

**CHAPTER 4**

## CHAPTER 4 BASIC STUDY STRATEGY

The basic strategy of the Study centered on a participatory investigation approach, with a primary focus on cost-effectiveness and project sustainability. Within the foregoing framework, several alternative plans were to be formulated as a basis for evaluation and selection of an optimum plan for the Project.

The Study also accorded major emphasis to alleviation of poverty, one of the key goals of the ongoing 8th National Development Plan (1992-1997). With this well in mind, the impoverished stratum of the Project area was identified, and the Study pursued with an aim to maximize the benefits extended to this group under the Project.

Maximum effort was made as well to transfer the survey and study technology under the above described strategy to the assigned counterparts throughout the course of the Study.

### 4.1 Adoption of Participatory Approach

Irrigation development has played a significant role in improvement of the socio-economic conditions in many countries. However, in recent years, as irrigation development projects have been implemented, there has been general and growing disappointment at the levels of productivity and sustainability in many schemes. One cause, which appears to be widespread, is that the beneficiaries in the irrigated area do not have a sense of ownership in the irrigation project, where they have not participated in the project. This coupled with shrinking development and operation and maintenance budgets makes it difficult to sustain the project and to attain the project goal of enhancing living standards of the beneficiaries. Importance of participation by beneficiaries in all stages of the project cycle has been recognized as a key to successful project performance; especially the importance on participation starting at the stage of investigation and planning.

Keeping in view the importance and benefit of the participatory type project, the Study Team adopted the participatory approach in field investigations through participatory rural appraisal and a number of meetings with farmers and stakeholders, and planners from the central and local agencies.

#### 4.1.1 Participatory Investigations

##### (1) Participatory Rural Appraisal

In order to know the situation of the rural society, questionnaire survey has traditionally and popularly been utilized by researchers and development consultants. While questionnaire survey is good to generate various kinds of quantitative data which can be analyzed statistically, it is also necessary to get qualitative data such as history of the society, farmer's perceptions, values and social action criteria (for example, mechanism of cooperation and conflict resolution) and so-called "invisible"

women's domestic household work in order to interpret the collected statistical data and understand the complex rural society in a holistic manner. Accordingly in this feasibility study, the JICA Study Team adopted the Participatory Rural Appraisal (PRA) to complement the traditional household questionnaire survey.

Another rationale of carrying out PRA is to promote the active participation of the targeted beneficiaries in the Project area right from the beginning of the project planning stage so that beneficiary farmers are well informed about the Project and can make their inputs to the Study. Through Participatory Rural Appraisal (PRA), the farmers were directly involved in data collection and given the opportunities to express their ideas and needs vis a vis the Project. This process of beneficiary participation and interactive discussions, consultations and communications between the Study Team and the beneficiary farmers will help the farmers develop a sense of ownership and responsibility for the Project and facilitate the farmers in organizing themselves into water users' associations later on which can take care of the operation and maintenance of the planned irrigation facilities jointly with the Department of Irrigation (DOI).

## (2) Field Level Acting Group (FLAG) Meeting

### 1) Modification of FLAG Meetings

The proposed command area of TIP is a long one. It stretches up to 12 km from the first command area to the last point of the command area. Topographical features are also such that the command area covers higher elevations like Majhitar and Beltar as well as lower areas along the Trisuli river bank at Devighat. The other important feature is that the farmers in the proposed TIP command area are not organized groups yet. Hence, it was not easy to establish contact representative farmer's group.

In order to organize the FLAG meetings, the Study Team made visits to different places within command area. Locations for the FLAG meeting were identified.

In the beginning, the FLAG meeting consisting of district officials and farmers was organized in the meeting hall of the District Development Committee of Nuwakot District on 15 December 1996.

Followed by this meeting, five FLAG meetings were organized during 21-26 January 1997. The participants of these meetings were the farmers. The objective of these meetings was to seek the farmers opinions directly. The farmers themselves, not farmer representatives, were requested to participate in the meetings. These five meetings of the farmers were followed by 10 irrigation block level meetings on the completion of the field work for the feasibility study. Farmers, not representatives, participated in the meetings and discussed with the Study Team about the alignment of the canal, irrigation block concept, operation and maintenance of the system and contribution of the farmers, etc.

These meetings made effort to establish contact with the farmers themselves so all the beneficiary farmers were requested to participate in the meetings. Since it was difficult to bring all the farmers to one place, farmer meetings were organized in various places within the command area in order to make the participation more effective.

## 2) FLAG Meetings

Two Field Level Acting Group (FLAG) Meetings took place in Bidur, Nuwakot District. The first FLAG meeting took place in the Meeting Hall of the District Development Committee on 15 December 1996. Fifteen district level offices were represented in this meeting, and 18 representatives from different parts of the proposed command area also participated in the meeting.

The main objective of this FLAG meeting was to share information both with the district level officials and the representatives of different parts of the command area of the Trisuli Irrigation Project (TIP) about the availability of irrigation water, basic approach of study and agriculture production with the help of irrigation. This meeting also worked as a means of communication to different levels of people who have direct relation with the Project.

The second FLAG meeting took place almost at the conclusion of the Trisuli Irrigation Project (TIP) Study on 28 February 1997. Representatives including CDO, LDO, vice chairman of the District Development Committee, DSP, Inspector of Police, the major from the Army Camp at Maithali and the District Irrigation Officer participated in this meeting. The team leader of the JICA Study Team briefed the participants about the progress of the Study. They were informed that water will be available in the irrigation system only for nine months during the wet season. They were also informed that an alternative intake site was recommended by the Study Team. The alternative intake site was proposed because of cost of construction from the original intake site was too expensive due to a long canal through difficult terrain. The alternative intake is proposed at the end of the balancing reservoir of the Trisuli Hydropower Project which will shorten the distance of the main canal by four kilometers. CDO suggested that he will try to contact with the local NEA staff and see what can be done. Vice-chairman of the District Development Committee of Nuwakot District and other officials of the district recognized the need of shifting the intake point in order to implement TIP quickly.

Elaborate discussion also took place about the alignment within the army camp at Maithali. The army camp representative indicated a positive approach to the Project. However, it is required to go through formal channels to seek approval to lay pipe lines inside the army camp.

It was also discussed in the meeting that it will be useful to let the concerned officials know where the main canal alignment would go, for example, the alignment inside the horticulture farm at Bidur. Prior information to these concerned agencies would help make decisions later on.

### (3) Sub Project Area-wise and Block-wise Farmers' Meeting

In order to have direct interaction with the farmers of the Project area, the Project area was divided into sub-areas, and farmers meetings were organized in these sub-project areas.

Sub project area-wise meetings took place from 21 to 26 January 1997. The details of the meetings are given below.

#### Farmers Participation in Awareness Creation Program for farmers in TIP (Exercise on Farmers Participation in TIP)

Date of Meeting	Name of the area /village	Location of the meeting	Number of participants		
			Male	Female	Total
Meeting No.1 21/1/97	Pipaltar Tallo Pipaltar Devighat	Near Chandra Joyti School	58	1	59
Meeting No.2 22/1/97	Majtar Part of Pipaltar	Pipaltar Pump house, Chauhadi	60	—	60
Meeting No.3 23/1/97	Maharanidi, Inarpati Degaun, Chandipokhari	Laxhmi Narayan Temple, Maharanidi	76	35	111
Meeting No.4 23/1/97	Pokhari-phat, Khadga-Bhanjyng VDC	Pokhari phat School	104	6	110
Meeting No.5 26/1/97	Gerkhua and Simutar	Indreni Chautara Simutar	17	6	23
Total Percentage			315 85%	48 15%	363 100%

It is estimated that there are 1,425 households within the command area of the proposed Trisuli Irrigation Project (TIP). The total participants in different meetings were 363, hence 25% of households participated in the farmers' meetings.

These meetings were organized in 5 places in the proposed command area. The objectives of these meeting were to share information about the Trisuli Irrigation

Project with the beneficiary farmers. At the same time, the meetings were designed to identify concerns of the farmers and incorporate those concerns during study and design of the system.

The concerns of the farmers were:

- 1) The farmers expressed the feelings that if the Project is implemented, it will be like a dream come true.
- 2) Farmers asked about the possibility of looking for an alternative water source such as from the Tadi river.
- 3) The farmers asked about the status of the subject Study among the many surveys in this regard.
- 4) Many farmers prefer to have a gravity irrigation system. However, they also recognized that a lift irrigation system is also necessary to irrigate at the more elevated places within the command area.
- 5) With irrigation, their economic condition will tremendously improve.
- 6) It is good to have year round irrigation. If not, even nine month irrigation would help their economic condition.
- 7) They are willing to take the responsibility of operation and maintenance.
- 8) They promised to extend full cooperation to the JICA Study Team for Trisuli Irrigation Project.

At the conclusion of the field study, 2nd round of farmers' meetings were organized on the basis of proposed irrigation blocks for TIP. 10 meetings were organized. See the table below for the detail information on farmers' meetings.

**Block-wise Farmer Participation in Second Round of Farmers' Meetings in TIP  
(25/2/1997-28/2/1997)**

Date	Block	Area (ha.)	Total Participants	Male Participants	Female Participants
26/2/1997	A	26	38	28	10
28/2/1997	B	44	48	46	2
28/2/1997	C	78	87	82	5
26/2/1997	D	67	102	68	34
26/2/1997	E	106	69	48	21
25/2/1997	F & G	78	74	45	29
25/2/1997	H	39	38	32	6
27/2/1997	I	59	52	51	1
25/2/1997	J & K	136	54	51	3
25/2/1997	L	124	65	33	32
	Total	760	627	484	143
	Percentage		(100%)	(78%)	(22%)

Total No. of HHs: 1425

Participation of HHs is 44%.

**Points discussed during the meeting.**

- 1) Water will be available in the canal only for nine months during the wet season.
- 2) Alternative 1 at the end of the balancing reservoir of NEA as the intake for TIP is proposed due to high cost of construction from the original intake at aqueduct no.2.
- 3) Larger part of the area will be served by gravity irrigation.
- 4) Five lift pumps are provided to irrigate the higher elevation areas. A separate block will be irrigated independently by each pump.
- 5) Operation, maintenance and electricity cost are to be born by the users themselves. Users agreed on this point.
- 6) On inquiry by the users about the spare parts of pumps, it was agreed that a reasonable quantity of spare parts will be made available. Appropriate training will be provided to the operators of the pumps who will be recruited by the beneficiaries themselves.
- 7) A number of points suggested by the beneficiaries to reduce the operation cost have been taken into consideration by the engineers to adjust the alignment of canal as well as the location of pump houses.

- 8) Farmers have understood that they have to take responsibility for O&M at the block level.
- 9) They have expressed their willingness to contribute their share for the construction. They suggested that contribution should not be limited only to cash. Labour contribution would also to be allowed.
- 10) The farmers wanted to know whether there will be volumetric measurement of water. The response to this was that some measuring devices will be placed at strategic points but it is not known whether water charge will be on a volumetric basis. This issue is to be settled by the WUAs at a later stage.
- 11) It is found that the farmers in Pokhariphant have been quite active. They have understood their environment and resources. They suggested a two phase lift irrigation system. The Study Team did survey along with the farmers and subsequently designed the system according to their need for irrigation in the command area. Farmers have expressed their willingness to undertake the responsibility to operate and maintain the system. It appears that this system will be an ideal system which will be managed by the beneficiaries themselves.

All in all, the exercise of farmer participation for design and alternative suggestions proved very fruitful.

#### (4) Central Coordinating Group (CCG) Meeting

The 1st Central Coordination Group (CCG) meeting took place at DPTC, Pulchowk Lalitpur on 25 December, 1997. The agenda of the CCG meeting was:

- a) The main canal alignment survey: Open canal was proposed but it is found not suitable due to forest area and difficult terrain. Alternative pipe canal line was considered.
- b) Alternative intake point: Investigation for alternative intake point was proposed. Study for alternative intake point was undertaken. Comparative study was made.
- c) Water status year round.

Discussion revolved around the fact that water for irrigation will be available only for nine months, and therefore irrigation planing should be only for nine months. The total number of participants in the meeting was 36. Nine agencies which have direct relation with irrigation development took part in the first CCG meeting. These agencies are : DOI, MOWR, MOPE, NEA, DOA, DOF, DOSC, ADB/N, CMS.

Proposal for DOI and NEA meeting:



Before the 2nd CCG meeting, the Study Team placed a request to DOI to open a dialogue between DOI and NEA about the shifting of the intake point from the original point at aqueduct no. 2 to the lower end of the balancing reservoir of the Trisuli Hydropower Project.

## **4.2 Pursuit of Cost-Effectiveness and Sustainability of the Project**

### **4.2.1 Cost-Effectiveness**

The present demand trend is for low cost irrigation systems, attributed to several main reasons as follows:

- to improve national budgetary balance by reducing public investment of which the irrigation sector occupies large portion;
- to promote effective recovery from irrigation project investment by the international donor agencies;
- to reduce farmers' payment imposed based on a certain ratio of capital cost of a project.

In Nepal, the need for low cost irrigation systems is perceived widely as one of the major issues under the current Irrigation Policy.

In recognition of this situation, the Team targeted a cost-effective project as one of the main basic approaches under the Study, by performing investigations on alternative plans and comparative studies during the field survey period.

### **4.2.2 Sustainability**

Attainment of the project goals is largely dependent on Project sustainability under good management.

Project sustainability would be based on the following factors:

#### **A. Continued Delivery of Services and Production;**

- Irrigation water supply must continuous in order to sustain higher agricultural production. This in turn would create in beneficiaries a sense of satisfaction and ownership.

#### **B. Maintenance of Physical Infrastructures;**

- Good maintenance of the irrigation system can be achieved by both good technical soundness and through social aspects such as positive participation for system management by beneficiaries.
- Good maintenance would enable the Project to keep efficiency of cost recovery and adequacy of operating budget.

#### **C. Long-Term Institutional Capacity;**

- Organizing Water Users' Associations whose activities are sound and positive.
- Technical capacity and appropriate mandate of the principal operating agencies.
- Stability of staff and budget of the operating agencies.
- Adequacy of interagency coordination.
- Adequacy of coordination with community organizations and beneficiaries.

**D. Support from Key Stakeholders**

- Strength and stability of support from the national government
- Strength and stability of support from provincial and local government agencies.
- Strength and stability of support at the community level.
- Extent to which the Project has been able to build a broad base of support and to avoid becoming politically controversial.

On the basis of the above understanding, the Team has pursued project sustainability by focusing on the above factors.

**4.3 Addressing Poverty Alleviation Issues**

**4.3.1 Poverty Alleviation in the Eight Plan**

The Eight plan envisages poverty alleviation by reducing the number of people below the poverty line from 49 % to 42 % in the whole country by the end of the plan period. Past poverty alleviation programs did not necessarily involve the households living in conditions of abject poverty.

In consideration of these facts, the poverty alleviation program to be undertaken in the Eighth Plan will be so formulated and implemented that the truly poor will benefit directly or indirectly. The poverty alleviation task is multifaceted in nature; it is essential for the programs of all sectors to make concerted efforts to alleviate poverty. Methodology for the actual poor identification and related policy arrangements are prescribed to address the poverty issues by the Eighth Plan as indicated in (1) and (2) below:

**(1) Identification of the Actual Poor**

It is essential to identify the backward rural areas and the people living below the absolute poverty line before formulating and implementing the poverty alleviation programme. The criteria used in the past under the rural development programme to identify poor families were faulty, therefore, the target group could not benefit effectively from the programme. In the past, different organizations employed different parameters to assess the level of poverty; and there accordingly was no uniformity in these and no accurate assessment could be made available regarding the extent of poverty in the country. In the Eighth Plan, simple parameters are devised to

ascertain the real situation of poverty. Accordingly, the poor living in areas where the poverty alleviation programme is to be introduced will be identified and effective programs will be launched for social and economic upliftment of such families. Decision will also be made regarding the regions to which such programmes ought to reach.

## (2) Policy Arrangements

The following policies will be adopted to alleviate poverty during the Eighth Plan period:

- (a) To develop a simple procedure for identification of undeveloped areas and poor families and use it uniformly across all sectoral programmes.
- (b) To carry out self-targeted and targeted programmes for poor people.
- (c) To increase the access of the poor to the means of production.
- (d) To make arrangements for awarding contracts of technically simple construction works to groups of poor people.
- (e) To make legal provisions for elimination of social evils and to create public awareness in this regard.
- (f) To make effective legal provisions against exploitation of the poor and the helpless.
- (g) To initiate dialogue for negotiations with foreign governments/agencies for the employment of unskilled and skilled Nepalese manpower seeking employment in foreign countries.
- (h) To arrange for creating employment opportunities in non-agricultural sectors through food security programmes.
- (i) To take environmental balance into consideration while designing a programme.
- (j) To make institutional arrangements for extending necessary support to the task of poverty alleviation.

## (3) TIP Strategy for Poverty Alleviation

In addressing the poverty alleviation program under TIP, the Study Team planned to follow the policy indicated above. However, among the articles (a) - (j), the articles of (e), (f), (g) and (h) would be beyond the scope of TIP; accordingly, the Study Team has adopted the following realistic basic plan in line with the said policy.

- (a) Regarding identification of poor groups, the Study Team adopted the income based parameter to establish the poverty line in the TIP area, since the government has not yet established simple parameters and methodology.
- (b) The TIP proposes the intensification and diversification of agriculture in order to increase income. During the project implementation period, the social preparation program directed at poor groups will be undertaken with the objective to make them aware of new methods and technologies and provide them the necessary information so that they can act on their own. After project implementation, strong supporting services will be provided to the poor so that benefits of TIP can be shared by them equally.
- (c) In order to break the vicious circle of poverty and equip them with the means of production, access to natural resources is to be promoted, especially water resources by irrigation facilities under TIP. Keeping in view the need to exploit water resource effectively and economically, development of irrigation facilities is given important consideration, especially appropriate conveyance and intake point for a sustainable irrigation system.
- (d) TIP proposes to generate employment. Intensive labour employment methods would be assured to marginal farmers, landless labour groups and women's' groups during construction. After construction of the irrigation system, labour employment would increase due to improved cropping intensity in the TIP area.
- (i) TIP gives careful attention to environmental issues in the selection of canal alignment and prevention of minus impact during construction of the irrigation system. A suitable and environment-friendly canal type would be proposed. Environment protection should be an on-going concern. TIP proposes to set up an environment monitoring unit to carry out monitoring of environmental conditions after the completion of construction.
- (j) Functional Water Users Associations (WUAs) would be formed as the institutional arrangement to provide poor people with access to the resources as organized groups. The WUAs would be organized in such a way as to encourage the participation of all farmers. The WUA would undertake multiple and diversified activities to support the needs of the different farmer classifications within the farmer groups. Appropriate programs would be carried on to enable the poor segment to raise their absorptive capacity for various supporting services.

Towards the effort to address the poverty alleviation activities, the poor people would be brought into the socio-economic mainstream of society by providing opportunities to them to participate in the decision making process. Participation empowers the poor to promote their cause. Hence, TIP is based on the participatory approach.

#### 4.4 Technology Transfer to Counterparts

One of key elements of the basic approach for this Study was to promote a participatory mode to assigned counterparts through on-the-job-training along with the Study Team.

Technology transfer to the counterparts was to be done with regard to survey methodology, project planning procedures, and recognition of project promotion by counterparts themselves.

For this purpose, the first meeting with the DOI personnel was done and the Study Team made clear the scope of the study to be carried out during the site visits. DOI assigned 5 full time counterpart personnel in different fields as mentioned below.

S.No.	Name	Title	Field
1.	Mr. Mahesh B. Pradhan	Chief Counterpart	Irrigation and Drainage
2.	Mr. Prakash M. Shrestha	Counterpart	Facility Design and Cost Estimation
3.	Mr. Khila N. Dahal	Counterpart	Engineering Geology
4.	Mr. Nirmal Gadai	Counterpart	Agronomist
5.	Mr. Hriday K. Jha	Counterpart	Environmentalist

The main issues on technology transfer to the counterparts during the site survey are as follows:

- Introduction of large scale pipe line system in the Hill irrigation system through reconnaissance survey and proposed canal alignment survey,
- Finding methods regarding the different options for the prevailing topography and site conditions for the ideal canal length, lift schemes and possible open canal system,
- The use of consequences based on the interaction with the user beneficiaries through FLAG meetings where men and women actively participated,
- Identification of hydrological delineations using aerial photos, topographical maps in the field with site verification in consultation with the user beneficiaries,
- Participatory approaches in co-ordination with the block-wise division in the hydrological boundary,
- Mobilization and motivation for the farmer meetings to create awareness of the Project, and,
- Environmental clearance methods for the implementation of this Project.

**CHAPTER 5**

## **CHAPTER 5    PRESENT CONDITIONS IN THE PROJECT AREA**

### **5.1    Methodology of Field Investigation**

#### **5.1.1    Methodology of Field Investigation**

In order to accurately identify present conditions in the Project area, study was based on a cross-check combination of field survey and participatory investigation. In the project planning stage following field survey, the hydrological boundaries were adopted as the foundation for the agricultural development plan and the farmer organization plan. Towards this end, it was necessary to carry out each category of field based data collection from the outset of the field survey stage in a timely manner, based on a reasonable estimation of irrigation block demarcation by hydrological boundaries to be ultimately confirmed in the latter part of the field survey stage.

In order to achieve the above, attention was given to the following conditions in study at 15 survey spots so selected as to appropriately cover all the proposed irrigation blocks in the command area:

- Elevation
- Type of soil (red, black, and other types)
- Cropping type (i.e., only maize growing area, maize and paddy area, and only paddy growing area)

#### **5.1.2    Selection of Survey Spots**

The command area of Trisuli Irrigation Project extends from part of Gerkhutar via Bidur, Battar, Pipaltar up to Pokharephant on the other side of Trisuli River. The command area is composed of different elevations, soil type and cropping pattern. In order to get representative field based information, the total command area is divided into fifteen survey spots. Information collection for all disciplines including social organization, agriculture, environment and rural social life was based on the said fifteen study points so that information can easily be compared and differences identified. The fifteen survey spots are demarcated on the location map. (See Location Map).

#### **5.1.2    Relationship between Irrigation Blocks and Survey Spots**

Twelve irrigation blocks were demarcated. These irrigation blocks are based on the irrigation system. Each block is made of a self-contained manageable unit of the irrigation system. Relationship between the twelve irrigation blocks and village name and survey spots is given below. As a result, these survey spots could cover all irrigation blocks.

### Survey Spots and Irrigation Blocks

Block	Survey Spots	Name of villages
A	1	Simutar, Gerkhutar
B	2	Bidur
C	3	Battar, Apaghari, Sukumbasitol
D, E	4	Inarpati, Dihigaun, Kajidihi
E	5	Maharanidi
D	6	Machale, Gharigaun
I	7	Beltar, Dhansar
E, F	8	Chandipokhari
I	9	Majhitar
J, K	10	Pipaltar
F	11	Lamabagaicha
G	12	Fallo Pipaltar
H	13	Devighat
L	14	Pokhariphant, Majhigaun
L	15	Pokhariphant, Lower Terrace

#### 5.1.4 General Features of Survey Spots

Gerkhutar paddy field has the problem of drainage whereas Simutar has the problem of water scarcity in the irrigation system which draws water from Gerku river. These areas have only seasonal irrigation. During the winter, effort is not made to grow crops due to menacing threat of monkeys in Simutar area. There are several social groups for self-help in this area.

Bidur grows paddy during the wet season. The Trisuli Irrigation Project has to lift water by pump for the command area of Bidur. Since Bidur is the District headquarters and commercial center as well, the farmers engage in other activities in addition to cultivation. Several social organizations are found here.

Battar is also like Bidur. This is even bigger market than Bidur. At present, it is only one crop growing area. Only monsoon paddy, is cultivated in this area. Battar lift irrigation system was supposed to provide irrigation water in this area, water could hardly reach here.

Middle terraces grow maize and millet, Digaun, Inarpati, Dukuntar used to get irrigation water earlier. No water is provided by the lift pump. Situation has changed. Life of the people have become difficult. In Majhitar, lift irrigation was provided only for couple years. This place grows only maize. Other crop like paddy is not advised to grow here due to fragile terrain of Majhitar. Beltar and Pipaltar were the command area of Battar Lift Irrigation system. They are now growing rainfed crops like maize and millet. Water is the main constraint in these areas. There are certain survey spots where social organizations are absolutely absent like in Dhansar and Gharigoan. In Pipaltar, the mass of the land is under rainfed agriculture. There are some social groups including soil conservation groups. In Maharanidi, there used to be prosperous



agriculture activities round the year when lift irrigation system was in operation. Now they cultivate only marginal crops. Majority of population in this area are Kumals, KC etc. Chandipokhari has some seasonal irrigation and it grows two crops. Lamabagaicha depend on rainfall and it grows only marginal crop. There is no sizeable village either in Chandipokhari or in Lamabagaicha. Land in Lamabagaicha belongs either to local school or to the people at Tallo Pipaltar. Tallo Pipaltar has several social groups which have been taking responsibility of forest protection and soil conservation. Agriculture depends on rainfall. Devighat has rain-fed agriculture. Devighat is a big market serving to several neighboring villages. Pokhariphant has irrigated agriculture but irrigation water is not enough for all winter crops. Majgoan does not have irrigation facility. These villages have very strong social organizations of both male and female. They have engaged on cooperative Dairy, Community Banking and Community development activities.

## **5.2 Rural Society**

### **5.2.1 Methodology of the Survey and Identification of Beneficiaries**

The investigation on rural society was carried out in three stages. Under the first stage in the latter part of December 1996, the Land Ownership Survey was conducted, under the second stage in January 1997, the Household Questionnaire Survey and Participatory Rural Appraisal (PRA) were concurrently executed, and under the third stage in the latter part of February 1997, the follow-up supplementary studies were carried out. The first and second stages were conducted jointly by the sub-contracted local consultant called Consolidated Management Services Nepal (P) Ltd. (CMS), the Team's anthropologist and DOI counterpart. The third stage was carried out by the Team's anthropologist and DOI counterpart in order to complement the Household Questionnaire Survey and PRA through the further investigation on key issues such as the situation of poverty and women which were identified in PRA. The detailed survey methodologies in the Land Ownership Survey, the Household Questionnaire Survey and PRA are described in the next section.

At the close of the field investigation in the Project area, the Study Team also obtained raw data from the Household Census Survey conducted by the District Development Committee (DDC), Nuwakot in 1995 (Gerku and Khadga Bhanjyan VDC) and 1996 (Bidur municipality) under the Participatory District Development Program (PDDP) which is implemented by the National Planning Commission (NPC) and Ministry of Local Development (MOLD) with assistance from the United Nations Development Program (UNDP). Although the Study Team discovered many errors and inconsistencies in this raw data from the Household Census Survey, these data have the advantage of covering all the households in the Project area. Accordingly, this data was carefully applied to get the general picture and provide aggregated data of the Project area, such as the total population and the total number of households in the Project area as well as to cross-check the results of the Land Ownership Survey, the Household Questionnaire Survey and PRA.

The basic principles of the investigation in this Study are (i) to avoid depending on only one information source such as government statistics, and instead try to obtain

multiple information sources to cross-check the validity of the information and (ii) to emphasize direct field-level investigations with farmers rather than depending on indirect information sources such as government officials.

#### (1) Land Ownership Survey and Identification of Beneficiaries

A complete list of the plot-wise land owners in the Project area was prepared by checking cadastral survey maps and land registration records in the District Land Survey Office, Nuwakot. Unfortunately, the District Land Survey Office still classifies cadastral survey maps and the names of land owners by the old VDC name and ward numbers which existed during the Panchayat times and before Bidur became the municipality, so the list of land owners are also based on these old VDC name and ward numbers. So while the Project areas currently belong to Ward 1, 3, 4, 5, 6, 7 of Bidur Municipality, Ward 3 of Gerku VDC and Ward 4, 5, 7 of Khadga Bhanjyan VDC, the list of land owners was classified by old administrative boundaries such as Ward 1, 2, 3, 4, 5, 6, 7, 8, 9 of Bidur VDC, Ward 1 of Bhairabi VDC, Ward 3 of Gerku VDC and Ward 4, 5, 7 of Khadga Bhanjyan VDC.

Since this plot-wise list of the land owners includes the repeated names of the same land owners which have more than one plot of land, it was edited into the ward-wise consolidated lists (14 lists for 14 old wards) by summing up the area of the land areas belonging to the same land owners. It turned out there are 3,174 individual land owners and 47 institutional land owners such as temples, schools, government offices, and private companies and organizations in the Project area.

These land owners are the primary beneficiaries under the proposed irrigation project, but the list of land owners cannot be translated into the list of beneficiary households, because many households have multiple land owners within their household (such as a father and a son, a husband and a wife, etc.). Since land registration records in the District Land Survey Office only give the name of the land owners and their fathers, there is no way to find which land owners belong to the same household and consolidate this list of land owners into the list of households. As a result, the number of land owners is much bigger than the actual number of households in the Project area.

The number of beneficiary households and population in the Project area are estimated in Table 5.2.1-1 by using the settlement-wise data from the Household Census Survey by DDC. Since the five settlements such as Gerkhutar, Simbutar, Dhunge, Bidur (upland) and Majhigaun are covered only partly by the Project, data presented in Appendix 5.2.1-1 are adjusted by checking the area coverage in each settlement as well as checking the data from the Land Ownership Survey.

#### (2) Household Questionnaire Survey

After the ward-wise consolidated lists of the land owners in the Project area were prepared, a stratified random sampling strategy was adopted for drawing a sample of 200 households out of the list of 3,174 land owners. (Since, at this moment in December 1996, the Study Team had not obtained the list of households from the

Household Census Survey by DDC, the result of the Land Ownership Survey is the only reliable source for sampling, although this list of the land owners has some inherent weaknesses as described below.) The sampling rate is calculated as 6.3%. In order to obtain the stratified random sample, the following steps were conducted:

- (i) The ward-wise lists of the land owners were sorted out in the ascending order of land holding of each land owner.
- (ii) The land owners in each ward-wise list are classified into the following four categories of land holding based on the criteria established by the National Planning Commission (NPC):

Marginal	:	land owners which have less than 0.2 ha of land
Small	:	land owners which have not less than 0.2 ha but less than 0.5 ha of land
Medium	:	land owners which have not less than 0.5 ha but less than 1.0 ha of land
Large	:	land owners which have not less than 1.0 ha of land

- (iii) For each category of land owner in each ward, the number of samples was calculated by multiplying the number of land owners in each category and the sampling rate of 6.3%. Then, the random numbers were used to draw the sample of the land owners for each category within each ward. For the case that the enumerators might encounter difficulty in finding the sampled land owners in the field because they are outside the Project area or the selected households happen to belong to the same household, the alternative candidates to the sampled households were also prepared using the same random sampling methodology.

This sampling strategy has the following two weaknesses because of the nature of the list of the land owners:

- (i) Since these sampled households are selected from the list of the land owners, the landless households were not selected. Since the first beneficiaries for the irrigation project are the land owners whose lands will be irrigated under this Project, this omission can be justified, but later effort was made to interview the landless population to know the situation they are living in.
- (ii) Some of the sampled households selected for each land holding category turned out to belong to a different category, because they have lands outside the Project area. So there are cases that households selected as marginal or small households turned out to be actually medium or large households. With this reason, the result of the Household Questionnaire Survey is biased toward the bigger land owners which means that more medium and large land owners were surveyed than originally planned.

Before starting the survey, the questionnaire was translated into Nepalese and pre-tested in the Project area for one day. To conduct the Household Questionnaire Survey, ten enumerators were hired by CMS and they were given one-day training in

Kathmandu and two-half day training sessions after the first and second days in the field on how to collect data based on the given questionnaire and how to interpret farmer's answers correctly. All filled-in questionnaires were meticulously checked out by two supervisors from CMS and all the inconsistencies were rectified on the very day of the administration of the questionnaire. Finally 202 filled-in questionnaires were collected and this sampling number of 202 exceeded the originally planned number of 200. The irrigation block-wise distribution of 202 sampled households is shown in Table 5.2.1-1, together with the estimated number of household and population in the Project area using the data from the Household Census Survey by DDC.

### (3) Participatory Rural Appraisal (PRA)

In addition to the baseline survey of 202 households, Participatory Rural Appraisal (PRA) was conducted to collect qualitative socio-economic information using the following PRA data collection tools:

- group interviews and discussions
- social and resource mapping
- pie-charts and diagrams
- key informant interviews
- case studies
- seasonal calendars
- time allocation studies

Four area-specific group meetings were organized to discuss key issues on the Project such as farmers' perceptions on social stratification, agricultural productivity, environmental problems and group activities in (i) Ward 4, 5, 7 of Khadga Bhanjyang VDC, (ii) Ward 5, 6, 7 of Bidur municipality, (iii) Ward 1, 2, 3, 4 of Bidur municipality, and (iv) Ward 3 of Gerku VDC. The participants of the group meetings ranged between 15 and 25. During these group meetings, farmers were helped to develop social and resource maps which showed farmers' perceptions on key resources in the area such as settlements, cultivated land areas, water sources, forest, grazing areas, motorable roads and foot tracks, existing traditional irrigation canals, bazaars, schools, government offices, temples, meeting places, parks, etc. The social and resource maps developed in the above four meetings are shown in Appendix 5-2-1~5. Key informant interviews were also conducted with government officers, group leaders, school teachers, and temple priests. Gender analysis was conducted to generate the gender-specific data such as women's daily time allocation and yearly activity calendar, women's roles in various agriculture and household activities and gender-specific decision making patterns.

These PRA exercises were conducted by one Nepali anthropologist and one Nepali gender specialist from CMS in collaboration with the Team's Japanese anthropologist and DOI counterpart in a period of two weeks in the first part of January 1997. Throughout PRA, the participation of the farmers was very active and encouraging and they expressed they had enjoyed making maps on the ground and they also learned a lot from the interactions with the PRA team.

**Table 5.2.1-1 Estimated Population and Households in the Project Area**

Irrigation Block	Municipality/VDC	Ward No.	Settlement Name	No. of Household (HH)	Population	Average No. in Household
A	Gerku Bidur	3	Gerkhutar *	15	128	8.53
		1	Simbutar *	20	144	7.20
		Sub-Total			35	272
B	Bidur	1	Dhunge *	10	59	5.90
		3	Bidur (upland) *	10	60	6.00
		4	Bidur (lowland)	42	286	6.81
		Sub-Total			62	405
C	Bidur	3	Battar (upland)	52	350	6.73
		4	Battar (lowland)	155	952	6.14
		4	Battar Purano Bajar	36	210	5.83
		4	Sangam Chok Battar	18	102	5.67
		4	Damki	18	117	6.50
		4	Kumalgaun	18	113	6.28
		Sub-Total			297	1,844
D	Bidur	5	Inarpati (upland)	18	103	5.72
		6	Inarpati (lowland)	90	566	6.29
		Sub-Total			108	669
E	Bidur	6	Dihigaun Maranidihi	18	107	5.94
		6	Maharanidihi	107	597	5.58
		Sub-Total			125	704
F**, G	Bidur	7	Tallo Pipaltar	178	1,132	6.36
		Sub-Total			178	1,132
H	Bidur	7	Devighat	155	879	5.67
		Sub-Total			155	879
I	Bidur	5	Majhitar	133	733	5.51
		Sub-Total			133	733
J	Bidur	5	Pipaltar Thulogaun	16	91	5.69
		5	Pipaltar Majhagaun	35	217	6.20
		Sub-Total			51	308
K	Bidur	5	Pipaltar	72	412	5.72
		Sub-Total			72	412
L	Khadga Bhanjyan	5	Phirkep Devighat	89	540	6.07
		5	Majhigaun *	15	90	6.00
		5	Chhotetar Dhodeni	32	180	5.63
		7	Shirkhali	93	574	6.17
		Sub-Total			229	1,384
Total				1,445	8,742	6.05

Source: Household Census Survey conducted by District Development Committee, Nuwakot in 1995 (Gerku and Khadga Bhanjyan) and 1996 (Bidur)

Note: \* These five settlements (Gerkhutar, Simbutar, Dhunge, Bidur and Majhigaun) are only partly covered by the project, so the number of the beneficiary households in these settlements is estimated in proportion with the area covered by the project.

\*\* In Irrigation Block F, there is no settlement, so no data is shown in this table. Agricultural land in this block is cultivated by farmers living in Tallo Pipaltar.

**Table 5.2.1-2 Sample Households in the Household Survey**

Irrigation Block	Municipality/VDC	Ward No.	Settlement Name	No. of Household (HH)	Population (persons)	Average No. in Household (persons/HH)	Sample Households				
							Households		No. of Family		
							No.	%	Total (persons)	% Covered	Average (persons/HH)
A	Gerkhu	3	Gerkhutar *	15	128	8.53	4	27%	41	32%	10.25
		1	Simbutar *	20	144	7.20	2	10%	15	10%	7.50
	Sub-Total				35	272	7.77	6	17%	56	21%
B	Bidur	1	Dhunge *	10	59	5.90	1	10%	6	10%	6.00
		3	Bidur (upland) *	10	60	6.00	1	10%	5	8%	5.00
		4	Bidur (lowland)	42	286	6.81	3	7%	17	6%	5.67
		Sub-Total				62	405	6.53	5	8%	28
C	Bidur	3	Battar (upland)	52	350	6.73	5	10%	61	17%	12.20
		4	Battar (lowland)	155	952	6.14	30	19%	219	23%	7.30
		4	Battar Purano Bajar	36	210	5.83	5	14%	35	17%	7.00
		4	Sangam Chok Battar	18	102	5.67	1	6%	5	5%	5.00
		4	Damki	18	117	6.50	0	0%	0	0%	
		4	Kumalgaun	18	113	6.28	4	22%	40	35%	10.00
Sub-Total				297	1,844	6.21	45	15%	360	20%	8.00
D	Bidur	5	Inarpati (upland)	18	103	5.72	1	6%	15	15%	15.00
		6	Inarpati (lowland)	90	566	6.29	18	20%	112	20%	6.22
		Sub-Total				108	669	6.19	19	18%	127
E	Bidur	6	Dihigaun Maranidhi	18	107	5.94	3	17%	19	18%	6.33
		6	Maharanidhi	107	597	5.58	12	11%	80	13%	6.67
		Sub-Total				125	704	5.63	15	12%	99
F**, G	Bidur	7	Tallo Pipaltar	178	1,132	6.36	24	13%	172	15%	7.17
		Sub-Total				178	1,132	6.36	24	13%	172
H	Bidur	7	Devighat	155	879	5.67	9	6%	79	9%	8.78
		Sub-Total				155	879	5.67	9	6%	79
I	Bidur	5	Majhitar ***	133	733	5.51	15	11%	117	16%	7.80
		Sub-Total				133	733	5.51	15	11%	117
J	Bidur	5	Pipaltar Thulogaun	16	91	5.69	6	38%	39	43%	6.50
		5	Pipaltar Majhagaun	35	217	6.20	6	17%	32	15%	5.33
		Sub-Total				51	308	6.04	12	24%	71
K	Bidur	5	Pipaltar	72	412	5.72	13	18%	106	26%	8.15
		Sub-Total				72	412	5.72	13	18%	106
L	Khadga Bhanjya	5	Phirkep Devighat	89	540	6.07	14	16%	88	16%	6.29
		5	Majhigaun * ****	15	90	6.00	7	47%	65	72%	9.29
		5	Chhotetar Dhodeni	32	180	5.63	3	9%	23	13%	7.67
		7	Shirkhali	93	574	6.17	15	16%	108	19%	7.20
Sub-Total				229	1,384	6.04	39	17%	284	21%	7.28
Total				1,445	8,742	6.05	202	14%	1,499	17%	7.42

Source: 1) Household Census Survey conducted by District Development Committee, Nuwakot during 1995 - 1996  
 2) Household Sample Survey conducted by the local consultant for JICA Feasibility Study Team in January, 1997

Note: \* These five settlements (Gerkhutar, Simbutar, Dhunge, Bidur and Majhigaun) are only partly covered by the project, so the number of the beneficiary households in these settlements is estimated in proportion with the area covered by the project.

\*\* In Irrigation Block F, there is no settlement, so no data is shown in this table. Agricultural land in this block is cultivated by farmers living in Tallo Pipaltar.

\*\*\* Sampled households in Majhitar include 1 household in Gangate Bajar.

\*\*\*\* Sampled households in Majhigaun include 2 households in Aprethok and 3 households in Pusuntar.

## 5.2.2 Land Tenure and Land Holding

Before the overthrow of the Rana regime in 1951, the land tenure system in Nepal was under the following five classifications:

- (i) Birta lands which the state granted to the private individuals who in turn were entitled to collect land taxes from local residents living in the granted land area on behalf of the state
- (ii) Jagir lands which the state assigned to the government employees as a form of salary
- (iii) Rakam lands which the state assigned to the manual labors and artisans such as carpenters, masons, brick layers, stonecutters, mail carriers, caretakers of the temples, etc. as remuneration for their services
- (iv) Guthi lands which the state assigned to the religious institutions such as temples in order to generate income to maintain the institutions and perform the religious services
- (v) Kipat lands which the state assigned to the certain ethnic groups such as Limbus of Dhankuta and Ilam in Eastern Nepal as communal lands

Birta, Jagir and Rakam tenures were abolished by the land reform legislation during 1951 - 1964. The Tenancy Right Security Act of 1951 recognized tenants' right to continue to cultivate on the same land and provided security to tenants against unlawful eviction by landowners. The Birta Abolition Act of 1959 converted all Birta lands into the taxable Raikar lands which were owned by actual cultivators, so it eliminated intermediary land tax collectors between the government and the cultivators. The Lands Act of 1964 made provisions for various measures such as setting the ceilings on land ownership and tenancy holdings, fixing of land rents, etc.

But these land reforms did not produce any drastic change in the land holding situation, except granting the secure tenure right to the tenant farmers. Because of the weak implementation capacity of the local government offices and the lack of the strong political will, the actual redistribution of lands to tenant farmers and landless households was insignificant. It was reported that the number of tenants was suddenly decreased before the enactment of the Tenancy Right Security Act of 1951, probably because the landowners had evicted tenants to secure their right. While the ceiling on land holding of agricultural lands under land owners' own cultivation in Hill area is set to 4.1 ha, the Team's Household Questionnaire Survey revealed that one sampled household in Gerkhutar owns 10.18 ha of agricultural land and the household census survey conducted by the District Development Committee, Nuwakot in 1995 - 1996 also indicates that the household with the largest land holding in Bidur municipality (living in Nuwakot Bhairabi temple area) owns 50 ha of land. Since the right of tenants is strongly protected by the Tenancy Right Security Act of 1951 and Lands Act of 1964, there is a tendency for landowners to go into informal arrangements with

sharecroppers to cultivate their lands rather than to register them as legal tenants at the District Land Survey Office.

The summary result of the Land Ownership Survey is shown in Appendix 5.2.2-1 and Appendix 5.2.2-2, and the result on land holding situation of the Household Census Survey by DDC is shown in Appendix 5.2.2-3. By perusing these tables, the following findings were extracted as consistent results and these findings were further verified and supplemented with some new information during the follow-up survey in February 1997:

- (i) As for the average size of land holding, households in Simbutar have the largest land holding (0.82 ha/household and 0.36 ha/land owner) followed by households in Pokhariphant (0.64 ha/household and 0.28 ha/land owner) and Gerkhutar (0.58 ha/household and 0.26 ha/land owner), while households in Bidur have the smallest land holding (0.24 ha/household and 0.12 ha/land owner) followed by Battar (0.29 ha/household and 0.13 ha/land owner). This land holding pattern reflects the rural nature of Simbutar, Pokhariphant and Gerkhutar where people have to depend on agricultural lands for their survival as well as the semi-urban nature of Bidur and Battar where people can earn money by working at the offices and conducting business and trade so they do not have to depend on the agricultural land to survive. In fact, many shop operators in Battar area with some land holdings are not seriously interested in agriculture and employ sharecroppers to cultivate their lands.
- (ii) About 20% of land owners are female, indicating that some female household members (wives and daughters) had inherited the land from parents or had been given land by the husband's family at the time of marriage, although Nepal's legal code Maluki Ain still reflects the local custom that favors the inheritance of lands by sons primarily. Even if women own the land, they do not have the same rights over the land as men, because women cannot dispose of more than half of the inherited land without the consent of her father or adult sons.
- (iii) Absentee land owners are less than 10% of individual land owners, who are mostly found in Battar, Inarpati and Pipaltar. This may reflect the fact that many people migrated to Kathmandu and other cities looking for better economic opportunities after Battar Lift Irrigation ceased to function and the agricultural lands in these area became unproductive.
- (iv) As for the landless people, the Household Census Survey data by DDC indicates that the landless people are mostly found in Bidur, Battar and Devighat which are semi-urban business and commercial centers. Especially in Battar, there is a place called Sukumbasitol which literally means "a place for landless people" where all the people living in this place are landless people. The first group of these landless people came from Fikuri VDC of Nuwakot District in 1986 because the flood had washed away their houses and lands there. They illegally occupied the land of the National Electricity Authority (NEA) and constructed small mud houses by themselves during the night time



in order to escape harassment from NEA. After the construction of houses, NEA seems to have abandoned efforts to evict them. More landless people have subsequently gathered in this place from various areas, and now 34 landless households are living in this area. As for ethnicity, they are diverse: Brahmin, Chhetri, Newar, Kumal, Tamang and Damai. They earn their living through wage labor, except some families who keep livestock on behalf of the other rich households on a sharecropping basis. The average wage rate is 30-50 Rs./day, and they get an average of 10 days' work per month, making their annual household income somewhere between Rs. 3,600 - 6,000.

- (v) The lands under the former command area of Battar Lift Irrigation Project (BLIP) were traditionally inhabited and owned by the people of Kumal ethnic group. While many Kumals sold part of their lands to Brahmins and Chhetris when BLIP was planned, still many Kumals own the large portion of lands in Battar, Majhitar, Lambagaicha, Maharani dihi, Inarpati, Pipaltar and Tallo Pipaltar. Throughout the Study, the Study Team encouraged the participation of Kumal people in Team's group meetings and informed them about the proposed Project so that they can take advantage of this new irrigation project contrary to their former experiences on the Battar Lift Irrigation Project.

As for the tenants in the Project area, out of 3,174 individual land owners identified by the Team's Land Ownership Survey, only 27 individual land owners (0.85%) have registered their tenant cultivators at the District Land Survey Office. Most of the tenants are cultivating institutional lands such as Guthi lands of Bhairabi temple in Nuwakot, Chandra Jyoti Secondary School in Tallo Pipaltar and Jalapa Devi (water goddess) temple in Devighat. The major land owners who rent out more than 1.0 ha of lands to their tenants are listed in the table below:

**Table 5.2.2-1 List of the Major Land Owners with Tenants in the Project Area**

Name of Land Owner	Total Area of Rented-out Farm Land	Location	Number of Tenants
Bhairabi Guthi	28.9 ha	Dhansar Maharani dihi Inarpati Tallo Pipaltar, etc.	68
Mrs. San Kumari Dangol	6.7 ha	Majhitar Pipaltar, etc.	24
Chandra Jyoti Lower Secondary School	6.5 ha	Lambagaicha	3
Jalapa Devi Guthi	4.9 ha	Devighat	4
Mr. Ratna Bahadur Gurbacharya	2.4 ha	Gerkhutar	15
Chwadi Secondary School	2.0 ha	Chwadi	1
Mr. Narendra Raj Bhattarai	2.0 ha	Tallo Pipaltar	3
Mr. Naresh Dangol	1.4 ha	Pipaltar	1

Source: Land Ownership Survey

According to the priests in Bhairabi temple and Jalapa Devi temple, many of the above Guthi lands under these temples have recently been transferred to the former tenants under the government policy of abolishing dual land ownership by tenants and land owners, which forced these temples into financial difficulties to maintain their religious services. Since the tenants under Guthi lands are now becoming the land owners, they are willing to participate in water users' associations and bear the water charge when the new irrigation project is materialized.

In case of Chandra Jyoti Lower Secondary School, it contracts out 6.5 ha of farm lands to three farmers for the period of five years at a fixed amount of money (Rs 16,200 /year). Every five years, the school conducts an auction where the interested land cultivators submit their proposal on the land rent and the persons with the best offer are awarded the five-year contract. Since the proposed irrigation project will surely increase the land rent in the next auction, the school is willing to send the representative to the water users' association and pay the water charge.

### 5.2.3 Demographic and Social Characteristics

The data on population, ethnicity, and occupation distribution in the Project area were obtained from the Household Census Survey by DDC and are shown in Appendix 5.2.3-1, Appendix 5.2.3-2 and Appendix 5.2.3-3, respectively. The major findings from these tables are as follows:

- (i) The percentage of the children under the age of 5 is the largest in Kumalgaun and Pipaltar (both 17%) followed by Gerkhutar, Devighat and Chhotetar Dhodeni (all 16%), while it is the smallest in Damki (6%) followed by lowland Bidur (8%) and Majhitar (9%). This reflects the general tendency that Kumal people have more children (Kumal people account for 83% in Kumalgaun and 60% in Pipaltar but only 11% in Majhitar) as well as the households in the rural areas such as Gerkhutar and Chhotetar Dhodeni have more children than those in the semi-urban areas such as Damki and Bidur.
- (ii) The percentage of the school-age children between 6 to 15 years old is the largest in Pipaltar Thulogaun (37%) followed by Damki (33%) and Sangam Chok Battar (32%), while it is the smallest in Dhunge (19%) followed by upland Bidur (19%). The data for Dhunge and Bidur reflects the general tendency that the households in the semi-urban areas have less children than those in the rural areas.
- (iii) The dependency rate which is a ratio of the dependent population (age 15 and under and age 50 and over) over the total population is the highest in Pipaltar Thulogaun (63%) followed by Sangam Chok Battar and Kumalgaun (both 58%), while it is the lowest in Dhunge (44%) followed by upland Bidur (45%). This again reflects the general tendency that the semi-urban areas have the lower percentage of dependent population than the rural areas because in urban areas there are more employment opportunities for the economically active population, while in rural areas many young people tend to migrate to the urban areas looking for job opportunities.

- (iv) Average number of household members is the largest in Gerkhutar (8.54 persons/household) followed by Simbutar (7.18 persons/household), while it is the smallest in Majhitar (5.51 persons/household) followed by Maharani dihi (5.58 persons/household). Since households in Gerkhutar and Simbutar have the larger land area compared with other project areas, they may afford to support a large number of family members within a household.
- (v) The percentage of female population is the highest (52%) in the age group of 0 - 1 and the lowest (48%) in the age group of 50 and over, showing the general tendency that the percentage of females is decreasing as the age goes up. This also reflects the national tendency that women in Nepal have the lower life expectancy at birth (53.0 years) than men (55.0 years) probably because of women's hard work and neglected status within the household.
- (vi) Many settlements are predominantly inhabited by one ethnic group. Brahmins occupy the majority in Simbutar (71%) and Shirkhali (62%). Chhetris occupy the majority in Gerkhutar (74%), Maharani dihi (58%) and Majhitar (51%). Newars occupy the majority in Chhotetar Dhodeni (100%), Battar Purano Bajar (67%), upland Battar (58%) and Pipaltar Thulogaun (56%). Kumals occupy the majority in Dhihigaun Marani dihi (89%), Kumalgaun and upland Inarpati (both 83%), Pipaltar Majhagaun (63%) and Pipaltar (60%). While the ethnic uniformity of Brahmins, Chhetris, or Newars in Gerkhutar, Simbutar and Chhotetar Dhodeni seems to have contributed in the active community group activities in these areas, the ethnic uniformity of Kumals has unfortunately become the sign of underdevelopment because of their backward economic situation and low educational level.
- (vii) As for the minority ethnic groups, Tamangs are mostly found in lowland Battar, Magars are mostly found in Majhitar, Rais are mostly found in Maharani dihi, Gurungs are only found in Dhunge and lowland Bidur, Majhis are mostly found in Majhigaun, Bhujels are mostly found in Majhitar and Shirkhali. Occupational castes (Sarkis, Kamis and Damais) and Muslims are mostly found in semi-urban areas such as Dhunge, lowland Battar, Sangam Chok Battar, Devighat, but many Damais are also found in Majhitar and Shirkhali.
- (viii) As for the main occupation, 81% of the households in the Project area responded that agriculture is the main occupation. But, through the interviews, it was also revealed that the main occupation does not necessarily mean the main income source. Even though some people in the household work for the government or the school, at the same time they have some land to cultivate, so they responded that they are farmers. This indicates that the rural people have a mentality of strong attachment to the land and agriculture even when it cannot supply enough livelihood for their family.

- (ix) As for the non-agricultural occupations, the households which responded that service for the government and the private sector was the main occupation were found mainly in upland Bidur (31%), lowland Bidur (17%), Battar (14%) and Damki (33%). This is because Bidur is the district headquarters and has many government offices as well as many private offices which employ local population. Dhunge, Battar, Damki and Devighat are the major trading centers in the Project area, and accordingly there are many traders (81% of Dhunge, 35% of upland Battar, 20% of lowland Bidur and 17% of Damki) as well as some employees hired by these traders. Wage labor is the commonest (61%) in Sangam Chok Battar, because there are many landless households.

#### 5.2.4 Incidence of Poverty

Poverty is not merely a problem of low income; rather, it is a multi-dimensional problem that includes low access to opportunities for developing human capital and to education, health, family planning, and nutrition. The effects of poverty can be seen in social indicators: high infant mortality and high premature female mortality, high morbidity, high fertility, low literacy rates, low primary school enrollments, and malnutrition. Education, basic health care, and family planning services are crucial for generating and sustaining economic growth. Deprivation in these areas reinforces the vicious circle created by low incomes, landlessness, and under- or unemployment.

A large number of these factors are responsible for poverty in Nepal. Some of them are inter linked, some work in cause-effect-chain fashion. The bottom line is that a poor person does not have enough income to buy goods and services required to fulfill his/her minimum basic needs.

##### (1) Definition of Poverty Line

The first attempt to define and quantify the level of poverty in Nepal was made by the National Planning Commission (NPC) in 1976/77 through a survey on employment, income distribution and consumption pattern. Two criteria were envisaged for the delineation of the poverty line: the minimum subsistence level of income and the minimum subsistence level of expenditure.

This level was based on the expenditure required to buy necessary food stuffs for achieving an average calorie need of 2,250 day/capita recommended by the Food Research Laboratory and FAO.

In 1988/89 rupees, this translates into Rs. 2,520 per person per annum in the Hill and Rs. 2,364 in the Terai, or the equivalent of US\$ 99 and \$ 93 respectively per person per annum. With this poverty line, the data suggest that about 40% of the population is in absolute poverty.

According to the country study "Nepal Poverty and Incomes, 1991" under a joint study by the World Bank and UNDP, it is stated that "this is a conservative definition of poverty by considering the implications of a poverty line equivalent to US \$150 per

capita per annum. (1988-89 average exchange rate Rs. 25.5 / US\$ 1.00). The proportion of the population with incomes below even this line (US\$ 150) is about 70% nation-wide, and almost 80% in the Hill<sup>2</sup>. Under the current exchange rate of Rs. 56/US\$ 1.00 (1997), this poverty line (US\$ 150) which is equivalent to Rs. 8,400 per capita per annum seems to be beyond the current income level in Nepal.

Considering these, the Study Team adopted the poverty line of Rs. 3,945 per capita per annum by updating the NPC original definition as per below.

**Table 5.2.4-1 Poverty Line Based on Calories Required**

Food Items	Food Requirement (kg/capita)	Food Availability (kg/capita)	Reqd. Calories	Calories Available	Value (Rs)
Cereals	191	169	1,800	1,616	1742
Potato & Tubers	42	43	113	116	336
Sugarcane	-	6	-	82	-
Pulses	12	11	116	106	360
Vegetables	60	54	46	42	300
Fruits	15	17	23	26	255
Milk & Milk Products	35	41	60	72	
Meat	5	8	22	35	
Egg	1	1	3	3	744
Fish	1	1	4	4	
Oil, Ghee & Butter	2	4	49	99	238
Species	2	2	14	14	
Liquor & drinks	-	1	-	2	
<b>Total</b>	<b>366</b>	<b>358</b>	<b>2,250</b>	<b>2,217</b>	<b>3,945</b>

Source: National Planning Commission 1996  
Marketing Development Division, DOA, 1996

Note: - APP\* has used the same Rs. 3,945 as poverty line for the Hill.  
- Calculation in calories based on DOA information  
- NPC has used 2,250 calories/day/capita  
Minimum calories required defined by NPC is 2,250 calories/day/capita.

\* APP: Agriculture Perspective Plan

## (2) Identification of the Poor Households in TIP

On the basis of the Household Census Survey carried out by the District Development Committee, Nuwakot in 1955-56, income and number of household members were surveyed for 1,445 beneficiary households previously identified in the TIP area. From this, per capita income per annum was computed and the poverty line criterion applied to identify the poor households. The results of this are indicated in the following table. Poor households are identified therein by irrigation block and by scale of land holding. Of the 1,291 households which completed and returned the questionnaire form (out of the above 1,445 households), 1,072 or 83% were found to be subsisting below the poverty line.

Table S.2.4-2 Number of Poor Households and Their Land Holding Size

Irrigation Block	Municipality/VDC	Ward No.	Settlement Name	No. of Household (HH)		No. of HH responded	No. of Poor Household* (HH) (%)	Land Holding											
				No. of Household	No. of HH			Landless		Marginal (< 0.2ha)		Small (0.2 - 0.5ha)		Medium (0.5 - 1.0ha)		Large (1.0ha +)			
								No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
A	Garkhu Bidur	3	Garkhu	15	15	15	93.3	1	100.0	2	100.0	3	100.0	7	85.7	2	100.0		
		1	Simbar	20	20	20	55.0	0	0	1	100.0	11	7	63.6	3	2	66.7	5	20.0
		35	Sub-Total	35	35	35	71.4	1	100.0	3	100.0	14	10	71.4	8	80.0	7	42.9	
B	Bidur	1	Dhung	10	10	10	70.0	2	50.0	7	5	71.4	1	100.0	0	0	0	0	
		3	Bidar (upland)	10	10	8	80.0	3	66.7	2	100.0	3	2	66.7	1	100.0	1	100.0	
		4	Bidar (lowland)	42	36	36	72.2	1	100.0	5	5	100.0	11	7	63.6	14	11	78.6	
			Sub-Total	62	56	56	41	73.2	6	66.7	14	12	85.7	15	10	66.7	15	12	80.0
C	Bidur	3	Battar (upland)	52	37	37	56.8	4	44.4	9	5	55.6	14	9	64.3	4	2	50.0	
		4	Battar (lowland)	155	155	155	84.5	35	88.6	38	27	71.1	54	49	90.7	17	17	100.0	
		4	Battar Purano Bajar	36	36	36	86.1	7	85.7	13	11	84.6	11	9	81.8	4	4	100.0	
		4	Sangam Chok Battar	18	18	18	61.1	6	83.3	0	0	0	0	1	33.3	6	3	50.0	
	Sub-Total	297	264	264	211	79.9	57	80.7	61	44	72.1	93	78	83.9	34	29	85.3		
D	Bidur	5	Inarpati (upland)	18	18	18	77.8	0	0	2	2	100.0	9	8	88.9	3	2	66.7	
		6	Inarpati (lowland)	90	88	88	89.8	1	100.0	21	21	100.0	36	30	83.3	26	25	96.2	
	Sub-Total	108	106	106	93	87.7	1	100.0	23	23	100.0	45	38	84.4	29	27	93.1		
E	Bidur	6	Dhigaun Maramidhi	18	17	17	76.5	1	100.0	5	4	80.0	7	5	71.4	4	3	75.0	
		6	Maharandhi	107	103	103	96	93.2	1	100.0	11	10	90.9	46	44	95.7	39	36	92.3
	Sub-Total	125	120	120	109	90.8	2	100.0	16	14	87.5	53	49	92.5	43	39	90.7		
F-G	Bidur	7	Tallo Pipaltar	178	159	159	88.7	1	100.0	18	15	83.3	64	60	93.8	49	44	89.8	
			Sub-Total	178	159	159	141	88.7	1	100.0	18	15	83.3	64	60	93.8	49	44	89.8
H	Bidur	7	Devighat	155	103	103	77.7	3	66.7	24	22	91.7	34	29	85.3	30	21	70.0	
			Sub-Total	155	103	103	80	77.7	3	66.7	24	22	91.7	34	29	85.3	30	21	70.0
I	Bidur	5	Majhitar	133	111	111	82.9	0	0	18	15	83.3	32	26	81.3	48	45	93.8	
			Sub-Total	133	111	111	92	82.9	0	0	18	15	83.3	32	26	81.3	48	45	93.8
J	Bidur	5	Pipaltar Thuloagaun	16	15	15	100.0	3	100.0	2	2	100.0	4	4	100.0	4	4	100.0	
		5	Pipaltar Majhagaun	35	32	32	90.6	0	0	4	2	50.0	15	15	100.0	10	10	100.0	
	Sub-Total	51	47	47	44	93.6	3	100.0	6	4	66.7	19	19	100.0	14	14	100.0		
K	Bidur	5	Pipaltar	72	65	65	87.7	0	0	7	4	57.1	25	23	92.0	27	26	96.3	
			Sub-Total	72	65	65	57	87.7	0	0	7	4	57.1	25	23	92.0	27	26	96.3
L	Khaedga Bhanjyan	5	Phirkep Devighat	89	87	87	83.9	1	100.0	8	7	87.5	34	31	91.2	32	25	78.1	
		5	Majhagaun	15	15	15	73.3	0	0	2	1	50.0	4	3	75.0	8	6	75.0	
		5	Chhoretar Dhokru	32	32	32	93.8	0	0	3	3	100.0	9	8	88.9	14	13	92.9	
		7	Shirchali	93	91	91	72.5	0	0	12	11	91.7	16	13	81.3	37	23	62.2	
	Sub-Total	229	225	225	180	80.0	1	100.0	25	22	88.0	63	55	87.3	91	67	73.6		
	Total	1,445	1,291	1,291	1,073	83.1	75	61	81.3	215	178	82.8	457	397	86.9	332	332	85.1	

Remarks: \* Poverty Line: 3,945 Rs. per Capita per Annum.  
No. of Poor Households out of Responded Households.

### 5.2.5 Status of Women

Women's situation in the Project area was studied by conducting gender analysis during the time of men/women-combined group meetings, women-only group meetings, and interviews with female group leaders. As the results of this gender analysis, a gender-specific seasonal activity calendar and women's typical daily time schedule table are developed as shown in Table 5.2.5-1 and Table 5.2.5-2.

In general, women's situation is found almost the same among the farming households within the Project area regardless of their ethnicity, location and land holdings, because women's heaviest work load is household work which is common to all kinds of the farming households. Every day, women typically spend 3 hours on cooking, 1 hour on laundry, 1 hour on cleaning the house, 2 hours on water collection, 2 hours on fodder collection, 1 hour on feeding and watering animals, 20 minutes on milking cows and buffaloes, 30 minutes on cleaning the animal sheds, and 2 hours on farming, which sum up a total of nearly 13 hours of work every day. In addition to this daily workload, women also have to collect fuelwoods during the winter time which takes about 3 hours a day.

The busiest time for women is during mid-May to mid-November which corresponds to the time of rice cultivation. As for the agricultural works, most of works are conducted jointly by men and women, except ploughing the field with oxen by men or male children, threshing rice by men, transplanting rice and millet by women, winnowing wheat and mustard by women, and bundling upland rice by women.

The proposed irrigation project will surely increase the work load on women, but many women in the Project area expressed that they are willing to work harder under the irrigation project, because it will surely increase the household income and enhance the living standards of the whole family.

Contrary to the general perception that irrigation is mainly men's work, many women in the Project area have been involved in maintaining and operating traditional irrigation canals, although women are seldom represented in the executive committees of the water users' associations of these canal systems. The Irrigation Policy of 1992 recognizes the importance of women's participation in irrigation projects and clearly states that at least 20% of the executive committee members should be women, but unfortunately this requirement has rarely been practiced on the ground level. Even if there is one or two female representatives in the executive committees, it is common to observe that female members have difficulty to attend all the monthly meetings due to their busy time schedule at home and, when they are able to attend the meeting, they tend to keep quiet and follow men's decisions. It is also commonly said that even when the development project has brought the increase in the household income, women's decision making power in disposing this increased income has decreased, and men used up all the increased income on such pursuits as drinking and gambling.

So what is important is not to involve women superficially in the executive committee of water users' associations, but to empower women before requesting them to participate in the Project so that women can express their opinions and needs of the

family assertively in front of the other male members and participate in the Project equally with men for the better operation and maintenance. In Pokhariphant and Simbutar, women are already organized into women's groups in which women save money, get loans from the group to start income generating activities, contribute their time for community development and attend adult literacy class and sanitation and environment education class. Women in these groups have already gained confidence in their capacity, and can negotiate with men equally. This means the empowerment of women.

Women in the other areas can learn the lessons of these existing women's groups, start their own groups and replicate their success, if there is a good field facilitator to coordinate these activities. Since the women's groups have been helped by a non-government organization called Center for Community Development and Research (C-CODER) based in Kathmandu, it may be good to collaborate with C-CODER to empower women in other areas, because C-CODER has a group of the experienced social workers and they are also interested in expanding their community development activities to the nearby areas.



**Table 5.2.5-1 Gender-specific Seasonal Activity Calendar in the Project Area**

Type of Activity	Daily Time Investment	January	February	March	April	May	June	July	August	September	October	November	December
		Push	Magh	Phagun	Chait	Baisakh	Jeth	Asar	Sawan	Bhadra	Asoj	Kartik	Mangsir
<b>1. Household</b>													
Cooking	3 hours/day												
Washing Laundry	1 hour/day												
Cleaning House	1 hour/day												
Water Collection	2 hours/day												
Fuelwood Collection	2 hours/3 days												
<b>2. Livestock</b>													
Grazing	3 hours/day												
Fodder Collection	2 hours/day												
Feeding/Watering	1 hour/day												
Milking	0.5 hour/day												
Cleaning Shed	0.5 hour/day												
<b>3. Agriculture</b>													
<b>(a) Rice</b>													
Sowing seeds in nursery													
Ploughing													
Manuring													
Irrigating													
Transplanting													
Weeding													
Harvesting													
Threshing													
Storing													
<b>(b) Upland Rice</b>													
Ploughing													
Sowing seeds													
Weeding													
Harvesting													
Threshing													
Bundling													
<b>(c) Maize (Lowland)</b>													
Ploughing													
Manuring													
Sowing seeds													
Weeding													
Harvesting													
Shelling													
Strawing													
<b>(d) Maize (Upland)</b>													
Ploughing													
Manuring													
Sowing seeds													
Weeding													
Harvesting													
Shelling													
Strawing													
<b>(e) Wheat</b>													
Ploughing													
Sowing seeds													
Manuring													
Irrigating													
Harvesting													
Threshing													
Winnowing													
<b>(f) Millet</b>													
Ploughing													
Transplanting													
Weeding													
Harvesting													
Threshing													
<b>(g) Soybean/Blackgram</b>													
Sowing seeds													
Harvesting													
<b>(h) Groundnut</b>													
Sowing seeds													
Harvesting													
<b>(i) Mustard</b>													
Ploughing													
Sowing seeds													
Irrigating													
Harvesting													
Threshing													
Winnowing													
<b>(j) Sesame</b>													
Sowing seeds													
Harvesting													
Threshing													
<b>(k) Potato</b>													
Ploughing													
Planting													
Irrigating													
Weeding													
Harvesting													
<b>4. Off-Farm Activity</b>													
Social Ritual/Festival	(1 hour/day)												
Adult Literacy Class	(1 hour/day)												

Source: Gender Analysis conducted by PRA team

Activity by Women     
  Activity by Men     
  Activity by either Men, Women or Both

**Table 5.2.5-2 Women's Typical Daily Time Schedule**

Time	Women's Activities
4:30 AM	Wakes up, washes face and mouth, prays
5:00 AM	Makes fire, makes tea, serves tea for family members
5:30 AM	Waters and feeds animals, cleans the bed for animals
6:00 AM	Goes to the water tap, washes laundry and fetches water (4 times)
6:30 AM	(continued)
7:00 AM	Works in the farm
7:30 AM	(continued)
8:00 AM	Prepares rice
8:30 AM	(continued)
9:00 AM	Serves rice for children before going to school
9:30 AM	Washes pots and utencils, cleans and sweeps floor
10:00 AM	Goes to the water tap and fetches water, waters and feeds animals
10:30 AM	Prepares lunch
11:00 AM	Serves lunch for husband and parents
11:30 AM	Takes lunch for herself, washes pots and utencils
12:00 PM	Goes to the water tap and fetches water, waters and feeds animals
12:30 PM	Collects foddors for animals, collects fuelwood
1:00 PM	(continued)
1:30 PM	(continued)
2:00 PM	(continued)
2:30 PM	Goes to the water tap and fetches water, waters and feeds animals
3:00 PM	Prepare snack
3:30 PM	(continued)
4:00 PM	Children come back from school and serves snack for them
4:30 PM	Works in the farm
5:00 PM	(continued)
5:30 PM	Goes to the water tap and fetches water, waters and feeds animals
6:00 PM	Prepares dinner
6:30 PM	(continued)
7:00 PM	Serves dinner for children
7:30 PM	Serves dinner for husband and parents
8:00 PM	Takes dinner for herself
8:30 PM	Washes pots and utencils, cleans and sweeps floor
9:00 PM	Goes to sleep

Source: Wives of the farming households living in Maharani dihi

### 5.2.6 NGO Activities in TIP Area

Three NGO and other foreign volunteers are found working in the Project area helping the people in health, drinking water, education institution development and income generating activities.

In Gerkhutar, the Kathmandu based NGO called CARITAS-Nepal has provided assistance to the villagers groups in the form of materials and technical assistance for the construction of the village drinking water project. The same NGO also donated sewing machines to give vocational training to village women on tailoring and needle works. The trainers are also supported by the NGO. The villagers' group organized these programs and provided logistics support. to the program.

In the middle part of the command area such as Bidur and Battar, Rayuki, an NGO has provided assistance for drinking water program, health education and ambulance service.

In Kumaltol of Tallo Pipaltar, a Peace Corps Volunteer has helped to organize the women's group for income generation activity. The volunteer contributed Rs. 30,000 as revolving fund for raising goat by each household. There are 28 households in the goat raising group. The women of each household are made eligible to get loan amounting to Rs. 4,000 to purchase a she goat. The loan amount is to be paid back in a year's time. In one year, seven households get the loan, in the following year, the other seven households get the loan. In 4 year's time, all the households in the village will get the loan. The women who received the loan to purchase the goats reported that they could make a good income out of selling goats annually.

Recently, a Japanese Volunteer has mobilized resources for health post construction and income generating activities to women by providing training in tailoring and needle works in the Kumaltol of Tallo Pipaltar. Several sewing machines were donated for the benefit of the villagers. In these NGO activities, the Sukumikhola Soil Erosion Control Community Group has also played an important role in mobilizing the village people. This group has played a complementary role in promoting forest protection activity, health program and women's income generating activities.

C-CODER, an other Kathmandu based NGO is found quite active and effective in assisting the villagers in Khadgabhanjyang across the Trisuli river from Devighat. C-CODER has helped the community to establish an English medium school for quality education to the children of the village. This NGO has contributed Rs. 50,000 for school building construction material procurement and groups within the village and contributed labour for the construction of the school building. This NGO also helped the villagers to organize themselves into saving groups, establish village bank and promote group enterprises including community shops, and dairy processing, fruit processing and rural tourism development. The NGO has been a catalyst to organize the villagers into groups. These groups took the responsibility of community development activities including health and sanitation, rural trail improvement and neighbourhood cleanliness campaign by contributing 10 minutes of voluntary labour each day.

Table 5.2.6-1 NGO Activities in TIP Area

No.	Name of the NGO	Location of NGO Activity	Irrigation Block	Type of Activities
1.	CARITAS-Nepal	Gerkhutar	A	<ul style="list-style-type: none"> <li>- Assistance in village drinking water project</li> <li>- Skill development training program to village women (tailoring and needle works)</li> </ul>
2.	Rayukai	Bidur and Battar	B and C	<ul style="list-style-type: none"> <li>- Assistance for drinking water project</li> <li>- Health education program</li> <li>- Ambulance service</li> </ul>
3.	Peace Crops Volunteer	Kumalgaon, Talloppaltar	G	<ul style="list-style-type: none"> <li>- Income generation activity by creating a revolving fund of Rs. 30,000 to give loan for goat raising activity, women of 28 HHs of Kumalgaon are made eligible for fund to buy goat for farming. This activity is still on-going.</li> </ul>
4.	Japanese Volunteer Contribution	Kumalgaon, Talloppaltar	G	<ul style="list-style-type: none"> <li>- Construction of health post</li> <li>- Women's training center</li> <li>- Skill development training program to women</li> </ul>
5.	C-CODER	Phirke Devighat, Majhigoan, Dhodeni, Sirkhali, Pokhariphant	L	<ul style="list-style-type: none"> <li>- School building construction for English medium education</li> <li>- Mobilization of both men and women's saving groups</li> <li>- Establishment of community bank</li> <li>- Community shop</li> <li>- Community dairy program</li> <li>- System of 10 minutes labor contribution each day for community infrastructure improvement activity.</li> </ul>

### 5.3 Agriculture

The total number of farm households in the Study area is 1,445, with average land holdings of 0.52 ha. per household. The total foodgrain availability in the Study area is 1,374 mt for 1,445 households which is a food deficit area (157 kg per person). The average farm income from agricultural activities is estimated at Rs. 4,041 per household per annum to Rs. 22,720, with an average income of Rs. 11,232 which is below the minimal income to meet the basic food need.

Under the rainfed condition, agriculture production centers on cereal crops. Maize-millet, and upland paddy are the major crops with the annual cropping intensity rate of 110 to 151. The performance of crops depends on the cyclical monsoon with average yield of 2.30 mt/ha. However, delay in rains or bad monsoon severely damages crops. Furthermore, the poor quality of seeds, cultural practices and lack of manure and irrigation water have resulted in poor yield.

Cereal crops account for 83 % of the total cropped area with the remaining 17% under other crops. The annual crop production in the Study area is estimated to be 1,920 mt of which 95% is cereals crops and 5% other crops. The average net income in the Study area is Rs. 6,720 per ha to Rs. 17,980 per ha.

The major constraint to the introduction of new market-oriented cash crops is the lack of efforts on crop diversification based on comparative advantages profitability over the traditional crops.

#### 5.3.1 Methodology

In the field the Team carried out the fact finding survey with the aim to identify agricultural conditions of the Study area at the 15 survey spots. The Team conducted farmer interviews both in groups as well as directed at individuals. The information gathered and analyzed was on cropping pattern, yields, production costs, gross income and net income as well as the crops desired for cultivation after irrigation facilities become available. The Team interviewed over 100 individuals and visited farms and households in the survey area to make field assessments.

Intensive group discussions were held with women regarding (a) women's concerns regarding irrigation; (b) cropping patterns and intensity; (c) crop yield and production; (d) varieties used and seed sources; (e) crops desired after irrigation; (f) work load and labour status after the introduction of new labour intensive vegetable crops; and (g) women's role in water users association as well as in the marketing of the surplus products. Field verification of the potential new crops and varieties was conducted in small groups. Thus, most of the information collected in the Project area was verified with the beneficiaries.

### 5.3.2 Farm Households and Land Holdings

The number of farm households in the 12 irrigation block areas was 1,445 (Table 5.3.2-1) with an average land holding of 0.52 ha per household. The number of farm households varied in irrigation blocks from 35 households in Block A to 297 households in Block C. Similarly, the average land holding also varied by irrigation blocks from 0.22 ha/household in Block H to 1.11 ha/household in Block J.

The total number of farm households can be classified by the following five types: 159 landless households (11%); 289 marginal households (20%); 448 small households (31%); 390 medium households (27%) and 159 large farm households (11%) (Table 5.3.2-2). Accordingly average land holdings of each type of farm household is assumed to be 0.12 ha for marginal, 0.37 ha for small, 0.78 ha for medium and 1.60 ha for large farmers. The total number of households with less than 0.5 ha are 889 households (62% of the total households in the Project area).

**Table 5.3.2-1 Number of Farm Households and Land Holding**

Irrigation Block	Total Cultivated land (ha)	Total HHs (no.)	Average Cultivated Land (ha/HH)	HHs with Less than 0.5ha
A	23.30	35	0.67	16 (45%)
B	48.00	62	0.77	52 (83%)
C	74.30	297	0.25	242 (82%)
D	81.40	108	0.66	75 (70%)
E	104.20	125	0.83	80 (64%)
F	29.90	-	-	-
G	51.50	178	0.46	97 (54%)
H	34.60	155	0.22	107 (67%)
I	46.20	133	0.35	63 (48%)
J	56.80	51	1.11	31 (61%)
K	79.00	72	1.10	37 (52%)
L	128.50	229	0.56	89 (39%)
Total	757.70	1,445	0.52	889 (62%)

Source : Household Sample Survey, January 1997.

**Table 5.3.2-2 Total Number by Types of Farm Household in the Study Area**

Types of Farm HH	Number of HHs	%	Average Cultivated Land (ha)
Landless	159	11	0
Marginal	289	20	0.12
Small	448	31	0.37
Medium	390	27	0.78
Large	159	11	1.60
Total	1,445	100	0.524

**(1) Food Self-sufficiency**

The total foodgrain availability in the Study area is 1,373.89 MT (see Table 5.3.2-3) for 1,445 households or 8,742 person (population). This comes to around 156 kg per person which is 35 kg less than the standard set by the government (191 kg/person). Therefore, on an average the Study area can be defined as a food deficient area.

**Table 5.3.2-3 Foodgrain Availability in the Study Area**

Commodities	Production Used (mt)	Used as Seed (mt)	Wastage (mt)	Extraction (mt)	Foodgrain Available (mt)
Paddy/Rice	577.53	14.70	57.75	186.88	315.05
Maize/Flour	897.74	11.23	89.77	23.54	768.41
Millet/Flour	291.88	3.06	29.19	18.17	241.73
Wheat/Flour	52.54	4.56	5.26	1.83	41.65
Total (Foodgrain)	1,819.69	33.55	181.97	230.68	1,366.84
Average foodgrain available per person					156 kg

Source: Calculated from the total foodgrain production in the Study area

**Table 5.3.2-4 Average Food Self-sufficiency in 12 Irrigation Blocks**

Irrigation Block	Production (mt)	Foodgrain Available (mt)	Population (no.)	Foodgrain Available (kg/person)	Food Self-sufficiency (standard 191 kg)
A	76.89	42.16	272	155	Deficient
B	157.54	111.06	405	274	Sufficient
C	135.66	97.18	1,844	53	Deficient
D	219.90	172.31	669	258	Sufficient
E	322.11	239.91	704	341	Sufficient
F	53.53	44.22	1,132	117	Deficient
G	108.62	88.31			
H	85.98	68.76	879	78	Deficient
I	67.63	52.67	733	72	Deficient
J	101.29	83.73	308	272	Sufficient
K	140.87	116.45	412	283	Sufficient
L	347.65	250.08	1,384	181	Deficient
Total	1,819.67	1,366.84	8,742	156	Deficient

The food self sufficiently in each of the 12 irrigation blocks on an average is presented in Table 5.3.2-4. The table shows that irrigation blocks A, C, G, H, I and L are deficient in food, whereas the irrigation blocks, B, D, E, J and K are self-sufficient in food on an average. However, as per the Table 5.3.2-1. There are 52%, 70%, 64%, 61% and 52% farm households in blocks B, D, E, F, J and K respectively with less than 0.5 ha of land per household. Therefore, even in overall self-sufficient blocks, there are many food deficient households.



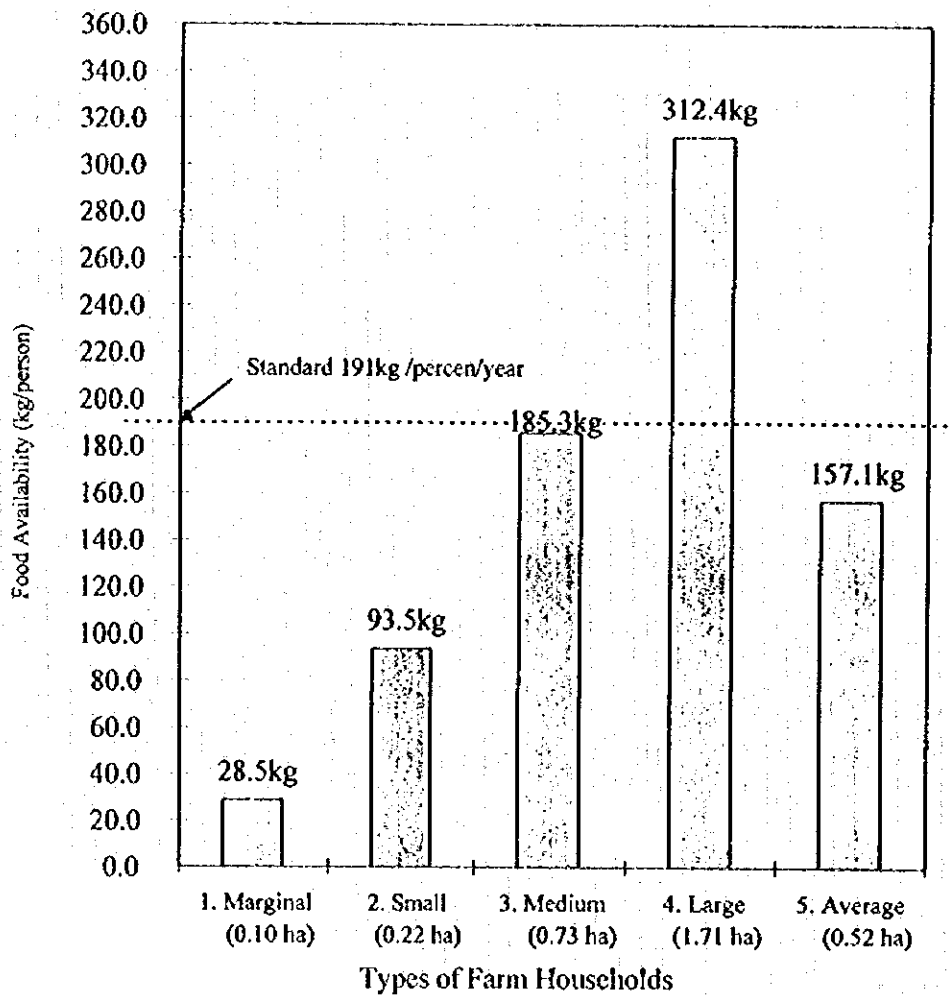
**Table 5.3.2-5 Food Availability by Types of Farm Households**

Types of Farm HH	Percentage of Population	Foodgrain Production (kg)	Foodgrain Available (kg)	Foodgrain Available (kg/pers)	Food Self-sufficiency (standard 191 kg)
Landless (0.00 ha)	11%				Very highly deficient
Marginal (0.10 ha)	20%	240	181	28.5	Very highly deficient
Small (0.22 ha)	31%	768	579	93.5	Highly deficient
Medium (0.73 ha)	27%	1,753	1,323	185.3	Deficient
Large (1.71 ha)	11%	4,107	3,099	312.4	Sufficient
Average (0.52 ha)		1,259	950	157.1	Deficient

Source: - Field Survey 1997 - Calculated based on present production

As shown in Table 5.3.2-5 the marginal and small farm households are highly deficient in food. Even the medium types of farm households are deficient. Only large farm households are self-sufficient in food.

**Figure 5.3.2-1 Foodgrain Availability by Types of Farm Households**



**(2) Farm Income**

The average farm income per household in 12 irrigation blocks of the Study area based on the agricultural activities are presented in Table 5.3.2-5. The average farm income per household are estimated lowest in Block C (only Rs. 4,041/household) and highest in Block E (Rs. 22,720/household). The average farm income per household in the Study area is Rs. 11,232 per household, which is below the minimal requirement to meet the basic needs of food.

**Table 5.3.2-6 Average Farm Income per Household by Agricultural Activities in 12 Irrigation Blocks of the Study Area**

Irrigation Block	Total HH no.	Total Value (Rs. 1,000)	Farm Income (Rs./HH)
A	35	711.23	20,320
B	62	1,337.45	21,571
C	297	1,200.24	4,041
D	108	1,865.40	17,272
E	125	2,840.01	22,720
F	-	508.91	-
G	178	953.70	8,217
H	155	736.12	4,749
I	133	629.15	4,730
J	51	968.38	18,988
K	72	1,346.83	18,706
L	229	3,133.39	13,683
Total	1,445	16,230.82	11,232

Source: Calculated based on cropping pattern and average yield

The estimated average farm income per household was cross checked with the estimated agricultural product value of the Study area (see Table 5.3.2-6). However, the average farm income of rural households with less than 0.5 ha of cultivated land was estimated to comprise a deficient household.

**Table 5.3.2-7 Estimated Agricultural Product Value in the Study Area**

Commodities	Production (mt)	Price (Rs./mt)	Estimated Value (Rs. 1,000)
Paddy	508.94	9.250	4,707.70
Upland Paddy	68.59	8.000	548.72
Maize	897.86	8.500	7,631.81
Millet	291.88	6.750	1,970.19
Wheat	52.39	7.000	366.73
Others	100.57	10,000	1,005.70
Total	1,920.23	8,452	16,230.82

Source: Value calculated based on the total production multiplied by the farmgate price

### 5.3.3 Soil Conditions

Soil survey was carried out to grasp the soil fertility in the Study area. For the said survey, the Study area was divided into 19 blocks according to topographical characteristics, and soil samples were taken in each block. At each point, soil samples were taken from the top-soil and sub-soil to represent cultivated land and 38 samples were collected in total.

The analyzed items are as follows:

pH, EC, NH<sub>4</sub>, NO<sub>3</sub>, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, CaO, MgO, Fe, Mn and Organic Matter

Location of sampling site and results of analysis are given in Table 5.3.3-1 and Figure 5.3.3-1.

Soil pH and available macro-nutrients (NO<sub>3</sub>-NH<sub>4</sub>, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O) as well as micro nutrients (CaO, MgO, Fe, Mn, etc.) as observed in soil analysis are as follows:

**pH** The PH of the top soil ranged from 4.9 to 6.8, whereas, the PH of the sub-soil ranged from 5.1 to 6.7 indicating the soil being acidic. The soil PH of Pokharaphant is toward neutral (6.7).

**Macro-Nutrients** The soils in the Study area are high in P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O but low in Nitrogen.  
**Micro-Nutrients** Slow down of micronutrients availability in soils (because of its acidic nature) as well as increased fixation of phosphatic matters indicated inhibition of plant growth.

The Study area has different levels of ancient and recent terraces. These terraces consist of alluvium and colluvium deposits with gravels.

The soil conditions in the Study area are divided into 3 types according to micro-topography, moisture regime, land use and age.

Part	Irrigation Block	Geography	Texture <sup>1)</sup> (topsoil)	(Moisture Regime)	pH (topsoil)	Organic Matter <sup>2)</sup>	Main Present Land Use
I	A, B, C, D, E, H	Middle and Lower Terrace	SiL, SL	(dry - wet)	acidic to neutral	medium	Upland Crop + Paddy
II	G, I, J, K	Upper Terrace	SiL, SL	(dry)	acidic to neutral	medium	Upland Crop
III	L	Terrace + Fan	SiL, SiC	(wet)	neutral	medium	Paddy

Notes 1): SiL; sandy loam, SiL; silty loam  
 2): medium is 2.5 - 5.0 % of soil by weight

The major soil types in the Study area are Rhodustalfs and Dystrochrepts. In Majhitar and Pipaltar, these soils are dominant and found to be scarcely covered by vegetation. These soils are severely affected by sheet and gully erosion. As mentioned above, the soil fertility in the Study area is relatively low and acidic. Accordingly, organic matter such as compost are essential for retaining nutrients and suppressing the potential toxicity of aluminum.

Thus, the major problems observed in the soil survey are:

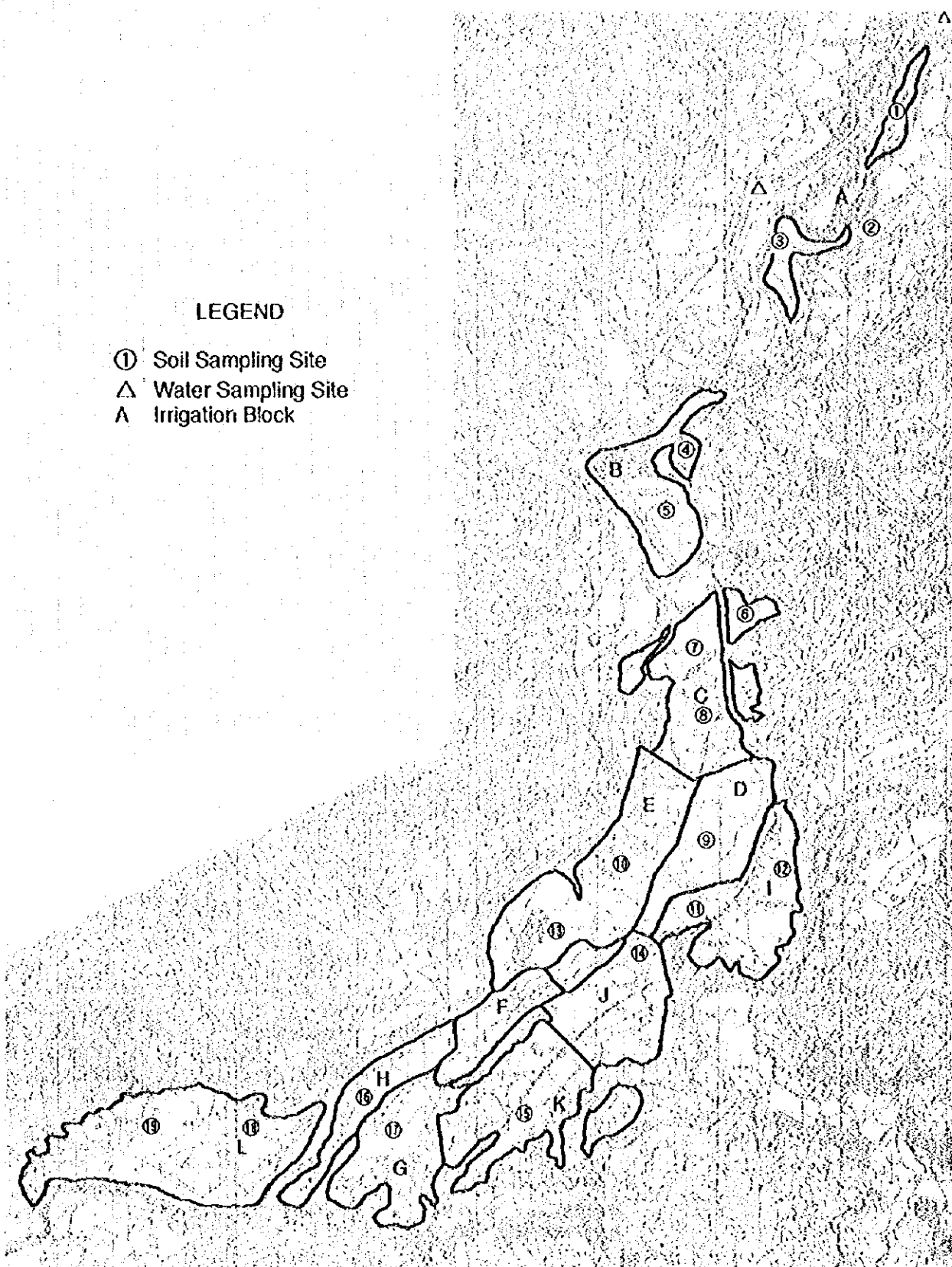
- (1) Minimal inclusion of leguminous crops in the present cropping pattern adopted by the farmers.
- (2) Only limited organic manures are available to apply in the field.
- (3) No rhizobium inoculums are introduced in the Study area for biological nitrogen fixation.
- (4) Reduction in crop productivity because of the poor soil and fertility management.
- (5) Limited fodder plants to raise livestock in order to provide organic manures to the soil.
- (6) Part II (Irrigation Block G, I, J, K) exhibit soil texture with high permeability. Also, in consideration of the time required for pan to develop, it is concluded that creation of new paddy field would be difficult.

Table 5.3.3-1 Results of Soil Analysis

Map No.	Hzi. #	Block	Place Name	Texture <sup>2</sup>	pH	EC (DMS)	O.M (%)	NH <sub>4</sub> -N (mg/100g)	NO <sub>3</sub> -N (mg/100g)	PO <sub>4</sub> (mg/100g)	K <sub>2</sub> O (mg/100g)	CaO (mg/100g)	MgO (mg/100g)	Fe (ppm)	Mn (ppm)
1-T	A		Gerkhatar	L.S	6.8	9	3.33	<1	<1	<1	20	50	1	75	<5
1-S			"	L.S	6.5	9	3.51	<1	<1	5	20	<50	1	75	5
2-T	A		Gerkhatar	SL	5.4	10	3.24	<1	1	5	25	50	<1	10	<5
2-S			"	L.S	5.6	7	3.66	<1	<1	<1	20	<50	<1	25	<5
3-T	A		Sumbhar	SiL	5.6	7	3.27	<1	1	7	25	100	<1	10	<5
3-S			"	L	5.7	9	3.09	<1	<1	<5	20	<50	<1	10	<5
4-T	B		Bidur	SiL	4.9	5	3.99	<1	<1	5	35	<50	<1	50	<5
4-S			"	SiL	6.4	10	3.48	<1	<1	<5	35	100	1	5	<5
5-T	B		Bidur	SiL	6.2	7	3.93	1	<1	<5	20	15	<1	25	<5
5-S			"	SiL	6.1	7	3.84	<1	<1	5	35	50	<1	10	<5
6-T	C		Demi	SL	5.0	4	2.52	<1	<1	5	35	100	<1	10	<5
6-S			"	SCR	6.5	7	2.82	<1	<1	<5	35	100	<1	5	<5
7-T	C		Subbasitol	L.S	5.2	12	2.88	<1	<1	<5	35	100	<1	<5	<5
7-S			"	SL	5.3	5	3.24	<1	<1	<5	35	200	<1	<5	<5
8-T	C		Fedigama	L.S	5.8	7	2.01	1	<1	6	20	20	<1	5	<5
8-S			"	SiL	6.2	7	3.81	2	<1	<5	20	10	<1	<5	<5
9-T	D		Inrapati	SL	5.5	6	2.76	<1	<1	<5	20	<50	<1	25	<5
9-S			"	SL	5.7	6	3.66	<1	<1	5	20	<50	<1	7	<5
10-T	E		Maharandhi	SL	5.5	4	3.15	<1	<1	<5	20	<50	1	5	<5
10-S			"	SiL	5.1	4	3.21	<1	<1	<5	35	<50	<1	<5	<5
11-T	I		Dhanar	SiL	5.5	5	2.97	2	<1	<5	20	20	<1	5	<5
11-S			"	SiL	5.2	4	3.81	<1	<1	<5	20	10	<1	5	<5
12-T	I		Majhitar	SiL	6.7	12	2.31	<1	<1	<5	35	100	<1	<5	<5
12-S			"	SiL	6.7	10	3.36	2	<1	<5	20	20	<1	<5	<5
13-T	E		Chandipokhan	SL	5.6	7	3.48	<1	<1	10	35	<50	5	15	<5
13-S			"	SL	5.6	7	2.88	<1	<1	10	35	<50	<1	15	<5
14-T	J		Pipatar	SiL	5.4	7	3.06	<1	<1	<5	20	<50	<1	<5	5
14-S			"	SL	5.3	5	3.03	<1	<1	<5	20	<50	<1	<5	<5
15-T	K		Pipatar	SiL	5.7	9	3.9	<1	<1	<5	35	<50	<1	<5	<5
15-S			"	SiL	5.7	8	3.54	<1	<1	<5	35	100	<1	<5	<5
16-T	H		Lambagnacha	SL	5.6	7	3.51	<1	<1	<5	20	<50	1	25	<5
16-S			"	L.S	5.6	5	3.18	<1	<1	5	20	<50	<1	20	<5
17-T	G		Lambagnacha	SL	5.6	9	3.81	<1	<1	<5	25	50	<1	<5	<5
17-S			"	SiL	6.4	11	3.33	<1	<1	7	70	100	<1	<5	<5
18-T	L		Pokharephat	SiC	6.7	11	2.94	<1	<1	<5	10	100	<1	25	<5
18-S			"	CL	7.6	19	3.12	<1	<1	<5	20	50	<1	<5	<5
19-T	L		Pokharephat	SiL	6.7	17	3.87	1	<1	<5	70	100	<1	25	<5
19-S			"	SiCR	6.4	12	2.82	<1	<1	7	20	<50	1	<5	<5

Remarks: 1) T: Topsoil, S: Sub-soil

2) LS: Loamy Sand, SiL: Silty Loam, SL: Sandy Loam, SCR: Sandy Clay Loam, CL: Clay Loam, SiCR: Silty Clay Loam



**LEGEND**

- ① Soil Sampling Site
- △ Water Sampling Site
- A Irrigation Block

**Fig. 5.3.3-1 Location Map of Soil and Water Sampling Sites**

### 5.3.4 Cultivation Methods

The cultivation technologies adopted by the farmers in the Study area, in general, were observed to be poor in all aspects of ploughing and land preparation, inputs use and management practices.

#### (1) Ploughing

Farmers of the Study area were observed ploughing the field and exposing the soil for a long time (two months or more from February to March or April) with the hope to harvest the rain water for crop planting. Most of the farmers also started heaping organic manure in the field at the same time causing loss of nutrient content. The main reasons for doing so as explained by the farmers are:

- 1) Many small farmers do not possess bullocks for timely ploughing;
- 2) The price of a pair of bullock with a ploughman cost Rs. 150 to Rs. 200/day in the planting season (expensive as per their version);
- 3) They are waiting for the rain to come and all planting has to be completed before the rain water dries out;
- 4) In most cases, especially the small farmers are dependent on household labour. They have no resources to employ outside labourers.

#### (2) Seeds

The seed use and seeding practices very much depend on the timing of rainfalls. Early rainfall in the season encourages farmers to plant the most suitable normal maturing varieties of maize, upland paddy, etc. whereas the late rainfall forces them to change to early maturing varieties of maize, upland paddy, etc. This has created problems both in supply management and required use of new improved seeds.

Three improved varieties of maize (Khumal yellow, Rampur yellow, and Arun) account for 90% of the total maize area. Similarly China Ball, CH45 and Bindheswori varieties of upland paddy account for more than 90% of the total upland paddy area. Farmers usually save their own seed for the variable situations. The shortage of superior seed supply has become the main reason for not adopting the new superior seeds. The seed rate used by various types of farm households is similar.

Main constraints on seeds are:

- Higher price of quality seed
- Untimely supply of quality seeds because of uncertain demand situation
- Uncertainty of crop varieties used because of uncertain rainfall

**Table 5.3.4-1 Average Seed used by Farmers in the Study Area**

Crops	Seed Used (kg/ha)	Value of Seed* (Rs./ha)
Paddy	65	740
Upland Paddy	60	600
Maize	26	256
Millet	20	160
Wheat	120	900
Sub-Total (Cereals)	58	531
Niger	20	400
Sesame	12	480
Ground Nut	50	2,600
Sub-Total (Others)	27	1,160
Total	458	7,827

Source: Farmer interviews.

Note: \* The unit seed prices comprise the average price of the local and improved seeds from various sources.

### (3) Fertilizers

Use of fertilizer varies for different crops as shown in Table 3.3.4-2. The use of fertilizer doses also varies by irrigation block and by type of farm household.

Main constraints on fertilizer use :

- 1) Uncertainty of crop performance
- 2) High risk of loosing the investments in the case of abnormal monsoon of less rain or late rainfall



**Table 5.3.4-2 Average Fertilizer used by Farmers in the Study Area**

Crops	Fertilizer Use						Value of fertilizer used		
	Urea (kg/ha)			DAP (kg/ha)			(Rs./ha)		
	Small HH	Medium HH	Large HH	Small HH	Medium HH	Large HH	Small HH	Medium HH	Large HH
Paddy	100	180	200	100	160	200	2,405	3,987	4,810
Upland Paddy	100	200	200	0	0	0	695	1,390	1,390
Maize	100	200	200	0	100	100	695	3,100	3,100
Millet	100	150	200	0	0	0	695	1,042	1,390
Wheat	100	200	200	100	100	100	2,405	3,100	3,100
Niger	0	0	0	0	0	0	0	0	0
Sesame	0	0	0	0	100	100	0	1,710	1,710
Ground Nut	0	0	0	0	0	0	0	0	0

Source: Farmer interviews.

Note: Small farm HH with less than 0.5 ha.

Large farm HH with more than 0.5 ha.

Fertilizers used in the Study area are mainly Urea and DAP. They are used in various combination of basal dressing and top dressing by different types of farm households.

#### (4) Organic Manures

Use of organic manure was observed limited although the farmers expressed that use of organic manure is necessary for maintaining the soil fertility. The quality of organic manures was observed to not be well decomposed.

Main constraints in organic manure use are:

- 1) Lack of leaf (litters) materials available for composting
- 2) Limited fodder plants for livestock feeding
- 3) No green manuring crops grown
- 4) Pulses/legumes not included in cropping pattern

#### (5) Agro-Pesticides

The use of agro-pesticides are limited to paddy (see Table 5.3.4-3) and upland paddy. In general, farmers have not applied agro-pesticides for millet, maize and other crops. Agro-pesticides are not used for local varieties with very low yield. Improved varieties and improved seeds are not used because of lack of knowledge on agro-pesticide application.

Main constraints in agro-pesticide use are:

- 1) Lack of knowledge
- 2) Lack of education to calculate the dose and application methods
- 3) Lack of sprayers
- 4) Price and trade mark variations

**Table 5.3.4-3 Agro-Pesticides Use by Farmers in the Study Area**

Crops	Pesticide Use	Value (Rs./ha)
Paddy	350	525
Upland Paddy	350	525
Maize	Only by some farmers	0
Millet	No	0
Wheat	No	0
Niger	No	0
Sesame	No	0
Ground Nut	No	0

Source: Farmer interviews.

Note: The use of agro-chemicals included mainly Metacid, BHC, Thiodan, Blitox, etc. However, Metacid spray in paddy was reported most common in the Study area.

#### Labour and Draft Animal Use

Labour use as indicated by the farmers is very high (see Table 5.3.4-4) and many expressed the necessity of hiring labourers. The small and marginal farmers have used their own family labour in farming and most of these families have a surplus of labour available for use. Therefore, new profitable crops introduced after irrigation should be mainly labour intensive for the best utilization of available labour resources within the family.

**Table 5.3.4-4 Average Labour Use in the Study Area**

Crops	Labour used (Man-days)						Value of			Draft animal use in animal days	Value of draft animal labour (Rs./ha)
	Family labour (Man-days)			Hired labour (Man-days)			Hired Labour (Rs/ha)				
	S	M	L	S	M	L	S	M	L		
Paddy	200	150	90	40	90	150	1,600	3,600	6,000	28 x 2	2,800
Upland Paddy	160	150	90	20	35	100	800	1,400	4,000	20 x 2	2,000
Maize	150	100	50	0	50	100	0	2,000	4,000	24 x 2	2,400
Millet	180	120	60	0	60	120	0	2,400	4,800	0	0
Wheat	100	80	20	10	30	80	400	1,200	3,200	14 x 2	1,400
Niger	120	100	20	0	20	100	0	800	4,000	0	0
Sesame	120	100	20	40	60	140	1,600	2,400	5,600	8 x 2	800
Ground Nut	200	150	50	50	100	200	2,000	4,000	8,000	14 x 2	1,400

Note: S: small farm III; M: medium III; L: large III

Source: Family interviews

Note: Hired Labor @ Rs. 40/Md and Draft Animal @ Rs. 100/pair

### 5.3.5 Cropping Pattern, Intensity, and Yield

At present, the performance of crop production depends on the cyclical monsoon. Delay in rains or abnormal monsoon have resulted in sharp declines in crop production and farm household real income. Furthermore, the poor quality of seeds, inappropriate application of chemical fertilizer and agro pesticides and lack of organic manures (humus in the soil) have severely constrained expanded agricultural productivity.

Maize, millet, upland paddy and oil seeds are the major crops grown in the Study area. Farmers have planted paddy and wheat wherever they found limited sources of water. The shortage of water has, however, severely damaged their crops. The cereal crops account for 83 % of the total cropped area with the remaining 17% area being under niger, sesame, and ground nut (see Table 5.3.5-1).

Target cropped area of 12 Irrigation blocks in the Study area as shown in Table 5.3.5-2 is 757.70 ha. Cropping rate, in a good rainfall year has ranged from 110% in Simbutar area (Block A) to as high as 151% in Pokharaphant area (Block L).

The upland maize-millet based cropping pattern dominates the Study area at present. The oil seeds are mainly grown in the Study area for cash sale during the Dasain and Tihar, (main Nepalese festivals) and to meet the immediate cash needs of the season. Thus, the main crops grown in the Study area are maize, paddy and millet for the farmer's own consumption (subsistence rather than commercial).

The details of the cropped area for each of the 15 survey points were calculated. They were then transposed to the 12 irrigation blocks. The details of the cropped area for each of the 12 irrigation blocks are presented here in Tables 5.3.5-2 as well as the cropping intensity for the same Table 5.3.5-2. The present dominant cropping pattern and cropping intensity are also presented in the cropping calendar sheets. However, the details of the individual farmer interviews for identifying the present agricultural situation for each of the 15 survey points were utilized to calculate and evolve average figures.

**Table 5.3.5-1 Present Cropped Area and Cropping Intensity of Crops Grown in the Study Area**

Crops	Cropped Area (ha)	Cropping Intensity (%)	% of Cropped Area	% of Cereal Crops
Paddy	212.22	28	20	24
Upland Paddy	33.36	4	3	4
Maize	432.27	57	41	50
Millet	153.19	21	15	18
Wheat	38.52	5	4	4
Sub-Total (Cereal Crops)	869.56	115	83	100
Other Crops (Cash Crops)	176.44	23	17	
Total	1,046.00	138	100	

Source: Farmer interviews.

**Table 5.3.5-2 Present Cropped Area and Cropping Intensity by Types of Farm Households**

Types of Farm III	Cultivated Land Area (ha/III)	Cropping Intensity (%)	Average Cropped Area (ha/III)	Cropping Cereals (%)	Cropping Other Crops (%)
Landless	0		0	110	25
Marginal	0.12	135	0.16	110	25
Small	0.37	142	0.53	100	42
Medium	0.78	151	1.18	130	21
Large	1.60	124	1.98	110	14
Average	0.524	138	0.72	115	23

**Table 5.3.5-3 Present Cropped Area and Cropping Pattern per Irrigation Block**

Irrigation Block	Cultivated Area (ha)	Cropped Area (ha)	Cropping Intensity (%)
A	23.30	25.63	110
B	48.00	67.68	141
C	74.30	99.56	134
D	81.40	114.77	141
E	104.20	152.13	146
F	29.90	39.00	130
G	51.50	70.69	137
H	34.60	46.36	134
I	46.20	59.60	129
J	56.80	73.84	130
K	79.00	102.70	130
L	128.50	194.04	151
Total	757.70	1,046.00	138

Source: Farmer interviews.

(1) Unit Yield

Table 5.3.5-3 presents the productivity trends of different crops in the Study area averaged from the 15 survey spots of the Study area. The average unit yields have been estimated based on the results of the interviews with the individual farmers. The variations in yield were reported because of the following reasons:

- 1) Uncertainty of rainfalls
- 2) Poor quality of seed including low yielding variety
- 3) Variable doses of fertilizer use
- 4) Small quantity of organic manure use
- 5) Shortage of water at the critical stages of cultivation

**Table 5.3.5-4 Average Yield of Various Crops in the Study Area by Types of Farm Households**

Crops	Average Yield (mt/ha)			Yield Range (mt/ha)	Average Yield of Nuwakot District 1995/96*
	Small HH	Medium HH	Large HH		
Paddy	2.10	2.40	2.60	2.00 to 3.67	2.31
Upland Paddy	1.80	2.06	2.20	1.00 to 3.00	-
Maize	1.60	2.08	2.20	1.22 to 2.56	1.60
Millet	1.60	1.88	2.00	0.86 to 2.30	1.10
Wheat	1.20	1.36	1.50	1.20 to 1.92	1.58
Niger	0.40	0.44	0.45	0.26 to 0.50	0.50
Sesame	0.50	0.52	0.54	0.35 to 0.60	0.50
Ground Nut	1.70	1.70	1.70	1.38 to 2.00	-

Source: Farmer interview

\*: Statistical Year Book 1995, Central Bureau of Statistics.

(2) Production:

The annual crop production in the Study area is estimated to be 1920.23 mt of which 95% (1819.66 mt) is cereal crops and only 5 % other crops (see Table 5.3.5-4).

The cereal crops occupied 83% of cropped land to produce 95% of foodgrains whereas the other crops occupied 17% of cropped land to produce 5% of cash crops indicating low yielding cash crops grown in the Study area.

The present crop production in 12 irrigation blocks is presented in Table 5.3.5-5 whereas the present cereal crop production in 12 irrigation blocks is presented in Table 5.3.5-6 and the present oil seeds crop production in Table 5.3.5-7.

**Table 5.3.5-5 Present Crop Production in the Study Area**

Crops	Cropped Area (ha)	Yield (mt/ha)	Production	
			(mt)	%
Paddy	212.00	2.40	508.94	26
Upland Paddy	33.36	2.06	68.59	4
Maize	432.27	2.08	897.74	47
Millet	153.19	1.88	291.88	15
Wheat	38.52	1.36	52.54	3
Sub-total	869.56	2.09	1819.69	35
Other Crops	176.44	0.57	100.56	5
<b>Total</b>	<b>1046.00</b>	<b>1.83</b>	<b>1920.25</b>	<b>100</b>

Source: Farmers interview

**Table 5.3.5-6 Present Crop Production in Irrigation Blocks**

Irrigation Block	Cropped Area (ha)	Production (MT)	Cropped Area (ha)	Production (MT)
A	25.63	76.89	25.63	76.89
B	67.68	158.91	65.28	157.54
C	99.56	142.44	87.67	135.66
D	114.77	224.54	106.63	219.90
E	152.13	332.81	133.38	322.11
F	39.00	61.06	25.80	53.53
G	70.69	119.50	51.60	108.62
H	46.36	88.74	41.52	85.98
I	59.60	76.32	44.35	67.63
J	73.84	115.53	48.85	101.29
K	102.70	160.68	67.94	140.87
L	194.04	362.83	170.91	349.65
<b>Total</b>	<b>1046.00</b>	<b>1,920.25</b>	<b>869.56</b>	<b>1,819.67</b>

Source: Calculated based on farmer interviews

**Table 5.3.5-8 Present Oil seed Crop Production in Irrigation Blocks**

Irrigation Block	Cropped Area (ha)	Production (mt)
A	0	0
B	2.40	1.37
C	11.89	6.78
D	8.14	4.64
E	18.75	10.69
F	13.20	7.52
G	19.09	10.88
H	4.84	2.76
I	15.25	8.69
J	24.99	14.24
K	34.76	19.81
L	23.13	13.18
Total	176.44	100.56

Source: Farmer interviews

### 5.3.6 Crop Budget

The present production cost for each crop grown in the 15 survey spots was identified through farmer interviews. The details of the present crop production cost for each crop were calculated for all the 15 survey spots and transposed to the 12 irrigation blocks. The average production costs of each crop in the Study area are presented below in Table 5.3.6-1 by type of farm household.



**Table 5.3.6-1 Present Average Production Costs of Major Crops Grown in the Study Area**

Crops	Range in Production Costs (Rs./ha)		
	Small III	Medium III	Larger III
Paddy	8,745	13,227	15,950
Upland Paddy	5,295	8,515	11,115
Maize	4,551	9,356	11,356
Millet	1,055	3,802	6,550
Wheat	5,805	7,800	9,800
Niger	600	1,400	4,600

Source: Farmer interview

Note: Small: < 0.5ha; large > 0.5ha

The net incomes for farmers by type of farm household were calculated as follows.

**Table 5.3.6-2 Net Income for Farmers by Type of Farm Household**

Type of Farm III	Cultivated Area (ha)	Cropping Intensity (%)	Cropped Area (ha)	Gross Return (Rs)	Production Cost (Rs)	Net Return (Rs)
Marginal	0.12	135	0.16	2,604	1,229	1,375
Small	0.37	142	0.53	8,087	3,616	4,471
Medium	0.78	151	1.18	19,728	9,503	10,225
Large	1.60	124	1.98	33,654	16,404	17,250
Average	0.524	138	0.72	11,847	5,636	6,211

The net incomes for farmers by growing various crops at the 15 survey spots were calculated based on the gross income of the farmers minus the crop production cost.

**Table 5.3.6-3 Crop-wise Net Income in the Study Area**

(Unit: Rs.)

Crops	Income	Small Farm III <0.5 ha	Medium Farm III	Large Farm III >0.5 ha
Paddy	Gross income	21,031	24,036	26,039
	Production cost	8,745	13,227	15,950
	Net income	12,286	10,809	10,089
Upland Paddy	Gross income	15,777	18,056	19,283
	Production cost	5,295	8,515	11,115
	Net income	10,482	9,541	8,168
Maize	Gross income	13,600	17,680	18,700
	Production cost	4,551	9,356	11,356
	Net income	9,049	8,324	7,344
Millet	Gross income	10,800	12,690	13,500
	Production cost	1,055	3,802	6,550
	Net income	9,745	8,888	6,950
Wheat	Gross income	8,400	9,520	10,500
	Production cost	5,805	7,800	9,800
	Net income	2,595	1,720	700
Niger	Gross income	8,800	8,800	8,800
	Production cost	600	1,400	4,600
	Net income	8,200	7,400	4,200

Source : Calculated from farmer interviews

### 5.3.7 Agricultural Extension

The District Agriculture Development Office (DADO), Nuwakot has the main responsibility of providing agriculture extension services to the farmers through 6 Agriculture Service Centers and 7 sub-centers. Devighat Agriculture Service Center in the Study area has one Junior Technician, and one Junior Technical Assistant. These extension agents are expected to cover five VDCs including the Project area.

The farmer group approach has been the extension method of DADO/ASC to reach farmers. DADO has been helping farmers organize into groups for effective delivery of extension services, but unfortunately the farmer groups formed in the Project area are not functional.

The focus of the agricultural extension program is production demonstration, result demonstration, farmers skill training, demonstration visits, distribution of minikits, etc. Promotion of fruits and vegetables as well as of cash crops as a means of crop diversification to more profitable crops has been initiated under the DADO program activities.

### 5.3.8 Agricultural Research

To promote new varieties and technologies for maize cultivation, as well as to introduce and verify new varieties of maize, a Maize Farm was established at Kakani. However this farm is not in existence today. Similarly, to promote production and sales of vegetable seeds, fresh vegetables and fruits saplings, a Horticultural Farm has been established at Dhunge, Trishuli. The farm also supports vegetable and vegetable seed production involving a large number of farmers.

Farmers of the Study area have perceived better benefits by growing vegetables and potatoes after irrigation project implementation. This results from their experiences under the Battar Irrigation Project. Therefore, they prefer to include vegetables and potato in their cropping pattern (with a higher percentage of cropping intensity). Vegetable cultivation is gaining a fair amount of popularity in the Dhikure area (an example of the introduction and adoption of vegetable crops after implementation of the irrigation project). They have already perceived the benefits of diversified vegetable production. The preliminary data collected on the benefits of growing vegetables and potatoes are presented below.

**Table 5.3.8-1 Economics of Fruits and Vegetable Production**

Crops	Gross Income (Rs/ha)	Production Cost (Rs/ha)	Net Income (Rs/ha)
Potato	90,000	35,300	54,700
Cabbage	200,000	65,620	134,380
Banana 1st Year	96,000	9,830	86,170
Banana 2nd year	192,000	9,830	182,170
Papaya	100,000	8,850	91,150
Litchi	200,000	22,650	177,350

Source: Farmer interviews

However, a strong research effort in testing and introducing of new varieties, integrated pest management methodology and in the introduction of other cash crops in the Study area is necessary.

Vegetable development activities to reach the masses for commercial scale production need to be supported by both adoptive research and extension. The present research support and extension activities do not meet the farmers' requirements.

### 5.3.9 Animal Husbandry

The data on livestock population by type of animals and their products in the Study area was very variable, and therefore not clear. The Team observed poor feeding, housing and overall poor management of animal husbandry in the Project area. A large number of buffaloes were observed unproductive as indicated by the low production of milk except in the Devighat Area, where the milk collection program was very successful.

The District Livestock Service Office (DLSO), Nuwakot is the main agency providing livestock services to farmers through its 6 livestock service centers and 8 livestock sub-centers. The DLSO activities as reported have been directed at drenching, vaccination, breed improvement, forage and fodder development, first aid and training support to farmers. Livestock services in the Study area are provided through its Devighat Livestock Service Center.

Farmers perceive livestock as a very important and integral part of their whole farming system. They esteem livestock not only for the use of draft power but also as a source of organic manure, and as a source of small cash to meet their emergency needs.

### 5.3.10 Major Constraints on Agricultural Development

The Team identified several major constraints on agricultural development in the Project area:

- (1) Traditional practice of self subsistence cereal crop production rather than on a market-oriented production system.
- (2) Inadequate technical transfer and technical extension system to reach the large number of small farmers adopting new varieties and technologies.
- (3) Lack of effort on crop diversification aimed at promoting the production and marketing of high value crops with comparative advantages and profitability over the traditional crops.
- (4) Delay in rains and/or low rainfall in the monsoon:

The observation data of rainfalls for the last 26 years for indicated a varying rainfall delay pattern during April and May for maize and upland paddy plantation as well as low rainfall monsoon during July, August and September. It was roughly observed that 50 percent of the years had some effect of delay in rains or low rainfall monsoon. Therefore, only 50 percent of the years were, in general, normal years showing only some variation.

For the Study area delay in rains implies the maize plantation in April ~ May and upland paddy in May ~ June, resulting in either reduced area of plantation such as in the years 1985, 1986, 1987 and 1995, or reduced yield such as in 1986. Low rainfall monsoon pertains to either low rains or less

number of days of rain during the monsoon, which reduces the paddy production by either reducing area of crop plantation or yield reduction as in the years 1986, 1989, 1994 and 1995.

The range in reduction of yield varied from 6% to 10% (DOA data for Nuwakot district) but in specific locations like the Project area there were reported large reductions in some abnormal (once in 10 years) years. Therefore, it is anticipated that the provision of irrigation systems in the Project area will reduce the risks of such abnormal years in crop production.