L-4 Hallan-1 Site of Naggar Model Area

L-4.1 Present Socio-economic and Natural Conditions

Hallan-1 site is located at a distance of 20 km in the northern direction from Kullu, District's headquarter, and its topography consists of plain, rolling area, mountainous area and steep area extending over high terrace on left bank terrace of the Beas River. The socio-economic and natural conditions of Hallan-1 site are summarized in Table L-4.1.1.

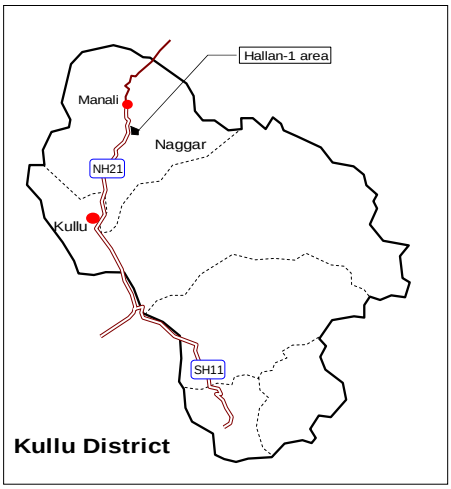


Fig. L-4.1.1 Location Map of Hallan-1 Site

Table L-4.1.1 Socio-economic and Natural Conditions of Hallan-1 Site

District	Kullu	Agro-ecological zone	Zone-3
Block	KU-37 Naggar	Annual rainfall (mm)	838
Panchayat	Hallan-1	Average Temperature (◦C)	16.7
Village	Dashal, Sarsai, Barka, Boshi, Batahr, Rongri, Chhakki, Raman, Balthaa, Charanag, Damadi, Kumarti, Bdehragran	Average Max.Temperature (◦C)	24.6
		Average Min. Temperature (◦C)	7.7
		Total area (ha)	773
		Cultivated area (ha)	407
Pattern	Category-I	*Source: Compiled by JICA Study Team*	

(1) People/ Community

Population in the Site: The Panchayats comprises of 640 households. The total population of the site is 4,074. The distribution of population in the 12 revenue villages is given below.

Table L-4.1.2 Village wise Population Details of Hallan-I Panchayat

Village	Population	Total SC Population	% of SC	Total ST Population	% of ST
Chragan	220	140	62.7	-	0
Baltha	365	-	0	-	0
Raman	346	12	3.46	-	0
Badhai R.G	320	-	0	-	0
Bhosh	370	111	30	-	0
Bhadka	138	18	13	20	14.4
Chakki	474	53	11	24	5.0
Kumarhtii	296	103	34.7	-	-
Dashal	454	76	16.7	41	9.0
Balahar	416	142	34.1	06	1.4
Sarsai	398	122	30.6	53	13.3
Ranghair	277	104	37.5	15	5.4
Total	**4074**	**881**	**21.6**	**159**	**3.9**

Source – Panchayat Record Hallan-I Panchayat

The population in the area is comprised of 3.9% STs, 21.6% SCs and 75% upper caste communities. The predominant community among SCs is Lohaar (Iron Smith). They are mainly agriculturists. The other two castes include Koli and Harijan. SCs are among the most marginal farming household in the area.

Ethnic Group and Religion: 3% of Tribal are found at the Project site, they are mainly Buddhist. The population is entirely Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar

but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 2037. Like in the other parts of the Sate, 70-80% of the agricultural labor is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labor input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are 5 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. There are 7 Mahila Mandal initiated by the Dept of Rural Development. All 7 groups have formed SHGs. Most of the groups have not received any training in income-generating activities. The women's groups have shown interest in taking up the following activities- dairy development, food processing (apple jelly and jam making) and weaving. The local DOA has suggested the formation of women Farmers Interest Groups under the Project. These groups will be valuable both for promoting extension work and promoting any project related activity.

L-4.2 Present Agriculture

(1) Cropping Pattern in Hallan - I Site

The existing cropping pattern of Hallan-I site is shown in Table L-4.2.1 and cropping calendar is in Fig. L-4.2.1. Total cropped area is 669 ha with a cropping intensity of 164 %.

Table L-4.2.1 Existing Cropping Pattern of Hallan-I Site

Crops		Kharif season (ha)			Rabi season (ha)			Ave. Yield (ton/ha)
		Rainfed	Full-Irrig.	Life save Irrig.	Rainfed	Full-Irrig	Life save Irrig.	
Food Grains	Maize	120						2.6
	Paddy	10						2.5
	Wheat				120			2.7
	Barley				20			2.0
	Pulses	10						1.0
Sub-total (food grains)		140			140			
Vegetables	Potato		32					10.0
	Peas					23		5.0
	Tomato	23						6.0
	Beans		1					8.0
	Cabbage		8					12.5
	Garlic					4		15.0
	Cauliflower		4					10.0
	Broccoli		2					4.0
	Mix Veg.	2						20.0
Sub-total (vegetables)		25	47			27		
Sub-total (food grains+vegetables)		165	47		140	27		
Fruits	Apple						275.0	23.0
	Pear						5.0	17.3
	Other fruits						5.0	10.0
Sub-total (fruits)							285.0	
Fodder Crops							5.0	20.0
Cropped Area (ha)								669.0
Cultivated Area (ha)								407.0
Current Fallow Area (ha)								40.0
Cropping Intensity (%)								164%

Note: The data is based on the farm household survey and discussion with farmers group.
Source: JICA Study Team

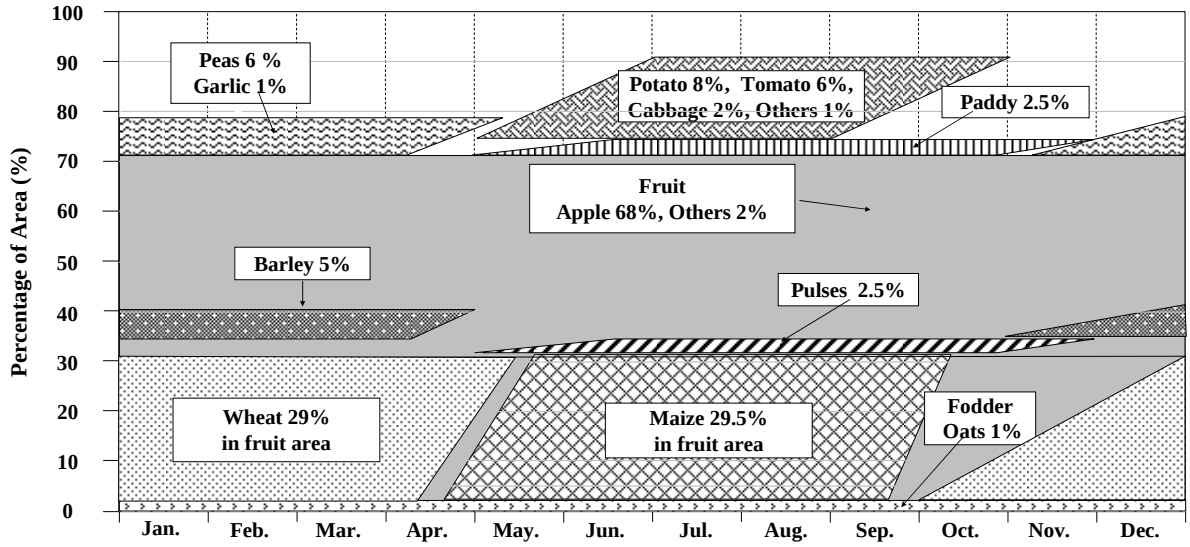


Fig. L-4.2.1 Existing Cropping Calendar of Hallan-I Site

In the site, fruit cultivation (mainly apple) is carried out on commercial purpose in about 70% of the cultivated area, and food grains are cultivated only for self-consumption and fodder purpose. Many fruit cultivating farmers also purchase their food grains. Vegetables are also cultivated in a relatively small area for commercial purpose.

Strategic vegetables including potato, tomato, peas, and cauliflower are cultivated in an area of 32 ha, 23 ha, 23 ha, and 4 ha respectively. Besides, other vegetables such as cabbage, broccoli, and beans are also cultivated. The yields of vegetables are comparatively low, compared to the District average. Exotic vegetable broccoli is cultivated by 4-5 farmers in an area of 2.0 ha. Vegetables are cultivated mainly under irrigated condition.

The major varieties of the crops grown in Hallan-I site are: Kanchan-101, 517, 581 for maize; Local Matali for paddy and PBW-343 and UP-2338 for wheat, Kufri Jyoti for potato, Azad P-1 for peas and Manisha (hybrid) for tomato.

(2) Farm Inputs

About 90% of the households purchase seeds for cereal crops from departmental outlet, and the remaining 10% purchase from the retail shops outside the village. In case of vegetable seeds, only 15% of households purchase their seeds from departmental outlet, whereas 85% purchase from retail shops outside the village. In case of fruit crops, 80% of the households purchase seedlings from certified nursery owners, and about 10% each purchase from horticulture department outlet or university.

On an average about 20 tons of organic manure is used by each household, and most of these manure are from self-owned animals. The major supplier of fertilizer in the area is HIMFED. Vermi-composting is not very popular in the area only 2-3 families have adopted the technique. The usage of fertilizer in the year 2007-08 in the area is given below.

Table L-4.2.2 Fertilizer Used in Hallan-I Panchayat

Name of the Fertilizer	Amount (ton)
Calcium Ammonium Nitrate (CAN)	6.35
Urea (Nitrogenous Fertilizer)	4.35
Muerotop Potash (MOP)	4
NPK 12:32:16	61.8
NPK 10:26:26	17.6
SSP	11.7

Source: ADO, Hallan-I Panchayat

In order to control pest including fruit borer, pod borer, leaf miner, bacterial wilt, buckeye rot in tomato, and powdery mildew in peas, about 85% of the households purchase from retail shops outside the village, and only 10% purchase chemicals from departmental outlet. All the farmers purchase fertilizers from the agricultural service cooperative society.

The farm machinery status in Hallan - I site is extremely low with only 1 sprayer in each household. Farmers usually hire harvesters/threshers.

Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. In addition to family labourers, some farmers employ seasonal labourers from the outside such as Bihar State and Nepal.

(3) Constraints in Crop Production

The major constraints as reported by farmers are poor or no irrigation facilities, and no marketing facilities such as collection center, and high transport cost to Delhi.

(4) Crop Diversification Potential

The farmers are interested in crop diversification to grow vegetable crops such as potato, tomato, peas, garlic, broccoli, cauliflower, and cabbage. The major requirements for crop diversification as reported by farmers are: development of irrigation facilities, marketing facilities such as collection center, and technical support from the government.

L-4.3 Present Agriculture-Allied Sector

(1) Horticulture

Present Status of Fruit Planting: Hallan-1 site is one typical apple planting area in the Kullu District. Apple has been giving best returns to farmers. Thus many farmers have converted more land under fruit plantation. Although no floriculture and medicinal plant cultivation have been put into practice yet, there is also potential in these plants cultivation for creating additional income sources for farmers.

Diversification Potential of Horticulture Crop: Diversification potential area will be waste land or other fallow area around in Hallan-1 site. Potential horticulture crops are: apple, pear, hazelnut, walnut and strawberry for promoting fruit planting; gladiolus, chrysanthemum, tulip, lillium and carnation for promoting floriculture; and stevia, jatamansi, salvia, tulsi, satawar, rosemerry and safed musli for diversifying medical and aromatic plant cultivation.

Technologies for exploitation of horticulture crops are required for the following points:

i) Vertical diversification of existing apple plantation;

ii) Cultivable waste land utilization for plantation of Hazelnut and Walnut;

iii) Horticulture tourism development;

iv) High density plantation;

v) Cluster approach to horticulture and medicinal plant cultivation; and

vi) Inter-cropping of medicinal plants.

(2) Animal Husbandry

The current livestock population in Hallan-1 site is 75 crossbred cattle, 483 indigenous cattle, 206 buffaloes, 7 sheep, 127 goat, and 6 horses and others. Hallan-I has more focus on crossbred dairy and sheep. The general observation is that the potential of crossbred cattle can further be augmented by improving feeding situation.

Available infrastructures of livestock sector in and around the site are 2 VD (veterinary dispensary), AI (artificial insemination) facility, private vendors for milk market, and public meat centre.

An attempt was made to calculate feed balance from natural resources and net area sown using the information collected from field survey. The estimated results are summarized below:

i) Dry matter supply is estimated at 1,625 tons against demand of 4,590 tons, having shortage of 64.6%;

ii) Green fodder supply is estimated at 1,754 tons against demand of 7,574 tons, having shortage of 76.8%; and

iii) Dry fodder supply is estimated at 1,420 tons against demand of 3,383 tons, showing shortage of 58.0%.

In Hallan-I site, there is deficit supply of green and dry fodder. The dairy production in this site can be enhanced by improving feeding situation through mix cropping of fruits and fodder in orchard.

Future development potential and constraints of animal husbandry in combination with crop diversification in Hallan-I site are defined as a type of “high potential dairy production”.

(2) Inland Fisheries

Trout fish production by using perennial cool water source from running water cemented raceways is attributable to supply of seed, balanced feeding and extension efforts of Department of Fisheries. It is evident that production from private investor is on the rise.

In the State, a total of 45 farmers are presently engaged in trout farming, including 11 persons in Kullu District and Hallan-1 site. There is only one feed mill in Kullu District, catering all the growers in the State. As the feed has a limited shelf period, growers based far away from Kullu are facing transportation problems. The trout is sold to hotels and restaurants directly or via commission agents in Delhi.

This running water trout culture is a “high risk high gain” investment. Therefore, the following constraints need to be overcome by appropriate means for developing potential:

i) To require heavy capital investment at the beginning and sufficient operation fund to cover high feeding cost due to a limited shelf period of the feed;

ii) To need careful management of stock being susceptible to disease due to lack of disease diagnosis and surveillance network;

iii) To enhance farmers’ knowledge about fish pathology and processing; and

iv) To establish a network linking all trout fish growers for rationalizing the current forwarding

system on individual basis.

Farmers having high investment capacity would have a chance to start trout fish culture through irrigation system. However, most of farmers in the site belong to small and marginal farmers. Accordingly, it will take time for these farmers to start trout culture at present.

L-4.4 Present Irrigation

(1) Existing Irrigation System

In this site, topography consists of plain, rolling area and mountainous area. Plain and rolling area have irrigation system under operation, while there is no irrigation in the mountainous area. These existing systems have free intakes constructed with stone placing in the river. Canals are also mostly earth canals and partly upgraded into concrete canals. Main irrigation systems in this site are summarized below.

Table 4.4.1 Main Irrigation System in Hallan-1 Site

Name / Village	Type	Source	Area (ha)
Dashal	DOA flow irrigation	Haripur Nalla	Not available
Rangri	DOA flow irrigation	Haripur Nalla	Not available
Chhakki	IPH flow irrigation	Chhakki Nalla	Not available

(2) Present Irrigation Practice

Present irrigation practice for the major crops is summarized below.

Table 4.4.2 Present Irrigation Practice in Hallan-1 Site

Crop	Area (ha)	Irrigation period	Nos. of times or interval
Paddy	20	Nov. - Apr.	Not fixed
Wheat	20	Nov. - Apr.	Not fixed
Vegetable	15	Mar. - Jun.	Not fixed
Apple	200	-	Not fixed

(3) Water User's Association (WUA, KVS)

There are two registered WUAs in Dashal and Rangri villages. However, they are not active in their functions and meetings are rarely held. Water charge of Rs.50 per year is being collected partially, which are deposited in the banks at Haripur and KCC Khaknala. Operation and maintenance works are not done satisfactorily. Farmers are complaining that water is not properly distributed and requesting improvement in the distribution system. It is proposed that duties and responsibility of water users should be specified and members of WUAs should be trained.

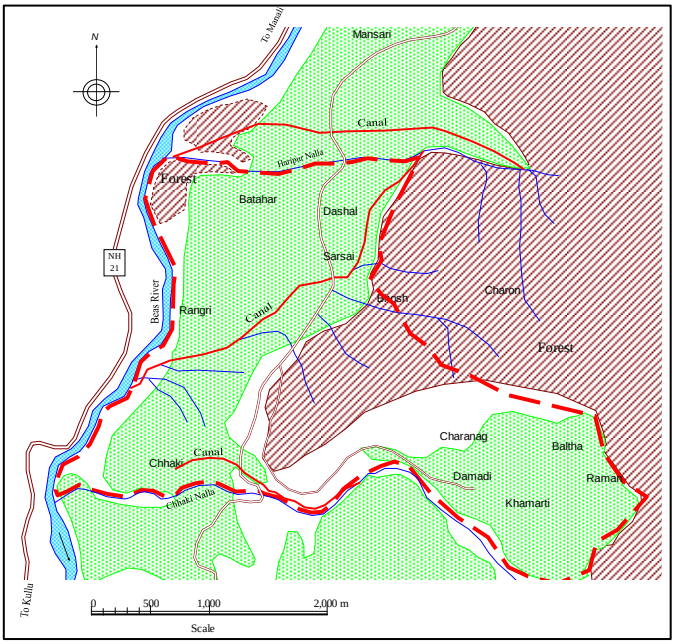


Fig. L-4.4.1 General Layout of Hallan-1 Site

(4) Constraints and Farmers' Needs

In the lower part of this site, three existing irrigation systems cover most of the part of the area in Dashal, Sarsai, Barka, Boshi, Batahr, Rongri, and Chhakki villages. However, in the downstream part of the system, the canals are not fully functional due to the damage and/or to some extent due to siltation in the canal. Therefore, proper water distribution system, rehabilitation of the damaged and silted canal portions are requested by the farmers. Meanwhile, the farmers in the mountainous area, like Raman, Balthaa, Charanag, Damadi, Kumarti, Bdehragran villages are requesting new irrigation system to be constructed for which water source is snow-fed perennial water in a mountain torrent.

L-4.5 Present Farm Road

(1) Road Network

There is one national highway (NH21) along the right bank of the Beas River, a major district road (MDR29) along the left bank of the River, and 72 links of motorable Public Works Department's village road (PWD VR) in the Block as shown in Fig.L-4.5.1. District road, MDR29 passes in the Site almost in parallel with the Beas River as shown in Fig.L-4.5.2. It is about 20 km from the Site to Kullu town of the District capital, and 541 km to Delhi via. Kullu.

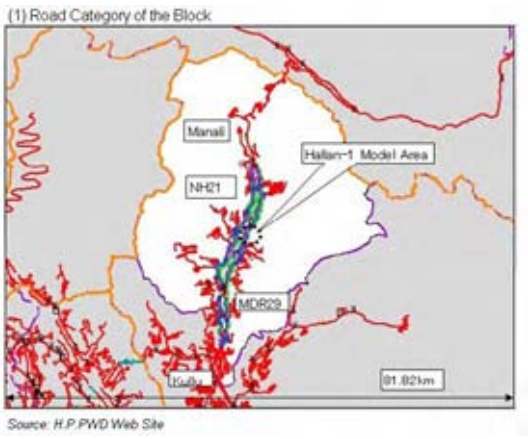


Fig. L-4.5.1 Trunk Road of Naggar Block

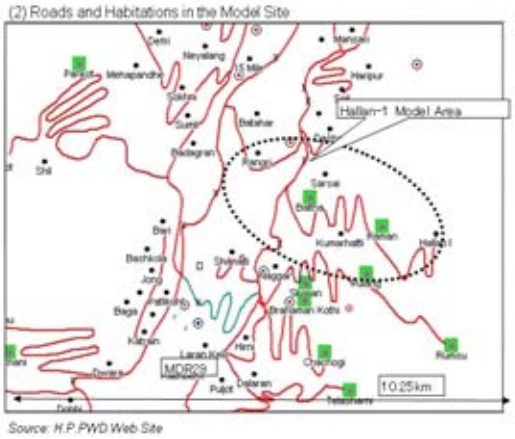


Fig. L-4.5.2 Roads and Villages in Hallan-1 Site

(2) Village Connectivity

Out of total 184 villages of 40 Panchayats in Naggar Block, 142 villages (77%) have been connected by all-weather motorable road, which is more than the State average of 60% and Kullu District average of 58%. There are 2 villages named Baltha and Raman in the steep terrain, however, they have been connected by the recently completed PWD all-weather tarred road.

(3) Roads in the Site

There are one major district road (MDR) and two Public Works Department's village roads (PWD VR) passing through the Site as shown in attached Fig. L-4.5.2. These roads are partially paved, depending on tarring conditions. As for footpaths, there are various types. Wide one is few and mostly they are narrow ones with various pavements made of compacted earth, stone and concrete. They start from the PWD VR or MDR and end in the crop fields or connects to another path or PWD VR.

(4) Constraints and Farmers' Needs

Maximum transportation distance is more than a km by foot and the number of transportation trip increases with the recent promotion of vegetable and fruit crops (with a yield of 10 to 30 ton/ha compared with 2 to 3 ton/ha for food grain). The farmers are requesting the following points:

i) Improvement or widening of the existing footpath so as to be passable in the rainy season in the rolling area, and

ii) Construction of new feeder roads to connect farm land to the existing PWD VR in the steep area.

L-4.6 Present Post Harvest Handling and Processing

Agro-processing activities in Kullu District, particularly apple processing is active, because this District is the one of largest apple production District.

Present activities governmental and private sector are explained below:

Governmental or semi-governmental Sector

i) HPMC has no processing plant in this District. However, huge amount of apples are transported to HPMC processing plants in Solan District. The constraints are a lot of apples are damaged or abandoned during transportation from the production area to the processing or consuming area because of the long drive on bad road condition. It is expected to improve truck road to minimize the losses.

ii) HPMC is managing cold storage facilities with the capacity of 1,000tonnes for apples at Patlikhal close to Hallan-1 site.

iii) Himachal Pradesh Fruit Canning Unit (himcu) is operating Fruit Canning Unit at Shamshi in the District with the processing capacity of 200 tonnes per year. At Shamshi Canning Unit, about 230 agro-processing technology training camps have been held since 1990, and about 9,000 trainees have been trained at the camps. After getting modern agro-processing technology at the camps, some women or women's groups have started the manufacturing and selling processed food such as pickles, chutney, chips, sweet made from Indian gooseberry (amla) in the neighborhood markets.

Private Sector

There are several processing plants for fruits are operated by private sector in the District. Lahaul Potato Growers' Cooperative is operating agro-processing plant in the District by utilizing the Cooperative fund. Activities in private sector are production of juice and jam etc. as shown in the following table:

Table L-4.6.1 Private Agro-Processing Plants in Kullu District

No.	Name of the Plant	Address	Year established	Capacity (ton/year)	Main commodities
1	Himachal Gramodyog Kendra	Village Mohal, Kullu	1979	-	Mainly pickles
2	Hill Thrill Juice Factory	Kullu, Kullu	1994	2.5	Mainly pickles
3	Himachal Honey House	Village Mohal, Kullu	1995	2	Mainly pickles
4	Lahaul Potato Society Fruit Processing Unit	Village Raison, Kullu	1999	5	Mainly pickles
5	Snow Fruit Processing Society	Village Snag, Manali, Kullu	1985	50	Fruits and vegetables products

Source: Department of Horticulture, Himarchal Pradesh. "Present Status of Fruits and Vegetables Processing Industries and Available Post Harvest Infrastructure in Himachal Pradesh"

The followings are the photographs of agro-processing plants taken at Kullu District.

1,000 tonnes capacity cold storage for apples operated by HPMC. At Patlikhal close to Hallan-1 site, Kullu District.

Fruits processing plant operated by the Lahaul Potato Growers Cooperative at Raison, Kullu District.

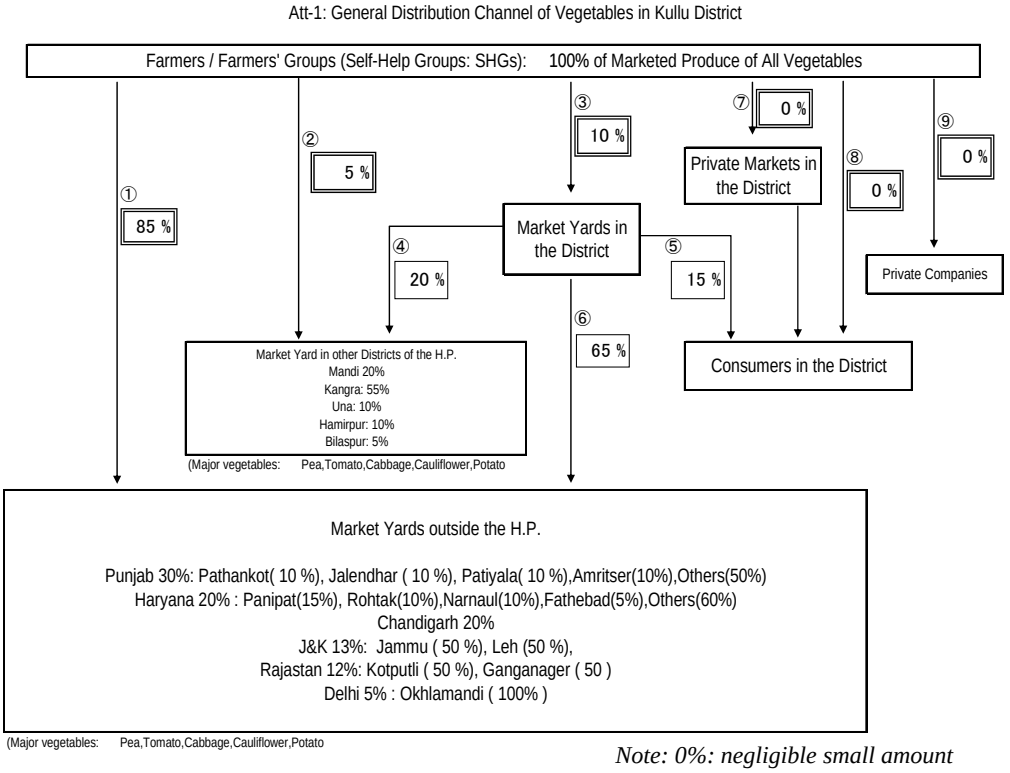
At the harvest season of apples, very big scale market yard is temporally set up by APMC Kullu. Near Katrain, Kullu District.

Constraints and Countermeasures

Kullu District is one of the largest fruits production area in the State. However, quantity of large scale processing plants in the District is not so many, because infrastructure conditions such as road etc. are not good and almost of the plants are concentrated on south western lower industrial area in the State. At present, most of the produces have been transported to the industrial area and processed at there.

L-4.7 Present Crop Marketing and Market Facilities

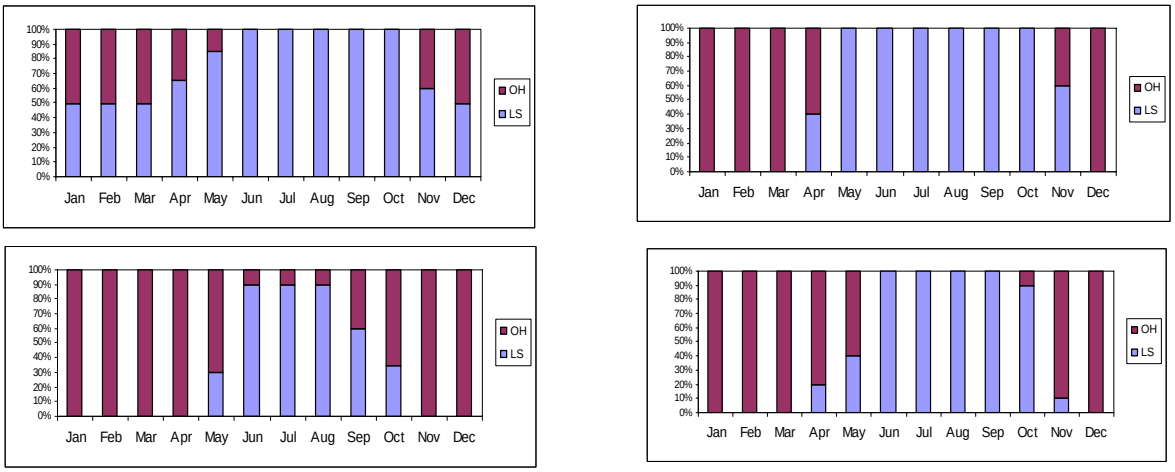
(1) Marketing Distribution of Vegetables



Note: 0%: negligible small amount
Prepared by JICA Study Team

Fig. L-4.7.1 Distribution Channel of Vegetables in Kullu District

Current situation of arrival quantity of local vegetables produced in the district and imported vegetables produced outside the State, is shown in Fig. L-4.7.2. Vegetables during the winter season are supplied from other States, while off-season vegetables are supplied locally.



Potato Peas

Note) OH: outside the State of H.P., LS: Local Supply within the State of H.P.

Fig. L-4.7.2 Proportion on Arrival of Vegetables from Local and Outside the State

There are various constraints against marketing system in each district as shown in Table L-2.7.1 in Chapter L-2. It is understandable that those constraints are similar to other districts in almost every aspect. It is expected that farmers try to find new countermeasures to increase farm income with due

consideration to the following points:

i) Farmers should comprehend that preference of consumers is various, not unified.

ii) Farmers should not undertake agriculture crops for producing vegetables, but for selling vegetables.

iii) Farmers should produce vegetables, based on the preference of consumers as well as buyers.

iv) Farmers should have pride and take responsibility for their produces.

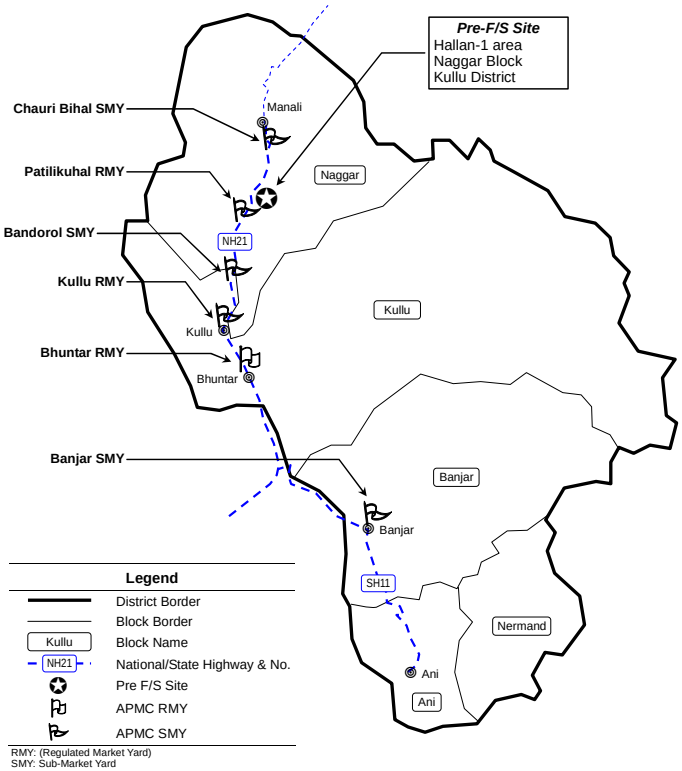
v) Farmers should organize their groups, in order to enhance their bargaining power.

vi) Farmers should share the latest market information with group farmers.

(2) Market Yards

In Kullu District, there are six (6) market yards, as shown in Fig. L-4.7.3. Out of six market yards, four (4) market yards except Kullu and Bhuntar Market Yards are seasonal market yards. Patlikhal Sub-Market Yard is nearby the Pre-F/S site in Halan-1 as shown in Fig. L-4.7.3 In this sub-market yard, there is no staff of APMC, further major commodities are apple and other fruits. Therefore, daily market price information of vegetables is not available.

Front View
Patlikhal Market Yard



Prepared by JICA Study Team

Fig. L-4.7.3 Location of Market Yards of APMC in Kullu District

L-4.8 Present Farmers' Groups and Agricultural Supporting Services

(1) Farmers Groups and Organizations in Hallan-1 Site

Farmers organization in Hallan-I site, problems and potential activities are mentioned below.

Table L-4.8.1 Farmers Organizations in Hallan-I Site

Group	Activities/Functions	Problems	Potentials
Water Users Association (KVS) formed by DOA for renovating khul in 2007.	Management and maintenance of the Khul and distribution of water.	Although there are 12-14 SC farmers no SC member has been included in the executive body of the KVS.	The KVS shall be expanded and strengthened to also take charge of the proposed irrigation activities.
Agricultural Cooperative Society	There are some agricultural cooperative societies but they handle only the Public Distribution System for Government Ration.	Existing group is not keen on taking on marketing of agricultural produce.	
Other Farmers Interest Groups	The Department has set up a Farmers Interest Group in this Panchayat comprising of 25 farmers under ATMA project. This was formed in 2000.	They have only received some Scheme-based extension services and are not active	This group needs to be Strengthened.

(2) Agricultural supporting services

Available agricultural supporting services in Hallan-1 site are summarized as follows:

i) Farmers training camps are held to provide information and to motivate the farmers on cultivation technology;

ii) Extension activities are also conducted on agricultural practices including organic farming, and vermin-compost;

iii) Inputs including vegetable seeds and pesticides are distributed to the farmers through the departmental outlet/sale centers. Subsidy is provided to the farmers based on the schemes such as Scheduled Caste / Scheduled Tribes (SC/ST) Sub-Plan, Backward Area Sub-Plan (BASP) and so on;

iv) Soil samples taken from different areas are brought and sent to Kullu soil testing laboratory under Integrated Nutrient Management (INM) scheme; and

e. Farm trials are conducted on tomato, cabbage and peas.

L-4.9 Vegetable Promotion and Agricultural Support Plan

(1) Basic Considerations

Vegetable promotion and agricultural support for the Hallan-I site is planned as follows:

i) Hallan-I site is a fruits dominated area occupying 70% of the cultivable area, where food grains including maize and wheat are cultivated in the fruits area. Therefore, these areas will be kept in the present level. However, the paddy area can be brought under life saving irrigation by the provision of irrigation facility.

ii) In Hallan-I area, the area under strategic (potato, tomato, cauliflower) multiple (cabbage) vegetables can be increased by using current fallow areas, and provision of full irrigation.

iii) Since the exotic vegetables are already cultivated in the area, it is planned to increase the

exotic vegetables area to 9 ha. Since the tourist town Manali is located close to the site, it shall be possible to sell exotic vegetables in the hotels are Manali. For this purpose, the farmers group need to be strengthened, and suitable linkage between the producers and the market (hotel chains etc.) need to be established.

iv) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days targeting the farmers of Hallan-I site.

v) In comparison with the livestock population, the green fodder supply is much low having a high shortage of animal feed. Therefore, it is planned to increase the fodder area from 5.0 ha to 30.0 ha under fruit trees.

vi) In consideration of quality improvement, varietals improvement trials are also needed.

vii) Introduction of post-harvest technology, especially sorting, grading and packing is needed for apples and vegetables. Protective cultivation (green house) is also to be promoted in the area.

Based on the above considerations the proposed cropping pattern and the cropping calendar are planned as shown below.

Table L-4.9.1 Proposed Cropping Pattern of Hallan-I Site

Crops		Kharif season (ha)			Rabi season (ha)		
		Rainfed	Full-Irrig.	Life save irrig.	Rainfed	Full-Irrig	Life save Irrig.
Food Grains	Maize	120					
	Paddy			10			
	Wheat				120		
	Barley				20		
	Pulses	10					
	Sub-total (food grains)	130		10	140		
Vegetables	Potato		40				
	Tomato		40				
	Peas					70	
	Garlic					39	
	Cabbage		10				
	Cauliflower		10				
	Broccoli		9				
	Sub-total (vegetables)		109			109	
Sub-total (food grains+vegetables)		130	109	10	140	109	
Fruits	Apple						275
	Pear						5
	Other fruits						5
	Fruits (sub-total)						285
Fodder Crops							30
Cropped Area							813
Cultivated Area							407
Current Fallow Area							3
Cropping Intensity							200%

Source : JICA Study Team

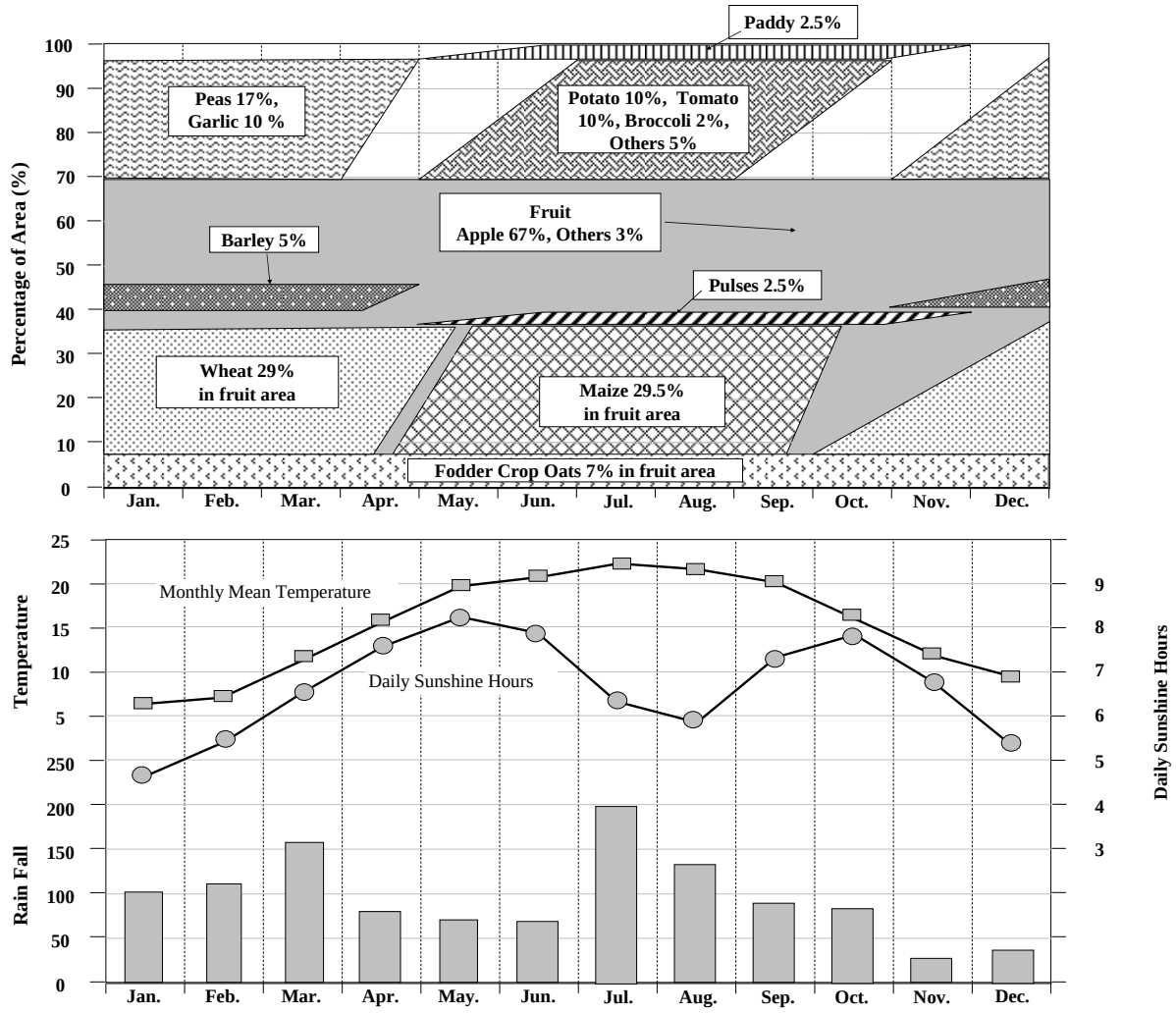


Fig. L-4.9.1 Proposed Cropping Calendar of Hallan-I Site

(2) Cropping Plan of Hallan-I Site

Food Grains:

i) In Hallan-I area, food grains including maize, wheat and barley are cultivated in fruits grown area, and the area is proposed to be maintained in the same level. Therefore, the areas of maize, wheat, and barley are 120 ha, 120, and 20 ha respectively. The 10 ha of pulses area shall also be maintained at the same level.

ii) The 10 ha of paddy area which is cultivated under rainfed condition, is proposed to be cultivated under life saving irrigation during Kharif season.

Vegetables:

i) With the availability of full irrigation in 109 ha, the vegetables are planned to be grown in 109 ha in Kharif and Rabi seasons.

ii) The selection of vegetables is made in consideration of existing farming conditions, intention of the farmers, and the current market conditions.

iii) During Kharif season, strategic vegetables including potato, tomato and cauliflower are planned to be grown in 40 ha, 40 ha, and 10 ha respectively under full-irrigation conditions.

And, cabbage is proposed in 10 ha area. Since the area close to the tourist town Manali, exotic vegetable broccoli is proposed in 9 ha area.

iv) During Rabi season, the strategic vegetable peas are proposed in 70 ha area and the popular vegetable garlic is proposed in 39 ha area.

Fruits:

i) Fruits including apple, pear, and other fruits (plum etc.) are continued to be grown in the same area of 275 ha, 5 ha and 5 ha respectively.

Fodder Crops:

i) Because of the relatively high livestock population, and high demand of green fodder in this area, fodder crops area under the fruit trees shall increased from 5 ha to 30 ha which is approximately 10% of the fruits area.

(3) Proposed Farmers Support Program Activities

The farmers support program activities which shall be carried out in Hallan-I site under the Master Plan are mentioned below.

1) Vegetable Promotion

i) Introduction of cropping patterns suitable for markets

ii) Promotion of strategic vegetables tomato, potato, cauliflower and peas.

iii) Introduction and promotion of exotic vegetables

iv) Promotion of organic farming

v) Organizing or strengthening of farmers group for the marketing purpose and water users association effective use of irrigation facilities

vi) Extension of protective cultivation (greenhouse)

vii) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

viii) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases

ix) Promotion of farming practices to reduce soil erosion

x) Introduction of contract farming.

2) Food Grain Crop Productivity Improvement

i) Promotion of diversified cropping patterns suitable for productivity increase of food grain crops

ii) Promotion of optimum quantities of farm inputs such as seeds and fertilizers

iii) Promotion of organic farming

iv) Organizing or strengthening of farmers' groups (marketing group)

v) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

vi) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and

biological control of pests and diseases.

vii) Promotion of farming practices to reduce soil erosion

3) Integrated Farm Management

i) Improvement of productivity and quality of horticulture crops.

ii) Promotion of fodder production and reuse of vegetable residues under integrated farming in crop diversification

iii) Promotion of cold water fish culture (trout) under integrated farming including the irrigation system

L-4.10 Post Harvest Processing and Marketing Plan

(1) Post Harvest Processing Plan

Based on the Post Harvest Processing Promotion Plan, the following activities are proposed:

i) Introduction or promotion of post-harvest activities, such as grading, sorting and packing etc., in accordance with the quality standard. Quality standard and post-harvest technologies should be disseminated by extension trainers by holding of the extension camps.

ii) Introduction or promotion of small scale agro-processing activities. Agro-processing technologies should be disseminated by extension trainers by holding of the extension camps.

iii) Since existing Fruit Canning Unit have been overage and performance also have been decreased than its designed time, it should be rehabilitated and strengthened by Department of Horticulture.

(2) Marketing Plan

Based on the Market System Improvement program component, the following points should be considered for promotion of aggressive marketing activities;

i) Farmers in Hallan-I area have sufficient experience for vegetable cultivation. However, they do not have any experience on group marketing. It is expected that they try to strengthen their ability for selling their produces by group, in order to improve quality of their vegetable produces, and strengthen their bargaining power.

ii) Promotion of vital and characteristic agriculture as well as crop diversification

iii) Formation of farmers' group (cooperative) for marketing of vegetable produces

iv) Promotion of green tourism, organic farming, cultivation of exotic cultivation, etc.

v) Carving out niche vegetables in vegetable consuming market

vi) Promotion of transaction of organic products and exotic products in local markets

vii) Promotion of program component on marketing system improvement

It will be necessary to plan the collection, grading and storage facilities, after the vegetable cultivation is established in the area. It will be necessary that a collection centers be established near Village Kumarti.

L-4.11 Infrastructure Development Plan

Infrastructure development plan was originally discussed by the farmers' participatory approach through preparation of resource map, based on which topographic survey and preliminary design were executed including alternative studies to compare technical and economical feasibility.

(1) Irrigation

There is no irrigation in the mountainous area, where the farmers are requesting new flow irrigation system utilizing snow-fed water source. Due to the steep topographic condition of the canal route and that canal will pass in the demarcated protected forest area, pipe line system is proposed. In addition, tank irrigation is also suitable in the hilly area.

(2) Access Farm Road

The crop field in Hallan-1 area distribute in the relatively flat land (Lower Hallan) and steep land (Upper Hallan). The resource map requested one new farm road and one existing road and 2 footpaths to be improved as follows:

- R-1: The proposed new farm road is extension from the end point of PWD VR (Village Road) to the orchard. The alignment is along the contour line which the road gradient is gentle. The beneficiaries agree for preparation of the road land. All design parameters are in line with the Manual.
- R-3: Proposed Mule path situates in the orchard and requires concrete pavement.
- R-5: Improvement of the existing muddy earth road by WBM pavement and by drainage.
- R-2 & R-4: These proposal are discarded because of different purposes (health centre) and too close alignment with other existing road.
- Pavement for the improvement of the existing road is WBM for the section of 500-600m from the dead end point of the existing farm access road, and rest of section may be planned by PMC (pre-mix bituminous carpet or asphalt), if the beneficiary requested and economically eligible (with a minimum benefited vegetable area of 5 ha per km of access farm road).

(3) Salient Features of the Proposed Infrastructure Development Plan

Salient features of the proposed infrastructure development plan both for irrigation and access farm road are summarized in Table L-4.11.1 and their location is shown in Fig. L-4.11.1.

Table L-4.11.1 Salient Features of Infrastructure Development Plan

Proposed works / location	No.	Description
1. Irrigation		
1) Construction of new flow irrigation system, Check dam and pipeline		
- Kamarti, Raman, Baltha	I-1	CCA = 52 ha, Pipeline L = 2,395, ϕ = 140 mm
2) Extension and up-grading of existing canal		
- Bathahar	I-4	L = 2 km
3) Tank irrigation		
- Provision of Field Tanks		20 field tanks approx. in total
2. Access Farm Road		
1) Construction of new access farm road		
- Baltha	R-1	B.A = 12 ha, L = 397 m, W = 3.0 m, WBM
2) Improvement of existing access farm road		
- Kamarhti (Footpath)	R-3	B.A = 3 ha, L = 435 m, W = 1.8 m, CC
- Bhaarka	R-5	B.A = 5 ha, L = 318 m, W = 3.0 m, WBM

CCA : Culturable Command Area H : Pump rising head, BHP : Break horsepower
B.A : Beneficiary area L : Length W : Width,
Pavement ; WBM : Water bound macadam PMC : pre-mix bituminous carpet
CC : Cement concrete

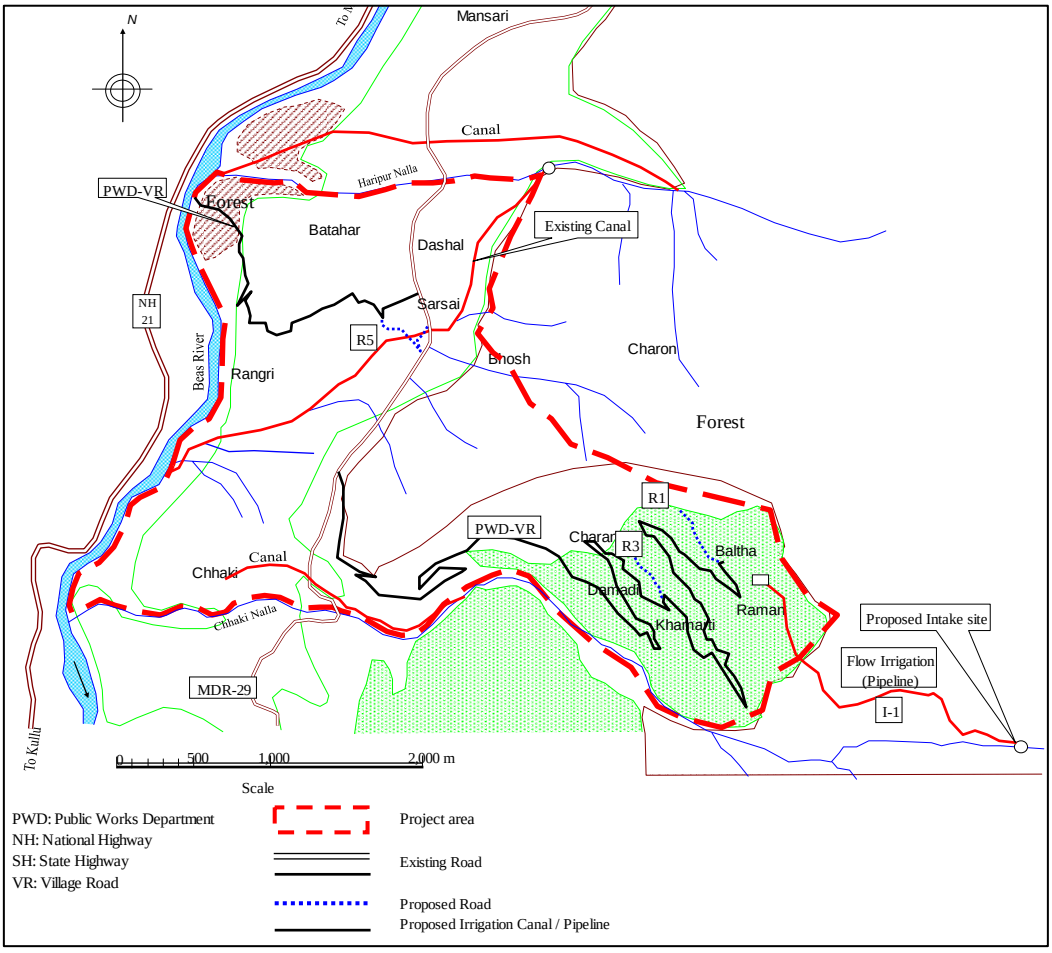


Fig. L-4.11.1 Location Map of Infrastructure Development Plan

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Hallan-1 site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor irrigation, supplementary irrigation and access farm roads. The development of the access farm roads will contribute not only to promotion of crop diversification but also to social purpose especially to the connectivity to the remote habitats. Therefore, a part of the estimated cost of the access farm road is allocated to the other purposed based on the individual condition referring to the topography and the covered area. Meanwhile, the cost of irrigation facilities is allocated to only the project area for crop diversification. The results of cost estimated and its allocation is summarized as below.

Table L-4.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development

Item		Amount (Rs.)	Cost Allocation	
			Individual	Weighted
1) Irrigation				
- Construction of Flow Irrigation, I-1	52 ha	11,528,000	(100%)	
- Improvement of Existing Flow Irrigation		1,602,000	(100%)	
- Water Harvesting Facilities		620,000	(100%)	
Sub-total		**13,750,000**		**(100%)**
2) Access farm road				
- Construction of New Road, R1	397 m	1,127,000	(30%)	
- Construction of New Footpath, R3	435 m	175,000	(30%)	
- Improvement of Existing Road, R5	318 m	294,000	(90%)	
Sub-total		**1,596,000**		**(41%)**
Total		**15,346,000**		**(94%)**

L-5 Nagwain Site of Mandi Sadar Model Areas

L-5.1 Present Socio-economic and Natural Conditions

Nagwain site is located at a distance of 35 km in the eastern direction from Mandi, District's headquarter, and its topography is of plain, rolling, mountainous and steep areas. The Beas River with a total width of 100 m flows from the north to the south along the site. The socio-economic and natural conditions of Nagwain site are summarized in Table L-5.1.1.

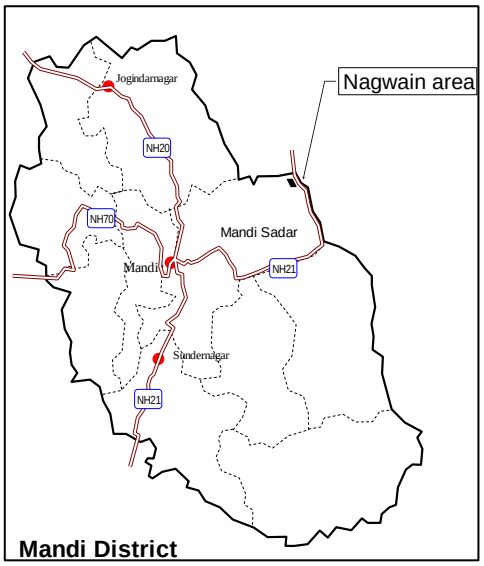


Fig. L-5.1.1 Location Map of Nagwain Site

Table L-5.1.1 Socio-economic and Natural Conditions of Nagwain Site

District	Mandi	Annual rainfall (mm)	838
Block	MD-47 Mandi Sadar	Average Temperature (◦C)	18.5
Panchayat	Nagwain	Average Max.Temperature (◦C)	32.5
Village	Nagwain, Shil Mashora & Palsehr	Average Min. Temperature (◦C)	1.8
		Total area (ha)	600
Category	II	Cultivated area (ha)	340
Agro-ecological zone	Zone-2		

Source: Compiled by JICA Study Team

(1) People/ Community

Population of the Project Area: Nagwain Panchayat consists of three villages- Nagwain, Shil Mashora and Palsehr. The Panchayats comprises of 758 households. The total population of the area is 4,130. The village-wise distribution of population is as follows.

Table L-5.1.2 Village-wise Population Details of Nagwain Panchayat

Village	Population	Total SC Population	% of SC*	Total ST Population	% of ST
Nagwain	2,245	1,070	47.6	175	7.7
Sheel Mashora	1,265	495	39.1	-	-
Palser	620	365	58.8	-	-
Total	**4,130**	**1,930**	**46.7**	**175**	**7.7**

Source – Panchayat Record Nagwain Panchayat

The population in the area is comprised of 7.7 % tribal, 46.7% SCs and 50.9 % upper caste communities. The predominant communities among SCs are Lohaar (Iron Smith) and Harijan. They are mainly agriculturists. The other Schedule Caste includes Tarkhaan and Thai. SCs are among the most marginal farming household in the area. There are 104 Below Poverty Line of whom 70 are SC families, 31 Upper Caste and 3 STs.

Ethnic Group and Religion: 7.7% of Tribals are found at the Project site they comprise of pastoral Gujjar Muslims. The rest of the population is Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 2065. There are 25 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme and have a total membership of 393 women1. All the ICDS initiated SHGs are linked to the Bank. ICDS has also provided most of the groups on vermin-composting, shawl and border weaving, carpet making and mushroom cultivation. There are 7 Mahila Mandal initiated by the Dept of Rural Development. All 7 groups have formed SHGs. One of the Mahila Mandal group also has taken up silkworm rearing. The local DOA has also set up a Farm Women Empowerment group. This group is valuable both for promoting extension work and promoting any project related activity. The women have shown interest in taking up vegetable nursery rearing, mushroom cultivation and dairy development as sources of income generation.

L-5.2 Present Agriculture

(1) Cropping Pattern in Nagwain Site

The existing cropping pattern of Nagwain site is shown in Table L-5.2.1 and cropping calendar is shown in Figure L-5.2.1. The total cropped area is 525 ha with cropping intensity of 150 %.

Table L-5.2.1 Existing Cropping Pattern of Nagwain Site

Crops		Kharif season (ha)			Rabi season (ha)			Ave. yield (ton/ha)
		Rainfed	Full-Irrig.	Life save Irrig.	Rainfed	Full-Irrig	Life save irig.	
Food Grains	Maize	105						2.5
	Wheat				109			2.5
	Pulses (B.Gram/ kidney beans)	4						0.7
Sub total (Food grains)		109			109			
Vegetables	Peas				57			6.2
	Cauliflower		20	10	12	10		20.2
	Tomato	45		2				15.6
	Cabbage		15			18		22.1
	Eggplant	5						19.2
	Garlic					4		10.0
	Bt / Bo Guard	3						15.0
	Radish				3			19.4
	Capsicum			3				7.0
	Onion				2			13.1
	Potato					2		16.7
	Chilies	1						11.7
	Mix vegetables	5				1		18.6
	Sub total (Vegetables)	59	35	15	74	35		
Sub-total (food grains + vegetables)		168	35	15	183	35		
Fruits	Apple						38	16.0
	Plum						26	17.6
	Pear						19	16.1
	Pomogranate						2	9.0
	Apricot						1	7.6
	Persimmon						1	4.4
	Sub total (Fruits)						87	
Fodder Crops							2	50.0
Cropped Area (ha)								525
Cultivated Area (ha)								350
Current Fallow Area (ha)								45
Cropping Intensity (%)								150%

Note : The data is based on the farm household survey and discussion with farmers group.
Source : JICA Study Team

[1]Data given by the ICDS office, Mandi.

In Nagwain site, integrated farming including food grains, vegetables, and fruit cultivation is carried out. Food grains and vegetables are cultivated in about 31% of the cultivated area respectively. Fruits including apple, plum, pear, pomogranate are grown in about 10% of the area in the higher elevation. The average yields of maize and wheat are about 2.5 ton/ha.

The major varieties of the crops grown in Nagwain site are: Kanchan-2005 and K-25 for maize; PU-19 for block gram; PBW-343, and PBW-373, HS-295, HS-240 for wheat, Azad P-1 for peas and Nutan, Himsona, 7711, 7730, Rakshita for tomato.

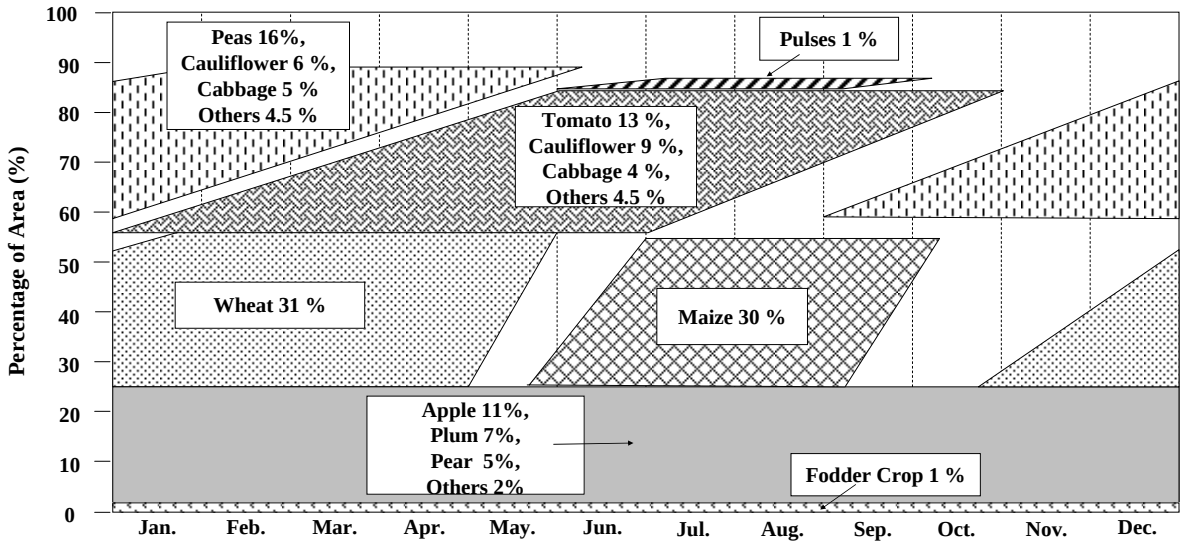


Fig. L-5.2.1 Existing Cropping Calendar of Nagwain Site

(2) Farm Inputs

All the households purchase cereal crop seeds from departmental outlet. In case of vegetable seeds, 50% of the households purchase from retail shops outside the village, and 50% purchase from the departmental outlet. In case of fruit crops, 30% of the households purchase from certified nursery owners, and about 50% purchase from horticulture department. The remaining 20% purchase seedlings from the university.

The major supplier of Fertilizer is HIMFED, and all the farmers purchase fertilizer through the cooperative societies. Vermi-composting is also started in the area, but the usage is not very high, and only 2% families have adopted this technique. The usage of Fertilizer in the year 2007/08 in the area is given below.

Table L-5.2.2 Fertilizer Used for Nagwain Panchayat

Name of the Fertilizer	Amount (Ton)
Urea (Nitrogenous Fertilizer)	35
Muerotop Potash (MOP)	0.1
NPK 12:32:16	0.35
SSP	0.25

Source: ADO, Nagwain Panchayat

The fertilizer use is low in the area. In order to control pests including cutworms for tomato, fruit flies, fruit shoot borer and cutworm for cauliflower, about 50% of the households purchase agro-chemicals from retail shops in the village, and 50% purchase chemicals from departmental outlet. The farm machinery in Nagwain site are about 10 tractors, 3 power tillers, 20 sprayers, and one harvester.

Farmers do not hire any casual labor, and only family labors (both male and female) are involved in all agricultural operations from land preparation to harvesting.

(3) Constraints in Crop Production

Main constraints reported by farmers are: not enough or no irrigation water and poor irrigation facilities, poor roads inside the Panchayats, and marketing such as non-availability of collection center.

(4) Crop Diversification Potential

If stable irrigation water supply is available, the farmers are interested to convert atleast 50% of the food grains area to vegetables. The farmers are interested in crop diversification to grow vegetable crops such as tomato, cabbage, cauliflower, capsicum, and egg plant. The farmers also reported that employment opportunity in the site can be improved by crop diversification.

Major requirements for crop diversification as reported by farmers are: development of irrigation facilities; roads (rural roads); and marketing facilities such as non-availability of collection center.

L-5.3 Present Agriculture Allied Sector

(1) Horticulture

Present Status of Fruit Planting: Similar to vegetable cultivation, fruit planting contributes to the present progress of crop diversification in Nagwain site. Farmers are focusing on enhancement of fruits from apple to other temperate fruits such as pear, plum, pomegranate, peaches, grapes, apricot, strawberry, pecan nut, walnut and persimmon. In addition to large plantation of apple, every household has small size of plantation of different fruits for home consumption and domestic marketing purpose.

Horticulture Crop Diversification Potential: Diversification potential area is waste land or other fallow around Nagwain site. Suitable horticulture crops are: apple, pear, plum, kiwi, peaches, apricot, grapes, pomegranate, pecan nut, walnut and strawberry for promoting fruit planting; gladiolus, chrysanthemum, lillium, marigold and carnation for promoting floriculture; and tulsi, stevia, jatamansi, salvia, satawar, rosemerry and safedmusli for diversifying medical and aromatic plant cultivation.

The following technologies transfer for exploitation of horticulture crop is required:

i) High density plantation of fruit crops;
ii) Inter-cropping of medical plants;
iii) Covered cultivation of high value crops;
iv) Adoption of drip and sprinkler irrigation;
v) Organic cultivation of fruits;
vi) Formation of clusters of farm; and
vii) Horticulture tourism development.

(2) Animal Husbandry

The current livestock population in Nagwain site is 465 crossbred cattle, 41 indigenous cattle, 30 buffaloes, and 41 sheep without goat, horse and others. Nagwain has a large focus for crossbred female cattle obviously reared for milk. In this location vegetables and crossbred cattle for milk go together as a production system and it is a visibly prevalent system in Mandi Sadar. There is an acute shortage of green fodder compared to dry fodder and milk production efficiency can be augmented by improving feeding situation on a priority.

Available infrastructures of livestock sector in and around the site are VH (veterinary health center),

VD (veterinary dispensary), AI (artificial insemination) facility, and private vendors for milk market. Future development potential and constraints of animal husbandry in combination with crop diversification in Nagwain site are defined as a type of “high potential for dairy production”.

An attempt was made to calculate feed balance from natural resources and net area sown using the information collected from field survey. The estimated results are summarized below.

i) Dry matter supply is estimated at 1,335 tons against demand of 1,487 tons, having shortage of 10.3%;
ii) Green fodder supply is estimated at 335 tons against demand of 2,454 tons, having shortage of 86.4%; and
iii) Dry fodder supply is estimated at 1,413 tons against demand of 1,096 tons, showing surplus of 28.9%.

Nagwain is also a potential milk producing site. There is surplus in dry fodder. A critical study is further required in Nagwain to enable a symbiotic relationship between vegetable and milk production together as a viable system which has a potential for organic vegetable and milk production.

(3) Inland Fishery

As for fish culture, no fish culture is done in this site.

L-5.4 Present Irrigation

(1) Existing Irrigation System

There is one IPH lift irrigation system covering three villages, Nagwain, Shil Mashora and Palsehr. This system was constructed in 1974 to irrigate the area of 100 ha, however the system has been deteriorated and actual irrigated area has decreased to 30 - 40 ha in these years. Major problems of pump station are observed as siltation in the suction pit, lowering river bed at intake channel and deterioration of old pump equipment. Other than this, no irrigation system exists except individual tank irrigation with water source from springs and small stream in hilly areas, private lift irrigation using small pump and private tubewell irrigation in low area in Lah. Main irrigation system available in this Nagwain site is summarized below.

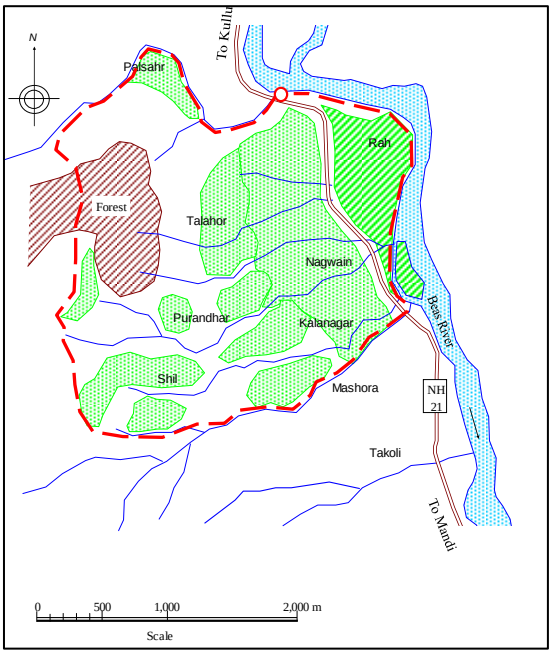


Fig. L-5.4.1 General Layout of Nagwain Site

Table L-5.4.1 Main Irrigation System in Nagwain Site

Name / Village	Type	Source	Area, (ha)
Nagwain	IPH lift irrigation	Beas river	35

(2) Present Irrigation Practice

Present irrigation practice for the major crops is summarized below.

Table L-5.4.2 Present Irrigation Practice in Nagwain Site

Crop	Area (ha)	Irrigation period	Nos. of times or interval
Vegetable	35	Mar. - Oct.	Not fixed

(3) Water User's Association (WUA, KVS)

One WUA has been formed in Nagwain village, but not yet registered. The members have a regular meeting once in a cropping season and additional meeting is called depending on the necessity. Water charge is collected by Rs.10 per year. Water distribution is being done rotationally in the field as per the schedule prepared before cropping season. Pump operation for irrigation is ordered by the farmers on their demand, and operation and maintenance of pump station and equipment are fully under the responsibility of the IPH Department. Some minor canal maintenance is done by farmers' participatory works.

(4) Constraints and Farmers' Needs

Though the lift irrigation system is under operation, it is not fully functional to cover the designed irrigation area. Also, all rainfed farm lands out of the IPH system require new irrigation system. Available water source is the Beas river or small streams. Farmers strongly request for the other lift irrigation systems to be newly constructed along the Beas river, some of them are identified by the DOA and reconnaissance at the proposed pump house and preliminary study are under progress. During the workshop for preparation of resource map, various requests were made, most of which are new lift irrigation system lifting water more than 100 m in height from the Beas river.

L-5.5 Present Farm Road

(1) Road Network

There are 3 national highways (NH21, 20 and 70), several major district roads and 142 links of motorable Public Works Department's village road (PWD VR) in the Block. However, only NH21 passes in the Site almost in parallel with the Beas River.. It is about 40 km from the Site to Mandi town of the District capital, and 487 km to Delhi via. Mandi.

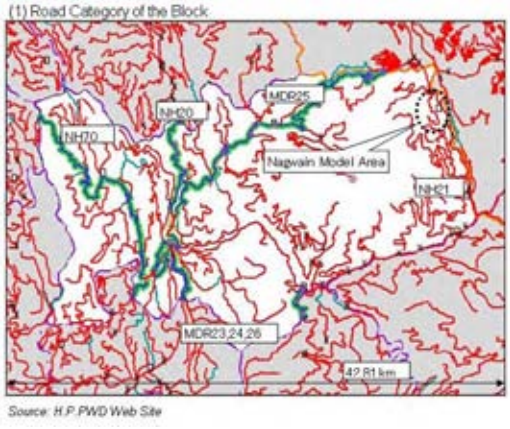


Fig. L-5.5.1 Road Category of Mandi Sadar Block

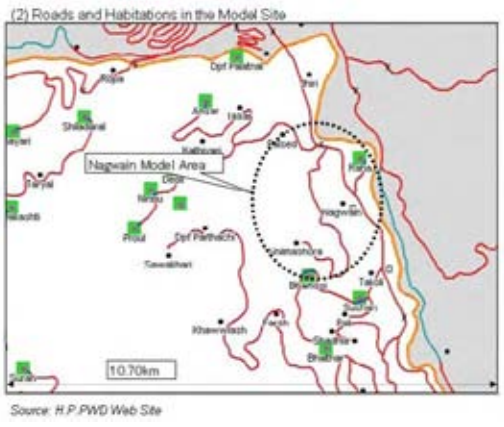


Fig.L-5.5.2 Roads and Villages in Nagwain Site

(2) Village Connectivity

Out of total 331 villages under 61 Panchayat in Mandi Sadar Block, 177 villages (53%) have been connected by all-weather motorable road, which is slightly less percentage than the State average of 60% and Mandi District average of 58%.

(3) Roads in the Site

There are two PWD village roads passing through the Site. These roads are mostly earthen road except few km from the beginning point at NH21. One more village road is under planning for Raha village (population about 500) along the Beas River. There is one Panchayat road connecting from the Primary Health Center at NH21 to Shobra village.

There are many wide and narrow footpaths with various type of pavement (compacted earth, stone and concrete), which start from the PWD VR and end in the crop fields or connect to another path or PWD VR.

(4) Constraints and Farmers' Needs

Maximum transportation distance is more than one km by foot and number of crop transportation trip increases with recent promotion of vegetable and fruit crops (with a yield of 10 to 30 ton/ha compared with 2 to 3 ton/ha for food grain). The farmers propose following improvement and new road linkage:

i) Improvement of the existing Panchayat road and path, and
ii) Construction of new farm road where only foot paths are available.

L-5.6 Present Post Harvest Handling and Processing

Processing activities in Mandi District are relatively active. Agro-processing in this district is not so active in general, since fruits production in Hamirpur District is quite small. Present activities governmental and private sector are explained below:

<u>Governmental or semi-governmental Sector</u>

i) HPMC is operating agro-processing plant at Jarol, and mainly produces apple processing products such as natural juice, jams etc. About 2,500 tons of apples are processed annually in this plant.
ii) Himachal Pradesh Fruit Canning Unit (himcu) has no facility in this District and agro-processing training camp has not been organized in the district. Small agro-processing was not found in the field survey.

Juice Bar located on HPMC agro-processing plant at Jarol in Mandi District.

Product Range of sold at Juice Bar

Private Sector

The following is current situation of agro-processing activities by private sectors in the District.

Table L-5.6.1 Details of Private Agro-Processing Plants in Mandi District

No.	Name of the Plant	Address	Year established	Capacity (ton/year)	Main commodities
1	Hygia Food & Vegetable Processor Pvt. Ltd.	Ratti, Mandi	1997	34	Fruits and vegetables products
2	Himachal Agro Processor Pvt. Ltd.	Bhambla, Mandi	2000	30	Mainly pickles
3	Pushpa Pickle	Bhambla, Mandi	-	20	Mainly pickles
4	Himachal Fruit Wine Beverages Pvt. Ltd.	Badhu, Mandi	-	100	Fruits wine
5	Surya-Gramoudyog Fruit Processing	Jarol, Sundernagar, Mandi	-	-	Fruits products
6	Society for Technology & Development	Village Taldhar, Nagwain, Mandi	1994	50	Mainly pickles
7	Himachal Juice Udyog Association	Balli Chowk, Mandi	1994	40	Mainly pickles
8	Fruit Processing Plant, hpmc	Jarol, Mandi	1974	2,500	Fruits products

Source: Department of Horticulture, Himarchal Pradesh. "Present Status of Fruits and Vegetables Processing Industries and Available Post Harvest Infrastructure in Himachal Pradesh"

Constraints and Countermeasures

In Mandi District, both of agriculture and horticulture production and agro-processing are comparatively inactive. Agro-processing facilities are very important to create the job opportunities and to raise the local industry, however they should be invited after preparing the industrial area, access roads and electricity etc.

L-5.7 Present Crop Marketing and Market Facilities

(1) Marketing Distribution of Vegetables

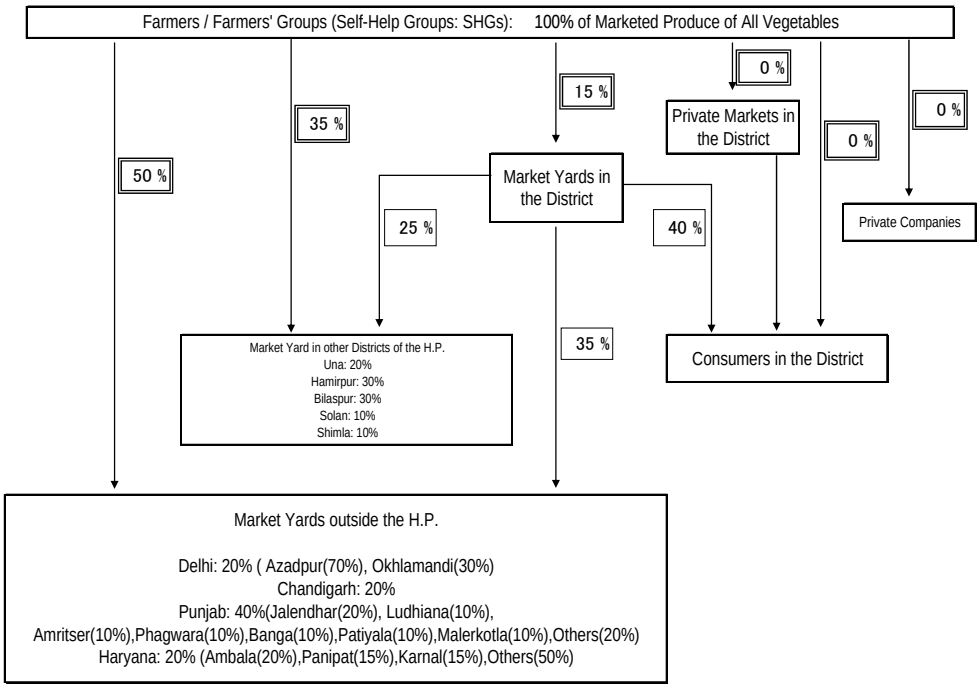
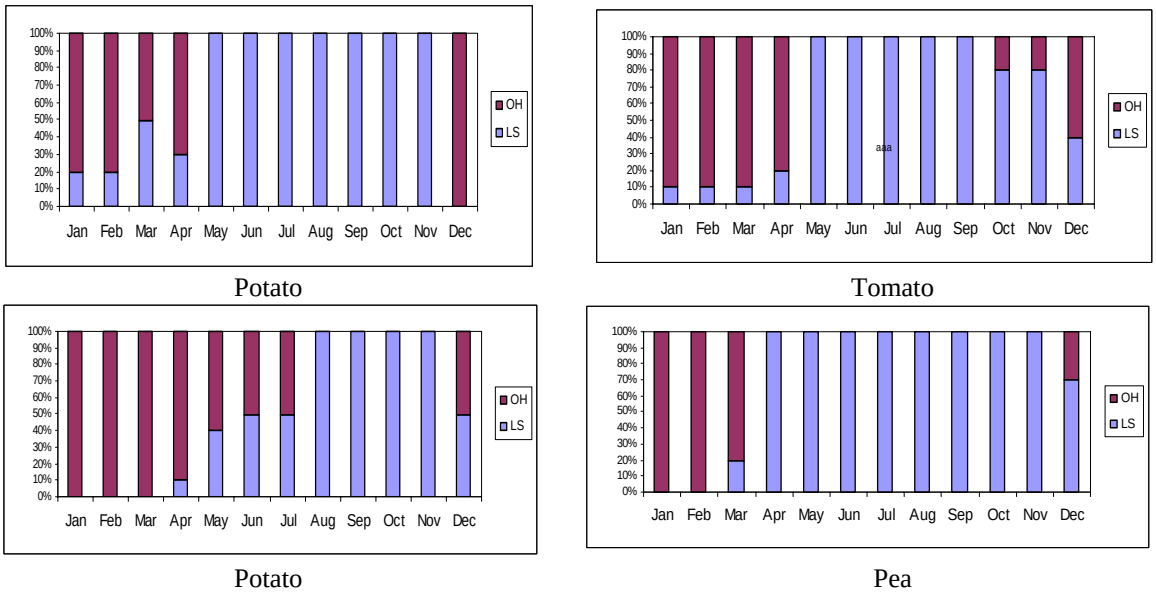


Fig. L-5.7.1 Distribution Channel of Vegetables in Mandi District

In the District, there are some active farmers, who have cultivated exotic vegetables such as broccoli, mushroom, etc., applying the protective cultivation. They have some contract with wholesalers in Delhi or other big consuming area, thus their shipped-out produces are brought into wholesalers directly not through any kind of market yards.

Current situation of arrival quantity of local vegetables produced in the district and imported vegetables produced outside the State, is shown in Fig. L-5.7.2. Vegetables during the winter season are supplied from other States, while off-season vegetables are supplied locally.



Potato　　Tomato

Potato　　Pea

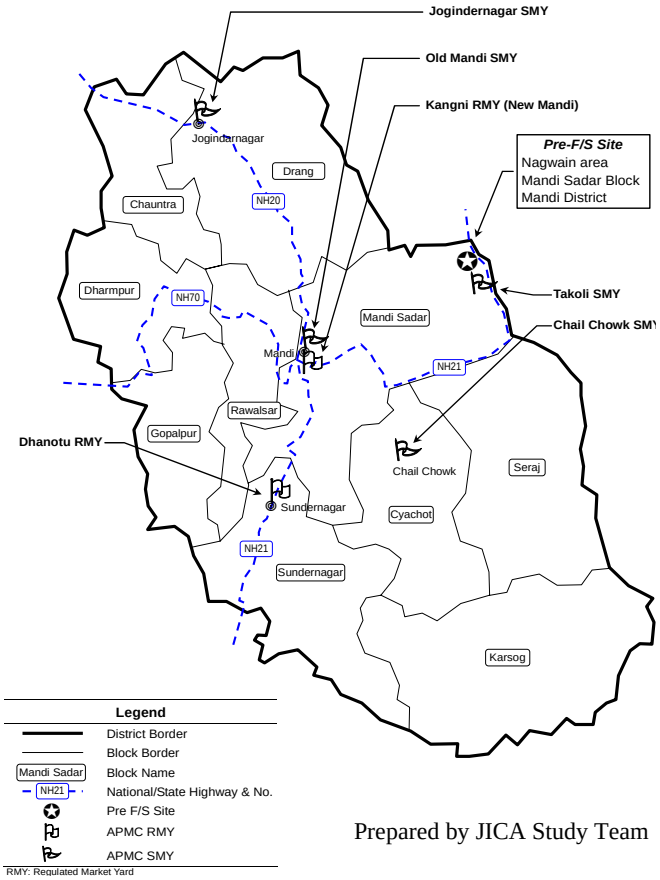
Note) OH: outside the State of H.P., LS: Local Supply inside the State

Fig. L-5.7.2　Proportion on Arrival of Vegetables from Local and Outside the State at Mandi Market Yard

(2)　Market Yards

In Mandi District, there are four (4) market yards. Out of four market yards, Takoli Sub-Market Yard is a seasonal market yard. Takoli Sub-Market Yard is nearby the sample site in Nagwain as shown in Fig.L-5.7.3. This sub-market yard has been under rehabilitation now. In this market yard, new grading facility has been planned.

Auction Platform
Takoli Market Yard



Prepared by JICA Study Team

Fig. L-5.7.3 Location of Market Yards of APMC in Mandi District

(3) Constraints and Countermeasures

There are various constraints against marketing system in each district as shown in Table L-2.7.1. It is understandable that those constraints are similar to other districts in almost every aspect. It is expected that farmers try to find new countermeasures to increase farm income with due consideration to the following points:

i) Farmers should comprehend that preference of consumers is various and not uniform.
ii) Farmers should not cultivate crops for producing vegetables, but for selling vegetables.
iii) Farmers should produce vegetables, based on the preference of consumers as well as buyers.
iv) Farmers should have pride and take responsibility for their produces.
v) Farmers should organize their groups, in order to enhance their bargaining power.
vi) Farmers should share the latest market information among group farmers.

L-5.8 Present Farmers' Groups and Agricultural Supporting Services

(1) Farmers Groups and Organizations in Nagwain Site

Farmers organization in Nagwain site, problems and potential activities are mentioned below.

Table L-5.8.1 Farmers Organizations of Nagwain Site

Group	Activities/Functions	Problems	Potential
Farmers Interest Groups (FIG)	The FIGs here has been formed over several Panchayats. In this Panchayat the Panchayat Pradhan is the only member of one of the FIG.	The farmers are not part of any Farmers Interest Groups. Not much initiative has been towards this in this Panchayat.	• **Farmers Interest Groups could be Initiated** Farmers Interest Groups could be initiated and could undertake some of the project related activities.
Water Users Association (KVS) by the IPH for the management of the irrigation facility provided by them.	The farmers claimed that their WUA is functional and active. They collect some money during the heavy agricultural season and add it to their revolving fund to use it as and when repair work on pipelines is required.	• The IPH and the Agricultural Department claimed that the WUA is defunct and that people have taken no interest in the management of the irrigation facilities. Its maintenance and management is done by the IPH. • According to the IPH, user groups are unable to take responsibilities for the maintenance and management of pump irrigation facilities because of the high recurring costs. They can only small maintenance of the pipelines that directly affect them.	• **WUA needs to Strengthened** The WUA could be reorganised when new irrigation activities is undertaken in this project area.

(2) Agricultural supporting services

Available agricultural supporting services in the Nagwain site are summarized as follows:

i) Farmers training camps are held at regular interval to provide information and to motivate the farmers on cultivation technology, especially in regard to crop diversification, and integrated farming;

ii) Extension activities are also conducted on agricultural practices including organic farming, and vermi-compost;

iii) Inputs including vegetable seeds and pesticides are distributed to the farmers through the departmental outlet/sale centers. Subsidy is provided to the farmers based on the schemes such as Scheduled Caste / Scheduled Tribes (SC/ST), Backward Area Sub-Plan (BASP) and so on;

iv) Soil samples taken from different areas are brought and sent to Sundernagar soil testing laboratory; and

v) Farm trials are conducted to test soils, seeds and fertilizer quality.

L-5.9 Vegetable Promotion and Agricultural Support Plan

(1) Basic Consideration

Vegetable promotion and agricultural support for the Nagwain site is planned as follows:

i) In Nagwain Area, about 45 ha (12.9% of total cultivable area) is left as current fallow area, and a part of the fallow area can be converted for food grains production.

ii) Assured irrigation will be available for 90 ha, and life saving irrigation will be available for 45 ha. Vegetables can be grown in both the seasons using the full irrigation, and in Kharif season using life-saving irrigation.

iii) In Nagwain area, the area under strategic (peas, tomato, cauliflower), and multiple (cabbage, garlic) vegetables shall be increased with the assured irrigation facilities. Tomato area shall also be increased by using life-saving irrigation.

iv) Since the farmers are already cultivating exotic vegetables in a small area and are interested to increase the area under exotic vegetables, it is planned to increase the exotic vegetables area to 10 ha. For this purpose, the farmers group need to be strengthened, and suitable linkage between the producers and the market (hotel chains etc.) need to be established.

v) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days targeting the farmers of Nagwain site.

vi) In comparison with the livestock population, the green fodder supply is much low having a high shortage of animal feed. Therefore, it is planned to increase the fodder area from 2.0 ha to 9.0 ha (10% of the fruit area) under fruit trees.

vii) Trials are different varieties are also needed for the area.

viii) Introduction of post-harvest technology, especially sorting, grading and packing is needed for apples and vegetables.

ix) Protective cultivation is already started in the area by advanced farmers and demonstration trials for protective cultivation shall be conducted in this area.

Based on the above considerations the proposed cropping pattern and the cropping calendar are planned as shown below:

Table L-5.9.1 Proposed Cropping Pattern of Nagwain Site

Crops		Kharif season (ha)			Rabi season (ha)		
		Rainfed	Full-Irrig.	Life save Irrig.	Rainfed	Full-Irrig	Life save Irrig.
Food Grains	Maize	105					
	Wheat				109		
	Pulses (B.Gram/ kidney beans)	4					
	Sub total (Food grains)	109			109		
Vegetables	Peas					50	
	Cauliflower		30				
	Tomato		30	45			
	Cabbage		30				
	Garlic					30	
	Red Cabbage					10	
	Sub total (Vegetables)		90	45		90	
Sub-total (food grains + vegetables)		109	90	45	109	90	
Fruits	Apple						38
	Plum						26
	Pear						19
	Pomogranate						2
	Apricot						1
	Persimmon						1
	Sub total (Fruits)						87
Fodder Crops							9
Cropped Area							539
Cultivated Area							350
Current Fallow Area							19
Cropping Intensity							154%

Source : JICA Study Team

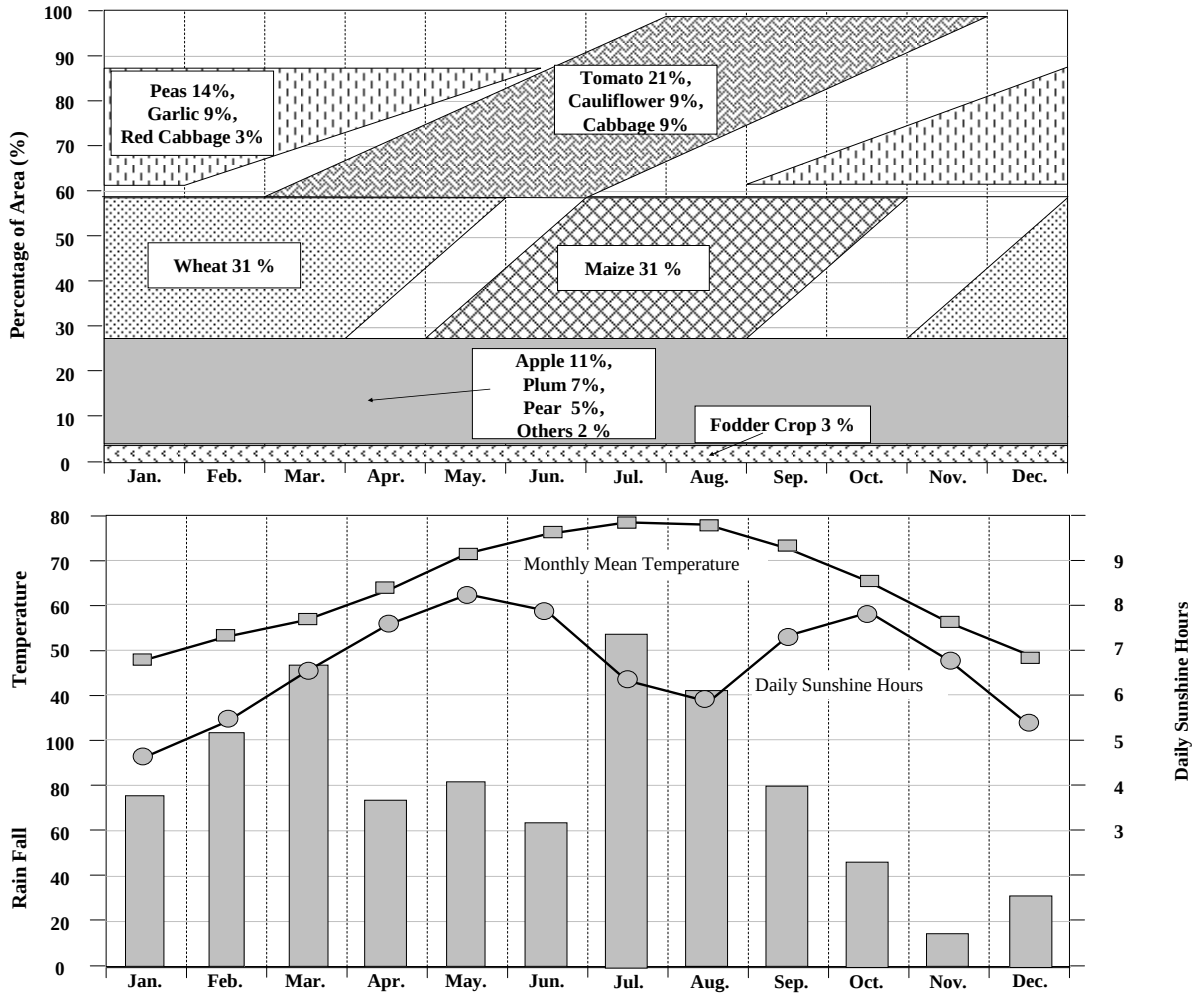


Fig. L-5.9.1 Proposed Cropping Calendar of Nagwain Site

(2) Cropping Plan of Nagwain Site

Food Grains:

i) In Nagwain area, food grains including maize, wheat and pulses are proposed to be maintained in the same level by converting 26 ha of fallow area to food grains, and the same food grains area can be converted to vegetables. Therefore, the areas of maize, and pulses grown in Kharif season are 105 ha, and 4 ha respectively.

ii) The area of wheat grown in Rabi season is 109 ha.

Vegetables:

i) With the existing vegetables area of 109 ha, and by converting 26 ha of food grains area to vegetables, 135 ha area will be cultivated with vegetables

ii) The selection of vegetables is made in consideration of existing farming conditions, intention of the farmers, and the current market conditions.

iii) With availability of full irrigation in 90 ha, the vegetables are planned to be grown in 90 ha area in Kharif and Rabi seasons. During Kharif season, strategic vegetables including tomato and cauliflower are planned to be grown in 30ha, and 30ha respectively under full-irrigation conditions. And, cabbage is proposed in 30 ha area under full-irrigation.

iv) Tomato is proposed to be grown in 45 ha area using life-saving irrigation during Kharif season.

v) During Rabi season, the strategic vegetable peas is proposed in 50 ha area, and the popular vegetable garlic is proposed in 30 ha area. Exotic vegetables red-cabbage is proposed in 10 ha area.

Fruits:

i) Fruits including apple, plum, pear, pomegranate, apricot and persimmon are proposed to be grown in the same area of 38ha, 26ha, 19ha, 2ha, 1ha, and 1ha respectively.

Fodder Crops:

i) Because of the relatively high livestock population, and high demand of green fodder in this area, fodder crops area under the fruit trees shall increased from 2 ha to 9 ha, which is cultivated approximately in 10% of the fruits area.

(3) Proposed Farmers Support Program Activities

The farmers support program activities which shall be carried out in Nagwain site under the Master Plan are mentioned below.

1) Vegetable Promotion

i) Introduction of cropping patterns suitable for markets

ii) Promotion of strategic vegetables tomato, potato, cauliflower and peas.

iii) Introduction and promotion of exotic vegetables

iv) Promotion of organic farming

v) Organizing or strengthening of farmers group for the marketing purpose and water users association effective use of irrigation facilities

vi) Extension of protective cultivation (greenhouse)

vii) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

viii) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases

ix) Promotion of farming practices to reduce soil erosion

x) Introduction of contract farming.

2) Food Grain Crop Productivity Improvement

i) Promotion of diversified cropping patterns suitable for productivity increase of food grain crops

ii) Promotion of optimum quantities of farm inputs such as seeds and fertilizers

iii) Promotion of organic farming

iv) Organizing or strengthening of farmers' groups (marketing group)

v) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

vi) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases.

vii) Promotion of farming practices to reduce soil erosion

3) Integrated Farm Management

i) Improvement of productivity and quality of horticulture crops.

ii) Promotion of fodder production and reuse of vegetable residues under integrated farming in crop diversification

iii) Promotion of cold water fish culture (trout) under integrated farming including the irrigation system

L-5.10 Post Harvest Processing and Marketing Plan

(1) Post Harvest Processing Plan

Based on the Post Harvest Processing Promotion Plan, following activities are proposed.

i) Introduction or promotion of post-harvest activities, such as grading, sorting and packing etc., in accordance with the quality standard. Quality standard and post-harvest technologies should be disseminated by extension trainers by holding of the extension camps.

ii) Introduction or promotion of small scale agro-processing activities. Agro-processing technologies should be disseminated by extension trainers by holding of the extension camps.

(2) Marketing Plan

Following points should be considered for promotion of aggressive marketing activities, considering their living situation and characteristics of land category I:

i) Farmers in Nagwain area have sufficient experience for vegetable cultivation. However, they do not have any experience on group marketing. It is expected that they try to strengthen their ability for selling their produces by group, in order to improve quality of their vegetable produces, and strengthen their bargaining power.

ii) Promotion of vital and characteristic agriculture as well as crop diversification

iii) Formation of farmers' group (cooperative) for marketing of vegetable produces

iv) Promotion of green tourism, organic farming, cultivation of exotic cultivation, etc.

v) Carving out niche vegetables in vegetable consuming market

vi) Promotion of transaction of organic products and exotic products in local markets

vii) Promotion of program component on marketing system improvement

L-5.11 Infrastructure Development Plan

Infrastructure development plan was originally discussed by the farmers' participatory approach through preparation of resource map, based on which topographic survey and preliminary design were executed including various alternative studies to compare technical and economical feasibility.

(1) Irrigation Design and Facility Plan

As the water resources in the Beas River are sufficient even in the driest months, new lift irrigation system can be considered. However, due to the high construction cost and operation cost because of high pumping head more than 100 m, most of the plans are not economically feasible. Also, high pump output capacity will be beyond the capacity of farmers' operation and maintenance. In case that lift irrigation will not be feasible, communal tank irrigation utilizing small stream or springs is proposed.

(2) Access Farm Road System Design and Facility Plan

For access farm road, 11 roads in total including new, improvement and footpath are proposed to connect from existing PWD road to the left out areas in both for hilly and lower area. Farm road development of Nagwain area consists of improvement of six existing farm roads in Nagwain area and improvement of 2 farm roads and new construction of 3 roads in the Palsahr village in the northern Nagwain where the road network is less developed.

- R-1: Improvement of muddy earth road by WBM and drainage.
- R-2: Improvement of important farm road which connect vegetable area and Panchayat office with NH21 by WBM and PMC. This road is the beginning point of R-3 and R-4. There are steep gradient with short distance which may be improved by additional zigzag in the detail design stage.
- R-3: Improvement of muddy earth road in the southern area of the Panchayat office by WBM and PMC.
- R-4: Improvement of muddy earth road in the northern vegetable area of the Panchayat office by WBM.

- R-5: A new road is proposed to connect orchard and vegetable area of Southern Palsahr with Nagwain.
- R-5new: A new roads is proposed to connect northern steep field with Palsahr village.
- R-6 & 7: Improvement of earth road in the vegetable area between NH21 and Beas river by pavement and drainage systems.
- R-8: Improvement of earth road in the orchard of northern end of Palsahr by pavement and drainage systems.
- R-9: Improvement of steep and short earth road in the vegetable area by concrete pavement and drainage systems.
- R-10: A new road is proposed to connect north-western orchard with Palsahr village.
- Following road and footpaths are discarded: R-11 (land conflict), Rf-1, 2 & 3 (different purpose as worship, etc.)

(3) Salient Features of the Proposed Infrastructure Development Plan

Salient features of the proposed infrastructure development plan both for irrigation and access farm road are summarized in Table.L-5.11.1 and their location is shown in Fig.L-5.11.1.

Table L-5.11.1 Salient Features of Infrastructure Development Plan

Proposed works / location	No.	Description
1. Irrigation		
1) Construction of new Lift irrigation		
- Sai Mashora	I-3	CCA = 25 ha, H = 80 m, BHP = 75 HP
2) Tank irrigation		
- Provision of Field Tanks		60 field tanks approx. in total
3) Rehabilitation of IPH pump system		Proposed to IPH
2. Access Farm Road		
1) Construction of new access farm road		
- Shiv Mandir, nagwain to manighraat	R5	B.A = 10 ha, L = 510 m, W = 3.0 m, WBM
- Palser	R5n	B.A = 15 ha, L = 1,550 m, W = 3.0 m, WBM
- Baloo road to Burku Thana Paleshar	R10	B.A = 20 ha, L = 945 m, W = 3.0 m, WBM
2) Improvement of existing access farm road		
- NH-21 to society ghar	R1	B.A = 12 ha, L = 287 m, W = 2.5 m, WBM
- NH-21 to talahar road via panchayat ghar	R2	B.A = 20 ha, L = 748 m, W = 2.5 m, WBM, PMC
- Panchayat ghar to Kalghar, sheetla mata rd.	R3	B.A = 20 ha, L = 968 m, W = 2.5 m, WBM, PMC
- Panchayat ghar to Sarsehar	R4	B.A = 16 ha, L = 270m, W = 2.5 m, WBM
- NH-21 to Raha village	R6	B.A = 20 ha, L = 945 m, W = 2.4 m, WBM, PMC
- NH-21 to Raha village via masjid	R7	B.A = 10 ha, L = 515 m, W = 2.4 m, WBM
- Baloo road near Check Post to Shamla ghai	R8	B.A = 20ha, L = 1,360 m, W = 2.4 m, WBM, PMC
- Baloo road Paleshar to Balu khadd	R9	B.A = 12 ha, L = 208 m, W = 2.2 m, CC

CCA : Culturable Command Area H : Pump rising head, BHP : Break horsepower
B.A : Beneficiary area L : Length W : Width,
Pavement ; WBM : Water bound macadam PMC : pre-mix bituminous carpet CC : Cement concrete

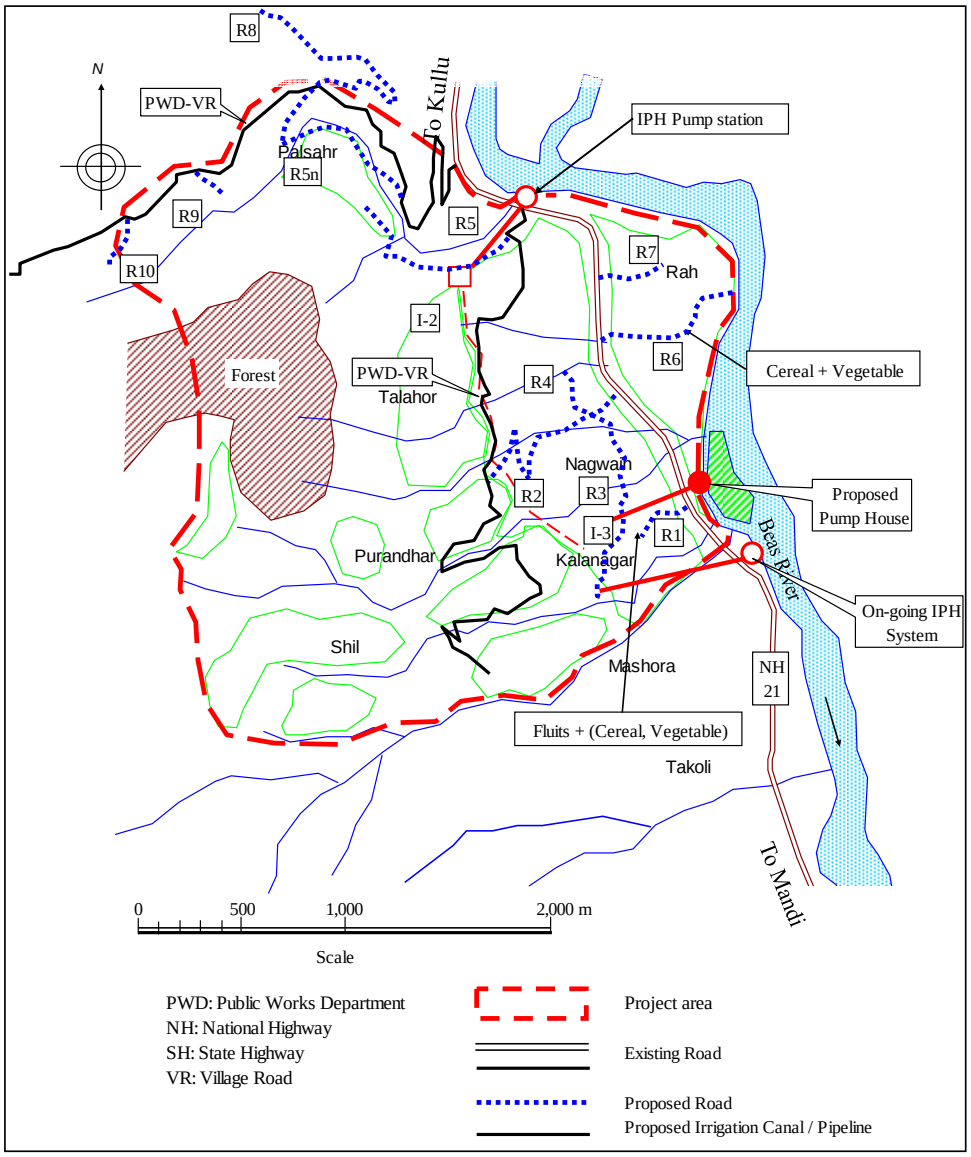


Fig. L-5.11.1 Location Map of Infrastructure Development Plan

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Nagwain site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor irrigation, supplementary irrigation and access farm roads. The development of the access farm roads will contribute not only to promotion of crop diversification but also to social purpose especially to the connectivity to the remote habitats. Therefore, a part of the estimated cost of the access farm road is allocated to the other purposed based on the individual condition referring to the topography and the covered area. Meanwhile, the cost of irrigation facilities is allocated to only the project area for crop diversification. The results of cost estimated and its allocation is summarized as below.

Table L-5.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development

Item		Amount (Rs.)	Cost Allocation	
			Individual	Weighted
1) Irrigation				
- Construction of Lift Irrigation, I-3	25 ha	4,944,000	(100%)	
- Rehabilitation of IPH Lift Irrigation		1,630,000	(100%)	
- Water Harvesting Facitlities		1,860,000	(100%)	
Sub-total		**8,434,000**		**(100%)**
2) Access farm road				
- Construction of New Road, R5	510 m	736,000	(30%)	
- Construction of New Road, R5n	1,550 m	4,546,000	(30%)	
- Construction of New Footpath, R5n	123 m			
- Construction of New Road, R10	945 m	2,080,000	(30%)	
- Improvement of Existing Road, R1	287 m	1,815,000	(50%)	
- Improvement of Existing Road, R2	748 m	805,000	(80%)	
- Improvement of Existing Road, R3	968 m	1,143,000	(50%)	
- Improvement of Existing Road, R4	270 m	289,000	(80%)	
- Improvement of Existing Road, R6	945 m	1,072,000	(50%)	
- Improvement of Existing Road, R7	515 m	497,000	(80%)	
- Improvement of Existing Road, R8	1,360 m	1,640,000	(30%)	
- Improvement of Existing Road, R9	208 m	335,000	(30%)	
Sub-total		**14,958,000**		**(46%)**
Total		**23,392,000**		**(58%)**

L-6 Bagain Site of Theog Model Areas

L-6.1 Present Socio-economic and Natural Conditions

Bagain site is located at a distance of 40 km in the eastern direction from Shimla, District's headquarter, and its topography consists of mountainous and steep areas. The site extends along the left bank of Giri River. The socio-economic and natural conditions of Bagain site are summarized in Table L-6.1.1.

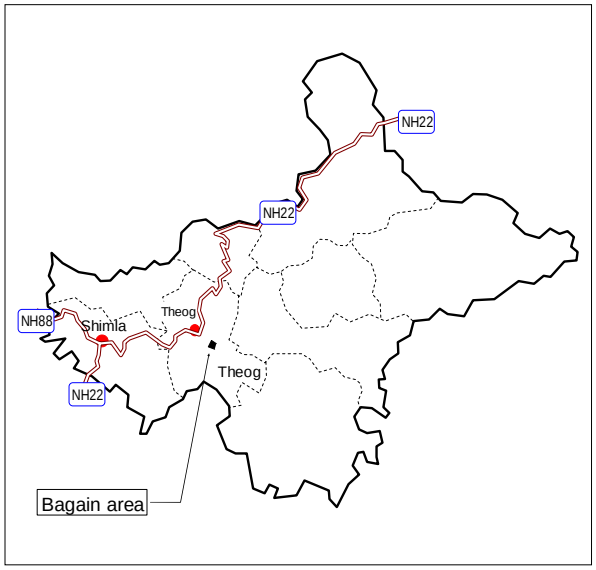


Fig.L-6.1.1 Location Map of Bagain Site

Table L-6.1.1 Socio-economic and Natural Conditions of Bagain Site

District	Shimla	Category	I
Block	SH-59 Theog	Agro-ecological zone	Zone 3
Panchayat	Bagain	Annual rainfall (mm)	1,420
Village	Basa Bagain, Charail,	Average Temperature (◦C)	No data
	Ulvi, Khahar, Bananal,	Average Max.Temperature (◦C)	No data
	Bagain, Deothi, Dasana,	Average Min. Temperature (◦C)	No data
	Damyana, Bagri, Indkul, Bhuin & Rena		

Source: Compiled by JICA Study Team

1) Population/Community

Bagain Panchayat includes 9 revenue villages and three hamlets of the Revenue village Basa Bagain. The Panchayats comprises of 480 households. The total population of the site is 2,561. The distribution of population in the 9 revenue villages is given below

Table L-6.1.2 Village-wise Population Details of Bagain Panchayat

Village	Population	SC Population	% of SC
01. Basa Bagain (Ulvi, Bagari, Charail)	636	255	40
02. Khar	372	122	32.7
03. Banahal	236	11	4.6
04. Dhak Bagain	374	158	42.2
05. Deothi	210	51	24.2
06. Dasana	269	64	23.7
07. Damyana	261	261	25.2
08. Bhuin	70	21	30
09. Renna	133	13	11.2
Total	**2,561**	**701**	**27.3**

Source – Panchayat Record Bagain Panchayat

27.3 % of the total population are SCs Village Dhak Baigan Basa Bagain and Khar have the highest population of Schedule Caste communities. The predominant communities among SCs are koli. They are mainly agriculturists. The other two castes include Barahi (Carpenter), Lohaar (Iron smith). SCs are among the most marginal farming household in the area. Also in some areas like village Dasana they seemed to have been left out of the irrigation facilities

Ethnic Group and Religion: There are no tribal communities found in this project site. The population is entirely Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 1269. Like in the other parts of HP, 70-80% of the agricultural labour is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labour input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are 3 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. Seven of the 12 villages have a Mahila Mandal each, initiated by the Dept of Rural Development. The SHGs have received no training in any income generating activities. The Mahila Mandal is Basa Bagain has received training in food processing. While currently none of the groups have taken up any income generating activity they expressed an interest to take up some agro-based activities as an alternate source of income generation.

L-6.2 Present Agriculture

(1) Cropping Pattern in Bagain Site

The existing cropping pattern of Bagain site is shown in Table L-6.2.1, and cropping calendar is shown in Fig. L-6.2.1. The total cropped area is 214 ha with cropping intensity of 87 %.

Table L-6.2.1 Existing Cropping Pattern of Bagain Site

Crops		Kharif season (ha)			Rabi season (ha)			Ave. yield (ton/ha)
		Rainfed	Full-Irrig.	Life save irr.	Rainfed	Full-Irrig	Life save Irrig.	
Food Grains	Maize	6						2.2
Sub-total (Food grains)		6						
Vegetables	Peas		12					5.4
	Beans		9					5.0
	Cabbage		9					15.0
	Cauliflower					24		27.0
Sub-total (Vegetables)			30			24		
Sub-total (food grains + vegetables)			30			24		
Fruits	Apple						160	9.0
Cropped Area (ha)								214
Cultivated Area (ha)								245
Current Fallow Area (ha)								55
Cropping Intensity (%)								87%

Note : The data is based on the farm household survey and discussion with farmers group.
Source : JICA Study Team

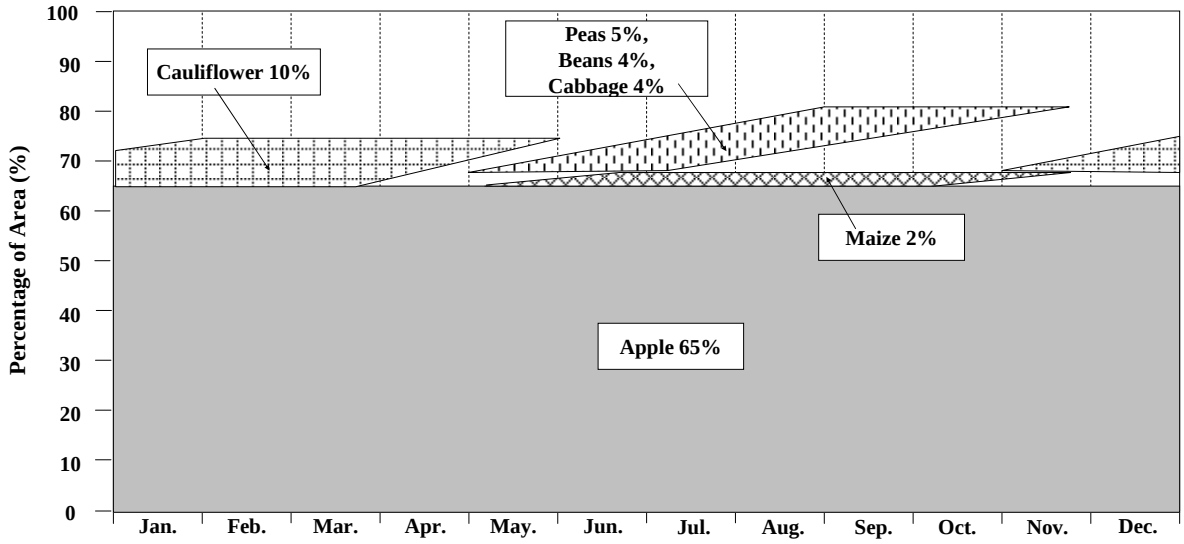


Fig. L-6.2.1 Existing Cropping Calendar of Bagain Site

In Bagain site, diversified farming including food grains, vegetables, and fruit cultivation are carried out in some extent. While vegetables and fruit cultivation are carried out for commercial purpose, food grains are cultivated mainly for self-consumption. The main vegetables cultivated in the area are peas, beans, cabbage, and cauliflower. The average yields of food grains are about 2.2 ton/ha. The average yields of peas, and beans are about 5.0-6.0 ton/ha, and the average yield of cabbage and cauliflower are 15.0 ton/ha and 27.0 ton/ha respectively.

The major varieties of the crops grown in Bagain site are: K-101, K-25 (Hybrid) for maize; Arkel, Lincoln and Azad P1 for peas; Falguni for beans; Sutton, Pride of India for cabbage; and Shweta, Ujala, Rudra, Maharani, Shimla Top, Jaykisan for cauliflower.

(2) Farm Inputs

About 10% of the households purchase seeds for cereal crops from departmental outlet, and 90% use their own seeds. In case of vegetable seeds, 100% of the households purchase from retail shops outside the village. In case of fruit crops, 85% of the households purchase seedlings from certified nursery owners, and about 15% purchase from horticulture department.

In order to control pests including cutworms, butterflies and rats for cauliflower and cabbage, and pod borer for peas, about 90% of the households purchase chemicals from retail shops outside the village, and only 10% purchase from departmental outlet. All the farmers purchase fertilizer from DOA's outlet. Vermi-composting is also started in the area, the usage of it is only 2-3% as it is only 2- 3 years old in the area. The usage of fertilizer in the year 2007-08 in the area is given below:

Table L-6.2.2 Fertilizer Use in Bagain Panchayat

Fertilisers	Quantity (ton)
Calcium Ammonium Nitrate (CAN)	1.2
Urea (Nitrogenous Fretilizer)	42
Meurotop Potash (MOP)	12:25
NPK 12:32:16	25
NPK 15:15:15	10

Source: ADO, Bagain Panchayat

The farm machinery status in Bagain site is extremely low with only 1 sprayer in each household. There is no other farm machinery in the site, and they usually hire threshers / harvesters.

Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. Farmers hire casual labor only for supporting to land preparation operation.

(3) Constraints in Crop Production

Major constraints as reported by farmers are: not enough or no irrigation water and poor irrigation facilities; pests and diseases; transport (rural roads) and marketing facilities such as collection center.

(4) Crop Diversification Potential

The farmers are interested in crop diversification to grow vegetable crops such as cauliflower, cabbage, beans, pea and capsicum.

The major requirements for crop diversification as reported by farmers are: development of irrigation facilities; market facilities such as collection and storage facilities, and technical support.

L-6.3 Present Agriculture-Allied Sector

(1) Horticulture

Present Fruit Planting: Coupled with a wide range of vegetable cultivation, Bagain site is one of apple producing areas with delicious varieties including Royal Delicious, Red Delicious, Red-e-Red, Golden Delicious and Red Gold. The harvesting season of temperate fruits except apple and pear is during the period of April to July when there is an absolute vacuum for the temperate fruits in the market. At a distance of 5 km from Bagain site, a new fruit winery is established with an annual requirement of about 8,000 tons of apple, plum, pear, apricot, peaches and kiwi. At a distance of 15 km from the site, Adani Agricultural Fresh Fruit Ltd. has commenced its cold storage, grading and packing plant targeting on direct purchase of apples.

Diversification Potential of Horticulture Crop: Diversification potential area will be waste land and fallow in and around Bagain site. Suitable horticulture crops are: apple, pear, plum, apricot, kiwi, peaches, pomegranate, pecan nut, walnut and strawberry for promoting fruit planting; marigold for promoting floriculture in open condition; and jatamansi, lavender, karru and satampanja on the higher elevation as well as lemon grass and ashawagandha on the lower elevation for diversifying medical and aromatic plant cultivation. Technologies transfer for exploitation of horticulture crops are the following points:

i) Variety diversification of apple;
ii) Stone fruit planting with mature period between May and July matching with high demand in the market;
iii) Inter-cropping of medicinal plants; and
iv) Establishment of clusters of grouping of flowers and medicinal plants.

(2) Animal Husbandry

The current livestock population in Bagain site is 210 crossbred cattle, 1,061 indigenous cattle, 9 buffaloes, 15 sheep, 58 goats, and 2 horses and others. Bagain has more indigenous female cattle than crossbred female cattle.

Available infrastructures of livestock sector in and around the site are VH (veterinary health center) and VD (veterinary dispensary), AI (artificial insemination) facility, and private vendors for milk

market.

An attempt was made to calculate feed balance from natural resources and net area sown using the information collected from field survey. The estimated results are summarized below:

i) Dry matter supply is estimated at 1,251 tons against demand of 3,755 tons, having shortage of 66.7%;

ii) Green fodder supply is estimated at 1,867 tons against demand of 6,195 tons, having shortage of 69.9%; and

iii) Dry fodder supply is estimated at 942 tons against demand of 2,762 tons, showing shortage of 65.9%.

Bagain has a potential for crossbreeding since it has more number of female indigenous cattle. Bagain is also running a shortage of green and dry fodder by about 70 and 60 percent. By mix cropping with fruit tree and fodder, fodder production will be increased.

Future development potential and constraints of animal husbandry in combination with crop diversification in Bagain site are defined as a type of "medium dairy production potential"

(3) Inland Fishery

As for fish culture, any development potential within the site has not been found yet.

L-6.4 Present Irrigation

(1) Existing Irrigation System

Some minor irrigation systems are available in this site, of which main systems are listed below. IPH Basa Bagain lift irrigation was constructed in 2002 to irrigate 32 ha of land, and is actually irrigating around 30 ha in these years. Other than systems listed below, many private irrigation systems are operated, which include mostly small tank systems taking water from spring and supplying water to their small farms by using hose. It was reported that five irrigation tanks are operated and some other tanks remain unutilized.

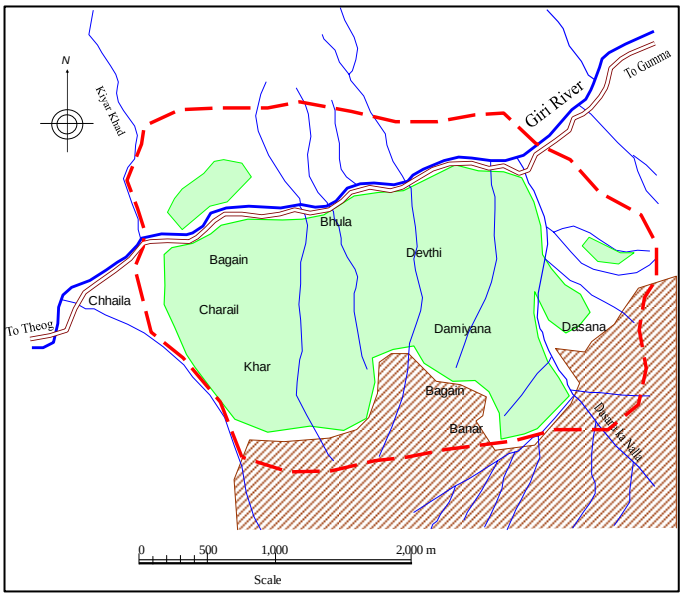


Fig. L-6.4.1 General Layout of Bagain Site

Table L-6.4.1 Main Irrigation System in Bagain Site

Name / Village	Type	Source	Area, (ha)
Basa Bagain	IPH lift irrigation	Giri river	30
Bagri	IPH lift irrigation	Giri river	No data
Charail	Tank by DOA	Spring	No data
Deothi	IPH flow irrigation	Dasana river	No data
Rena	Communal lift irrigation	Giri river	No data

(2) Present Irrigation Practice

Present irrigation practice for the major crops is summarized below.

Table L-6.4.2 Present Irrigation Practice in Bagain Site

Crop	Area (ha)	Irrigation period	Nos. of times or interval	Irrigation method
Apple	No data	Apr. - Jul.	Not fixed	Pipe / hose
Cabbage	No data	May. - Aug.	Once a week	Sprinkler
Cauliflower	No data	Jan. - Jun.	Every 3 days	Sprinkler
Peas	No data	Feb. - Apr.	Once a week	Sprinkler
Beans	No data	Feb. - Apr.	Once a week	Pipe / hose

(3) Water User's Association (WUA, KVS)

One WUA has been formed in Basa Bagain village but not registered. This WUA is not active and meetings are rarely held. Water charge is not being collected. In IPH lift irrigation, operation and maintenance are under the responsibility of the IPH Department, while water management at field is under the farmers' responsibilities applying rotational irrigation as per the schedule prepared before cropping season. Maintenance of the distribution system is occasionally done by the farmers.

(4) Constraints and Farmers' Needs

Farmers out of the existing lift irrigation area request other lift irrigation systems to be newly constructed along the Giri river or its tributary. On existing system, insufficient storage tank capacity and numbers, deterioration of steel pipe and hose are reported by the farmers as constraints. Future development plan in Bagain site will consist of 1) rehabilitation of existing lift irrigation system and 2) construction of new lift irrigation system and 3) upgrading and increasing of tank irrigation system utilizing local water source like springs and small rivers.

L-6.5 Present Farm Road

(1) Road Network

There are one national highway (NH22), 3 state highways (SH06, 08 and 10), a major district road (MDR16) and 48 links of motorable Public Works Department's village road (PWD VR) in the Block. It is about 60 km from the Site to Shimla town, the district and state capital, and 407 km to Delhi via. Shimla which is about 15 hours' drive by cargo

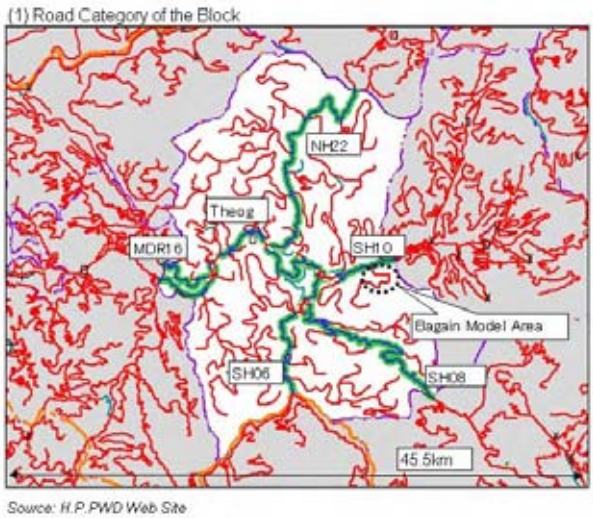


Fig. L-6.5.1 Road Category of Theog Block

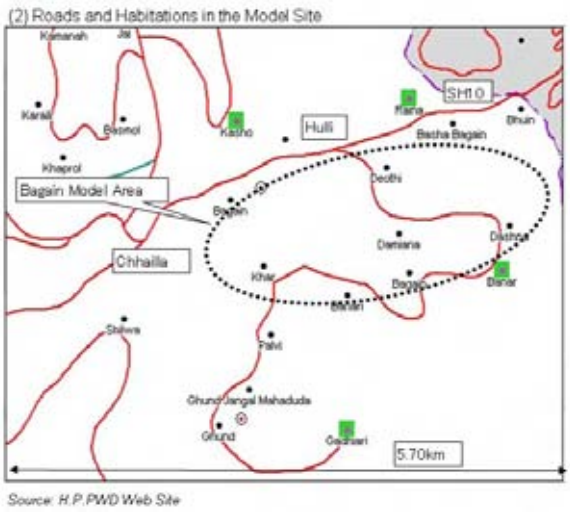


Fig. L-6.5.2 Roads and Villages in Bagain Site

(2) Village Connectivity

Out of total 335 villages under 50 Panchayat in Theog Block, 191 villages (57%) have been connected by all-weather motorable road, which is slightly lower percentage than the State average of 60% and higher than Shimla District average of 54%.

(3) Roads in the Site

The Site is connected by a PWD VR with a total length of 22 km, a part of which (7km) is paved with tar and the rest is earthen road. Bus service is available for 3 times a day. This PWD VR is diverted at Huli from the state highway (SH10) to Rohru or the center of apple belt along Giri River. There are 2 feeder village roads under construction at the area between the SH10 and village road. At Khar village (8 km from Huli along the VR), a Pachayat road diverts and connects Khar village up to the western end of the Site. This road is frequently blocked in the rainy season.

Most of villages in the Site have been connected except Banahar village with a population of 200. Panchayat constructed a part of the road between Banahar and Dak Bagain, however, it is only in poorly jeepable condition. The road route is entirely in the Protective Forest area. There are many narrow footpaths with various type of pavement (compacted earth, stone and concrete), which starts from the existing village road and ends in the crop fields.

(4) Constraints and Farmer's Needs

The farmers propose following improvement and new linkage:

i) Improvement of the Panchayat road to full jeepable road by widening and provision of cross drainage works where the road is blocked sometimes in the rainy season and farmers have to transport their produce by foot. The road runs along contour line.

L-6.6 Present Post Harvest Handling and Processing

There are many governmental or semi-governmental processing facilities in the District as follows.

<u>Governmental or semi-governmental Sector</u>

i) HPMC is operating 4 cold storage facilities mainly for apples which have each capacity of 1,000 tonnes.

ii) Himachal Pradesh Fruit Canning Unit (himcu) is operating one Fruit Canning Unit at Naubahar with the processing capacity of 200 tonnes per year. At Naubahar Canning Unit, about 370 agro-processing technology training camps have been held from 1990, and about 20,000 trainees have been trained at the camps. After getting modern agro-processing technology at the camps, some women or women's groups have started the manufacturing and selling processed food such as pickles, chutney, chips, sweet made from Indian gooseberry (amla) in the neighbourhood markets.

Private Sector

The following is current situation of agro-processing activities by private sectors in the District.

Table L-6.6.1 Details of Private Agro-Processing Plants in Shimla District

No.	Name of the Plant	Address	Year established	Capacity (tons/year)	Main commodities
1	Minocha Industries	Shoghi	-	100	Fruits and vegetables products
2	Shivalik Foods & Beverage	Mashobra, Shimla	-	25	Mainly pickles
3	Tripti Food Products	Shimla	-	20	Mainly pickles
4	New White Gate Fruit Products	Naubahar, Shimla	1996	150	Fruits products
5	Green Valley Cider Pvt. Ltd.	Shoghi, Shimla	-	-	Fruits cider

Source: Department of Horticulture, Himarchal Pradesh. "Present Status of Fruits and Vegetables Processing Industries and Available Post Harvest Infrastructure in Himachal Pradesh"

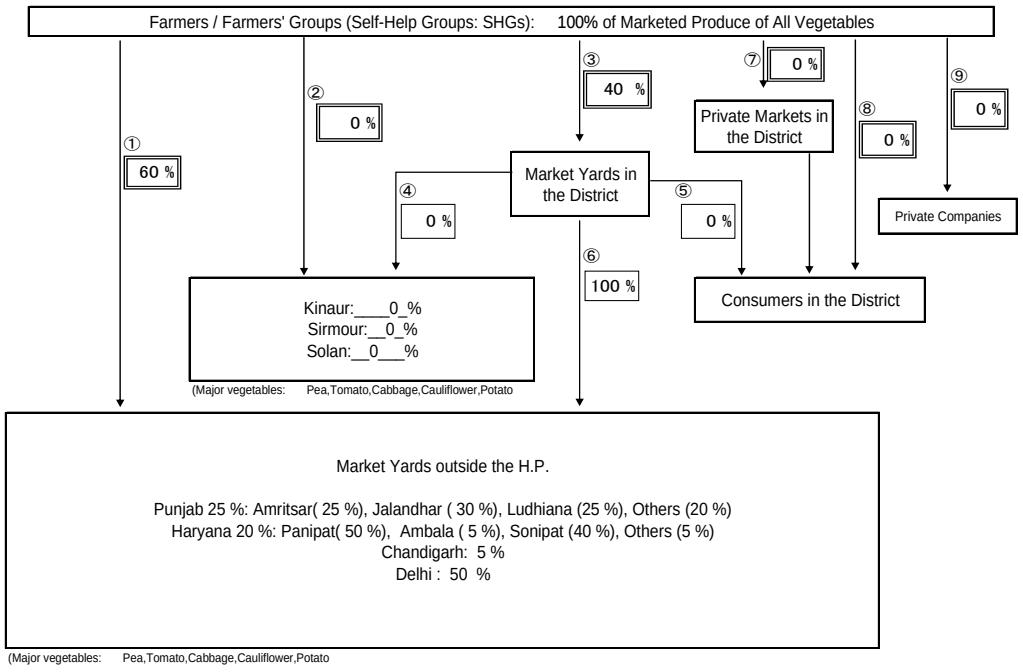
Constraints and Countermeasures

Shimla District is one of the largest fruits production area in the State. However, quantity of large scale processing plants in the District is not so many, because infrastructure conditions such as road etc. are not good and almost of the plants are concentrated on south western lower industrial area in the State. At present, most of the produces have been transported to the industrial area and processed at there.

L-6.7 Present Crop Marketing and Market Facilities

(1) Marketing Distribution of Vegetables

In Shimla District, almost all vegetables, which are locally produced, are shipped out to other states as shown in Fig. L-6.7.1 Meanwhile it is noted that vegetables during the winter season are supplied from other districts, while off-season vegetables are supplied locally.



Note: 0%: negligible small amount
Prepared by JICA Study Team

Fig. L-6.7.1 Distribution Channel of Vegetables in Shimla District

(2) Outline of Market Yards

In Shimla District, there are six (6) market yards, as shown in Fig.L-6.7.2. Out of six market yards, four Market Yards except Rampur and Rahroo Sub-Market Yards are seasonal market yards. Theog Sub-Market Yard is nearby the Pre-F/S site in Theog as shown in Fig.L-6.7.2. This Sub-Market Yard is old and not functional. Permanent staff is not deployed; therefore market price information is not available.

Auction Platform
Theog Market Yard

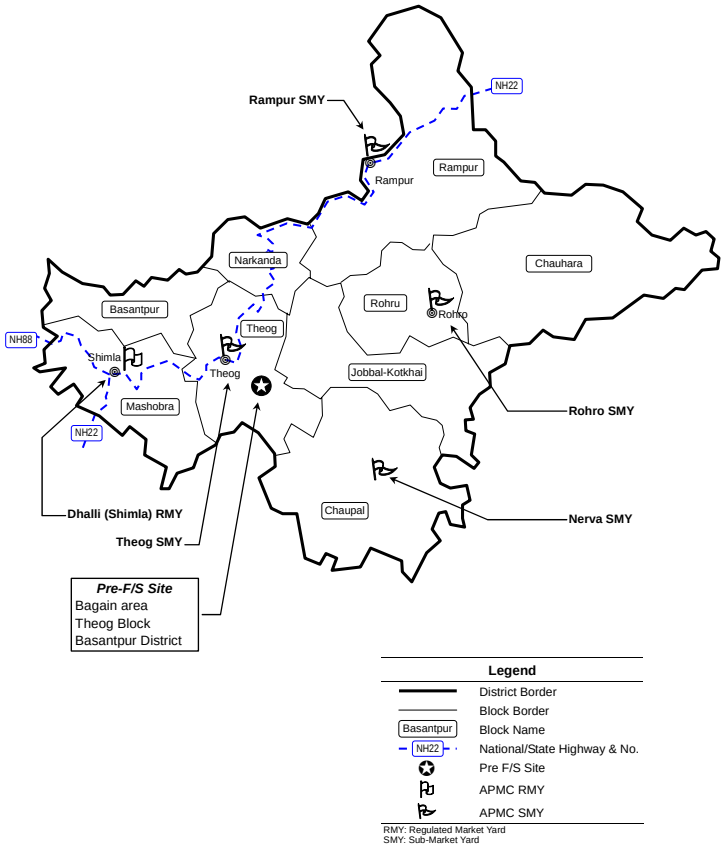


Fig. L-6.7.2 Location of Market Yards of APMC in Shimla District

(3) Constraints and Countermeasures

There are various constraints against marketing system in each district as shown in Table L-2.7.1 in Chapter L-2. It is understandable that those constraints are similar to other districts in almost every aspect. It is expected that farmers try to find new countermeasures to increase farm income with due consideration to the following points:

i) Farmers should comprehend that preference of consumers is various, not unified.

ii) Farmers should not undertake agriculture crops for producing vegetables, but for selling vegetables.

iii) Farmers should produce vegetables, based on the preference of consumers as well as buyers.

iv) Farmers should have pride and take responsibility for their produces.

v) Farmers should organize their groups, in order to enhance their bargaining power.

vi) Farmers should share the latest market information with the group farmers.

For example, it is easy to comprehend the difference of quality between the following strawberries. These grading and packing should undertaken by the farmers' as their responsibilities, otherwise it is difficult to comprehend the preference of consumers and improve quality of their produce.

Strawberry in Maharashtra
Well- sized and well-shaped

Strawberry in Himachal Pradesh
Uneven Size and Shape

L-6.8 Present Farmers' Group and Agricultural Support Services

(1) Farmers Groups and Organizations in Bagain Site

Farmers organization in Bagain site, problems and potential activities are mentioned below.

Table L-6.8.1 Farmers Organizations of Bagain Site

Group	Activities/Functions	Problems	Potential
Water Users Association (KVS) for the IPH irrigation facilities. It comprises of 52 families who receive water from the facility.	They are responsible for collecting money for repair work as and when needed. Members who are entitled to draw water from the source also sell them to others at the rate of Rs. 50/hr.	• The KVS is not very strong because members are upset about having to pay maintenance every season as the source of the water is damaged annually in the rainy season.	• **Strengthening of KVS** The KVS could be restructured and be given training in group activities and system maintenance. Funds for maintenance could be initiated and a savings group could be encouraged. Addressing the problem of annual damages caused to the irrigation facility would also help.
Informal Water Users Group in village Dasana Society	In village Dasana, where the upgrading of tank irrigation is proposed, there is no formal water users association. The villagers under the supervision of their village headman have devised their own system of water management and distribution.	• According to the villagers the system of management works quiet effectively, and there is relatively few problems.	• **Reorganizing the existing set up into WUA** This group can be formalized as a WUA for effective and sustained management of the tank irrigation system.
Morarka foundation established a farmers group to promote organic farming	Some farmers are in the process of registration for organic farming.	The activities have been started and there is no problem at present.	This group shall effectively promote organic farming in the panchayat.

(2) Agricultural supporting services

Available agricultural supporting services in the Bagain site are summarized as follows:

i) Farmers training camps are held to provide information and to motivate the farmers on cultivation technology, especially in regard to crop diversification;

ii) Extension activities are also held on agricultural practices including organic farming and vermi-compost;

iii) Inputs including vegetable seeds and pesticides are distributed to the farmers through the departmental outlet/sale centers. Subsidy is provided to the farmers based on the schemes such as Scheduled Caste / Scheduled Tribes (SC/ST), Backward Area Sub-Plan (BASP) and so on;

iv) Soil samples taken from different areas are brought and sent to Sundernagar soil testing laboratory; and

v) Farm trials are conducted to test soils, seeds and fertilizer quality.

L-6.9 Vegetable Promotion and Agricultural Support Plan

Vegetable promotion and agricultural support for the Bagain site is planned as follows:

i) In Bagain Area, about 55 ha is left as current fallow area, which can be converted for vegetable production with irrigation facilities.

ii) By the implementation of irrigation project, full irrigation will be available for 51 ha area, and life-saving irrigation will be available for 25 ha area in kharif season. Using this irrigation, the area under strategic (peas, and cauliflower), and multiple (cabbage) vegetables shall be increased.

iii) Since the farmers are already cultivating vegetables and are interested to cultivate exotic vegetables, it is planned to introduce exotic vegetables in 15 ha area. For this purpose, the farmers group need to be strengthened and suitable linkage between the producers and the market (hotel chains etc.) need to be established.

iv) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days targeting the farmers of Bagain site.

v) In comparison with the livestock population, the green fodder supply is much low having a high shortage of animal feed. Therefore, it is planned to include 10% of the total area as the fodder area under fruit trees.

vi) In consideration of quality improvement, varietal improvement trials are also needed.

vii) Introduction of post-harvest technology, especially sorting, grading and packing is needed for apples and vegetables.

viii) Protective cultivation is already started in the area by advanced farmers and demonstration trials for protective cultivation shall be conducted in this area.

Based on the above considerations the proposed cropping pattern and the cropping calendar are planned as shown below.

Table L-6.9.1 Proposed Cropping Pattern of Bagain Site

Crops		Kharif season (ha)			Rabi season (ha)		
		Rainfed	Full-Irrig.	Life save irr.	Rainfed	Full-Irrig	Life save irr.
Food Grains	Maize	6					
	Wheat				6		
Sub-total (Food grains)		6			6		
Vegetables	Peas		36				
	Cabbage		15	10			
	Broccoli			15			
	Cauliflower					51	
Sub-total (Vegetables)			51	25		51	
Sub-total (Food grains + Vegetables)		6	51	25	6	51	
Orchard	Apple						160
Fodder crop (under fruit trees)							25
Cropped Area							324
Cultivated Area							245
Current Fallow Area							3
Cropping Intensity							132%

Source : JICA Study Team

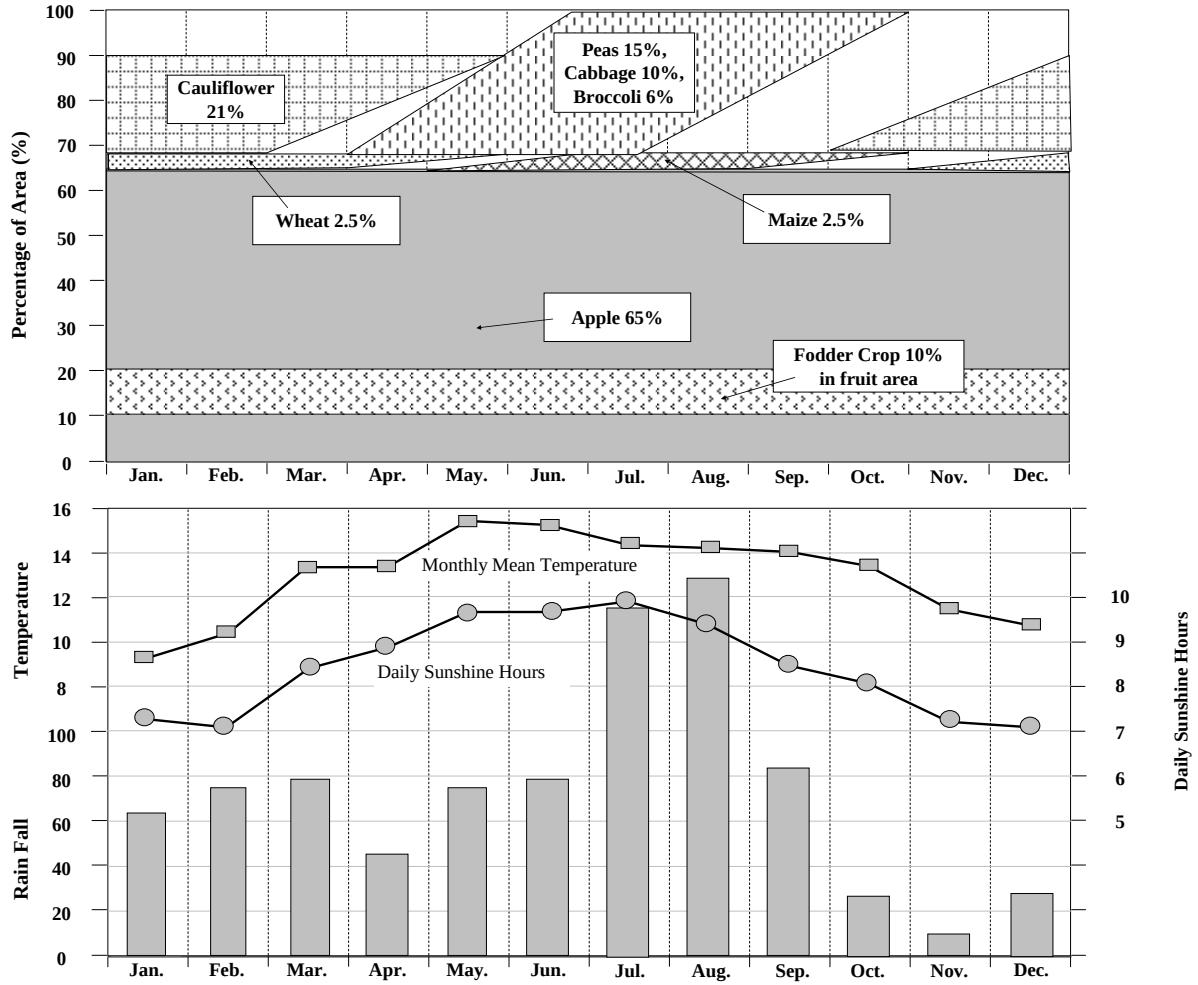


Fig. L-6.9.1 Proposed Cropping Calendar of Bagain Site

(2) Cropping Plan of Bagain Area

Food Grains:

i) In Bagain area, maize is grown only in a small 6 ha area during Kharif season. By utilizing this area, it is proposed to cultivate wheat during Rabi season in 6 ha area.

Vegetables:

i) With the availability of full irrigation in 51 ha, the vegetables are planned to be grown in 51 ha of fallow area in Kharif and Rabi seasons.

ii) The selection of vegetables is made in consideration of existing farming conditions, intention of the farmers, and the current market conditions.

iii) During Kharif season, strategic vegetable peas are proposed in 36ha area, and cabbage is proposed in 15 ha area under full-irrigation. Besides, by using life-saving irrigation cabbage is proposed in another 10 ha area. Exotic vegetable broccoli is also proposed in 15 ha area under life-saving irrigation.

iv) During Rabi season, the strategic vegetable cauliflower is proposed in 51 ha area under full irrigated condition.

Fruits:

i) Fruits apple area is proposed to be grown in the same area of 160 ha.

Fodder Crops:

i) Because of the relatively high livestock population, and high demand of fodder in this area, fodder crops area under the fruit trees shall be cultivated in 25 ha, which is approximately 10% of the cultivated area.

(3) Proposed Farmers Support Program Activities

The farmers support program activities which shall be carried out in Bagain site under the Master Plan are mentioned below.

1) Vegetable Promotion

i) Introduction of cropping patterns suitable for markets

ii) Promotion of strategic vegetables tomato, potato, cauliflower and peas.

iii) Introduction and promotion of exotic vegetables

iv) Promotion of organic farming

v) Organizing or strengthening of farmers group for the marketing purpose and water users association effective use of irrigation facilities

vi) Extension of protective cultivation (greenhouse)

vii) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

viii) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases

ix) Promotion of farming practices to reduce soil erosion

x) Introduction of contract farming.

2) Food Grain Crop Productivity Improvement

Since food grains are cultivated only in a small area, no extension activities are needed in regard to food grain production.

3) Integrated Farm Management

i) Improvement of productivity and quality of horticulture crops.

ii) Promotion of fodder production and reuse of vegetable residues under integrated farming in crop diversification

L-6.10 Post Harvest Processing and Marketing Plan

(1) Post Harvest Processing Plan

Based on the Post Harvest Processing Promotion Plan, following activities are proposed.

i) Introduction or promotion of post-harvest activities, such as grading, sorting and packing etc., in accordance with the quality standard. Quality standard and post-harvest technologies should be disseminated by extension trainers by holding of the extension camps.

ii) Introduction or promotion of small scale agro-processing activities. Agro-processing technologies should be disseminated by extension trainers by holding of the extension camps.

iii) Since existing Fruit Canning Unit have been overage and performance also have been decreased than its designed time, it should be rehabilitated and strengthened by Department of Horticulture.

(2) Marketing Plan

Following points should be considered for promotion of aggressive marketing activities, considering their living situation and characteristics of land category I:

i) Farmers in Bagain area have sufficient experience for vegetable cultivation. However, they do not have any experience on group marketing. It is expected that they try to strengthen their ability for selling their produces by group, in order to improve quality of their vegetable produces, and strengthen their bargaining power.

ii) Promotion of vital and characteristic agriculture as well as crop diversification

iii) Formation of farmers' group (cooperative) for marketing of vegetable produces

iv) Promotion of green tourism, organic farming, cultivation of exotic cultivation, etc.

v) Carving out niche vegetables in vegetable consuming market

vi) Promotion of transaction of organic products and exotic products in local markets

vii) Promotion of program component on marketing system improvement

L-6.11 Infrastructure Development Plan

Infrastructure development plan was originally discussed by the farmers' participatory approach through preparation of resource map, based on which topographic survey and preliminary design were executed including various alternative studies to compare technical and economical feasibility.

(1) Irrigation Design and Facility Plan

Due to the high construction cost and operation cost because of high pumping head more than 100 m, most of the plans are not economically feasible. Also, high pump output capacity will be beyond the capacity of farmers' operation and maintenance. In case that lift irrigation will not be feasible, communal tank irrigation utilizing small stream or springs is proposed. For access farm road, one new road and improvement of three existing roads are proposed.

(2) Access Farm Road System Design and Facility Plan

There are PWD SH-10 and 3 PWD VRs, one of each for upper Bagain (completed), middle Bagain

(under construction) and lower Bagain (almost completed). One new farm road and improvement of 3 existing road are proposed. The area has been converted from food grain to fruit and vegetable.

- R-2: A new road is proposed to connect crop field in the lower bagain between Devti village and SH-10, which requires 18 hairpin curves due to available narrow land agreed by the beneficiaries for road construction. The construction cost/km of this road is highest among all proposed roads due to the cost of retaining wall for cut and fill and spoil banks. Another same type proposed new road (R-1) was discarded due to land conflict.
- R-3, 4 & 5: Improvement of muddy earth road in the rainy season by pavement and drainage systems.

(3) Salient Features of the Proposed Infrastructure Development Plan

Salient features of the proposed infrastructure development plan both for irrigation and access farm road are summarized in Table.L-6.11.1 and their location is shown in Fig.L-6.11.1.

Table L-6.11.1 Salient Features of Infrastructure Development Plan

Proposed works / location	No.	Description
1. Irrigation		
1) Construction of new Lift irrigation		
- Kahroli	I-1	CCA = 15 ha, H = 100 m, BHP = 95 HP
2) Tank irrigation		
- Provision of Field Tanks		60 field tanks approx. in total
3) Rehabilitation of IPH pump system		Proposed to IPH
2. Access Farm Road		
1) Construction of new access farm road		
- Hotel farmer's nest, Bhuin to Lower Deothi	R-2	B.A = 15 ha, L = 2,260 m, W = 3.0 m, WBM
2) Improvement of existing access farm road		
- Dasana nalla, Ghund road to sarog	R-3	B.A = 5 ha, L = 945m, W = 2.5 m, WBM, PMC
- Ghoond road to village Bagain (upto kahlog)	R-4	B.A = 10 ha, L = 775 m, W = 3.0 m, WBM, PMC
- Kahar, ghoond road to lower khahar	R-5	B.A = 20 ha, L = 835 m, W = 3.0 m, WBM, PMC

CCA : Culturable Command Area H : Pump rising head, BHP : Break horsepower
B.A : Beneficiary area L : Length W : Width,
Pavement ; WBM : Water bound macadam PMC : pre-mix bituminous carpet CC : Cement concrete

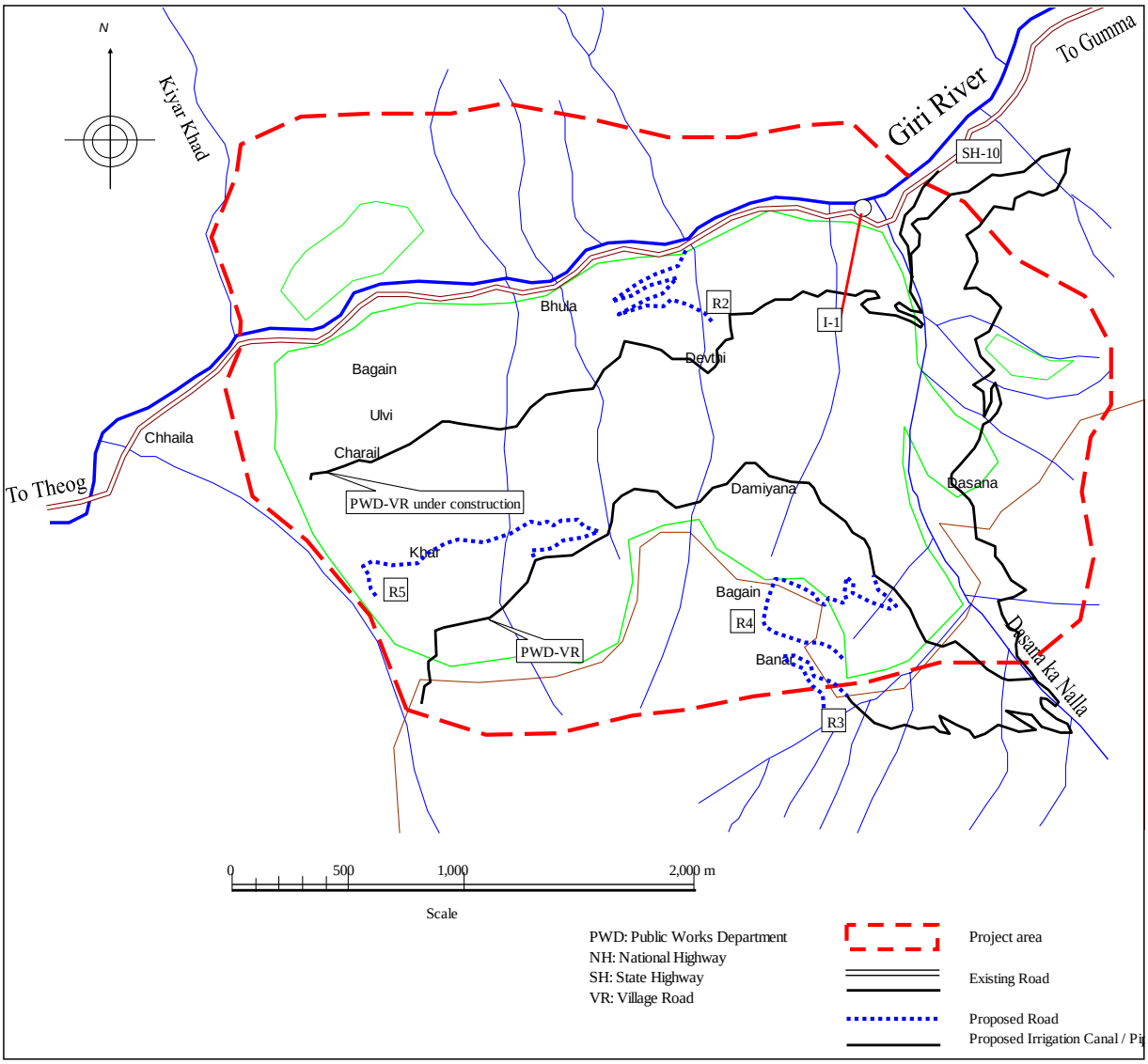


Fig. L-6.11.1 Location Map of Infrastructure Development Plan

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Bagain site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor irrigation, supplementary irrigation and access farm roads. The development of the access farm roads will contribute not only to promotion of crop diversification but also to social purpose especially to the connectivity to the remote habitats. Therefore, a part of the estimated cost of the access farm road is allocated to the other purposed based on the individual condition referring to the topography and the covered area. Meanwhile, the cost of irrigation facilities is allocated to only the project area for crop diversification. The results of cost estimated and its allocation is summarized as below.

Table L-6.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development

Item		Amount (Rs.)	Cost Allocation	
			Individual	Weighted
1) Irrigation				
- Construction of Lift Irrigation, I-1	15 ha	3,677,000	(100%)	
- Rehabilitation of IPH Lift Irrigation		237,000	(100%)	
- Water Harvesting Facilities		1,240,000	(100%)	
Sub-total		**5,154,000**		**(100%)**
2) Access farm road				
- Construction of New Road, R2	2,262 m	12,515,000	(50%)	
- Improvement of Existing Road, R3	946 m	1,053,000	(50%)	
- Improvement of Existing Road, R4	770 m	968,000	(50%)	
- Improvement of Existing Road, R5	834 m	1,065,000	(50%)	
Sub-total		**15,601,000**		**(50%)**
Total		**20,755,000**		**(62%)**

L-7 Chamo Site of Dharampur Model Areas

L-7.1 Present Socio-economic and Natural Conditions

Chamo site is located at a distance of 30 km in the south-western direction from Solan, the district's headquarter, and its topography is of mountainous and steep areas. The site extends along a deep valley named Koshalla Nala River. The socio-economic and natural conditions of Chamo site are summarized in Table L-7.1.1

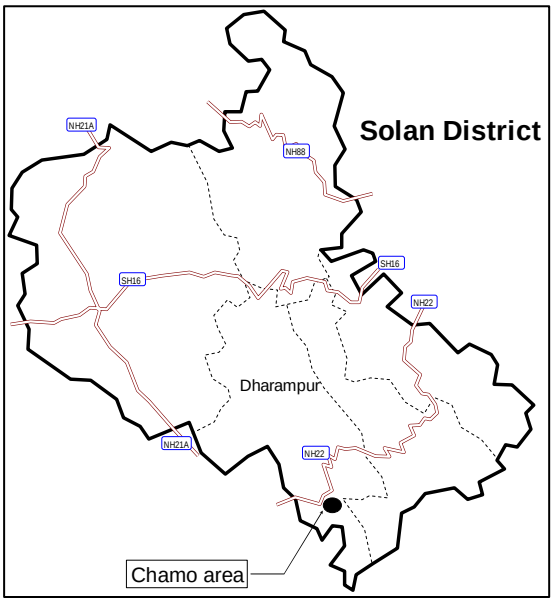


Fig L-7.1.1 Location Map of Chamo Site

Table L-7.1.1 Socio-economic and Natural Conditions of Chamo Site

District	Solan	Category	I (vegetable oriented)
Block	SO-66 Dharampur	Agro-ecological zone	Zone-2
Panchayat	Chamo	Annual rainfall (mm)	1,336
Village	Gadyar, Batoli Khurd, Batoli Kalan, Sanana, Nakaiyar, Chaamon, Dol, Chuancha, Karol, Oail, Shodon, Vayla Valau & Kainthi	Average Temperature (◦C)	No data
		Average Max. Temperature (◦C)	No data
		Average Min. Temperature (◦C)	No data
		Total area (ha)	361
		Cultivated area (ha)	109

Source: Compiled by JICA Study Team

(1) People/ Community

Population of the Project Area: Chamo Panchayat comprises of 13 villages. The total number of farm household is 231. The population distribution, number of families, the total population of Schedule Castes and Schedule Tribes is given below.

Table L-7.1.2 Village-wise Population Details of Chamo Panchayat

Village	Number Of House Hold		Total Population			Non SC Population			SC Population		
	*Non SC	**SC	Male	Female	Total	Male	Female	Total	Male	Female	Total
Chammo	12	14	65	57	122	30	24	54	35	33	68
Nakyar	10	08	39	39	86	26	31	57	13	16	29
Batol Kalan	06	-	19	07	26	19	07	26	-	-	-
Chadon	04	-	12	08	20	12	08	20	-	-	-
Shodon	04	-	07	04	11	07	04	11	-	-	-
Dol	01	-	07	04	11	07	04	11		-	-
Batol Khurd	09	04	30	25	55	22	18	40	07	08	15
Oyaal	04	-	08	10	18	08	10	18	-	-	-
Sanana	15	03	61	45	106	47	32	79	14	13	27
Bayla Balau	24	06	76	72	148	64	62	126	12	10	22
Gadyaar	10	17	71	73	144	28	27	55	43	46	89
Karol	24	05	82	82	164	64	65	129	18	17	35
Chavanja	03	-	08	06	14	08	06	14	-	-	-
Kanthi	16	32	129	120	249	52	45	97	77	75	152
TOTAL	**142**	**89**	**614**	**552**	**1174**	**394**	**343**	**737**	**219**	**89**	**437**

Source: - Panchayat Records, Chammon Panchayat
*Note: *Non SC: Non-Schedule Caste, SC: Schedule Caste*

37.23 % of the total population comprises of Schedule Castes. The majority of SC population are found in the villages Kainthi, Gadyaar and Chamo. The predominant communities among SCs are Harijan and Koli. The other two castes include Barahi (Carpenter), Lohar (Iron smith). They are mainly agriculturists. SCs are among the most marginal farming household in the area. 35 SC household in the Panchayat are Below the Poverty Line.

Ethnic Group and Religion: There are no Tribal communities found at the project site. The population of Chammon is entirely Hindus. There are seasonal migrant agricultural labourers from Nepal but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 552. The female literacy rate is less than 50%. Like in the other parts of HP, 70-80% of the agricultural labour is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labour input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are several active women's group in the project site. There are 3 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. There is a Mahila Mandal initiated by the Dept of Rural Development and a Women Farmer's Group formed by the Dept of Agriculture. The agriculture group serve as focus group for departmental training and extension work. All groups have received training in income generating activities but have not taken up any activity yet. They are keen on taking on agro-based income generating activities.

L-7.2 Present Agriculture

(1) Cropping Pattern in Chamo Site

The current cropping pattern of Chamo site is shown in Table L-7.2.1 and cropping calendar is shown in Figure L-7.2.1. The total cropped area is 146 ha with a cropping intensity of 90 %.

Table L-7.2.1 Existing Cropping Pattern of Chamo Site

Crops		Kharif season (ha)			Rabi season (ha)			Ave. yield (ton/ha)
		Rainfed	Full-Irrig.	Life save Irrig.	Rainfed	Full-Irrig	Life save Irrig.	
Food Grains	Maize	45						1.5
	Wheat				50			1.5
	Pulses (Black Gram)	5						0.7
Sub-total (food grains)		50			50			
Vegetables	Tomato	6		6	12			18.3
	Capsicum			9				10.0
	Ginger			9				13.0
	Cucumber			2				14.5
	Peas				1			17.5
	Garlic				1			7.5
Sub-total (vegetables)		6		26	14			
Sub-total (food grains + vegetables)		56		26	64			
Cropped Area (ha)		146						
Cultivated Area (ha)		162						
Current Fallow Area (ha)		80						
Cropping Intensity (%)		90%						

Note: The data is based on the farm household survey and discussion with farmers group.
Source : JICA Study Team

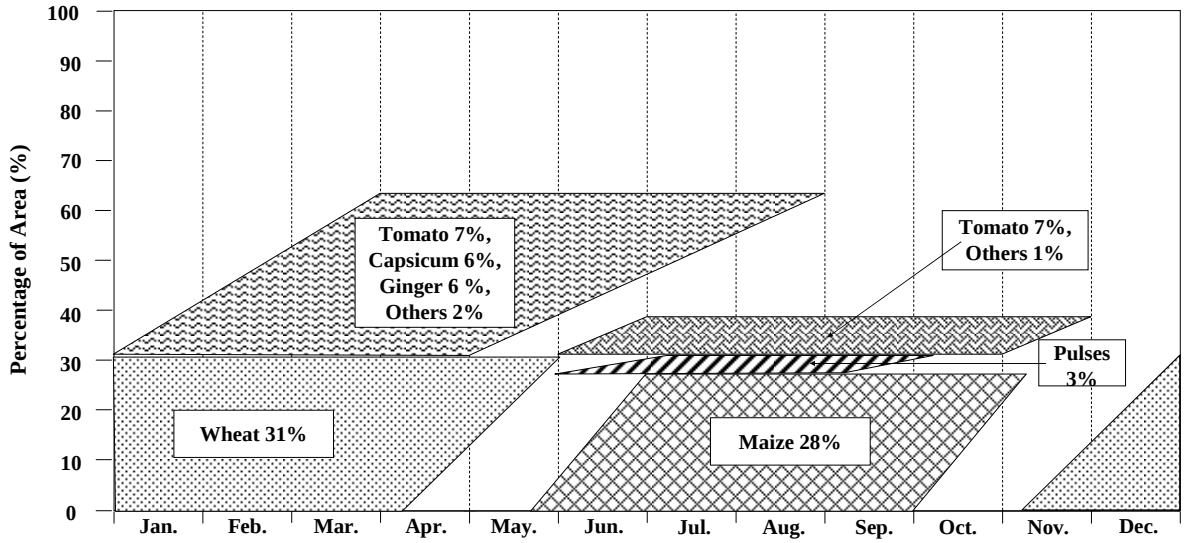


Fig. L-7.2.1 Existing Cropping Calendar of Chamo Site

The food grains are mostly cultivated under rainfed condition, and are used mostly for self-consumption. The major vegetables grown in the area are tomato, capsicum, ginger, cucumber, peas and garlic.

The yield of maize, and wheat is about 1.5 ton/ha. The average yield of tomato is about 18.3 ton/ha, which is much less than the potential yield of 40 ton/ha (CSKHPAU, Package of Practices). Similarly, the yields of most of the vegetables are lesser than the potential yield. The yield reduction is mainly

due to insufficient irrigation water, and usage of less quantity fertilizers in comparison with quantity recommended in the package of practices.

The major varieties of the crops grown in Chamo site are: K-88, Vijeta, Kanchan-Polo and K-Rani for maize; HPW-89, UP2338, PBW-343/373 and HS-295 for wheat; and PU-19/Local; UG-218 for black gram; and Naveen 2000, 7711, Himsona, Manisha, and Yash for tomato.

(2) Farm Inputs

90% of the households purchase seeds for cereal crops from departmental outlet and 10% use their own seeds. On the other hand, only 30% of the households purchase seeds for the vegetable crops from departmental outlet, whereas 70% purchase from retail shops outside the village.

With the support of extension services of the Agriculture Department most families have taken to the use of vermi-compost. Major supplier of fertilizers in the area is IFFCO and HIMFED, and supply is monitored by DOA. The usage of fertilizer in the year 2007/08 in the area are given below.

Table L-7.2.2 Fertilizer Use in Chamo Panchayat

Name of the Fertilizer	Amount (ton)
Urea (Nitrogenous Fertilizer)	7.5
NPK 10:26:26	21.5
NPK 12:32:16	55.15
NPK 15:15:15	5

Source: ADO Office, Dharampur

The usage of fertilizer is low in the area. About 10 tons of organic manure on an average is used by each household, of which 90% are from self-owned animals, and the remaining 10% are purchased from the farmers in the same panchayat. In order to control pests including cutworms, fruit borer, fruit flies and nematode for tomato, and damping-off, buckeye rot and bacteria wilt for vegetable crops, about 70% of the households purchase chemicals from DOA's outlet and 30% purchase them from retail shops outside the village.

Since the farm household area is relatively small and marginal, the farm operations are mostly carried out by farm animals. In the Panchayat, there are only one (1) power tiller, 2 sprayers, 50 threshers and 100 chaff cutters.

Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. Simultaneously, they also hire casual labor for the operations including land preparation, weeding, application of fertilizers & chemicals and harvesting.

(3) Constraints in Crop Production

The major constraints as reported by the farmers include: irrigation, labor required for vegetable farming, and pests and diseases.

(4) Crop Diversification Potential

With counter measures against the above constraints, the farmers are interested to convert at least 50% of the food grains area to vegetables. The major preferred crops by the farmers of the Chamo site are tomato and capsicum, cucumber and ginger.

Since the vegetables are sold at relatively higher prices compared to processing of vegetables, the farmers informed that they have almost no interest in processing of vegetables. The major requirements for crop diversification as reported by farmers are: irrigation facilities; and transport

facilities to market especially rural roads.

L-7.3 Present Agriculture-Allied Sector

(1) Horticulture

Present Fruit Planting: In Chamo site, small orchards grow 150 plants of mango and 120 plants of apricot. Besides, there are 90 plants of guava, 55 plants of pomegranate, 60 plants of aonla, 160 plants of Kagzi Lime and 25 plants of hill lemon, all of which are grown in home yards. Since Chamo site is outside of the frost prone area, seedlings of mango are adequately growing.

Diversification Potential of Horticulture Crop: Diversification potential area will be fallow in around Chamo site. Suitable horticulture crops are: mango, aonla, guava, peaches, apricot, kagzi lime, pecannut and strawberry for promoting fruit planting; gladiolus, chrysanthemum, marigold and carnation for promoting floriculture; and sarpgandha, kaunch, tulsi, ashwagandha, satawar and aloevera for diversifying medical and aromatic plant cultivation. There is also a very good potential for mushroom cultivation as ancillary activity, and bee keeping have high potentials. Technologies transfer for exploitation of horticulture crop are required in the following points.

i) Floriculture in open and protective cultivation;
ii) Cultivation of medicinal plants in clusters;
iii) Fruit plantation to enhance farm income; and
iv) Efficient use of water by adopting water harvesting, and drip & sprinkler irrigation.

(2) Animal Husbandry

The current livestock population in Chamo site is 75 crossbred cattle, 483 indigenous cattle, 206 buffaloes, 7 sheep, 127 goat, and 6 horses and others. As Chamo is closer to Haryana State, more numbers of female buffaloes and crossbred females to some extent are reared for milk production.

Available infrastructures of livestock sector in and around the site are VD (veterinary dispensary), AI (artificial insemination) facility, and private vendors for milk market.

An attempt was made to calculate feed balance from natural resources and net area sown using the information collected from field survey. The estimated results are given in Table L-2.2.3 in Chapter L-2 and summarized below:

i) Dry matter supply is estimated at 3,724 tons against demand of 2,659 tons, having surplus of 40.0%;
ii) Green fodder supply is estimated at 5,581 tons against demand of 4,388 tons, having surplus of 27.2%; and
iii) Dry fodder supply is estimated at 2,878 tons against demand of 2,925 tons, showing shortage of 1.6%.

Chamo site shows a surplus position for dry matter and green fodder and almost balance position for dry fodder.

Future development potential and constraints of animal husbandry in combination with crop diversification in Chamo site are defined as a type of “low dairy production potential”.

(3) Inland Fishery

As for fish culture, any development potential within the site has not been found yet.

L-7.4 Present Irrigation

(1) Existing Irrigation System

There is no irrigation system developed by the government, while small scale communal and private irrigation systems are operated utilizing local water source like spring and small streams. It is reported that there are about 50 private tank irrigations utilizing local small water source in the site.

Table L-7.4.1 Main Irrigation System in Chamo Site

Name / Village	Type	Source	Area, (ha)
Nakiyaar	Communal flow irrigation	Spring & stream	No data
Chauncha	Communal flow irrigation	Small stream	No data
Shadon	Communal flow irrigation	Small stream	No data

(2) Present Irrigation Practice

Present irrigation practice for the major crops is summarized below.

Table L-7.4.2 Present Irrigation Practice in Chamo Site

Crop	Area (ha)	Irrigation period	Nos. of times or interval	Irrigation method
Capsicum	No data	Mar. - Jul.	every 10 days or so	By hose
Tomato	No data	Mar. - Jul.	No information	By hose
Other vegetable	No data	May. - Aug.	Not fixed	By hose

(3) Water User's Association (WUA, KVS)

There is no WUA in this site, since all the irrigation systems are operated on communal or private basis.

(4) Constraints and Farmers' Needs

In this site, major constraints are lack of available water source and steep geographic conditions, therefore limited water should be efficiently utilized. Farmers request some new lift irrigation systems to be constructed on the small tributaries. They also proposed improvement of the tank irrigation system consisting increase tank capacity and numbers and replacing hose with steel pipe. In addition, they request training for improvement of irrigation system and proper management.

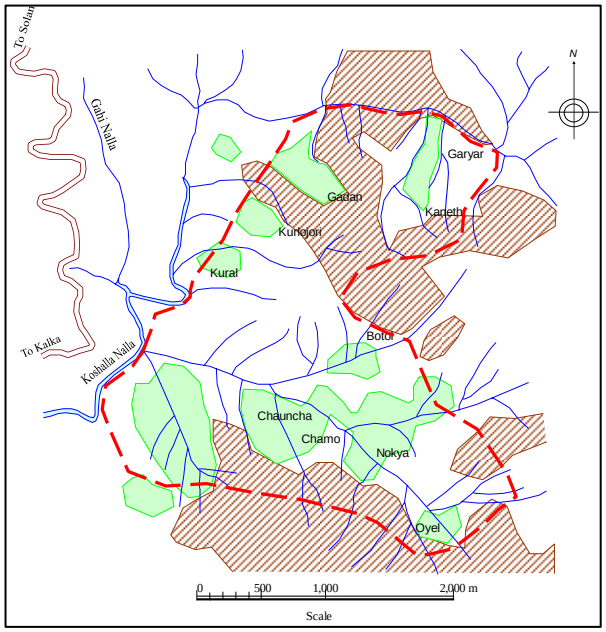


Fig. L-7.4.1 General Layout of Chamo Site

L-7.5 Present Farm Road

(1) Road Network

There are two national highways (NH22 and 88), two state highways (SH09 and 16), one major district road (MDR07) and 70 links of motorable Public Works Department's village road (PWD VR) in the Block. It is about 30 km from the Site to Solan town of the District capital, and 288 km to Delhi. Solan town which is 318 km from Delhi is one of the nearest towns in the State from Delhi; however, it takes about 10 hours by a cargo truck for agriculture produce.

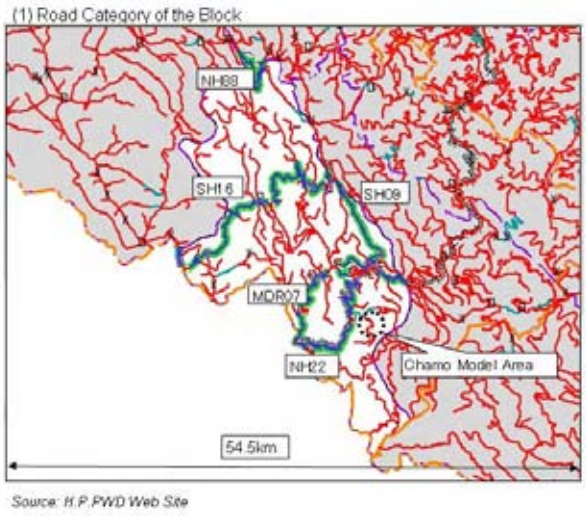


Fig. L-7.5.1 Road Category of Dharampur Block

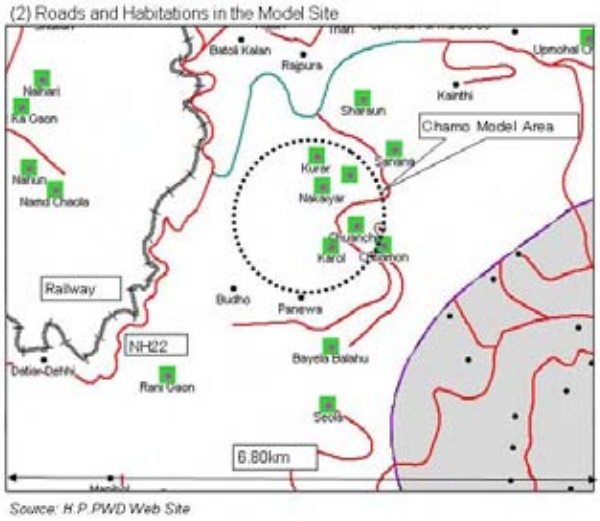


Fig. L-7.5.2 Roads and Villages in Chamo Site

(2) Village Connectivity

Out of total 443 villages under 38 Panchayat in Dharampur Block, 287 villages (65%) have been connected by all-weather motorable road, which is higher percentage than the State average of 60% and slightly lower than Solan District average of 66%.

(3) Roads in the Site

Although the Site has been connected by the PWD feeder village road (turned over recently from the RDD Block Office after completion), many villages are still recorded as unconnected presumably because of poor condition of the feeder road without cross drainage works. There is an extension plan to connect southern outside area from Chamo. There are many narrow footpaths with various type of pavement (compacted earth, stone and concrete), which starts from the PWD feeder village road and ends in the crop fields or hamlets.

(4) Constraints and Farmer's Needs

The farmers propose following improvement and new linkage:

i) Improvement of the PWD feeder village road by provision of cross drainage works at about 8 locations where the road is blocked for 3 months in the rainy season. Farmers have to transport their produce by foot for minimum one way distance of 2.5 km with vertical height 200m on average; and

ii) Construction of new zigzag farm road

L-7.6 Present Post Harvest Handling and Processing

Since Solan District is close to big consuming area and comparatively flat areas, many agro-processing facilities are exists.

Governmental or semi-governmental Sector

i) HPMC is operating 2 processing plant with total capacity of about 26,000 tonnes per year which is more than 90% of total processing capacity of HPMC. 3,000 tonnes capacity of cold storage facilities is also operated by HPMC in this District,

ii) Himachal Pradesh Fruit Canning Unit (himcu) has no facilities in this District and agro-processing training camp has not been organized in the district. Small agro-processing was not found in the field survey.

Private Sector

The following is current situation of agro-processing activities by private sectors in the District. Many private processing plants are located at this District. Nearly 50% of the agro-processing capacity is installed in this District.

Table L-7.6.1 Details of Private Agro-Processing Plants in Solan District

No.	Name of the Plant	Address	Year established	Capacity (tons/year)	Main commodities
1	Chambaghat Mushroom Growers Gramodyog Association	Village Basal, Mamlig, Teh. Kandaghat, Solan	1990	30	Mushroom products
2	Thakur Fruit & Vegetable Processing Unit	Chambaghat, Solan	1994	20	Fruits and vegetables products
3	Quality Food Product	Shed No.11, Industrial Estate, Dharampur, Solan	1997	250	Fruits and vegetables products
4	Syen Food Products	Block No.11-B-1, Sector-6, Parwanoo, Solan	1997	1,487	Fruits and vegetables products
5	Ruchi Agro Food Processing Industry	Plot No.21, I/A, Baddi, Solan	1998	125	Fruits and vegetables products
6	Renu Foods	Plot No.95, I/A, Baddi, Solan	1998	80	Mainly pickles
7	J.K. Industry	Plot No.28, I/A, Baddi, Solan	1998	70	Mainly pickles
8	Himland Agro Foods Ltd.	Plot No.193, I/A, Baddi, Solan	1998	250	Fruits and vegetables products
9	Himalayan Vege Fruit Ltd.	Koti, Solan	1995	10,000	Fruits and vegetables products
12	Revens Fruit Products	Plot No.19, Sector-II, Parwanoo	-	100	Fruits products
13	Soland Food Products		-	2	Mainly pickles
14	Laxmi Canners Power House		-	5	Mainly pickles
15	Hops Processing Unit	Baddi, Solan	-	250	Hop products

Source:Department of Horticulture, Himarchal Pradesh. "Present Status of Fruits and Vegetables Processing Industries and Available Post

Constraints and Countermeasures

Many large scale agro-processing plants are located in Solan District, and this District has the largest agricultural and horticultural processing capacity in the State. Since the District is adjoining to the Punjab State, it is convenient to transport the processed goods to the big consuming area.

Many raw agricultural and horticultural produces have been transported to this District from the production area through the road, however the road condition is not good and it damages the produces easily during transportation. To improve the road condition or to construct the new highways are strongly desired.

HPMC fruits processing plant at Parwanoo. Production capacity is 25,500 tonnes and facilities are comparatively new.

Centralized control panel of Parwanoo plant

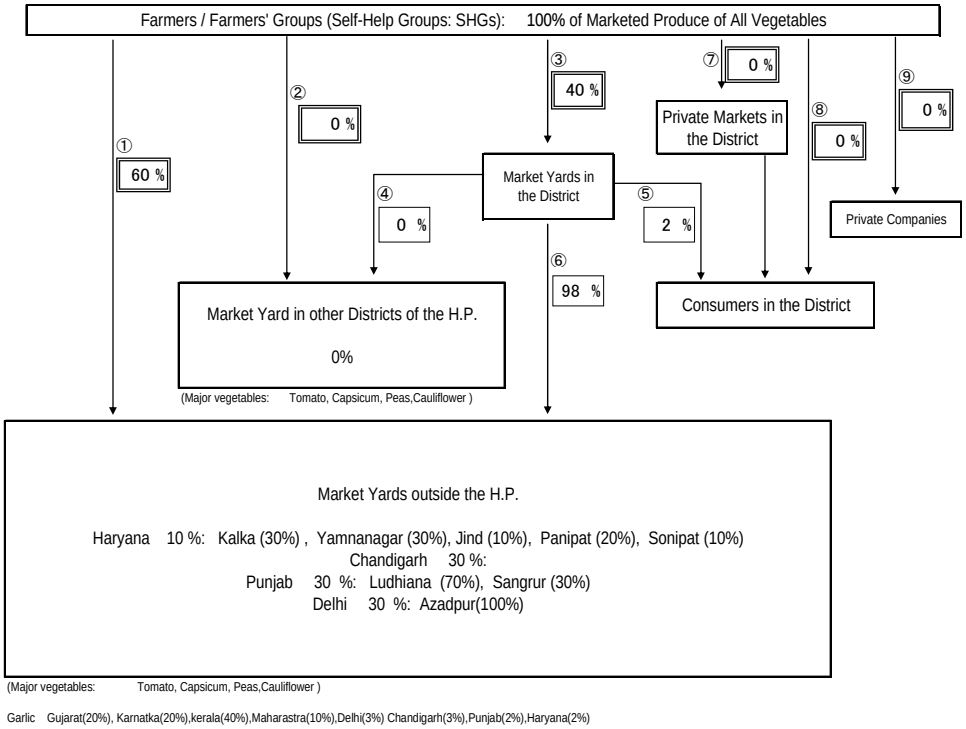
Sanitary processing line in Parwanoo plant.

HPMC fruits processing plant at Jabli in Solan District. Capacity is 1,000 tones per year and the plant becomes too old for work.

L-7.7 Present Crop Marketing and Market Facilities

(1) Marketing Distribution of Vegetables

In Solan District, around 60% out of total vegetables, which are locally produced, are shipped out to other states as shown in Fig. L-7.7.1. Meanwhile it is noted that vegetables during the winter season are supplied from other districts, while off-season vegetables are supplied locally.



Note: 0%: negligible small amount, Prepared by JICA Study Team

Fig. L-7.7.1 Distribution Channel of Vegetables in Solan District

(2) Market Yards

In Solan District, there are two market yards, as shown in Fig. L-7.7.2. Chakki Ka Mour Sub-Market Yard is nearby the sample site in Chamo as shown in Fig. L-7.7.2. This Sub-Market Yard does not function well now. Originally farmers brought their produces by themselves to this sub-market yard, however, they bring most of their produces to other markets which they can get higher prices. Because road network was improved outside of the Site, and farmers are able to take their produces to other market easily.

Front View
Chakki Ka Mour Sub- Market Yard

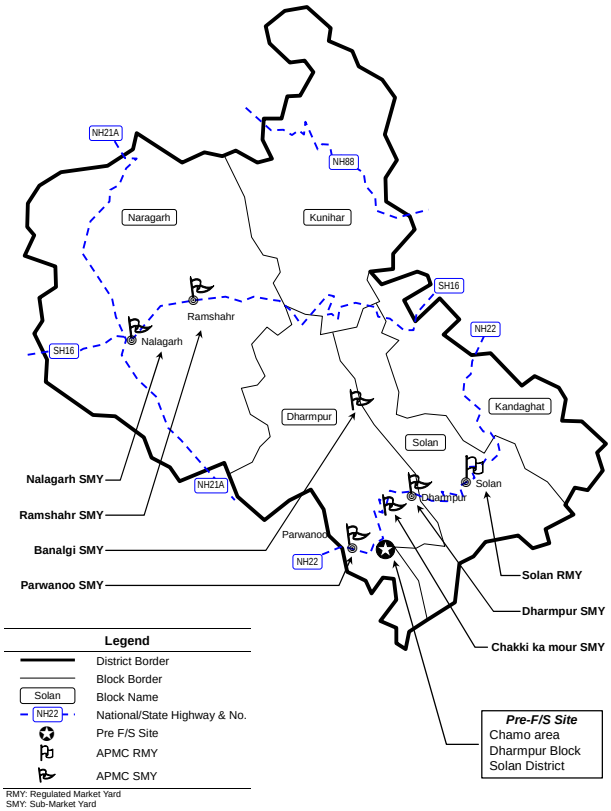


Fig. L-7.7.2 Location of Market Yards of APMC in Solan District

(3) Constraints and Countermeasures

There are various constraints against marketing system in each district as shown in Table L-2.7.1. It is understandable that those constraints are similar to other districts in almost every aspect. It is expected that farmers try to find new countermeasures to increase farm income with due consideration to the following points:

i) Farmers should comprehend that preference of consumers is various, not unified.

ii) Farmers should not undertake agriculture crops for producing vegetables, but for selling vegetables.

iii) Farmers should produce vegetables, based on the preference of consumers as well as buyers.

iv) Farmers should have pride and take responsibility for their produces.

v) Farmers should organize their groups, in order to enhance their bargaining power.

vi) Farmers should share the latest market information with the group farmers.

For example, there are some farmers in Solan District, who cultivate exotic vegetables such as broccoli, capsicum, etc. Generally broccoli is directly sold to wholesalers in Delhi. Meanwhile, unsold broccoli partly appear on street shops through auction at Solan Market Yard. In this case, vendors do not care quality control of broccoli, so low quality broccoli together with good quality one appears on shops. It is understood that grading of farm produces is indispensable for farmers before shipping to market yards in order to get reputation form consumers.

Broccoli in Solan: Relatively better

Broccoli in Solan: Over-ripened

L-7.8 Present Farmers' Groups and Agricultural Support Services

(1) Farmers Groups and Organizations in Chamo Site

As discussed in the following table there are no farmers interests group or other farmers group in the area. There are only 2 women groups organized by DOA under women improvement scheme for growing off-season vegetables and raising indigenous cattle.

Table L-7.8.1 Farmers Organizations of Chamo Site

Group	Functioning/Activities	Problems	Potential Activities
Farmers Interest Groups There are currently no Farmers groups, but the Department is soon going to implement the ATMA project in the Panchayat and under this the Farmers Interest groups will be formed	There is no activity.	There is no farmers group in the area.	Encourage and initiate the formation of Farmers Interest Group
Cooperative/Marketing/ Groups of farmers	There are no or group activities of farmers in this area.	The farmers have not initiated any group.	Farmers are interested in forming a cooperative. There is a market yard at chaki ka more.

(2) Agricultural supporting services

Available agricultural supporting services in the Chamo site are summarized as follows:

i) Farmers training camps focusing on crop diversification are held aiming at provision of information to motivate the farmers on advanced cultivation technology and to guide the advantages of converting from traditional farming to diversified farming and integrated farming including animal husbandry

ii) Inputs including vegetable seeds, pesticides and farm machinery are distributed to the farmers through the departmental outlet/sale centers. Subsidy is provided to the farmers based on the schemes such as Macro-management of agriculture, Scheduled Caste / Scheduled Tribes (SC/ST), Backward Area Sub-Plan (BASP), and so on;

iii) Soil samples taken from different areas are brought and sent to soil testing laboratory;

iv) Farm trials are conducted to test soils, seeds and fertilizer quality.

L-7.9 Vegetable Promotion and Agricultural Support Plan

(1) Basic Considerations

Vegetable promotion and agricultural support for the Chamo site is planned as follows:

i) In Chamo Area, about 80 ha is left as current fallow area, of which a part can be can be converted for vegetable production with irrigation facilities.

ii) By the implementation of irrigation project, full irrigation will be available for 15 ha area, and life-saving irrigation will be available for 56 ha area in kharif season. Using this irrigation, the area under strategic (peas, and cauliflower), and multiple (capsicum and ginger) vegetables shall be increased.

iii) Since the farmers are already cultivating vegetables and are interested to cultivate exotic vegetables, it is planned to introduce exotic vegetables in 3 ha area. For this purpose, the farmers group need to be strengthened and suitable linkage between the producers and the market (hotel chains etc.) need to be established.

iv) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days targeting the farmers of Chamo site.

v) In consideration of quality improvement, varietal improvement trials are also needed.

vi) Introduction of post-harvest technology, especially sorting, grading and packing is needed for apples and vegetables.

vii) Protective cultivation is already started in the area by advanced farmers and demonstration trials for protective cultivation shall be conducted in this area.

Based on the above considerations the proposed cropping pattern and the cropping calendar is planned as shown below.

Table L-7.9.1 Proposed Cropping Pattern of Chamo Site

Crops		Kharif season (ha)			Rabi season (ha)		
		Rainfed	Full-Irrig.	Life save irrig.	Rainfed	Full-Irrig	Life save irrig.
Food Grains	Maize	62					
	Wheat				117		
Sub-total (food grains)		62			117		
Vegetables	Tomato		5	28			
	Capsicum		5	28			
	Ginger		5				
	Cauliflower	29			30	6	
	Peas					6	
	Broccoli					3	
Sub-total (vegetables)			15	56		15	
Sub-total (Food grains + Vegetables)		91	15	56	147	15	
Cropped Area							324
Cultivated Area							162
Current Fallow Area							0
Cropping Intensity							200%

Source : JICA Study Team

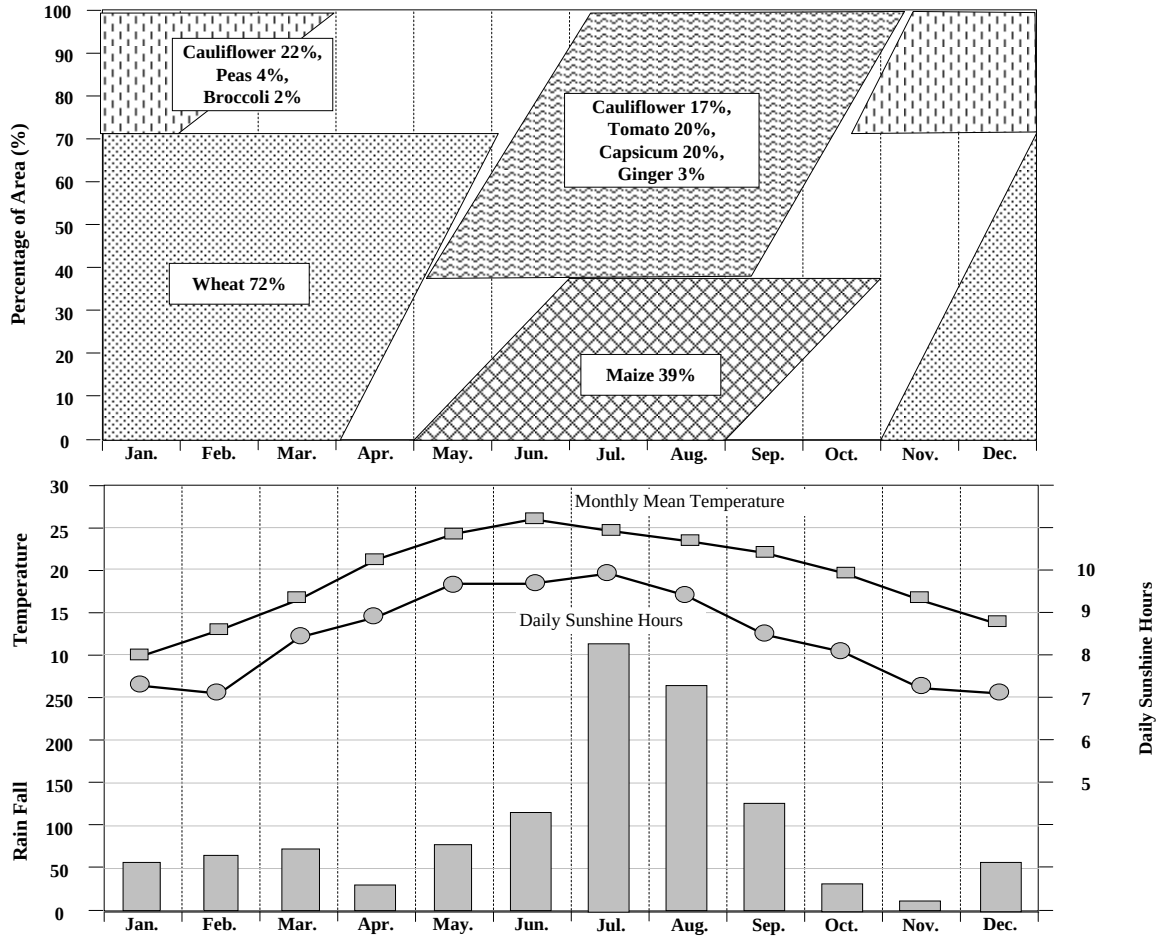


Fig. L-7.9.1 Proposed Cropping Calendar of Chamo Site

(2) Cropping Plan of Chamo Site

Food Grains:

i) In Chamo area, there is a current fallow area of 80 ha, and by using a part of this area, the food grains area can be maintained at the same level of 50 ha.

ii) During kharif season, maize is proposed to be cultivated in 50 ha area, and wheat is proposed to be cultivated in the same 50 ha area during rabi season.

Vegetables:

i) With the availability of full irrigation system in 15 ha, the vegetables are planned to be grown in 15 ha area in kharif and rabi seasons.

ii) The selection of vegetables is made in consideration of existing farming conditions, intention of the farmers, and the current market conditions.

iii) During kharif season, strategic vegetable tomato is proposed in 5ha area, and popular vegetables capsicum and ginger are proposed in 5 ha area respectively under full-irrigation.

iv) By using life-saving irrigation in kharif season, tomato and capsicum are proposed in 28 ha area respectively.

During rabi season, the strategic vegetables cauliflower, and peas are proposed in 6 area each, and exotic vegetable is proposed in 3ha area, which can be sold at the Solan market.

(3) Proposed Farmers Support Program Activities

1) Vegetable Promotion

i) Introduction of cropping patterns suitable for markets

ii) Promotion of strategic vegetables tomato, potato, cauliflower and peas.

iii) Introduction and promotion of exotic vegetables

iv) Promotion of organic farming

v) Organizing or strengthening of farmers group for the marketing purpose and water users association effective use of irrigation facilities

vi) Extension of protective cultivation (greenhouse)

vii) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

viii) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases

ix) Promotion of farming practices to reduce soil erosion

x) Introduction of contract farming.

2) Food Grain Crop Productivity Improvement

i) Promotion of diversified cropping patterns suitable for productivity increase of food grain crops

ii) Promotion of optimum quantities of farm inputs such as seeds and fertilizers

iii) Promotion of organic farming

iv) Organizing or strengthening of farmers' groups (marketing group)

v) Introduction of farm mechanization through identification of suitable machinery and equipment for hilly area.

vi) Promotion of optimum use of pesticides under Integrated Pest Management (IPM) and biological control of pests and diseases.

vii) Promotion of farming practices to reduce soil erosion

3) Integrated Farm Management

i) Promotion of fodder production and reuse of vegetable residues under integrated farming in crop diversification

L-7.10 Post Harvest Processing and Marketing Plan

(1) Post Harvest Processing Plan

Based on the Post Harvest Processing Promotion Plan, following activities are proposed.

i) Introduction or promotion of post-harvest activities, such as grading, sorting and packing etc., in accordance with the quality standard. Quality standard and post-harvest technologies should be disseminated by extension trainers by holding of the extension camps.

ii) Introduction or promotion of small scale agro-processing activities. Agro-processing technologies should be disseminated by extension trainers by holding of the extension camps.

(2) Marketing Plan

Following points should be considered for promotion of aggressive marketing activities;

i) Farmers in Chamo area have sufficient experience for vegetable cultivation. However, they do not have any experience on group marketing. It is expected that they try to strengthen their ability for selling their produces by group, in order to improve quality of their vegetable produces, and strengthen their bargaining power.

ii) Promotion of vital and characteristic agriculture as well as crop diversification

iii) Formation of farmers' group (cooperative) for marketing of vegetable produces

iv) Strengthening geographical advantage (promotion of suburban agriculture)

v) Carving out niche vegetables in vegetable consuming market

vi) Promotion of transaction of organic products and exotic products in local markets

vii) Promotion of program component on marketing system improvement

L-7.11 Infrastructure Development Plan

Infrastructure development plan was originally discussed by the farmers' participatory approach through preparation of resource map, based on which topographic survey and preliminary design were executed including various alternative studies to compare technical and economical feasibility.

(1) Irrigation Design and Facility Plan

Due to the high pumping head, most of the plans are not economically feasible. In case that lift irrigation will not be feasible, communal tank irrigation utilizing small stream or springs is proposed.

(2) Access Farm Road System Design and Facility Plan

There is only one Block road in Chamo area which was turn over from the Block to PWD recently which situates along the contour line of the average height of the crop field of the Chamo area. Two new roads are proposed by the Panchayat.

- R-1: A new road is proposed to connect vegetable area of Oyel, Botol and Kurlajori. The alignment of the road with a length of 3.9 km (longest in the all roads in the 6 model area) is determined by the survey and participation of the beneficiaries, which is in line with the existing footpath, contour and boundary of protected forest. Construction cost includes for pavement of existing Block road with a length of 1.1 km at the entrance and 200m of

footpath at the end of the new road. Cut and fill earth work method and terrace field for spoil bank are applied. Drainage system in cluding a small bridge, parapet, etc. are included.

- R-2: A new road is proposed to connect crop field in the lower part of Chamo, Chauncha and Byala villages by the Panchayat before the resource mapping in order to reduce the manual transportation distance of 2 km with steep ascent. This farm road is a sample of such road observed some hilly areas which require slope protection, river bank protection, concrete parapet at the valley side. Retaining walls for cut and fill method and terrace field spoil bank, 2 small bridges, etc. are included.

(3) Salient Features of the Proposed Infrastructure Development Plan

Salient features of the proposed infrastructure development plan both for irrigation and access farm road are summarized in Table. L-7.11.1 and their location is shown in Fig. L-7.11.1

Table L-7.11.1 Salient Features of Infrastructure Development Plan

Proposed works / location	No.	Description
1. Irrigation		
1) Construction of new Lift irrigation		
- Karol	I-3	CCA = 15 ha, H = 100 m, BHP = 65 HP
2) Tank irrigation		
- Provision of Field Tanks		60 field tanks approx. in total
2. Access Farm Road		
1) Construction of new access farm road		
- Kurla to Oyal	R-1	B.A = 20 ha, L = 3,900 m, W = 3.0 m, WBM
- Hanuman mandir near kaushalya river to Vayla	R-2	B.A = 20 ha, L = 2,398 m, W = 3.0 m, WBM, CC
2) Improvement of existing footpath		
- Kurla to Oyal	Rf-1	B.A = 5 ha, L = 200 m, W = 1.0 m, CC

CCA : Culturable Command Area H : Pump rising head, BHP : Break horsepower
B.A : Beneficiary area L : Length W : Width,
Pavement ; WBM : Water bound macadam PMC : pre-mix bituminous carpet CC : Cement concrete

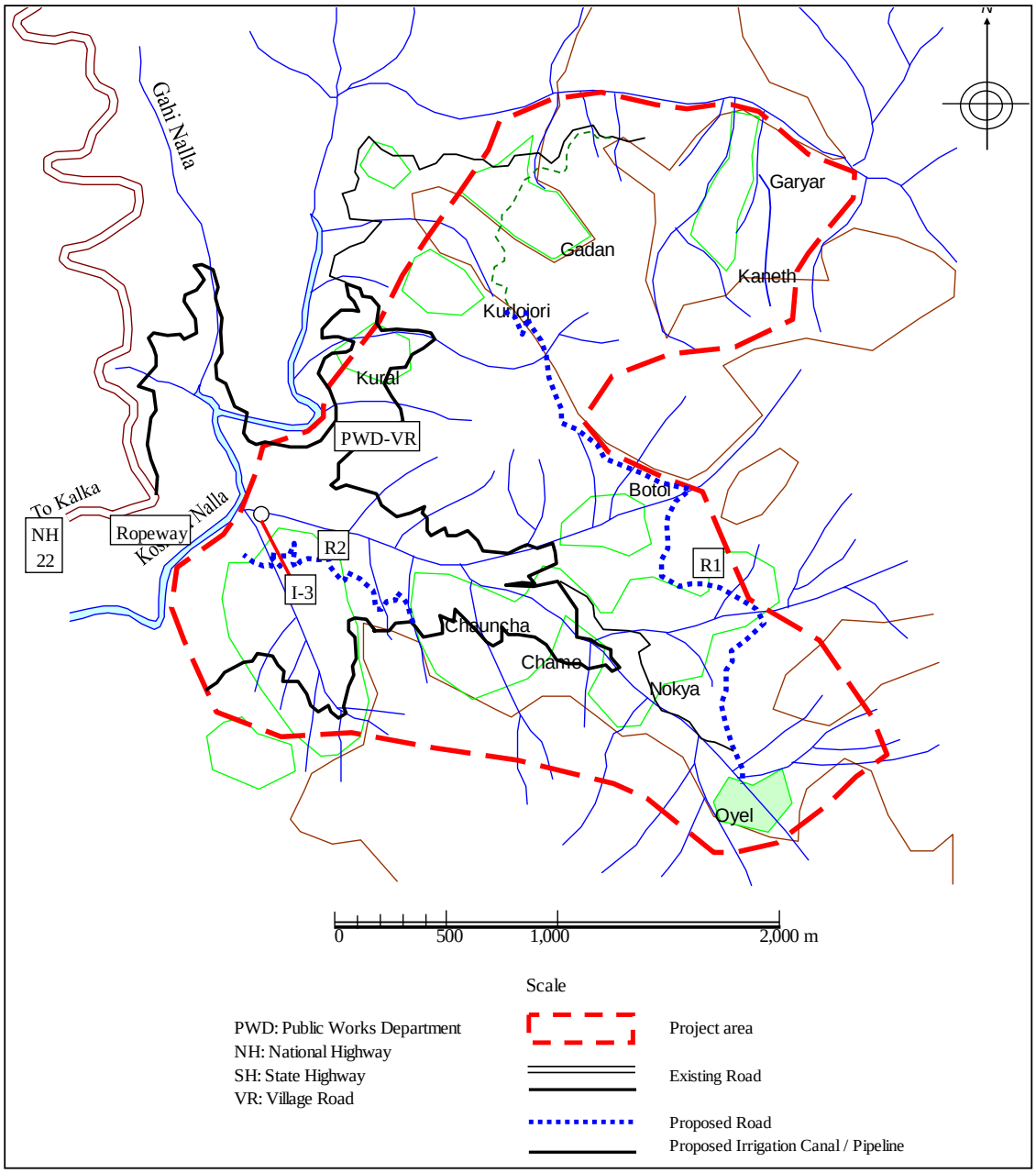


Fig. L-7.11.1 Location Map of Infrastructure Development Plan

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Chamo site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor irrigation, supplementary irrigation and access farm roads. The development of the access farm roads will contribute not only to promotion of crop diversification but also to social purpose especially to the connectivity to the remote habitats. Therefore, a part of the estimated cost of the access farm road is allocated to the other purposed based on the individual condition referring to the topography and the covered area. Meanwhile, the cost of irrigation facilities is allocated to only the project area for crop diversification. The results of cost estimated and its allocation is summarized as below.

Table L-7.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development

Item		Amount (Rs.)	Cost Allocation	
			Individual	Weighted
1) Irrigation				
- Construction of Lift Irrigation, I-3	15 ha	3,572,000	(100%)	
- Water Harvesting Facilities		1,860,000	(100%)	
Sub-total		**5,432,000**		**(100%)**
2) Access farm road				
- Construction of New Road, R1	3,900 m	10,769,000	(50%)	
- Construction of New Foothpath, R1	200 m			
- Construction of New Road, R2	2,389 m	10,938,000	(20%)	
Sub-total		**21,707,000**		**(35%)**
Total		**27,139,000**		**(48%)**

L-8 Initial Environment Examination of Sample Study at Pre-F/S Level

L-8.1 General

The objectives of the Initial Environment Examination (IEE) are to identify potential negative environmental impacts caused by implementation of proposed activities of the Study and to suggest mitigation measures and monitoring methods in order to avoid and/or mitigate the negative impacts as much as possible.

Based on the screening results of the program components of the Master Plan explained in ANNEX-K, IEEs have been conducted for selected program components which need to be examined. The potential impacts are examined based on the activities of the proposed activities of the Study. In addition, the mitigation measures and monitoring methods are preliminarily proposed.

L-8.2 Environment of Lalri Site

L-8.2.1 Project and Site Description of Lalri Site

(1) Site Description

Lalri is located at a distance of 2.5 km in the south-eastern direction from Hamirpur District's headquarter, and its topography consists of plain with partly adulating area It is surrounded by Hathli Khad River and its tributaries are in eastern, southern and western boundaries whereas the national highway NH-88 lies in northern boundary except small outland. Lalri, unlike the other site is not a Panchayat but a part of Ward No.11 of Hamirpur Town and comes under the Municipal Authority.

(2) Project Description

Table L-8.2.1 Description of Lalri Site

Proposed Components;	I Infrastructure Components Rehabilitation of a check dam -construction of a pump house, water storage tank (approx 10m x 10m), raising main pipeline (approx 700 m) between pump & tank, water distribution for (approx. 70 ha) , Improvement of an existing farm road (approx 800 m) by widening (50cm) New construction of one collection centre (approx. 100 m2 x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement Use of fallow area for food grains and conversion of a part of food grains area to vegetables production with the improvement of irrigation system
Location/Total Area;	Lalri, Hamirpur Block, Hamirpur District; 90 ha
Characteristics;	Social: Farmers live on food grain cultivation under rain-fed condition. No irrigation system is available at present. Farmer's organization has been set up but is not active. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, Marketing Board
Category in the Study	Block Category – III type farming

L-8.2.2 Social Environment of Lalri Site

(1) Population and Community

Population of the Project Area: The Total Population of Ward No. 11 of which Lalri is a part is given below:

Table L-8.2.2 Village wise Population Details of Ward No. 11

Village	House Hold	Total Population			Non SC Population			OBC/SC Population		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Lalri	462	1,229	917	2,146	1,017	770	1,787	212	147	359

Source: - Municipal Committee Record Lalri , District Hamirpur
Note: Non SC: Non-Schedule Caste OBC: Other Backward Caste SC: Schedule Caste

The above statistics include more area than village Lalri. In the village Lalri there are between 90-95 households of which 12 belong to Other Backward Classes. There is no SC household within the village boundaries. The OBCs are mostly landless or are marginal landholders. They are engaged in other petty businesses. The Backward classes comprise of Nai (Barber), Jhiwar castes.

Ethnic Group and Religion**:** There is no tribal community in the site. The population of Lalri is predominantly Hindus.

Gender Issues: Total women population is 917. Literacy rate among women are 39.3 %. Like in the other parts of the State, 70-80% of the agricultural labor is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labor input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are several active women's groups in the site. There are 3 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. There is a Mahila Mandal initiated by the Dept of Rural Development. The women's groups have not received any training in income generating activities but are keen on taking up some agro-based income generating activities.

Education: The total literacy rate of the village is 76.24%, Primary and Secondary schools are located in Hamirpur District, which is 2.5 km away from the village. The nearest college is Government Degree College, Hamirpur.

Local Community: This village is a part of Municipal Corporation and has one representative called as Ward member. This is an open seat.

Local conflict: There is no major conflict going on in the area.

(2) Public Facility and Services

Water Usage for Domestic Use: Currently there is 1 lift water supply scheme that meets the drinking water needs of Lalri Panchayat. It is considered covering the area completely. The details of the IPH scheme are given in the following Table:

Table L-8.2.3 IPH Water Supply Scheme for Lalri

Village	Scheme	Source	Quantity
Lalri	LWSS	Hathli Khadd	15 litres/sec

Source: IPH Sub-Divisional Office, Hamirpur
Note: LWSS: Lift Water Supply Scheme

Electricity: The project site is 100% electrified.

Health and Medical Services: The nearest Primary Health Centre, Sub-centre and Hospital are in Hamirpur town, which is 5 km away from the main village. Under the Integrated Child Development Schemes there are 2 Aanganwari Centers that look after the primary health care of infants and pregnant and nursing mothers. The site is not known for any specific form of health problems.

(3) Local Economy

The local economy is typically multi-occupational -agriculture, animal husbandry, wage labor and salaried jobs. Since there is no irrigation facility, only food grain crops are cultivated under rain-fed condition. Some vegetables such as, peas, coriander, cabbage, cauliflower, okra, cucumber, bitter/bottle gourds, colocasia, spinach etc. are grown mostly in kitchen garden. One farmer however has been successful in commercial cultivation of vegetable through his private lift irrigation facility.

Family labor (both male and female) are involved in all the agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. In addition to family laborer and labor from the village, some farmers employ seasonal laborers from other states such as Uttar Pradesh and Bihar.

The current livestock population in Lalri site is 55 crossbred cattle, 17 indigenous cattle, 92 buffaloes and 1 sheep without goat and others. The village is near to the urban limits, there is demand for milk and every house hold has at least one buffalo to support the household income.

L-8.2.3 Natural Environment of Lalri Site

(1) Natural and Climatic Condition

The details on the natural and climatic condition are given below.

Table L-8.2.4 Natural and Climatic Condition in Lalri Site

Agro-ecological zone	Zone-1
Annual rainfall (mm)	1,359
Average Temperature (◦C)	22.5
Average Max.Temperature (◦C)	36.8
Average Min. Temperature (◦C)	10.9

(2) Forest and Wild Life

No forests were found at the project site.

(3) Fish and Habitants

Currently there are no fishing activities in the area. There is only one check dam on the tributary of the Hathli Khadd River constructed by DOA soil and water conservation program. The Study team has identified potential for utilization of check dams for sustainable fish production in Hamirpur district, including the Lalri area. If this is promoted, it will be done so through the concept on check dam fish culture for integrating agriculture and aqua culture.

L-8.2.4 Water Quality Survey Results

JICA Study Team carried out the water quality survey of proposed irrigation intake water in Lalri site. The result is shown following table. As the result, the water quality was satisfactory for irrigation purpose water.

Table L-8.2.5 Water Quality Survey Result in Lalri Site

S.No	Description	Sample No.1	Sample No.2	Standard Range	Unit
1	pH	7.7	7.0	7.0-8.20	-
2	Dissolved Oxygen	6.5	6.0	6.00-10.0	mg / litter
3	Water Temperature	24.3°C	24.0°C	15-38°C	Deg C
4	Turbidity	130	240	100-700	mg / litter
5	Conductivity	0.394	0.427	0.300-0.998	S/m

L8.2.5 Initial Environmental Examination of Lalri Site

(1) Impact Matrix

Table L-8.2.6 Initial Environmental Examination Impact Matrix in Lalri Site

Activity / Potential Impact		Lalri Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	*	*	*	No land securement in Lalri Site. New collection center will be constructed on community land.
4	Social institutions	*	*	++/B	Formation and strengthening of farmers' group is proposed.
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers. The proposed irrigation activities will also benefit the Other Backward Class families by enabling them to take up small scale vegetable cultivation on their marginal landholding
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritage sites here.
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	*	*	*	The proposed site for check dam has no down stream intake and has sufficient water. The local IPHD has also expressed its approval for the site.
11	Sanitation	*	--/C	*	Construction worker will enter in the construction site during the time.
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction worker will enter in the construction site during the time.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	

15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Flora, Fauna and Biodiversity	*	*	*	No forests and rare species were found at the project site.
18	Meteorology	*	*	*	
19	Landscape	*	*	*	
20	Global Warming	*	*	*	
Pollution					
21	Air Pollution	*	*	*	
22	Water Pollution	*	*	*	
23	Soil Contamination	*	*	*	
24	Waste	*	*	*	
25	Noise and Vibration	*	*	*	
26	Ground Subsidence	*	*	*	
27	Offensive Odor	*	*	*	
28	Bottom sediment	*	*	*	
29	Accidents	*	--/C	*	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
*Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, *: No impact or no corresponding impact*

(2) Major Possible Impact and Direction for Mitigation Measures

Table L-8.2.7 Major Possible Impact and Direction for Mitigation Measures in Lalri Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures / Monitoring method	Action time for Avoidance / mitigation
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (mitigation)
29. Accidents	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles ➢ Periodic caution to workers on disciplines for safety operation.	Construction (mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. No forest land is required for construction and no new land development is proposed.

L-8.3 Environment of Malan Site

L-8.3.1 Project and Site Description of Malan Site

(1) Site Description

Malan site is located at a distance of 15 km in the south-eastern direction from Dharamshala, District's headquarter, and its topography consists of plain and rolling area. Jogal Khad River and a main irrigation canal across a middle part of the site exist from the north to the south. National Highway NH20 passes along the southern edge of the Site. The site is about 20 km from the Site to Kangra town of the major town in the District, and 468 km to Delhi via. Kangra. There is only one sub market at Nagrota Bagwan town around the site.

(2) Project Description

Table L-8.3.1 Project Description of Malan Site

Proposed Components;	Infrastructure Components Rehabilitation/improvement works of existing irrigation system such as intake facility and concrete lining of canals. Construction of 2 new access farm roads (approx. 500m and 600m, respectively) Improvement of 1 existing farm road (approx. 600m) by widening of 50 cm both sides Improvement of 1 existing footpath (approx. 600m) Construction of one collection centre (centre house: approx 100m2 x 1 no and storage: approx 100m2x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement Conversion of a part of food grains area to vegetables
Location/Total Area;	Panchayat Malan, Nagrota Bagwan Block, Kangra District; 600 ha
Characteristics;	Social: Farmers live on food grain and potato cultivation under irrigation condition. One farmer's organization has been set up. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, Marketing Board
Category in the Study	Block Category – II type farming

L-8.3.2 Social Environment of Malan Site

(1) Population and Community

Malan Panchayat includes 6 revenue villages. The Panchayats comprises of 689 households. Total population of the area is 3,586. Village-wise distribution of population is as follows:

Table L-8.3.2 Population Distribution of Malan Panchayat

Village	Population	Total SC Population	% of SC	Total ST Population	% of ST	Total OBC Population	% of OBC
Malan	910	164	18	-	-	746	81.9
Pankher	367	79	21.5	-	-	122	33.2
Manjethli Uparli	1,346	284	21	105	7.8	774	57.5
Manjethli Bhulli	326	73	22.3	-	-	240	73.6
Bamneher	278	05	1.7	-	-	273	98.0
Total	3,227	605	18.7	105	3.3	2,155	66.8

Source; Panchayat Record Malan Panchayat,
Note: SC - Schedule Castes, ST - Schedule Tribe, OBC - Other Backward Classes

The population in the area is comprised of 3.3 % Schedule Tribal, 18.7 % Schedule Castes, 66.8% Other Backward Castes and 11.2 % upper caste communities. The predominant communities among Scheduked Castes are Lohaar (Iron Smith). The other two caste include Mochi (Cobbler) and Harijan. The Other Backward Class includes Julahas (weaver). Scheduled Castes and Other Backward Classes

are among the most marginal farming households.

Ethnic Group and Religion: There are 6.94% tribal communities found in this project site. They mainly belong to Gaddis and Gujjars Tribes and are pastoral communities. The population is entirely Hindu. There are seasonal migrant agricultural laborer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: The total population of women is 1,770. Like every other part of Himachal, the women of this area are as hardworking, contributing 70-80% of the agricultural labor, this in addition to the majority of the responsibility they take for livestock and cattle management and household.

There are 14 SHGs in the area formed under the Integrated Child Development (Department of Social Justice and Welfare). 8 of these groups are linked to the Bank and have taken loans. The groups use these loans for agricultural inputs and household events. They also do inter-loaning among members. There are also 5 Mahila Mandals, groups formed by the Department of Rural Development. They have received some training on certain activities but no enterprise has been developed yet. The women however have shown interest in taking up the following activities-mushroom cultivation, vegetable nursery raising and dairy development. The Department of Agriculture in Malan is keen on setting up a women's potato group in this area. They feel that these enable better extension service outreach among women.

Education: The total literacy of Malan Panchayat is 48.8 %. Total male literacy is 75.2%. Total female literacy is 60.3%.

Within the Panchayat area there are 7 primary schools and 2 middle schools. The nearest college is Government Degree College, is in Haripur.

Local Community: Malan Panchayat has 9 election wards. Their Gram Panchayat, their local unit of governance consists of 10 elected members of which 3 are three women. They have one SC woman reserved seat.

Malan is very famous for patoto cultivation and there is a very active farmer's interest group called the potato group. This was formed by the Dept of Agriculture in 2000 and consists of 25 members. They serve as the focus group for the Department to impart extension related trainings and information. The group also adopts a group approach to marketing. There are two local marketing agents in the group. They are responsible for marketing the potato crop of the group as well as sell almost 40% of the total local potato produce. The agents provide the sellers with market price and information. They also give financial loans to local farmers for agricultural inputs.

Local conflict: There are no major local conflicts ongoing in the area.

(2) Public Facility and Services

Water Usage for Domestic Use : Currently there is one Gravity water Supply Schemes that meet the dinking water needs of Malan Panchayat.

Table L-8.3.3 IPH Water Supply Scheme for Malan Panchayat

Village	Scheme	Source	Quantity
Gujrehra, Malan, Pankher, manjethli Uparli, Manjethli Bhulli, Bamnehr	GWSS	Jogal Khad.	5.29 litter/sec

Source: IPH Sub-Divisional Office, Nagrotta Baguwa
Note GWSS: Gravity Water Supply Scheme, LWSS: Lift Water Supply Scheme

Electricity: The Panchayat is 100% electrified.

Health and Medical Services: The nearest Primary Health Centre is at Malan. The nearest hospital is in Nagrota. Under the integrated Child Development Schemes there are 9 Anganwadi Centres that look after the Primary health care and pregnant and nursing mothers. The Panchayat is not known for any specific form of health problems.

(3) Local Economy

In Malan site the, because of availability of irrigation they are able to grow both food crops and vegetables. Maize and paddy are their main Kharif crop and during potato occupies half of the cropped area. Crop is a good commercial crop for them as there are some big private buyers who then sell it further. The Potato group also acts as a private marketing agent for the local people.

Apart from potato other vegetables including ginger, egg plant, okra, beans, cucumber, onion, garlic, cabbage and cauliflower are cultivated in a relatively small area.

Family labours (both male and female) are involved in all the agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. Simultaneously, they also hire casual labour for operations including land preparation, weeding, harvesting, threshing and cleaning. In regard to vegetables, all the operations including land preparation, weeding, and harvesting are done by both family labour and casual labour. The male casual labour is mostly responsible for marketing. the harvesting operations.

Malan Panchayat has a relatively better farm machinery status with about 10 tractors, 2 power tillers and 10 harvesters. Besides, 90% of the farm household have sprayers and also have locally made puddlers.

The current livestock population of Malan site is 362 crossbred cattle, 371 indigenous cattle, 180 buffaloes, 131 sheep, 123 goat and 29 horses among others. While most of the cross bred are female and used for milk indigenous cattle are males used for agricultural operations. The site also has a good number of graded buffaloes reared for milk.

L-8.3.3 Natural Environement of Malan Site

(1) Natural and Climatic Condition

Table L-8.3.4 Natural and Climatic Condition in Malan Site

Agro-ecological zone	Zone-2
Annual rainfall (mm)	1,481
Average Temperature (Deg C)	19.8
Average Max.Temperature (Deg C)	32.1
Average Min. Temperature (Deg C)	4.4

(2) Forest and Wild Life

The total forest area of Malan Panchayat is 64 ha. These are mainly protected Deodar, Chil and Kail forests. They don’t have much forest area within the Panchayat site. The main types of wildlife found in these forests are brown bear, leopard and wild boar.

(3) Fish and Habitants

There are 30-40 farmers who are undertaking fishing licensed commercial carp fishing on Jogal Khad. As confirmed by the local fisheries Department, since the proposed irrigation activity is more in the

nature of renovation and does not obstruct the waterway it will not affect their fishing activities.

L-8.3.4 Initial Environmental Examination of Malan Site

(1) Impact Matrix

Table L-8.3.5 Initial Environmental Examination Impact Matrix in Malan Site

Activity / Potential Impact		Malan Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	--/C	*	*	Land for new farm road will be secured with consensus of the individuals and the farmer's organization New collection center will be constructed on community land.
4	Social institutions	*	*	*	
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers. 90% of Malan are marginal farmers. Efforts will be made to ensure that the Scheduled Caste among the marginal farmers are also included as beneficiaries.
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritages in this site
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	*	*	*	Existing irrigation system and water supply scheme will not be affected by the proposed irrigation activity.
11	Sanitation	*	--/C	*	Construction workers will enter the site
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction workers will enter the site
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Flora, Fauna and Biodiversity	*	*	*	No forest area activity is envisaged and no rare species were found at the project site.
18	Meteorology	*	*	*	
19	Landscape	*	*	*	
20	Global Warming	*	*	*	
Pollution					
21	Air Pollution	*	*	*	
22	Water Pollution	*	*	*	
23	Soil Contamination	*	*	*	

24	Waste	✻	✻	✻	
25	Noise and Vibration	✻	✻	✻	
26	Ground Subsidence	✻	✻	✻	
27	Offensive Odor	✻	✻	✻	
28	Bottom sediment	✻	✻	✻	
29	Accidents	✻	--/C	✻	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, ✻: No impact or no corresponding impact

(2) Major Possible Impact and Direction for Mitigation Measures

Table L-8.3.6 Major Possible Impact and Direction for Mitigation Measures in Malan Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures / Monitoring method	Action time for Avoidance / mitigation
3. Land use and utilization of local resources	Designing	C	Land securement for new farm road will be needed	➢ Farmer's meetings to discuss the site and obtain consensus with the land owners	Designing (Mitigation)
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (Mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (Mitigation)
29. Accident	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles. ➢ Periodic caution to workers on disciplines for safety operation.	Construction (Mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. No forest land is required for construction, nor is new land development proposed. Certain social impacts of conflicts of interests and misdistribution will be addressed at the time of designing by adopting participatory mechanisms.

L-8.4 Environment of Hallan-I Site

L-8.4.1 Project and Site Description of Hallan-I Site

(1) Site Description

Hallan-1 site is located at a distance of about 20 km from the Site to Kullu town of the District capital, and 541 km to Delhi via. Kullu. The topography consists of plain, rolling area, mountainous area and steep area extending over high terrace on left bank terrace of the Beas River. There is one national highway (NH21) along the right bank of the Beas River, a major district road (MDR29) along the left

bank of the river. District road, MDR29 passes in the Site almost in parallel with the Beas River.

(2) Project Description

Table L-8.4.1 Project Description of Hallan-I Site

Proposed Components;	Infrastructure Components Improvement of existing canals (approx 3 km), Extension of a branch canal in existing water distribution system, Construction of one new intake and new water distribution system (pipeline), Provision of field tanks (approx. 20 sites) Construction of a new farm road (approx. 400m and improvement of 2 existing footpath (approx. 400m and 300m respectively) New construction of one collection centre (approx. 100 m2 x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement The area under vegetables will be increased by using current fallow areas. Fodder areas under fruit trees will be increased.
Location/Total Area;	Hallan-1, Naggar Block, Kullu District; 773 ha
Characteristics;	Social: Farmers live on food grain and fruit cultivation at present. Two farmer's organizations have been set up. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, Marketing Board, Irrigation & Public Health Department
Category in the Study	Block Category – I type farming

L-8.4.2 Social Environment of Hallan-I Site

(1) Population and Community

Population in the Site: The Panchayats comprises of 640 households. The total population of the site is 4,074. The distribution of population in the 12 revenue villages is given below.

Table L-8.4.2 Village wise Population Details of Hallan Panchayat

Village	Population	Total SC Population	% of SC	Total ST Population	% of ST
Chragan	220	140	62.7	-	0
Baltha	365	-	0	-	0
Raman	346	12	3.46	-	0
Badhai R.G	320	-	0	-	0
Bhosh	370	111	30	-	0
Bhadka	138	18	13	20	14.4
Chakki	474	53	11	24	5.0
Kumarhtii	296	103	34.7	-	-
Dashal	454	76	16.7	41	9.0
Balahar	416	142	34.1	06	1.4
Sarsai	398	122	30.6	53	13.3
Ranghair	277	104	37.5	15	5.4
Total	4,074	881	21.6	159	3.9

Source – Panchayat Record Hallan-I Panchayat
Note: SC - Schedule Castes, ST - Schedule Tribe, OBC - Other Backward Classes

The population in the area is comprised of 3.9% STs, 21.6% SCs and 74.5% upper caste communities. The predominant community among SCs is Lohaar (Iron Smith). They are mainly agriculturists. The other two castes include Koli and Harijan. SCs are among the most marginal farming household in the area.

Ethnic Group and Religion: 3% of Tribals are found at the Project site, they are mainly Buddhist. The population is entirely Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 2037. Like in the other parts of the Sate, 70-80% of the agricultural labor is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labor input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are 5 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. There are 7 Mahila Mandal initiated by the Dept of Rural Development. All 7 groups have formed SHGs. Most of the groups have not received any training in income-generating activities. The women's groups have shown interest in taking up the following activities- dairy development, food processing (apple jelly and jam making) and weaving. The local DOA has suggested the formation of women Farmers Interest Groups under the Project. These groups will be valuable both for promoting extension work and promoting any project related activity.

Education: The total literacy of Halan I Panchayat is 66.5 %. Total male literacy is 76.9%. Total female literacy is 55.6%.

Within Panchayat area there are 6 Primary and 1 Secondary school. The nearest college, Government Degree College, is in Kullu.

Local Community: The local governance unit, the Gram Panchayat of Hallan comprises of 9 wards with 10 elective representatives. 3 seats are reserved in Panchayat, two for SC woman and one for SC male.

A Farmers Development Group (KVS) has been formed and are undertaking irrigation project through a grant from the Soil Conservation Wing of the Department of Agriculture. The agricultural cooperatives societies in the area handle only the Public Distribution System for Government Ration. Village Dashal has a local NGO called Jan Jagran Avam Vikas Sanstha (Organisation for Peoples Awareness and Development).

Local conflict: There are no major conflicts ongoing in the area.

(2) Public Facility and Services

Water Usage for Domestic Use: Currently two are water Supply Schemes that meet the dinking water needs of Hallan Panchayat. The following are the intake from Chakki Nallah for irrigation and drinking water for Hallan-I and downstream as well.

Table L-8.4.3 IPH Water Supply Scheme for Hallan Panchayat

Village	Scheme	Source	Quantity
Charang, Kumarhatti, Raman, Balthan, Badai Rakran	GWSS	Spring	999 LPD
Bosh, Dasal, Chakki, Rangri, Batar, ,	GWSS	Chakki ka Nallah	566 LPD

Source: IPH Sub-Divisional Office, Patlikull
Note GWSS: Gravity Water Supply Scheme, LWSS: Lift Water Supply Scheme

Table L-8.4.4 IPH Irrigation scheme on Chakki Nallah, Hallan-I Panchayat

Village	Scheme	Source	CCA (Hect)
Hallan	FIS Bhaknoj	Nalah	197.99
Naggar	FIS Chaklari Hallan	Nallah	62.11

Source: IPH Sub-Divisional Office, Patlikull

Electricity: The Panchayat is 100% electrified.

Health and Medical Services: The nearest Primary Health Centre is at Sarsai. The nearest hospital is in Naggar. Under the integrated Child Development Schemes there are 9 Anganwadi Centres that look after the Primary health care and pregnant and nursing mothers. The Panchayat is not known for any specific form of health problems.

(3) Local Economy

Major economic activities of this area are agriculture and horticulture. Farming was the major occupation of 95.86% responding marginal farmers, 98.02% responding small farmers and 100 per cent of the sampled marginal farmers.

Fruit cultivation (mainly apple) is carried out for commercial purpose in about 65% of the cultivated area, and food grains are cultivated only for self-consumption. Many fruit cultivating farmers also purchase their food grains. Vegetables are also cultivated in a relatively smaller area for commercial purpose. Vegetables such as potato, tomato, beans, garlic, cabbage, cauliflower, radish, okra, chilies and egg plant are cultivated mainly under irrigated condition. Patlikhal Sub-Market Yard is located nearby the site.

The farm machinery status in Hallan - I site is extremely low with only 1 sprayer in each household. Farmers usually hire harvesters/threshers.

Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. In addition, some farmers employ seasonal laborers from outside such as Bihar State and Nepal. Agricultural labor was found to be the subsidiary occupation of nearly 46.24 per cent of sampled marginal farmers, 53.47 per cent of the small farmers and 83.33 per cent of the sampled medium farmer.

The current livestock population in Hallan-1 site is 75 crossbred cattle, 483 indigenous cattle, 206 buffaloes, 7 sheep, 127 goat, and 6 horses and others. Hallan-I has more focus on crossbred dairy and sheep. The general observation is that the potential of crossbred cattle can further be augmented by improving feeding situation. Animals are kept for the dual purpose of milk and animal dung. The aged animals are also kept for the production of manure.

Some families in the area receive retirement pension. Some also operate as local artisans. Weaving of traditional clothes and borders for shawl by women also adds to the family income

L-8.4.3 Natural Environment of Hallan-I Site

(1) Natural and Climatic Condition

Hailing, untimely snow and soil erosion are some of the specific problems that characterize the geo-climatic condition of this area. The climatic condition of the area is given below

Table L-8.4.5 Natural and Climatic Condition in Hallan-I Site

Agro-ecological zone	Zone-2 & 3
Annual rainfall (mm)	838
Average Temperature (Deg C)	16.7
Average Max. Temperature (Deg C)	24.6
Average Min. Temperature (Deg C)	7.7

(2) Forest and Wild Life

Although in the revenue records the total Forest area of Hallan I is 17.52, according to the Forest Department the total forest area of Hallan-I Panchayat is 234.87 ha. The forests are mainly Demarcated Protected Forests and Unprotected around 1000 hectares comprising of Class I, II and III types. It needs to be clarified that I the actual forest area is not often clear from the land records of the revenue department. There are mainly Deodar forests in this site. The main wildlife found in these forests is Bears, Pheasant, l, Tragopan, Red Jungle fowl and the state bird the Monal.

(3) Fish and Habitants

Kullu is famous for trout fishing. The biggest Trout Fishing Farm is present in Patlikuhl area, run by the Department of Fisheries. There are many private commercial trout fishing farms in the area. There 15 trout farming ongoing in Haripur Nala and 2 in Chaki Nala. There are 11 farmers in the Halan-I area who are underaking trout fishing. The proposed irrigation activity is not on the main Chacki Nalla but a tributary that meets the Nala therefore it will not interfere with the trout fishing, as trout needs flowing water.

L-8.4.4 Initial Environmental Examination of Hallan-I Site

(1) Impact Matrix

Table L-8.4.6 Initial Environmental Examination Impact Matrix in Hallan-I Site

Activity / Potential Impact		Hallan-I Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	--/C	*	*	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization The source of the water for irrigation activity may be within the forest area. New collection center will be constructed on community land.
4	Social institutions	*	*	*	
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	The project has proposed a new irrigation structure for the benefit of predominant Scheduled Caste dominated village who are very marginal and have no irrigation facilities. The main beneficiaries of all activities in this area are for mostly marginal (70%) and marginal farmers (28%).
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritage sites within this Panchayat area.
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	--/C	*	--/C	In the two proposed areas for irrigation structure the downstream will not be affected. The first site involves only

					renovation of existing facility to enhance the efficient use of water. The second site no other irrigation facilities exist further down. There is a IPH drinking water source but as confirmed by the Department, the volume intake for drinking water is small and will not be affected by new irrigation project.
11	Sanitation	*	--/C	*	Construction worker will enter in the construction site during the time.
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction worker will enter in the construction site during the time.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Flora, Fauna and Biodiversity	--/C	--/C	*	A buried pipeline will pass partly through forest area.
18	Meteorology	*	*	*	
19	Landscape	*	*	*	
20	Global Warming	*	*	*	
Pollution					
21	Air Pollution	*	*	*	
22	Water Pollution	*	*	*	
23	Soil Contamination	*	*	*	
24	Waste	*	--/C	*	Excavated earth material of new farm road construction will be generated.
25	Noise and Vibration	*	*	*	
26	Ground Subsidence	*	*	*	
27	Offensive Odor	*	*	*	
28	Bottom sediment	*	*	*	
29	Accidents	*	--/C	*	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
*Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, *: No impact or no corresponding impact*

(2) Major Possible Impact and Direction for Mitigation Measures

Table L-8.4.7 Major Possible Impact and Direction for Mitigation Measures in Hallan-I Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures/ Monitoring method	Action time for Avoid/mitigation
3. Land use and utilization of local resources	Designing	C	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization The source of the water for irrigation activity may be within the forest area.	➢ The projects will be implemented by application basis by farmers' groups Farmer's meetings to discuss the site and obtain consensus with the land owners ➢ Irrigation pipeline will be buried under ground. The necessary clearance from the concerned department has to be sought.	Designing (Mitigation)
10. Water Usage	Designing & Operation	C	Water intake from a river is registered in District office. New water intake may affect other existing intake downstream in the	➢ Confirmation of new water intake in District office in design stage ➢ Meeting to discuss and obtain consensus with the affected irrigation system under district administration in design stage	Designing & Operation (Mitigation)

			river. In this area – new intake will not affect down stream as no other irrigation or drinking water source is located here	➢ When necessary, meeting to discuss and obtain consensus in water allocation among water users in operation stage	
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (Mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (Mitigation)
17. Flora, Fauna and Biodiversity	Planning Stage (Pre-F/S)	C	A pipeline will pass partly a forest area and may affect local flora, fauna and biodiversity.	➢ Confirmation of construction possibility in District office ➢ Due procedure for forest clearance will be sought from the Forest Department ➢ When it is possible, pipeline will be buried to reduce impact to local flora, fauna and biodiversity.	Designing (Mitigation)
24. Waste	Construction	C	Excavated earth material of new farm road construction will be generated.	➢ Excavated earth material should be reduced as much as possible ➢ Dumping sites for the debris must be identified.	Construction (Mitigation)
29. Accident	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles. ➢ Periodic caution to workers on disciplines for safety operation.	Construction (Mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. No new land development is proposed. The water source and pipeline will pass partly a forest area but with appropriate clearance from the Forest Department

L-8.5 Environment of Nagwain Site

L-8.5.1 Project and Site Description of Nagwain Site

(1) Site Description

This Nagwain site is located at a distance of 35 km in the eastern direction from Mandi town of the District capital, and 487 km to Delhi via. Mandi. The topography is of plain, rolling, mountainous and steep areas. The Beas River with a total width of approx. 100 m flows from the north to the south along the site. National highways, NH21 passes along the Beas River.

(2) Project Description

Table L-8.5.1 Project Description of Nagwain Site

Proposed Components;	Infrastructure Components Rehabilitation of existing pump station Construction of one Lift irrigation system consisting of pump stations, supply pipelines (approx 3 km) and distribution channels. Provision of field tanks (approx. 60 sites) Construction of 3 new farm roads (approx. 500m, 1,600m and 900m, respectively), improvement of 8 existing earth farm roads (approx 5,500 m in total) by widening and pavement Construction of one collection centre (approx. 100 m2 x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement Use of fallow area for food grains and conversion of a part of food grains area to vegetables production with the improvement of irrigation system
Location/Total Area;	Nagwain, Mandi Sadar Block, District Mandi. 600 ha
Characteristics;	Social: Farmers live on food grain, vegetable & fruit cultivation mainly under rain-fed condition partly under irrigation. One Farmer's organization has been set up, but not yet registered. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, Marketing Board and Irrigation & Public Health Department
Category in the Study	Block Category – II type farming

L-8.5.2 Social Environment of Nagwain Site

(1) Population and Community

Population of the Project Area: Nagwain Panchayat consists of three villages- Nagwain, Shil Mashora and Palsehr. The Panchayats comprises of 758 households. The total population of the area is 4,130. The village-wise distribution of population is as follows.

Table L-8.5.2 Village-wise Population Details of Nagwain Panchayat

Village	Population	Total SC Population	% of SC*	Total ST Population	% of ST
Nagwain	2,245	1,070	47.6	175	7.7
Sheel Mashora	1,265	495	39.1	-	-
Palser	620	365	58.8	-	-
Total	**4,130**	**1,930**	**46.7**	**175**	**4.2**

Source – Panchayat Record Nagwain Panchayat
Note: SC - Schedule Castes, ST - Schedule Tribe, OBC - Other Backward Classes

The population in the area is comprised of 4.2% ST, 46.7% SC and 49.1% upper caste communities. The predominant communities among SCs are Lohaar (Iron Smith) and Harijan. They are mainly agriculturists. The other Schedule Caste includes Tarkhaan and Thai. SCs are among the most marginal farming household in the area. There are 104 Below Poverty Line of whom 70 are SC families, 31 Upper Caste and 3 STs.

Ethnic Group and Religion: 7.7% of Tribal are found at the Project site they comprise of pastoral Gujjar Muslims. The rest of the population is Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 2065. There are 25 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme and have a total membership of 393 women1. All the ICDS initiated SHGs are linked to the Bank. ICDS has also provided most of

[1]Data given by the ICDS office, Mandi.

the groups on vermin-composting, shawl and border weaving, carpet making and mushroom cultivation. There are 7 Mahila Mandal initiated by the Dept of Rural Development. All 7 groups have formed SHGs. One of the Mahila Mandal group also has taken up silkworm rearing. The local DOA has also set up a Farm Women Empowerment group. This group is valuable both for promoting extension work and promoting any project related activity. The women have shown interest in taking up vegetable nursery rearing, mushroom cultivation and dairy development as sources of income generation.

Education: The total literacy of Malan Panchayat is 63.3%. Total male literacy is 71.5%.Total female literacy is 54.7%.

Within the Panchayat area there are 6 primary schools and 1 Secondary school. The nearest college, Government Degree College, is in Kullu.

Local Community: The local governance unit, the Gram Panchayat of Nagwai Panchayat comprises of 9 wards with 10 elective representatives. 3 seats are reserved in Panchayat, two for SC women and one for SC male.

The pradhan of the Panchayat is a member of the Farmers Interest Group that has been formed over several Panchayats. They have an active Krishi Vikas Sangathan created by the IPH for the management of the irrigation facility provided by them. There are no farmer's cooperatives in this area.

Local conflict: There is no major conflict going on in the Panchayat.

(2) Public Facility and Services

Water Usage for Domestic Use: Currently there are four Gravity water Supply Schemes that meet the dinking water needs of Nagwain Panchayat. There is no downstream intake for irrigation on the Beas in this area. Besides, since Beas is a river and perennial supply, the proposed irrigation schemes will not affect the current intake of water in the area.

Table L-8.5.3 IPH Water Supply Scheme for Nagwain Panchayat

Village	Scheme	Source	Quantity
Palser	GWSS	Spring (Palser Nalah)	0.25 LPS
Sheel Mashora	GWSS	Spring (Mori Nallah)	0.11 LPS
Nagwai	GWSS	Plaser I	1.65 LPS
Nagwai	GWSS	Palser II	0.14 LPS

Source: IPH Sub-Divisional Office, Nagwain
Note GWSS: Gravity Water Supply Scheme, LWSS: Lift Water Supply Scheme

Table L-8.5.4 IPH Irrigation for Nagwain Panchayat

Village	Scheme	Source	CCA (Hect)
Nagwai	Lift Irrigation Scheme	Beas River	100

Source: IPH Sub-Divisional Office, Nagwain

Electricity: The Panchayat is 100% Electrified.

Health and Medical Services: The nearest Primary Health Centre is at Nagwain. The nearest hospital is Zonal Hospital Kullu. Under the integrated Child Development Schemes there are 9 Anganwadi Centres that look after the Primary health care and pregnant and nursing mothers. The Panchayat is not known for any specific form of health problems.

(3) Local Economy

About 89.41 % of the sampled marginal farmers have farming as their major occupation. This site is mostly rain-fed area but has irrigation potential through the improvement of existing flow and lift irrigation from Beas River. Accessibility is comparatively better except in highly elevated area. In addition, protective agriculture for high value commercial crops has already started in the site. Further, Animal Husbandry is practiced as a secondary source of income in this area.

Integrated farming including food grains, vegetables, and fruit cultivation is carried out. Food grains are cultivated in about 79% of the cultivated area, and vegetables are cultivated only in about 11% of the area where the irrigation facilities are available. Fruits are also grown in about 10% of the area in the higher elevation. Takoli Sub-Market Yard, a seasonal market yard, is located nearby the Nagwain site. Fruit processing is relatively active in the district, and small scale groups of housewives are processing in their houses in most cases. Meanwhile there are several processing plants for fruits.

All the households purchase cereal crop seeds from departmental outlet. In case of vegetable seeds, 50% of the households purchase from retail shops outside the village, and 50% purchase from the departmental outlet. Although Nagawain site are defined as a type of “high dairy production potential’ by the JICA study team, the current commercial dairy activity is not very high in this area.

The current livestock population in Nagwain site is 465 crossbred cattle, 41 indigenous cattle, 30 buffaloes, and 41 sheep without goat, horse and others.

Some of the marginal farmers were also traditional artisans. The transfer payments in the form of retirement pension were also the major source of income for 16 numbers of selected marginal farmers. The small farmers were also opting for government jobs. The agriculture labourers, unskilled labour, household chores, petty business and employment in service sector are the other subsidiary occupations in the area. In the low irrigation area, agricultural labour and unskilled wage labour is also a major source of income for the marginal farmers.

L-8.5.3 Natural Environment of Nagwain Site

(1) Natural and Climatic Condition

Nagwain Panchayat is among the last Panchayats of Mandi Sadr and is on the border of district Kullu. Much of the landscape is mountainous. Much of the land area is in the upland hilly area. Some of the land is low lying, running along the Beas. According to the ADO, Nagwain Panchayat falls in the Drought Prone Area. The rainfall is inadequate and rain water harvesting has not been very successful in this area. The area is also vulnerable to cloud bursts. Cloud bursts in the past have also caused washing away of farm lands. The Hydro-power projects on Beas have increased the frequency of cloud bursts.

The Natural and Climatic Condition of Nagwain is given below:

Table L-8.5.5 Natural and Climatic Condition in Nagwain Site

Agro-ecological zone	Zone-3
Annual rainfall (mm)	838
Average Temperature (℃)	18.5
Average Max.Temperature (℃)	32.5
Average Min. Temperature (℃)	1.8

(2) Forest and Wild Life

Although in the records of the Revenue Department total forest area of the Panchayat is 66 Hect, according to Forest Department the total forest area of Nagwain Panchayat is 131.45 Hect. These forests mainly comprises of Protected Chil Forests. The forests also have Deodars and an inferior variety Oak which are mainly unprotected forests. There are no wildlife in the area.

(3) Fish and Habitants

Fishing is done mainly for sports purposes; there are 50-60 private commercial fishermen at the Project site. They main type of fish found are Mahsher, Schizo Thorax, Git and Millser Carp. However because there is enough water in Beas the construction would not affect the fish habitat. Under a special scheme the SCs are provided with net.

L-8.5.4 Initial Environmental Examination of Nagwain Site

(1) Impact Matrix

Table L-8.5.6 Initial Environmental Examination Impact Matrix in Nagwain Site

Activity / Potential Impact		Nagwain Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	--/C	*	*	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization
4	Social institutions	*	*	*	
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers. The project will also pay particular attention to the inclusion of the Scheduled Caste community in the area.
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritage sites within the proposed area
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	--/C	*	--/C	Downstream intake might be affected. As confirmed by the District Office the volume of intake of water by the proposed irrigation project will not affect the down stream intake as the source is a river.
11	Sanitation	*	--/C	*	Construction worker will enter in the construction site during the time.
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction worker will enter in the construction site during the time.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	

16	Hydrological Situation	✻	✻	✻	
17	Flora, Fauna and Biodiversity	--/C	--/C	✻	A buried pipeline will pass partly through forest area.
18	Meteorology	✻	✻	✻	
19	Landscape	✻	✻	✻	
20	Global Warming	✻	✻	✻	
Pollution					
21	Air Pollution	✻	✻	✻	
22	Water Pollution	✻	✻	✻	
23	Soil Contamination	✻	✻	✻	
24	Waste	✻	--/C	✻	Excavated earth material of new farm road construction will be generated.
25	Noise and Vibration	✻	✻	✻	
26	Ground Subsidence	✻	✻	✻	
27	Offensive Odor	✻	✻	✻	
28	Bottom sediment	✻	✻	✻	
29	Accidents	✻	--/C	✻	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, ✻: No impact or no corresponding impact

(2) Major Possible Impact and Direction for Mitigation Measures

Table L-8.5.7 Major Possible Impact and Direction for Mitigation Measures in Nagwain Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures/ Monitoring method	Action time for Avoid/mitigation
3. Land use and utilization of local resources	Designing	C	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization The source of the water for irrigation activity may be within the forest area.	➢ Farmer's meetings to discuss the site and obtain consensus with the land owners ➢ Irrigation pipeline will be buried under ground. The necessary clearance from the concerned department has to be sought.	Designing (Mitigation)
10. Water Usage	Designing & Operation	C	Water intake from a river is registered in District office. New water intake may affect other existing intake downstream in the river.	➢ Confirmation of new water intake in District office in design stage ➢ Meeting to discuss and obtain consensus with the affected irrigation system under district administration in design stage ➢ When necessary, meeting to discuss and obtain consensus in water allocation among water users in operation stage	Designing & Operation (Mitigation)
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (Mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (Mitigation)
17. Flora, Fauna and Biodiversity	Planning Stage (Pre-F/S)	C	A pipeline will pass partly a forest area and may affect local flora, fauna and biodiversity.	➢ Confirmation of construction possibility in District office ➢ Due procedure for forest clearance will be sought from the Forest Department ➢ When it is possible, pipeline will be buried to reduce impact to local flora, fauna and biodiversity.	Designing (Mitigation)

24. Waste	Construction	C	Excavated earth material of new farm road construction will be generated.	➢ Excavated earth material should be reduced as much as possible ➢ Dumping sites for the debris must be identified.	Construction (Mitigation)
29. Accident	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles. ➢ Periodic caution to workers on disciplines for safety operation.	Construction (Mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. Some forest land is required for construction but no new land development is proposed.

L-8.6 Environment of Bagain Site

L-8.6.1 Project and Site Description of Bagain Site

(1) Site Description

This Bagain site is located at a distance of 50 km in the eastern direction from Shimla town, the district and state capital, and 407 km to Delhi via. Shimla which is about 15 hours' drive by cargo trucks for agriculture produce. The site topography consists of mountainous and steep areas. The site extends along the left bank of Giri River. State highways, SH 10 passes a long the river.

(2) Project Description

Table L-8.6.1 Project Description of Bagain Site

Proposed Components;	Infrastructure Components Rehabilitation (repair) of existing lift irrigation system. Construction of one new lift irrigation system consisting of pump house, supply pipe, a tank and distribution line. Provision of field tanks (approx. 60 sites) Construction of a new farm road (approx. 2,300m), and improvement of 3 existing roads (approx. 700m, 800 and 800m, respectively) Construction of one collection centre (approx. 100 m2 x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement Use of fallow area for food grains and vegetables production with the improvement of irrigation system
Location/Total Area;	Bagain, Theog Block, Shimla District; 580ha
Characteristics;	Social: Farmers live on food grain, vegetable & fruit cultivation mainly under rain-fed condition partly under irrigation. One Farmer's organization has been set up. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, Marketing Board, Irrigation and Public Health Department
Category in the Study	Block Category – I type farming

L-8.6.2 Social Environment of Bagain Site

(1) Population and Community

Bagain Panchayat includes 9 revenue villages and three hamlets of the Revenue village Basa Bagain. The Panchayats comprises of 480 households. The total population of the site is 2,561. The distribution of population in the 9 revenue villages is given below

Table L-8.6.2 Village-wise Population Details of Bagain Panchayat

Village	Population	SC Population	% of SC
01. Basa Bagain (Ulvi, Bagari, Charail)	636	255	40
02. Khar	372	122	32.2
03. Banahal	236	11	4.6
04. Dhak Bagain	374	158	42.2
05. Deothi	210	51	24.2
06. Dasana	269	64	23.7
07. Damyana	261	66	25.2
08. Bhuin	70	21	30
09. Renna	133	13	9.8
Total	**2,561**	**761**	**29.7**

Source – Panchayat Record Bagain Panchayat
Note: SC - Schedule Castes, ST - Schedule Tribe, OBC - Other Backward Classes

29.7 % of the total population are SCs Village Dhak Baigan Basa Bagain and Khar have the highest population of Schedule Caste communities. The predominant communities among SCs are koli. They are mainly agriculturists. The other two castes include Barahi (Carpenter), Lohaar (Iron smith). SCs are among the most marginal farming household in the area. Also in some areas like village Dasana they seemed to have been left out of the irrigation facilities

Ethnic Group and Religion: There are no tribal communities found in this project site. The population is entirely Hindu. There are seasonal migrant agricultural labourer from Nepal and Bihar but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 1269. Like in the other parts of HP, 70-80% of the agricultural labour is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labour input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are 3 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. Seven of the 12 villages have a Mahila Mandal each, initiated by the Dept of Rural Development. The SHGs have received no training in any income generating activities. The Mahila Mandal is Basa Bagain has received training in food processing. While currently none of the groups have taken up any income generating activity they expressed an interest to take up some agro-based activities as an alternate source of income generation.

Education: The total literacy of Bagain Panchayat is 68.8%. Total male literacy is 76.9%.Total female literacy is 60.5%.

Within the Panchayat area there are 6 primary schools, I middle school and I higher-secondary school. The nearest college, Government Degree College, is in Theog.

Local Community: The local governance unit, the Gram Panchayat of Baigan comprises of 7 wards with 8 elected representatives. 3 seats are reserved in Panchayat, one for women and 2 for Schedule Caste members. One water user's organization (KVS) has been formed in Basa Bagain village but not registered. This KVS is not active and meetings are rarely held. Water charge is not being collected.

Water management at field level is under the farmers' responsibilities and the maintenance of the distribution system is occasionally done by the farmers. There is also informal water management body in village Dasana.

Local conflict: There are no major local conflicts ongoing in the area.

(2) Public Facility and Services

Water Usage for Domestic Use: Currently there are 3 Gravity Water Supply Schemes that meet the drinking water needs of Bagain Panchayat. It is considered a completely covered area. There is Lift Water Supply Scheme in Ghoond Panchayat that meets the water shortage needs of Bagain Panchayat in the summer months. Many of the village have traditional sources from small springs and 'chasmas'. The details of the IPH schemes are given in the following Table:

Table L-8.6.3 IPH Water Supply Scheme for Bagain Panchayat

Village	Scheme	Source	Quantity
Chailla	GWSS	Nallah	2000 LPD
Basa Bagain	GWSS	Nallah (Intake Tank)	2000 LPD
Banahal	GWSS	Spring	1720 LPD

Source: IPH Sub-Divisional Office, Sainj
Note GWSS: Gravity Water Supply Scheme, LWSS: Lift Water Supply Scheme

Electricity: The Panchayat is 100% electrified.

Health and Medical Services: The nearest Primary Health Centre is at Chailla. There is a Sub Center in Village Dasana. The nearest hospital is in Theog town. Under the Integrated Child Development Schemes there are 6 Anganwadi Centres that look after the primary health care of infants and pregnant and nursing mothers. The Panchayat is not known for any specific form of health problems.

(3) Local Economy

Major economic activities are agriculture, off-season vegetables, apples and animal husbandry. In this area majority of the population depend on farm income to a large extent. Almost 37% depend on farm income only. 54% are dependent on both farm and non-farm income. Only 8% of the population have no farm income.

Diversified farming includes food grains, vegetables, and fruit cultivation. While vegetables and fruit cultivation are carried out for commercial purpose, food grains are cultivated mainly for self-consumption. The main vegetables cultivated in the area are peas, beans, cabbage, cauliflower and capsicum.

The farm machinery status in Bagain site is extremely low with only 1 sprayer in each household. There is no other farm machinery in the site, and they usually hire threshers / harvesters. Theog Sub-Market yard is located nearby for shipping agricultural produces. Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. Farmers hire casual labor only for supporting land preparation operation.

The current livestock population in Bagain site is 210 crossbred cattle, 1,061 indigenous cattle, 9 buffaloes, 15 sheep, 58 goats, and 2 horses and others. Bagain has more indigenous female cattle than crossbred female cattle. Milk production here is mainly for own consumption and not commercial purpose.

The main source of non-farm for much of the population includes retirement pensions. The marginal farmers were found to be supplementing their farm incomes through small business enterprises. Some marginal farmers also operate as traditional artisans. Non-farm income activities include wage labour and petty businesses.

L-8.6.3 Natural Environment of Bagain Site

(1) Natural and Climatic Condition

Table L-8.6.4 Natural and Climatic Condition in Bagain Site

Agro-ecological zone	Zone-III
Annual rainfall (mm)	1,420
Average Temperature (℃)	15.21
Average Max.Temperature (℃)	22
Average Min. Temperature (℃)	Below 0

(2) Forest and Wild Life

The total forest area and the type of forests village wise are given in the Table below. These are mainly biosphere forests and predominantly comprise of deodar and kail forests. The main types of wildlife found in these forests are brown bear, leopard, porcupine, wild boar. These forests are also home to monkeys, considered a menace in the area.

Table L-8.6.5 Forest Area in Bagain Panchayat

Village	Total Forest Area (ha)	Type of Forest
Basa Bagain	Nil	-
Deothi	0.28	UPF*
Bhuin	0.22	UPF
Khar	17.13	UPF
Dhak Bagain	13.15	UPF
Damyana	6.61	UPF
Dasana	18.13	UPF
Banahal	40.07	UPF &PF**
Ulvi	Nil	-
Raina	15.07	UPF

Source – Assistant Ranger, Range Office Theog Dated 23-08-2008
** UPF- Unprotected Forests, ** PF – Protected Forest*

(3) Fish and Habitants

The project site has no fishing activities. No development potential has been identified by the JICA team either.

L-8.6.4 Initial Environmental Examination of Bagain Site

(1) Impact Matrix

Table L-8.6.6 Initial Environmental Examination Impact Matrix in Bagain Site

Activity / Potential Impact		Bagain Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	--/C	*	*	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization New pipeline will pass through forest area
4	Social institutions	*	*	*	
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers. The project will also pay particular attention to the inclusion of the Scheduled Caste community in the area.
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritage sites near the proposed area.
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	--/C	*	--/C	There is downstream water intake both for Dasana Ka Nala and from Giri khad.
11	Sanitation	*	--/C	*	Construction worker will enter in the construction site during the time.
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction worker will enter in the construction site during the time.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Flora, Fauna and Biodiversity	*	--/C	*	The forest land required for the proposed road already has an existing path and the adjoining area though classified as forest land does not have much tree cover.
18	Meteorology	*	*	*	
19	Landscape	*	*	*	
20	Global Warming	*	*	*	
Pollution					
21	Air Pollution	*	*	*	
22	Water Pollution	*	*	*	
23	Soil Contamination	*	*	*	
24	Waste	--/C	--/C	*	Excavated earth material of new farm road construction will be generated.
25	Noise and Vibration	*	*	*	
26	Ground Subsidence	*	*	*	
27	Offensive Odor	*	*	*	

28	Bottom sediment	*	*	*	
29	Accidents	*	--/C	*	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
*Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, *: No impact or no corresponding impact*

(2) Major Possible Impact and Direction for Mitigation Measures

Table L-8.6.7 Major Possible Impact and Direction for Mitigation Measures in Bagain Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures/ Monitoring method	Action time for Avoid/mitigation
3. Land use and utilization of local resources	Designing	C	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization The source of the water for irrigation activity may be within the forest area.	➢ The projects will be implemented by application basis by farmers' groups. Farmer's meetings to discuss the site and obtain consensus with the land owners ➢ Irrigation pipeline will be buried under ground. The necessary clearance from the concerned department has to be sought.	Designing (Mitigation)
10. Water Usage	Designing & Operation	C	Water intake from a river is registered in District office. New water intake may affect other existing intake downstream in the river.	➢ Confirmation of new water intake in District office in design stage ➢ Meeting to discuss and obtain consensus with the affected irrigation system under district administration in design stage ➢ When necessary, meeting to discuss and obtain consensus in water allocation among water users in operation stage	Designing & Operation (Mitigation)
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (Mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (Mitigation)
17. Flora, Fauna and Biodiversity	Planning Stage (Pre-F/S)	C	A pipeline will pass partly a forest area and may affect local flora, fauna and biodiversity.	➢ Confirmation of construction possibility in District office ➢ Due procedure for forest clearance will be sought from the Forest Department ➢ When it is possible, pipeline will be buried to reduce impact to local flora, fauna and biodiversity.	Designing (Mitigation)
24. Waste	Construction	C	Excavated earth material of new farm road construction will be generated.	➢ Excavated earth material should be reduced as much as possible ➢ Dumping sites for the debris must be identified.	Construction (Mitigation)
29. Accident	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles. ➢ Periodic caution to workers on disciplines for safety operation.	Construction (Mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. Some forest land may be used but it does not any significant tree cover and due clearance will be sought. No new land development is proposed. Although there is downstream intake of water from the sites of proposed irrigation activities, a preliminary discussion with concerned authorities has clarified that since the existing volume of water in both sources in adequate for the new structures proposed.

L-8.7 Environment of Chamo Site

L-8.7.1 Project and Site Description of Chamo Site

(1) Site Description

Chamo site, in Dharampur Block, District Solan, is located at a distance of 30 km in the south-western direction from Solan town of the District capital, and 288 km to Delhi or about 10 hours by a cargo truck from Delhi. The topography is of mountainous and steep areas. The site extends along a deep valley named Kaushalya River. A national highway, NH22 is passing nearby this site.

(2) Project Description

Table L-8.7.1 Project Description of Chamo Site

Proposed Components;	Infrastructure Components Provision of rain water harvest facilities with tanks and collection ditches, Construction of one Lift irrigation system consisting of pump station, raising main pipeline (approx 3 km) and distribution channels. Construction of 2 new farm roads (approx. 4,200m and 2,400m, respectively), Construction of one collection centre (approx. 100 m2 x 1 no.) Soft Components Farmer's support program such as formation and strengthening of Farmer's organization (KVS, etc) and market system improvement Use of fallow area for food grains and vegetables production with the improvement of irrigation system
Location/Total Area;	Chamo, Dharampur Block, Solan District; 15 ha (new)
Characteristics;	Social: Farmers live on food grain and vegetable cultivation under rain-fed condition. No irrigation system is available at present. Natural: No specific nature. Pollution: No specific pollution
Duration;	Infrastructure Components: 2 Years, Soft Components: 3 Years
Executing Agency;	Department of Agriculture, H.P. State Agricultural Marketing Board
Category in the Study	Block Category – I type farming

L-8.7.2 Social Environment of Chamo Site

(1) Population and Community

Population of the Project Area: Chamo Panchayat comprises of 13 villages. The total number of farm household is 231. The population distribution, number of families, the total population of Schedule Castes and Schedule Tribes is given below.

Table L-8.7.2 Village-wise Population Details of Chamo Panchayat

Village	Number Of House Hold		Total Population			Non SC Population			SC Population		
	*Non SC	**SC	Male	Female	Total	Male	Female	Total	Male	Female	Total
Chammo	12	14	65	57	122	30	24	54	35	33	68
Nakyar	10	08	39	47	86	26	31	57	13	16	29
Batol Kalan	06	-	19	07	26	19	07	26	-	-	-
Shodon	04	-	07	04	11	07	04	11	-	-	-
Dol	01	-	07	04	11	07	04	11		-	-
Batol Khurd	09	04	29	26	55	22	18	40	07	08	15
Oyaal	04	-	08	10	18	08	10	18	-	-	-
Sanana	15	03	61	45	106	47	32	79	14	13	27
Bayla Balau	24	06	76	72	148	64	62	126	12	10	22
Gadyaar	10	17	71	73	144	28	27	55	43	46	89
Karol	24	05	82	82	164	64	65	129	18	17	35
Chavanja	03	-	08	06	14	08	06	14	-	-	-
Kanthi	16	32	129	120	249	52	45	97	77	75	152
TOTAL	**138**	**89**	**601**	**553**	**1,154**	**382**	**335**	**717**	**219**	**218**	**437**

Source: - Panchayat Records, Chammon Panchayat
Note: Non SC: Non-Schedule Caste, SC: Schedule Caste

37.8 % of the total population comprises of Schedule Castes. The majority of SC population are found in the villages Kainthi, Gadyaar and Chamo. The predominant communities among SCs are Harijan and Koli. The other two castes include Barahi (Carpenter), Lohar (Iron smith). They are mainly agriculturists. SCs are among the most marginal farming household in the area. 35 SC household in the Panchayat are Below the Poverty Line.

Ethnic Group and Religion: There are no Tribal communities found at the project site. The population of Chammon is entirely Hindus. There are seasonal migrant agricultural labourers from Nepal but they do not stay in the Panchayat villages.

Gender Issues: Total women population is 553. The female literacy rate is less than 50%. Like in the other parts of HP, 70-80% of the agricultural labour is put in by women. Apart from ploughing the land and marketing women are involved in every activity. The labour input is much more for vegetable cultivation. Women are also primarily responsible for animal husbandry activities. Most household chores are also done by women.

There are several active women's group in the project site. There are 3 micro-credit and savings groups (Self-Help Groups) formed under the Integrated Child Development Scheme. There is a Mahila Mandal initiated by the Dept of Rural Development and a Women Farmer's Group formed by the Dept of Agriculture. The agriculture group serve as focus group for departmental training and extension work. All groups have received training in income generating activities but have not taken up any activity yet. They are keen on taking on agro-based income generating activities.

Education: The total literacy of the Panchayat is 68.4%. Male literacy is much higher than female literacy at 79.7%. Female literacy is at 56.5% There are 4 Primary schools, 2 middle schools and I higher-secondary school in the Panchayat area. The nearest college, Government Degree College, is in

Solan.

Local Community: The local governance unit, the Gram Panchayat of Chamo comprises of 5 wards with 6 elected representatives. 3 seats are reserved in Panchayat; two for Female members, one each for Schedule Caste and Non Schedule Caste, and 1 for male Schedule Caste There are no farmers groups or cooperatives in this area.

Local conflict: There is no major conflict going on in the area.

(2) Public Facility and Services

Water Usage for Domestic Use: Currently there are 4 Gravity Water Supply Schemes and 7 Lift Water Supply Scheme that meet the drinking water needs of Chamo Panchayat. It is considered a completely covered area. In Chauncha the water source is maintained by the villagers. Drinking water need of Nakaiyar village is met by the water Supply Scheme constructed by Block Development Department. The details of the IPH schemes are given in the following Table.

Table L-8.7.3 IPH Water Supply Scheme for Chamo Panchayat

Village	Scheme	Source	Quantity
Chamo	LWSS, Chamo Sanana	Chamo Ka Nallah	0.40 LPS
Sanana	LWSS Chamo Sanana	Chamo Ka Nallah	0.40 LPS
Batol Khurd	GWSS batol Khurd	Karol ka Pani (Spring source)	0.10 LPS
Oyal	GWSS Oyal Phase II	Katli Neri (Spring Source)	0.15 LPS
Chadon	LWSS Ghaighat	Chamdok Pani (Spring Source)	0.38 LPS
Shodon	LWSS Ghaighat	Chamdok Pani (Spring Source)	0.38 LPS
Doyal	GWSS Kothian Okal Dol	Kharthia Ka Pani (Spring Source)	0.19 LPS
Bayala Balau	LWSS Bayala Balau	Kaushalya Khadd	1.05 LPS
Gadyar	LWSS Ghaighat	Chamdok Pani (Spring Source)	0.38 LPS
Karol	LWSS Banasar Sandhog	Local Khadd	2.68 LPS
Kainthi	LWSS Ghaighat	Chamdok Pani (spring Source)	0.38 LPS
Batol Kalan	GWSS Batol Kalan	Khola Ka Pani (Spring Source)	0.04 LPS

Source: IPH Sub-Divisional Office, Solan
Note GWSS: Gravity Water Supply Scheme, LWSS: Lift Water Supply Scheme

Electricity: The Panchayat is 100% electrified.

Health and Medical Services: The nearest Primary Health Centre / Sub- centre and Hospital is at Parwanoo. Under the Integrated Child Development Schemes there are 4 Aanganwari Centres that look after the primary health care of infants and pregnant and nursing mothers. The Panchayat is not known for any specific form of health problems.

(3) Local Economy

Agriculture, horticulture and animal husbandry are the mainstay of the local economy. The food grains are mostly cultivated under rain-fed condition, and are used mostly for self-consumption. The major vegetables grown in the area are tomato, potato, onion, garlic, cucumber, capsicum and ginger. Besides, colocasia, turmeric and coriander are also grown in small areas, and these crops are usually grown in the ginger areas. Except for cucumber and ginger grown in kharif season, the other vegetables are grown under irrigated condition. This site is an advanced area for vegetable production, however, accessibility within the site is poor and farmers expect improvement of transport measures.

90% of the households purchase seeds for cereal crops from departmental outlet. 70% the households purchase seeds for the vegetable crops from retail shops outside the village. Since the farm household

area is relatively small and marginal, the farm operations are mostly carried out by farm animals. In the Panchayat, there are only one (1) power tiller, 2 sprayers, 50 threshers and 100 chaff cutters.

Family labors (both male and female) are involved in all agricultural operations including land preparation, sowing, weeding, application of fertilizers & chemicals and harvesting. Simultaneously, they also hire casual labor for the operations including land preparation, weeding, application of fertilizers & chemicals and harvesting.

The current livestock population in Chammon site is 75 crossbred cattle, 483 indigenous cattle, 206 buffaloes, 7 sheep, 127 goat, and 6 horses and others. As this Chammon site is closer to Haryana State, more numbers of female buffaloes and crossbred females to some extent are reared for milk production.

The owners of the marginal land holdings were found to involved in the practice of traditional artisan, household chares, animal husbandry, unskilled labour, government jobs and own business so as to supplement the meager farm incomes. The small farmers were also found to be involved in traditional artisan, animal husbandry and work as household chares. Land was also found mortgaged on marginal farmers.

L-8.7.3 Natural Environment of Chamo Site

(1) Natural and Climatic Condition

Cloud bursts, soil erosion and landslides are common seasonal incidences. The climatic condition of the site is given below.

Table L-8.7.4 Natural and Climatic Condition in Chamo Site

Category	I
Agro-ecological zone	Zone-2
Annual rainfall (mm)	1,336
Average Temperature (°C)	18
Average Max.Temperature (°C)	24.40

(2) Forest and Wild Life

The total forest area at the project site is 217.4 Hect. These are mainly Demarkated Protected Forests and predominantly comprise of cheel, mango, kango, camble, *amaltaas, bihul* (Gravia Octivia). The main types of wildlife found in these forests are pheasants, loepard,wild pig and *ghoraal*.

(3) Fish and Habitants

There are no fishing activities ongoing in this area. Any development potential within the site has not been found by the JICA study team.

L-8.7.4 Initial Environmental Examination of Chamo Site

(1) Impact Matrix

Table L-8.7.5 Initial Environmental Examination Impact Matrix in Chamo Site

Activity / Potential Impact		Bagain Site			
		Designing	Construction	Operation	Comments
Social Environment					
1	Involuntary Resettlement	*	*	*	
2	Local economy (employment, etc)	*	=/C	++/B	Local economy will be encouraged both by the enhancement of agriculture activities as well employment generated through engaging local communities in employment activities..
3	Land use and utilization of local resources	--/C	*	*	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization New pipeline will pass through forest area
4	Social institutions	*	*	*	
5	Existing social infrastructures and services	*	*	*	
6	The poor, indigenous and ethnic people	*	*	++/B	Beneficiaries are mostly small and marginal farmers. There are no tribal groups in this area The largest concentration of Scheduled Caste population in Kainthi village will be benefited by one of the proposed irrigation activity in this area.
7	Misdistribution of benefit and damage	*	*	*	
8	Cultural heritage	*	*	*	There are no cultural heritage sites near the proposed area.
9	Local conflict of interests	*	*	*	Participatory process for implementation will be made.
10	Water Usage	*	*	*	The proposed irrigation sites are the last points of the downstream and will not affect any intake.
11	Sanitation	*	--/C	*	Construction worker will enter in the construction site during the time.
12	Hazards (Risk), Infectious diseases	*	--/C	*	Construction worker will enter in the construction site during the time.
Natural Environment					
13	Topography & Geographical features	*	*	*	
14	Soil Erosion	*	*	*	
15	Groundwater	*	*	*	
16	Hydrological Situation	*	*	*	
17	Flora, Fauna and Biodiversity	--/C	--/C	*	The construction of some of the proposed infrastructure may require clearing of some trees.
18	Meteorology	*	*	*	
19	Landscape	*	*	*	
20	Global Warming	*	*	*	
Pollution					
21	Air Pollution	*	*	*	
22	Water Pollution	*	*	*	

23	Soil Contamination	*	*	*	
24	Waste	*	--/C	*	Excavated earth material of new farm road construction will be generated.
25	Noise and Vibration	*	*	*	
26	Ground Subsidence	*	*	*	
27	Offensive Odour	*	*	*	
28	Bottom sediment	*	*	*	
29	Accidents	*	--/C	*	During construction, some accident may occur.

Remarks: Left side; ++: Positive impact --: Negative Impact =: Neutral Impact
*Right side; A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now, *: No impact or no corresponding impact*

(2) Major Possible Impact and Direction for Mitigation Measures

Table I L-8.7.6 Major Possible Impact and Direction for Mitigation Measures in Chamo Site

Potential Impacts	Phase	Rating	Impact cause/ severity	Assumed mitigation measures/ Monitoring method	Action time for Avoid/mitigation
3. Land use and utilization of local resources	Designing	C	Land for new minor irrigation and new farm road will be secured with consensus of the individuals and the farmer's organization The source of the water for irrigation activity may be within the forest area.	➢ The projects will be implemented by application basis by farmers' groups. Farmer's meetings to discuss the site and obtain consensus with the land owners ➢ Irrigation pipeline will be buried under ground. The necessary clearance from the concerned department has to be sought.	Designing (Mitigation)
11. Sanitation	Construction	C	Sanitary condition may degenerate due to input of construction workers at construction site.	➢ Provision of temporary sanitary arrangements (toilet, other requirement).	Construction (Mitigation)
12. Hazard (Risk), Infection Diseases	Construction	C	Infected construction workers may enter into the construction site.	➢ Implementation of health monitoring of construction workers by their declaration	Construction (Mitigation)
17. Flora, Fauna and Biodiversity	Planning Stage (Pre-F/S)	C	A pipeline will pass partly a forest area and may affect local flora, fauna and biodiversity.	➢ Confirmation of construction possibility in District office ➢ Due procedure for forest clearance will be sought from the Forest Department ➢ When it is possible, pipeline will be buried to reduce impact to local flora, fauna and biodiversity.	Designing (Mitigation)
24. Waste	Construction	C	Excavated earth material of new farm road construction will be generated.	➢ Excavated earth material should be reduced as much as possible ➢ Dumping sites for the debris must be identified.	Construction (Mitigation)
29. Accident	Construction	C	Accidents caused by construction machinery and vehicles are predicted during the construction phase.	➢ Appropriate maintenance of machinery and vehicles. ➢ Periodic caution to workers on disciplines for safety operation.	Construction (Mitigation)

Note: A: relatively significant impact, B: relatively medium-size impact, C: relative small impact, D: unknown as of now

(3) Conclusion

Generally there are no significant environmental impacts envisaged. The proposed works are minor in nature and will help to enhance agricultural outputs and efficiency of the water source for irrigation. Further the project will have a positive impact by promoting effective waste management practices, promoting optimum use of fertilizers and pesticides, promoting IPM and INMP and vermin-composting. Some forest land may be required for construction.

L-9 Economic Evaluation of the Sample Study Sites

Based on the present condition and future development for crop diversification in the sample study sites, the economic benefit and project cost are calculated at the preliminary level in order to examine the economic viability. In this process, the following assumptions are taken into account:

i) Benefit calculation is focused on grains and vegetables, and no fruits production is counted due to no change in fruits cultivation and production.

ii) In order to simplify the process, crops grown in the sample study sites are represented by the typical food grains and vegetables. Food grains are maize and paddy in Kharif season and wheat in Rabi season. Vegetables are tomatoes, potatoes, peas and cauliflowers of the strategic vegetables.

iii) The present and future farming practices are assumed to be the same as the Action Plan, and accordingly the same unit yields and crop budgets are applied for estimation of the benefit.

L-9.1 Benefit in Each Sample Study Sites

(1) Change of Cropped Area

The present cropped area in each site is described in the foregoing sections and summarized in the Table L-9.1.1 below. Some areas are under fruits trees in the sample study sites, however, they are excluded in this table since no change in cropping and production of fruits, as mentioned above:

Table L-9.1.1 Present Cropping Area in Sample Study Sites

		Kharif Season			Rabi Season	
		Rainfed	Life Saving	Irrigated	Rainfed	Irrigated
Lalri	Food Grain	51 ha	-	-	42 ha	-
	Vegetables	-	-	-	-	-
Malan	Food Grain	-	-	170 ha	-	69 ha
	Vegetables	-	-	18 ha	-	121 ha
Hallan-I	Food Grain	140 ha	-	-	140 ha	-
	Vegetables	23 ha	-	47 ha	-	27 ha
Nagwain	Food Grain	109 ha	-	-	109 ha	-
	Vegetables	55 ha	15 ha	35 ha	74 ha	35 ha
Bagain	Food Grain	6 ha	-	-	-	-
	Vegetables	30 ha	-	-	24 ha	-
Chamo	Food Grain	50 ha	-	-	50 ha	-
	Vegetables	6 ha	26 ha	-	14 ha	-

Note: Food grains are maize and paddy in Kharif season and wheat in Rabi season.
Irrigated area: 0 ha in Lalri, 180 ha in Malan, 47 ha in Hallan-I, 35 ha in Nagwain, 0 ha in Bagain, and 0 ha in Chamo.
Life saving irrigation (by water harvesting facilities): 15 ha in Nagwain, and 26 ha in Chamo.
Source: Data and information obtained in the field survey by the JICA study team.

After implementation of the crop diversification programs, cropped area of vegetable would be expanded by the irrigation development with proper farming practices. In Lalri site, total area under food grains will reduce from the present 93 ha to 55 ha in the future with keeping food security, and 15 ha will be cultivated for vegetables in each of Kharif and Rabi season. Future cropped area in each site is summarized below:

Table L-9.1.2 Future Cropping Area in Sample Study Sites

		Kharif Season			Rabi Season	
		Rainfed	Life Saving	Irrigated	Rainfed	Irrigated
Lalri	Food Grain	10 ha	-	15 ha	15 ha	15 ha
	Vegetables	-	-	25 ha	-	25 ha
Malan	Food Grain	-	-	160 ha	-	52 ha
	Vegetables	-	-	23 ha	-	131 ha
Hallan-I	Food Grain	140 ha	-	-	140 ha	-
	Vegetables	23 ha	-	109 ha	-	109 ha
Nagwain	Food Grain	109 ha	-	-	109 ha	-
	Vegetables	55 ha	45 ha	90 ha	-	90 ha
Bagain	Food Grain	6 ha	-	-	6 ha	-
	Vegetables	-	25 ha	51 ha	-	51 ha
Chamo	Food Grain	62 ha	-	-	117 ha	-
	Vegetables	29 ha	56 ha	15 ha	30 ha	15 ha

Note: Food grains are maize and paddy in Kharif season and wheat in Rabi season.
Irrigated area: 15 ha in Lalri, 183 ha in Malan, 109 ha in Hallan-I, 90 ha in Nagwain, 51 ha in Bagain, and 25 ha in Chamo.
Life saving irrigation by water harvesting facilities in Kharif season only: 45 ha in Nagwain, 25 ha in Bagain, and 56 ha in Chamo.
Source: Plans in each sample study sites described in the foregoing sections.

(2) Unit Yields and Crop Production

Unit yields under the present and future conditions are anticipated to be the same as the Action Plan, assuming that the program components like vegetable promotion and food grains production will be conducted under the Farmers' Support Program. Unit yields of rainfed food grains are conservatively estimated to be same under the present and future conditions. Other unit yields are within the potential level, as shown below:

Table L-9.1.3 Present and Future Unit Yields of Sample Study Sites

	Present Condition			Future Condition		
	Rainfed	Life Saving	Irrigated	Rainfed	Life Saving	Irrigated
Food Grain						
Maize	1.8 ton/ha	-	3.6 ton/ha	1.8 ton/ha	-	4.0 ton/ha
Paddy	1.6 ton/ha	-	3.0 ton/ha	1.6 ton/ha	-	3.5 ton/ha
Wheat	1.5 ton/ha	-	2.7 ton/ha	1.5 ton/ha	-	3.0 ton/ha
Vegetables						
Tomato	18.0 ton/ha	24.0 ton/ha	30.0 ton/ha	25.1 ton/ha	28.3 ton/ha	31.4 ton/ha
Potato	6.9 ton/ha	9.2 ton/ha	11.5 ton/ha	11.8 ton/ha	13.2 ton/ha	14.7 ton/ha
Peas	6.2 ton/ha	8.3 ton/ha	10.4 ton/ha	8.3 ton/ha	9.4 ton/ha	10.4 ton/ha
Cauliflower	9.5 ton/ha	12.7 ton/ha	15.9 ton/ha	9.9 ton/ha	13.2 ton/ha	16.5 ton/ha

Source: refer to Annex I of this report.

Based on the cropped areas and unit yields mentioned above, the present crop production will increase in future. Food grains production will maintain the food security level, and produced food grains will satisfy the consumption level of the farm households and local communities. The present and future production are shown below:

Table L-9.1.4 Present Crop Production of Sample Study Sites

	Present Condition		Future Condition		Increment	
	Food Grain	Vegetables	Food Grain	Vegetables	Food Grain	Vegetables
Lalri	154 ton	0 ton	143 ton	1,153 ton	-9 ton	+1,153 ton
Malan	713 ton	1,932 ton	725 ton	2,609 ton	+12 ton	+677 ton
Hallan-I	460 ton	1,263 ton	460 ton	4,015 ton	0 ton	+2,753 ton
Nagwain	360 ton	2,865 ton	360 ton	5,766 ton	0 ton	+2,901 ton
Bagain	11 ton	444 ton	12 ton	1,793 ton	+1 ton	+1,349 ton
Chamo	165 ton	960 ton	287 ton	2,065 ton	+122 ton	+1,105 ton

Source: estimated based on the unit yields and cropped area, Tables L-9.1.1, L-9.1.2 and L-9.1.3.

Vegetable production will remarkably increase, by minimum 680 ton at Malan site and maximum 2,900 ton in Nagwain site. Most of produce will be marked outside the sites through marketing arrangement improved by the program components of market system improvement and post-harvest processing.

(3) Economic Net Production Value and Benefit

Net production value per ha in the economic terms are estimated based on the crop budgets of each crop, assuming the same in the Action Plan. Vegetable market prices have been fluctuating by season, and the conservative farmgate prices are applied to avoid over estimation. Net production values are not much different between those in the present and future conditions except rainfed vegetables, as shown below:

Table L-9.1.5 Economic Net Production Value per ha

	Present Condition			Future Condition		
	Rainfed	Life Saving	Irrigated	Rainfed	Life Saving	Irrigated
Food Grain						
Maize	Rs.100/ha	-	Rs.3,500/ha	Rs.100/ha	-	Rs.4,200/ha
Paddy	Rs.400/ha	-	Rs.4,900/ha	Rs.400/ha	-	Rs.6,400/ha
Wheat	Rs.500/ha	-	Rs.6,200/ha	Rs.500/ha	-	Rs.7,600/ha
Vegetables						
Tomato	Rs.10,500/ha	Rs.13,200/ha	Rs.21,000/ha	Rs.17,500/ha	Rs.19,900/ha	Rs.22,500/ha
Potato	Rs.5,800/ha	Rs.8,000/ha	Rs.9,700/ha	Rs.12,900/ha	Rs.14,600/ha	Rs.15,000/ha
Peas	Rs.14,100/ha	Rs.19,800/ha	Rs.25,300/ha	Rs.22,000/ha	Rs.24,100/ha	Rs.25,500/ha
Cauliflower	Rs.17,600/ha	Rs.24,700/ha	Rs.31,700/ha	Rs.19,000/ha	Rs.25,600/ha	Rs.32,100/ha

Source: Refer to Attachment I-3 in Annex I of this report.

Based on the above net production values, increment of the net production values between the present and future conditions are calculated as the economic benefit. Total net production values under the present condition range from Rs.27,000 in Lalri to Rs.4,278,000 in Nagwain, and those will increase under the future condition to Rs.1,134,000 in Lalri to Rs.7,089,000 in Nagwain. Accordingly, total increment or benefit ranges from Rs.1,107,000 in Lalri to Rs.3,932,000 in Hallan-I.

Increment of net production value is mainly derived from expansion of vegetable cultivation area under irrigated condition, accounting at 98% of total benefit in the six sites ranging from 85% in Lalri to 100% in Hallan-1 of total benefit. Total net production value and benefit is summarized below:

Table L-9.1.6 Total Net Production Value and Incremental

(unit: Rs.'000)

	Present Condition			Future Condition			Increment
	Food Grains	Vegetables	Total	Food Grains	Vegetables	Total	(Benefit)
Lalri	27.0	0.0	27.0	196.5	937.5	1,134.0	1,107.0
Malan	1,221.6	1.553.5	2,775.1	1,379.6	3,137.1	4,516.7	1,741.6
Hallan-I	87.0	1,512.5	1,599.5	87.0	5,333.2	5,331.2	3,931.5
Nagwain	65.4	4,212.4	4,277.8	65.4	7,023.5	7,088.9	2,811.1
Bagain	0.6	876.9	877.5	3.6	3,696.6	3,680.2	2,802.7
Chamo	30.0	560.4	590.4	64.7	3,100.8	3,165.5	2,575.1
Total	1,431.6	8,715.7	10,147.5	1,796.8	23,319.7	25,116.5	14,969.2

Source: Calculation based on the cropped area (Tables L-9.1.1 & L-9.1.2) and unit net production value (Table L-9.1.6).

L-9.2 Project Cost

(1) Financial Project Cost

Project cost consists of i) direct cost for procurement and works, ii) survey, design and construction supervision and iii) such other costs for administration and taxes. Direct cost for procurement and works is divided into costs for 1) Institutional Development Program, 2) Farmers' Support Program, 3) Infrastructure Development Program as well as 4) price escalation and 5) physical contingency. In estimation of the project costs for the sample study sites, the cost of Institutional Development Program is excluded, since this cost is mainly for capacity development of agricultural extension system and engineering for the entire State, not for the particular sites.

For production increase and marketing improvement, the Farmers' Support Programs are to be selectively conducted according to the requirement of the site based on the site scale as well as diversification progress expressed by the Category, as shown in Attachment L-9.1 and summarized below:

Table L-9.2.1 Requirement of Farmers Support Program

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo	Total
1. Vegetable Promotion							
- Demonstration Plots	2	9	7	13	6	2	39
- Training Group	4	28	21	42	17	6	118
- Poly house	0	2	2	2	2	2	10
2. Food Grain Productivity	2	28	21	42	17	6	116
3. Integrated Farm Management	4	28	21	42	17	6	118
4. Post-harvest Processing							
- Small-scale agro-industry	2	2	2	2	2	2	12
- PPP Promotion	1	1	1	1	1	1	6
5. Market System Improvement	1	1	1	1	1	1	5

Source: Refer to Attachment L-9.1 Cost Estimate of Farmers' Support Program in the Sample Study Sites.

Physical requirement of the Infrastructure Development Program (irrigation and access farm road) is determined based on the topographic survey and preliminary design of facilities. For construction and improvement of irrigation facilities and access farm roads, technical support necessary for survey, design and supervision would be provided from out-source on contract basis. Based on these conditions, the financial cost is estimated Rs.10 million in Lalri site at minimum to Rs.42.8 million in Nagwain at maximum, as shown in Attachment L-9.2 and summarized below:

Table L-9.2.2 Summary of Financial Cost

(unit: Rs.'000))

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo
1. Procurement and Works	9,049	13,135	24,353	39,134	29,207	32,930
1.1 Institutional Develop.	0	0	0	0	0	0
1.2 Farmers' Support	1,015	8,465	6,668	12,059	5,672	2,672
1.3 Infra. Develop.	7,211	3,476	15,471	23,517	20,880	27,264
1.4 Physical contingency	823	1,194	2,214	3,558	2,655	2,994
2. Survey, Design, Supervision	389	185	844	1,287	1,142	1,493
3. Administration & Other Cost	551	792	1,478	2,374	1,775	2,006
Grand Total (1 + 2 + 3)	**9,989**	**14,112**	**26,675**	**42,795**	**32,124**	**36,429**

Source: Cost estimation by the JICA study team.

Based on the financial project cost estimated above, the economic project cost is estimate and summarized in the table below:

Table L-9.2.3 Summary of Economic Cost

(unit: Rs.'000))

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo
1. Procurement and Works	8,595	12,478	23,135	37,177	27,746	31,283
1.1 Institutional Develop.	0	0	0	0	0	0
1.2 Farmers' Support	964	8,042	6,335	11,456	5,388	2,538
1.3 Infra. Develop.	6,850	3,302	14,697	22,341	19,836	25,901
1.4 Physical contingency	781	1,134	2,103	3,380	2,522	2,844
2. Survey, Design, Supervision	370	176	802	1,223	1,085	1,418
3. Administration & Other Cost	0	0	0	0	0	0
Grand Total (1 + 2 + 3)	**8,965**	**12,654**	**23,937**	**38,400**	**28,831**	**32,701**

Source: Cost estimation by the JICA study team.

L-9.3 Evaluation Results

Based on he economic cost and benefits, EIRR is calculated along with B-C and B/C and summarized below;

Table L-9.3.1 Results of Economic Evaluation

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo
1. Economic IRR	10.3%	11.9%	14.8%	3.5%	7.0%	4.4%
2. Net Present Value (at 12%)						
Benefit (Rp.'000)	7,242	11,393	25,720	18,334	18,334	16,845
Cost (Rp.'000)	8,127	11,471	21,699	34,810	26,136	29,644
Benefit – Cost (Rp.'000)	-885	-78	4,021	-16,476	-,7,801	-12,799
Benefit / Cost (Rp.'000)	0.89	0.99	1.19	0.53	0.70	0.57

Source: estimation and calculation by the JICA study team.

In three sites of Lalri, Malan and Hallan-1, the result shows rather higher economic viability as the independent project. Other three sites of Nagwain, Bagain and Chamo seem low evaluation results, and this is mainly due to rather heavy cost of the Farmers' Support and Infrastructure Development Programs against the smaller coverage area. These Programs will extend the direct impact and effects on the socio-economic aspects in community of the sites as well as the surrounding areas. Taking this direct impact into account, it is assumed to allocate part of project costs to other impacts. After

allocation of costs, the economic cost is estimated at 50% to 90% and summarized below:

Table L-9.3.2 Summary of Economic Cost after Cost Allocation

(unit: Rs.'000))

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo
1. Procurement and Works	7,788	8,540	19,071	22,164	17,040	15,697
1.1 Institutional Develop.	0	0	0	0	0	0
1.2 Farmers' Support	768	5,321	3,534	5,481	3,065	1,773
Vegetable Promotion*1	(100%)	(100%)	(100%)	(100%)	(100%)	(100%)
Food Grains Productivity*1	(26%)	(24%)	(24%)	(2%)	(5%)	(9%)
Integrated Farm Mange.*1	(85%)	(81%)	(81%)	(7%)	(16%)	(31%)
1.3 Infra. Develop.	6,312	2,443	13,803	14,668	12,426	12,497
Irrigation*1	(100%)	(100%)	100%	100%	100%	100%
Access Farm Road*1	(20%)	(61%)	(41%)	(46%)	(50%)	(35%)
1.4 Physical contingency	781	1,134	2,103	3,380	2,522	2,844
2. Survey, Design, Supervision	341	128	753	800	677	681
3. Administration & Other Cost	0	0	0	0	0	0
Grand Total (1 + 2 + 3)	8,129	8,668	19,824	22,964	17,717	16,697
Proportion against the Original	(90.7%)	(68.5%)	(82.8%)	(59.8%)	(61.5%)	(50.1%)

*Remarks: *1 Figures in bracket show the allocation proportion to the sample study sites.*
For the Farmers Support Program, cost are allocated based on the proportional basis to cover the area assumed in the Action Plan for the program components of Food Grains Productivity and Integrated Farm Management.
For the Infrastructure Development Program, cost of roads are allocated based on the connectivity and welfare of the surrounding area.
Source: Estimation and calculation by the JICA study team.

Results of economic evaluation after cost allocation is summarized below:

Table L-9.3.3 Results of Economic Evaluation after Cost Allocation

		Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo
1. Economic IRR		11.7%	18.7%	18.5%	10.1%	14.2%	14.1%
2. Net Present Value (at 12%)							
Benefit	(Rp.'000)	7,242	11,393	25,720	18,334	18,334	16,845
Cost	(Rp.'000)	7,369	7,858	17,971	20,817	16,061	14,847
Benefit – Cost	(Rp.'000)	-127	3,535	7,749	-2,483	2,274	1,998
Benefit / Cost	(Rp.'000)	0.98	1.45	1.43	0.88	1.14	1.13

Source: Estimation and calculation by the JICA study team.

Results mentioned above indicate that crop diversification in all the sample study sites will attain the economic viability of more than 10% of EIRR, and enable the public investment.

In addition to the direct impact, various socio-economic impacts are expected from the activities of crop diversification. Particularly, access farm road may improve the transportation and communication circumstance in the surrounding area, and accelerate further development.

Attachment L-9.1 Cost Estimate of Farmers' Support Program in the Sample Study Sites

(unit: Rs.'000 for unit cost and amount, times for quantity)

	Unit Cost	Lalri		Malan		Hallan-I		Nagwain		Bagain		Chamo		Total	
		Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
1. Vegetable Promotion															
1.1 Demonstration Activities	216	2	432	9	1,944	7	1,512	13	2,808	6	1,296	2	432	39	8,424
1.2 Training for farmers' groups	41	4	164	28	1,148	21	861	42	1,722	17	697	6	246	118	4,838
1.3 Poly House (2 units per block)	500	0	0	2	1,000	2	1,000	2	1,000	2	1,000	2	1,000	10	5,000
Sub-total		**6**	**596**	**39**	**4,092**	**30**	**3,373**	**57**	**5,530**	**25**	**2,993**	**10**	**1,678**	**167**	**18,262**
2. Food Grain Productivity															
Demonstration & Training	129	2	258	28	3,612	21	2,709	42	5,418	17	2,193	6	774	116	14,964
Sub-total		**2**	**258**	**28**	**3,612**	**21**	**2,709**	**42**	**5,418**	**17**	**2,193**	**6**	**774**	**116**	**14,964**
3. Integrated Farm Management															
Training for farmers' group	25	4	100	28	700	21	525	42	1,050	17	425	6	150	118	2,950
Sub-total		**4**	**100**	**28**	**700**	**21**	**525**	**42**	**1,050**	**17**	**425**	**6**	**150**	**118**	**2,950**
4. Promotion of Post-harvest Processing															
4.1 Promotion of small scale agro-industry (training activity, 2 activities per site)	12	2	24	2	24	2	24	2	24	2	24	2	24	12	144
4.2 PPP Promotion (Seminar at APMC)	14	1	14	1	14	1	14	1	14	1	14	1	14	6	84
Sub-total		**3**	**38**	**3**	**38**	**3**	**38**	**3**	**38**	**3**	**38**	**3**	**38**	**18**	**228**
5. Makret System Improvement															
Workshop on market promotion	23	1	23	1	23	1	23	1	23	1	23	1	23	6	138
Sub-total		**1**	**23**	**1**	**23**	**1**	**23**	**1**	**23**	**1**	**23**	**1**	**23**	**6**	**138**
Total			**1,015**		**8,465**		**6,668**		**12,059**		**5,672**		**2,663**		**36,542**

	Lalri	Malan	Hallan-I	Nagwain	Bagain	Chamo	Total
1. Cultivated area (ha)*2	68 ha	197 ha	407 ha	340 ha	245 ha	109 ha	1,366 ha
2. No. of farmers (households)*2	120 HH	830 HH	611 HH*1	1,250 HH	510 HH	164 HH*1	3,485 HH
3. No. of farmers' groups (30HH per group)	4 groups	28 groups	21 groups	42 groups	17 groups	6 groups	118 groups
4. Demonstration plots (one plots for 100HH)	2 plots	9 plots	7 plots	13 plots	6 plots	2 plots	39 plots

Remarks *1: estimated based on the following assumption: 20 ha of cultivated area per 30 households.
*2: based on data and information on each sample study site described in Annex L.

Note HH: household

Attachment L-9.2 Summary of Economic Evaluation for Pre-F/S Sites

	Lalri	Malan	Hallan-1	Nagwain	Bagain	Chamo	Total
Financial Project Cost	**9,989**	**14,112**	**26,675**	**42,795**	**32,124**	**36,429**	**162,124**
1. Procurement and Works Rs.'000	**9,049**	**13,135**	**24,353**	**39,134**	**29,207**	**32,930**	**147,808**
1.1 Inst. Develop. Program	0	0	0	0	0	0	0
1.2 Farmers' Support Program	1,015	8,465	6,668	12,059	5,672	2,672	36,551
1.3 Infra. Develop. Prgram	7,211	3,476	15,471	23,517	20,880	27,264	97,819
1.4 Price Escalation							0
1.5 Physical Contingency	823	1,194	2,214	3,558	2,655	2,994	13,438
2. Survey, Design and Supervision Rs.'000	**389**	**185**	**844**	**1,287**	**1,142**	**1,493**	**5,340**
2.1 Consultants (5% of 1.3 (1))	354	168	767	1,170	1,038	1,357	4,854
2.2 Price Escalation							0
2.3 Physical Contingency	35	17	77	117	104	136	486
3. Administration and Other Costs Rs.'000	**551**	**792**	**1,478**	**2,374**	**1,775**	**2,006**	**8,976**
3.1 Administration (2%)	181	263	487	783	584	659	2,957
3.2 Other Costs	0	0	0	0	0	0	0
3.3 Tax & Duty	370	529	991	1,591	1,191	1,347	6,019
Economic Project Cost figures for IRR calculatin	**8,965**	**12,654**	**23,937**	**38,400**	**28,831**	**32,701**	**145,488**
(SCF = 0.95) before Allocation	**8,965**	**12,654**	**23,937**	**38,400**	**28,831**	**32,701**	**145,488**
1. Procurement and Works Rs.'000	**8,595**	**12,478**	**23,135**	**37,177**	**27,746**	**31,283**	**140,414**
1.1 Institutional Develop. Progran Rs.'000	0	0	0	0	0	0	0
1.2 Farmers' Support Program	964	8,042	6,335	11,456	5,388	2,538	34,723
1.3 Infra. Develop. Prgram	6,850	3,302	14,697	22,341	19,836	25,901	92,927
1.4 Price Escalation	0	0	0	0	0	0	0
1.5 Physical Contingency	781	1,134	2,103	3,380	2,522	2,844	12,764
2. Survey, Design and Supervision Rs.'000	**370**	**176**	**802**	**1,223**	**1,085**	**1,418**	**5,074**
2.1 Consultants (5% of 1.3 (1))	336	160	729	1,112	986	1,289	4,612
2.2 Price Escalation	0	0	0	0	0	0	0
2.3 Physical Contingency	34	16	73	111	99	129	462
3. Administration and Other Costs Rs.'000	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3.1 Administration (2%)	0	0	0	0	0	0	0
3.2 Other Costs	0	0	0	0	0	0	0
3.3 Tax & Duty	0	0	0	0	0	0	0
Economic Benefit Rs.'000	1,107	1,742	3,932	2,811	2,803	2,575	14,970
Proportion against Economic Cost	12.3%	13.8%	16.4%	7.3%	9.7%	7.9%	10.3%
Economic Evaluation							
EIRR: Base (all cost)	10.3%	11.9%	14.8%	3.5%	7.0%	4.4%	7.7%
Net Present Value (NPV at 12% discount rate)							
Benefit	7,242	11,393	25,720	18,334	18,334	16,845	97,929
Cost	8,127	11,471	21,699	34,810	26,136	29,644	131,887
Balance	-885	-78	4,021	-16,476	-7,801	-12,799	-33,959
Benefit Cost Ratio (B/C)	0.89	0.99	1.19	0.53	0.70	0.57	0.74
Cost after Allocation	**8,129**	**8,668**	**19,824**	**22,964**	**17,717**	**16,378**	**93,680**
1. Procurement and Works Rs.'000	7,788	8,540	19,071	22,164	17,040	15,697	90,300
1.1 Institutional Develop. Program	0	0	0	0	0	0	0
1.2 Farmers' Support Program	768	5,321	3,534	5,481	3,065	1,773	19,942
1.3 Infra. Develop. Prgram	6,312	2,443	13,803	14,668	12,426	12,497	62,149
(1) Infra. Develop./Improve.	6,194	2,324	13,684	14,549	12,307	12,378	
1.4 Price Escalation	0	0	0	0	0	0	0
1.5 Physical Contingency	708	776	1,734	2,015	1,549	1,427	8,209
2. Survey, Design and Supervision Rs.'000	**341**	**128**	**753**	**800**	**677**	**681**	**3,380**
3. Administration and Other Costs Rs.'000	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Economic Evaluation after Cost Allocation							
EIRR after Cost Allocation	11.7%	18.7%	18.5%	10.1%	14.2%	14.1%	14.4%
Net Present Value							
Benefit	7,242	11,393	25,720	18,334	18,334	16,845	97,929
Cost	7,369	7,858	17,971	20,817	16,061	14,847	84,922
Balance	-127	3,535	7,749	-2,483	2,274	1,998	13,006
Benefit Cost Ratio (B/C)	0.98	1.45	1.43	0.88	1.14	1.13	1.15