**DEPARTMENT OF AGRICULTURE,**
**THE STATE GOVERNMENT OF HIMACHAL PRADESH**

# THE STUDY
# ON
# DIVERSIFIED AGRICULTURE
# FOR
# ENHANCED FARM INCOME
# IN
# THE STATE OF HIMACHAL PRADESH

## FINAL REPORT

## VOLUME-III
## ANNEXES PART-2

**MARCH 2009**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**NIPPON KOEI CO., LTD.**

**THE STUDY ON DIVERSIFIED AGRICULTURE FOR ENHANCED FARM INCOME IN THE STATE OF HIMACHAL PRADESH**

**FINAL REPORT**

**LIST OF VOLUMES**


## VOLUME-I MAIN REPORT

## VOLUME-II ANNEXES PART-1

ANNEX-A NATIONAL AND SOCIO-ECONOMIC BACKGROUND

ANNEX-B AGRICULTURE

ANNEX-C AGRICULTURE-ALLIED SECTORS

- ANNEX-CA HORTICULTURE
- ANNEX-CB ANIMAL HUSBANDRY
- ANNEX-CC FISHERY

ANNEX-D CATEGORIZATION OF DIVERSIFIED AGRICULTURAL PATTERNS

ANNEX-E AGRICULTURAL SUPPORTING SERVICES

ANNEX-F MARKETING

ANNEX-G POST-HARVEST PROCESSING AND STORAGE FACILITIES

ANNEX-H INFRASTRUCTURE

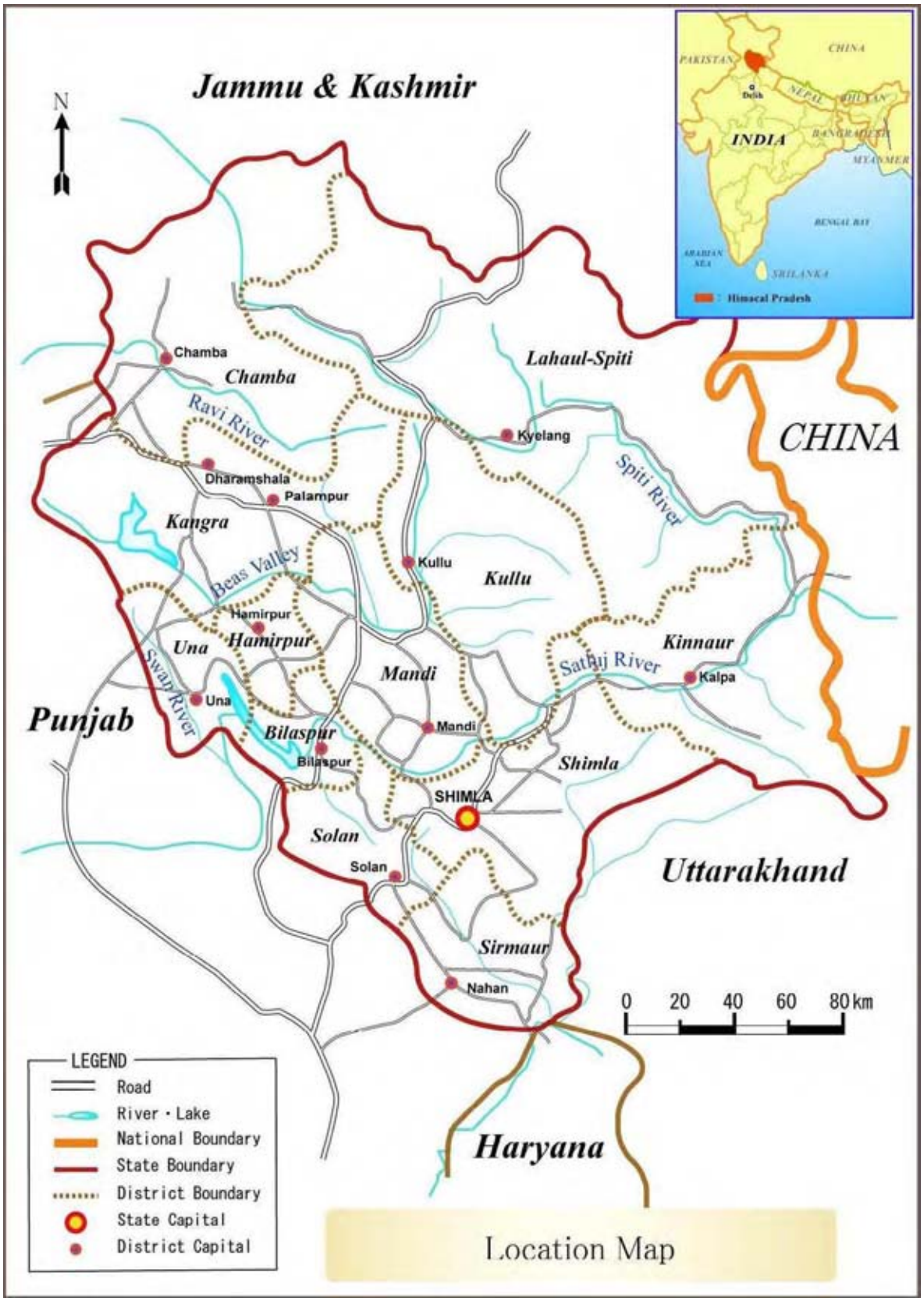
ANNEX-I IMPLEMENTATION PLAN, COST ESTIMATE AND PROJECT EVALUATION

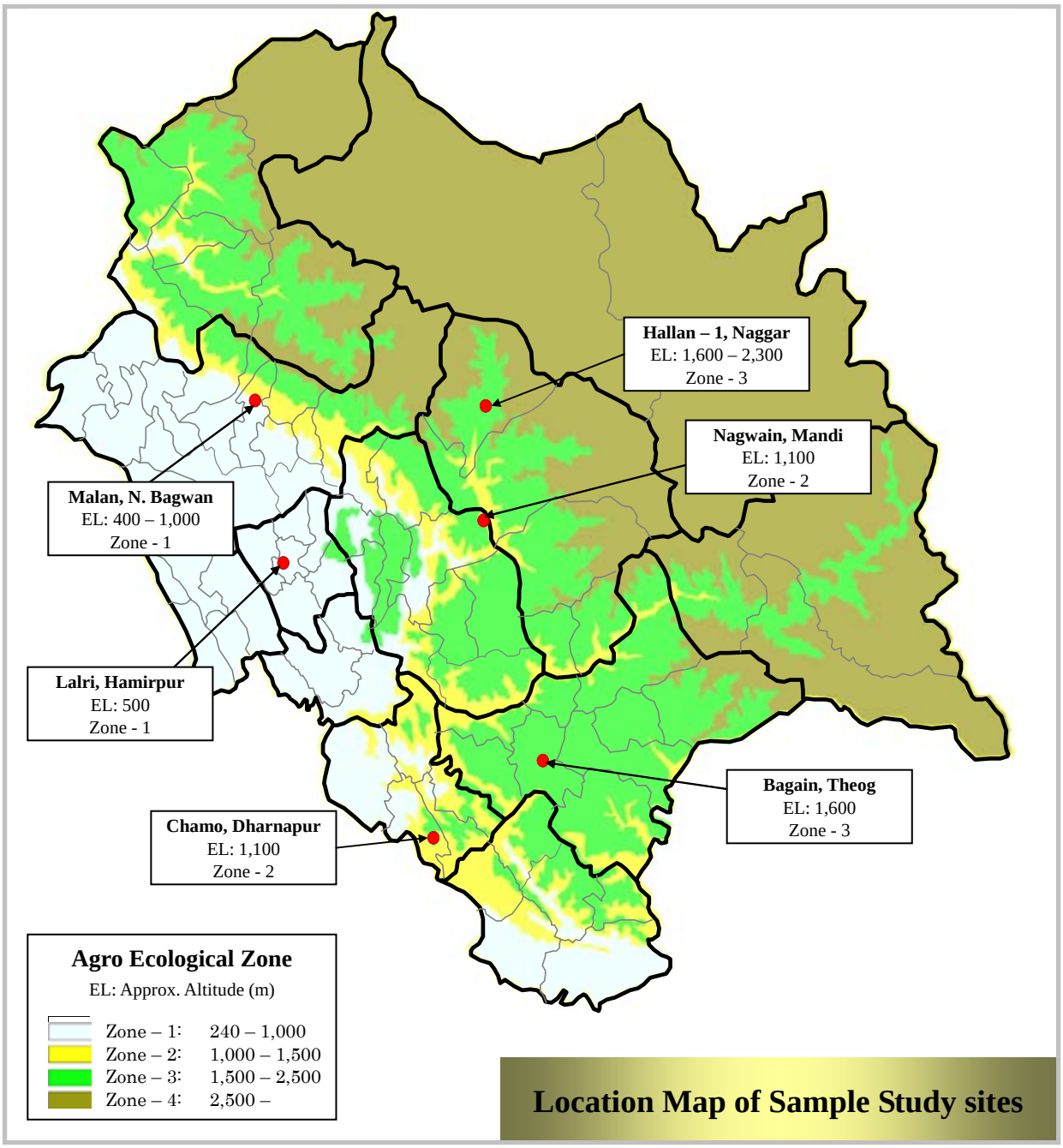
ANNEX-J WORKSHOP

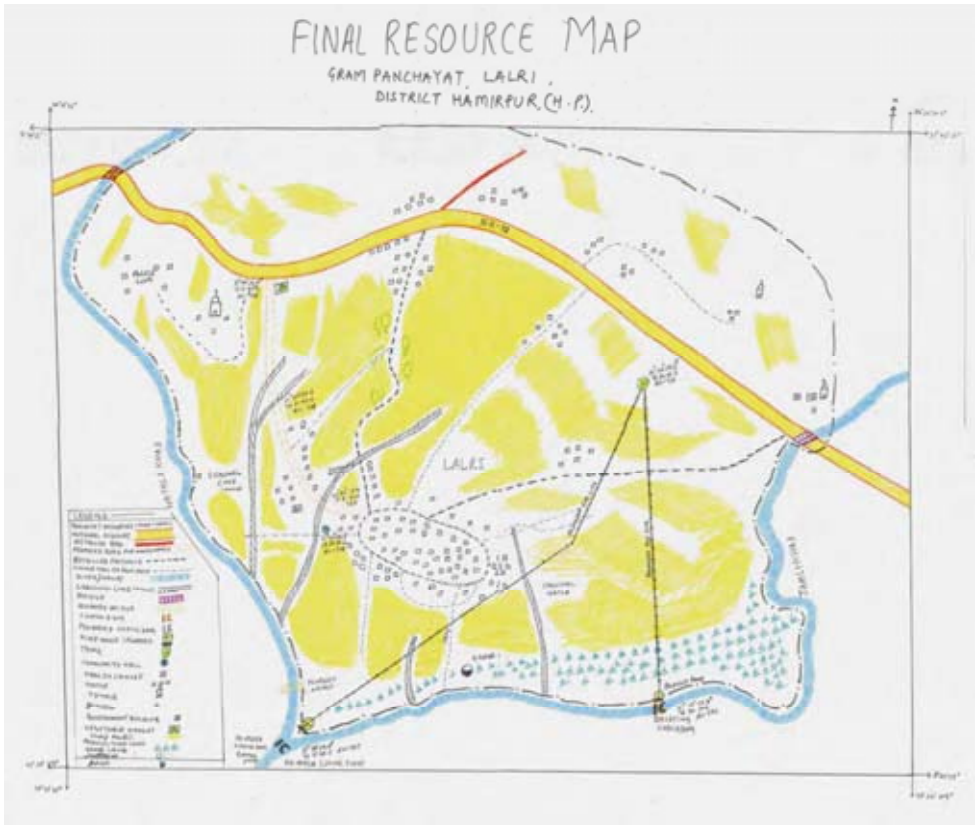
ANNEX-K ENVIRONMENTAL & SOCIAL CONSIDERATION

## VOLUME-III ANNEXES PART-2

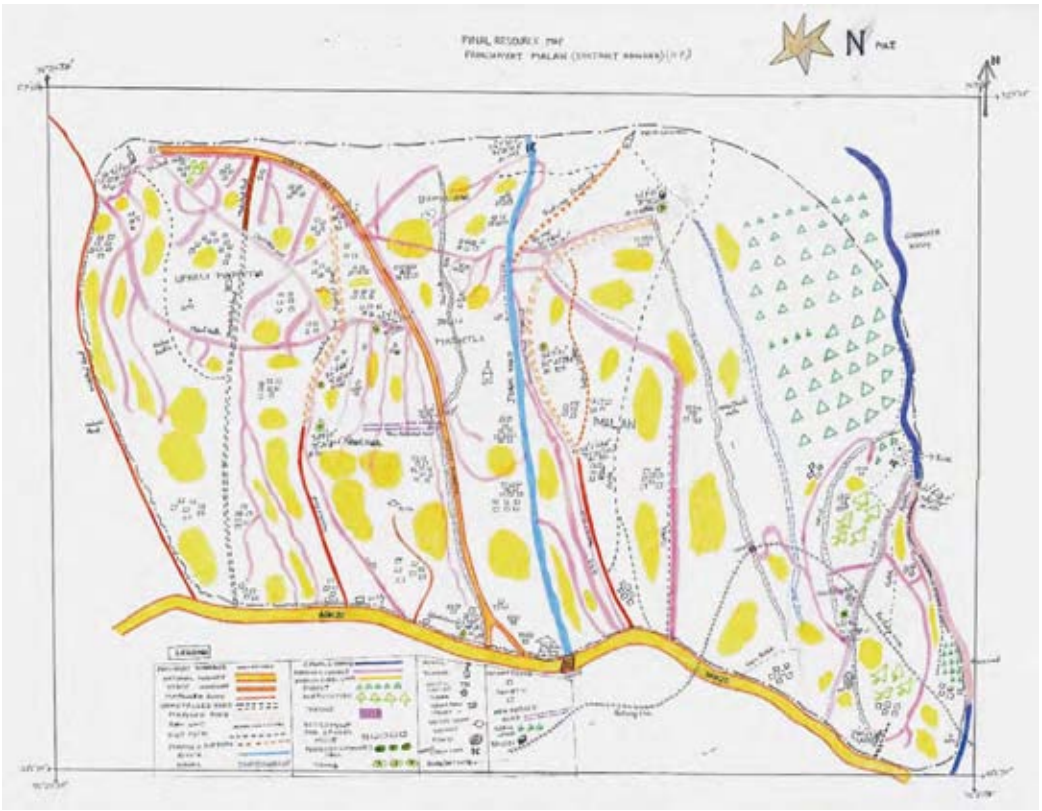
ANNEX-L SAMPLE STUDY AT PRE-FEASIBILITY STUDY LEVEL


Jammu & Kashmir
N
CHINA
PAKISTAN
NEPAL
INDIA
BANGLADESH
MYANMER
BENGAL BAY
ARABIAN SEA
SRILANKA
Himacal Pradesh
Chamba
Chamba
Ravi River
Lahaul-Spiti
Kyelang
Spiti River
CHINA
Dharamshala
Palampur
Kangra
Beas Valley
Kullu
Kullu
Hamirpur
Hamirpur
Una
Swan River
Mandi
Satluj River
Kinnaur
Kalpa
Una
Punjab
Bilaspur
Bilaspur
Mandi
Shimla
SHIMLA
Solan
Solan
Uttarakhand
Sirmaur
Nahan
0 20 40 60 80 km
LEGEND
Road
River・Lake
National Boundary
State Boundary
District Boundary
State Capital
District Capital
Haryana
Location Map

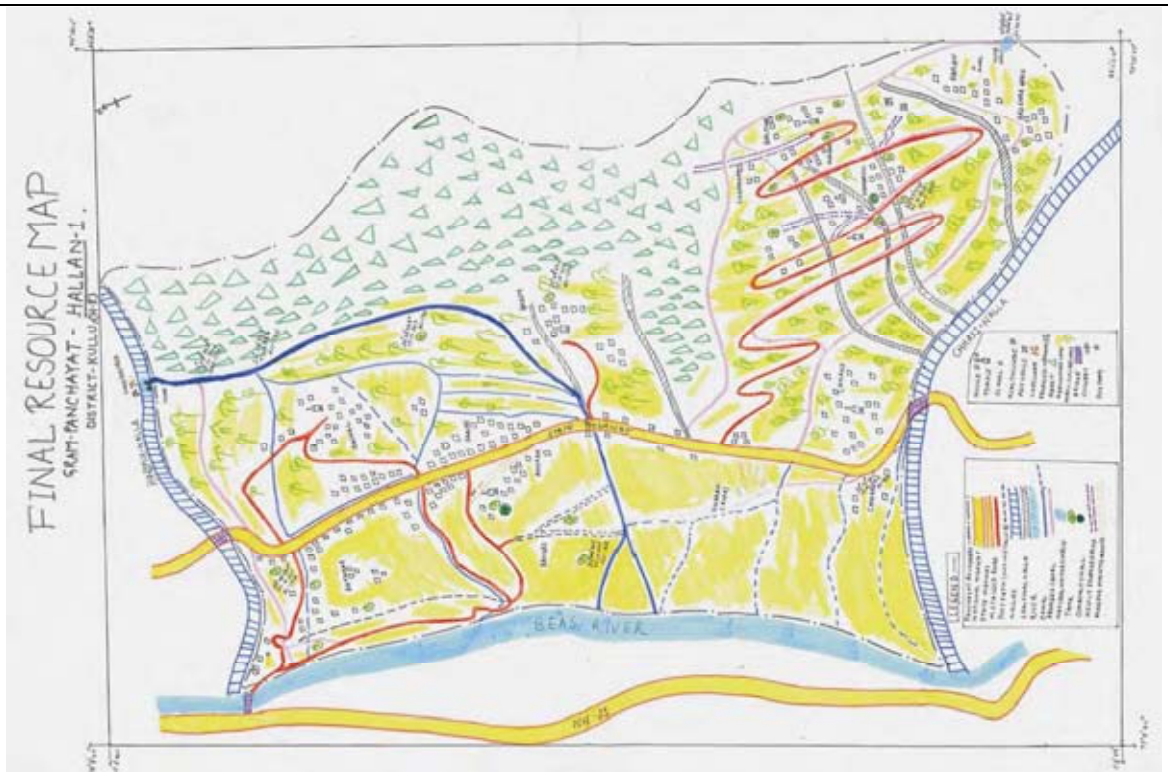

Hallan – 1, Naggar
EL: 1,600 – 2,300
Zone - 3
Nagwain, Mandi
EL: 1,100
Zone - 2
Malan, N. Bagwan
EL: 400 – 1,000
Zone - 1
Lalri, Hamirpur
EL: 500
Zone - 1
Bagain, Theog
EL: 1,600
Zone - 3
Chamo, Dharnapur
EL: 1,100
Zone - 2
Agro Ecological Zone
EL: Approx. Altitude (m)
Zone – 1: 240 – 1,000
Zone – 2: 1,000 – 1,500
Zone – 3: 1,500 – 2,500
Zone – 4: 2,500 –
Location Map of Sample Study sites



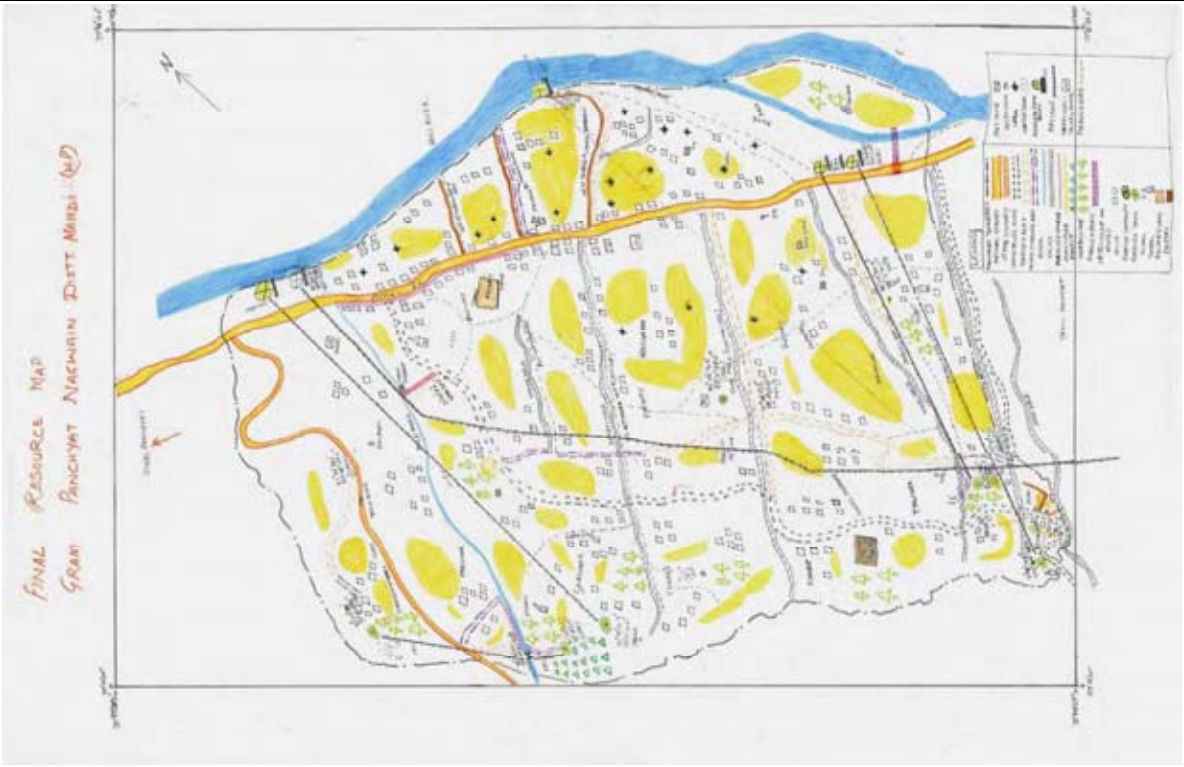

**Resource Mapping for Lalri Site in Hamirpur Block (Hamirpur District)**



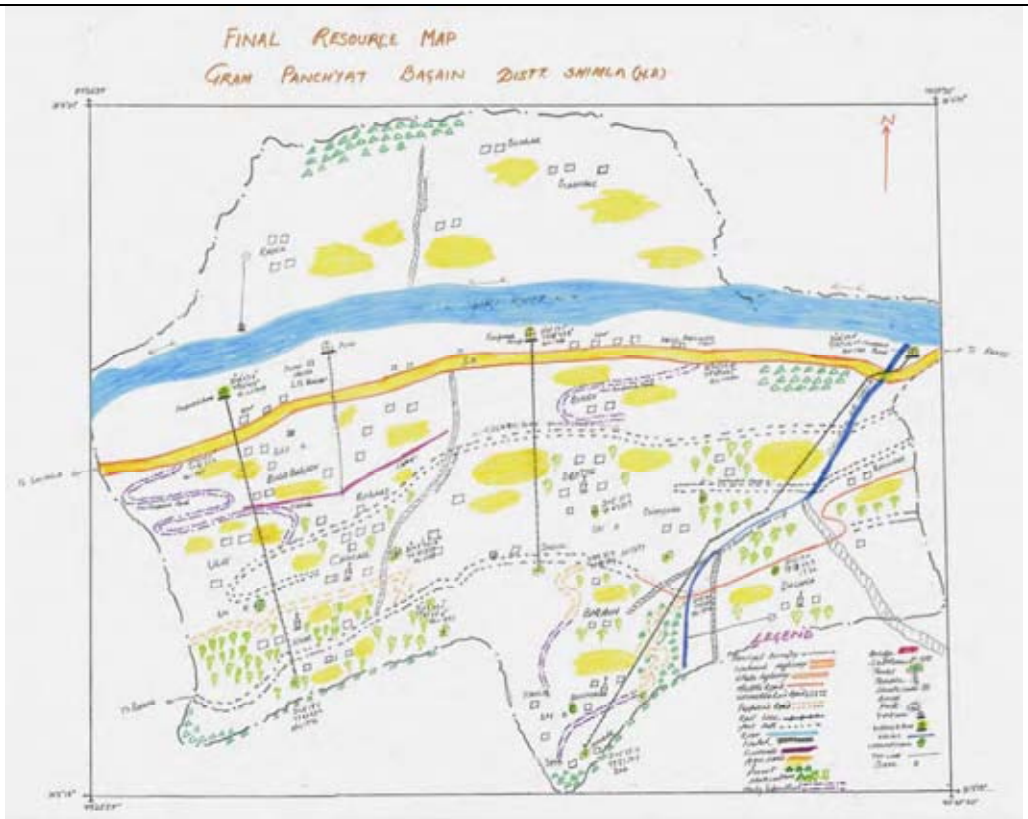

**Resource Mapping for Malan Site in Nagrota Bagwan Block (Kangra District)**



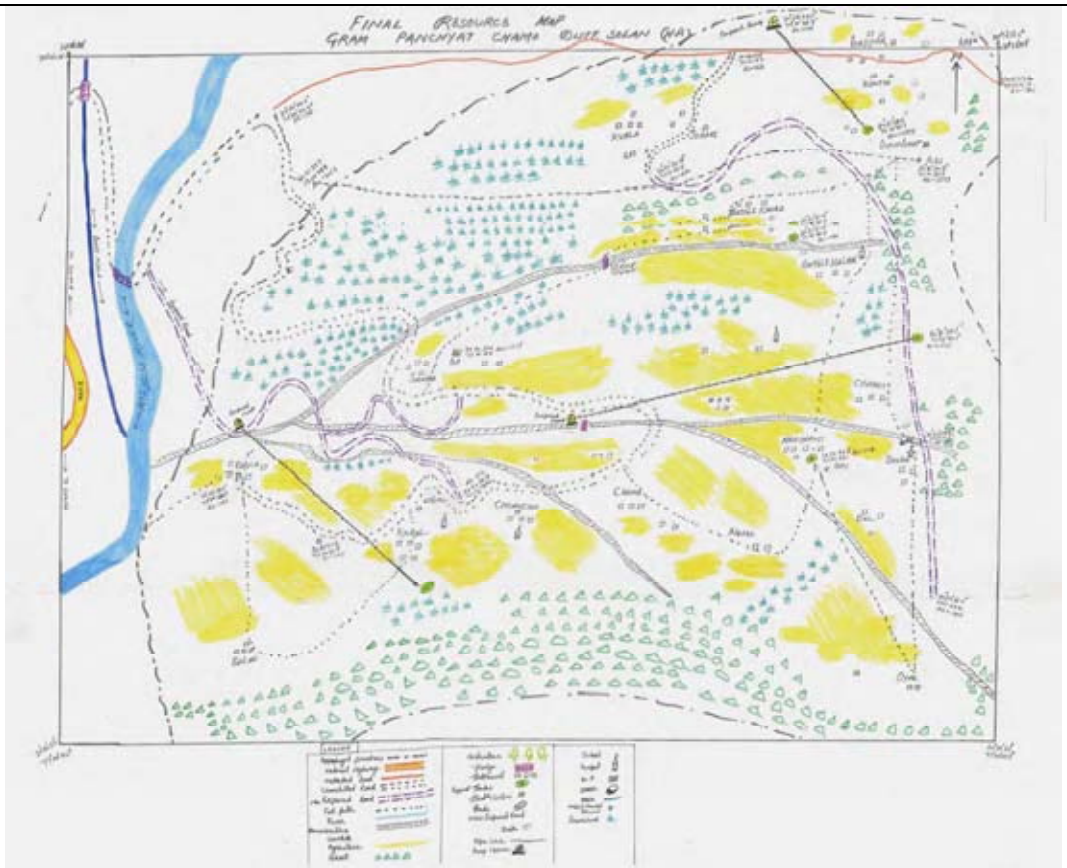

**Resource Mapping for Hallan-I Site in Naggar Block (Kullu District)**




**Resource Mapping for Nagwain Site in Mandi Sadar Block (Mandi District)**




**Resource Mapping for Bagain Site in Theog Block (Shimla District)**




**Resource Mapping for Chamo Site in Dharampur Block (Solan District)**

# *ANNEX-L*

*Sample Study*
*at Pre-Feasibility Study Level*

**THE STUDY ON DIVERSIFIED AGRICULTURE FOR ENHANCED FARM INCOME IN THE STATE OF HIMACHAL PRADESH**

**FINAL REPORT**

**ANNEX-L**
**SAMPLE STUDY AT PRE-FEASIBILITY STUDY LEVEL**

**Table of Contents**


Page

L-1 General ..... L-1- 1
L-1.1 Objectives of Sample Study at Pre-feasibility Study Level ..... L-1- 1
L-1.2 Selection of Representative Model Areas and Study Sites ..... L-1- 1
L-1.3 Outline of Sample Study Results ..... L-1- 2

L-2 Lalri Site in Hamirpur Model Area ..... L-2 - 1
L-2.1 Present Socio-economic and Natural Conditions ..... L-2 - 1
L-2.2 Present Agriculture ..... L-2 - 2
L-2.3 Present Agriculture-Allied Sector ..... L-2 - 4
L-2.4 Present Irrigation ..... L-2 - 8
L-2.5 Present Farm Road ..... L-2 - 8
L-2.6 Present Post-Harvest Handling and Processing ..... L-2 - 10
L-2.7 Present Crop Marketing and Market Facilities ..... L-2 - 11
L-2.8 Present Farmers' Group and Agricultural Support Services ..... L-2 - 14
L-2.9 Vegetable Promotion and Agricultural Support Plan ..... L-2 - 15
L-2.10 Post-Harvest Processing and Marketing Plan ..... L-2 - 18
L-2.11 Infrastructure Development Plan ..... L-2 – 19

L-3 Malan Site in Nagrota Bagwan Model Areas ..... L-3 - 1
L-3.1 Present Socio-economic and Natural Conditions ..... L-3 - 1
L-3.2 Present Agriculture ..... L-3 - 2
L-3.3 Present Agriculture-Allied Sector ..... L-3 - 4
L-3.4 Present Irrigation ..... L-3 - 5
L-3.5 Present Farm Road ..... L-3 - 6
L-3.6 Present Post-Harvest Handling and Processing ..... L-3 - 7
L-3.7 Present Crop Marketing and Market Facilities ..... L-3 - 9
L-3.8 Present Farmers' Group and Agricultural Support Services ..... L-3 - 12
L-3.9 Vegetable Promotion and Agricultural Support Plan ..... L-3 - 12
L-3.10 Post-Harvest Processing and Marketing Plan ..... L-3 - 16
L-3.11 Infrastructure Development Plan ..... L-3 – 16

L-4 Hallan-I Site in Naggar Model Area Model Areas ..... L-4 - 1
L-4.1 Present Socio-economic and Social Conditions ..... L-4 - 1
L-4.2 Present Agriculture ..... L-4 - 2
L-4.3 Present Agriculture-Allied Sector ..... L-4 - 4

L-4.4 Present Irrigation ..... L-4 - 5
L-4.5 Present Farm Road ..... L-4 - 7
L-4.6 Present Post-Harvest Handling and Processing ..... L-4 - 8
L-4.7 Present Crop Marketing and Market Facilities ..... L-4 - 10
L-4.8 Present Farmers' Group and Agricultural Support Services ..... L-4 - 12
L-4.9 Vegetable Promotion and Agricultural Support Plan ..... L-4 - 12
L-4.10 Post-Harvest Processing and Marketing Plan ..... L-4 - 16
L-4.11 Infrastructure Development Plan ..... L-4 – 17

L-5 Nagwain Site in Mandi Model Areas ..... L-5 - 1
L-5.1 Present Socio-economic and Natural Conditions ..... L-5 - 1
L-5.2 Present Agriculture ..... L-5 - 2
L-5.3 Present Agriculture-Allied Sector ..... L-5 - 4
L-5.4 Present Irrigation ..... L-5 - 5
L-5.5 Present Farm Road ..... L-5 - 6
L-5.6 Present Post-Harvest Handling and Processing ..... L-5 - 7
L-5.7 Present Crop Marketing and Market Facilities ..... L-5 - 8
L-5.8 Present Farmers' Group and Agricultural Support Services ..... L-5 - 11
L-5.9 Vegetable Promotion and Agricultural Support Plan ..... L-5 - 12
L-5.10 Post-Harvest Processing and Marketing Plan ..... L-5 - 15
L-5.11 Infrastructure Development Plan ..... L-5 – 16

L-6 Bagain Site in Theog Model Areas ..... L-6 - 1
L-6.1 Present Socio-economic and Natural Conditions ..... L-6 - 1
L-6.2 Present Agriculture ..... L-6 - 2
L-6.3 Present Agriculture-Allied Sector ..... L-6 - 4
L-6.4 Present Irrigation ..... L-6 - 5
L-6.5 Present Farm Road ..... L-6 - 6
L-6.6 Present Post-Harvest Handling and Processing ..... L-6 - 7
L-6.7 Present Crop Marketing and Market Facilities ..... L-6 - 8
L-6.8 Present Farmers' Group and Agricultural Support Services ..... L-6 - 11
L-6.9 Vegetable Promotion and Agricultural Support Plan ..... L-6 - 12
L-6.10 Post-Harvest Processing and Marketing Plan ..... L-6 - 15
L-6.11 Infrastructure Development Plan ..... L-6 – 15

L-7 Chamo Site in Charampur Model Areas ..... L-7 - 1
L-7.1 Present Socio-economic and Natural Conditions ..... L-7 - 1
L-7.2 Present Agriculture ..... L-7 - 3
L-7.3 Present Agriculture-Allied Sector ..... L-7 - 5
L-7.4 Present Irrigation ..... L-7 - 6
L-7.5 Present Farm Road ..... L-7 - 7
L-7.6 Present Post-Harvest Handling and Processing ..... L-7 - 8
L-7.7 Present Crop Marketing and Market Facilities ..... L-7 - 9
L-7.8 Present Farmers' Group and Agricultural Support Services ..... L-7 - 12
L-7.9 Vegetable Promotion and Agricultural Support Plan ..... L-7 - 13

L-7.10 Post-Harvest Processing and Marketing Plan ..... L-7 - 16
L-7.11 Infrastructure Development Plan ..... L-7 – 16

L-8 Initial Environment Examination of Sample Study at Pre-F/S Level ..... L-8 - 1
L-8.1 General ..... L-8 - 1
L-8.2 Environment of Lalri Site ..... L-8 - 1
L-8.3 Environment of Mallan Site ..... L-8 - 6
L-8.4 Environment of Hallan-I Site ..... L-8 - 10
L-8.5 Environment of Nagwain Site ..... L-8 - 16
L-8.6 Environment of Bagain Site ..... L-8 - 22
L-8.7 Environment of Chamo Site ..... L-8 – 28

L-9 Economic Evaluation of the Sample Study Sites ..... L-9 - 1
L-9.1 Benefit in Each Sample Study Sites ..... L-9 - 1
L-9.2 Project Cost ..... L-9 - 4
L-9.3 Evaluation Results ..... L-9 - 5

## List of Tables

Page

Table L-1.1 Representative Model Areas and Study Sites ..... L-1 - 1
Table L-1.2 General Features of Sample Study Sites ..... L-1 - 2
Table L-2.1.1 Socio-economic and Natural Condition of Lalri Site ..... L-2 - 1
Table L-2.1.2 Village-wise Population Details of Ward No.11 ..... L-2 - 1
Table L-2.2.1 Existing Cropping Pattern of Lalri Site ..... L-2 - 2
Table L-2.2.2 Fertilizer Use in Lalri Panchayat ..... L-2 - 3
Table L-2.2.3 Present Condition of Animal Husbandry ..... L-2 - 7
Table L-2.6.1 Private Agro-Processing Plants in Hamirpur District ..... L-2 - 10
Table L-2.7.1 Constraints and Countermeasures concerning Enhancement of Marketing System L-2 - 13
Table L-2.8.1 Farmers Organization of Lalri Site ..... L-2 - 14
Table L-2.9.1 Proposed Cropping Area of Lalri Site ..... L-2 - 16
Table L-2.11.1 Salient Features of Infrastructure Development Plan ..... L-2 - 19
Table L-2.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-2 - 20
Table L-3.1.1 Socio-economic and Natural Conditions of Malan Site ..... L-3 - 1
Table L-3.1.2 Population Distribution of Malan Panchayat ..... L-3 - 1
Table L-3.2.1 Existing Cropping Pattern of Malan Site ..... L-3 - 2
Table L-3.2.2 Fertilizer Use in Malan in the Year 2007 - 2008 ..... L-3 - 3
Table L-3.4.1 Main Irrigation System in Malan Site ..... L-3 - 5
Table L-3.4.2 Present Irrigation Practice in Malan Site ..... L-3 - 6
Table L-3.6.1 Private Agro-Processing Plants in Kangra District ..... L-3 - 8
Table L-3.6.2 Typical Women's Agro-Processing Group in Kangra District ..... L-3 - 8
Table L-3.9.1 Proposed Cropping Pattern of Malan Site ..... L-3 - 13
Table L-3.11.1 Salient Features of Infrastructure Development Plan ..... L-3 - 17
Table L-3.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-3 - 18
Table L-4.1.1 Socio-economic and Natural Conditions of Hallan-I Site ..... L-4 - 1

Table L-4.1.2 Village-wise Population Details of Hallan-I Panchayat ..... L-4 - 1
Table L-4.2.1 Existing Cropping Pattern of Hallan-I Site ..... L-4 - 2
Table L-4.2.2 Fertilizer Used in Hallan-I Panchayat ..... L-4 - 4
Table L-4.4.1 Main Irrigation System in Hallan-I Site ..... L-4 - 6
Table L-4.4.2 Present Irrigation Practice in Hallan-I Site ..... L-4 - 6
Table L-4.6.1 Private Agro-Processing Plants in Kullu District ..... L-4 - 9
Table L-4.8.1 Farmers Organization of Hallan-I Site ..... L-4 - 12
Table L-4.9.1 Proposed Cropping Pattern of Hallan-I Site ..... L-4 - 13
Table L-4.11.1 Salient Features of Infrastructure Development Plan ..... L-4 - 18
Table L-4.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-4 - 19
Table L-5.1.1 Socio-economic and Natural Conditions of Nagwain Site ..... L-5 - 1
Table L-5.1.2 Village-wise Population Details of Nagwain Panchayat ..... L-5 - 1
Table L-5.2.1 Existing Cropping Pattern of Nagwain Site ..... L-5 - 2
Table L-5.2.2 Fertilizer Use in Nagwain Panchayat ..... L-5 - 3
Table L-5.4.1 Main Irrigation System in Nagwain Site ..... L-5 - 5
Table L-5.4.2 Present Irrigation Practice in Nagwain Site ..... L-5 - 6
Table L-5.6.1 Details of Private Agro-Processing Plants in Mandi District ..... L-5 - 8
Table L-5.8.1 Farmers Organizations of Nagwain Site ..... L-5 - 11
Table L-5.9.1 Proposed Cropping Pattern of Nagwain Site ..... L-5 - 13
Table L-5.11.1 Salient Features of Infrastructure Development Plan ..... L-5 - 17
Table L-5.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-5 - 19
Table L-6.1.1 Socio-economic and Natural Conditions of Bagain Site ..... L-6 - 1
Table L-6.1.2 Village-wise Population Details of Bagain Panchayat ..... L-6 - 1
Table L-6.2.1 Existing Cropping Pattern of Bagain Site ..... L-6 - 2
Table L-6.2.2 Fertilizer Use in Bagain Panchayat ..... L-6 - 3
Table L-6.4.1 Main Irrigation System in Bagain Site ..... L-6 - 5
Table L-6.4.2 Present Irrigation Practice in Bagain Site ..... L-6 - 6
Table L-6.6.1 Details of Private Agro-Processing Plants in Shimla District ..... L-6 - 8
Table L-6.8.1 Farmers Organization of Bagain Site ..... L-6 - 11
Table L-6.9.1 Proposed Cropping Pattern of Bagain Site ..... L-6 - 12
Table L-6.11.1 Salient Features of Infrastructure Development Plan ..... L-6 - 16
Table L-6.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-6 - 18
Table L-7.1.1 Socio-economic and Natural Conditions of Chamo Site ..... L-7 - 1
Table L-7.1.2 Village-wise Population Details of Chamo Panchayat ..... L-7 - 2
Table L-7.2.1 Existing Cropping Pattern of Chamo Site ..... L-7 - 3
Table L-7.2.2 Fertilizer Use in Chamo Panchayat ..... L-7 - 4
Table L-7.4.1 Main Irrigation System in Chamo Site ..... L-7 - 6
Table L-7.4.2 Present Irrigation Practice in Chamo Site ..... L-7 - 6
Table L-7.6.1 Details of Private Agro-Processing Plants in Solan District ..... L-7 - 8
Table L-7.8.1 Farmers Organization of Chamo Site ..... L-7 - 12
Table L-7.9.1 Proposed Cropping Pattern of Chamo Site ..... L-7 - 13
Table L-7.11.1 Salient Features of Infrastructure Development Plan ..... L-7 - 17
Table L-7.11.2 Preliminary Cost Estimate of Infrastructure Development ..... L-7 - 19
Table L-8.2.1 Description of Lalri Site ..... L-8 - 1
Table L-8.2.2 Village wise Population Details of Ward No. 11 ..... L-8 - 2

Table L-8.2.3 IPH Water Supply Scheme for Lalri ..... L-8 - 2
Table L-8.2.4 Natural and Climatic Condition in Lalri Site ..... L-8 - 3
Table L-8.2.5 Water Quality Survey Result in Lalri Site ..... L-8 - 4
Table L-8.2.6 Initial Environmental Examination Impact Matrix in Lalri Site ..... L-8 - 4
Table L-8.2.7 Major Possible Impact and Direction for Mitigation Measures in Lalri Site ..... L-8 - 5
Table L-8.3.1 Project Description of Malan Site ..... L-8 - 6
Table L-8.3.2 Population Distribution of Malan Panchayat ..... L-8 - 6
Table L-8.3.3 IPH Water Supply Scheme for Malan Panchayat ..... L-8 - 7
Table L-8.3.4 Natural and Climatic Condition in Malan Site ..... L-8 - 8
Table L-8.3.5 Initial Environmental Examination Impact Matrix in Malan Site ..... L-8 - 9
Table L-8.3.6 Major Possible Impact and Direction for Mitigation Measures in Malan Site .... L-8 - 10
Table L-8.4.1 Project Description of Hallan-I Site ..... L-8 - 11
Table L-8.4.2 Village wise Population Details of Hallan Panchayat ..... L-8 - 11
Table L-8.4.3 IPH Water Supply Scheme for Hallan Panchayat ..... L-8 - 12
Table L-8.4.4 IPH Irrigation scheme on Chakki Nallah, Hallan-I Panchayat ..... L-8 - 12
Table L-8.4.5 Natural and Climatic Condition in Hallan-I Site ..... L-8 - 13
Table L-8.4.6 Initial Environmental Examination Impact Matrix in Hallan-I Site ..... L-8 - 14
Table L-8.4.7 Major Possible Impact and Direction for Mitigation Measures in Hallan-I Site . L-8 - 15
Table L-8.5.1 Project Description of Nagwain Site ..... L-8 - 17
Table L-8.5.2 Village-wise Population Details of Nagwain Panchayat ..... L-8 - 17
Table L-8.5.3 IPH Water Supply Scheme for Nagwain Panchayat ..... L-8 - 18
Table L-8.5.4 IPH Irrigation for Nagwain Panchayat ..... L-8 - 18
Table L-8.5.5 Natural and Climatic Condition in Nagwain Site ..... L-8 - 19
Table L-8.5.6 Initial Environmental Examination Impact Matrix in Nagwain Site ..... L-8 - 20
Table L-8.5.7 Major Possible Impact and Direction for Mitigation Measures in Nagwain Site L-8 - 21
Table L-8.6.1 Project Description of Bagain Site ..... L-8 - 22
Table L-8.6.2 Village-wise Population Details of Bagain Panchayat ..... L-8 - 23
Table L-8.6.3 IPH Water Supply Scheme for Bagain Panchayat ..... L-8 - 24
Table L-8.6.4 Natural and Climatic Condition in Bagain Site ..... L-8 - 25
Table L-8.6.5 Forest Area in Bagain Panchayat ..... L-8 - 25
Table L-8.6.6 Initial Environmental Examination Impact Matrix in Bagain Site ..... L-8 - 26
Table L-8.6.7 Major Possible Impact and Direction for Mitigation Measures in Bagain Site ... L-8 - 27
Table L-8.7.1 Project Description of Chamo Site ..... L-8 - 28
Table L-8.7.2 Village-wise Population Details of Chamo Panchayat ..... L-8 - 29
Table L-8.7.3 IPH Water Supply Scheme for Chamo Panchayat ..... L-8 - 30
Table L-8.7.4 Natural and Climatic Condition in Chamo Site ..... L-8 - 31
Table L-8.7.5 Initial Environmental Examination Impact Matrix in Chamo Site ..... L-8 - 32
Table L-8.7.6 Major Possible Impact and Direction for Mitigation Measures in Chamo Site... L-8 - 33
Table L-9.1.1 Present Cropping Area in Sample Study Sites ..... L-9 - 1
Table L-9.1.2 Future Cropping Area in Sample Study Sites ..... L-9 - 2
Table L-9.1.3 Present and Future Unit Yields of Sample Study Sites ..... L-9 - 2
Table L-9.1.4 Present Crop Production of Sample Study Sites ..... L-9 - 3
Table L-9.1.5 Economic Net Production Value per ha ..... L-9 - 3
Table L-9.1.6 Total Net Production Value and Incremental ..... L-9 - 4
Table L-9.2.1 Requirement of Farmers Support Program ..... L-9 - 4

Table L-9.2.2 Summary of Financial Cost ..... L-9 - 5
Table L-9.2.3 Summary of Economic Cost ..... L-9 - 5
Table L-9.3.1 Results of Economic Evaluation ..... L-9 - 5
Table L-9.3.2 Summary of Economic Cost after Cost Allocation ..... L-9 - 6
Table L-9.3.3 Results of Economic Evaluation after Cost Allocation ..... L-9 - 6

## List of Figures

Page

Fig. L-1.1 Location of Representative Model Areas ..... L-1 - 1
Fig. L-2.1.1 Location Map of Lalri Site ..... L-2 - 1
Fig. L-2.2.1 Existing Cropping Calendar of Lalri Site ..... L-2 - 2
Fig. L-2.4.1 General Layout of Larli Site ..... L-2 - 8
Fig. L-2.5.1 Trunk Road in Hamirpur Block ..... L-2 - 9
Fig. L-2.5.2 Road and Villages in Lalri Site ..... L-2 - 9
Fig. L-2.7.1 Distribution Channel of Vegetables in Hamirpur District ..... L-2 - 11
Fig. L-2.7.2 Proportion on Arrival of Vegetables from Districts fo H.P. and Outside H.P. ... L-2 - 11
Fig. L-2.7.3 Location of Market Yards of APMC in Hamirpur District ..... L-2 - 12
Fig. L-2.9.1 Proposed Cropping Calendar of Lalri Site ..... L-2 - 16
Fig. L-2.11.1 Location Map of Infrastructure Development Plan ..... L-2 - 20
Fig. L-3.1.1 Location Map of Malan Site ..... L-3 - 1
Fig. L-3.2.1 Existing Cropping Calendar of Malan Site ..... L-3 - 2
Fig. L-3.4.1 General Layout of Malan Site ..... L-3 - 5
Fig. L-3.5.1 Trunk Road of Nagrota Bagwan ..... L-3 - 7
Fig. L-3.5.2 Roads and Villages in Malan Site ..... L-3 - 7
Fig. L.3.7.1 Proportion on Arrival of Vegetables from Local and Outside the State ..... L-3 - 9
Fig. L-3.7.2 Distribution Channel of Vegetables in Kangra District ..... L-3 - 10
Fig. L-3.7.3 Location of Market Yards of APMC in Kangra District ..... L-3 - 11
Fig. L-3.9.1 Proposed Cropping Calendar of Malan Site ..... L-3 - 14
Fig. L-3.11.1 Location Map of Infrastructure Development Plan ..... L-3 - 18
Fig. L-4.1.1 Location Map of Hallan-I Site ..... L-4 - 1
Fig. L-4.2.1 Existing Cropping Calendar of Hallan-I Site ..... L-4 - 3
Fig. L-4.4.1 General Layout of Hallan-I Site ..... L-4 - 6
Fig. L-4.5.1 Trunk Road of Naggar Block ..... L-4 - 7
Fig. L-4.5.2 Roads and Villages in Hallan-I Site ..... L-4 - 7
Fig. L-4.7.1 Distribution Channel of Vegetables in Kullu District ..... L-4 - 10
Fig. L-4.7.2 Proportion on Arrival of Vegetables from Local and Outside the State ..... L-4 - 10
Fig. L-4.7.3 Location of Market Yards of APMC in Kullu District ..... L-4 - 11
Fig. L-4.9.1 Proposed Cropping Calendar of Hallan-I Site ..... L-4 - 14
Fig. L-4.11.1 Location Map of Infrastructure Development Plan ..... L-4 - 18
Fig. L-5.1.1 Location Map of Nagwain Site ..... L-5 - 1
Fig. L-5.2.1 Existing Cropping Calendar of Nagwain Site ..... L-5 - 3

Fig. L-5.4.1 General Layout of Nagwain Site ..... L-5 - 5
Fig. L-5.5.1 Road Category of Mandi Sadar Block ..... L-5 - 6
Fig. L-5.5.2 Roads and Villages in Nagwain Site ..... L-5 - 6
Fig. L-5.7.1 Distribution Channel of Vegetables in Mandi District ..... L-5 - 8
Fig. L-5.7.2 Proportion on Arrival of Vegetables from Local and Outside the State at Mandi Market Yard ..... L-5 - 9
Fig. L-5.7.3 Location of Market Yards of APMC in Mandi District ..... L-5 - 10
Fig. L-5.9.1 Proposed Cropping Calendar of Nagwain Site ..... L-5 - 13
Fig. L-5.11.1 Location Map of Infrastructure Development Plan ..... L-5 - 18
Fig. L-6.1.1 Location Map of Bagain Site ..... L-6 - 1
Fig. L-6.2.1 Existing Cropping Calendar of Bagain Site ..... L-6 - 3
Fig. L-6.4.1 General Layout of Bagain Site ..... L-6 - 5
Fig. L-6.5.1 Road Category of Theog Block ..... L-6 - 6
Fig. L-6.5.2 Roads and Villages in Bagain Site ..... L-6 - 6
Fig. L-6.7.1 Distribution Channel of Vegetables in Shimla District ..... L-6 - 8
Fig. L-6.7.2 Location of Market Yards of APMC in Shimla District ..... L-6 - 9
Fig. L-6.9.1 Proposed Cropping Calendar of Bagain Site ..... L-6 - 13
Fig. L-6.11.1 Location Map of Infrastructure Development Plan ..... L-6 - 17
Fig. L-7.1.1 Location Map of Chamo Site ..... L-7 - 1
Fig. L-7.2.1 Existing Cropping Calendar of Chamo Site ..... L-7 - 3
Fig. L-7.4.1 General Layout of Chamo Site ..... L-7 - 6
Fig. L-7.5.1 Road Category of Dharampur Block ..... L-7 - 7
Fig. L-7.5.2 Roads and Villages in Chamo Site ..... L-7 - 7
Fig. L-7.7.1 Distribution Channel of Vegetables in Solan District ..... L-7 - 10
Fig. L-7.7.2 Location of Market Yards of APMC in Solan District ..... L-7 - 11
Fig. L-7.9.1 Proposed Cropping Calendar of Chamo Site ..... L-7 - 14
Fig. L-7.11.1 Location Map of Infrastructure Development Plan ..... L-7 – 18

## Attachments

L-9.1 Cost Estimate of Farmers' Support Program in the Sample Study Sites
L-9.2 Summary of Economic Evaluation for Pre-F/S Sites

# ANNEX-L SAMPLE STUDY AT PRE-FEASIBILITY STUDY LEVEL

## L-1 General

### L-1.1 Objectives of Sample Study at Pre-feasibility Study Level

The purpose of Sample Study at Pre-Feasibility Study Level is: i) to upgrade maturity of proposed programs from technical, economic and social view points and ii) to feed-back to Draft M/P and A/P for its finalization, especially in infrastructure planning and cost estimates. The study results will conduce to the acceleration of diversified agriculture toward the target of M/P as well as A/P.

### L-1.2 Selection of Representative Model Areas and Study Sites

Following eleven criteria were minutely considered to select representative model areas (blocks) of diversified agriculture as the models for effective and efficient promotion of diversified agriculture project in the State of Himachal Pradesh:

- 4~6 model areas on block basis;
- Consideration to progress pattern of diversified agriculture;
- Coordination with Governing Board of ATMA;
- Consideration to Soil and Water Conservation Scheme in Hamirpur;
- Type of vegetable cultivation areas in Zone 2 and Zone 3,
- Diversified agriculture in low-lying area of Zone 1 and Zone 2,
- Diversified agriculture based on fruit planting,
- High irrigation needs (potential),
- Accessibility within the blocks,
- Condition of market yard, and
- Integrated agriculture potential.

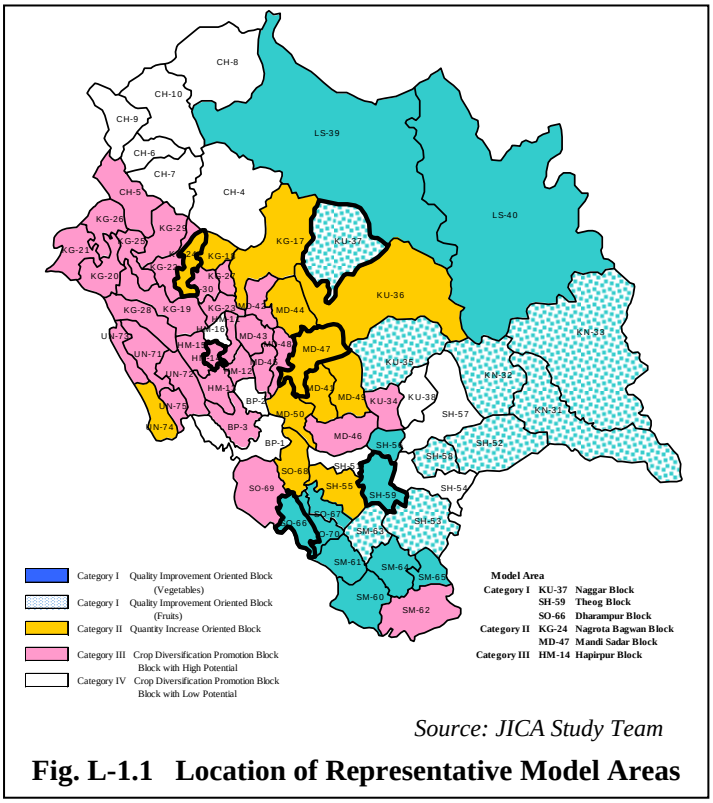
As a result, six areas consisting of:

- Three blocks from Category-I (Quality Improvement-oriented Block),
- Two blocks from Category-II (Quantity Increase-oriented Block), and
- One block from Category-III (Crop Diversification Promotion Block with High Potential)

were selected as shown in Table L-1.1 and Fig. L-1.1.

**Table L-1.1 Representative Model Areas and Study Sites**

| Category of Block | Agro-ecological Zone | District | Model Area (Block) | Study Site |
|---|---|---|---|---|
| I | Zone-2 | Solan | Dharampur | Chamo |
| I | Zone-3 | Shimla | Theog | Bagain |
| I (Fruits) | Zone-3 | Kullu | Naggar | Hallan-I |
| II | Zone-2 | Kangra | Nagrota Bagwan | Malan |
| II | Zone-2 | Mandi | Mandi Sadar | Nagwain |
| III | Zone-1 | Hamirpur | Hamirpur | Lalri |




*Source: JICA Study Team*

**Fig. L-1.1 Location of Representative Model Areas**

### L-1.3 Outline of Sample Study Results

Sample study for the selected sites was commenced and is continued in the third field work period up to October 2008. During this third field work period, present conditions, potentials and constraints in the study sites have been grasped and studied, and preliminary design and cost estimate of planned facilities i.e. minor irrigation and access farm roads have been made, which are explained in the following sections. The results of sites reconnaissance and the study in the mid course, such as present conditions, site potentials and constraints are summarized as follows:

**Table L-1.2 General Features of Sample Study Sites**

| Sample Study Site | 1. **Lalri** | 2. **Malan** | 3. **Hallan-I** | 4. **Nagwain** | 5. **Bagain** | 6. **Chamo** |
|---|---|---|---|---|---|---|
| Block | Hamirpur | Nagrota Bagwan | Naggar | Mandi Sadar | Theog | Dharampur |
| District | Hamirpur | Kangra | Kullu | Mandi | Shimla | Solan |
| Block Category* Block Status in Diversification | **III** High Potential | **II** Quantity -oriented | **I** Quality -oriented | **II** Quantity -oriented | **I** Quality -oriented | **I** Quality -oriented |
| Agro-eco. Zone Zone Range | **Zone-1** 240 – 1,000 m | **Zone-1** 240 – 1,000 m | **Zone-3** 1,500 – 2,500 m | **Zone-2** 1,000 - 1,500 m | **Zone-3** 1,500 – 2,500 m | **Zone-2** 1,000 - 1,500 m |
| Altitude at Site | Approx 500 m | Approx.900 m | Approx.1,600 m | Approx.1,100 m | Approx 1,600 m | Approx 1,100 m |
| Present Major Crops | wheat, rice, maize, pulses & very limited vegetable | wheat, rice, maize, potato, okra, egg plant, ginger | Apple & maize, wheat, rice, broccoli, peas, tomato, garlic, apple | maize, wheat, pulses, pea, cabbage, tomato, plum, apple, peach, | maize, wheat, cauliflower, cabbage, pea, capsicum, bean, apple, pear | maize, wheat, pulses, tomato, ginger, capsicum, cucumber, potato, garlic |
| Constraints in crop production | low quality seed, high price of inputs with lack of finance, lack of irrigation, damage by animals | high price of in-puts with lack of finance, insufficient technical support, transport & market, damaged irrigation facility, crop damage by animal | limited irrigation facilities, shortage of manpower, marketing facilities, finance /credit for inputs, poor road connectivity | limited irrigation facility, marketing & transport, market facilities, finance /credit for inputs, poor road connectivity | limited irrigation facility, transport facility to market, damage by animal, collec- tion/storage & marketing facilities, finance /credit for inputs, poor tech support | limited irrigation facility, transport facility to market, pests & diseases, damage by animals & weed |
| Irrigation | Non/Rainfed | Mostly covered | Partly covered | Partly covered | Partly covered | Partly covered |
| Water source | Limited source | Available | Limited source | Available | Available | Limited source |
| Road access | Good | Good | Not good | Not good | Not good | Not good |
| Animal Husbandry | surplus of dry matter & fodder due to less live-stock population | dairy production potential but deficit of green & dry fodder and dry matter | dairy production potential but deficit of green & dry fodder and dry matter | dairy production potential but acute shortage of green fodder | dairy production potential but deficit of green & dry fodder and dry matter | surplus of dry matter & green fodder but low dairy production potential |
| Inland Fishery | Potential of fish culture in check dam | - | - | - | - | - |
| Farmers' will to diversified crop | High to vegetables | High to vegetables | High to fruits and vegetables | High to vegetables | High to vegetables | High to vegetables |
| Vegetable Promotion | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ |
| Food Grain Productivity Improvement | ◎ | ○ | ○ | ○ | _ | ○ |
| Integrated Farm Management | ○ | ○ | ◎ | ◎ | ◎ | _ |
| Post Harvest Process. | ○ | ○ | ○ | ○ | ◎ | ○ |
| Market System Improvement | ○ | ◎ | ◎ | ◎ | ◎ | ◎ |

| Sample Study Site | 1. **Lalri** | 2. **Malan** | 3. **Hallan-I** | 4. **Nagwain** | 5. **Bagain** | 6. **Chamo** |
|---|---|---|---|---|---|---|
| Block | Hamirpur | Nagrota Bagwan | Naggar | Mandi Sadar | Theog | Dharampur |
| District | Hamirpur | Kangra | Kullu | Mandi | Shimla | Solan |
| Infrastructure Development | ◎ | – | ◎ | ◎ | ◎ | ◎ |
| Infrastructure Develop. Support | ○ | ◎ | ◎ | ◎ | ◎ | ○ |

*Notes; * Category of block in the diversified pattern, Source; JICA study team,*
*◎: Top priority program, ○: Priority program*

As shown in the above Table L-1.2, six sites have various types of cropping, potentials and constraints; however, farmers' willingness to crop diversification in all the sites is high in general with some site-specific conditions. For crop diversification, especially vegetable production, it is thought by farmers that in general, irrigation is essential. The six sites are further explained below:

1) **Lalri site**: **Block Category-III, Agro-eco zone 1**

Major crop is food grain crops such as wheat and maize. Vegetables are limited in home garden. A check dam was recently constructed, however, the dam is not utilized for irrigation and there is no irrigation system at present. Provision of new lift irrigation system by using the check dam will enable farmers to divert their crops to vegetables, since Hamirpur APMC is located nearby, one kilometre from the site. The study results of this site will be reflected by similar sites, especially for crop diversification in food grain cropping area.

2) **Malan site**: **Block Category-II, Agro-eco zone 1**

This site is famous for potato cultivation mostly covered by existing irrigation system; therefore, crop diversification can be promoted through irrigated farming as a sample. It is also necessary to strengthen water user's group for better water distribution. Since this site is special producing area for potato, one of the strategic crops under the present Study will be useful for reference to other potato producing areas. The farmers have a keen interest in marketing to obtain a better price for their produces.

3) **Hallan-I site**: **Block Category-I, Agro-eco zone 3**

This site is famous for apple production with partly covered existing irrigation system. The Farmers of this site have intention to produce fruits. In addition, there are some community-based trout farms using perennial cold water in village, therefore, it would be an example for the promotion of integrated farming combined with inland fishery. In addition, market accessibility for the farm produces is comparatively better except elevated area.

4) **Nagwain site**: **Block Category-II, Agro-eco zone 2**

This site has irrigation potential through the improvement of existing flow or lift irrigation from Beas river for diversified

agriculture. 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. Areas of this site might be an example for development of integrated farming.

5) **Bagain site**: **Block Category-I, Agro-eco zone 3**

This site is covered by several villages and is one of the advanced vegetable production area where various types of vegetables are cultivated in wider area. In addition, marketability is comparatively better. This site might be, therefore, an example of quality-oriented type of farming with the combination of proposed programs from agricultural production, support services and irrigation.

6) **Chamo site**: **Block Category-I, Agro-eco zone 2**

It is easy to access to this site and accessibility from the site to the market is also good. However, accessibility within the site is poor and farmers expect improvement of transport measures. This site is an advanced area for vegetable production and might be a model for advanced crop diversification and marketing.

Resource maps for all these six sites were prepared, which aimed at preparation of not only the maps but also for the planning of the facilities by the community through active community participation to strengthen the sense of ownership in the community. The primary concern of this activity was not only the cartographic precision, but getting useful information about local perceptions of resources. The procedure of resource mapping was divided into the following steps; 1) workshop to explain to the farmers the need of resource map followed by preparation of preliminary resource map, 2) participatory walk-through at site and 3) finalization of resource map.

Contents of the resource map were determined by the participants themselves, which included; a) land resources such as agricultural land, forest and residential area b) water resources, such as river, canal and existing irrigation system and c) important infrastructures, such as road and marketing facilities, etc. In the preliminary resource map, the constraints of prevailing condition and prospects for further development of diversified agriculture were discussed with various stakeholders in the Panchayat. Based on outcome of such discussions on facilities for irrigation, roads and marketing were included in the resource map. Six (6) resource maps for six sites were completed in April, 2008.

On completion of the resource maps of each site indicating information about the facilities proposed by the local communities, simple topographic survey was carried out in order to measure the locations and routes of proposed facilities. Based on the survey results, preliminary designs for minor irrigation and access farm road were made from July to September 2008.

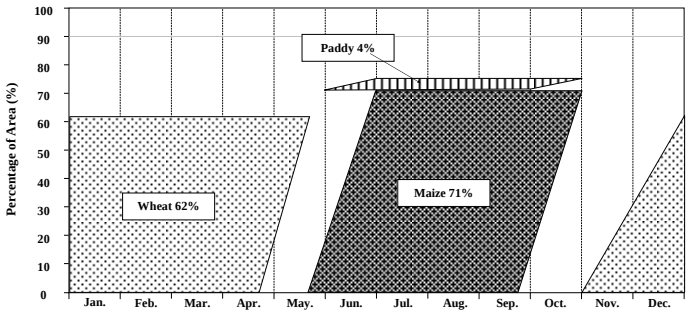
The results of six Sample Studies at Pre-Feasibility Study Level are summarized and explained in following section.

# (1) Lalri

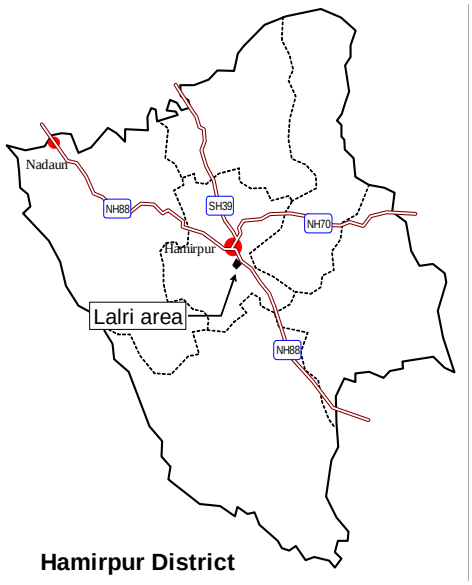
## Present Condition

Socio-economic and Natural Conditions

| | | | |
|---|---|---|---|
| District | Hamipur | Category | III |
| Block | HM-14 Hamirpur | Agro-ecological zone | Zone-1 |
| Panchayat | Lalri | Annual rainfall (mm) | 1,359 |
| Village | Lalri | Average Temperature | 22.5 |
| Total Population | 380 | Average Max. Temperature | 36.8 |
| No. of FHH | 120 | Average Min. Temperature | 10.9 |
| | | Total area (ha) | 90 |
| | | Cultivated area (ha) | 68 |




Present Cropping Pattern




Location Map

## Present Situation, Constraints and Measures

(1) Agriculture

Food grains are mostly cultivated under rainfed condition, and are used mostly for self-consumption. The yield of food grains are relatively law. Vegetables, such as tomato, capsicum, ginger, cucumber, peas and garlic are cultivated in Rabi season mostly in kitchen garden. The major constraints include: i) no availability of irrigation facility, ii) Law quality of food grain crop seeds, iii) lack of finance in procurement of agro-chemicals and fertilizers, and iv) Damage by animals (monkeys) and weed. About 40% of farm households purchase cereal crop seeds from outlets of the department, while remaining 60% purchase seed from other farmers in the village. Main supplier of fertilizers in IFFCO and HIMFED.

The farmers in the site are highly interested in crop diversification. If the irrigation facilities are available, they hope that at least 50% of the site can be converted for vegetable production. Since Hamirpur APMC is located close to the site, the vegetables to be produced in Lalri can be easily marketed at Hamirpur APMC.

Since Lalri site is identified as a frost prone area, therefore no orchard has been developed.Few hundred fruit trees are grown in home yards, including hill lemon, lime, jhamiri, plum, peach, guava, walnut, Pecan nut and Banana. While animal husbandry is also popular in the site. On average, every farm family keeps approx. two heads or more.

(2) Post-harvesting and Marketing

Agro-processing in this district is nor so active in general, since fruits production in Hamirpur District is quite small. There are no agro-processing facilities operated by HPMC, which is governmental or semi-governmental sector, while three private processing plants are available in Hamirpur.

Hamirpur Market Yard is nearby the Pre-F/S site in Lalri area. This Market Yard is a regulated market yard, and the office of APMC is located in this market, and other sub-market yards are controlled by this office of APMC. All the information on arrival quantity and market price of major vegetables are collected by market supervisor of the APMC.

(3) Infrastructure

There is one check dam on the tributary of the Hathli Khad river. Though it was expected to utilize this check dam for irrigation by installing pump equipment by the farmers, it remains unutilized till now due to the high installation cost of pump facilities beyond the capacity of the farmers. There is no other irrigation possibility in the site.

There is one PWD village road passing through the center of the Site from NH88 to the south. This road is expected to connect village Baral (with population of 150) by extension of the PWD village road (VR). There are many wide and narrow footpaths. New road construction is not proposed, while only widening of existing village road from NH-88 is proposed.

Farm Land

Hamirpur Market Yard

Existing Check Dam

Footpath

## Proposed Plan

(1) Agricultural Development Plan

Vegetable promotion and agricultural support for the Lalri site are planned as follows:

i) Among the cultivable area of 68 ha, the farmers are cultivating 51.0 ha in Kharif season and 42.0 ha in Rabi season. By using the current fallow area of 17.0 ha for food grains cultivation, the food grains area shall be maintained at the same level,

ii) With the introduction of irrigation system, vegetables shall be cultivated newly in 17 ha area which is equivalent to 25% of the total area.

iii) Selection of vegetables is made in consideration of existing farming conditions, experience of the farmers in the area on vegetable cultivation, intention of the farmers, and the current market conditions,

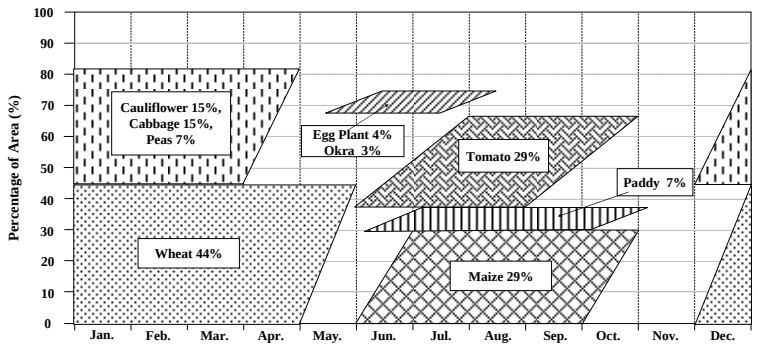
iv) Since the Lalri site belongs to Category - III, which has a high potential to convert from food grains to vegetable production, 25% of the total food grains area (17 ha) shall be converted for vegetable production.

(2) Post-Harvesting and Marketing Plan

Training program shall be proposed to promote agro-processing activities in the site, and further one multi-purpose collection centre is proposed near Lalri village. At a later stage, collection, grading, and storage facilities shall be additionally planned based on the necessity, after vegetable cultivation will be broadly promoted in a few years.

(3) Facility Plan

In this area, construction of new lift irrigation system utilizing the existing check dam will be beneficial with the construction of the raising main pipeline, delivery tank and distribution system. This system will cover 40 ha. For reducing manual transportation of vegetable, improving one existing road (W=2.5m) is proposed which will cover the beneficially area of 17 ha.



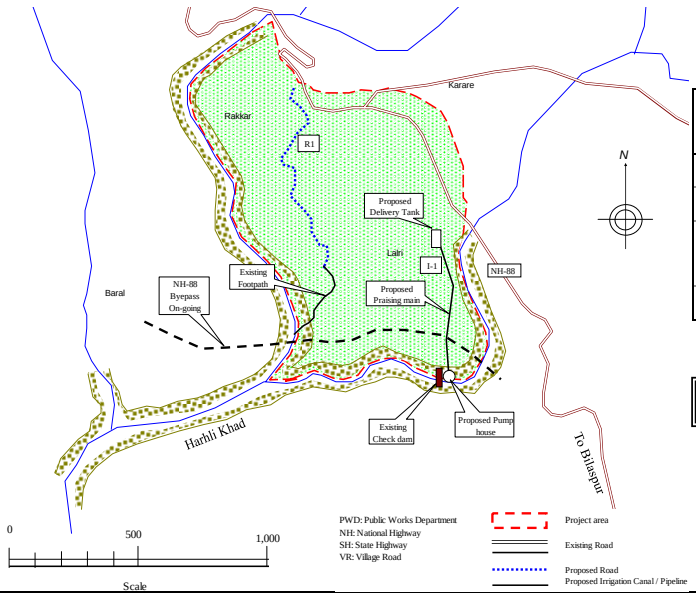

### Proposed Cropping Pattern

### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Promotion of strategic crops
- Introduction of suitable cropping pattern

(2) Market system improvement
- Promotion of improvement of quality control
- Improvement of market information system




### Salient Features and Estimated Cost of Infrastructure development

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - Lift irrigation, I-1 | CCA=40 ha | 6,378 |
| - Improvement of Existing Road, R1 | L=837 m | 708 |
| - Collection Center | 240 $m^2$ | 3,120 |

Economic Internal Rate of Return = 11.7 %

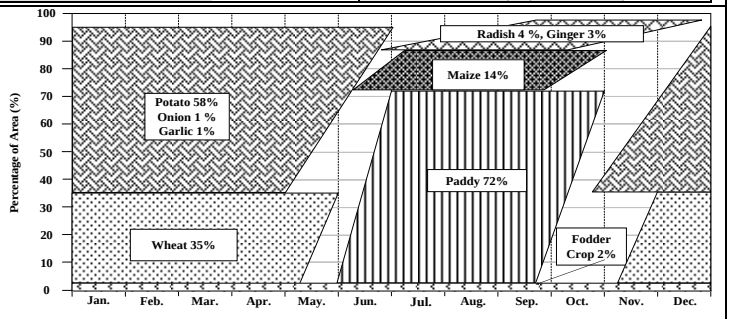
*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

## (2) Malan

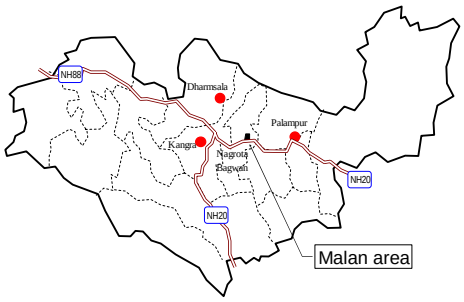
### Present Condition

Socio-economic and Natural Conditions

| | | | |
|---|---|---|---|
| District | Kangra | Category | II |
| Block | KG-24 Nagrota Bagwan | Agro-ecological zone | Zone-1 |
| Panchayat | Malan | Annual rainfall (mm) | 1,481 |
| Village | | Average Temperature | 19.8 |
| Uprali Majhetli, Malan, Pankhar, Bhuli Majhetli, & Bamnehar | | Average Max. Temperature | 32.1 |
| | | Average Min. Temperature | 4.4 |
| Total Population | 2,970 | Total area (ha) | 600 |
| No. of farm household | 830 | Cultivated area (ha) | 197 |




**Present Cropping Pattern**




**Kangra District**

**Location Map**

### Present Situation, Constraints and Measures

(1) Agriculture

Malan site is fully facilitated with the existing irrigation system so that the both food grain crops and vegetables are grown under irrigated condition. During Kharif season, maize and paddy are the main crops, while during Rabi season potato occupies half of the cropped area. The major constraints include: i) High cost of seed potato and diseases because of continuous cultivation of potato, ii) Transport and marketing for vegetables. There are no marketing farmers' groups in the site.

Suitable horticulture crops in the site are: Mango, Litchi, Peaches, Aonla and Strawberry for promoting fruit planting; Gladiolus, Chrysanthemum, Lillium, Gerbera and Carnation for promoting floriculture; and Kaunch, Tulsi, Ashwagandha, Satawar, Safedmusli and Aloevera for diversifying medical and aromatic plant cultivation. As ancillary activities, mushroom cultivation and bee keeping have high potentials.

(2) Post-harvesting and Marketing

Processing activities in Kangra District are relatively active. Mainly, agro-products are processed by comparatively small scale groups or by housewives in their houses. Meanwhile, regarding governmental or semi-governmental sector, Himachal Pradesh Fruit Canning Unit (himcu) is operating two (2) Community Fruit Processing and Training Centers at Dehra and Nurpur, and also operating Fruit Canning Unit at Nagrota Bagwan with the processing capacity of 200 tonnes per year.

In the District, there are some active farmers, who have cultivated exotic vegetables such as yellow and red capsicums, applying the protective cultivation. While some farmers have tried to cultivate tomato as well as marigold. They directly supply their produces to wholesalers in Delhi or other big consuming area.

(3) Infrastructure

Existing irrigation system covers almost all the parts of this area. There exist some irrigation systems, most of which have been developed by farmers themselves since more than 100 years ago and partly rehabilitated and/or upgraded with the assistance of IPH Department. Though this site is fully facilitated with the existing irrigation system, farmers are aware the lack of adequate water management and maintenance works. They propose to frame a rule for water management and to form a committee over WUA, in addition to some up-grading works of the existing system.

There are many wide and narrow footpaths with various type of pavement (compacted earth, stone and concrete), which starts from the village road and ends in crop fields or connects to another path or roads. The most farmers satisfied with the present village road and footpaths, expecting some improvement works.

Vegetable Cultivation

Vegetable Cultivation

Paddy-Potato Field

Palampur Market Yard

## Proposed Plan

(1) Agricultural Development Plan

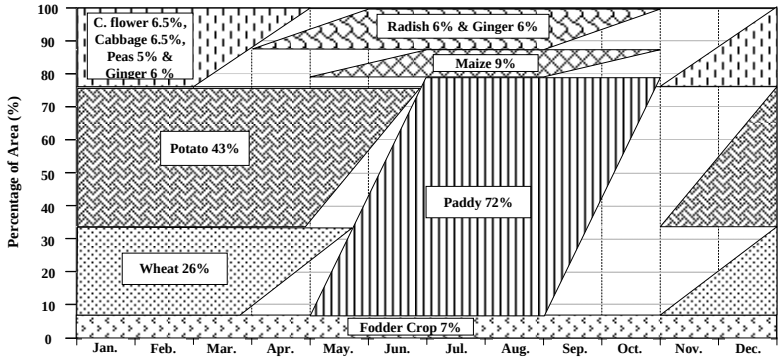
Vegetable promotion and agricultural support for the Malan site are planned as follows: i) The food grain yields are planned to be increased further by better water management practices, ii) About 25% of the wheat area shall be converted to vegetables such as peas, cauliflower which has much higher value than wheat. The areas which are used for rice cultivation shall be continued for food security, iii) In consideration of crop rotation, 25% of potato area (30 ha) is planned to be converted to other vegetables such as peas, cauliflower etc, iv) It is planned to introduce exotic vegetables in 6 ha area, v) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days.

(2) Post-Harvest Processing and Marketing Plan

It is proposed that one collection centre be established near Malan village for marketing and farmers should control marketing of table potatoes to fetch higher selling price by storage. Meanwhile, existing market yards are readily available in Nagrota Bagwan, Palampur, etc., so it is not necessary to newly establish market yards.

(3) Facility Plan

In this area, irrigation and farm road network have less constraint compared to the other areas, requiring only improvement works of the existing facilities and short length of new roads. In this study, one improving works of existing irrigation intake is proposed from temporary intake to permanent structure, which commands about 50 ha. For access farm road, improving one existing farm road and one footpath, and construction of two new roads are proposed. These roads will contribute to improve manual transportation in beneficially area of 50 ha approximately.



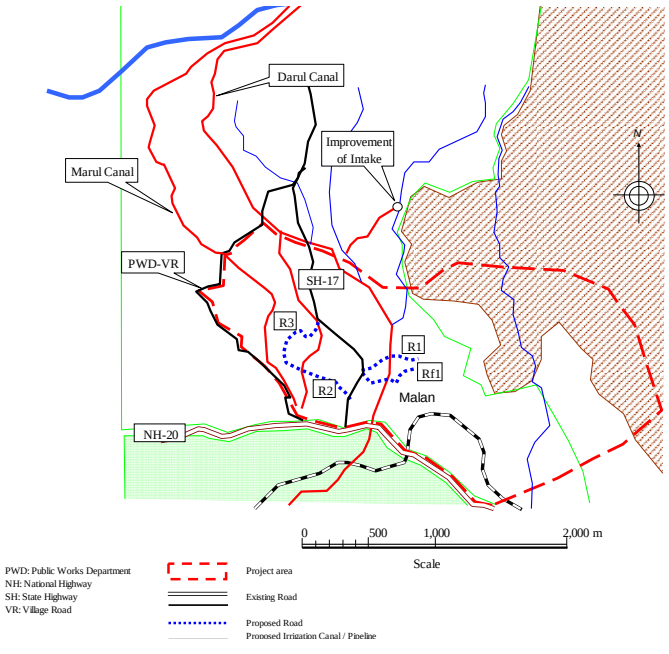

**Proposed Cropping Pattern**

### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Quality improvement
- Introduction of exotic vegetables
- Introduction of promising varieties

(2) Market system improvement
- Quality control
- Improvement of market information system
- Improvement of bargaining power of farmers' groups




**Salient Features and Estimated Cost of Infrastructure Development**

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - Improvement of Intake | | 1,032 |
| - New Road, R1 | L=499 m | 790 |
| - New Road, R2 | L=2,398 m | 882 |
| - New Footpath, Rf1 | L=556 m | 286 |
| - Improvement of Existing Road, R3 | L=560 m | 361 |
| - Collection center | 240 $m^2$ | 3,120 |

Economic Internal Rate of Return = 18.7 %

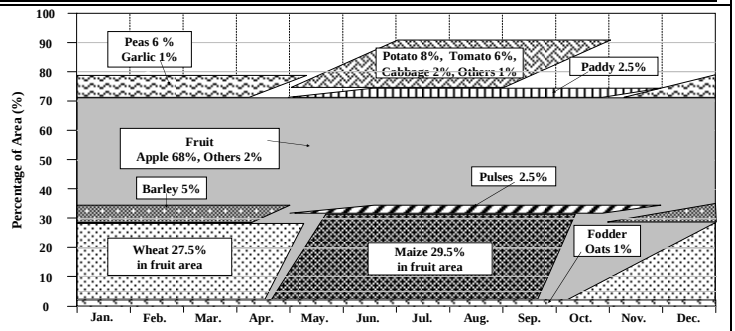
*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

## (3) Hallan-I

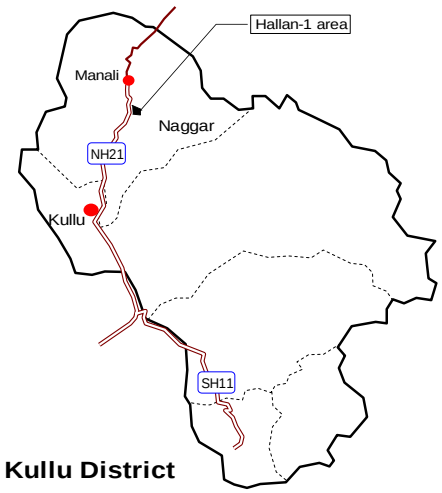
### Present Condition

Socio-economic and Natural Conditions

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




**Present Cropping Pattern**




**Location Map**

### Present Situation, Constraints and Measures

(1) Agriculture

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. Strategic vegetables including potato, tomato, peas, and cauliflower are cultivated in the area. Besides, other vegetables such as cabbage, broccoli, and beans are also cultivated. The major constraints include: i) transport and marketing, ii) poor or no irrigation facilities, iii) not enough manpower for farming, and iv) pests and diseases.

The farmers are interested in crop diversification to grow vegetable crops such as potato, tomato, peas, garlic, broccoli, cauliflower, and cabbage. Since the tourist town Manali is located close to the site, it shall be possible to sell exotic vegetables in the hotels are Manali.

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, rosemary and safed musli for diversifying medical and aromatic plant cultivation.

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.

(2) Post-harvesting and Marketing

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

In Kullu District, there are six (6) market yards. 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. 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.

(3) Infrastructure

In plain and rolling area they 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. 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. Maximum transportation distance is more than one km on foot and the number of transportation trip increases with the recent promotion of vegetable and fruit crops. The farmers are requesting improvement or widening of the existing footpath so as to be passable in the rainy season in the rolling area, and construction of new feeder roads to connect farm land to the existing PWD VR in the steep area.

Farm land

Patlikul Seasonal Market

Apple Collection Place

Apple Seasonal Market

## Proposed Plan

(1) Agricultural Development Plan

Vegetable promotion and agricultural support for the Hallan-I site are planned as follows: i) Fruits cultivation areas will be kept in the present level, ii) The area under strategic (potato, tomato, cauliflower) multiple (cabbage) vegetables can be increased by using current fallow areas, and provision of full irrigation, iii) It is planned to increase the exotic vegetables area to 9 ha, iii) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days.

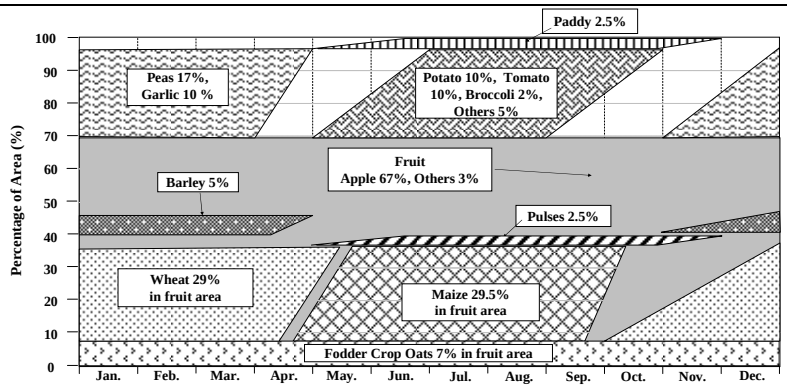
In comparison with the livestock population, the green fodder supply is much low having a high shortage of animal feed. Therefore, it is planned to increase the fodder area from 5.0 ha to 30.0 ha under fruit trees.

(2) Post-Harvest Processing and Marketing Plan

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

(3) Facility Plan

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 existing irrigation area improvement and extension of existing canal system is also proposed. In addition, tank irrigation is also suitable in the hilly area. For access road, construction of one new road and improvement of two existing roads are proposed, total length of which is 1,150 m.




**Proposed Cropping Pattern**

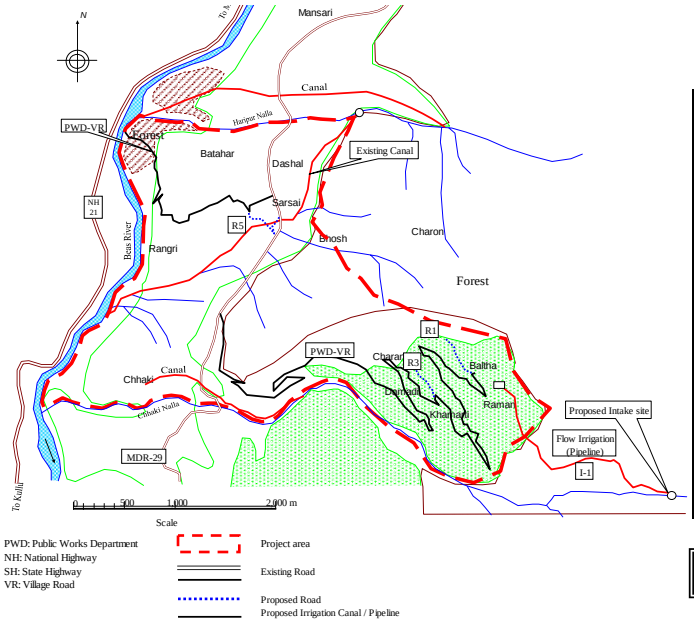
### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Promotion of exotic vegetables
- Improvement of quality control

(2) Integrated Farm Management
- Promotion of fodder crops

(3) Market system improvement
- Promotion of improvement of quality control
- Improvement of market information system
- Promotion of farmers' groups




**Salient Features and Estimated Cost of Infrastructure Development**

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - New flow irrigation, I-1 | CCA=52 ha | 11,528 |
| - Improv. Existing flow irrigation | | 1,602 |
| - Water harvesting facilities | | 620 |
| - New Road, R1 | L=397 m | 1,127 |
| - New footpath, R3 | L=435 m | 175 |
| - Improv. Exist. Road, R5 | L=318 m | 294 |
| - Collection Center | 240 $m^2$ | 3,120 |

Economic Internal Rate of Return = 18.5 %

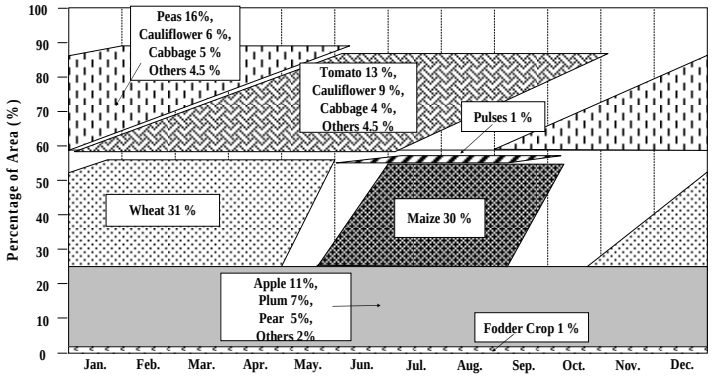
*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

# (4) Nagwain

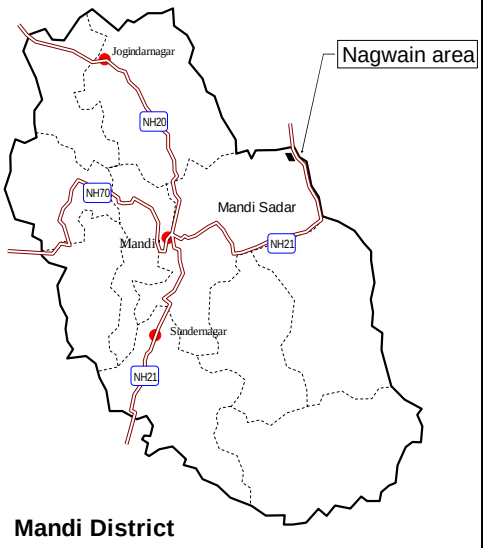
## Present Condition

Socio-economic and Natural Conditions

| | | | |
|---|---|---|---|
| District | Mandi | Category | II |
| Block | MD-47 Mandi Sadar | Agro-ecological zone | Zone-3 |
| Panchayat | Nagwain | Annual rainfall (mm) | 838 |
| Village | | Average Temperature | 18.5 |
| Nagwain, Shil Mashora & Palsehr | | Average Max. Temperature | 32.5 |
| Total Population | 3,920 | Average Min. Temperature | 1.8 |
| No. of Farm Household | 1,250 | Total area (ha) | 600 |
| | | Cultivated area (ha) | 340 |




**Present Cropping Pattern**




**Mandi District**

**Location Map**

## Present Situation, Constraints and Measures

(1) Agriculture

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, etc. are grown in about 10% of the area in the higher elevation. The farmers are already cultivating exotic vegetables in a small area and are interested to increase the area under exotic vegetables The major constraints include: i) transport and marketing, ii) poor or no irrigation facilities, iii) pests and diseases.

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.

If stable irrigation water supply is available, the farmers are interested to convert at least 75-80% 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.

(2) Post-harvesting and Marketing

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. 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.

(3) Infrastructure

There is one IPH lift irrigation system covering three villages, Nagwain, Shil Mashora and Palsehr. This system was constructed 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. 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. There are many wide and narrow footpaths, which start from the PWD VR and end in the crop fields or connect to another path or PWD VR. Maximum transportation distance is more than one km on foot and number of crop transportation trip increases with recent promotion of vegetable. The farmers propose improvement and new road linkage such as improvement of the existing Panchayat road and path, and construction of new farm road where only foot paths are available.

Harvesting of Cauliflower

Pump System

Pump Outlet Tank

Existing Farm Road

## Proposed Project

(1) Agricultural Development Plan

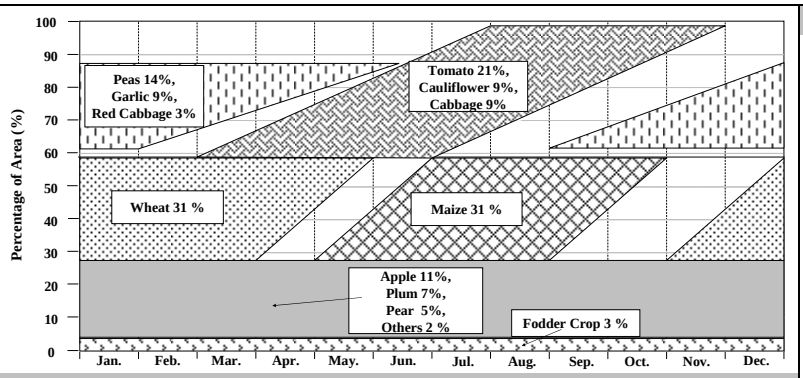
Vegetable promotion and agricultural support for the Nagwain site are planned as follows: i) In Nagwain Area, about 45 ha (12.9% of total cultivable area) is left as current fallow area, and a part of the fallow area can be converted for food grains production., ii) The area under strategic (peas, tomato, cauliflower), and multiple (cabbage, garlic) vegetables shall be increased with the assured irrigation facilities. Tomato area shall also be increased by using supplementary irrigation, iv) It is planned to increase the exotic vegetables area to 10 ha, v) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days.

(2) Post-Harvest Processing and Marketing Plan

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.

(3) Facility Plan

As the water resources in the Beas River is sufficient even in the driest months, new lift irrigation system is 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. 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.



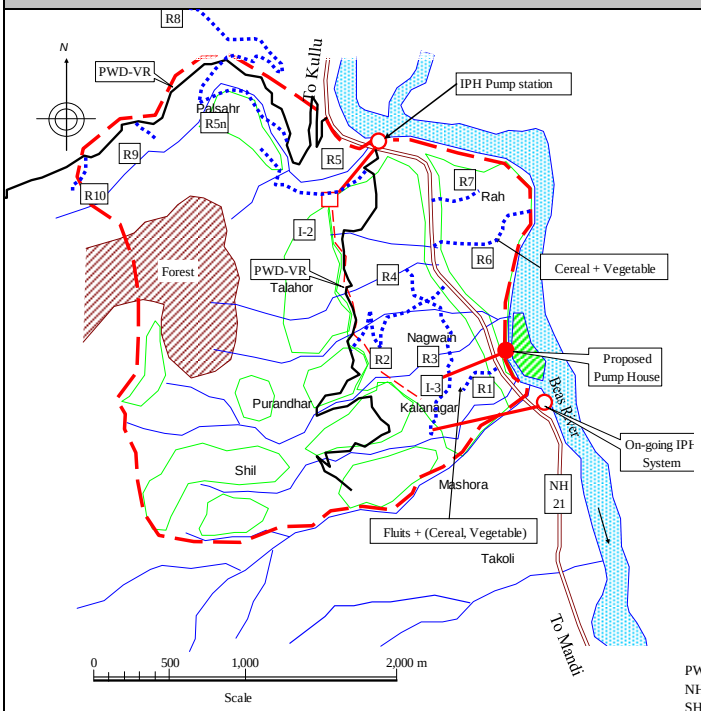

**Proposed Cropping Pattern**

### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Promotion of exotic vegetables
- Improvement of quality control

(2) Market system improvement
- Promotion of improvement of quality control
- Improvement of market information system
- Promotion of farmers' groups




**Salient Features and Estimated Cost of Infrastructure Development**

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - New Lift Irrigation, I-3 | 25 ha | 4,994 |
| - Rehabilitation of IPH Lift Irrigation | | 1,630 |
| - Water Harvesting Facilities | | 1,860 |
| - New Road, 4 nos. | L=3,128 m | 7,362 |
| - Improv. Exsit, road, 8 nos | L=5,301 m | 7,596 |
| - Collection Center | 240 $m^2$ | 3,120 |

Economic Internal Rate of Return = 10.1 %

*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

PWD: Public Works Department
NH: National Highway
SH: State Highway
VR: Village Road

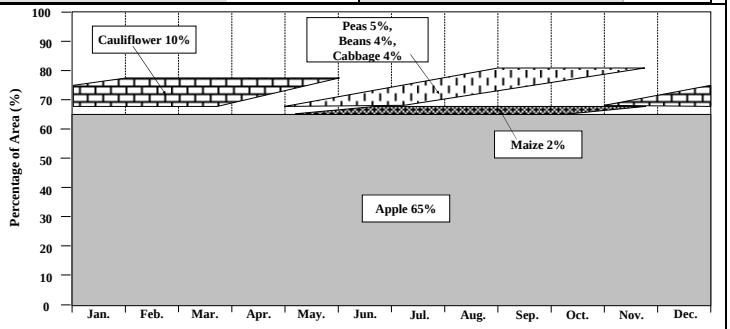
Project area
Existing Road
Proposed Road
Proposed Irrigation Canal / Pipeline

## (5) Bagain

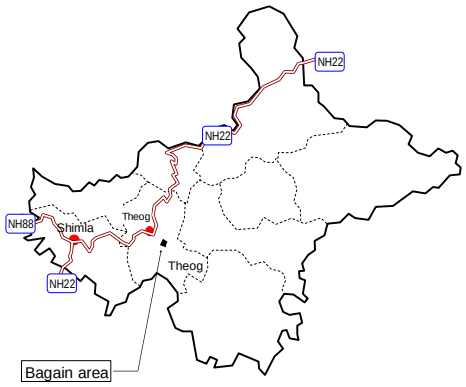
### Present Condition

Socio-economic and Natural Conditions

| | | | |
|---|---|---|---|
| District | Shimla | Category | I |
| Block | SH-59 Theog | Agro-ecological zone | Zone-3 |
| Panchayat | Bagain | Annual rainfall (mm) | 1,420 |
| Village | Basa Bagain, Ulvi, Charail, Khahar, Bananal, Deothi, Dasana, Damyana, Bagri, Indkul, Bhuin & Rena | Average Temperature | No data |
| | | Average Max. Temperature | No data |
| | | Average Min. Temperature | No data |
| | | Total area (ha) | 580 |
| Total Population | 1,670 | Cultivated area (ha) | 245 |
| No. of farm household | 510 | | |




**Present Cropping Pattern**




**Shimla District**

**Location Map**

### Present Situation, Constraints and Measures

(1) Agriculture

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 major constraints include: i) transport and marketing, ii) poor or no irrigation facilities, iii) pests and diseases and iv) damage by animals.

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.

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

(2) Post-harvesting and Marketing

In Shimla District, there are six (6) market yards. 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. This Sub-Market Yard is old and not functional. Permanent staff is not deployed, therefore market price information is not available.

(3) Infrastructure

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. 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.

Most of villages 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, which starts from the existing village road and ends in the crop fields.

Field Tank

Farm Road

Theog Market Yard

Theog Collection Depo

## Proposed Project

(1) Agricultural Development Plan

Vegetable promotion and agricultural support for the Bagain site are 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) It is planned to introduce exotic vegetables in 15 ha area, iv) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days.

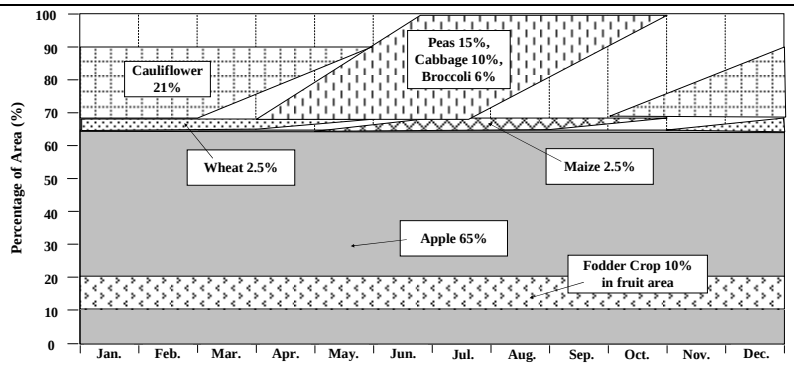
(2) Post Harvest Processing and Marketing Plan

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.

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.

(3) Facility Plan

Giri river is a perennial water source, and lift irrigation system is 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. Only one lift irrigation system is proposed to command relatively lower area, while high land are mostly covered with apple fruit. In addition, 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.



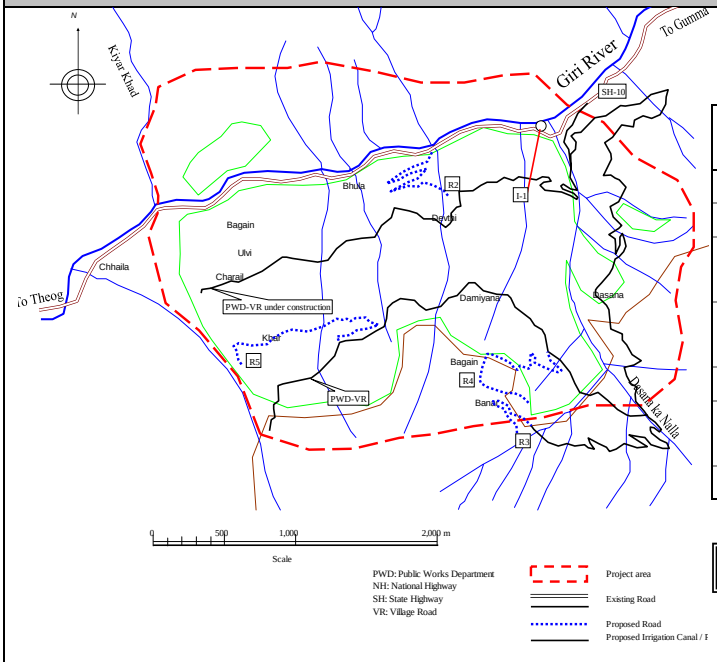

**Proposed Cropping Pattern**

### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Improvement of productivity and quality control

(2) Market system improvement
- Promotion of improvement of quality control
- Improvement of market information system
- Promotion of farmers' groups




### Salient Features and Estimated Cost of Infrastructure Development

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - New Lift irrigation, I-1 | CCA=15 ha | 3,677 |
| - Rehabilitation of IPH Lift Irrigation | | 237 |
| - Water Harvesting Facitlities | | 1,240 |
| - New Road, R-2 | L=2,262 m | 12,515 |
| - Improv. Exist. Road, 3nos | L=2,550 | 3,086 |
| - Collection Center | 240 $m^2$ | 3,120 |

Economic Internal Rate of Return = 14.2 %

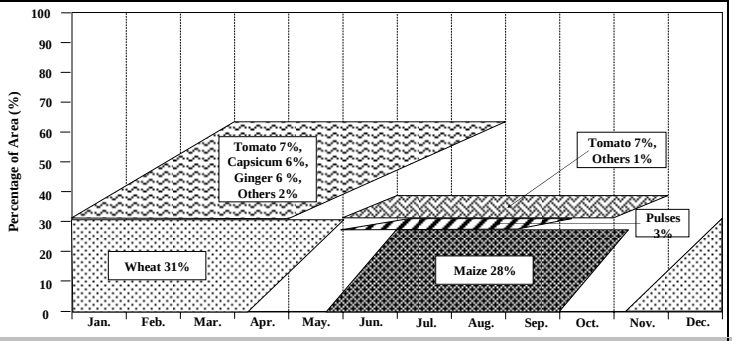
*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

## (6) Chamo

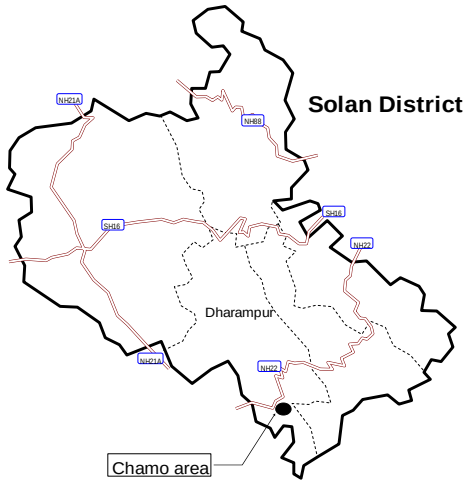
### Present Condition

Socio-economic and Natural Conditions

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




Present Cropping Pattern




Location Map

### Present Situation, Constraints and Measures

(1) Agriculture

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 major constraints include: i) irrigation, ii) labor required for vegetable farming, iii) pests and diseases, and iv) damage by animals (monkeys).

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 counter measures against the constraints, the farmers are interested to convert at least 95% of the food grains area to vegetables. The major preferred crops are tomato, 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. They informed that they have enough technical support from the Department of Agriculture and are satisfied with on-going programs of the department.

(2) Post-harvesting and Marketing

Since Solan District is close to big consuming area and comparatively flat areas, many agro-processing facilities exists including Governmental or semi-governmental sector and private sector. In Solan District, almost all vegetables, which are locally produced, are shipped out to other states. Meanwhile, vegetables during the winter season are supplied from other districts, while off-season vegetables are supplied locally.

Chakki Ka Mour Sub-Market Yard is nearby the Pre-F/S site in Chamo. 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

(3) Infrastructure

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. Major constraints are lack of perennial water source and steep geographic conditions, therefore limited water should be efficiently utilized. Some new lift irrigation systems to be constructed on the small tributaries and tank irrigation system including rehabilitation/improvement are required. Training for improvement of irrigation system and proper management are necessary.

Accessibility within the site is poor and farmers expect improvement of transport measures, with new construction of access farm roads.

Tomato Cultivation

Chakkikamor Sub-Market

Solan Market yard

Sorting Tomato at Field

## Proposed Project

(1) Agricultural Development Plan

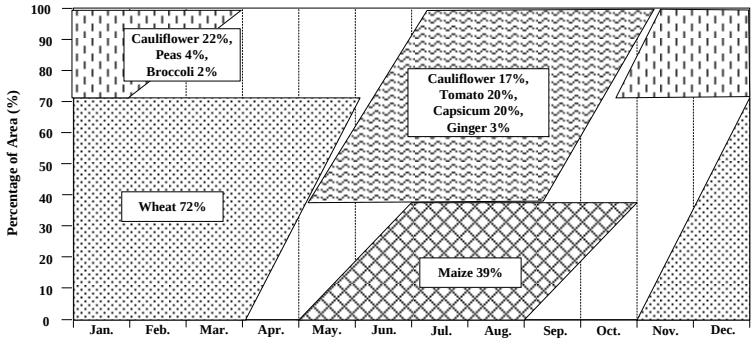
Vegetable promotion and agricultural support for the Chamo site are planned as follows: i) about 80 ha is left as current fallow area, of which a part can be converted for vegetable production with irrigation facilities, ii) By the implementation of irrigation project, full irrigation will be available for 15 ha area, and supplementary irrigation will be available for about 50 ha area in kharif season. Using this irrigation, the area under strategic (peas, and cauliflower), and multiple (capsicum and ginger) vegetables shall be increased, and exotic vegetables is planed to introduce in 3 ha area. iii) DOA should also conduct exotic vegetable promotion activities including demonstration trials, training camps, exposure visits and field days

(2) Post-Harvest Processing and Marketing Plan

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.

(3) Infrastructure Development Plan

In this site, perennial water source is quite limited. Also, due to the high pumping head, most of the plans are not economically feasible. One lift irrigation system of which CCA is 15 ha is proposed. For access farm road, two roads and one footpath are proposed including provision of cross drainage culvert, causeway, and bridges, and slope protection. The proposed new access farm road will connect 40 ha of remote area with total length of about 6 km.



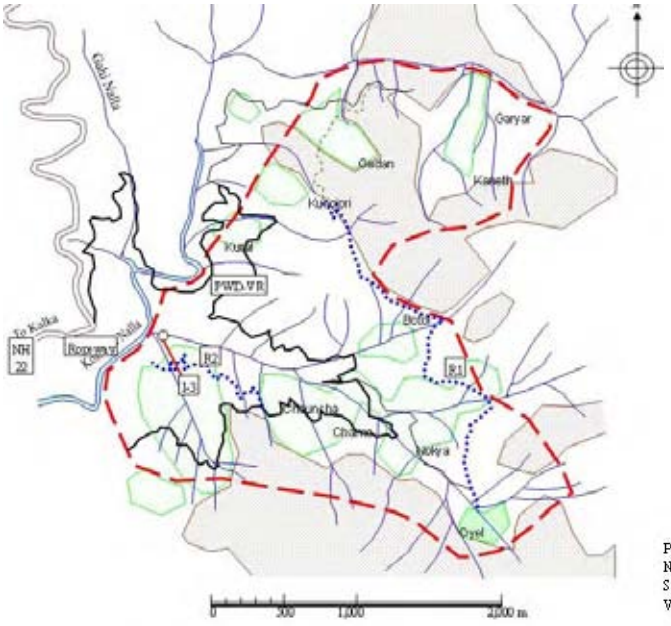

### Proposed Cropping Pattern

### Farmers' Support Program

Especially, the following support programs are required for improvement of the situation of the Pre-F/S site.

(1) Vegetable Promotion
- Promotion of exotic vegetables
- Improvement of quality control

(2) Market system improvement
- Promotion of improvement of quality control
- Improvement of market information system
- Promotion of farmers' groups




### Salient Features and Estimated Cost of Infrastructure Development

| Proposed works | Description | Cost (Rs.000) |
|---|---|---|
| **Construction** | | |
| - Lift irrigation, I-3 | CCA = 15ha | 3,752 |
| - Water harvesting facilities | | 1,860 |
| - Access Farm Road, R-1 | L=3,900 m | 10,769 |
| - Access Farm Road, R-2 | L=2,398 m | 10,983 |
| - Collection Center | 240 $m^2$ | 3,120 |
| | | |

Economic Internal Rate of Return = 14.1 %

*Note: Economic internal rate of return after cost allocation. For detail, refer to Annex-L section L-9.*

PWD: Public Works Department
NH: National Highway
SH: State Highway
VR: Village Road

Scale
Project area
Existing Road
Proposed Road
Proposed Irrigation Canal / Pipeline

## L-2 Lalri Site of Hamirpur Model Areas

### L-2.1 Present Socio-economic and Natural Conditions

Lalri is located at a distance of about 2.5 km in the south-eastern direction from Hamirpur District's headquarter, and its topography consists of plain with partly undulating 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. Socio-economic and natural conditions in Lalri site are summarized in Table L-2.1.1.

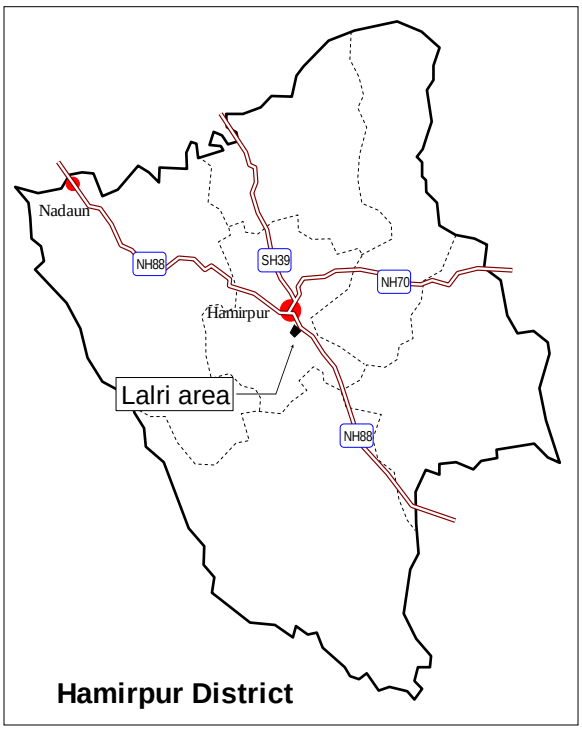



**Fig. L-2.1.1 Location Map of Lalri Site**

**Table L-2.1.1 Socio-economic and Natural Conditions of Lalri Site**

| | | | |
|---|---|---|---|
| District | Hamirpur | Agro-ecological zone | Zone-1 |
| Block | HM-14 Hamirpur | Annual rainfall (mm) | 1,359 |
| Panchayat | Lalri | Average Temperature (◦C) | 22.5 |
| Village | Lalri | Average Max. Temperature (◦C) | 36.8 |
| Total Population | 380 | Average Min. Temperature (◦C) | 10.9 |
| No. of Farm Household | 120 | Total area (ha) | 90 |
| Category | III | Cultivated area (ha) | 68 |

*Source: Compiled by JICA Study Team*

#### (1) People/Community

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

**Table L-2.1.2 Village wise Population Details of Ward No. 11**

| Area | House Hold | Total Population | | | *Non SC Population | | | **OBC/***SC Population | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| **Ward No. 11** | 462 | 1,230 | 913 | 2,143 | 1,017 | 770 | 1,784 | 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 Lalri village. In the Lalri village 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 913. 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.

## L-2.2 Present Agriculture

### (1) Crop Cultivation

The existing cropping pattern of Lalri site is shown in Table L-2.2.1 and the cropping calendar is shown in Figure L-2.1.1. The total cropped area is 93ha with a cropping intensity of 137%.

**Table L-2.2.1 Existing Cropping Pattern of Lalri Site**

| Crops | | Kharif season (ha) | | Rabi season (ha) | | Ave. Yield |
|---|---|---|---|---|---|---|
| | | Rainfed | Irrigated | Rainfed | Irrigated | ton/ha |
| Food Grains | Maize | 48 | | | | 1.18 |
| | Paddy | 3 | | | | 1.67 |
| | Wheat | | | 42 | | 1.27 |
| | Sub-total | 51 | | 42 | | |
| Cropped Area | | 93 | | | | |
| Cultivated Area | | 68 | | | | |
| Current Fallow Area | | 17 | | | | |
| Cropping Intensity | | 137% | | | | |

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

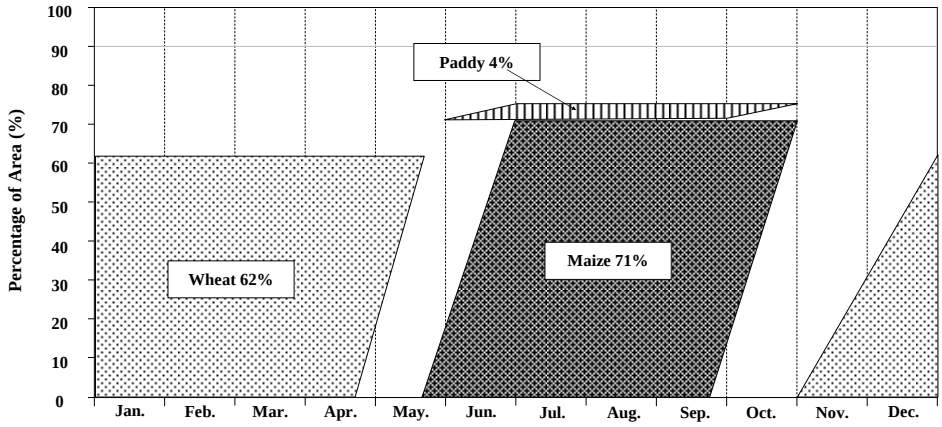



**Fig. L-2.2.1 Existing Cropping Calendar of Lalri Site**

Since there is no irrigation facility in the site, only food grain crops are cultivated in Lalri site under rainfed condition. However, some vegetables such as, cucumber, okra and egg plant are grown in Kharif season, and peas, cabbage, and cauliflower are grown in Rabi season mostly as kitchen garden. One farmer in the Lalri site is cultivating vegetables in 0.5 ha area growing peas, cabbage, okra, cauliflower, medicinal crops (stevia) by using his personal lift irrigation facility.

The average yields of maize, paddy and wheat are 1.18, 1.67 and 1.27 ton/ha respectively. In general, the food grains are mostly used for self-consumption, except for a few farmers who cultivate the food grains in a larger area. The major varieties of the crops grown in Lalri site are: Kanchan, Desi, Roharu, Gadan, Sathu and Hybird (K-1) for maize; Parmal and RP2421 for paddy; and PBW 343, PBW 373, PBW 502, UP 2338 and Raj 3765 for wheat.

(2) Farm Inputs

About 40% of the households purchase cereal crop seeds from departmental outlet, while the remaining 60% purchase seeds from other farmers in the village. In case of vegetable seeds, 30% of households purchase seeds from departmental outlet, whereas the remaining 70% purchase seeds from retail shops outside the village. The main supplier of fertilizers for the area is IFFCO and HIMFED, and DOA is the monitoring authority. The usage of fertilizer in the year 2007/08 in the area is given below.

**Table L-2.2.2 Fertilizer Use in Lalri**

| Name of the Fertilizer | Amount (ton) |
|---|---|
| Urea (Nitrogenous Fertilizer) | 6 |
| NPK 12:32:16 | 3 |
| NPK 15:15:15 | 2 |

*Source: DOA Office, Hamirpur*

As it can be seen, the use of fertilizer in the area is very low, most of the farmers mainly use organic fertilizers. On an average, each household uses about 10 tons of organic manure which are mostly from self-owned animals. In order to control pests including stem borer, blister beetle and grass hopper as well as bacterial blight disease for maize, about 40% of the households purchase agro-chemicals from agricultural departmental outlet, while the remaining 60% purchase agro-chemicals from retail

shops outside the village. The farmers reported that the chemicals from the private shops are better than that of the government. In Lalri site, there are only 2 pump sets, 2 sprayers and 9 harvesters/threshers. Although Lalri site is located in zone 1 and it is possible to use farm machineries like tractor or power tiller, the use of farm machinery is still low because of small landholding size.

Family labors (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 labor for the harvesting operations. In addition to family laborers, some farmers employ seasonal laborers from other States such as Uttar Pradesh and Bihar.

(3) Constraints in Crop Production

Major constraints in crop production as reported by farmers are as follows:

- Non-availability of irrigation facilities
- Low use of fertilizers in the area and not following the recommended quantities of fertilizer usage
- Low quality of food grain crop seeds, and
- Lack of finance in procurement of agrochemicals and fertilizers.

(4) Crop Diversification Potential

If the irrigation facilities are provided in the site, the farmers hope that at least 25% of the site can be converted for vegetable production. The farmers are highly interested in crop diversification to grow vegetable crops such as tomato, eggplant, okra, cabbage, cauliflower and peas. Since the Hamirpur APMC is located close to the site, they feel that the vegetables can be easily marketed without any transport problem. The major requirements for crop diversification reported by farmers are development of irrigation facilities, and technical support from government.

### L-2.3 Present Agriculture-Allied Sector

(1) Horticulture

Present Fruit Planting: Since Lalri site is identified as a frost prone area, no orchard has been developed. Few hundred fruit trees are grown in home yards, including Hill Lemon, Kagzi Lime, Jhamiri, Plum, Peach, Guava, Loquat, Walnut, Pecan nut and Banana.

Diversification Potential in Horticulture Crops: Diversification potential area is expected to be 20 ha in Lalri site. However, remaining land not used cropping is 25 % or about 17 ha and it is difficult to expand horticulture area up to 20 ha without conversion from Kharif maize. Suitable horticulture crops are: Kagzi Lime, Hill Lemon, Peaches, Pomegranate, Aonla and Fig for promoting fruit planting; Chrysanthemum, Marigold and Carnation for promoting floriculture; and Harad, Bahera, Ashwagandha, Satawar, Stevia and Brahmi for introducing medical and aromatic plant cultivation. Technologies required for exploitation of horticulture crop are as follows:

i) Protective cultivation of carnation, and open cultivation of marigold and medicinal plants;

ii) In-situ cultivation of fruit crops;

iii) Cluster approach for adoption of medical plant cultivation and floriculture; and

iv) Drip and sprinkler irrigation for water saving.

(2) Animal Husbandry

The current livestock population in Lalri site is 55 crossbred cattle, 17 indigenous cattle, 92 buffaloes and 1 sheep without goat and others. On average every farm family keeps approx 2 heads or more.

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

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 for all six sample sites are given in Table L-2.2.3 and summarized for this site below:

i) Dry matter supply is estimated at 3,724 ton against demand of 2,659 ton, having surplus of about 40.0%;

ii) Green fodder supply is estimated at 5,581 ton against demand of 4,388 ton, having surplus of about 27.2%; and

iii) Dry fodder supply is estimated at 2,878 ton against demand of 2,925 ton, showing shortage of about 1.6%.

As shown in the above estimate, Lalri shows a surplus situation for dry matter and dry fodder due to less livestock population. However, there is a deficit of green fodder by 1.6 %. Actually, a shortage of fodder is observed in the site, and some farmers buy fodder from outside. Future development potential and constraints of animal husbandry in combination with crop diversification in Lalri site are defined as a type of “medium dairy production potential”.

As part of the integrated farm management in crop diversification, fodder production in orchard or utilization of residuals of marketed diversified crops such as vegetables will be effective in this site.

(3) Inland Fisheries

Such a new avenue as utilization of check dams for sustainable fish production has become available in Himachal Pradesh. These check dams have been constructed under various schemes with different objectives by IPH, Department of Forestry and DOA. Usually, several check dams are constructed on the same stream with the water surface size of 0.1 to 2.0 ha. As there are about 500 check dams in Hamirpur District. Through implementation of fish culture in check dam in the Hamirpur District, the following constraints have been identified:

i) A check dam is leased to an individual only, not to a group, with a 5-year lease period;

ii) Integrated agriculture-aquaculture concept is not familiar to concerned farmers;

iii) Farmers have no knowledge about stocking ratio and density of the fish seed as well as intensive fish farming;

iv) Fish seed of required species and size as well as quality concentrate feeds are not available;

v) Farmers have no manpower, tools and awareness for harvesting, resulting in total dependence on external private agencies in terms of harvesting and marketing; and

vi) No networking system is available linking individuals who are conducting fish culture in different check dams.

In order to overcome the above constraints and to avoid the risks, the following conditions are favourable for exploiting check dam fish culture:

i) Inputs required for intensive aquaculture such as organic fertilizers and artificial feed are locally available at affordable rates;

ii) Water is in continuous flow for most of the time so as to make oxygen depletion occurrence very less and heavy stocking possible;

iii) Check dam can be maintained in required condition for natural breeding so as to increase revolving chances of auto stocking; and

iv) Spillway of check dam is facilitated with iron mesh so as to prevent loss of large size fish during the rainy season. The iron mesh, however, hampers smooth flush water flow during floods.

There is some potential for fish culture using check dam, however, the culture still has the above constraints in check dam fish culture. It is expected that Fishery Department will provide both of technical and financial support such as subsidy to small and marginal farmers at subsistence level who want to start check dam fish culture in this site.

# Table L-2.2.3 Present Condition of Animal Husbandry

| Pre-F/S Site | Block | Distruct | Crossbred cattle | Indigenous cattle | Buffalo | Sheep | Goat | Others | Dry Matter (ton) | | | Green Fodder (ton) | | | Dry Fodder (ton) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Supply | Demand | Surplus/Deficit | Supply | Demand | Surplus/ Deficit | Supply | Demand | Surplus/Deficit |
| Lalri | Hamirpur | Hamirpur | 55 | 17 | 92 | 1 | 0 | 0 | 3,724 | 2,659 | 1,065 | 5,581 | 4,388 | 1,193 | 2,878 | 2,925 | -47 |
| Malan | Nagrota Bagwan | Kangra | 362 | 371 | 180 | 131 | 123 | 29 | 1,462 | 3,205 | -1,743 | 1,113 | 5,288 | -4,175 | 1,382 | 3,525 | -2,143 |
| Hallan-1 | Naggar | Kullu | 75 | 483 | 206 | 7 | 127 | 6 | 1,625 | 4,590 | -2,965 | 1,754 | 7,574 | -5,820 | 1,420 | 3,383 | -1,963 |
| Nagwain | Mandi Sadar | Mandi | 465 | 41 | 30 | 41 | 0 | 0 | 1,335 | 1,487 | -152 | 335 | 2,454 | -2,119 | 1,413 | 1,096 | 317 |
| Bagain | Theog | Shimla | 210 | 1,061 | 9 | 15 | 58 | 2 | 1,251 | 3,755 | -2,504 | 1,867 | 6,195 | -4,328 | 942 | 2,762 | -1,820 |
| Chamo | Dharampur | Solan | 75 | 483 | 206 | 7 | 127 | 6 | 3,724 | 2,659 | 1,065 | 5,581 | 4,388 | 1,193 | 2,878 | 2,925 | -47 |
| Total | | | 1,242 | 2,456 | 723 | 202 | 435 | 43 | 13,121 | 18,355 | -5,234 | 16,231 | 30,287 | -14,056 | 10,913 | 16,616 | -5,703 |

Remarks; Trial estimate of feed balance from natural resources and caltivated land (net area sown) using the information collected from field survey
Source; JICA study team

## L-2.4 Present Irrigation

(1) Existing Irrigation System

There is one check dam on the tributary of the Hathli Khad river constructed by DOA soil & water conservation program. Though it was expected to utilize this check dam for irrigation by installing pump equipment by the farmers, it remains unutilized till now due to the high installation cost of pump facilities beyond the capacity of the farmers. There is no other irrigation possibility in the site except small scale private irrigation facilities, and only limited farmers are irrigating the vegetable using private irrigation facilities and field tanks. Some farmers are using drinking water source for kitchen garden farming in some cases.

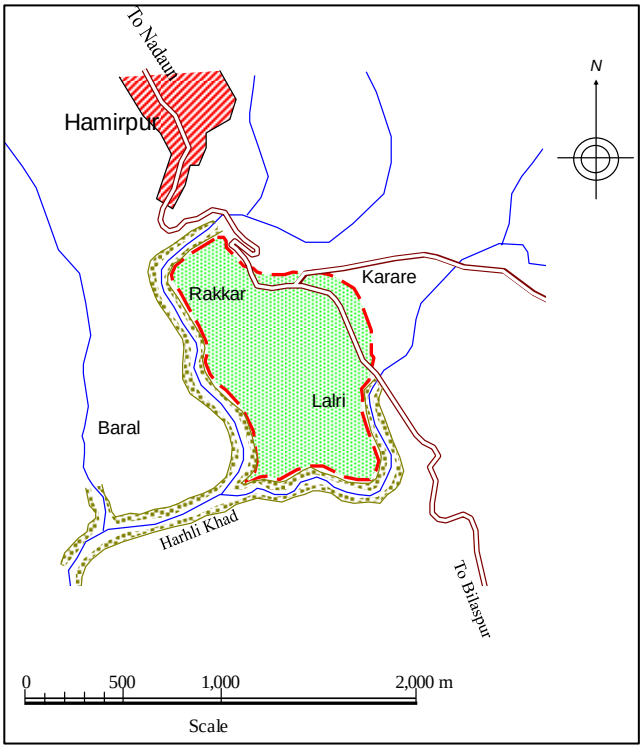



**Fig. L-2.4.1 General Layout of Lalri Site**

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

One WUA was formed to conduct the construction of the check dam with irrigation system under soil & water conservation program, however it is currently not functioning because irrigation system has not been developed yet.

(3) Constraints and Farmers' Needs

Major constraint of this site is lack of irrigation system despite of certain volume of available water storage at the existing check dam. Farmers strongly request to construct a lift irrigation system at the existing check dam site and conveyance system to the proposed tank on the hill to distribute the water to the most farm land in the site by gravity. During the workshop for preparation of the resource map, new construction of alternative check dam at the confluence of the Hathli Khad River and its tributary was also proposed. According to the information given in the workshop, most of farmers consent to the plan and land acquisition may not be a fatal matter.

## L-2.5 Present Farm Road

(1) Road Network

There are 1 national highway (NH88), 1 state highway (SH39) and 56 links of motorable Public Works Department (PWD) village road (VR) in the Block. NH88 passes along the northern edge of the Site. It is about 3 km from the Site to Hamirpur town of the District capital, and 438 km to Delhi.

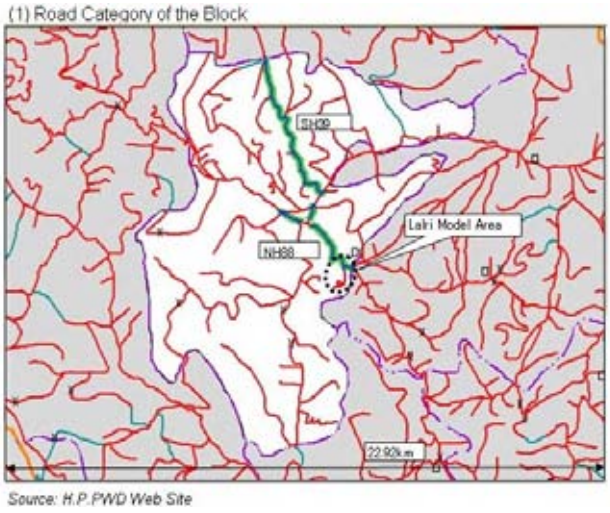



**Fig. L-2.5.1 Trunk Roads in Hamirpur Block**

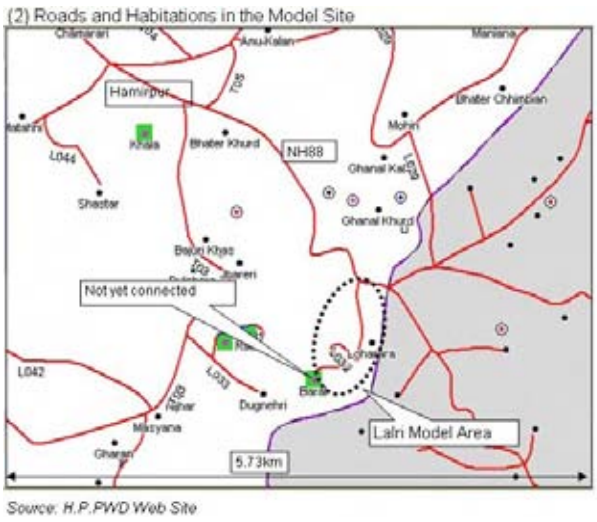



**Fig. L-2.5.2 Roads and Villages in Lalri Site**

(2) Village Connectivity

Out of total 198 villages under 24 Gram Panchayat (village community) in Hamirpur Block, 119 villages (60%) have been connected by all-weather motorable roads, which is the same percentage rate as the State average, and lowest within district though District Hamirpur is famous for its highest road density in the State.

(3) Roads in the Site

There is one PWD village road passing through the center of the Site from NH88 to the south. This road is expected to connect village Baral (with population of 150) by extension of the PWD village road (VR). There are many wide and narrow footpaths with various type of pavement (compacted earth, stone and concrete), which starts from the village road (VR) and ends at the crop fields or connects to another path. In addition, the bypass of the national highway NH-88 is scheduled to pass in this area, for which land acquisition has been completed and tendering is in progress.

(4) Constraints and Farmers' Needs

In the workshop for preparation of the resource map, new road construction was not proposed, while only widening of existing village road from NH-88 was proposed. The farmers seem to be satisfied with the present village road (VR) and footpaths presumably because of following reasons:

i) Present transport distance of agriculture produce by foot is not more than 300m by the narrow width of the Site and well-developed footpath network, and

ii) Present cropping is mainly food grain with low yield of 2-3 ton/ha which does not require wider road and right of way for new road connection.

## L-2.6 Present Post Harvest Handling and Processing

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:

Governmental or semi-governmental Sector

i) There are no agro-processing facilities operated by HPMC in Hamirpur District.

ii) Himachal Pradesh Fruit Canning Unit (himcu) under Department of Horticulture is operating two (2) Community Fruit Processing and Training Centers at Tauni Devi and Nadaun. After getting modern agro-processing technology at those training centers, some women or women's groups have started to produce and sell processed food such as pickles, chutney, chips, sweet made from Indian gooseberry (amla) in the neighbourhood markets.

iii) Followings are the photographs of Community Fruit Processing and Training Centers at Tauni Devi

Pickles processing facility.

Processing of citrus pickles

Lecture room for small scale agro-processing

Private Sector

Followings are current situation of agro-processing activities by private sectors in the district:

**Table L-2.6.1 Private Agro-Processing Plants in Hamirpur District**

| No. | Name of the Plant | Address | Year established | Capacity (ton/year) | Main commodities |
|---|---|---|---|---|---|
| 1 | Himachal Mahila Grih Udyog | Village Tibi, Kuthera, Hamirpur | 1996 | 96 | Fruits and vegetables products |
| 2 | R. S. Food Product | Village Bhud, Kuthera, Hamirpur | 1996 | 80 | Fruits and vegetables products |
| 3 | Himpro Food Pvt. Ltd. | Village Nakhner Souran, Kuthera, Hamirpur | - | 100 | 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"*

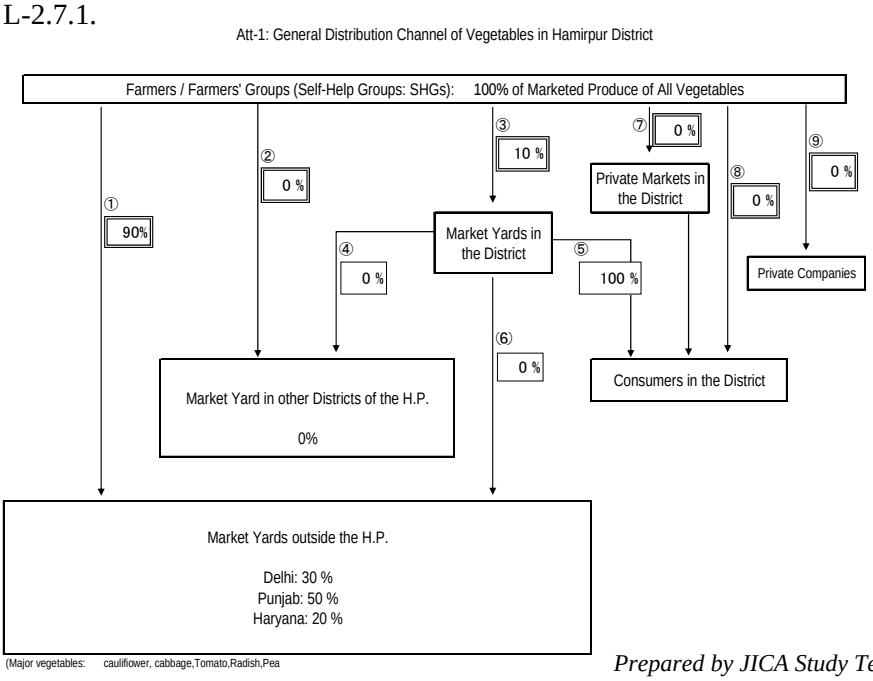
Constraints and Countermeasures

In Hamirpur 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-2.7 Present Crop Marketing and Market Facilities

(1) Marketing Distribution of Vegetables

In Hamirpur District, almost all vegetables, which are locally produced, are consumed in the district as shown in Fig. L-2.7.1.

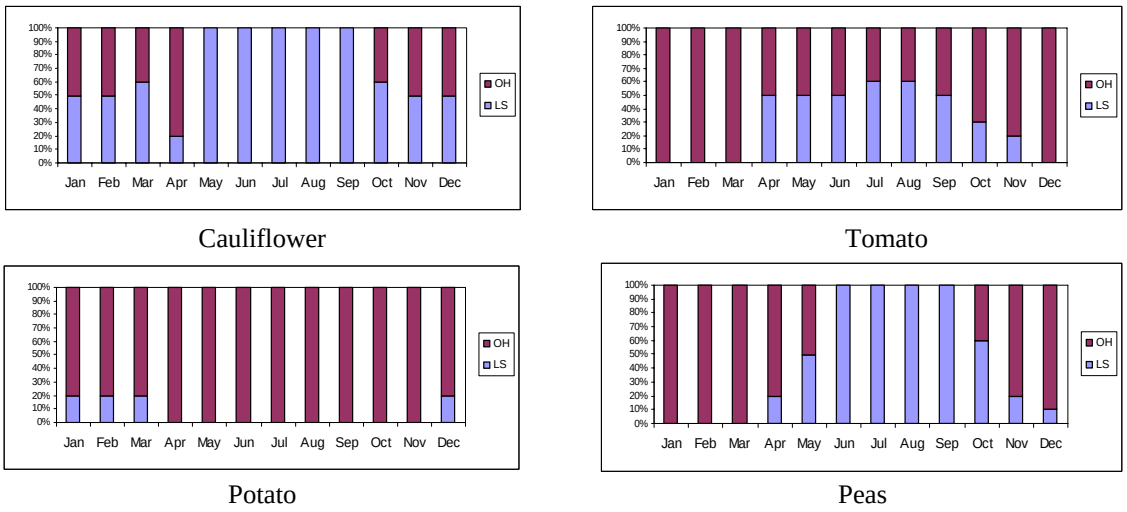



*Prepared by JICA Study Team*

**Fig. L-2.7.1 Distribution Channel of Vegetables in Hamirpur District**

In the District, there are some active farmers, who have cultivated exotic vegetables such as yellow and red capsicums, applying the protective cultivation. Those farmers have received some subsidy from Horticultural Technology Mission. They have contacted some wholesalers in Delhi or other big consuming areas.

Current situation on arrival quantity of local vegetables produced in the H.P. and imported vegetables, from other states is shown in Fig. L-2.7.2. Vegetables during the winter season are supplied from other states, while off-season vegetables are supplied locally.




*Note) OH: Supply outside the State of H.P., LS: Supply from Districts of H.P.*

**Fig. L-2.7.2 Proportion on Arrival of Vegetables from Districts of H.P. and Outside H.P.**

(2) Outline of Market Yards

Front View
Hamirpur Market Yard

In Hamirpur District, there are two market yards, as shown in Fig.L-2.7.2. Hamirpur Market Yard is nearby the sample site in Lalri area as shown in Fig. L-2.7.2. This Market Yard is categorized into a regulated market yard, and the office of APMC is located in this market, and the other sub-market yard is categorized as a sub-market yard. In the sub-market yard, there is no office of APMC, therefore APMC has to deploy some supervisor to control the sub-market yard. All the information on arrival quantity and market price of major vegetables are collected by market supervisor of the APMC, thus those information is given to AGMARKNET, Marketing Board, and DOA.

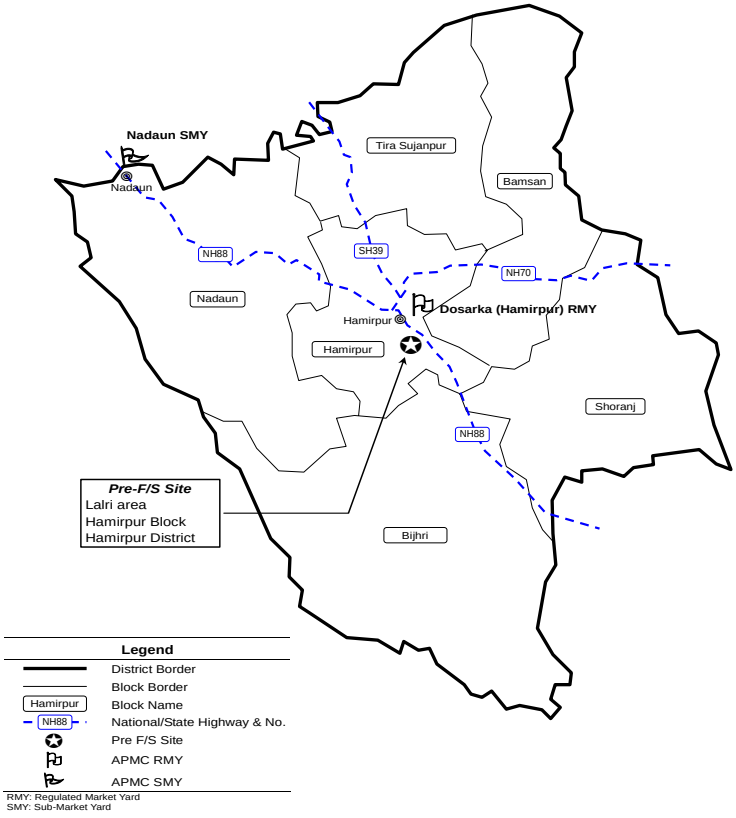



**Fig. L-2.7.3 Location of Market Yards of APMC in Hamirpur District**

(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:

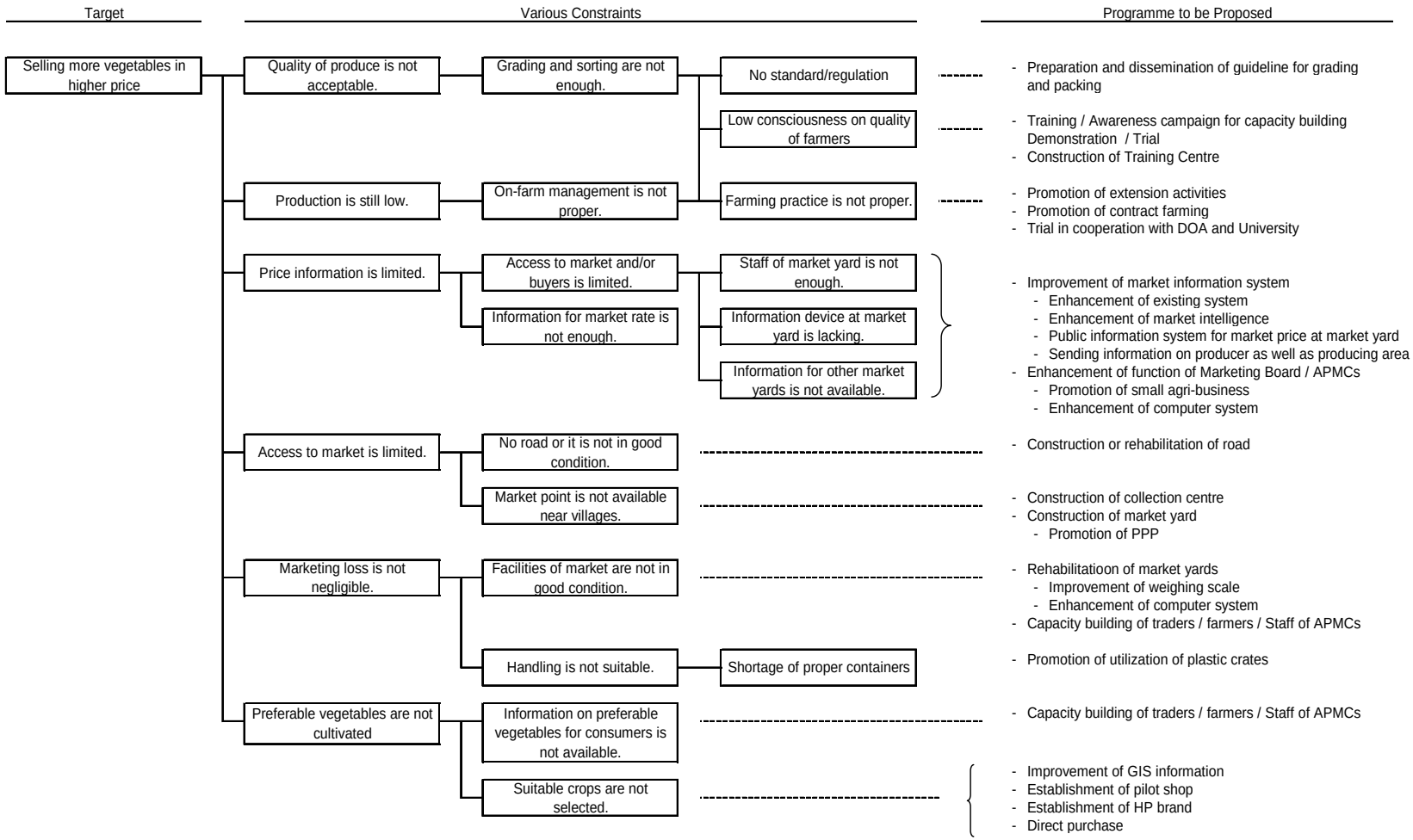



**Table L-2.7.1 Constraints and Countermeasures concerning Enhancement of Marketing System**

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-2.8 Present Farmers' Groups and Agricultural Supporting Services

(1) Farmers Organization/Groups in Lalri Site

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

**Table L-2.8.1 Farmers Organizations of Lalri Site**

| Organization | Activities | Problems | Potentials |
|---|---|---|---|
| KVS/ Water Users Association formed by the assistance of Soil Conservation Wing of Department of Agriculture. It was formed in 2002-2003 | • This is a 7 member body formed during the construction of the check dam. They were meant to oversee the construction and later look after its management.<br>• They had also collected a sum of Rs. 2,500-3,000 initially as a fund to be spent on the expenses incurred in the maintaining of the Check Dam. | • The group is currently non-functional.<br>• Initially the KVS was also meant to serve as a target group for the Departmental extension activities in the village but DOA has had no further interaction with the KVS. The farmers said that they had no incentive to keep their group active.<br>• The farmers proposed to use the water for irrigation through lift-irrigation, but the scheme was not carried out by the govt. and therefore the check dam fell into disuse. Thus the KVS had no role to play. | • Reviving and Strengthening of the KVS<br>This group could be revived and strengthened to build consensus in the village and to take on a responsible role for the project activities to be initiated in the village. They could also be made responsible for the future management and maintenance of the irrigation structure proposed. |
| Gram Sudhar Sabha | • They work on improving the social amenities and services of the village. They collect 10 Rs per month from each household. | • They have around Rs. 3 lakhs as saving, but they are not clear on how they want to use it. | • There is a potential for Inclusion in local institutional mechanism of the project. |

(2) Agricultural supporting services

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

i) Farmers training camps are held to provide information on the recommended package of practices of food grains and vegetables and to motivate the farmers to follow these recommended cultivation technology;

ii) Extension activities are also held focusing on agricultural practices including organic farming, vermi-compost, and poly-house construction;

iii) Inputs including food grain seeds, 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) Farm trials are conducted to test the soil, fertilizer and seed quality;.

v) Training programs to women are conducted on how to grow vegetables;

vi) Seed certification is done by seed certification agency in the areas where there are potential for seed multiplication. Inspections are done and seeds are certified; and

vii) Soil samples taken from different areas are brought and tested. Fertilizer testing is done to check the fertilizer's quality. There is a soil testing laboratory in Hamirpur.

### L-2.9 Vegetable Promotion and Agricultural Support Plan

(1) Basic Considerations

Vegetable promotion and agricultural support for the Lalri site are planned as follows in accordance with proposed program components:

i) The farmers are growing food grains mainly due to non-availability of irrigation facilities. Therefore, vegetable promotion plan is planned mainly based upon the availability of irrigation using the check-dam facility which is already available in the village.

ii) Among the cultivable area of 63 ha, the farmers are cultivating 51.0 ha in Kharif season and 42.0 ha in Rabi season with a cropping intensity of 137%. By using the current fallow area of 17.0 ha for food grains cultivation, the food grains area shall be maintained at the same level.

iii) By introducing the irrigation system, and by adapting suitable package of practices, the yield level of food grains is also expected to increase to a significant level.

iv) Since the Lalri site belongs to Category - III, which has a high potential to convert from food grains to vegetable production, 25% of the total food grains area (17 ha) shall be converted for vegetable production.

v) In consideration of marketing, strategic vegetables such as tomato is introduced in Kharif, and cauliflower, peas and cabbage are introduced in rabi season.

vi) The farmers are already aware of farming practices to grow vegetables, since they are already cultivating vegetables in kitchen gardening. It is planned to introduce multiple vegetables such as egg plant and okra.

vii) Since Hamirpur APMC is located close to the site, the vegetables to be produced in Lalri can be easily marketed at Hamirpur APMC.

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

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

**Table L-2.9.1 Proposed Cropping Area of Lalri Site**

| Crops | | Kharif season (ha) | | Rabi season (ha) | |
|---|---|---|---|---|---|
| | | Rainfed | Irrigated | Rainfed | Irrigated |
| Food Grains | Maize | 10 | 10 | | |
| | Paddy | | 5 | | |
| | Wheat | | | 15 | 15 |
| | Sub-total (Food grains) | 10 | 15 | 15 | 15 |
| Vegetables | Tomato | | 20 | | |
| | Egg plant | | 3 | | |
| | Okra | | 2 | | |
| | Cabbage | | | | 10 |
| | Cauliflower | | | | 10 |
| | Peas | | | | 5 |
| | Sub-total (Vegetables) | | 25 | | 25 |
| Sub-total (Food grains & Vegetables) | | 10 | 40 | 15 | 40 |
| Cropped Area | | | | | 105 |
| Cultivated Area | | | | | 68 |
| Current Fallow Area | | | | | 0 |
| Cropping Intensity | | | | | 154% |

*Source : JICA Study Team*

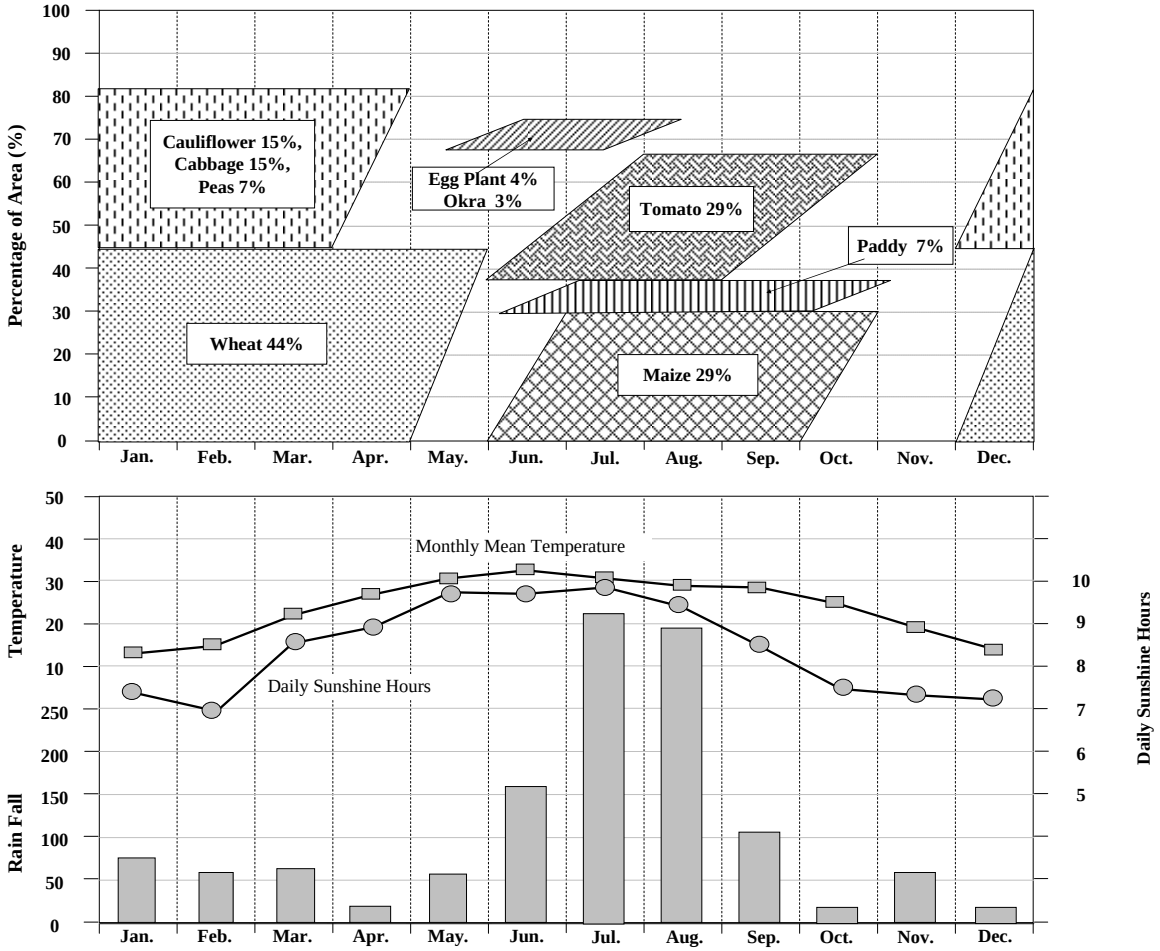



**Fig. L-2.9.1 Proposed Cropping Calendar of Lalri Site**

(2) Cropping Plan for Lalri Site

Food Grains:

i) In Lalri site, the 51 ha of food grains area will maintained at the present level, by converting 17 ha of current fallow area to food grains, while 17 ha of food grains area will be converted to vegetables.

ii) While the total maize area (48 ha) will be maintained, 20 ha area is proposed to be cultivated under irrigated condition with the introduction of irrigation system, and 28 ha shall be grown under rainfed condition.

iii) While the 3 ha of paddy area will be maintained, it is also proposed to be cultivated under irrigated condition.

Vegetables:

i) With the introduction of irrigation system, vegetables shall be cultivated newly in 17 ha area which is equivalent to 25% of the total area. 17 ha of the food grains area shall be converted to vegetables cultivation.

ii) The selection of vegetables is made in consideration of existing farming conditions, experience of the farmers in the area on vegetable cultivation, intention of the farmers, and the current market conditions

iii) It is proposed that the strategic vegetable tomato shall be cultivated in 12 ha area, and the vegetables egg plant and okra shall be cultivated in 3 ha and 2 ha respectively during kharif season.

iv) Similarly, it is proposed that the strategic vegetables including cauliflower and peas shall be cultivated in 6ha and 5 ha area respectively, while cabbage shall be cultivated in 5ha area.

(3) Proposed Farmers Support Program Activities

The farmers support program activities which shall be carried out in Lalri 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) Promotion of organic farming

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

v) Extension of protective cultivation (greenhouse)

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

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

viii) Promotion of farming practices to reduce soil erosion

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

ii) Promotion of warm water fish culture (carp & cat fish) under integrated farming including the irrigation system

### L-2.10 Post Harvest Processing and Marketing Plan

(1) Post Harvest Processing Plan

Agro-processing is not active at present due to availability processing materials, therefore, it is recommended to post harvest activities are proposed 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 organizing of the extension camps.

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

iii) Existing Community Fruit Processing and Training Centers 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 III:

i) Farmers in Lalri area do not have sufficient experience for vegetable cultivation, however they have enough experience for other business. It is expected that they carry out vital and characteristic agriculture, if they will be interested in vegetable cultivation, and thus chase surprising dreams.

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

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

iv) Carving out niche vegetables in vegetable consuming market

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

vi) Promotion of program component on marketing system improvement

One multi-purpose collection centre is proposed near Lalri village. At a later stage, collection, grading, and storage facilities shall be additionally planned based on the necessity, after vegetable cultivation will be broadly promoted in a few years.

### L-2.11 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 Design and Facility Plan

In this area, construction of new lift irrigation system utilizing the existing check dam will be beneficial with the construction of the raising main pipeline, delivery tank and distribution system. Alternative survey and design were also made at the junction of Hatli Khad and Jamali Khad. This lift irrigation system will cover about 40 ha which is beyond the normal size to be developed by the DOA. Also, the pump capacity will be more than 100 HP which will be beyond the capacity of the operation and maintenance by the WUA, and hence this system may be divided to two separate systems, if needed.

(2) Access Farm Road System Design and Facility Plan

The proposed road of Lalri R-1 penetrates the slightly western side of the entire area from the north to the south and plays an important role of the transportation of produce in the area. A Hamirpur bye-pass of NH-88 is under bidding for the construction and a multipurpose collection centre is proposed along the end of the proposed road. The main improvement work consist of reconstruct the aged and mostly disappeared pavement with rehabilitation and reconstruction of the cross drainages. Although the road gradient is slightly steeper than the criteria in the Rural Road Manual (IRC-SP20) at 250m of the entrance, the traffic safety is expected to increase for pickup type after reconstruction of the pavement.

(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-2.11.1 and their location is shown in Fig. L-2.11.1.

**Table L-2.11.1 Salient Features of Infrastructure Development Plan**

| Proposed works / location | No. | Description |
|---|---|---|
| 1. Irrigation | | |
| 1) Lift irrigation at existing check dam | | |
| - Lalri | I-1 | CCA = 40 ha, H = 68 m, BHP = 195 HP |
| 2. Access Farm Road | | |
| 1) Improvement of existing access farm road | | |
| - Lalri | R-1 | L = 837 m, W = 2.5 m, Beneficiary area = 17 ha |

*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*

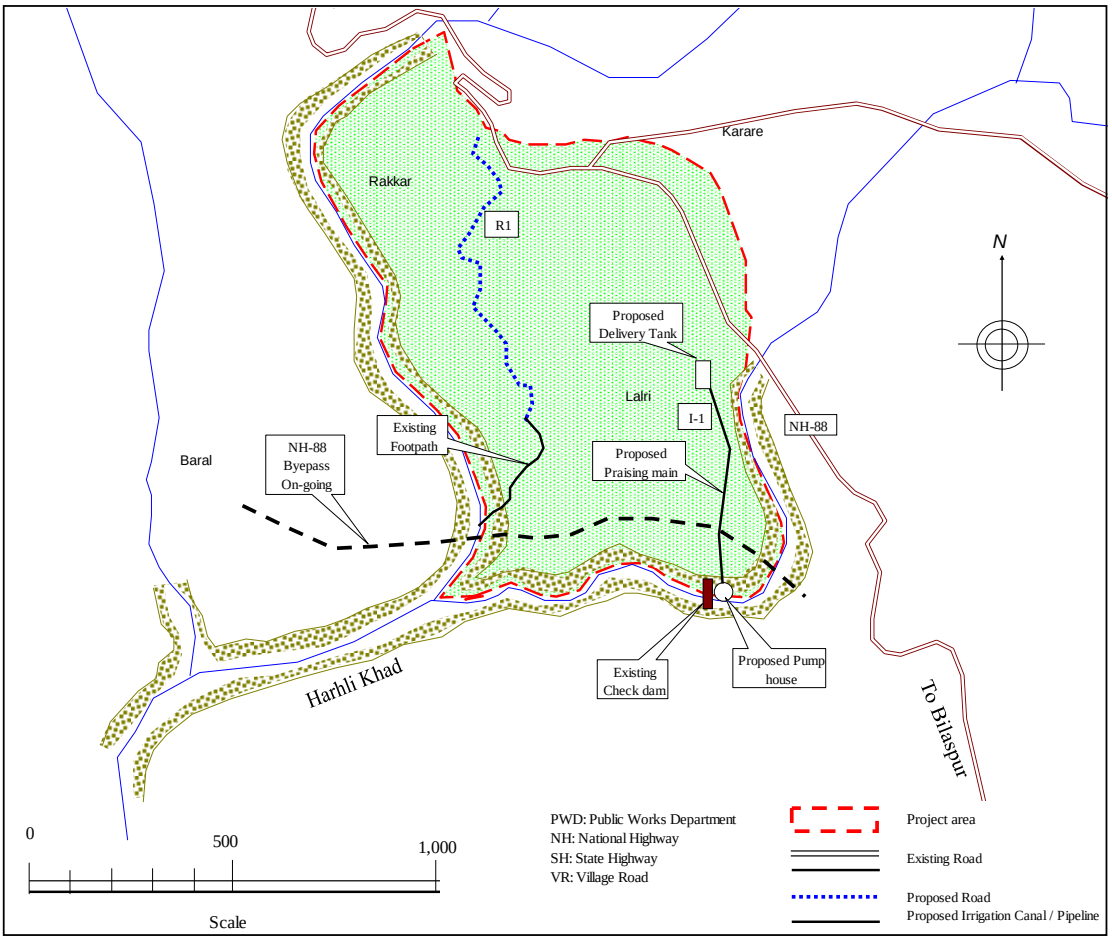



**Fig. L-2.11.1 Location Map of Infrastructure Development Plan**

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Lalri site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor 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-2.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development**

| Item | | Amount (Rs.) | Cost Allocation | |
|---|---|---|---|---|
| | | | Individual | Weighted |
| 1) Irrigation | | | | |
| - Construction of Lift Irrigation | 40 ha | 6,378,000 | (100%) | |
| **Sub-total** | | **6,378,000** | | **(100%)** |
| 2) Access farm road | | | | |
| - Improvement of Existing Road, R1 | 837 m | 708,000 | (20%) | |
| **Sub-total** | | **708,000** | | **(20%)** |
| **Total** | | **7,086,000** | | **(92%)** |

## L-3 Malan Site of Nagrota Bagwan Model Areas

### L-3.1 Present Socio-economic and Natural Conditions

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 cross a middle part of the site exist from the north to the south.

The natural conditions of Malan site are summarized in Table L-3.1.1.

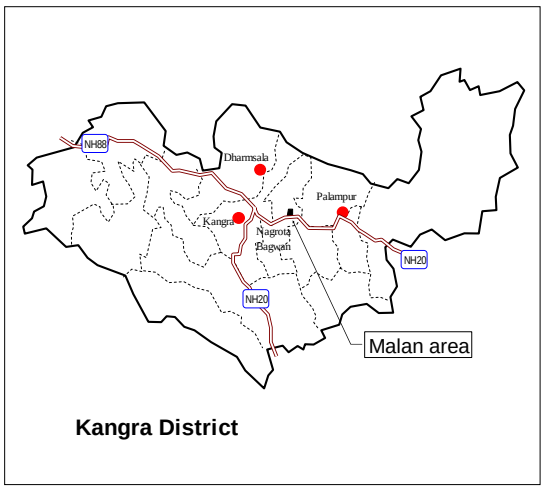



**Fig. L-3.1.1 Location Map of Malan Site**

**Table L-3.1.1 Socio-economic and Natural Conditions of Malan Site**

| | | | |
|---|---|---|---|
| District | Kangra | Annual rainfall (mm) | 1,481 |
| Block | KG-24 Nagrota Bagwan | Average Temperature (◦C) | 19.8 |
| Panchayat | Malan | Average Max.Temperature (◦C) | 32.1 |
| Village | Uprali Majhetli, Malan, Pankhar, Bhuli Majhetli, & Bamnehar | Average Min. Temperature (◦C) | 4.4 |
| | | Total area (ha) | 600 |
| | | Cultivated area (ha) | 197 |
| Category | II | Annual rainfall (mm) | 1,481 |
| Agro-eco zone | Zone-1 | | |

*Source: Prepared by JICA Study Team*

(1) Population / 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-3.1.2 Population Distribution of Malan Panchayat**

| Village | Population | Total SC Population | % of SC* | Total ST** Population | % of ST | Total OBC Population | % of OBC*** |
|---|---|---|---|---|---|---|---|
| Gujreda | 359 | 97 | 27 | 144 | 41 | 14 | 3.8 |
| 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 | 1770 | 702 | 19.5 | 249 | 6.94 | 1,077 | 60.48 |

*Source; Panchayat Record Malan Panchayat, Note: * Schedule Castes, ** Schedule Tribe, *** Other Backward Classes*

The population in the area is comprised of 6.94 % tribal, 19.5 % Schedule Castes, 60.48% Other Backward Castes and 12.5 % upper caste communities. The predominant communities among SCs are Lohaar (Iron Smith). The other two caste include Mochi (Cobbler) and Harijan. The Other Backward Class includes Julahas (weaver). SCs and OBCs 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.

## L-3.2 Present Agriculture

(1) Crop Cultivation

The current cropping pattern in Malan site is shown in Table L.3.2.1 and cropping calendar is in Fig. L.3.2.1. The total cropped area is 382 ha with cropping intensity of 194%.

**Table L-3.2.1 Existing Cropping Pattern of Malan Site**

| Crops | | Kharif season (ha) | | Rabi season (ha) | | Ave. Yield |
|---|---|---|---|---|---|---|
| | | Rainfed | Irrigated | Rainfed | Irrigated | ton/ha |
| Food Grains | Maize | | 28 | | | 2.7 |
| | Paddy | | 142 | | | 2.9 |
| | Wheat | | | | 69 | 2.9 |
| Sub-total (food grains) | | | 170 | | 69 | |
| Vegetables | Potato | | | | 115 | 20.0 |
| | Radish | | 7 | | | 10.0 |
| | Ginger | | 6 | | | 15.0 |
| | Onion | | | | 2 | 20.0 |
| | Garlic | | | | 2 | 10.0 |
| | Turnip | | | | 2 | 10.0 |
| | Mix Vegetables | | 5 | | | 5.0 |
| | Sub-total (vegetables) | | 18 | | 121 | |
| Sub-total (Food grains & Vegetables) | | | 188 | | 190 | |
| Fodder Crops | | | | | 4 | 42.0 |
| Cropped Area | | | | | | 382 |
| Cultivated Area | | | | | | 197 |
| Current Fallow Area | | | | | | 3 |
| Cropping Intensity | | | | | | 194% |

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

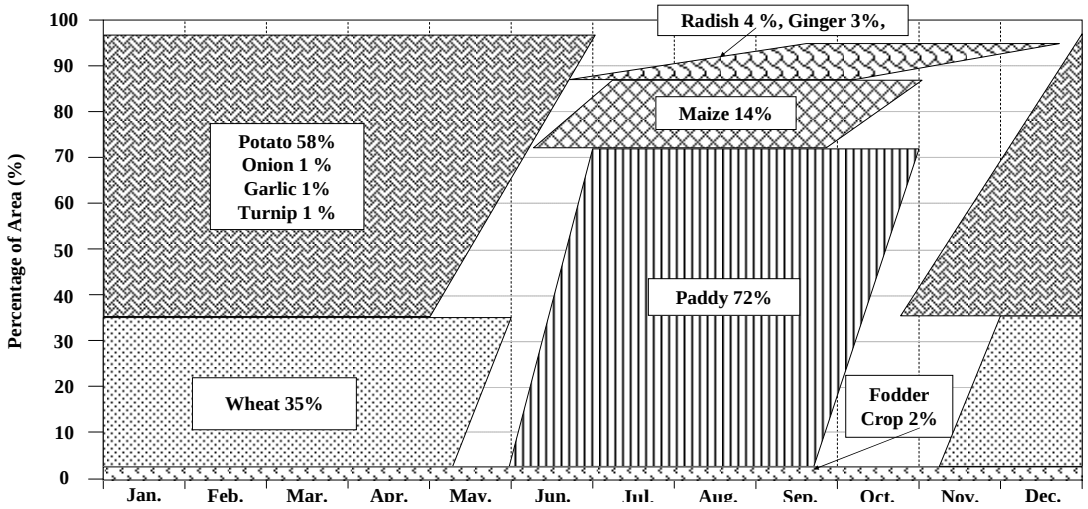



**Fig. L-3.2.1 Existing Cropping Calendar of Malan Site**

In Malan site, the area is fully facilitated with the existing irrigation system so that the both food grain crops and vegetables are grown under irrigated condition. During Kharif season, maize and paddy are the main crops, while during Rabi season, potato occupies half of the cropped area. The major reasons for growing potato in the site reported by the farmers are as follows:

i) The climate of the site is ideally suitable for potato cultivation, and potato has been grown in the site for more than 20 years with a relatively higher yield;

ii) The water source in the site is sufficient enough for growing potato, and

iii) Marketing of potato is easier and market channel has been already established in the site

Although the farmers have been cultivating potato for a long time in the area, they are also concerned that the cost of seed is very high. Besides, there are also diseases in the potato such as bacterial wilt and potato tuber moth. The farmers are interested to convert atleast 25% of the potato area to other vegetables such as peas, cauliflower, onion, garlic. At present, the other vegetables including radish, ginger, onion, garlic, cabbage and cauliflower are cultivated in relatively smaller areas.

The average yields of food grains are 2.7 to 2.9 ton/ha which are relatively much higher than the State average yields. The average yield of potato is about 20.0 ton/ha, which is also higher than the State average yield of about 10.0 ton/ha, since the site is irrigated. The major varieties of the crops grown in Malan site are: Kanchan (hybrid), Local for maize; RP 2421, RP 2143, HPU 2216 for paddy; PBW-343, 373, UP 2338 for wheat; Kufri Jyoti for potato; Tulsi (hybrid), Parbhni kranti for okra; PPL, PPC, Arka Keshav, Arka Nidhi for egg plant; and Local, Bahar, Himgiri for ginger.

(2) Farm Inputs

About 90% of the households purchase their seeds for cereal crops from departmental outlet, while the remaining 10% purchase from the farmers in the village. In case of potato seeds, 60% of households purchase from private dealers of retail shops outside the village, 20% of the households purchase from Lahaul Potato Society (LPS), and the remaining 20% purchase from the farmers in the nearby villages. In case of vegetable seeds, 50% of households purchase vegetable seeds from departmental outlet, whereas the remaining 50% purchase from retail shops in the village. HIMFED is the major supplier of Fertilizers at the site. Vermi-composting is also started in the area and each farming household has adopted this technique. The usage of Fertilizer in the year 2007-08 in the area is given below.

**Table L-3.2.2 Fertilizer Use in Malan in the Year 2007-2008**

| Name of the Fertilizer | Amount (ton) |
|---|---|
| Urea (Nitrogenous Fertilizer) | 42.5 |
| NPK 12:32:16 | 60 |

*Source: ADO, Malan*

The major pest in potato is potato tuber moth, and the major diseases are early blight and late blight. About 80% of the households purchase their agro-chemicals from agricultural departmental outlet and 20% of the households purchase their agro-chemicals from retail shops in the village. All the farmers purchase their fertilizer from the cooperative society. On an average about 20 tons of organic manure is used by each household, of which 60-70% are from self-owned animals, and the remaining 30-40% are purchased from the farmers in the same Panchayat.

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.

Family labours (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, harvesting, threshing and cleaning. In regard to vegetables, all the operations including land preparation, weeding, and harvesting are done by both family labor and casual labor. However, application of fertilizers &

chemicals is done only by the family labor. The male casual labours are mostly involved for the transport of vegetables to the market.

(3) Constraints in Crop Production

Major constraints as reported by farmers are as follows:

- Lack of finance in procurement of fertilizers, agrochemicals and seeds;
- Occurrence of pests and diseases in potato; and
- High cost involved in transport & marketing of potato to Delhi, Punjab and other markets.

(4) Crop Diversification Potentials

Because of the high seed & input costs and diseases because of continuous cultivation of potato, the farmers are interested to diversify at least 25% of potato area to other crops such as peas, cabbage, cauliflower and ginger. Besides, they are also looking for a higher benefit of vegetables including potato through better marketing. The major requirements for crop diversification reported by farmers are improvement of irrigation facilities; and technical support from the government.

### L-3.3 Present Agriculture-Allied Sector

(1) Horticulture

Present Planting: There are 12 plots of mango and litchi fields with 25~30 plants each. One mushroom plot is producing and supplying 2 tons of mushrooms to local hotels and restaurants. Cultivation of medicinal plants including Kaunch, Ashwagandha, Satawar and Safed Musli has been successfully done by several farmers. One green house is under installation for flower cultivation.

Diversification Potential of Horticulture Crop: The site is covered with existing irrigation area and potato, wheat, maize and rice occupy the most of the site. For the diversification it is necessary to convert some of these cropped areas to horticulture crops. Suitable horticulture crops in the site are: Mango, Litchi, Peaches, Aonla and Strawberry for promoting fruit planting; Gladiolus, Chrysanthemum, Lillium, Gerbera and Carnation for promoting floriculture; and Kaunch, Tulsi, Ashwagandha, Satawar, Safedmusli and Aloevera for diversifying medical and aromatic plant cultivation. As ancillary activities, Mushroom cultivation and Bee keeping have high potentials.

Technologies required for exploitation of horticulture's diversification potential are as follows:

i) Covered cultivation of flowers, and open cultivation of marigold and medicinal plants;
ii) Formation of clusters of growers;
iii) High density plantation of peaches to fill gap for marketing in May to June; and
iv) Planting of high quality seedlings of Mango, Litchi and Aonla.

(2) Animal Husbandry

The current livestock population in Malan site is 362 crossbred cattle, 371 indigenous cattle, 180 buffaloes, 131 sheep, 123 goat, and 29 horses and others. While most of the crossbred are female and used for milk, indigenous cattle are males used for agricultural operations. The site has also good number of graded buffaloes reared for milk. The location needs focus on improving feeding situation.

Available infrastructures of livestock sector in and around the site are VH (veterinary health center) and 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 given in Table L-2.2.3 in Chapter L-2 and summarized below:

i Dry matter supply is estimated at 1,462 tons against demand of 3,205 tons, having shortage of about 54.4%;

ii) Green fodder supply is estimated at 1,113 tons against demand of 5,288 tons, having shortage of about 79.0%; and

iii) Dry fodder supply is estimated at 1,382 tons against demand of 3,525 tons, showing shortage of about 60.8%.

Malan is in a dairy belt and has a deficit of green and dry fodder. For dairy development it is necessary to decrease the deficit.

(3) Fish Culture

Potential for fish culture has not been found, since there is no pond and existing activity.

## L-3.4 Present Irrigation

(1) Existing Irrigation System

According to the information from the Block office, the existing irrigation system covers almost all parts of this area. There exist some irrigation systems, most of which have been developed by farmers themselves since more than 100 years ago and partly rehabilitated and/or upgraded with the assistance of IPH Department.. These systems mostly have free intakes with temporary traditional check dam 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:

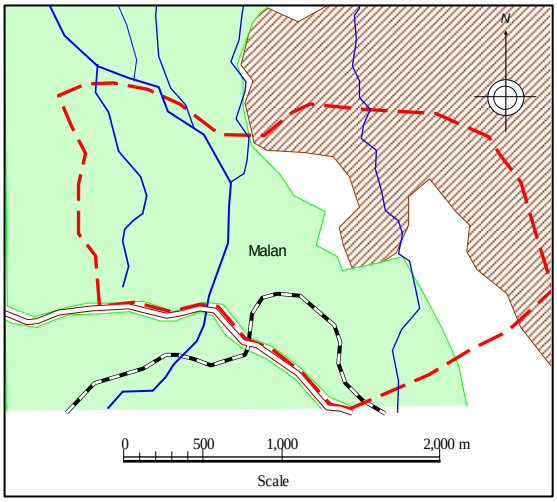



**Fig. L-3.4.1 General Layout of Malan Site**

**Table L-3.4.1 Main Irrigation System in Malan Site**

| Name / Village | Type | Area (ha) |
|---|---|---|
| Uparli Mjheti | Communal flow irrigation | 58 |
| Malan | Communal flow irrigation | 39 |
| Pankhar | Communal flow irrigation | 26 |
| Bhuli Majheti | Communal flow irrigation | 28 |
| Bamnehar | Communal flow irrigation | 22 |

(2) Present Irrigation Practice

Present irrigation practice for the major crops is summarized below.

**Table L-3.4.2 Present Irrigation Practice in Malan Site**

| Crop | Area (ha) | Irrigation period | Nos. of times or interval |
|---|---|---|---|
| Potato | 100 | Dec. - Apr. | Not fixed |
| Wheat | No data | Nov. - Apr. | Not fixed |
| Paddy | No data | Jun. - Aug. | Not fixed |
| Maize | No data | Jun. - Aug. | Not fixed |
| Vegetable | No data | Mar. - Jun. | 5-6 times in growing period |

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

One WUA has been organized in Malan village and registered. The members have a regular meeting every month and are managing group activities for operation and minor maintenance works. According to the interview to the farmers, however, the activities of the WUA is quite limited and not so functional at moment. For water management, rotational irrigation is applied as per the schedule prepared before the season, while major maintenance works are being carried out by individual farmers with less control by WUA.

(4) Constraints and Farmers' Needs

Though this site is fully facilitated with the existing irrigation system, farmers aware the lack of adequate water management and maintenance works. They propose to frame a rule for water management and to form a committee over WUA. In addition, some canals require rehabilitation of the damaged sections due to the land slide, which are presently causing interruption in the water flow in the canals. During the workshop for preparation of resource map, one new check dam or head wall (concrete wall for guiding intake water) was proposed to replace the traditional intake facility at the Jogal Khad river.

## L-3.5 Present Farm Road

(1) Road Network

There are one national highway (NH20), one state highway (SH17) and 70 links of motorable Public Works Department's village road (PWD VR) in the Block. NH20 passes along the southern edge of the Site. It is about 20 km from the Site to Kangra town of the major town in the District, and 468 km to Delhi via. Kangra.

(2) Village Connectivity

Out of total 280 villages under 54 Panchayat in Nagrota Bagwan Block, 188 villages (67%) have been connected by all-weather motorable road, which is higher percentage of the State average (60%) and District average (64%). All villages have been connected by a PWD village road and NH21. There is an isolated village named Chakban Phatiar (with a population of 53) in the protected forest area in the hinterland.The connectivity to this village by motorable road seems to be difficult due to environmental and its construction cost under DOA jurisdiction.

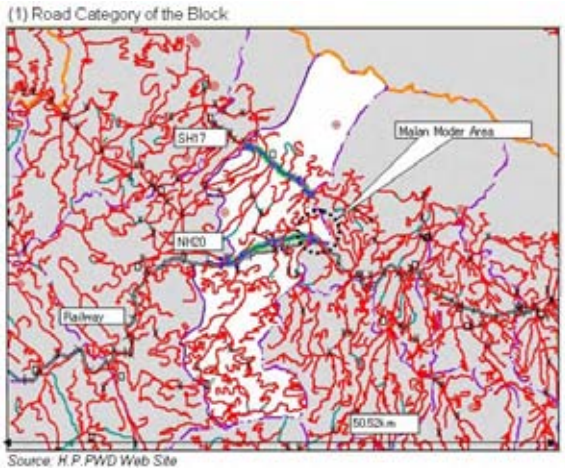



**Fig. L-3.5.1 Trunk Road of Nagrota Bagwan**

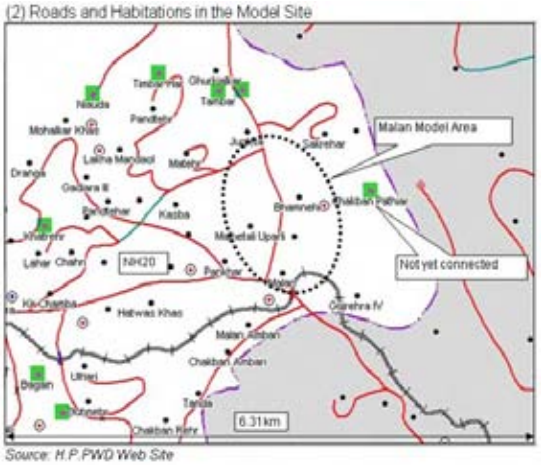



**Fig. L-3.5.2 Roads and Villages in Malan Site**

(3) Roads in the Site

There is one PWD village road passing through the center of the Site from NH21 to the north in parallel with a small river and canal. There are many wide and narrow footpaths with various type of pavement (compacted earth, stone and concrete), which starts from the village road and ends in crop fields or connects to another path or roads. Northern railway Kangra line also passes along the south of the Site in parallel with NH21.

(4) Constraints and Farmer's Needs

The most farmers seem to be satisfied with the present village road and footpaths presumably because of following reasons:

i) Present transport distance of agriculture produce is less than 1000m by well-developed footpath network, and

ii) Present cropping is mainly food grain and maize with low yield as 2-3 ton/ha which does not require additional road system which requires right of way for its construction.

Farmers recently increase the crop area for potatoes, which may require expansion of road network in near future.

## L-3.6 Present Post Harvest Handling and Processing

Processing activities in Kangra District are relatively active. Mainly, agro-products are processed by comparatively small scale groups or by housewives in their houses. Present activities governmental and private sector are explained below:

Governmental or semi-governmental Sector

（1） HPMC is not operating agro-processing plant in this District.

（2） Himachal Pradesh Fruit Canning Unit (himcu) is operating two (2) Community Fruit Processing and Training Centers at Dehra and Nurpur, and also operating Fruit Canning Unit at Nagrota Bagwan with the processing capacity of 200 tonnes per year. At Nagrota Bagwan Canning Unit, about 670 agro-processing technology training camps have been held since 1990, and about 28,000 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 producing and selling processed food such as pickles, chutney, chips, sweet made from Indian gooseberry (amla) in the neighbourhood markets.

Private Sector

Following are current situation of agro-processing activities by private sectors in the District.

**Table L-3.6.1 Private Agro-Processing Plants in Kangra District**

| No. | Name of the Plant | Address | Year established | Capacity (ton/year) | Main commodities |
|---|---|---|---|---|---|
| 1 | Fruit & Flower Society of Himachal | Sungal, Tea Estate, Palampur, Kangra | 1996 | 100 | Fruits and vegetables products |
| 2 | Ganesh Fruits & Vegetable Products | Sansapur Terrace, Kangra | 1998 | 50 | Fruits and vegetables products |
| 3 | The Kangra Pickle Unit | Village Atwas, Kangra | 1997 | 8 | Mainly pickles |
| 4 | Samridhi Mahila Cooperative Society Ltd. | Thakurdwara, Morinda, Palampur, Kangra | 2001 | 25 | Mainly pickles |
| 5 | Seneh Food | Dagli, Dharamsala, Kangra | 2001 | 10 | Mainly pickles |
| 6 | Tarsem Airary | Surajkund Road, Shila Bhawan, Kangra | 1992 | 10 | Mainly pickles |
| 7 | Vitamin Food | Village Ghanwi, Panhara, Nurpur, Kangra | 1993 | 25 | Mainly pickles |
| 8 | Pure Foods | Mallan, Kangra | - | 21 | Mainly pickles |
| 9 | Honey Processing Unit | Kandrori, Kangra | - | 120 | 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"*

About 30,000 tons of quality potato suitable for chips production are produced in the Kangra valley, and are sent to international agro-processing companies in Punjab or Haryana.

During the period from 1994 to 2006, Indo-German Changar Eco-Development Project was executed by GTZ, Germany. The project aimed at sustainable management of processing activities by village groups and enhancement of their own responsibility and ownership. Women's groups were trained and grown up by themselves. Three (3) typical acting processing groups are shown in following table.

**Table L-3.6.2 Typical Women's Agro-Processing Group in Kangra District**

| Name | Members | Activities |
|---|---|---|
| Samridhi Mahila Co-operative Society Ltd. | 250 | processing and manufacturing of achar (pickle), chutney (paste), jam, etc. |
| Vasundhara Van Utpad Producer's Co., Ltd. | 83 | dry amla (Indian gooseberry) and its powder etc. |
| Anmol Baans Shilpkar Society | 22 | bamboo craft |

*Source: JICA Study Team*

Followings are the photographs of himcu Nagrota Bagwan Fruit Canning Unit in Kangra District:

Processing facilities of himcu Nagrota Bagwan.

Agricultural produce is processed under sanitary facilities. Gingers are being

Products of himcu.
Fruits juice, concentrate and jam etc.

Constraints and Countermeasures

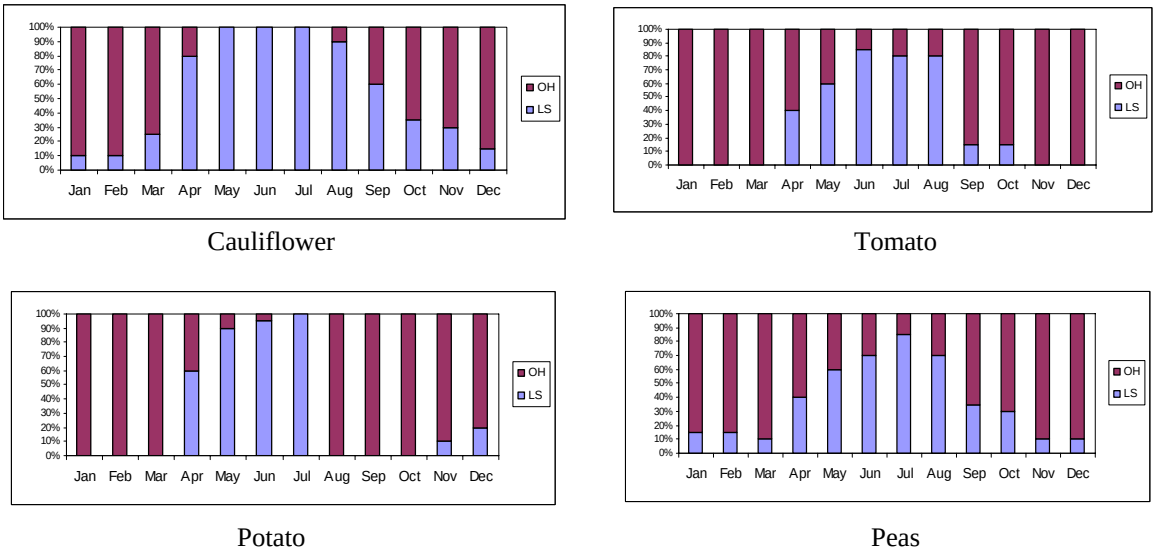
In Kangra District, both of agriculture and horticulture production and large and medium scale agro-processing are comparatively inactive. Agro-processing facilities are very important to create the job opportunities and to raise the local industry; however they should be invited after preparing the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

## L-3.7 Present Crop Marketing and Market Facilities

(1) Marketing Distribution of Vegetables

In Kangra District, almost all local vegetables are consumed in the district as shown in Fig. L-3.7.2. However, it is said that potatoes, bitter gourd, and cucumber, which are produced locally, are shipped out from the district to other states. Especially, it is said that around 50% out of total shipped-out potato is delivered to Punjab as raw material for processing.

Current situation of arrival quantity of local vegetables produced in the State and imported vegetables produced outside the State, is shown in Fig. L-3.7.1. Vegetables during the winter season are supplied from other districts, while off-season vegetables are supplied locally.




Cauliflower Tomato

Potato Peas

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

**Fig. L-3.7.1 Proportion on Arrival of Vegetables from Local and Outside the State**

Att-1: General Distribution Channel of Vegetables in Kangra District

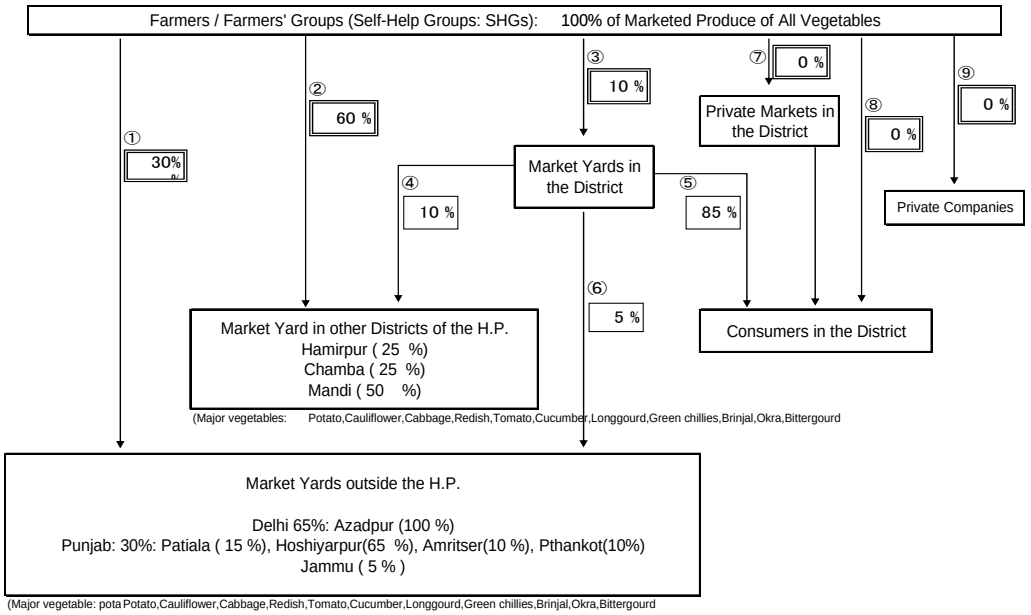



**Fig. L-3.7.2 Distribution Channel of Vegetables in Kangra District**

In the District, there are some active farmers, who have cultivated exotic vegetables such as yellow and red capsicums, applying the protective cultivation. While some farmers have tried to cultivate tomato as well as marigold. They directly supply their produces to wholesalers in Delhi or other big consuming area.

(2) Outline of Market Yards

In Kangra District, there are five (5) market yards, as shown in Fig. L-3.7.2. Nagrota Bagwan Sub-Market Yard is nearby the sample site in Malan area. In this sub-market yard, there is no staff of APMC, therefore daily market price information is not collected properly. Meanwhile, it is said that market price in this sub-market yard is relatively lower compared with other market yards such as Kangra, Palampur, etc. Therefore farmers tend to bring their produces into other markets.

Front View
Nagrota Bagwan Market Yard

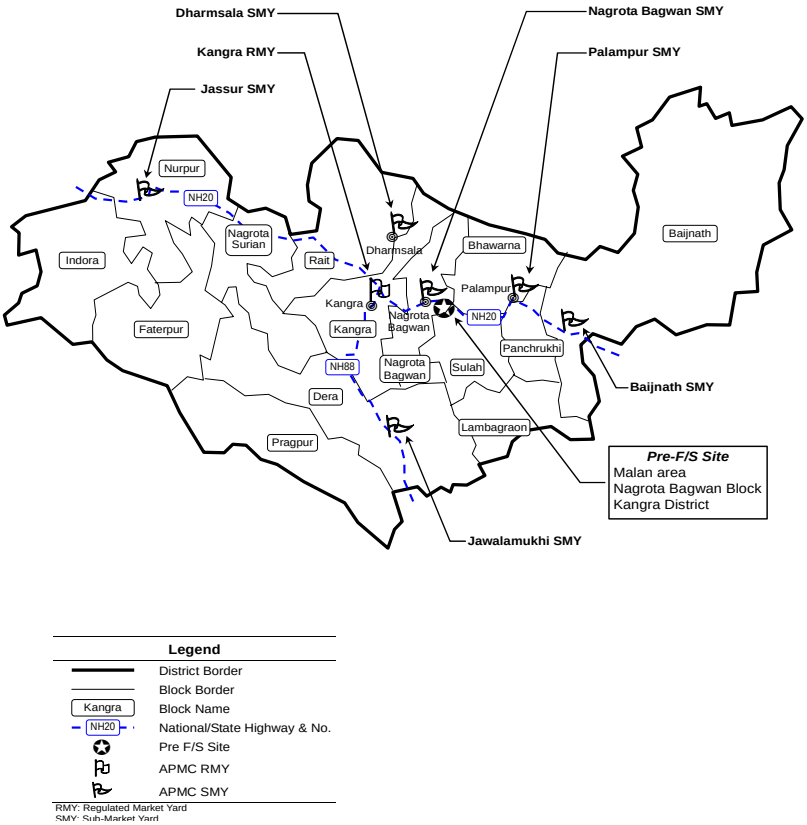



**Fig. L-3.7.3 Location of Market Yards of APMC in Kangra District**

(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 conduct agriculture 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 keep pride and 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.

In this site, potato farmers are well networked with traders. Most of their produces are sold to the traders in the field. This existing situation is comfortable for farmers, however farmers can not negotiate with traders concerning price, and can not change traders. It seems that opportunity for free and open trade is limited in the site.

## L-3.8 Present Farmers' Groups and Agricultural Supporting Services

(1) Farmers Groups and Organizations in Malan Site

There is a potato farmers group under ATMA scheme aiming at technology dissemination. An agricultural cooperative society is involved in the activities including supply of fertilizers, provision of loans. However, there are no groups or organization for marketing or related activities.

(2) Agricultural supporting services

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

i) Farmers training camps are conducted by DOA. Further farmer trainings are also conducted by training centre (KVK) of Himachal Pradesh Agricultural University. The farmers training camps are held for the purpose of providing information to motivate the farmers on advanced crop cultivation technology including potato and guide the advantages of converting from traditional farming to diversified farming;

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) Sub-Plan, Backward Area Sub-Plan (BASP) and so on;

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

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

## L-3.9 Vegetable Promotion and Agricultural Support Plan

(1) Basic Considerations

Vegetable promotion and agricultural support for the Malan site is planned as follows in accordance with the proposed program components:

i) The Malan site is already 100% irrigated, and has a relatively higher food grains yields. The yields are planned to be increased further by better water management practices, and the areas which are used for rice cultivation shall be continued with rice cultivation, and thereby food security can be maintained.

ii) Although wheat is cultivated in 69 ha area in Rabi season, the benefit of vegetables such as peas, cauliflower are two to three times higher than wheat. Therefore, about 25% of the wheat area shall be converted to vegetables such as peas, cauliflower.

iii) 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 4.0 ha to 14.0 ha.

iv) Although potato is a strategic crop and has been grown in the area for more than 20 years, the farmers are reporting diseases because of continuous cultivation of potato, and are interested to convert a part of the area to other strategic/multiple vegetables, which are equally or more profitable. In consideration of crop rotation, 25% of potato area (30 ha) is

planned to be converted to other vegetables such as peas, cauliflower etc.

v) Since the farmers have been growing vegetables for a long time, and are also having a farmers group, it is planned to introduce exotic vegetables in 6 ha area. Since the tourist towns such as Dharamsala, and Palampur are located close to the site, it shall be possible to sell exotic vegetables in these markets.

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

vii) In consideration of quality improvement, varietal improvement trials are also needed, especially for potato.

viii) Introduction of post-harvest technology, especially sorting, grading and packing is needed for potato and other 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-3.9.1 Proposed Cropping Pattern of Malan Site**

| Crops | | Kharif season (ha) | | Rabi season (ha) | |
|---|---|---|---|---|---|
| | | Rainfed | Irrigated | Rainfed | Irrigated |
| Food Grains | Maize | | 18 | | |
| | Paddy | | 142 | | |
| | Wheat | | | | 52 |
| | Sub-total (food grains) | | 160 | | 52 |
| Vegetables | Potato | | | | 85 |
| | Peas | | | | 10 |
| | Ginger | | 11 | | 10 |
| | Radish | | 12 | | |
| | Cauliflower | | | | 13 |
| | Cabbage | | | | 13 |
| | Sub-total (vegetables) | | 23 | | 131 |
| Sub-total (food grains + vegetables) | | | 183 | | 183 |
| Fodder Crops | | | 14 | | 14 |
| Cropped Area | | | | | 394 |
| Cultivated Area | | | | | 197 |
| Current Fallow Area | | | | | 0 |
| Cropping Intensity | | | | | 200% |

*Source : JICA Study Team*

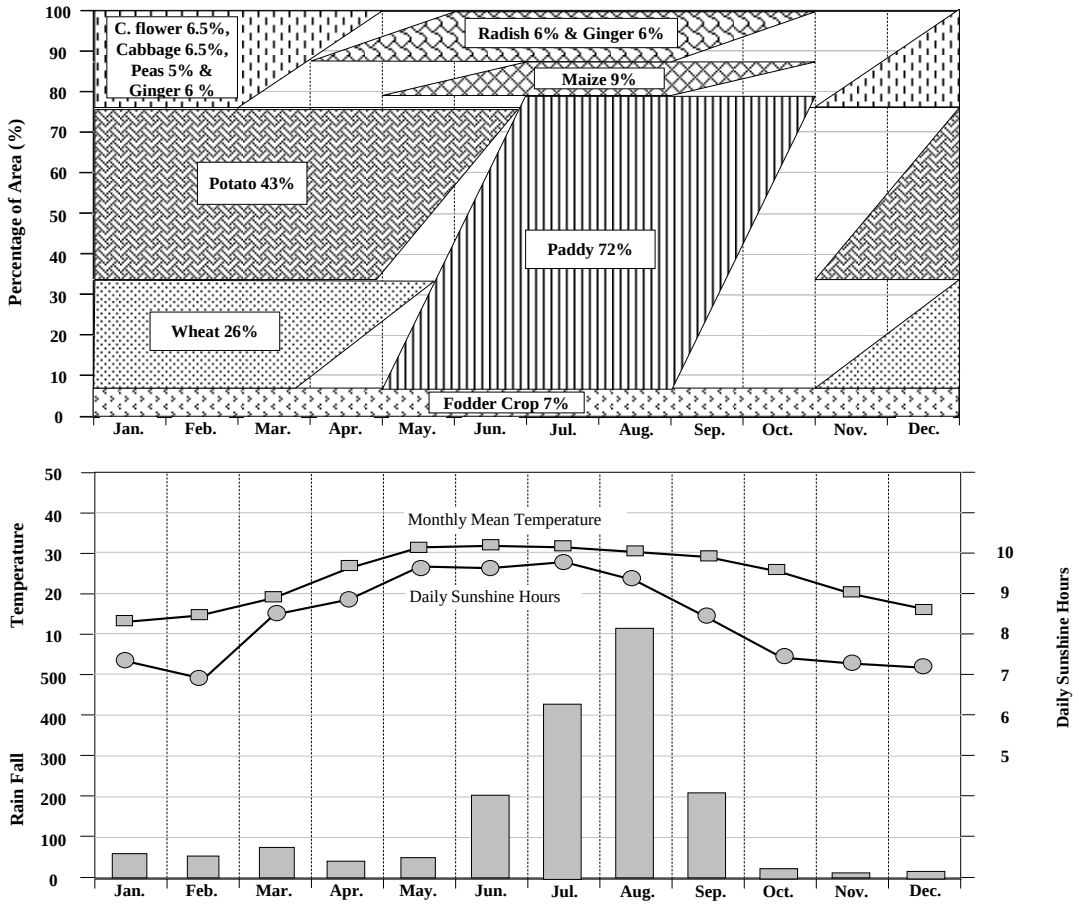



**Fig.L-3.9.1 Proposed Cropping Calendar of Malan Site**

(2) Cropping Plan for Malan Site

Food Grains:

i) In Malan area, paddy is the major food grain crop cultivated in the area of 142 ha, and it is proposed to be maintained at the same level. However, the yield shall be increased further by optimum water management practices through the effective functioning of water users association in the area.

ii) Because of the relatively high livestock population, and only 4 ha of fodder area, there is a high demand of fodder in this area. Therefore, it is proposed that a part of the maize area (10 ha) shall be converted to fodder production, and the proposed maize area is 18 ha.

iii) In Rabi season, about 25% the wheat area (17ha) will be converted from food grains to vegetables and therefore, wheat area is planned as 52 ha.

Vegetables:

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

ii) Although potato is the major vegetable in the area, the farmers are interested to convert to other vegetables, because of the occurrence of diseases, and therefore, approx. 25% of potato area (30 ha) will be converted to other vegetables, and the proposed potato area is 85 ha.

iii) Since 100% of the area is irrigated, it is proposed that Kharif vegetables area shall be

increased from 18 ha to 23 ha, and the popular vegetables in the area in Kharif season including ginger and radish are proposed as 11 ha, and 12 ha respectively.

iv) Similarly in Rabi season, the vegetables area shall be increased from 121 ha to 131 ha, and the strategic vegetable including potato, peas, and cauliflower are proposed in an area of 85 ha, 10 ha, and 13 ha respectively, and vegetables including ginger and cabbage are proposed in areas of 10 ha and 13 ha respectively.

Fodder Crops:

i) Because of the relatively high livestock population, and high demand of fodder in this area, fodder crops area shall be increased from 4ha to 14ha.

(3) Proposed Farmers Support Program Activities

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

1) Vegetable Promotion

i) Introduction of cropping patterns suitable for markets
ii) Promotion of strategic vegetables potato, cauliflower and peas.
iii) Improvement of productivity and quality of vegetables
iv) Promotion of organic farming
v) Organizing or strengthening of farmers group for the marketing purpose and water users association for 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 for potato

2) Food Grain Crop Productivity Improvement

i) Promotion of diversified cropping patterns suitable for productivity increase of food grain crops focusing on paddy production
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-3.10 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 organizing of the extension camps.

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

iii) Since existing Community Fruit Processing and Training Centers at Dehra and Nurpur have been overage, they 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;

- Control of marketing of potato in order to fetch a higher price, applying storage facilities
- Formation of farmers' group (cooperative) for marketing of vegetable produces
- Carving out niche vegetables in vegetable consuming market
- Promotion of transaction of organic products and exotic products in local markets
- Promotion of program component on marketing system improvement

It may be necessary to plan the collection, grading and storage facilities at a later stage, after the vegetable cultivation is established in the area. It is proposed that one collection centre be established near Village Malan for marketing and farmers should control marketing of table potatoes to fetch higher selling price by stage. Meanwhile, existing market yards are readily available in Nagrota Bagwan, Palampur, etc., so it is not necessary to newly establish market yards.

### L-3.11 Infrastructure Development Plan

(1) Irrigation Design and Facility 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. In this area, irrigation facilities have less constraint compared to the other areas, requiring only improvement works of the existing facilities.

(2) Access Farm Road System Design and Facility Plan

The crop fields in the Malan area distribute in the flat land. The resource map requested 2 new farm roads and one existing road and 2 footpaths to be improved as follows:

- R-1: Proposed new road situates mostly along paddy fields in Malan village. The land for road construction is available. The vertical road gradient can be designed in accordance with the Rural Road Manual.
- R-2: Proposed new road situates mostly along paddy fields in Pankhar village. The land owners agreed for 2.5 m wide road width. The vertical road gradient can be designed in accordance with the Rural Road Manual. The road will be constructed on 50cm high embankment and protected by cross drainage (CD).
- R-3: The main improvement work consist of reconstruct the aged and mostly disappeared pavement constructed 20 years ago, together with rehabilitation and reconstruction of the cross drainages in order to jeepable in the rainy season.
- Rf-1: Proposed footpath situates along paddy fields in Pankhar village. The main work is reconstruction of the aged concrete pavement of the existing mule path.

(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-3.11.1 and their location is shown in Fig. L-3.11.1.

**Table L-3.11.1 Salient Features of Infrastructure Development Plan**

| Proposed works / location | No. | Description |
|---|---|---|
| 1. Irrigation | | |
| 1) Improvement of existing Flow irrigation | | |
| - Improvement of existing intake | I-1 | Construction of check dam, CCA = 50 ha, |
| 2. Access Farm Road | | |
| 1) Construction of new access farm road | | |
| - Radha krishan Mandir | R-1 | B.A = 15 ha, L = 499 m, W = 3.0 m, WBM |
| - Chamunda road SH to Pankhar | R-2 | B.A = 10 ha, L = 644 m, W = 2.5 m, WBM, PMC |
| 2) Improvement of existing access farm road | | |
| - Pankhar | R-3 | B.A = 10 ha, L = 560 m, W = 3.0 m, PMC |
| 3) Improvement of existing footpath | | |
| - Dhiman Basti malan to Kui basti | Rf-1 | B.A = 15 ha, L = 556 m, W = 1.8 m, CC |

*CCA : Cultivable 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*

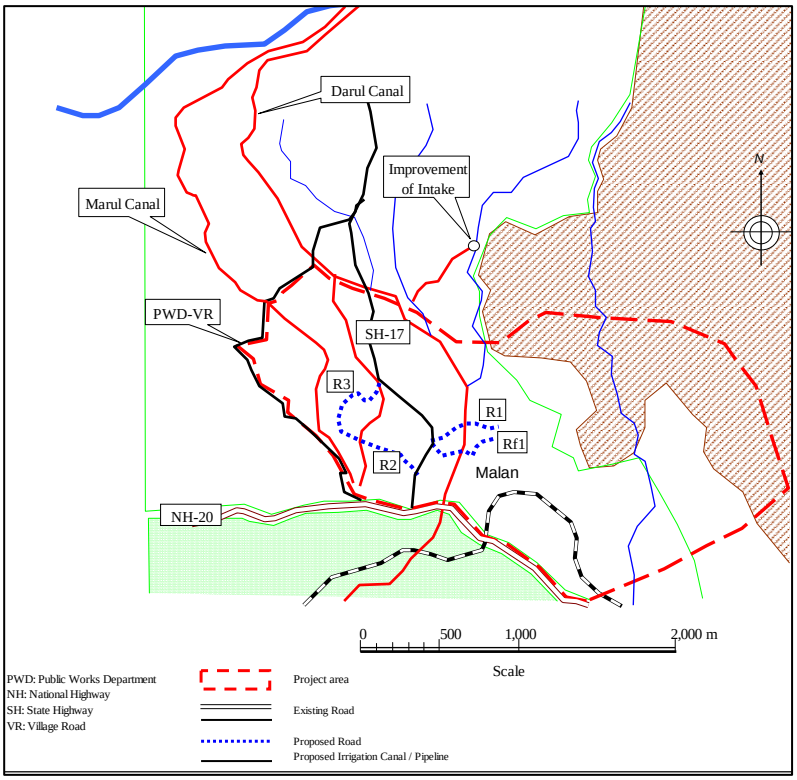



**Fig. L-3.11.1 Location Map of Infrastructure Development Plan**

(4) Preliminary Cost Estimate of Infrastructure Development

The cost for the infrastructure development in Malan site is estimated at the preliminary level based on the topographic survey and the preliminary design of planned facilities i.e. minor 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-3.11.2 Preliminary Cost Estimate and Allocation of Infrastructure Development**

| Item | | Amount (Rs.) | Cost Allocation | |
|---|---|---|---|---|
| | | | Individual | Weighted |
| 1) Irrigation | | | | |
| - Improvement of Intake | | 1,032,000 | (100%) | |
| **Sub-total** | | **1,032,000** | | **(100%)** |
| 2) Access farm road | | | | |
| - Construction of New Road, R1 | 499 m | 790,000 | (50%) | |
| - Construction of New Road, R2 | 644 m | 882,000 | (50%) | |
| - Construction of New Footpath, Rf1 | 556 m | 286,000 | (90%) | |
| - Improvement of Existing Road, R3 | 560 m | 361,000 | (90%) | |
| **Sub-total** | | **2,319,000** | | **(61%)** |
| **Total** | | **3,351,000** | | **(73%)** |