants in the project affected areas. This is narrated by maximum respondents among project affected families and non-affected families. The present chapter looks for the impasse faced by apple growers in Hydroelectric Project areas under study. these are some visible and short term impact of hydroelectric projects, but the long term impact needs a specialized studies on geography, hydrology, ground water status, terrestrial environment, climatic conditions and human environment, which may likely change in course of time

8.1 Problems faced due to implementation of Hydroelectric Project in apple crop production by Sample Households

Problems related with local infrastructure due to project implementation and impact on quality of fruits is the matter of Table-8.1, wherein, it is seen that unduly high time in fruit transport has been the major problem which faced by project-affected families and non-affected families in both the Districts. The problem of damaged roads and blockage of roads have been the most likely occurring trouble in District Kinnaur under study area. Unavailability of trucks etc., due to bad roads haunt the project affected families and non-affected families in District Kullu. As it is seen (Table-8.1), maximum respondents revealed that their spoilage of apple produce have increased less than twenty percent which is the sign of some hope that, still there is chance to improve the local environment so that apple production again gets the momentum. According to households, during the project implementation period households of project affected families have received less production of apple crop. This is now improving, but not satisfactorily. Pollination problem is also a cause of this reduction in production in the study area of District Kullu, and depleting ground water status add to fluctuation in production in the study area of District Kinnaur.

8.2 Deforestation in the area of Sample Households

Deforestation in the area of Sample Households is presented in Table-8.2, wherein, it is seen that, 100 per cent respondents of study area in both the Districts find project implementation is the main cause of deforestation in the area. Deforestation is done basically for roads and transmission lines. But the extent of such activity is generally small. There are illegal public activities also (Table-8.2) its extent is more in the study area of District Kinnaur.

TABLE-8.1: Problems Faced due to Implementation of Hydroelectric Projects in Apple Crop Production by Sample Households

(Percentage)

Problems	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Problems related with local infrastructure due to project implementation				
• Damaged Roads	30.55	28.33	85.00	80.83
• Road Blocks	10.55	10.00	84.44	68.33
• Fruit Damaged due to bad roads	6.11	3.33	37.22	38.33
• High Transportation charges due to bad roads	5.55	8.33	13.33	14.16
• Unavailability of Trucks etc., due to bad roads	86.66	89.16	36.11	42.50
• Unduly high time in fruit transport	96.67	90.00	97.77	100.00
(B) Impact on Quality of Fruits				
• Spoilage increased by more than 20 percent	3.33	00.00	00.00	00.00
• Spoilage increased by more than 10 percent	30.00	40.00	46.67	45.00
• Spoilage increased by less than 10 percent	66.67	60.00	46.67	50.00
• No Change in spoilage	00.00	00.00	6.66	5.00
Total Respondents	30	20	30	20

TABLE-8.2: Deforestation in the Area of Sample Households

Cause/Agency	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Project Implementation				
• Yes	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• No	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(i) Activities				
• Road	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• Transmission Line	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(ii) Extent				
• Large	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Medium	0 (00.00)	0 (00.00)	10 (33.33)	7 (35.00)
• Small	30 (100.00)	20 (100.00)	20 (66.67)	13 (65.00)
(B) State Government Activities				
• Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(C) Illegal Public Activities				
• Yes	8 (22.67)	5 (25.00)	16 (53.33)	11 (55.00)
• No	22 (73.33)	15 (75.00)	14 (46.67)	9 (45.00)
(i) Activities				
• Road and other activities	8 (26.67)	5 (25.00)	16 (53.33)	11 (55.00)
(ii) Extent				
• Large	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Medium	0 (00.00)	0 (00.00)	10 (33.33)	7 (35.00)
• Small	8 (26.67)	5 (25.00)	6 (20.00)	4 (20.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

8.3 Impact of Deforestation on environment and apple fruit yield

The scenic beauty of mountains and valleys are ornamented by dense forests. Forests are the rich source of flora and fauna in hilly areas. Therefore the depletion of forests would create havoc to the cycle of life. This understanding becomes the matter of all sub-tables of Table 8.3

(a, b, c, d). Table-8.3(a) deals with impact of deforestation of rainfall in the area under study, wherein, maximum respondents revealed that rainfall has decreased 2 to 4 percent over the years. This has decreased fruit production 2 to 4 percent in both the Districts under study. Table-8.3(b) draws the attention on atmospheric warming. It is seen (Table-8.3(b)) that 2 to 4 percent and 4 to 6 percent in District Kullu and District Kinnaur, respectively the atmospheric warming has increased in the study area, during 10 to 15 years. It has negative impact on the fruit yield in the study area, which has reduced as revealed by more respondents to 2 to 4 percent and 4 to 6 percent in District Kullu and District Kinnaur, respectively. The study area of District Kullu has relatively more humidity in atmosphere than the study area of District Kinnaur. People of both the District have observed decrease in humidity during 10 to 15 years. Though in the study area of District Kullu there has been a minor change, but in the study area of District Kinnaur, people experienced 2 to 4 percent decrease in humidity. According to people, in the study area of District Kinnaur, the reduction of density of water in Satluj River due to projects has increased this problem further. It has reduced fruit yield 2 to 4 percent in both the Districts as people expressed. Environmental pollution is the obvious output of deforestation. Table-8.3(d) deals with this problem. All respondents of study area of District Kullu and 73.33 & 75 percent of respondents of project affected families and non-affected families of District Kinnaur respectively, have expressed that due to deforestation the problem of pollution has increased. It has increased most likely 4 to 6 percent. It has also negatively affected the fruit production, which has reduced 2 to 4 percent in the study areas of both the Districts. Since last 15 years, the problem of pollution has mostly increased. It can be infer from all the sub-tables of Table-8.3 that increasing the area under forest is an essential task before all the stack holders.

8.4 Deterioration in Apple Fruit Quality of Sample Households due to greater atmospheric pollution

Table-8.4 draws the perception of sample households regarding the deterioration in fruit quality due to greater atmospheric pollution. The Table-8.4 extracts the conclusion that all the respondents in District Kullu for project affected families and non-affected families have accepted that pollution is one of the reason of their lower apple productivity, while 80 percent households are agree with that in District Kinnaur. Lower intensity of honey bees disturbs the expectations of orchardists in both the Districts. Problem of fruit size is also a matter of worry to sample households. Colour of fruits is not the problem as seen in (Table-8.4). Production and productivity of fruits depends upon many factors, environment is one of them. Therefore, pollution reducing measures are required in the study area, to improve the quality of fruit production.

TABLE-8.3 (a): Impact of Deforestation on Rainfall and Apple Fruit Yield

Impact	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Impact on Rainfall				
(i) Increase				
• Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(ii) Decrease				
• Yes	22 (73.33)	17 (85.00)	22 (73.33)	15 (75.00)
• No Change	8 (26.67)	3 (15.00)	8 (26.67)	5 (25.00)
(iii) Extent %				
• 0-2%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 2-4%	19 (63.33)	14 (70.00)	6 (20.00)	3 (15.00)
• 4-6%	3 (10.00)	3 (15.00)	16 (53.33)	12 (60.00)
• Above 6%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(iv) Duration				
• Last 15 years	4 (13.33)	4 (20.00)	6 (20.00)	4 (20.00)
• Last 10 years	18 (60.00)	13 (65.00)	16 (53.33)	11 (55.00)
• Last 5 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(v) Fruit Yield				
• Increase				
➢ Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• Decrease				
➢ Yes	23 (76.67)	17 (85.00)	22 (73.33)	15 (75.00)
➢ No Change	7 (23.33)	3 (15.00)	8 (26.67)	5 (25.00)
• Extent %				
➢ 0-2%	1 (3.33)	0 (00.00)	0 (00.00)	0 (00.00)
➢ 2-4%	23 (76.67)	16 (80.00)	8 (26.67)	5 (25.00)
➢ 4-6%	4 (13.33)	3 (15.00)	18 (60.00)	13 (65.00)
➢ Above 6%	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.3 (b): Impact of Deforestation on Atmospheric Warming and Apple Fruit Yield

Impact	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(B) Impact on Atmospheric Warming				
(vi) Increase				
• Yes	28 (93.33)	19 (95.00)	28 (93.33)	19 (95.00)
• No Change	2 (6.67)	1 (5.00)	2 (6.67)	1 (5.00)
(vii) Decrease				
• Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(viii) Extent %				
• 0-2%	1 (3.33)	0 (00.00)	0 (00.00)	0 (00.00)
• 2-4%	23 (76.67)	16 (80.00)	8 (26.67)	5 (25.00)
• 4-6%	4 (13.33)	3 (15.00)	18 (60.00)	13 (65.00)
• Above 6%	0 (00.00)	0 (00.00)	2 (6.66)	1 (5.00)
(ix) Duration				
• Last 15 years	3 (10.00)	2 (10.00)	16 (53.33)	11 (55.00)
• Last 10 years	25 (83.33)	17 (85.00)	12 (40.00)	8 (40.00)
• Last 5 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(x) Fruit Yield				
• Increase				
➢ Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• Decrease				
➢ Yes	28 (93.33)	19 (95.00)	28 (93.33)	19 (95.00)
➢ No Change	2 (6.67)	1 (5.00)	2 (6.67)	1 (5.00)
• Extent %				
➢ 0-2%	1 (3.33)	0 (00.00)	0 (00.00)	0 (00.00)
➢ 2-4%	20 (66.67)	13 (65.00)	6 (20.00)	5 (25.00)
➢ 4-6%	7 (23.33)	6 (30.00)	14 (46.67)	9 (45.00)
➢ Above 6%	0 (00.00)	0 (00.00)	8 (26.66)	5 (25.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.3 (c): Impact of Deforestation on Humidity and Apple Fruit Yield

Impact	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(C) Impact on Humidity				
(xi) Increase				
• Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(xii) Decrease				
• Yes	19 (63.33)	14 (70.00)	12 (40.00)	7 (35.00)
• No Change	11 (36.67)	6 (30.00)	18 (60.00)	13 (65.00)
(xiii) Extent %				
• 0-2%	19 (63.33)	14 (70.00)	0 (00.00)	0 (00.00)
• 2-4%	0 (00.00)	0 (00.00)	10 (33.33)	6 (30.00)
• 4-6%	0 (00.00)	0 (00.00)	2 (6.67)	1 (5.00)
• Above 6%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(xiv) Duration				
• Last 15 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Last 10 years	19 (63.33)	14 (70.00)	10 (33.33)	5 (25.00)
• Last 5 years	0 (00.00)	0 (00.00)	2 (6.67)	2 (10.00)
(xv) Fruit Yield				
• Increase				
➢ Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• Decrease				
➢ Yes	19 (63.33)	14 (70.00)	12 (40.00)	7 (35.00)
➢ No Change	11 (36.67)	6 (30.00)	18 (60.00)	13 (65.00)
• Extent %				
➢ 0-2%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ 2-4%	19 (63.33)	14 (70.00)	12 (40.00)	7 (35.00)
➢ 4-6%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ Above 6%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.3 (d): Impact of Deforestation on Pollution and Apple Fruit Yield

Impact	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(D) Impact on Pollution				
(xvi) Increase				
• Yes	30 (100.00)	20 (100.00)	22 (73.33)	15 (75.00)
• No Change	0 (00.00)	0 (00.00)	8 (26.67)	5 (25.00)
(xvii) Decrease				
• Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• No	30 (100.00)	20 (100.00)	22 (73.33)	15 (75.00)
(xviii) Extent %				
• 0-2%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 2-4%	3 (10.00)	1 (5.00)	8 (26.67)	7 (35.00)
• 4-6%	23 (76.67)	18 (90.00)	14 (46.66)	8 (40.00)
• Above 6%	4 (13.33)	1 (5.00)	0 (00.00)	0 (00.00)
(xix) Duration				
• Last 15 years	21 (70.00)	15 (75.00)	10 (33.33)	6 (30.00)
• Last 10 years	9 (30.00)	5 (25.00)	12 (40.00)	9 (45.00)
• Last 5 years	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(xx) Fruit Yield				
• Increase				
➢ Yes	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
➢ No	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
• Decrease				
➢ Yes	30 (100.00)	20 (100.00)	22 (73.33)	15 (75.00)
➢ No Change	0 (00.00)	0 (00.00)	8 (26.67)	5 (25.00)
• Extent %				
➢ 0-2%	1 (3.33)	1 (5.00)	0 (00.00)	0 (00.00)
➢ 2-4%	26 (86.67)	18 (90.00)	14 (46.67)	9 (45.00)
➢ 4-6%	3 (10.00)	1 (5.00)	8 (26.66)	6 (30.00)
➢ Above 6%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.4: Deterioration in Apple Fruit Quality of Sample Households due to Greater Atmospheric Pollution

Perception	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Lower production due to pollution problems.	30 (100.00)	20 (100.00)	24 (80.00)	16 (80.00)
(B) Lower Intensity of Honey Bees.	26 (86.67)	17 (85.00)	22 (73.33)	16 (80.00)
(C) Problems in Fruit Size	19 (63.33)	12 (60.00)	20 (60.00)	13 (65.00)
(D) Problems in Colour of Fruits.	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

8.5 Benefits Accrued by Sample Households due to Project Implementation

Project implementation in the study area has benefited the local people in several ways. It is by providing employment opportunities to local people in the projects, employment in transport sector, employment opportunities as petty contractors and local business opportunities, local infrastructure development etc. This has directly as well as indirectly increased the income and consumption level of local people. Nevertheless, maximum respondents in the study area of District Kullu have Stated that projects have provided them casual and contractual employment, projects should have scope for full time employment opportunities to local youth. Benefits due to project implementation are presented in Table-8.5 (a, b), wherein, it is seen that increase in off-farm employment opportunities mostly in transport and local business activities, have increased off-farm income 10 to 20 percent in the study areas of both the Districts. This increased off-farm income is utilized by the sample households mostly for consumption purposes (Table-8.5(a)). Local infrastructure development, training in farm management to local people, and development of local market is the matter of Table-8.5(b), wherein, it is concluded that training in farm management is yet to be provided by project

authorities, but they have worked in better road density, quality, establishment of new offices and availability of resources for public conveniences. Development of local market has given the income opportunities to local people. Mostly, their income has increased 20 to 50 percent and 10 to 20 percent, respectively in the study areas of District Kullu and District Kinnaur.

8.6 Impact of Transmission Line on the Apple

A giant, mighty, several armed, iron structures are standing on fields, over the orchards, holding transmission lines of electricity, is alien to local people of study areas. They are learning how to live under these lines and among these iron structures. They have several rumours and beliefs that they might be in trouble in future, while working in their fields. All this is discussed in Table-8.6, wherein, sample households have expressed their views regarding the impact of transmission line on their orchard and their life. The situation is rather sensitive in the study area of District Kullu, where the transmission line overcast the fields and orchards. Here on an average one bigha (0.097 hectare) of land per household is covered by transmission line and on an average affecting thirty seven apple plants per household. Households express that there are adverse impacts of these transmission line on their apple crop. The 36.66 per cent respondents observed that their production of apple crop has reduced to 2 to 4 percent, while 16.67 per cent respondents observed a reduction of 4 to 6 per cent in apple crop production. Only 6.67 per cent respondents believed that they have received more than 6 per cent reduction in the production of their apple crop. There are 40 per cent respondents, who observed no reduction in production, because their land is not affected by transmission line, but they too believe the fall in production due to the dearth of pollination plants. In other impacts the fear of mishap under the transmission line and continuous noise in transmission line disturb honey bees and other pollinating agents in the area, are also expressed by households

TABLE-8.5 (a): Benefits Accrued by Sample Households due to Project Implementation (increase in off-farm employment & income)

Benefits	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Increase in Off-farm Employment				
(a) Employment in Hydro electric Project	15 (50.00)	9 (45.00)	20 (66.67)	13 (65.00)
(b) Local Business Opportunities	24 (80.00)	15 (75.00)	28 (93.33)	18 (90.00)
(c) Employment in Transport Sector	23 (76.67)	13 (65.00)	18 (60.00)	12 (60.00)
(d) Employment as Patty Contractor	9 (30.00)	5 (25.00)	10 (33.33)	6 (30.00)
(B) Increase in Off-farm Income				
(a) > 50%	2 (6.67)	1 (5.00)	0 (00.00)	0 (00.00)
(b) 20 to 50%	5 (16.67)	3 (15.00)	10 (33.33)	6 (30.00)
(c) 10 to 20%	16 (53.33)	11 (55.00)	16 (53.33)	11 (55.00)
(d) < 10%	7 (23.33)	5 (25.00)	2 (6.67)	2 (10.00)
(e) No Change	0 (00.00)	0 (00.00)	2 (6.67)	1 (5.00)
(f) Declined	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(C) Use of Enhanced Off-farm Income				
(a) Invested in Farm	0	0	0	0
• > 50%	(00.00)	(00.00)	(00.00)	(00.00)
• 20-50%	2 (6.67)	2 (10.00)	4 (13.33)	3 (15.00)
• 10-20%	23 (76.67)	16 (80.00)	20 (66.67)	14 (70.00)
• < 10%	5 (16.66)	2 (10.00)	4 (13.33)	2 (10.00)
(b) Enhanced Consumption	2	2	4	3
• > 50%	(6.67)	(10.00)	(13.33)	(15.00)
• 20 to 50%	27 (90.00)	16 (80.00)	20 66.67)	13 (65.00)
• 10 to 20%	1 (3.33)	2 (10.00)	4 (13.33)	3 (15.00)
• < 10%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(c) Saving	0	0	0	0
• > 50%	(00.00)	(00.00)	(00.00)	(00.00)
• 20 to 50%	4 (13.33)	1 (5.00)	8 (26.67)	9 (45.00)
• 10 to 20%	25 (83.33)	19 (95.00)	16 (53.33)	10 (50.00)
• <10%	1 (3.33)	0 (00.00)	4 (13.33)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.5 (b): Benefits Accrued by Sample Households due to Project Implementation (infrastructure, training & development of local market)

Benefits	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(D) Infrastructure				
• Better Road Density	28 (93.33)	20 (100.00)	8 (26.67)	6 (30.00)
• Better Quality of Roads	11 (36.67)	7 (35.00)	22 (73.33)	15 (75.00)
• Establishment of New Offices	12 (40.00)	10 (50.00)	30 (100.00)	20 (100.00)
• Availability of Public Conveniences	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)
(E) Training				
• Facility is Provided by Project Management for better Farm Management	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Project Management Providing guidance about day to day problems in Farm Management	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• Project Management providing Farm Inputs	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
(F) Development of Local Market				
• Off-farm income increased > 50%	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
• 20 to 50%	21 (70.00)	16 (80.00)	2 (6.67)	2 (10.00)
• 10 to 20%	7 (23.33)	3 (15.00)	18 (60.00)	9 (45.00)
• < 10%	2 (6.67)	1 (5.00)	8 (26.67)	7 (35.00)
• No Change	0 (00.00)	0 (00.00)	2 (6.66)	2 (10.00)
• Declined	0 (00.00)	0 (00.00)	0 (00.00)	0 (00.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

TABLE-8.6: Impact of Transmission Line on the Apple Crop of Sample Households

Particulars	District Kullu	District Kinnaur
	Project affected families	Project affected families
(A) Area affected (Ha.)/Households	0.097	0.037
(B) No. of Plants affected/Households	37	0
(C) Adverse Impact on Production		
• > 6%	2	0
	(6.67)	(00.00)
• 4 to 6%	5	0
	(16.67)	(00.00)
• 2 to 4%	11	0
	(36.66)	(00.00)
• < 2%	0	0
	(00.00)	(00.00)
• No Impact	12	0
	(40.00)	(00.00)
(D) Other Impacts		
• Fear of Mishap Under Transmission Line	18	0
	(60.00)	(00.00)
• Continuous noise in Transmission Line disturb honey bees and other Pollination agents in the area	17	0
	(56.66)	(00.00)
Total Respondents	30	30
	(100.00)	(100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

8.7 Short term and Long term impact of hydroelectric power projects

There are short term and long term impact of hydroelectric power projects on affected people. The environment impact of construction works is mostly direct and short term. Direct impact means the sensitivity of an action and lasts for the construction period or so. They are visible as households of the study areas have revealed in chapter 7 and chapter 8. But the long-term impact demands expert knowledge of many subjects. To assess the long-term impact of hydroelectric projects there should be a great emphasis on following special studies (Goyal, D. P. and Bharadwaj, H. C., 1992):

i) There should be study on the geography of the region, including the study of the soil

ii) A hydraulic study on the sediment transport and bed deformation after diversion (increased roughness, general erosion etc.,)

iii) Studies should be on ground water levels before and after diversions in the affected regions

iv) Studies should be on terrestrial environment, i.e. forests and wild life, earthquakes, climate and agriculture etc.

v) A socio-economic study of the area, affect on human environment i.e., resettlement, and expected changes which may take place.

It is observed during the course of investigation that multidimensional problems are caused by the hydroelectric projects and the benefits they have provided to local community are diverse also. Therefore, the efforts should be done to tame all the adverse affects on hydroelectric projects on the people and environment in the larger interest.

8.8 Summing Up

This chapter draws the conclusions regarding problems faced by apple crop growers in the study area. As the households reveal, during the project implementation period, due to dust and pollution, households of project affected families have received less production of apple crop. This is now improving, but not satisfactorily. Pollination problem is one of the problems in the study area of District Kullu, while depleting ground water status add to fluctuation in the production of apple crop in the study area of District Kinnaur. It is found that unduly high time in fruit transport has been the major problem which is faced by project affected families and non-affected families in both the Districts. As it is seen maximum respondents revealed that their spoilage of apple produce have increased less than twenty percent, which is the sign of some hope that there is chance to improve the local environment, so that apple production again gets the momentum. Households in the study area find the project implementation is the main cause of deforestation in the study area. Deforestation is basically, for roads and transmission lines. But the extent of such activity is generally small. Production and productivity of fruits depend upon many factors, environment is one of them, and therefore, pollution reducing measures are required in the study area to improve the quality and quantity of fruit production. Some benefits such as, employment opportunities, local market development, increase in off-farm income and availabilities of public conveniences are given by project authorities to the local people of the study areas. Nevertheless, maximum respondents in the study area of District Kullu have Stated that projects have provided them casual and contractual employment. Projects should have scope for full time employment opportunities to local youth. It is seen that increase in off-farm employment opportunities mostly in transport and local business activities have increased off-farm income 10 to 20 percent in the study areas of both the Districts. Households are spending off-farm income mostly on consumption purposes. People seem sceptical about the negative effects of transmission line on apple crop and their lives.

Chapter-9

CONCLUSIONS, SUGGESTIONS AND POLICY IMPLICATIONS

9.1 Conclusions

Horticulture is the main source of income in the study areas of District Kullu and District Kinnaur. Commencements of hydroelectricity projects in these areas have directly and indirectly affected the income, employment, apple crop area and production of the sample households. No problem is solved at one time, and no solution is the final solution of all the grievances. There is always been scope for proper utilization of resources as well as capacities to channelize the development process. People participation is inevitable for the success of any projects and plans.

In Himachal Pradesh the area under apple crop as well as the production of apple has increased in recent years. The same is true for Kinnaur and Kullu Districts. The data of Manali Tehsil of Kullu District and Nichar Tehsil of Kinnaur District is also taken into consideration. Here, it is also found that the area and production of apple crop has increased since last eight to ten years. People are shifting cultivated lands to orchards in lieu of getting more profits in recent years in both the Districts.

Households in the study areas are also experiencing changes over the time period. Projects have affected their lives in many ways. Their land use and cropping pattern is also changing. They are planting more apple trees instead of utilizing their fields for field crops. Households in both the Districts are growing apple in different agro-climatic conditions, but their problems and requirements are more or less the same. Their socio-economic development requires improvement in educational status, especially technical education among the youth of the affected areas. It will help them to get good employment opportunities in projects and other fields also.

In apple varieties, Royal Delicious variety is dominating in the study area. Its area, production and marketing are high in the study areas in comparison of other apple crop varieties. There is a lot of scope in the improvement of the production, size and marketing of apple crops in the study areas of both the Districts. Officials in Districts believe that besides hydroelectric projects, there are various factors like climatic/ weather conditions, maintenance of orchards, availability of pollinizing varieties, pollinating insects, age of trees etc.; among which abiotic factors (climatic conditions) play a major role in the fluctuation of production of apple crop.

As the households narrated that the project authorities used to visit to get cooperation in the implementation of the project and giving benefits out of that. They also come to address the grievances of the local people such as; crakes in the houses of households due to blasting and other problems. The project affected of the study area of District Kullu seems anxious about the depleting ground water status in the area. The demand of full time employment opportunities in projects is still among the households in this District. Respondents of both the Districts have found elected local panchayat body is a good platform to raise all demands to the settlements of their all grievances due to projects.

It is found that unduly high time in fruit transport has been the major problem which is faced by project affected families and non-affected families in both the Districts. Maximum respondents revealed that their spoilage of apple produce have increased less than twenty percent, which is the sign of some hope that there is chance to improve the local environment, so that apple production again gets the momentum. Households in the study area find the project implementation is the main cause of deforestation. Basically, deforestation is for roads and transmission lines. But the extent of such activity is generally small. But increasing the forest area in the project affected areas is an essential task before all the stake holders.

Production and productivity of fruits depend upon many factors, environment is one of them, and therefore, pollution reducing measures are required in the study area to improve the quality and quantity of fruit production. As the households reveal, during the project implementation period, due to dust and pollution, households of project affected families have received less production of apple crop. This is now improving, but not satisfactorily. Pollination problem is one of the problems in the study area of District Kullu, while depleting ground water status add to fluctuation in the production of apple crop in the study area of District Kinnaur.

Some benefits such as, employment opportunities, local market development, increase in off-farm income and availabilities of public conveniences are given by project authorities to the local people of the study areas. This has directly as well as indirectly increased the income and consumption levels of local people. Nevertheless, maximum respondents in the study area of District Kullu have Stated that projects have provided them casual and contractual employment. Projects should have scope for full time employment opportunities to local youth. It is seen that increase in off-farm employment opportunities mostly in transport and local business activities have increased off-farm income 10 to 20 percent in the study areas of both the Districts. Households are spending off-farm income mostly on consumption purposes. People seem sceptical about the negative effects of transmission line on their lives and apple crop.

9.2 Suggestions

This chapter has comprises the suggestions too, which is given by sample households. Table-9.1 deals with such suggestions, wherein, it is seen that the pollination, pollution and effects of transmission line on apple & other fruits is in top consideration for the sample households of District Kullu. Therefore, they have emphasised on the solution of this problem. While reducing ground water status in apple orchard, training and better farm management techniques, preservation of local biotic resources and afforestation work is also in consideration among the sampled households. In the study area of District Kinnaur, the emphasis is on the improvement of transportation network surrounding the apple orchards. Here, the depleting ground water status is also in main consideration for project affected families. Providing Training and Inputs for better farm Management and required seriousness in the afforestation work are too in the consideration of the sample households.

TABLE-9.1: Suggestions Given by Sample Households

Suggestions	District Kullu		District Kinnaur	
	Project affected families	Non-affected families	Project affected families	Non-affected families
(A) Solve the Problem of Pollination, Pollution and check the effects of Transmission Line on Apple & Other Fruits.	30 (100.00)	20 (100.00)	0 (00.00)	0 (00.00)
(B) Improve the Transportation Network surrounding the Apple Orchard.	0 (00.00)	0 (00.00)	16 (53.33)	12 (60.00)
(C) Check the reducing ground water status in the orchard.	26 (86.67)	16 (80.00)	30 (100.00)	9 (45.00)
(D) Provide Training and Inputs for better farm Management.	28 (93.33)	19 (95.00)	20 (66.66)	13 (65.00)
(E) Preserve the local Biotic Resources.	16 (53.33)	12 (60.00)	0 (00.00)	0 (00.00)
(F) Properly does the work of afforestation.	21 (70.00)	14 (70.00)	20 (66.66)	13 (65.00)
Total Respondents	30 (100.00)	20 (100.00)	30 (100.00)	20 (100.00)

Note: Figures in parenthesis are the percentages of the total respondents.

9.3 Policy Implications

After analysing all the relevant information from the sample households, considering their suggestions and observing the local conditions surrounding the project affected areas, some recommendations emerge for the improvement in interaction between the project authorities and the households. Besides, State Government initiatives, project authorities can take some policy initiatives to solve all the grievances of project affected families. Some of these kinds of policy initiatives are given below. It would help households in many ways, and they could get good benefits from their orchards:

(a) Horticulture Development:

(vi) Project authorities can organise Training and New farm management technique camps in the local areas in regular time interval, and local people participation should be insured in them.

(vii) Project authorities can help in the marketing of apple crop in project affected areas, and the involvement of local progressive and enterprising orchardist can be taken for this.

(viii) Value addition in the apple fruit crop can be encouraged in the area by Project authorities.

(ix) A regular check up of depleting ground water status, if it is there in orchards, should be done by project authorities. They could conduct studies or coordinate such studies related to such problems. It will improve their interaction with affected families.

(x) Project authorities should help the affected families in the preservation of local biotic resources, especially forests. This will have direct as well as indirect effect on the production of apple crop in the area.

(b) Income and Employment Generation:

(iv) A good way of fruitful interaction is, if projects provide technical and employment oriented education to the local youth of project affected area. This will help them to get high income employment opportunities in projects as well as other areas also.

(v) Projects developers can make plans to provide full time employment opportunities to local unemployed youth. Preference can be given to educated and technically sound

candidates. This will improve their income as well as their involvement in the project activities.

(vi) Projects authorities can help the local enterprising people to develop the self employment opportunities in their area.

In general, project authorities should regularly interact with affected families through their elected panchayat body. It will help them to listen the grievances of these families due to projects, and on this platform with the involvement of Gram Shaba a satisfactory solution of all their problems can be found. This will improve the participation, coordination, cooperation and interaction of local community with project authorities.

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