- Farmers' organization
- Labourers' organization (not formed in Gulmi and Arghakhanchi Districts)

The class organizations represent the interests of the respective groups. Candidates standing for election of panchayats at any level must be members of one of the class organizations.

2.11.3 Function of Local Administrative Organizations

The Village Assembly meets once or twice a year to

- review village level activities of the preceding year,
- adopt the budget presented by the Village Panchayat for the coming year,
- decide on future village level activities.

The District Assembly meet at least once a year for undertaking following activities:

- review of activities carried out in the preceding year,
- review and sanctioning of activities and corresponding budgets for the coming year,
- review and sanctioning of programs and activities forwarded by the District Plan Formulation Committees.

2.11.4 Present Condition of the Institutions

In order to lrarify the present condition of institutions for planning and implementation of the development project at the district level, a series of field surveys were carried out on the present setting of institutions and staffing of each district of the project area. The details of Ilaka Service Centers established in each District are as shown below;

	Gulmi	Argha-khanchi	Kapilvastu	Rupandehi
Agriculture	6	4	9	9
Veterinary	3	3	6	6
Health post/1	13	2	6	6
Public works	0	0	0	0

/1: Number of health post includes Ilaka and ordinary health posts.

The number of officers in the district office for irrigation, water supply and public works is as below:

	Gulmi	Argha-khanchi	Kapilvastu	Rupandehi
Irrigation:				
Engineer	0	0	0	0
Assist. Engi.	1	1	1	1
Overseer	2	2	2	3
Water supply:				
Engineer	0	0	0	0
Assist. Engi.	1	1	1	1
Overseer	2	7	2	3
Public works:				
Engineer	0	0	0	0
Assist. Engi.	1	1	1	1
Overseer	3	5	4	3

As seen in the above tables, the number of Service Centers in Ilaka, especially in the hill areas seems to be far short to fulfil the requirement. The number of staff of each offices especially for engineering overseers is also need to be strengthen both in number and capability to meet the requirement for planning and implementation of the development projects of local level.

CHAPTER 3 LUMBINI IRDP'S NEEDS, POTENTIALS AND APPROACHES

3.1 Development Needs

3.1.1 National Level Development Needs

(1) The Basic Needs Program (BNP)

His Majesty called on Constitution Day 1985 for the attainment by the year 2000 of a standard of living for the Nepalese people "commensurate to lead a life with human dignity by Asian standards". The speech identified six basic needs areas: food, clothing, shelter, health, education and security.

In June 1987 a detailed program including prospective costs over the 15-year period (1985-2000) was endorsed by the National Development Council. The line ministries responsible for BNP execution have been preparing BNP implementation documents for the remaining years of the Seventh Plan (up to 1989/90), while a wide range of structural reorganization of line ministries involved in BNP, including creation of new assistant-minister for overseeing BNP implementation.

BNP stresses the need for commitment at all levels of society, with leadership in the first instance due from the political level. Monitoring of BNP implementation is thus entrusted not only to the Planning Commission and Line Ministries, but also to those of the National Assembly represented on the National Development Council.

BNP reflects the approach to basic needs fulfillment advocated in the Seventh Plan - "increasing the income and purchasing power of the target population" rather than direct distribution of goods and services. The strategy proposed is to selectively intensify ongoing sectoral development programs as well as to expand or develop special targeted employment or income generation programs.

(2) Decentralization

There has been a strong administrative need that overconcentrated decision making power and responsibility has to be decentralized not only for easening the burden of expanding central bureaucratic system but also for mobilizing the local resources, which have not been tapped yet into the national development activities. Encouragement of formulating

district development plan (DDP) at the district level under the Decentralization Act (1982) and by-laws (1984) has a symbolic meaning to confirm the strong will of HMG to pursue this policy.

Along with this direction, district development plans in the Districts of Lumbini Zone have been tried to be formulated for the Seventh Plan. Since this was the first learning experience in formulation of DDP in a systematical way, the result was not so satisfactory. However, despite the deficiencies of the first DDP formulation experience, necessity and enthusiasm of decentralization exists both in the central level and district level, which will guide the design direction of the administrative system of Lumbini IRDP.

(3) People's Participation

In order to activate the local potentials, administrative decentralization is not enough. Real problem of local area in Nepal is that local people, especially young generation, are losing their identity in the rural communities. Shortage of attractive activities in the remote rural communities discourages youth to stay their born villages, and population migration from the rural area (especially from hill area) to urban area is becoming common. Thus, acceleration of rural potential enhancement is an acute issue.

DDP formulation requires village panchayat level project identification. However, actual people's participation demands much lower level involvement in DDP formulation, i.e. ward level or community level, where traditional cooperative spirit still exists. How to encourage the community participation and enhance their energy towards the bottom up development is the key for success of Lumbini IRDP.

An ultimate target here is to formulate at the lowest level of the panchayat system a self-help development mechanism. Without being provided proper opportunities, it is not only remaining the resources unutilized but accumulated frustration of the local people may work as self destructive power, which accelerate the deterioration of traditional natural as well as socio-cultural heritages.

3.1.2 Development Needs of the Project Area

(1) Needs for Increase in Income

Present conditions of rural life in the project area are indicated and summarized as shown in Table 2.3.4. The population densities in the districts is rather higher than 115/km^2

of the national average. The population pressure has made the cultivated area of a farmer very small. The average cultivated area by one household in the hill and the Terai areas is 0.78, and 1.52 ha, respectively.

The level of income of the inhabitants is rather lower than the average of the whole Nepal. The average gross income per capita in the hill and Terai was about US$89, 97, respectively, while the GDP of the national level was about US$160 (1988, estimation). The inhabitants are insisted to live at the subsistence level by earning income with finding employment opportunities in the other areas or India, besides keeping the production from the small farms.

It is obvious that the generation of production in the project area is fundamental matter to uplift the income level for achieving alleviation of poverty and improved rural life.

(2) Needs of Uplift the Living Standard

As seen in Table 2.3.4, the living standard of inhabitants in the project area is very low. Most peoples in the rural area have no latrines, very few sanitaries in schools and public offices, for example indicators of the condition of living environments. In the rural area, especially in the hill districts, there are very limited motorable roads. The district head quarters of Gulmi and Arghakhanchi have no motorable roads which link with the highway all year round. The existing roads are not for all weather, during the rainy season these roads are closed, for about six months, and the areas become as isolated area without supply of basic human needs, such foods, kerosene for light, medicines, as well as social services.

In order to secure the alleviation of poverty by uplifting the living standard, improvement of the social service and living environments is necessary to be launched concurrently with the activation of economy.

3.1.3 Development Needs of the Hill Area (Gulmi, Arghakhanchi)

(1) Eradicating Poverty and Easening Hardship of Life

As seen in the previous chapters, the hill area is in more severe situation than the Terai area in terms of both production and living condition aspects. 20 - 40% of food consumed in hill districts has to be imported from outside, mainly Terai area. This necessarily creates the dependence on outside economy, i.e. seasonal migration of the young

males, for enabling them remittance to support food import. The difficulty of economic self-sufficiency is the fundamental cause of the problems in the hill area.

Thus, first priority need is to ease the local people's material poverty and raise their living standard. One of the element sub-needs to form above is to improve the agricultural productivity and to distribute the effect to the local farmers. Another sub-need is to create opportunities for local people to earn cash income by various ways, even including to encourage seasonal migration.

The second priority need is to up-grade the social service level of the hill area. The level of the services, such as length of the high grade road, drinking water supply situation, and health facilities condition, are relatively low in the hill area compared with Terai area in the Lumbini Zone. Only exception is the educational level, including literacy rate and primary school enrollment rate. It is needed to pay special attention to reduce the people's (especially women and children) hardship of daily lives.

Interlinked with the above needs complicatedly, another felt need exists in the environmental protection, especially in the forest preservation. The agriculture practice and the life of hill area's people are, different from the ones of Terai area, intimately connected with the forestry. This essential resources are deteriorating due to the population increase and according encroachment of the field into the ex-forest area. Thus, not only careful ecological assessment is needed when development actions are planned but also careful development plan should be formulated to prevent ecological system from these kind of degradation.

(2) Encouraging Youth to Stay in the Locality

In order to cope with the hill area problems, it is necessary to see the situation from different angles, i.e. people's internal psychology. Due to the poverty and hardship of the daily life, people, especially young and capable males, have tendency to move out from the local area temporally or even permanently.

This situation itself is not bad from the total national economy's point of view. However, local people would see a different picture. If remaining people become socially weaker segments, such as children, women, and elderly people, local production capacity would become much lower, and dependency rate on the outside economy would be much greater, unless remittances from the outside become huge enough to reverse this vicious circle, which is difficult to expect to occur in a short run.

Thus, there is a strong need to create works (not jobs for income only) which can attract capable young youth and satisfy them locally. This need closely relates to the self-sustained development activities. Participation from the planning stage to implementation, operation and maintenance stage under the local people's responsibility and leadership may provide ideal opportunities for the youth to have work satisfactions. Therefore, it is essential to prepare suitable conditions to promote local participatory development, not only for expecting the results but also attracting the local capable youth on their process.

Seasonal migration, from the above view point, should not always been breamed, firstly because it provides cash income to the locality, which can be mobilized as a capital for the local development activities, secondly because it provides necessary skills as well as knowledge trainings for the youth, which can be utilized for the future development activities. However, permanent migration should be desirably prevented, since it is an absolute loss of local human resources.

3.1.4 Development Needs of the Terai Area

Population pressure in the Terai area has increased explosively since transmigration programs promoted with eradication of malaria. The migrants resettlement and land reclamation caused a rapid disappearance of virgin forest areas and is creating the environmental degradation such as soil erosion, decrease of flood control capacity, etc. as stated preceding chapters. These phenomena are affecting people's daily life mainly as shortage of fuel wood, construction materials of house, safe drinking water, and inconvenience of transportation in rural area. As the result of population pressure, the capacity of food supply of the Terai area to the hill areas has been decreasing rapidly.

As seen in the present condition of agriculture, increase in agricultural production in the Terai area has been mostly depended upon increase of cropped area not upon increase in unit yield which is staying stagnated level. Most of farmers in the area could not get expected high yield of crops and sufficient income for maintaining reasonable daily life.

3.2 Development Potential

3.2.1 Development Potential of the Hill Area

(1) Natural Resources

The most essential natural resource is land in the hill area, which is in small size (about 70 - 80% of national average per household and 40 - 50% of Terai area in Lumbini Zone) and scattered within the area. Productivity of land is below national average in major producing items, such as paddy, maize, wheat, etc. This is mainly due to the topographical features and climatic conditions of the area.

Regarding the improvement possibility of the land productivity of hill area, although potential seems to be large according to the Western standard, it may require quite high cost for irrigation, agricultural input distribution, marketing, etc., due to the fragmented feature of land and the difficulty of goods transportation.

One of the unutilized resources of the area is the forest resources. People are using the forestry in a traditional manner, such as for fodder, fuelwood, and compost collection, besides wild animals, natural fruits etc., which are essential for the rural daily life, yet, it is far away from the systematic use of the forestry.

The climate, which varies from sub-tropical to temperate, provide comfortable living condition, meanwhile various kinds of fruits or other cash crops may be possible to grow, although the amount of produces are not in bulk.

Thus, transportation is the largest bottleneck of hampering the utilization of natural resources in the area.

(2) Human and Social Resources

Despite the relatively poorly endowed natural resources, the area seems to possess rich human and social resources. Firstly, looking at the individuals, local people, both males and females, poses strong and healthy physical bodies, with which they can work in the topographically undulated environment. Not so many people in the world can do in the similar conditions. The famous Gorukha soldier is a good examples of this.

The Gorukha soldier is not only a unique and superb example of the physical quality of the hill area people in Nepal but also a good sample of mental and intellectual capacity. It has proven by British with their long lasting recruitment reliance on the hill area without any intervention in the process of growth of the youth.

Economically, Gorukha soldiers bring in immense amount of cash income as the form of salary remittance and even pension after retirement continuously. Moreover, retired ex-servicemen tend to be valuable community leaders with their overseas experience and acquired knowledge through their service period.

Unexpectedly high interest in the education, seen in the high literacy and school enrollment rates, is a good sign of investment for future human resources.

In contrast with the Terai area, one of the significant social characteristics is the narrowness of the rich and poor disparity. This is partially due to the dispersed population distribution together with the scattered and small land ownership. Although dispersed population creates inefficient service provision, non-existence of prominent urban center within the project area may be considered as a positive potential, such as relatively equal status of the members, thus democratic decision making possibility on the communal and regional issues exists.

Paying attention on the above stated human potentials, some of the signs of the spontaneous development are observable. One of the prosperous examples is coffee cultivation in Ampchole in Gulmi District. It is undoubted that people in the hill area possess innovative potentials, i.e. curiosity to the new things and creativity.

Strong community consciousness is also considered a good potential for the communal base development activities. Various reports show that people's participation in the hill area has been much more active than Terai area. Thus, it is recommended that community and people's voluntary potential should be fully activated.

3.2.2 Development Potential of the Terai Area

Development potential for increase in agricultural production and income is assessed on the bases of land resources, possibility of irrigation development, possibility of increase in unit yield of major crops and increase in cropping intensity by improving cropping patterns, and improvement of livestock production.

Possibility of expansion of agricultural land is very limited in the Terai area, while there exist much possibility to increase the unit yields of most crops cultivated in the area. The possibility of introduction of vegetables and fruits as cash crops which will be sold to the big local markets such as Bhairahwa, Butwal, Kapilvastu, Siddhartanagar, etc. in the area is also confirmed.

Fish culture and livestock improvement is promising measure for promoting agricultural production in the Terai area.

Drinking water supply is one of the most important basic needs of the people in the Terai area for improvement of living environment in connection with sanitation, health care, and also to operate home garden and to keep livestocks. In the Terai area the appropriate safe water supply resource is groundwater, and there is high potentiality for its development by location by location.

3.3 Basic Development Concepts

3.3.1 Development Objectives

Based on the development needs and potentials, the final goal of the Lumbini Integrated Rural Development Project is defined as to create proudable home land by the people's hands through the alleviation of poverty by fulfilling basic needs of the people with achieving the following two objectives:

- An increase in the people's income, and
- Improvement of the people's living standards.

In order to achieve the above objectives, it is defined as an essential objective to strengthen the capacity for plan preparation and project implementation especially at the local(district, village and ward) level.

3.3.2 Development Strategy

In order to achieve the above objectives, following five interrelated areas of strategy have been identified.

(1) promotion of agricultural production,
(2) improvement of living environment,

(3) consolidation of basic infrastructure,

(4) reinforcement of human resources and organizational capacity

(5) maintenance of financial resources.

General attention to be paid in working out the above areas is how to enhance the potential of the local resources. In this connection it is essential to develop the both areas of hill and Terai in geographically integrated manner to secure a mutual complement. For example, the hill area has low potential to obtain self sufficiency in food while the Terai area has surplus of food to be exported at present. The hill area has low capacity of population holding and continuous migration has been accepted by the Terai area. The migration has resulted high population pressure in the Terai area and rapid decreasing in food supplying capacity to the hill area. It is estimated that the food surplus in the Terai area will be faced in danger of extinct in case where present food production level will be maintained without development. For securing the objectives of the Lumbini IRDP, the mutual complementary development in the hill area and the Terai area is essential.

(1) Strategies for Promotion of Agricultural Production

Undoubtedly, promotion of production capacity, i.e. agricultural production, is one of the priority areas of the IRDP. Especially, showing satisfactory results in a short term seems to be essential for encouraging local people to participate in the development activities. Thus, identifying locally suitable cash crops, which can be fostered to the local special products in future, is decisively important. A formation of cash crop study group in the locality may be helpful.

Agricultural production requires various kinds of inputs, such as water, seeds, fertilizer, pesticides, insecticides, animal force, machines and tools, etc. Timely supply system of these inputs has to be well organized. Functions of AIC and the role of Sajha Cooperatives have to be carefully examined and unique distribution and collection system, including the Illaka Centers reinforcement, has to be designed.

Another important aspect of cash crop production is to keep close contact with market and to be well informed the market conditions. Therefore, marketing strategy, including formation of producers organization, sales network, etc. seems to be indispensable.

(2) Strategies for Improvement of Living Environment

Living environment covers various subjects such as water supply and sanitation, health, education, housing, consumer goods supply including daily goods, fuel, cloths, etc. This sector, except consumer goods supply, has a common characteristics of welfare and thus consumption oriented and not economical. As the result of this characteristics, this sector tended to be kept behind, despite high and pressing demands, unless HMG or foreign donors provide special funds for improving them.

However, since national BNP direction stresses the priority of fulfilling this sector's needs, it is a good opportunity to show a strategy to achieve drastic advancement in this sector.

One direction is that along with the BNP guideline, a "community minimum standards', which are specific to the local conditions, can be set. Then, according to the gap between the standards and the actual service levels, each community will be allocated certain amount of fund for improvement, which will match with their own contribution portion.

In order to rationalize the purchase and consumption of the local people, a consumers' cooperative can be organized so far as it doesn't oppress the local private merchants.

(3) Strategies for Consolidation of Basic Infrastructure

Since infrastructure arrangement is usually beyond the capacity of local units, the Central Government are expected to provide both fund and expertise to install them. However, operation and maintenance are expected to be taken cared by the locality except large and important facilities for the nation. Thus, initial close coordination, possibility at the planning stage, between the executing agency and local body who takes care the facility, is indispensable.

The infrastructure items identified to be improved in the project area are as follows:

1) Transportation ..... roads
2) Living condition ..... rural water supply
3) Agricultural Infrastructure..... irrigation

4)	Communication	.....	telephone, radio
5)	Energy	.....	electricity, fuel

(4) Strategies for Reinforcement of Human Resources and Organizational Capacity

At the bottom level of the development field, quality of the local people is decisive on the success of the projects. As seen elsewhere, potential capacity of the people in the project area is quite high. Thus, once an individual shows a successful achievement in a certain area, next theme is how to organize them in such a way that their capacity is positively enhanced. Effectively organizing the ex-servicemen, youth, and especially women for development activities at the grassroots level is the first step of the strategy.

Community level strengthening of planning, implementation, and operation & maintenance capacity, through actual development activities is essential. In doing that, creating a competitive atmosphere among communities may be effective. For instance communities which show better performance should be given further opportunities.

The effects of community level activation is expected to expand to the upper cadres of the administrative system, i.e. Village level, Illaka level, and District level. Meanwhile, District level planning, implementation and management capacity reinforcement actions should be concomitantly taken. At the district level, activation of financial section is particularly important.

It is worthy to reconsider here that one of the objectives of the project is to activate the local society. Local people, especially local capable youth have to be provided work opportunities throughout the process, in other words, recruitment and training opportunities should be open to the local people as much as possible.

(5) Strategies for Maintenance of Financial Resources

There are various kinds of financial resources available for the development activities in the project area. These are broadly classified into two categories, i.e. external financial source and internal financial source. Both sources should be thoroughly examined before the project starts, and optimum mix of those resources should be strategically identified.

The external sources are such as Development Grant from HMG through MPLD, sectorial project/program budget allocation from HMG through line ministries, and foreign aid in the form of either grant-in-aid, loan, or technical assistance. The loan of ADB/N or other banks can be considered as external sources.

Internal sources are tax income, revenues from operation of the projects, and various types of savings originated from internal production increase, remittance from outside, pension, etc.

Continuous and timely availability of finance is a decisive factor of successful implementation of the project. Hence, district headquarters should pay sufficient attention on this aspect and should strengthen the financial personnel to manage this issue.

3.3.3 Development Approach

(1) Approach by Administrative Level

1) Central level

The central government offices, which are coordinated by the MPLD, provide various supports and services to the IRDPs. The main role of the central offices is to arrange the basic infrastructure for smooth implementation of the IRDPs, such as large scale physical infrastructure installation, provision and training of human resources, appropriate financial support, and necessary legislative arrangements.

2) District/Illaka level

The District level is the one which is expected to assume important role in the decentralized development process. However, there are several impeding factors for the progress of District level development. These are summarized in the following four points:

i) Weakness to draw up a realistic future development vision.
ii) Weakness to plan, implement, and manage development activities.
iii) Shortage of local professional experts.
iv) Shortage of local financial resources.

Thus, the first step would be to improve and reinforce the District administrative capacity based on which the District development projects would then be started. In particular, since the Central level offices show intention of delegating to the District the role and the responsibility of operation and maintenance of completed development projects to the District, reinforcement of O & M capacity is urgent.

Meanwhile, the District is expected to act as a technical training center, which provides various training to the lower cadres of the administration system, such as the Illaka, the Village, and the Ward.

The final target here is to have the District reach the stage in which it will be able to form its own mid-term development plan mainly by its own manpower and implement it. The plan should contain loan projects as well as self-financed projects.

The Illaka level services centers will be important logistic centers for connecting the village centers to the District Center and supporting them as satellite branches in absorbing from and disseminating to the villages development ideas, information, resources and outputs.

3) Villages/Ward/People Level

The Village level is considered the lowest rung of the Nepalese Panchayat System. Since the higher level development plans should ideally be formulated based on the Village level development plans, this level has to be strengthened particularly in their project appraisal capacity.

According to the decentralization policy, it is expected that construction, operation and maintenance works of Village level development projects will be delegated to the Village panchayats. Thus, strengthening the Village technical capacity is also needed.

The aim at this level is to reach a stage in which the Villages implement and maintain loan projects or self-financed development projects based on realistically formulated village development plans.

The Ward level, which more or less corresponds to the traditional community level, is important as the traditional unit for various activities, thus has experience and potential capacity for collective activities for the development.

As a means of utilizing their technical capacity as well as awareness and confidence of their potential, providing opportunities for carrying out small community scale projects at the Ward level have proven to be very effective.

Once the Ward level communities are activated, existing soft loan schemes, i.e. Small Farmers Development Project of ADB/N seems to be readily accepted.

The target of this level is to encourage and activate communities to involve in self-propelling upwards development cycles, in other words, slipping out of the static stagnancy and participating in the investment-profit-reinvestment productive mechanism.

4) Project level

Apart from the above three administrative levels, the Project level maintains an independent position for objective monitoring and impact assessment, and provides timely advice and recommendations to each level of the project implementing body as well as higher project management.

This level consists of qualified experts in various areas, and periodically conducts systematic monitoring studies, the results of which will be distributed to concerned groups.

Selection and recommendation for overseas training candidates is one of the responsibilities of this level.

(2) Approach by Stage

Development process by stagewise approach for Lumbini IRDP is formulated as follows:

Stage I Consolidation of development infrastructure provision and training,

Stage II Initiation of the induced development-gradual shifts to autonomous development,

Stage III Realization of self-sustaining development.

The development investment should follow the above mentioned stagewise process and should be focused on the following objectives defined by the development stage and administrative levels as follows:

1) Stage I

a) Central level

- Conduct F/S and implement priority infrastructure projects.
- Examine District level legislative systems and improve the District's financial and manpower conditions.
- Reinforce high level technical staff in the District to assist the District and the lower level cadre's planning and implementation activities.

b) District/Ilaka level

- Install necessary facilities for further project implementation (especially Ilaka centers).
- Consolidate the District level planning and implementation systems, together with strengthening the District level human capacity.
- Train and retain the overseers/technicians manpower.
- Assess and improve the District financial conditions and management.

c) Village/Ward/People level

- Implement confidence building projects at the Ward level.
- Strengthen the capacity of project formulation and project appraisal at the Ward and the Village level respectively.
- Train and retain Village level technicians for operation and maintenance of small projects.
- Identify leading farmers who will receive various inputs through the project and will act as catalysts for the grass roots development.

d) Project level

- Establish a Monitoring and Evaluation system.
- Conduct a base-line survey.
- Select and send trainees overseas.

2) Stage II

a) Central level

- Continue the implementation of priority physical infrastructure projects.
- Provide development grants to the District, gradually changing to subsidies and loans according to the District's financial condition improvement.
- Decrease the number of engineers/experts sent from the Central level in accordance with the numerical increase of locally hired ones.

b) District/Ilaka level

- Implement the District priority projects according to the institutional and administrative arrangement advancements.
- Start centrally subsidized/loan projects partially with locally raised funds.
- Promote the recruitment of local technical staff.
- Advance the improvement of District financial base and management.

c) Village/Ward/People level

- Promote small loan projects (such as SFDP) for more active involvement in productive projects at the community level.
- Initiate small scale Village level subsidized projects partially based on people's contribution.
- Encourage people's financial contributions to development activities as well as operation and maintenance.
- Expand the advanced farmers' influential network together with a continuous effort to raise the leading farmers' standards.

d) Project level

- Continue periodical monitoring, evaluation and impact studies by experts, and reporting/publication.
- Provide local progressive individuals opportunities to obtain new ideas and knowledges through overseas study tours and training.

3) Stage III

a) Central level

- Continue an appropriate level of financial support to the Districts (loan/grant).
- Provide minimum trained manpower from the Centers to the lower cadres of the local administration.

b) District/Ilaka level

- Conduct loan/self-financed development projects as appropriate in principle due to financial improvement.
- Practice planning, implementation, operation and maintenance autonomously through use of their own technical/administrative staff in the Districts.
- Expand widely income-generating activities, and ensure that produced value be re-invested within the District.

c) Village/Ward people level

- Conduct Village/Ward level loan/self-financed projects.
- Retain sufficient technicians at the Villages for operation and maintenance.
- Formulate Village development plans based on reliable/feasible project ideas at the Ward level.

e) Project level

- Continue periodic monitoring and evaluation.
- Conduct a large scale impact survey, which can show the dynamic process of regional socio-economic progress.

Development approach by stagewise and by administrative level is summarized in the following table.

Development Approach (Multi-level Approach)

	STAGE 1 (Consolidation of Development Infrastructure)	STAGE 2 (Initiation of the induced development – gradual shift to autonomous development)	STAGE 3 (Realization of self-sustaining development)
Central level	• Conduct F/S and implement priority infrastructure projects • Examine District level legislative systems and improve the District's financial and manpower conditions • Reinforce high level technical staff in the District to assist the District and the lower level cadre's planning and implementation activities.	• Continue the implementation of priority physical infrastructure projects. • Provide development grants to the District, gradually changing to subsidies and loans according to the District's financial condition improvement. • Decrease the number of engineers/experts sent from the Central level in accordance with the numerical increase of locally hired ones.	• Continue an appropriate level of financial support to the Districts (loan/grant). • Provide minimum trained manpower form the Centre to the lower cadres of the local administration.
District/Ilaka level	• Install necessary facilities for further project implementation (especially Ilaka centres). • Consolidate the District level planning and implementation systems, together with strengthening the District level human capacity. • Train and retain the overseers/technicians manpower. • Assess and improve the District financial conditions and management.	• Implement the District priority projects according to the institutional and administrative arrangement advancement. • Start centrally subsidized/loan projects partially with locally raised funds. • Promote the recruitment of local technical staff. • Advance the improvement of District financial base and management.	• Conduct loan/self-financed development projects as appropriate in principle due to financial improvement. • Practice planning, implementation, operation and maintenance autonomously through use of their ow technical/administrative staff in the District. • Expand widely income-generating activities, and ensure that produced value be reinvested within the District.
Village/Ward/ People level	• Implement confidence building projects at the Ward level. • Strengthen the capacity of project formulation and project appraisal at the Ward and the village level respectively. • Train and retain Village level technicians for operation and maintenance of small projects. • Identify leading farmers who will receive various inputs through the project and will act as catalysts for the grass roots development.	• Promote small loan projects (such as SFDP) for more active involvement in productive projects at the community level. • Initiate small scale Village level subsidized projects partially based on people's contribution. • Encourage people's financial contributions to development activities as well as operation and maintenance. • Expand the advanced farmers' influential network together with a continuous effort to raise the leading farmers' standards.	• Conduct Village/Ward level loan/self-financed projects • Retain sufficient technicians at the villages for operation and maintenance. • Formulate Village development plans based on reliable/feasible project ideas at the ward level.
Project level	• Establish a Monitoring and Evaluations system • Conduct a base-line survey. • Select and send trainees overseas	• Continue periodical monitoring, evaluation and impact studies by experts, and reporting/publication. • Provide local progressive individuals opportunities to obtain new ideas and knowledges through overseas study tours and trainings.	• Continue the periodical monitoring and evaluation. • Conduct a large scale impact survey, which can show the dynamic process of regional socio-economic progress.

CHAPTER 4 MASTER PLAN AND SECTORAL DEVELOPMENT PROGRAMS

4.1 The Master Plan

4.1.1 Conceptual Picture of the Master Plan

There are four main aspects of the Master Plan which are mutually interlinked to form the integrated Master Plan. Those are:

1) Production promotion,
2) Improvement of living conditions,
3) Infrastructure consolidation, and
4) Institutional reinforcement.

The interlinkage of these four aspects is shown in Fig. 4.1.1. The production promotion requires support by infrastructure and institutions. In a similar manner, living conditions have a connection with both infrastructure and institutions. Hence, if the production and the living conditions are considered to be the two major priority areas to be targeted, they must be supported by infrastructure and institutional development.

The two major priority areas represent two important development concepts, economic growth and welfare, whereas the two supportive areas represent traditional and contemporary aid subjects, namely foundations and sustainability. Therefore, the Master Plan picture unexpectedly contains four essentials of development in a integrated manner.

Within this structure, Lumbini IRDP will take up limited numbers of elements, which are shown in Fig. 4.1.1 with a circle on the right corner of the element label. It can be understood by the selection of elements that present Lumbini IRDP puts stress on the production (agriculture) area and relating infrastructure and institutions.

4.1.2 Master Plan Components and Their Structural Relationship

Fig. 4.1.2 shows the components of Master Plan and their structural relationships. Each of four large headings contains several projects/program components as shown below.

1) Promotion of agricultural production
2) Improvement of living environment
3) Consolidation of infrastructure
4) Reinforcement of plan implementation capacity

The planning period of the Lumbini IRDP is for 15 years starting from 1990/91, including three consecutive 5-year plans. As indicated in the previous chapter, this Master Plan does not show any concrete numerical target to accomplish at the final year nor in the intervening years. Instead, it sets three development stages for the indicative pictures to reach. However, the timing when it can be reached is kept blank since it will depends on various surrounding factors, which planners and local people cannot control.

Instead the Master Plan suggests establishment of an independent monitoring to evaluation team at the project level, and carefully examine the progress and impact of the project, in order to provide timely information to the decision making body.

4.1.3 Means of Implementation

Fig. 4.1.3 shows the system of the financial flow of the development expenditure. There are three types of development means according to the origin of the project funds namely central level projects, district level projects and loan projects.

(1) Central Level Projects

Central level projects will receive budget allocations from each line ministry, according to the subject, and are managed by the concerned line ministry project offices. These projects tend to be large in scale and provide effects to a large area.

Relatively large scale projects for basic infrastructure of Lumbini IRDP correspond to this category. These projects will be identified by effort of concerned staff, and be implemented by line ministries as national projects, thus local people will be beneficiaries of the projects.

Since HMG line ministries have long experience in pursuing this type of project, project implementation is not a serious problem. What is needed here is to try not to isolate these projects from other components of IRDP and integrate them so that synchronizing effects can be enjoyed at maximum scale.

(2) District Level Projects

District level projects, which will be relatively small in scale, will receive budget allocation both from line ministries and MPLD. These projects will be subject to the approval of the district assembly. Regarding the sector relating projects, actual project formulation will be handled by the line ministry officials at the district level. Meanwhile, development grants, which are managed by the LDO, are not year marked to any specific sector, thus can be utilized by the priority projects in the district.

Living environmental condition improvement projects of Lumbini IRDP mostly correspond to this category. These projects are supposed to be initially formulated by local people. However, because of the weakness of local technical capacity, line ministry officials are expected to help local people who need search help. Thus, instead of reinforcing the line ministries capacity which has limitations, it may be more feasible to bring found local people through practice and training. In doing so, ward level project execution committee formation should be encouraged. Community leader identification is also important.

Opportunities should be given equally to all communities, then according to evaluation of the first trial, the communities which showed the best achievement should be rewarded by being given further new opportunities. This, reward system should be included as part of the implementation system.

(3) Loan Projects

The third category loan projects have been mainly practiced by ADBN in the form of agricultural loans or Small Farmers Development Program (SFDP) loans, and they seems to reach the bottom of rural society quite successfully. Part of the women's development projects will receive financial support from commercial banks as community development and women training projects.

Productive activity promotion projects of Lumbini IRDP will be covered by this means. Since productive projects produce benefits a revolving system can be created based on this. It is desirable that local people who started the district level grant project can be successfully shifted to being loan borrowers.

Thus, close monitoring of project implementors and information exchange among different level project promoters will be useful in preparing for the expected upward shift of the local people's development activities.

4.2 Agricultural Production Promotion Program

4.2.1 General

Agriculture has been recognized as the only source of income and employment of the majority of the people in the project area . Poverty is most rampant in the agricultural sector. Hence, to raise the standard of living of the majority of the poor people, it is imperative that the agricultural sector be developed and advanced. The agricutural sector, as the development strategy, has been given a pivotal role in the economic development in the country.

The main objectives of the agricultural development strategy have been identified in the Seventh Plan as follows:

- to increase sustained food production to meet the food requirements of the growing population and to improve the consumption level,
- to maintain production increase in vegetables, fruits, fish, meat and milk products,
- to increase income and employment opportunities through increasing production of exportable items and import substitution products, and
- to increase self-reliance of agro-based industries through increased production of raw materials.

Taking into consideration the agricultural development policy mentioned above and the development potentials of the project area, development projects are proposed as follows:

(1) Needs for Promotion of Agricultural Production

Income of farmers in the project area is lower than US$160 which corresponds to the national average per capita GDP. Average gross income of farmer is estimated at NRs.2,500 (US$ 89) in the hill area and NRs.2,730 (US$97) in the Terai area. Most of these incomes are generated from agricultural production. In order to raise the present low living standard, agricultural production must be increased.

More than 90 % of farmers in the hill area have less than 1.0 ha of farm land. They have to buy food as they cannot grow enough to feed themselves. It is necessary to increase cash income of small farmers to raise the living standards.

A food balance study for the target year has been carried out using projected population and food production potential. (Refer to Annex A)

The result of study shows that in the hill area, food self sufficiency will be a little difficult (self sufficiency rate 96%) even in the case with the low population growth rate and maximized irrigation is development. In the Terai area, there are no shortage of food in any cases.

However, for the total of the both area, hill and Terai, the short supply of food will appear only the case with high population growth rate and no irrigation development.

In order to overcome the above situation, it is necessary to promote increase of case crop production as well as increase of food production in the hill area.

For the Terai area, build up of their position which functioned as food supply zone of the project area is required.

(2) Potential and Approach for Development

There are various problems to be cleared in the promotion for agricultural production. However, the project area has potentials as summarized below.

- The abundant labour force can sustain intensive farming.
- The topographic and climatic conditions will permit introduction of various crops into the suitable areas, such as fruits, coffee, vegetables, spicy crops and seed multiplication.
- The abundant livestock resources can be made more productives improvement raising conditions.
- Fish culture in the Terai area and apiculture in the hill area can be developed by further utilization of natural resources.

The agricultural development plans have been prepared to develop these potentials to sure the preventing conditions.

In the project area there is no reclaimable land and attention must be given to environmental conservation. It is necessary therefore that increasing agricultural production and raising farm income shall be done through a combination of the following means.

- Increase in cropping intensity,
- Increase unit yield,
- Introduction and expansion of cash crops,
- Increase livestock productivity and improvement of livestock raising condition,
- Promotion of fish culture and apiculture,
- Conservation of the environment, and
- Strengthening of extension services.

(3) Reconciliation of Development and Environmental Conservation

In the project area, as in the other area of Nepal environmental degradation is a serious problem. The most conspicuous aspects of this in the area are deforestation, soil erosion (sometimes landslides) and extensive flooding downstream.

There is cause-and-effect relationship between human activities and environmental degradation. As discussed in preceding chapter, present land use has expanded into marginal land for cropping already, and there are fears of accelerated soil erosion which will take place in near future.

In order to meet the above situation, the following measures would be adopted in this master plan.

(a) The proposed land use plan includes no new land reclamation project, and promotion of agriculture production will be achieved through increase of productivity of the existing cropped land.

(b) The following farming practices will be introduced into the proposed farming:

- Terracing of sloping upland field in the hill area:
  As a countermeasure against soil erosion terracing and leveling of steeply sloping upland fields are necessary.
- Introduction of fodder trees and fencing on pasture land:
  For the purpose of soil conservation and supply of fodder for livestock, introduction of fodder trees will be promoted. Fodder trees will produce not only the fodder for livestock but also fuel wood for the farmers. Further by fencing pasture land with improving grasses, livestock will be kept from strolling and attacking forest reserves.

- Introduction of temperate fruit trees such as chestnut and walnut to sloping land at high altitude and covering the land surface with vegetation.

4.2.2 Land Use Plan

As mentioned previously, there should be no new farmland development. The countermeasures are proposed for land, forest and farmland conservation.

4.2.3 Proposed Cropping Pattern

The proposed cropping pattern as illustrated in Fig. 4.2.1 has been formulated taking into consideration the future irrigated area, present cropping patterns and climatic conditions. The cropped area of each crop is estimated follows:

(unit: ha)

Crops	Hill area			Terai area		
	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total
Paddy	7,160	1,740	8,900	46,010	40,390	86,400
Wheat	6,360	1,740	8,100	11,500	34,500	46,000
Maize	5,560	34,000	39,560	11,500	3,300	14,800
Millet	-	5,000	5,000	-	-	-
Pulses	-	6,000	6,000	-	23,500	23,500
Oilseed	-	6,000	6,000	-	15,800	15,800
Sugarcane	-	-	-	-	4,500	4,500
Orchard/1	-	3,200	3,200	-	3,100	3,100
Others/2	900	-	900	600	-	600
Total	19,980	57,680	77,660	69,610	125,090	194,700
Cultivated area	6,660	38,940	45,600	46,210	51,290	97,500
Cropping intensity(%)			170			200

/1 : Hill area : coffee, citrus, chestnut, walnut, etc.
Terai area : mango, banana, etc.
/2 : Vegetables, spicy crops

4.2.4 Promotion of Food Crop Production

(1) Objectives of the Plan

The objectives are to produce the food which meets the increasing population, to raise the self sufficiency in food in the hill area, and to establish the foundations in the Terai area as the food supply zone.

(2) Procedure for Production Increase

(a) To stir up farmers' will to increase production of food and to introduce the advanced farming practices.

(b) To construct the production infrastructure required such as irrigation facilities.

(c) To strengthen the guidance to farmers in improved farming techniques through the extension services.

(d) To supply the farm inputs necessary for farming.

(a), (c) and (d) will be carried out for promotion for production. (a) and (c) will be conducted by ADOs of respective districts as the agricultural extension services. (d) will be conducted by AIC as the supply plan of farming input in cooperation with the extension services.

(1) Strengthening of Extension services

The present agricultural extension services will be strengthened by the following;

(a) Establishment of Demonstration Farms

The demonstration farms will be established to promote integrated agriculture including improved varieties, advanced farming practice, irrigation farming, livestock, forestry and environmental conservation. Integrated farming will then expand into the area from the nucleus of demonstration farms.

Demonstration farms will be established on the farmers' own farms. The farms will be utilized as practical farming places. In order to demonstrate crop

cultivation and farming adaptable for actual locations, the farms will be established by each for respective wards as a rule. Technical guidance will be provided by JTs and JTAs of Ilaka service centers, and PLLAs of respective village Panchayats.

(b) Arrangement of Ilaka Service Centers

Ilaka service center buildings will be arranged with a training hall and staff quarters, machinery and equipment such as vehicle, audio visual aids, farm machinery for farmers training, soil test kit, etc.

(c) Training for Staff and Farmers

(2) Supply of Inputs

Seeds, fertilizers, agro-chemicals, small scale agricultural machinery such as sprayers, irrigation pumps will be supplied.

(3) Plan of production

On the basis of the cropping plan, agricultural extension, and input supply, the following unit yields and production will be realized:

Anticipated Unit Yield in 2005

(unit : ton/ha)

Crops	Anticipated yield	
	Irrigated	Rainfed
Paddy	4.0	2.5
Wheat	2.5	2.0
Maize	2.5	2.0
Millet	-	1.0
Pulses	-	0.9
Mustard	-	0.9
Sugarcane	-	40.0

Production of Food Crops

(unit : ton)

Crop	Hill area	Terai area	Total
Paddy	32,990	285,020	318,010
Wheat	19,380	97,750	117,130
Maize	81,900	35,350	117,250
Millet	5,000	-	5,000
Pulses	5,400	21,150	26,550

4.2.5 Development Plan for Cash Crops

(1) Objectives of Development

The objectives are to increase the production of cash crops in order to increase cash incomes of farmers in the project area. The increase of farm income should be promoted by the development of cash crops, because farmers especially in the hill areas have to purchase part of their daily food. Also as for small-scale farmers in the Terai, they have to increase the productivity per ha by introducing cash crops for raising farm income. In both the hill and the Terai areas, there is plenty of surplus labour. In view of the available labour it is possible to promote intensive agricultural development, and employment opportunities of farmers.

(2) Procedure for Development

Two kinds of crops are considered. There are crops which are traditionally cultivated and which will become more productive by introduction of improved varieties, improved cultivation methods and increasing cropped area. There are also new crops which are suitable for introducing into the project area. The kinds of crops to be introduced are fruits such as mandarin orange, pear, persimmon, mango, banana, etc., nuts such as chestnut and walnut, and coffee, oil seeds, sugarcane, vegetables etc.

Suitable Altitude Range for Orchard Crops

Crops		Altitude range
Banana, Pineapple, Papaya	:	Below 1,000 m
Lemon(eureka), Guava, Mango	:	below 1,100 m
Coffee	:	600 - 1,200 m
Mandarin orange, Sweet orange, Graps	:	800 - 1,800 m
Lime(kagji), Persemmon	:	1,000 - 1,500 m
Pear, Peach, Plum, Lemon(galgal)	:	1,000 - 1,800 m
Chestnut Walnut	:	800 - 1,800 m
Lemon(galgal)	:	1,000 - 1,800 m
Apple	:	1,800 - 2,800 m

The necessary inputs will have to be supplied in parallel with the increase of cropped area and the guidance in cultivation methods by establishing demonstration farms at appropriate site as a chain of agricultural extension services under control of ADOs of the districts concerned.

(3) Production

According to the plan, the production of cash crops in the target year is estimated as follows:

Production of Cash Crops

(unit : ha , ton)

Crops	Hill area		Terai area		Total	
	Area	Production	Area	Production	Area	Production
Mustard	6,000	5,400	15,800	14,220	21,800	19,620
Sugarcane	-	-	4,500	180,000	4,500	180,000
Coffee	1,200	2,520	-	-	1,200	2,520
Citrus	900	4,500	-	-	900	4,500
Chest nut /Walnut	200	1,000	-	-	200	1,000
Pear/Peach /Persimmon	400	2,000	-	-	400	2,000
Other temperate fruits	300	1,500	-	-	300	
Tropical fruits	200	-	3,100	-	3,300	-
Vegetables/spacy crops	900	-	600	-	1,500	-
Total	10,100		24,000		34,100	

4.2.6 Livestock Development Plan

(1) Objectives of the Plan

The objectives are to raise farmers' income and improve their nutritional condition by improving the feed supply and livestock health, and to contribute to environmental conservation by the control of grazing and the promotion of fodder trees.

(2) Procedure for Development

Without increasing the number of livestock, the productivity will be raised by the following:

(a) Improvement of Feed Condition

Planting of fodder trees, production of pasture in improved grass land and distribution of improved seeds, effective utilization of agricultural by-products such as by adding urea to rice straw, and prohibition of excess grazing will be effective.

(b) Improvement of Livestock Health

Livestock health services such as medical examination of livestock, vaccination, etc. will be conducted by strengthening the various livestock service centers of Ilaka including buildings, machinery and equipment, and staff. In these service centers technical guidance for livestock rearing will be conducted.

(c) Improvement of Strains

In order to promote strain improvement of cattle, buffaloes, artificial impregnation services will be carried out. A semen center where frozen semen can be supplied, and an artificial insemination center attached to the livestock service center will be established.

4.2.7 Fish Culture Development Plan

(1) Objectives of the Plan

The objectives will be to raise farmers' income by utilizing ponds which are widely distributed in the Terai, and to improve their nutritional condition by supplying protein.

(2) Procedure for Development

Fry supplying farmers and fish breeding farmers will be increased. Technical guidance will be extended by Bhairahawa fishery development center, through agricultural development offices of respective districts and Ilaka service centers.

4.2.8 Apiculture Development Plan

(1) Objectives of Development

The objectives will be to raise farmers' cash incomes as in part-time work by promoting beekeeping which is conducted in small scale by farmers in the hill area.

(2) Procedure for Development

Honey production and productivity will be raised by the following:

(a) Supply of beehives,

(b) Strengthening of technical guidance for farmers, and

(c) Training of extension workers and farmers.

4.2.9 Production Cost and Benefit

Production cost and benefit of major crops are estimated as below:

Production Cost and Net Profit per Ha

(Unit: NRs.)

Crops	Area	Condition	Gross Return	Production Cost	Net Profit
Paddy	hill	irrigated	22,800	8,310	14,490
	hill	rainfed	14,250	7,770	6,480
	Terai	irrigated	20,600	6,980	13,620
	Terai	rainfed	12,880	7,250	5,630
Wheat	hill	irrigated	19,500	7,470	12,030
	hill	rainfed	15,600	6,910	8,690
	Terai	irrigated	17,720	5,580	12,140
	Terai	rainfed	14,180	5,310	8,870
Maize	hill	irrigated	15,250	6,330	8,920
	hill	rainfed	12,200	5,650	6,550
	Terai	irrigated	13,750	5,810	7,940
	Terai	rainfed	11,000	5,190	5,810
Onion	hill	irrigated	189,000	12,800	176,200
	hill	rainfed	126,000	11,800	114,200
Tomato	Terai	irrigated	194,400	14,490	179,910
	Terai	rainfed	129,600	13,510	116,090
Coffee	hill	irrigated	42,570	15,730	26,840
	hill	rainfed	29,700	13,940	15,760
Citrus	hill	irrigated	135,000	20,050	114,950
	hill	rainfed	90,000	17,390	72,610

4.2.10 Farmers' Economy

In case of with project, the total farm income of the average farmer is estimated as below. The total farm income exceeds NRs. 35,100 in both the hill areas and the Terai, and the average per capita gross income is estimated at US$180.

According to the comparison the above figures with the present one mentioned in 2.4.8, the figures show an increase of about two times. Even farmers in the hill areas, if the prospective off-income is similar to one gained in the present stage, can obtain almost same income as could be obtained in the Terai.

Household Gross Income

	Hill		Terai	
	NRs.	(%)	NRs.	(%)
Agriculture	31,100	(89)	35,300	(99)
Cereal crops	14,500	(41)	23,300	(65)
Cash crops	10,500	(30)	10,000	(28)
Livestock	6,100	(18)	2,000	(6)
Non-farm/1	4,000	(11)	300	(1)
Wages	200	(0)	300	(1)
Remittance	3,800	(11)	-	
Total	35,100	(100)	35,600	(100)

/1 : Figure is assumed same income at present.
Note : Cultivated area : Hill 0.72 ha, Terai 1.12 ha
Family size : Hill 7.0 persons, Terai 7.0 persons

4.3 Irrigation Development Plan

4.3.1 Development Potential

As mentioned in the previous sections, in the area of IRDP, (a) the development of new water resources is limited, (b) the existing irrigation systems and facilities have not functioned well due to breakage and deterioration, (c) water utilization is not yet systematically organized due to lack of water control facilities. Therefore, the potential for irrigation development in the IRDP exists in re-development of the major rivers, streams and rivulets, in rehabilitation and upgrading of the existing irrigation systems and facilities including protection works of floods and land sliding. Development of large rivers such as the Kali Gandaki, the Ridi Khola and Rapti have to be assessed by further studies. There is less potential for new development for groundwater for irrigation based on the results of field investigation and data collection mentioned in the Annex B Hydrogeology.

According to the investigations carried out so far, the existing paddy area and the farm land under irrigation in the four objective districts are as tabulated below:

	Paddy Area/1 (ha)	Farm Land Under Irrigation (ha)	(%)	Balance (Rainfed) (ha)	(%)
Gulmi	4,030	1,840	46	2,190	54
Arghakhanchi	4,090	2,260	55	1,830	45
Kapilvastu	74,890	25,320	34	49,570	66
Rupandehi	76,090	31,540	41	44,550	59
Total	159,100	60,960	38	98,140	62

/1 : The Land Resources Mapping Project (LRMP) in 1986

Based on the result of field survey, the above figures may be interpreted as follows:

1) Rainfed culture is prevailing in the existing paddy areas;

2) Paddy areas have been developed on most of the lowlands along the rivers and streams in the hill districts and occupy almost all of the farm lands in the Terai districts;

3) It is hardly possible to further extend paddy areas in both Hill and Terai districts because;

   a) the lowlands along the rivers and streams in the hill districts have already been developed to the maximum extent as paddy areas, and

   b) almost all of lowlands in the Terai districts have been developed as paddy areas and there are no room for further expansion of the paddy areas.

However, it seems that there is considerable potential for expansion of irrigable land in the existing paddy areas in both hill and Terai districts. The potential could be developed in following possible ways:

a) Construction of dams and barrages in the hill area, to irrigate paddy areas, particularly in the Terai districts;

b) Construction of ponds particularly in the Terai districts, to store rain and flood water in the monsoon season;

c) Rehabilitation of existing irrigation systems and facilities together with construction of flood protection dikes and river training, for mitigating flood damage to and for enlarging the paddy areas;

d) Effective and rational use of existing irrigation systems and facilities by saving water losses, constructing protection works and introducing improved water management and operation and maintenance techniques;

e) Further development of surface water resources particularly in the hill districts by constructing intakes in the mountain streams and introducing sprinkler irrigation; and

f) Use of handy type diesel-powered centrifugal pumps, to pump up water from rivers and streams particularly in the dry season.

The tentative potential of irrigation development in the existing paddy areas is assessed as follows. This estimation is based on the existing project list obtained through DOI. The total area expected to be irrigated excludes the areas to be implemented at the each district level because of unavailability of precise project lists.

(Unit: ha)

		Gulmi	Argha-khanchi	Kapil-vatsu	Rupan-dehi/1	Total
Existing Paddy Area (A)		4,030	4,090	74,890	76,090	159,100
Irrigated Paddy Area						
Existing (B)		1,840	2,260	25,320	31,540	60,960
	(%)	(46)	(55)	(31)	(37)	(35)
Rehabilitated (C)		680	770	8,529	18,960	28,930
	(%)	(17)	(19)	(11)	(22)	(17)
D = B + C		2,520	3,030	33,840	50,500	89,890
	(%)	(63)	(74)	(42)	(60)	(52)
Newly Developed (E)		430	680	20,230	9810	31,150
	(%)	(11)	(17)	(25)	(12)	(18)
Total (F = D + E)		2,950	3,710	54,070	60,310	121,040
	(%)	(73)	(99)	(67)	(71)	(70)

/1 : The figures of Rupandehi includes all area of Ruphandehi, out of this figure, the area of Marchawar Lift Irrigation Project is 5,770 ha.

4.3.2 Master Plan for Irrigation Development

The following projects have been tentatively selected for the Master Plan Study for the year of 2005, taking into account the circumstances previously mentioned and a realistic

capacity to absorb into consideration. The projects are classified into (1) Central level projects and (2) District level projects according to magnitude, etc. Some projects in the following list may be substituted in future by others according to the result of further studies and change of circumstances.

(1) Central Level

The central level projects will consist of construction of diversion weirs and intakes, irrigation canals, and related structures. All necessary works for implementation such as field survey and design, construction works will be made under the Department of Irrigation. The total irrigation area will be about 8,890 ha so about 600 ha has to be implemented every year in the coming 15 years. Considering that the amount of funds required is quite large, some foreign aid will be indispensable for smooth implementation. The locations of the projects selected are shown in Fig. 4.3.1.

In the hill districts, sprinkler irrigation is proposed for effective use of water. The required material such as discharge pipe, riser pipe, sprinkler, etc. can be supplied to the farmers and then construction works will be done by the farmers.

1) Kapilvastu District

Name of Project	Panchayat	Command Area (ha)
a. Rajkudwa I.P.	Mahendrakot	2,400
b. Bel Nadi I.P.	Maharajgung	400
c. Khanchaniya Bandh I.P.	Lalpur	160
d. Phulika I.P.	Phulika	1,500
e. Patana I.P.	Patana	540
f. Jakjira Bandh I.P.	Patthardoiya	700
g. Charanga I.P.	Guganli	320
Total		6,020

2) Gulmi District

Name of Project	Panchayat	Command Area (ha)
a. Ghamir Khola I.P.	Marbhung	250
b. Khadga Kot I.P.	Marbhung	110
c. Paudi Areba I.P.	Paudi Amarai	110
d. Chaldi Khola	Arje	100
e. Purti Ghat	Purtighat & Foxing	90
f. Sireseni	Sireseni	140
g. Lahata	Wangla	40
h. Sprinkler irrigation		300
Total		1,140

3) Arghakhanchi District

Name of Project	Panchayat	Command Area (ha)
a. Rindi Wangla I.P.	Wangla	70
b. Chauwatar I.P.	Thulo Pokhara	70
c. Mil Mile Khola I.P.	Wangla	220
d. Pipalta Nerbi I.P.	Kerunga	100
e. Rajvang Khola I.P.	Jukena & Thada	110
f. Durga Khola I.P.	Maidan	400
g. Khanchi Khola I.P.	Marpani	160
h. Sprinkler irrigation		600
Total		1,730

(2) District Level Project

There are many minor irrigation schemes including rehabilitation of facilities, tubewell irrigation, pond irrigation, etc. proposed by District Panchayat Assembly and/or village panchayats. However, all the schemes mentioned above are yet to be formulated and identified in detail in terms of location, command area, necessary facilities, etc. Taking the capacity of absorb into consideration, one third of the proposed schemes are tentatively selected for the IRDP. The command area is estimated on the assumption of 100 ha for one scheme in the Terai plain and 20 ha for one in the Hill area. The Marchawar Lift Irrigation Project is being above by DOI. This project covers the most of the project area in the Marchawar area of Rupandehi district. So no district level project is proposed in this Master plan. The necessary work for implementation such as identification of the location, field survey and design, and construction work will be conducted by the district panchayat office.

People's participation will take care of a large part of these works particularly the construction work. However, the necessary materials for civil works such as cement and reinforcing steel, etc. and pumps if necessary, will be supplied by the local Government. The total irrigation area will be about 9,880 ha.

Name of District	Nos. of Scheme Proposed		Nos. of Scheme Selected	Command Area (ha)
Kapilvastu	282		90	9,000
Gulmi	114	Irrigation	30	600
	8	River training	2	
Arghakhanchi	43	Irrigation	14	280
	4	River training	1	
Total				9,880

(3) Total Irrigation Area

After implementation of the Master Plan, the irrigation area in each district will be estimated as follows:

(Unit: ha)

Name of District	Existing	Increase	Total
Kapilvastu	25,320	15,020	40,340
Rupandehi (Marchawar)	100	5,770*	5,870
Gulmi	1,840	1,110	2,950
Arghakhanchi	2,260	1,450	3,710
Total	29,520	23,350	52,870

*: Marchawar Lift Irrigation Project

4.3.3 Priority Projects for Pre-Feasibility Study

The selected projects in the above section 4.3.2 are classified into several groups taking capital cost required, location, etc. into consideration. Then priority of the projects are examined based on the following standards.

(a) Economic viability is reasonably expected.

(b) A technical study has been carried out thoroughly and a concrete idea of the project has been proposed in terms of location, magnitude and technical soundness, etc.

(c) Early implementation of the project is desired.

(d) Existing water rights would not be affected by implementation of the project.

(e) Adjustment and unification of water rights, which may take a long time, is not required for the implementation of the project.

The projects were examined by applying the criteria mentioned in the above paragraph as shown in Table 4.3.1.

In the Table, a capital cost of each project is estimated based on the conditions described in chapter 5. The benefit of each project was estimated based on the conditions mentioned in section 4.2. Then the net present value of the cost and benefit is calculated at a discount rate of 10%. The economic viability of each project is examined by Benefit minus Cost, Benefit by Cost and Internal Rate of Return. Households benefited by each project were estimated by applying average farm size estimated in section 2.3.5. Concreteness and problem of water right of the project were judged by the survey team based upon the information, data and report supplied by the HMG/N.

As a result, the following project was selected as the priority project.

- Rajkudwa Irrigation, and Gorshinghiya and Rajpur Ponds Projects : 2,400 ha

The detailed information and principal features of the projects are described in the following section 8.3.

4.4 Development Plan for Rural Roads

4.4.1 Plan of the Development

In view of need to meet the basic needs of the villagers, and to promote agricultural development, and in view of the present position of the project area, priority of the roads will be given in the following order:

1) To areas where the road improvement ratio is low.
2) To roads which will benefit a much population and wide a area.
3) To basic roads. namely:

1) Feeder roads linking each district with a highway.
2) District roads linking districts and the headquarters with major villages.
3) Rural roads connecting major villages and villages to farmlands.

Consequently early execution of the following projects is required.

List of Road Projects

District	Road	Distance	Development Degree
Hill Area			
Gulmi	Tamghas-Tansen	75 km	Improvement
	Wamitaksar-Ridibazar	64 km	Improvement
	Tamghas-aglung	42 km	Improvement
	Rural roads connecting the above-said feeder roads, district roads and major villages	20 km	Improvement
Arghakhanchi	M.R.M-Sandhikarka	69 km	Improvement
	Sandhikarka-Tamghas	45 km	Improvement
	Sandhikarka-Pyuthan	30 km	Improvement
	Rural roads connecting the above-said feeder roads, district roads and major villages	20 km	Improvement
Terai Area			
Kapilvastu	Taulihawa-Jitpur	24 km	Improvement
	Taulihawa-Lumbini	16 km	Improvement
	Taulihawa-Bahadurganj	22 km	Improvement
Total		427 km	

4.4.2 Priority of the Development

The existing roads are inadequate both in distance and in quality, and it is considered that the present condition of the road is one of the main obstruct to implementing other development projects. Development of road network mentioned in Section 4.4.1 "Plan of the Development" proposes the medium/long term rural road development plan.

(1) Category of the First Priority

In the higher priority development, Roads in the hill area which are not perennially accessible should be improved, first of all, under the year-round accessible conditions. In

this meaning, development of two roads of "Tamghas-Tansen Road" and "MRM-Sandhikarka Road" should be taken up as urgent development projects.

(2) Category of the Second Priority

The above-said is a grade-up development for year-round accessibility, therefore the road ratio will not be changed. The ratio of the roads in the hill area remains inferior both to the national average and that of the Terai area. From the viewpoint, the following development should be taken up secondly.

1) Wamitaksar - Ridi Bazar Road

This is located in the hill area, and the development effect is considered rather high.

2) Tamghas - Sandhikarka Road

This is an important road connecting the two headquarters which are administrative and economic centers in Gulmi and Arghakhanchi Districts though the direct benefited area and the benefited cultivated area are not so wide, and the benefited population is not so much; and it is considered that the demonstration effect is remarkable. With the formation of circulation road of "(Siddarta Highway) - (Tansen) - (Tamghas) - (Sandhikarka) - (East-West Highway)", an additional connecting route will be ensured in the hill area at the time of disaster in the monsoon seasons.

(3) Category of the Third Priority

Roads which do not belong to the categories of the first and second priorities correspond to the category of the third priority.

(4) Consideration and Pre-Feasibility Study

Comments on priority of development presented by MPLD and DOR are same as above.

Judging from data collected, as for MRM-Sandhikarka road the early implementation is expected because the feasibility study was completed.

In this project the pre-feasibility study on Tamghas-Tansen Road and MRM-Sandhikarka Road will be conducted.

4.4.3 Selection of the District Level Projects

It is also necessary to construct or improve terminal roads to transport materials for daily life such as food, clothes, kerosene, medicine etc., as well as agricultural equipment and products. The works for the terminal roads will include casting road surface, construction of suspension bridges, and provision of small-scale drainages and slope protection works etc.

4.5 Development Plan for Water Supply Systems

4.5.1 Target

The target of the master plan for the water supply will be planned at 80% of the water supply coverage by the year 2005.

4.5.2 General Planning

(1) Water Sources

As well as the current situation, water sources in the future will be small streams and springs in the hill area and groundwater in the Terai area.

(2) Water Quality

Water quality is to be complied with the Drinking Water Standards of WHO in principle. Water to be proposed by the project, however, will not necessarily meet the above standards, but will be of good quality locally available.

(3) Population to be Served and Water Demand

In the frame of the master plan study, water supply systems, either new or existing, will be planned or expanded in order to accommodate the water demand in year 2005, which will increase according to population increase.

Regarding per capita consumption, the followings will be employed based on the guideline of DWSS.

- For public taps : 45 liter/day
- For private taps : 65 liter/day

In addition to the above domestic use, water for livestock (20-30 liter per head), for schools (10 liter per pupil), for a health post (2,500 liter each), and for buildings of offices and tea houses (500 liter each) will be counted. Furthermore, loss of wastage and system leakage will be added by about 20% of total demand.

4.5.3 System of Water Supply

The water supply systems for the near future in the project area will be summarized as follows, by classification of gravity flow and groundwater pumping-up.

Water Supply Systems for the Master Plan

Area	Hill Area	Terai Area
District	Gulmi and Arghakhanchi	Kapilvastu
Water source	Small streams and springs	Deep groundwater
Intake facility	Intake chamber	Deep well and pump
Supply system	Gravity flow (Power not needed)	Pumping up (power required)
Population served	Several hundreds to several thousands	Several thousands to to ten thousands
Transmission	Long pipeline	Short pipelines pressurized
Storage	Ground-level reservoir	Overhead tank
Distribution	Pipelines	Pipelines
Service	Public taps and private taps	Public taps and private taps

4.5.4 Master Plan

The master plan for water supply in, the target year of which is 2005, is summarized in the following table.

Summary of Master Plan for Water Supply

District	Gulmi	Arghakhanchi	Kapilvastu	Total
Present Status (Year: 1988/1989)				
(1) Number of villages	79	41	79	199
(2) Total population	267,900	177,000	379,800	824,700
(3) Served population	94,800	62,300	34,900	192,000
(4) Rate of coverage (%)	35.4	35.2	9.2	23.3
(5) Quantity (m^3/day)	5,690	3,740	2,090	11,520
(6) Water source	Spring and stream	Spring and stream	Deep groundwater	
Master Plan (Year: 2005)				
(7) Total population	284,100	207,700	438,000	929,800
(8) Rate of coverage (%)	80	80	80	80
(9) Population to be served	27,300	166,200	350,400	743,900
(10) Quantity (m^3/day)	17,050	12,470	26,280	55,800
(11) Additional population to be served	132,500	103,000	315,500	551,900
(12) Additional development quantity (m^3/day)	11,360	8,730	24,190	44,280
(13) New facilities	Piped public system	Piped public system	Piped public system	
(14) Water source	Spring and stream	Spring and stream	Deep groundwater	
(15) Intake facility	Chamber	Chamber	Deep well	
(16) Water transmission	Gravity flow	Gravity flow	By pumping	
(17) Reservoir	Ground-level tank	Ground-level tank	Overhead tank	
(18) Distribution	Pipelines	Pipelines	Pipelines	
(19) Water taps	Public and private	Public and private	Public and private	
20. Cost for development	Rs. 186 mil.	Rs. 125 mil.	Rs. 284 mil.	Rs. 595 mil.
21. Per capita cost	Rs. 1,400	Rs. 1,200	Rs. 900	Rs. 1,080

Note: (4) = (3)/(2), (5) = (3) x 60 liter/day, (9) = (7) x (8), (10) = (9) x 75 liter/day, (11) = (9) - (3), (12) = (10) - (5), (20) = (11) x (21)

Its outline is as follows:

1) Development and extension of water supply systems in villages in the project area should be promoted, targeting 80% of a rate of the coverage.

2) The water sources will be small streams and springs in the hill area, and groundwater in the Terai area.

3) The total present population in the three districts is 824,700. Of these, 192,000 people (23.3%) have already been supplied. By the year 2005, the total population will be 929,800 and 80% (743,900) will have been supplied.

4) Accordingly, the additional population to be supplied by the year 2005 will be 551,900. This will be about three times the present served population.

5) The water quantity to be newly developed will be about 44,000 m^3/day.

6) The project cost to achieve the above targets will be Rs. 595 millions, that is Rs. 1,080 per capita.

4.5.5 Implementation Schedule

The water supply systems planned in the above are to be constructed or expanded year by year until the year 2005 with constant annual budgets to be distributed to all districts in the project area.

4.6 Development Plan for Agricultural Marketing and Processing

4.6.1 General

According to the agricultural development plan, the future requirement in the target year of 2005 is estimated at 26,500 tons of fertilizers and 3,300 tons of certified seed of food grains in the project area.

Agricultural production will be increased to 139,270 tons of food grains and 5,400 tons of pulses in the hill area, and 418,120 tons of food grains and 21,150 tons of pulses in the Terai area. However there will be a deficit of food in the hill area, and a marketable surplus of food in the Terai area. Cash crops will be introduced and expanded in both the Terai and hill areas.

The development plan is accordingly formulated in terms of the following components;

1) agricultural input supply,
2) marketing system of agricultural products, and
3) processing of agricultural products.

4.6.2 Master Plan for Marketing and Processing Aspects

(1) Agricultural Input Supply

The input supply system is divided into three categories in terms of the marketing flow as follows :

1) Agricultural Input Corporation (AIC);
2) Retailers (cooperatives and individual dealers);
3) Farmers;

In each category, the following development will be necessary to secure the input supply to farmers level:

1) The allocation of Inputs for the Project area by AIC

The following amount of certified seed is estimated to be required by the improvement of farming practices in the project area;

(Unit : Tons)

Area	Paddy/1	Wheat/2	Maize/1	Millet/1	Total
Hill area	90	160	400	50	700
Terai area	860	920	150	-	1,930
Total	950	1,080	550	50	2,630

/1 : Requirement of certified seed is estimated at 20% of total requirement of seed.
/2 : Requirement of certified seed is estimated at 40% of total requirement of seed.

2) Facilities of AIC in the Hill Area

The proposed locations and capacity of facilities are listed as follows;

No. of Location	Facilities	Capacity
3	Office building and quarter Storages for fertilizer x 3 Storages for seed x 2	 300 tons x 3 50 tons x 2

/1 : The existing facilities will be renovated in Tamghas and Sandhikharkha.

3) Establishment and Improvement of Cooperatives at the District Level

The proposed number of cooperatives to be established and improvements of facilities are as follows;

Area	Existing	To be established	Total	Facilities/1
Hill	10	8	18	Office, shop and storage (100 tons)
Terai/2	24	-	24	Office, shop and storage (200 tons)

/1 : The facilities will be 1 set of office, shop and storage.
/2 : Rupandehi district includes only Marchawar area.

4) Establishment of Facilities for Input Supply in the District Panchayat

Small storage facilities will be provided on rental base at the main marketing points by the district panchayats. The proposed number of cooperative establishments and improvement of local facilities are as follows;

District	Number of locations	Facilities (Capacity)
Gulmi	9	Storages (100 tons x 9)
Arghakhanchi	9	Storages (100 tons x 9)

(2) Marketing System of Agricultural Products

1) Establishment of a Public Wholesale Market in the Central Level

The central part of the Terai area in the project area is not covered by any such facility. Since Gorusinge located on the East-West Highway is the center of the central part of the Terai area, it is necessary to establish a public wholesale market at Gorusinge to market products of this area. The main commodities on the wholesale market will be food grains, vegetables, fruit and fish. Proposed facilities will consist of multipurpose shade areas, cold storages, unloading yard, packing and loading yards, office building and utilities such as water supply. The area of the wholesale market is estimated as 20,000 m^2 (100 m x 200 m).

2) Reinforcement of Function of NFC in the Hill Area

Proposed sites and facilities of NFC in the hill area are as follows;

Location	Facilities in Each Location	Capacity
3	Office building and quarters Storages for fertilizer x 3	300 tons x 3

/1 : The existing facilities will be renovated in Tamghas and Sandhikharkha.

3) Improvement and Reinforcement of Haat Bazaars in District and Village Level

Proposed facilities consists of permanent shaded areas, cemented floors, water supply, small warehouses and office buildings. The estimated area of one Haat Bazar is about 2,500 m^2 (50 m x 50 m). At least one Haat Bazar should be established in one village in each Panchayat. The number of Hart Bazaars to be established is as follows;

Area	Number of locations
Hill	112
Terai/1	102
Total	214

/1 : Rupandehi district includes only Marchawar area.

4) Formation of Producers' Groups and Associations

By organizing individual farmers as producers' groups or associations like cooperatives and establishing small marketing points, farmers will get more profit and information on market for selling their products to wholesale markets timely and directly. The following producers' groups or associations are proposed in the project area;

Crops	Hill	Terai	Total
Vegetables	2	2	4
Citrus	2	-	2
Honey	2	-	2
Coffee	2	-	2
Fruits	2	2	4
Fish	-	2	2

5) Establishment of Small Marketing Groups

To market small amount of products from the home gardens such as eggs, vegetables, etc, it is necessary to establish small marketing groups. The proposed number of model small marketing groups are listed as follows;

Area	Number of Groups
Hill area	2
Terai area	2

6) It will be necessary to establish marketing points along the main roads for smooth collection, grading and packing of products, and depending upon the improvement of road and transportation, increasing the number of marketing points in the future as well. These marketing points should be equipped with temporary storage space.

Area	Number
Hill area	10
Terai area	6

(3) Processing of Agricultural Products

1) Increasing the Processing Capacity of Cereal Processing in the Hill Area

In the hill areas, there are still exists many areas where milling cereals and expelling oil is done manually. To reduce this time consuming work, it will be necessary to introduce small scale mills and expellers driven by water turbines or diesel engines in small production spots through the organization of farmers groups.

2) Introduction of Simple Processing Facilities in the Hill Area

Simple processing machines such as pulpers will be effective in reducing transportation costs and increasing value of cash crops at farmers level. For example, although farmers sell dried coffee cherries at present, farmers can sell

pulped coffee beans at a higher price and transportation costs will be reduced by pulping the coffee cherries.

Along with promotion of cash crops, introduction of small scale processing and preserving facilities at farmers' level will be essential to increasing farmers income. The envisaged facilities are pulpers for coffee, juice or jam plants for citrus, refiners for honey, etc. These facilities will be operated both by individual farmers and users associations.

(4) Training of Staff and Improvement of Financial Capacity

Each component will include training of staff and improvement of financial capacities. Training includes aspects on technical matters, management, accounting, etc. Financial capacities will be improved in terms of working capital , etc.

4.7 Living Environment Improvement Program

The living environment in the project area is generally poor mainly due to lack of appropriate education and limited availability of infrastructure such as domestic water supply, rural roads, etc. One of the basic needs of the people, domestic water supply, is recognized as essential for improving the living environment not only for supplying safe drinking water but also for improvement of sanitation which considerably influences the people's health. Concerning the water supply and rural road development, some projects were identified and included in the master plan as stated in preceding sections.

The identified main components for social and living environment improvement other than those described above are as follows:

1)	Living environment	:	Sanitation and sewerage, houses and other living related facilities
2)	Education services	:	Construction of school building, promotion of adult education classes, etc.
3)	Health services	:	Construction of health posts, improvement of health service activities at the level of health post, promotion of family planning

4) Women's development: : Promote women's participation for the improvements of the living environments. Women undertake the most important role of house keeping and daily home life in connection with food, child care, health care, etc.

Most of the above projects are small in scale and relatively simple in necessary technology, therefore, unless the scale and the cost far exceeds the local capacity, such as building a large hospital or school, most of the projects can be implemented at the lower levels of the district system, such as Village level or even community (Ward) level.

Here, the capacity of the local community becomes important, since most of those projects will require a certain amount of community participation at the Ward or Village level. Moreover, the operation and maintenance of these projects is expected to be managed solely at community level according to the new regulations.

Looking the situation from a different angle, this is a good opportunity for the communities to improve their living conditions, at the same time, to expand their plan/implementation capacity through on-the-job training.

Thus, not only for living environment improvement purposes but also to increase the capability of local communities, providing them with projects for confidence building is to be recommended. There are about 1,800 wards in the project area, each of which should have the opportunity to initiate and conduct its own living environment improvement project, at the early stage in the IRDP.

The expected program cost will be as follows:

Rs. 20,000/ward/year (1 project) x 1,800 = Rs. 36 million/year

As a confidence building project period, three years will be needed before each community has acquired sufficient know-how in planning, implementation, operation & management system establishment. The whole process will be carefully monitored and evaluated by the project team, and rewards will be given, in the form of the next opportunity, to improve their communities.

4.8 The Strengthening of Plan Implementation Capacity

4.8.1 Clarification and Standardization of the Plan Implementation Process

(1) Clarification of the PlanningProcess

1) Re-assessment of the planning process

There is a standard planning procedure based on the Decentralization Act; however, each District needs to reassess this procedure carefully and to formulate a procedure appropriate to the District's unique conditions.

Districts covered by the Lumbini IRDP in particular which have different conditions, such as the availability of donor funding, should follow a different planning process.

2) Clarification of roles at each administrative level

Four levels, i.e. Central level, District/Illaka level, Village/Ward level, and Project (Donor) level, are involved in the planning process with complex inter-linkage. Thus, a clear definition and demarcation of each level's role must be provided initially, although the role may change during the development process .

(2) Standardization of the District Development Planning Process

At the District level, standardization and manual preparation on the planning process, is needed for constructive development management, which provides a common means for development planning among the concerned responsible persons.

The following are the areas which require standardization and manual preparation.

1) Long-term vision, mid-term plan (5 year plan) formulation.

2) Development project preparation, feasibility study, design, project finance arrangement, and appraisal.

3) Project implementation, operation and management, maintenance, monitoring and evaluation.

4) Administrative procedures, such as budgeting, accounting, auditing.

5) Ilaka, Village, Ward level administration and development project management procedures.

(3) Need for establishing a Planning Unit

In order to manage the above stated District level and lower level planning and implementation practices, a District Planning Unit, which is responsible for managing and coordinating the various existing line agencies and guiding them towards the agreed future District image, is needed.

This Unit should be directed by the LDO and be assisted by the Planning Officer, and should develop procedures in order to formulate future development plans for the District, taking into consideration financial, manpower, and natural resources availability, with the help of prepared standard manuals.

4.8.2 Human Resources Development

(1) Maintaining Appropriate Numbers and Composition of Local Public Officers/staff

1) Size of the local public officers/staff

The required numbers of officers/staff (especially technical) are in short supply in many sectors at the District level. Considering that various new development activities will be created by the Lumbini IRDP and are expected to be executed by the District and the lower level administrative system, it is imperative to expand the numbers of the officers/staff as well as upgrade their quality.
Required numbers of officers/staff should be estimated by each sector's development plan. How to recruit, train and retain these personnel will have to be examined together with the existing financial conditions.

2) Composition of the public officers/staff

At present, a majority of the officers/staff are centrally appointed, and this situation creates two major drawbacks.

Firstly, the numbers cannot be increased flexibly according to the District level manpower demand due to nationwide budgetary constraints and complicated administrative procedures.

Secondly, they are transferred quite frequently, usually every 2-3 years in the case of officers, thus knowledge and experience which are valuable for advancing further development of the District, are not accumulated within the District but are transferred with the officers/staff.

An examination of the appropriate composition of centrally appointed staff and locally hired staff is needed. Under the present constraints of hiring new staff by both the Districts and the Projects, one of the few means of overcoming this situation may be a gradual replacement of centrally assigned staff by locally hired staff without changing the payment source.

3) Planning Unit staff

A Planning Unit, which is suggested to be established under the District Panchayat, consists of the LDO and a Planning Officer as core staff. There should be at least a couple of additional technical staff (preferably an architect or civil engineer and a economist or sociologist), who can conduct extensive surveys and basic data collection for planning.

Each Ilaka should have a branch office of the unit, and at least one staff member should keep in close contact with 5-7 Villages within its coverage through Village Panchayat Secretaries, in order to monitor conditions and changes which are then reflected in future planning.

The Planning Unit staff should be gradually replaced by local employees, although initial staff may have to be largely provided by the Central level.

(2) Training

Training is one of the key project components, especially at the early stages of the IRDP, since it will determine the future success of the project, particularly of its sustainability.

There are two types of training needed with respect to the human resources requirement, (a) Planning/Administration training for planning, programming, budgeting, management, monitoring and evaluation. (b) Engineering and Technology training for project identification, design, implementation, operation and maintenance.

Meanwhile, there are four main methods of training; (a) Overseas training provided by foreign donors or International Organizations. (b) Outside-the-region training provided by the Central level government. (c) Within-the-region training provided by the District or lower level agencies with possible assistance by the Project and/or sectoral offices. (d) General information dissemination to the local people.

1) Planning/administration training

(a) Participants

- Central level: MPLD officers in Kathmandu, Pokhara Regional Directors, PPRTC (Pokhara Panchayat Regional Training Center) Staff
- District level: District Chairman, LDO, Planning Officer, Planning Unit staff, all the main sector officers, control officer, treasury officer, Plan Formulation Committee members, Class representatives
- Ilaka level: Planning Unit Illaka staff, sector officers in the Illaka Center
- Village level:Pradan Pancha, Upa Pradhan Pancha, Village Panchayat Secretary
- Ward level:Ward Chairman, progressive farmers

(b) Means

- Overseas training
- Outside region training
- District/Illaka level training

2) Engineering/Technology training

(a) Participants

- District level: District sector officers/staff
- Illaka level: Illaka sector officers/staff
- Village level: Village O & M staff

- Ward level: Ward O & M staff, users committee members

(b) Means

- Outside region training
- District/Illaka level training
- Village/Ward level training

3) Popularization/Dissemination of project information

Firstly, it is important to let people know the existence of the Lumbini IRDP. The second stage is to have them become interested in the activities of the IRDP. Then, the third stage is convince them of the IRDP's direct benefit and advantages to the people. A careful management of public relations and full utilization of media for a communication campaign are essential to make people supportive of the IRDP in the long run.

Thus, the project needs a group of staff, which consists of both central and local staff, to conduct communication activities in the project area effectively. Usable medias for communication are as follows:

- Pamphlets, Notice boards, Photographs, School explanatory meetings, Field demonstrations and sample distribution, Exhibitions, Movies/slides/videos (travelling show), Radio (national, local/community broadcasting) and T.V. broadcasting

4) Training/communication materials production

In order to make the above training/communication activities effective, appropriate material preparation is imperative. A small production group which consists of Project level staff and local staff together with necessary equipments is needed.

4.8.3 Financial Strengthening (Local Resource Mobilization)

(1) Need for Making an Assessment of the District Financial Management

Presently, District finance is largely dependent on grants provided by the Central Government. This is far from local autonomy in terms of their financial situation. If the spirit

of the Decentralization Policy is to be realized at the District level, some measures have to be taken to improve the District's resource mobilization, together with the promotion of actual development projects/programs.

There could be two ways in which the District financial situation can be improved by the Districts efforts, i.e. (1) tax increase or at least improvement of the present tax collection system, and (2) starting District businesses. Probably, both measures have to be taken in order to see a significant improvement in the short run.

It is strongly advised that the District Panchayat start with an assessment of their financial management at an early stage of the IRDP, similar to the exercise carried out with supportive of UNDP/World Bank under the MSTP project.

(2) Development Project/Program Finance

The main purpose of the above stated financial assessment is to identify methods/procedures enabling the District to secure their own financial resources to promote their local development in the long run. "Supporting District development by the District's own power" is the basic principle of the Decentralization Policy.

However, in reality, the District power, particularly its financial power is weak mainly because of its weak economic base. Nevertheless, this can be said partly because of the lack of proper support to encourage and enhance the local potential, and the District has remained under heavy dependence on the Central grants particularly in their development activities.

Thus, development grants to the District will be needed initially, but in a manner that the grant (including foreign donors grant) leads to an increase in the District's financial income. As a result, the grant should gradually be shifted to act more as subsidies, and accordingly matching funds should be raised by the District.

At a later stage, it is expected that District level development should be financed mainly by either its own funds or through loans which would be provided by the government banks, commercial banks and even International banks. The Agricultural Development Bank of Nepal (ADB/N) activities (especially in their SFDP) show a good potential existing even at the bottom level of the rural areas for efficient utilization of loans.

(3) Reinforcement of Personnel Finance

In the previous section, the importance of retaining well trained manpower at the District level has been stressed in order to promote the expected level of development activities. The present situation of heavy manpower dependence on the Central level does not help, in the long run, to create a self-propelling development system at the District level, which is the main thrust of the Decentralization Policy.

However, it is not easy to create a system in which to accumulate the needed human resources at the District level, mainly because of financial constraints. Since the donor can provide training but not provide personnel salary and allowances according to a recent regulation (this is reasonable from the sustainability point of view), presently the only possible financial source which can be used retaining trained manpower at the District level is the Central Government grant.

It is therefore suggested that the recruitment and promotion system of the staff presently assigned to the District level by the Central Government be altered. Local recruitment should be encouraged for posts which it is desired should be managed by the District. The replacement of existing centrally controlled posts by locally recruited, and thus long term personnel who will not be transferred may be a significant positive impact to District level development.

In order to reinforce the District level trained manpower, a substantial increase in Central grants in both training and retaining personnel is essential, especially at the early stages of the IRDP. Training can be financed by donor funding, but the costs of retaining trained manpower has to be supported by the Central level until the District can support its own required manpower costs.

CHAPTER 5 COST ESTIMATE

5.1 Basic Conditions

(1) Mode of Construction

Considering the scale of each project, the construction works will be executed on the local competitive bidding. The construction machinery and equipment required for the construction will be provided by the contractors themselves.

(2) Price Level, Currency and Exchange Rate

The price level of cost estimate is assumed as of the middle of 1989. The exchange rate between US$ and NRs. is assumed at current official rate in October.

US$ 1.00 = 28.00 NRs. = Yen 141.00

(3) Price Escalation

The price escalation factor is assumed at 12% for local currency and 3.5% for foreign currency by referencing the those applied in the recent irrigation project, road project such as the East Rapti Irrigation Project, Narayani Zone Irrigation Project, etc.

Year	Escalation in %	
	Local	Foreign
1986	10.0	12.0
1987	12.0	3.0
1988	12.0	1.0
1989	12.0	1.0
1990	12.0	1.0
After 1991	12.0	3.5

(4) Physical Contingency

The physical contingency shall be assumed at 10% of the sum of direct and indirect construction cost.

(5) Tax

The construction machineries, equipment and materials to be imported from abroad are to be exempted from the tax.

(6) Unit Price

The unit prices of major work item are estimated synthetically on the basis of the prices obtained from the recent irrigation project, road project and water supply project in Nepal and the prevailing prices of similar works in Nepal. The price escalation factors are considered for adjusting the prices to 1989 level prices.

(7) Construction Method

The construction works will be carried by mainly manpower except some heavy works such as sheet piling, excavation under submerged condition, road excavation, etc.

5.2 Project Cost of the Master Plan

The cost for the Master Plan was estimated based on the above mentioned conditions and the quantities estimated by the preliminary design.The cost estimated herein are the construction cost, operation and maintenance cost, recurrent cost for such as training, input/material supply ,and cost for confidence building programs, etc.

(1) Construction Cost

The total construction cost of the Master Plan is estimated as follows:

(Unit: million NRs)

	Irrigation	Rural Road	Rural Water Supply	Agriculture	Marketing and Processing	Total
Construction cost	1,529	1,440	595	218	306	4,088
Price escalation	1,533	1,517	576	270	717	4,613
Total	3,062	2,957	1,171	488	1,023	8,701

The construction cost of each component is shown in Table 5.2.1 for irrigation, Table 5.2.2 for Rural road, Table 5.2.3 for Rural water supply, Table 5.2.4 for Agriculture. The annual disbursement schedule of each component is shown in Tables 5.2.5 to 5.2.8.

(2) Operation and Maintenance Cost

The annual operation and maintenance cost in year of 2005 when full development stage of the Lumbini IRDP, includes the salaries of technical and administrative staff; repair and maintenance costs for O&M equipment; fuel cost for O&M equipment, electric charge for tubewell pump operation; repair and maintenance for tubewell pumps; labour and material cost for repair and maintenance of project facilities. In irrigation, most of the O&M cost will be borne by the farmers. The annual operation and maintenance cost for each component is estimated as follows:

	(million NRs. per year)
Irrigation	
- Central level project (8,890 ha)	5.4
- District level project (9,880 ha)	1.5
Rural road (427 km)	4.9
Rural water supply (551,000 population)	31.7
Agricultural production promotion (143,000 ha)	10.9

(3) Recurrent Cost for Agricultural Production Promotion

The recurrent costs are mainly for agricultural production promotion, and include the training cost for staff, farmers, training in th foreign country, etc.; cost for supply of equipment (sprayers and pumps) and input (fertilizers and certified seed). The recurrent cost is estimated as follows:

	(million NRs. per year)
Training of staff,farmers	7.3
Supply of equipment and input	25.5
Total	32.8

(4) Cost for Initial Operation of the Marketing and Input Supply Organizations

Cost for initial operation of the marketing and input supply organizations is required as a type of revolving. The fund required is estimated as follows:

	(million NRs. per year)
Initial operation fund	30.9

(5) Cost for Improvement of Living Environment

Improvement of living standard consists of 1) confidential building program and 2) living environment program in the ward level. These costs are estimated as follows:

	(million NRs. per year)
1) Confidence building program (the first three years)	36.0
2) Living environment program	36.0

5.3 Project Cost of the Priority Projects

The cost of the priority projects at the pre-feasibility study level are estimated as follows:

(million NRs.)

(1)	Irrigation	
	1) Rajkudwa, and Gorshinghiya and Rajipur Ponds Irrigation Projects (2,400 ha)	281.4
(2)	Rural Road	
	1) Tamghas - Tansen (75 km)	237.0
	2) MRM - Sandhikarkha (69 km)	288.2
(3)	Rural Water Supply	47.5
(4)	Agricultural Production Promotion	
	1) Strengthening of Agricultural Extension Service	134.4
	2) Livestock Development	78.1

Detail of the above costs are shown in Table 5.3.1 to 5.3.4.

CHAPTER 6 PROJECT EVALUATION

The objective of this chapter is try to integrate sectors from the view point of project evaluation. In the previous chapter, the projects identified in each sector are given priorities according to the sector criteria. However, it is necessary here that evaluation and priority decision has to be done across the sectors, from the integrated regional planning view points. In order to achieve this, the following two steps are taken:

(1) Evaluation in each sector,
(2) Integrated cross-sector evaluation.

6.1 Evaluation in Each Sector

6.1.1 Project Identification

First step is identifying projects to be accomplished within the IRDP project period, which has been basically done in the sectoral basis. Here, some of the previously identified projects are combined into one unit, to suit the evaluation purposes, and corresponding costs figures are attached. There are 40 projects identified altogether, of which 15 projects are in the irrigation sector, whereas 11, 6, and 7 projects are in the road, water supply and agriculture sector respectively. One project is identified from the living environment improvement sector.

Because of the difficulties of sub-dividing the agricultural sector projects due to the inter-connection of various elements, large units, such as agricultural production, livestock development, etc., had to be taken as evaluation project units in this sector. Actually, the agricultural sector was divided into two, i.e. "Agricultural Production (H): Hill" and "Agricultural Production (T): Terai", while other sectors, such as "Livestock Development", "Fisheries Development", etc. are treated as separate evaluation units. However, for the purpose of long term direction making, the level of preciseness seems to be enough.

6.1.2 Selection of Evaluation Criteria

Different from the micro project evaluation, a multi-sector integrated project, which contains various sectors projects interlinked complicatedly, has to take into account not only tangible benefits of the projects but also various aspects of the project impacts. The

study team tentatively selected the following 9 criteria, each of which are given 5 points if full mark is given, according to the direct impacts, objective related impacts, and indirect impacts.

(1) Direct impacts
  1) Unit cost
  2) Local people's burden

(2) Objective related impacts
  3) Production increase contribution
  4) Living standard raising contribution

(3) Indirect impacts
  5) Environmental protection effects
  6) Increase of the movement of goods and people
  7) Prevention of population migration effects
  8) Promotion of people's participation

(4) Others
  9) Readiness to start

6.1.3 Provision of Evaluation Scores

Experts filled in the evaluation table with scores corresponding to each project. (See Table 6.1.1) These scores are comparable among projects within a sector, but inter sectoral comparison is not valid until appropriate adjustment is done. Total score of a project show the effectiveness of the project, i.e.. the higher the score is, the effectiveness is larger. Thus, within a sector, a priority order, besides the economic project evaluation results shown by IRR, etc., will be given by the order of the total score.

6.2 Integrated Evaluation

6.2.1 Provision of Integrated Weights

(1) Sector Adjustment

In order to integrate the different sectors evaluation, certain kinds of sector adjustment is needed. This step makes the inter-sectoral comparison possible by providing

the adjustment score matrix. The scores are obtained by the team members' discussion, consisting of sector experts and an evaluation expert. (See Table 6.2.1.)

(2) Evaluation Criteria Weighting

A special attention is given to the certain aspects of the project, such as stress on the production increase, encouragement of people's participation, etc. Thus, evaluation criteria relating these aspects have to be given heavier weights.

Table 6.2.2 shows the weight distribution among the evaluation criteria. Actual weights are obtained by multiplying (1) matrix and (2) figures. (See Table 6.2.3)

(3) Additional Criteria for Integrated Evaluation

Four additional evaluation criteria has been chosen, from the integrated project point of view. These are:

1) Urgency
2) Benefit for weaker people
3) Future development potential
4) Total impact

These evaluation criteria are chosen in order to stress the total objectives of this IRDP and the role of the development, i.e.. answering the urgent and the most seriously suffering people's needs, as well as providing long lasting impacts in the project area.

Here, sectors are sub-divided into two, except drinking water, large-scale and small-scale. Score matrix is given in Table 6.2.4.

(4) Integrated Weight

The ultimate integrated weight scores are given by multiplying (2) and (3) scores. These are finally seen as a set of percentage numbers according to the 7 sub-sectors. (See Table 6.2.5.) The "Living Environment Improvement" project weight is taken from the average score, since precise contents of the project is not known yet due to its grass roots and people's initiative characteristics.

6.2.2 Preparation of Integrated Project List

(1) Calculation of Integrated Evaluation Scores (IES)

By multiplying the scores given in 6.1.3 (Table 6.1.1) and the corresponding integrated weight given in 6.2.1 (4) (Table 6.2.5), a set of weighted total scores is obtained. (See Table 6.2.6.)

(2) Integrated Priority Projects List

Sorting out this score table in the decedent order provides the priority projects list containing various sectors. (See Table 6.2.7.) 40 projects identified by the Lumbini IRDP Master Plan are distributed between the highest score of 18.8 and the lowest score of 9.0. The highest score project is considered, in this project evaluation, as the high priority project, but this doesn't mean that higher score projects have to be implemented earlier. This table shows merely impact size of each projects, thus, provides a decision making material for decision makers.

6.2.3 Selection of Priority Projects

One of the common constraints of the plan and project implementation is budget. Table 6.2.8 shows the priority projects together with the corresponding project costs. It may be useful to do an excise under assumptions that budget is only the main constraint and projects implementation decision is taken based only the priority project list as presented above.

However, various other factors, such as technology availability, human capacity (including administration capacity), political considerations, etc., affect the priority projects selection. Hence, the study team can provide only the technical data and the actual selection function of the implementation projects should be left in the hands of local decision mechanism.

CHAPTER 7 PROJECT IMPLEMENTATION PROGRAM

7.1 Project Implementation Schedule

7.1.1 Integrated Project Implementation Schedule

Project implementation schedule is necessary to be formulated as to secure full impact and multi-effects of expected benefits by integrating the projects implementation. As stated in paragraph 3.3.3, it is essential that the projects proposed in the master plan should be implemented under the adequate agencies (administrative level) and at the best stage of timing depend on nature, scale and kind of the projects. Since plan implementation capacity of the district and the lower levels will be still insufficient to carry out the project implementation at the initial stage of the Lumbini IRDP, the relatively large scale and prerequisite infrastructure construction projects will be implemented by the central level agencies what have enough experience and capacity for plan implementation.

On the other hand, for the district and the lower levels, i.e. Ilakas, villages and wards, it will be indispensable at the initial stage to make efforts to implement some adequate scale and nature of projects especially to secure reinforcement of plan implementation capacity and promoting peoples' participation in the rural development through training and recruit of technical and administrative staff.

As described in the preceding chapter, the project implementation schedule will be subjected to change and adjustment depend on the results of monitoring and evaluation on the projects, and progress of the plan implementation capacity reinforcement of the district and the lower levels. Then the presently proposed project implementation schedule herein is prepared only for the initial stage of the Lumbini IRDP for the different administrative levels(agencies).

The proposed project implementation schedule shown in Table 7.1.1 is formulated under the above conditions and with referring to the individual project implementation schedule which prepared by each sector concerned.

7.1.2 Irrigation

(1) Central Level Project

The project will be implemented every five-year in consonance with the periodical development plan as shown in Fig. 7.1.1. The implementation schedule of the priority project is shown in Fig. 7.1.2. The Department of Irrigation in Ministry of Water Resources may have an important role on the project formulation, preparation of necessary data for foreign agency, project design and implementation.

The sprinkler irrigation will be implemented 20 ha in Gulmi and 40 ha in Arghakhanchi districts every year. The major materials for sprinkler irrigation such as pipe, sprinkler, valve, etc. will be supplied by the Government as subsidy to the farmers. Civil works such as water intake and settling basin, farm ponds, pipe line will be constructed by local tender or farmers themselves.

7.1.3 Rural Road

The implementation schedule of rural road development is shown in Fig. 7.1.3. The village road improvement will be conducted in Gulmi and Arghakhanchi districts at a rate of 1.5 km every year. The implementation schedule of priority project is shown in Figs. 7.1.4 and 7.1.5.

7.1.4 Rural Water Supply

The planned water supply systems will be constructed or expanded every year continuously till year 2005 with constant annual budgets to be distributed to all districts in the project area, as shown in Table 7.1.6.

7.1.5 Promotion of Agricultural Production

The projects for promotion of agricultural production in the plan will be commenced from the first year and continued for the project period. Further, the construction of facilities such as the office buildings and demonstration farms, will be executed in early stage.

Projects of the marketing and processing development will be implemented in connection with such conditions as improvement of the roads, commencement of the

agricultural production promotion projects or increase in demand for marketing and processing of agricultural inputs and production so as to expect multi effects of the project benefits.

7.2 Project Implementation Organization

The Lumbini Integrated Rural Development Project (IRDP) has no plan to establish its own separate organization for project implementation. The project works will be carried out through existing administrative structures in line with the rules and regulations of the Decentralization Act and its by laws, and through the existing project implementation system described in paragraph 4.1.3.

This means that implementation of sectoral projects of the IRDP will be carried out by central line agencies and district panchayats in accordance with scale and nature of projects and the regulations in force in Nepal.

In order to hold the integrated approach of the implementation, coordination between the line agencies concerned as well as concerning districts are very important, and the coordination work would be undertaken by NPC/IRDB through the MPLD. Since the Lumbini IRDP area covers four districts of the Lumbini Zone, a project coordinator would be provided by MPLD to the regional development directorate in order to manage coordinating work for implementation of district level projects through the LDO of each district.

i) to play liaison role between the project and the central agencies,

ii) to monitor and evaluate project activities,

iii) to provide inputs to the districts for the effective implementation of the projects,

iv) to disseminate project information and,

v) to render coordinating services as an extended arm of IRD Board.

The Decentralization Act gives authority and power for the rural development to district, but capability for planning and implementation at the district level is very low at present. In order to overcome the above and expect sustainable development in the IRDP,

strengthening of plan implementation capacity at the district level through recruiting and training of staff will be strongly required.

Under the above conditions, the proposed plan implementation organization is formulated and shown in Table 7.2.1. As seen in the table, as the key staff, 1-adviser is requested for the central level(in MPLD, Kathmandu), and 1-project level management adviser for Development Region level (at Pokhara, Western Region Development Directorate), and 1-taskforce team for each district (Marchawar area will be covered by the taskforce team assigned to Kapilvastu district), each team will be composed of 3-experts and 6- associate experts.

CHAPTER 8 PRE-FEASIBILITY STUDY ON THE PRIORITY PROJECTS

8.1 General

Identification of priority projects for development in the project area was carried out taking into consideration such development components as follows:

i) Promotion of agricultural production,
ii) Irrigation system,
iii) Rural roads,
iv) Rural water supply,
v) Reinforcement of plan implementation capacity.

The priority projects were identified based on the following criteria:

i) The priority projects should be self-contained, i.e., not dependent upon additional project(s).

ii) The projects should have symbolic value and also have a considerable impact i.e., multiplier effects on rural development.

iii) The projects should benefit in general the people in general as much as possible.

iv) The priority projects should be development support infrastructure projects, which are essential for succeeding projects.

v) The priority projects should be for strengthening the project implementation system especially at the local level.

vi) The National Development Plan and development budget of HMG/N, and implementation capacity of agencies involved in the project should be considered.

vii) The priority projects should be feasible from the technical and budgetary point of view.

8.2 Promotion for Agricultural Production

8.2.1 Priority Projects

In order to promote agricultural production, strengthening of agricultural extension and livestock development have been selected as priority projects.

(1) Strengthening of Agricultural Extension

On the food crop production, it sis essential to increase land productivity. Most of farmers depend upon traditional farming practices, therefore they have not adequate opportunity to can learn advanced farming practices and utilize high yielding varieties. It is necessary to introduced practices and superior varieties through strengthening extension services. In order to develop cash crops, systematic agricultural extension services are required.

The agricultural extension is strengthened through following measures:

- Construction of the district agricultural development offices and Ilaka service centers with training facilities,
- Installment of vehicles, equipment for training, soil test kits, etc.,
- To improve ability and increase number of extension workers, training and recruit of required staff will be promoted,
- Training in Ilaka service centers for farmers,
- Establishment of demonstration farms by farmers themselves in order to demonstrate improved varieties, cash crops, advanced farming practices and integrated farming system including aspects of environmental conservation and livestock raising,
- Establishment of seeds and saplings production farms by farmers themselves, and
- Supply of agricultural inputs such as fertilizers, agro-chemicals, tools, etc.

(2) Livestock Development

Although number of livestock such as cattle, buffaloes, etc. is plentiful, the productivity is very low due to the shortage of feed, poor animal health and local strains, and livestock sector is one of the factors of environmental deterioration. In this sense, the livestock productivity is raised by following measures:

- Construction of the district livestock offices, Ilaka service centers for livestock development and semen bank,
- Introduction of superior strain and providing artificial insemination services to improve local strains,
- Installment of vehicles, equipment, medicines for animal health and livestock extension services,
- Training of livestock extension workers for artificial insemination and recruit of required staff,
- Establishment of single-bullock harrowing method by introducing improved equipment,
- Increase of animal feed by improved pasture and afforestation of fodder tree, introduction of superior varieties , and
- Effective management of pasture and fodder trees by introducing equipment and materials.

8.2.2 Components of Priority Projects

(1) Agricultural Extension Service

1) Construction of buildings

(a)	District agricultural development offices	:	500 sq.m x 3 buildings (Gulmi, Arghakhanchi, Kapilvastu)
(b)	Ilaka service centers with	:	200 sq.m x 22 buildings

	training hall		(Gulmi-9, Arghakhanchi-9, Kapilvastu-4)
(c)	Staff quarters	:	33 buildings (3 districts office x 2 buildings + 27 Ilaka service centers x 1 building)
2)	Equipment and facilities		
(a)	Vehicles	:	4WD cars - 6 (2 cars x 3 districts) Motor bikes - 50 (district offices and Ilaka service centers)
(b)	Soil test kits	:	25 sets (3 district offices and 22 Ilaka service centers)
(c)	Audio visual aids	:	25 sets (3 district offices and 22 Ilaka service centers)
(d)	Sprayers for training	:	81 sets (27 Ilaka service centers x 3 sets)
3)	Demonstration farms and Nursery farms in farmers level (0.2 to 0.5 ha per plot)		
(a)	Food crops (including seed grower farmers)	:	1,800 plots (each ward; Gulmi 79 x 9, Arghakhanchi 41 x 9, Kapilvastu 79 x 9)
(b)	Cash crops	:	900 plots (one plot per two wards)
(c)	Nursery farms: 17 farms	;	coffee; 4 farms in Gulmi and Arghakhanchi citrus; 4 farms in Gulmi and Arghakhanchi other fruits; 3 farms in Gulmi, Arghakhanchi and Kapilvastu vegetables; 6 farms in Gulmi, Arghakhanchi and Kapilvastu
4)	Supply of agricultural inputs		
(a)	Fertilizer	:	29,700 ton/year
(b)	Agro-chemicals (liquid)	:	2,000 lit/year

	Agro-chemicals (dust)	:	100 ton/year
(c)	Sprayers	:	1,500 sets
(d)	Small scale pumps for irrigation	:	600 sets

5) Training for staff and farmers

(a)	Staff (local training)	:	400 persons x 30 days/year
(b)	Staff (overseas training)	:	30 persons x (2-6 months)
(c)	Farmers (local training)	:	1,000 persons x 20 days/year
(d)	Trainer (expatriates)		

6) Recruit of staff

(a)	GII class	:	1 person
(b)	GIII class	:	1 person
(c)	NGI class	:	33 persons
(d)	NGII class	:	69 persons
(e)	PLAA	:	49 persons

(2) Livestock Development Project

1) Construction of Buildings

(a)	District office	:	400 m^2 x 3 buildings (Gulmi, Arghakhanchi, Kapilvastu)
(b)	Ilaka service center	:	110 m^2 x 27 buildings (3 districts x 9 Ilakas)
(c)	Semen bank & stall	:	Rupandehi
(d)	A.I. station	:	6 stations (3 districts x 2 stations)
(e)	Staff quarter	:	31 buildings (3 district offices, one semen bank, 27 Ilaka centers)

2) Equipment & facilities

(a)	Vehicles	:	4WD car - 4 (Gulmi-1, Arghakhanchi-1, Kapilvastu-2) Motor bike - 40 (District office, Ilaka service center) Liquid nitrogen pickup - 1 (Semen center)
(b)	Semen bank equipment	:	1 set
(c)	Equipment for animal health services	:	54 sets (27 center x 2 sets)
(d)	A.I. service kit	:	12 sets (6 stations x 2 sets)
(e)	Bull for semen bank	:	4 heads (2 bulls and 2 buffaloes)

3) Training for staff and farmers

(a)	Staff (local training)	:	100 person x 30 days/year
(b)	Staff (overseas training)		
(c)	Farmer (local)	:	500 person x 20 days/year
(d)	Trainer (expatriates)		

4) Recruit of staff

(a)	GII class	:	1 person
(b)	GIII class	:	2 persons
(c)	NGI class	:	50 persons
(d)	NGII class	:	36 persons

8.2.3 Cost Estimate

The project cost is estimated as follows:

(Unit: Million NRs.)

Item	Strengthening agricultural extension	Livestock development
Construction cost including facilities and equipment	134.3	78.1
O/M cost (per year in full stage)	5.7	5.1
(Facilities and equipment /1)	(4.0)	(3.9)
(Recruit)	(1.7)	(1.2)
Training cost	68.7	24.6
Input Supply (per year in full stage)	23.5	-
(Fertilizer)	(11.9)	(-)
(Agro-chemicals)	(8.2)	(-)
(Small machinery)	(3.4)	(-)

/1 : 5% of total construction cost

8.2.4 Implementation Schedule

The construction of the priority projects will be commenced in the first 5 years. Further, the training and input supply will be continued during 15 years.

8.2.5 Benefit of the Projects

The projects will bring the various benefits mentioned below:

(1) Strengthening of agricultural extension service project

- The living standard of farmers will be improved according to the cropping improvement and increase of agricultural products.
- The self supply ratio of food in the hill area will be raised, and the amount of surplus food in the Terai will be increased.
- Advanced farming technics can be developed in the project area, since in respective Panchayats and Wards, the leaders will promote the improved farming technics.
- Ilaka service centers having training facilities will be utilized for communication among communities.

(2) Livestock Development Project

- The productivity of livestock will be increased by improvement of raising method and strain of livestock.
- The environment will be prevented from deterioration.
- The livestock products will supply nutritious food to farmers and contribute to their health condition.

8.3 Irrigation Improvement Projects

8.3.1 Rajkudwa Irrigation, and Gorsinghiya and Rajpur Ponds Projects
(A shortened name "Rajkudwa Irrigation Project")

(1) Rajkudwa Irrigation

This project located in the Mahendrakot Panchayat in Kapilvastu District depends upon the irrigation water resources of the Kondre and Rajkudwa rivers which originate from the southern slope of the Churia hills. The command area will be about 900 ha. Basic idea of the project was identified and the construction works have started since the last fiscal year (1988/89). Because only one tenth of total construction costs have been allocated in one year, it will take more than ten years to complete the construction works as a whole. The headworks will be located at the junction of the two rivers and no water right appears to exist so far. However, headworks and main canal are not appeared to be properly designed. Secondary and tertiary canals required for adequate water distribution are not designed.

(2) Gorsinghiya and Rajpur Ponds Project

Eight ponds for irrigation purposes are presently located in the Gorsinghiya and Rajpur villages. It is planned to enlarge these ponds and supply water through the canal proposed in the Rajkudwa Irrigation Project so as to stabilize irrigation in the rainy season and to retain more irrigation water during the dry seasons for about 1,500 ha.

(3) Component of the Project

The component of the project is comprised of design and construction of new diversion weir, irrigation canals and related facilities, rehabilitation and enlargement of

existing ponds in the Gorshingiya and Rajipur Panchayats. Assuming that the project is transferred from district level to central level and that a certain amount of foreign aid is provided, all necessary works such as review of existing plans and designs, and construction works will be completed within three years. According to the basic design made by the district engineer office so far, the salient features of the Rajkudwa Irrigation Project are as follows: The location of the project is shown in Fig. 8.2.1.

(4) Pre-requisite for Implementation

A topographic map with a scale of 1 to 10,000 or 1 to 20,000 has to be prepared for a gross area of about 120 km^2. Because the definite plan of the project has not yet identified from both technical and economical viewpoints, a feasibility study has to be made based on the map and field investigation. The study includes (a) identification of irrigable area, canals and other irrigation facilities, (b) hydrological study on the rivers, (c) preliminary design of facilities, (d) cost estimate and project evaluation.

The detailed design and tender will follow after the feasibility study.

(5) Principal Features

Command Area : 900 + 1,500 = 2,400 ha

Diversion Weir and Intake

Type of weir	:	Concrete Gravity Type
Crest length	:	23.0 m
Crest height	:	2.0 m
Intake discharge	:	3.0 m^3/sec

Settling Basin

Length	:	40.0 m
Water Depth	:	3.0 m

Main Canal

Rectangle Conduit Type Section (Free flow) : 3.0 km

Discharge	:	3.0 m^3/sec
Base width	:	2.5 m
Water depth	:	2.3 m

Open Trapezoidal Earthen Type Section : 14.0 km

Discharge	:	3.0 m^3/sec - 1.5 m^3/sec
Base width	:	1.6 m - 1.5 m

Ponds		:	8 nos.
	Base length	:	630 m x 630 m
	Height	:	3 m
	Effective storage capacity	:	992,250 m^3 per each

(6) Evaluation

- Construction Cost	:	Nrs. 281.4 million
- B/C	:	1.36 (Interest rate 10.0%)
- EIRR	:	13.4%

8.4 Rural Roads

Based on the study conducted in the previous chapter, a pre-feasibility study on Tansen-Tamghas Road and MRM -Sandhikharkha Road which have been considered to have high priority will be carried out.

8.4.1 Outline of Pre-Feasibility Study

Name of the Project	Tansen - Tamghas	MRM - Sandhikharkha
Location	Tansen (H.Q) - Tamghas (H.Q)	Gorusinge Village - Sandhikharkha (H.Q)
Distance	75 km	69 km
Classification of Road	Feeder road (Nepal - Road Standard Class III)	Feeder road (Nepal - Road Standard Class III)
Number of village panchayats benefited	Gulmi District : 79 Arghakhanchi District : 8	Arghakhanchi District : 35 Kapilvastu District : 2
Number of beneficiaries	264,000 persons (year 1987)	149,000 persons (year 1987)

Engineering Standard

Design speeds	Hilly area 40 km/hr Mountains 25 km/hr	Flat area 80 km/hr Hilly area 40 km/hr Mountains 25 km/hr
Formation width	5.0 (excluding drainage)	5.0 m (excluding drainage)
Carriage way	3.5 m	3.5 m
Pavement	Gravel (thickness : 30 cm)	Gravel (thickness : 30 cm)
Right of way	15 m (both sides from the road center line)	15 m (both sides from the road center line)
Gradient	Maximum average gradient : 9% Maximum gradient : 12% Minimum gradient : 1%	Flat : 5%, Mountain/Hill : 9% Flat : 7%, Mountain/Hill : 12% Flat - , Mountain/Hill : 1%
Minimum radius	10 m	10 m
Minimum stopping Sight distance	30 m	30 m

Structures

Bridge	Kurung River (L = 30 m and 20 m spans)	7 nos. (L = 130 m total)
Culvert	470 nos. (30 cm - 90 cm pipe culvert, slab culvert)	450 nos. (30 cm - 90 cm pipe culvert, slab culvert)

8.5 Rural Water Supply

8.5.1 Criteria for Selection

In order to identify the priority projects, the following criteria were used:

- The project area should be densely populated and have little or no supply of safe water.
- A water source should already be available or have a higher potential for development.

- The project should be implemented and operated by the responsibility of DWSS (The Department of Water Supply and Sewerage, under the Ministry of Housing and Physical Planning).

8.5.2 Banganga Rural Water Supply Project

This was proposed to be taken up as the first priority project to be immediately implemented.

(1) Subject of the Project

The project is to construct a new public piped water supply system in Banganga Village where there has not been an existing system.

(2) Location

Location of the project is in Banganga Village Panchayat and Gajeda Village Panchayat in Kapilvastu District, vicinity of a crossing point of the Banganga River and the East-West Highway; the left bank side of the Banganga River. (See Fig. 8.5.1)

(3) Population to be Served

Total population in the project area, the whole of Banganga Panchayat and a part of Gajeda Panchayat, is 8,600 in 1988, and it is forecasted to be about 11,900 in 2005, target year. All of them are to be planned for supply.

(4) Water Demand

The water demand in 2005 will be 900 m^3/day, totaling demands for domestic use, livestock, institutions and leakage.

Total Water Demand (Year:2005)
(Banganga Water Supply)

	Category	Water Demand (m^3/day)
-	Domestic	596
-	Livestock	75
-	Institutions	42
	Sub-total	713
-	Leakage and wastage (25%)	178
	Total demand	891 → 900

(5) Water Source

According to the hydrogeological survey, this area has high potential for development of groundwater deeply confined. The water will be taken by way of deep tubewells, about 200 m in depth, with power-driven submersible pumps.

(6) Distribution System

The groundwater will be first pumped up to an overhead tank (25 m high from the ground level) to be located nearby the deep tubewells; and then distributed to consumers through distribution pipelines. (See Fig. 8.5.2)

Diameters of the distribution pipelines were decided based on hydraulic calculation (Refer to Annex F, Table F.3 for detail), and summarized in the following table with distances.

List of Distribution Pipelines
(Banganga Water Supply)

Diameter (I.D.)	Total Distance
250 mm	100 m
200 mm	850 m
150 mm	10,700 m
100 mm	4,960 m
75 mm	5,070 m
50 mm	2,980 m
40 mm	3,440 m
Sub-total	28,100 m
30 mm	2,000 m
25 mm	2,000 m
Total	32,100 m

(7) Main Facilities

Main facilities to be constructed for the Banganga Water Supply Project is summarized below:

List of Main Facilities
(Banganga Water Supply)

Facility	Capacity	Nos.
Deep well	200 m deep	2 (one standby)
Submersible pump	0.94 m^3/min x 80 m	2 (one standby)
Generator	50 kVA	1
Overhead tank	V = 450 m^3, H = 25 m	1
Pipelines	250 mm - 25 mm	32,100 m
Water taps	Public/private	188 Nos.
Emergency water source	(River intake)	1

(8) Executing Agency

The executing agency of the project will be DWSS, the Ministry of Housing and Physical Planning. It has a District Engineer Office in Krishnanagar, Kapilvastu District

under DWSS. The office will be in charge of the implementation of the project under direction of the Ministry.

8.5.3 Hill Area Schemes

The second priority projects will be distributed in the hill area. The components for the project are proposed as following:

- Supply of pipe materials for Gulmi District, and
- Supply of pipe materials for Arghakhanchi District.

The pipe length totaled 42,000 m is preliminarily proposed by each diameter as given below:

List of Pipes to be Supplied
(for the hill area)

Diameter (O.D.)	Proposed Length
160 mm	1,680 m
140 mm	2,100 m
110 mm	2,100 m
90 mm	3,360 m
75 mm	4,200 m
63 mm	4,200 m
50 mm	5,460 m
40 mm	5,880 m
32 mm	6,720 m
25 mm	4,200 m
20 mm	2,100 m
Total	42,000 m

8.5.4 Project Cost and Implementation Schedule

(1) Project Cost

The project cost for the priority project is estimated at Rs. 47.5 millions, equivalent to US$. 1,695,000. It consists of construction cost for Banganga Water Supply Project, and procurement cost of pipe materials for the hill area (For detail, see Annex F, Table F.4).

Project Cost

(Priority Projects, Water Supply)

Project		Implementation Cost
1) Banganga Rural water supply	:	Rs. 40,768,000.- (=US$1,456,000.-)
2) Hill area scheme	:	Rs. 6,705,000.- (=US$239,000.-)
Total Project Cost	:	Rs. 47,473,000.- (=US$1,695,000.-)
Broken-down into: - Foreign currency portion	:	Rs. 28.5 millions (=US$1,017,000.-)
and - Local currency portion	:	Rs. 19.0 millions (=US$678,000.-)

(2) Implementation Schedule

See Fig. 7.1.6.

CHAPTER 9 CONCLUSION AND RECOMMENDATION

The both aspects of production and living environment are necessary to be developed or improved in integrated manner by the Lumbini IRDP. It is ideal that the preparation of the development plan, implementation of the project and operation and maintenance are executed by people's participation. While in the project area , improvement or development of the fundamental infrastructures such as feeder road, irrigation facilities are in very low stage. In the Lumbini IRDP some of these infrastructural improvement projects are defined and proposed as the indispensable prerequisite investment for the rural development project.

The basic approach to achieve the ultimate target of the integrated rural development is to implement the lowest level development projects by people's participation, and this is the key factor to maintain self help and sustainable rural development. In order to meet this situation, it is necessary that the local level has a capacity for plan formulation and implementation at least at the district level.

However, the capacity at the district level at present is very weak. That is the reason why the capacity reinforcement programme is undertaken as a development priority project in the master plan.

In the development priority projects of the master plan, several central level projects are identified in the pre-feasibility study level, and district level projects are not clearly identified, because of limited study period, difficult accessibility to the project area, and lack of relevant information.

It is recommended that infrastructure development project by central level will be implemented for the time being, and at the same time the capacity reinforcement programme would be implemented. For the reinforcement , it will be indispensable to promote people's participation as well as to secure employment of technical and administrative staff in sufficient number. For promoting people's participation, it is proposed that the small scale projects which are very close to the rural life of the people will be implemented parallel with implementation of the central level projects. And it is recommended that the feasibility study on the Plan Implementation Capacity Reinforcement Project should be carried out in possible early stage.

It is strongly recommended that reinforcement of the existing organization for promoting implementation of the Lumbini IRDP should be carried out by assigning some advisers and experts at the project level along with the regulations and the development system in Nepal. Through the reinforcement , it is necessary to deseminate project information, and to establish a system to carry out monitoring and evaluation on the projects for obtaining accurate progress and impact of the projects. In this connection it is recommended to carry out a benchmark survey in early stage for the monitoring and evaluation.

TABLES

Table 1.3.1 Gross Domestic Product (GDP) and Population Growth Rate

(Unit: %)

	1970/71 - 1984/85*	1970/71 - 1974/75* (Fourth Plan Period)	1975/76 - 1979/80* (Fifth Plan Period)	1980/81 - 1984/85* (Sixth Plan Period)	Annual Growth Rate				
					1980/81	1981/82	1982/83	1983/84	1984/85
Gross Domestic Product	2.8	1.9	2.4	4.0	8.3	3.8	-3.0	7.8	3.0
Agriculture	2.1	2.1	-1.1	5.2	10.4	4.6	-1.1	9.5	2.4
Non-agriculture	4.3	1.7	9.0	2.2	5.5	2.6	-5.8	4.9	4.0
Population Growth Rate	2.6	2.5	2.7	2.6	2.6	2.6	2.6	2.6	2.6

* : Average annual growth

Source: Central Bureau of Statistics and Economic Survey (annual reports), Ministry of Finance, HMG.

Table 2.2.1 Area of Land Use Type by Physiographic Region (1/4:Gulmi)

(unit:ha)

Land Use Type	Terai	Siwalik	Middle Mountain	High Mountain	Total
I. Agricultural Land Use					
Wet, Upper Wet Lands (W)	-	-	-	-	-
Dry Lands (D)	-	-	-	-	-
Mixed Lands (X)	-	-	-	-	-
Sloping Terrace (% of cultivated area)					
C1 (25%-50%)	-	-	8,310	-	8,310
C2 (50%-75%)	-	-	19,190	-	19,190
C3 (75%-100%)	-	-	2,030	-	2,030
Alluvial terraces, footslopes (F)	-	-	4,630	-	4,630
Grazing Land (above mean sea level)					
G1 (< 1000m)	-	-	1,790	-	1,790
G2 (1000m-2000m)	-	-	9,990	-	9,990
G3 (2000m-2600m)	-	-	180	-	180
Level Terraces (% of cultivated area)					
T1 (25%-50%)	-	-	7,660	50	7,710
T2 (50%-75%)	-	-	11,320	-	11,320
T3 (75%-100%)	-	-	740	-	740
Valley floor including footslopes and/or alluvial fans					
V	-	-	90	-	90
H	-	-	-	-	-
Subtotal	-	-	65,930	50	65,980
II. Forestry Land Use					
C Coniferous	-	-	6,190	-	6,190
H Hardwood	-	-	19,520	-	19,520
M Mixed Wood	-	-	7,130	-	7,130
S Shrub	-	-	7,700	120	7,820
P1 Plantation	-	-	-	-	-
Subtotal	-	-	40,540	120	40,660
III. Other Land					
I Ice	-	-	-	-	-
R Rock	-	-	-	-	-
B Sand/gravel/boulders	-	-	720	-	720
P Swamps	-	-	-	-	-
U Urban centres	-	-	-	-	-
Sl Landslides	-	-	390	-	390
EF Experimental Farm	-	-	-	-	-
Subtotal	-	-	1,110	-	1,110
IV. Grand Total	-	-	107,580	-	107,760

Source : Land Utilization Report, Land Resources Mapping Project, 1986, Canadian International Development Agency.

Note : Areas of each land use type are represented in gross.

Table 2.2.1 Area of Land Use Type by Physiographic Region (2/4:Arghakhanchi)

(unit:ha)

Land Use Type	Terai	Siwalik	Middle Mountain	High Mountain	Total
I. Agricultural Land Use					
Wet, Upper Wet Lands (W)	-	-	-	-	-
Dry Lands (D)	-	-	-	-	-
Mixed Lands (X)	-	-	-	-	-
Sloping Terrace (% of cultivated area)					
C1 (25%-50%)	-	1,620	8,540	-	10,160
C2 (50%-75%)	-	1,660	18,820	-	20,470
C3 (75%-100%)	-	210	1,980	-	2,190
Alluvial terraces, footslopes (F)	-	1,620	4,140	-	5,760
Grazing Land (above mean sea level)					
G1 (< 1000m)	-	70	2,270	-	2,340
G2 (1000m-2000m)	-	240	6,900	-	7,140
G3 (2000m-2600m)	-	-	260	-	260
Level Terraces (% of cultivated area)					
T1 (25%-50%)	-	-	210	-	210
T2 (50%-75%)	-	210	160	-	370
T3 (75%-100%)	-	130	320	-	450
Valley floor including footslopes and/or alluvial fans					
V	-	160	170	-	330
H	-	-	-	-	-
Subtotal	-	5,920	43,770	-	49,690
II. Forestry Land Use					
C Coniferous	-	330	4,890	-	5,220
H Hardwood	-	11,600	16,760	-	28,370
M Mixed Wood	-	20,810	11,460	-	32,270
S Shrub	-	150	7,130	-	7,280
P1 Plantation	-	-	-	-	-
Subtotal	-	32,890	40,240	-	73,130
III. Other Land					
I Ice	-	-	-	-	-
R Rock	-	-	-	-	-
B Sand/gravel/boulders	-	420	10	-	420
P Swamps	-	-	-	-	-
U Urban centres	-	-	-	-	-
S1 Landslides	-	10	20	-	30
EF Experimental Farm	-	-	-	-	-
Subtotal	-	430	20	-	450
IV. Grand Total	-	39,240	84,030	-	123,270

Source : Land Utilization Report, Land Resources Mapping Project, 1986, Canadian International Development Agency.

Note : Areas of each land use type are represented in gross.

Table 2.2.1 Area of Land Use Type by Physiographic Region (3/4:Kapilvastu)

(unit:ha)

Land Use Type	Terai	Siwalik	Middle Mountain	High Mountain	Total
I. Agricultural Land Use					
Wet, Upper Wet Lands (W)	54,820	-	-	-	54,820
Dry Lands (D)	3,720	-	-	-	3,720
Mixed Lands (X)	5,760	-	-	-	5,760
Sloping Terrace (% of cultivated area)					
C1 (25%-50%)	-	490	-	-	490
C2 (50%-75%)	-	370	-	-	370
C3 (75%-100%)	-	-	-	-	-
Alluvial terraces, footslopes (F)	720	110	-	-	830
Grazing Land (above mean sea level)					
G1 (< 1000m)	930	-	-	-	930
G2 (1000m-2000m)	-	-	-	-	-
G3 (2000m-2600m)	-	-	-	-	-
Level Terraces (% of cultivated area)					
T1 (25%-50%)	-	60	-	-	60
T2 (50%-75%)	-	-	-	-	0
T3 (75%-100%)	-	-	-	-	0
Valley floor including footslopes and/or alluvial fans					
V	-	-	-	-	-
H	27,810	-	-	-	27,810
Subtotal	93,760	1,030	-	-	94,790
II. Forestry Land Use					
C Coniferous	-	-	-	-	-
H Hardwood	48,330	25,700	-	-	74,040
M Mixed Wood	-	1,580	-	-	1,580
S Shrub	400	-	-	-	400
P1 Plantation	1,820	-	-	-	1,820
Subtotal	50,550	27,280	-	-	77,840
III. Other Land					
I Ice	-	-	-	-	-
R Rock	-	-	-	-	-
B Sand/gravel/boulders	2,400	40	-	-	2,440
P Swamps	-	-	-	-	-
U Urban centres	170	-	-	-	170
S1 Landslides	-	60	-	-	60
EF Experimental Farm	400	-	-	-	400
Subtotal	2,970	100	-	-	3,070
IV. Grand Total	147,280	28,410	-	-	175,690

Source : Land Utilization Report, Land Resources Mapping Project, 1986, Canadian International Development Agency.

Note : Areas of each land use type are represented in gross.

Table 2.2.1 Area of Land Use Type by Physiographic Region (4/4:Rupandehi)

(unit:ha)

Land Use Type	Terai	Siwalik	Middle Mountain	High Mountain	Total
I. Agricultural Land Use					
Wet, Upper Wet Lands (W)	48,080	30	-	-	48,110
Dry Lands (D)	60	-	-	-	60
Mixed Lands (X)	7,270	-	-	-	7,270
Sloping Terrace (% of cultivated area)					
C1 (25%-50%)	-	490	50	-	540
C2 (50%-75%)	-	190	190	-	390
C3 (75%-100%)	-	120	-	-	120
Alluvial terraces, footslopes (F)	7,650	280	-	-	7,930
Grazing Land (above mean sea level)					
G1 (< 1000m)	900	40	-	-	940
G2 (1000m-2000m)	-	10	60	-	70
G3 (2000m-2600m)	-	-	-	-	-
Level Terraces (% of cultivated area)					
T1 (25%-50%)	-	-	-	-	-
T2 (50%-75%)	-	-	-	-	-
T3 (75%-100%)	-	-	-	-	-
Valley floor including footslopes and/or alluvial fans					
V	50	-	-	-	50
H	33,440	-	-	-	33,440
Subtotal	97,460	1,160	300	-	98,920
II. Forestry Land Use					
C Coniferous	-	-	-	-	-
H Hardwood	20,710	18,060	70	-	38,830
M Mixed Wood	-	-	-	-	-
S Shrub	140	130	150	-	420
P1 Plantation	80	-		-	80
Subtotal	20,930	18,190	220	-	39,330
III. Other Land					
I Ice	-	-	-	-	-
R Rock	-	410	-	-	410
B Sand/gravel/boulders	2,020	-	-	-	2,020
P Swamps (pond)	440	-	-	-	440
U Urban centres	220	-	-	-	220
Sl Landslides	-	-	-	-	-
EF Experimental Farm	-	-	-	-	-
Subtotal	2,680	410	-	-	3,100
IV. Grand Total	121,070	19,760	520	-	141,350

Source : Land Utilization Report, Land Resources Mapping Project, 1986, Canadian International Development Agency.

Note : Areas of each land use type are represented in gross.

Table 2.2.2 Land Capability in the Project Area

Class	Gulmi		Arghakhanchi		Hill area total		Kapilvastu		Rupandehi		Terai total		Total	
	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent	Area (ha)	Proportional Extent
Suitable														
I/1 or 2	1,500	1.4%	1,600	1.3%	3,100	1.3%	26,200	14.9%	31,300	22.1%	57,500	18.1%	60,600	11.1%
I/1R or 2R	0	0.0%	900	0.7%	900	0.4%	65,800	37.5%	60,600	42.9%	126,400	39.9%	127,300	23.2%
I/5	0	0.0%	0	0.0%	0	0.0%	2,100	0.0%	1,100	0.0%	3,200	0.0%	3,200	0.0%
II/2	3,500	3.2%	2,300	1.9%	5,800	2.5%	22,500	12.8%	14,400	10.2%	36,900	11.6%	42,700	7.8%
II/5	400	0.4%	400	0.3%	800	0.3%	5,500	3.1%	3,300	2.3%	8,800	2.8%	9,600	1.8%
sub-total	5,400	5.0%	5,200	4.2%	10,600	4.6%	122,100	69.5%	110,700	78.3%	232,800	73.4%	243,400	44.4%
Marginal														
III	41,900	38.8%	31,300	25.4%	73,200	31.7%	1,700	1.0%	1,500	1.1%	3,200	1.0%	76,400	13.9%
Unsuitable														
IV	60,400	56.0%	52,300	42.4%	112,700	48.7%	21,600	12.3%	5,800	4.1%	27,400	8.6%	140,100	25.6%
V	0	0.0%	0	0.0%	0	0.0%	900	0.5%	1,700	1.2%	2,600	0.8%	2,600	0.5%
VI	100	0.1%	33,400	27.1%	33,500	14.5%	26,800	15.3%	18,600	13.2%	45,400	14.3%	78,900	14.4%
Others	100	0.1%	1,100	0.9%	1,200	0.5%	2,600	1.5%	3,100	2.2%	5,700	1.8%	6,900	1.3%
sub-total	60,600	56.2%	86,800	70.4%	147,400	63.8%	51,900	29.5%	29,200	20.7%	81,100	25.6%	228,500	41.7%
Total	107,900	100.0%	123,300	100.0%	231,200	100.0%	175,700	100.0%	141,400	100.0%	317,100	100.0%	548,300	100.0%

Source: Land Capability Report, Land Resources Mapping Project, 1986, Canadian International Development Agency

Table 2.2.3 (1/2) Meteorological Data at Each Station

703 BUTWAL El. 205 m 27'42" Lati. 83'28" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	16.6	18.9	24.2	29.1	29.8	30.1	28.7	29.1	27.4	26.3	22.9	18.6	25.1
Relative Humidity (%)	72	64	47	40	51	69	81	81	82	73	64	69	66
Rainfall (mm)	9	14	14	22	95	403	639	461	387	119	6	25	2194

Average from 1976 to 1986

705 BHAIRHAWA (AIRPORT) El. 110 m 27'31" Lati. 83'26" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	15.4	17.8	23.1	28.1	30.0	30.5	29.2	29.7	28.5	26.1	21.8	17.2	24.8
Relative Humidity (%)	78	67	47	38	49	63	78	78	79	74	72	78	67
Rainfall (mm)	15	7	13	22	63	302	580	334	306	64	8	18	1732

Average from 1976 to 1986

707 BHAIRHAWA (AGRI) El. 120 m 27'32" Lati. 83'28" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	15.5	17.3	22.4	27.4	29.5	30.1	29.2	29.6	28.4	25.9	21.7	17.4	24.5
Relative Humidity (%)	84	78	62	52	60	69	82	82	84	81	78	83	75
Sunshine Hours (hr/day)	7.1	8.1	8.5	8.9	9.4	7.6	5.6	6.4	6.3	8.0	8.5	7.6	7.7
Rainfall (mm)	16	11	14	24	65	351	564	311	339	72	7	20	1793

Average from 1976 to 1986

Table 2.2.3 (2/2) Meteorological Data at Each Station

715 KHANCHIKOT El. 1,760 m 27'56" Lati. 83'09" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	8.8	10.3	14.6	18.2	19.0	20.2	19.9	20.3	18.9	16.8	13.4	10.1	15.9
Relative Humidity (%)	71	69	55	53	66	81	92	90	87	75	75	70	74
Sunshine Hours (hr/day)	6.3	7.9	9.8	10.0	9.2	7.6	7.0	6.4	7.5	7.8	7.3	7.6	7.9
Rainfall (mm)	26	26	26	26	124	320	553	364	458	65	13	42	2042

Average from 1977 to 1986

716 TAULIHAWA El. 94 m 27'33" Lati. 83'04" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	15.4	17.4	22.7	27.9	29.8	30.7	29.2	29.7	28.4	26.1	21.3	16.9	24.6
Relative Humidity (%)	84	72	52	43	53	66	81	80	81	77	77	82	71
Rainfall (mm)	18	14	20	28	62	236	561	301	293	57	7	16	1613

Average from 1979 to 1986

725 TAMGHAS El. 1,530 m 28'04" Lati. 83'15" Long.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean/Total
Mean Temperature	9.4	11.4	16.0	19.1	20.3	22.2	22.1	22.6	20.7	18.1	13.7	10.3	17.1
Relative Humidity (%)	82	78	67	58	75	84	93	90	90	81	81	83	80
Rainfall (mm)	35	18	25	57	161	304	490	340	418	70	24	36	1978

Average from 1981 to 1986

Table 2.2.4 (1/4) Summary Table of Mean Monthly Flow

(in Gulmi District) — Predicted Hydrograph m3/sec

No.	Name of the River	C.A. (Km2)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1.\	Kali Gandki *1	6,630	48.50	37.40	33.50	52.20	90.50	307.00	927.00	946.00	703.00	280.00	128.00	71.90	302.08
2.\	Badi Gad	1,990	5.56	4.15	3.24	2.44	2.95	17.73	44.36	66.54	51.02	22.18	9.61	7.39	19.76
3.\	Hugdi Khola	125	1.52	1.16	0.90	0.68	0.82	4.94	12.36	18.54	14.22	6.18	2.68	2.06	5.51
4.\	Chhaldi Khola	480	1.03	0.78	0.61	0.46	0.56	3.34	8.36	12.54	9.62	4.18	1.81	1.39	3.72
5.\	Panaha Khola	160	1.19	0.90	0.70	0.53	0.64	3.85	9.63	14.45	11.08	4.82	2.09	1.60	4.29
6.\	Ridi Khola	550	3.24	2.46	1.93	1.45	1.75	10.54	29.36	39.54	30.32	13.18	5.71	4.39	11.99
7.\	Kharjeng Khola	145	1.19	0.90	0.70	0.53	0.64	3.85	9.63	14.45	11.08	4.82	2.09	1.60	4.29
8.\	Bharse Khola	20	0.36	0.27	0.21	0.16	0.19	1.16	2.91	4.36	3.34	1.45	0.63	0.48	1.29
9.\	Daram Khola	255	1.19	0.90	0.70	0.53	0.64	3.85	9.63	14.45	11.08	4.82	2.09	1.60	4.29
10.\	Nisti Khola	110	0.81	0.61	0.48	0.36	0.44	2.62	6.54	9.82	7.53	3.27	1.42	1.09	2.92
11.\	Gyadi Khola	31.5	0.96	0.73	0.57	0.43	0.52	3.13	7.82	11.74	8.99	3.91	1.69	1.30	3.48
12.\	Baudi Khola	-	0.29	0.22	0.18	0.13	0.16	0.96	2.39	3.59	2.75	1.20	0.52	0.40	1.07
13.\	Tal Khola	14	0.47	0.36	0.28	0.21	0.25	1.53	3.83	5.74	4.40	1.91	0.83	0.64	1.70
14.\	Harewa Khola	15.2	0.36	0.27	0.21	0.16	0.19	1.16	2.91	4.36	3.34	1.45	0.63	0.48	1.29
15.\	Lumdi Khola	13	0.67	0.51	0.40	0.30	0.36	2.18	5.45	8.18	6.27	2.73	1.18	0.91	2.43
16.\	Jumdi Khola	17	0.45	0.34	0.27	0.20	0.24	1.45	3.64	5.45	4.18	4.18	1.82	0.61	1.90
17.\	Ulli Khola	30	0.31	0.24	0.19	0.14	0.17	1.02	2.54	3.82	2.93	1.27	0.55	0.42	1.13
18.\	Dhodwa Khola	-	0.36	0.27	0.21	0.16	0.19	1.16	2.91	4.36	3.34	1.45	0.63	0.40	1.29
19.\	Jhedi Khola	-	0.25	0.19	0.15	0.11	0.13	0.80	2.00	3.00	2.30	1.00	0.43	0.33	0.89
20.\	Raiti Khola	-	0.22	0.17	0.13	0.10	0.12	0.73	1.82	2.73	2.09	0.91	0.39	0.30	0.81

*1: Average of 3 years from 1974 to 1976 at Seti Beni near Dumrichar

Table 2.2.4 (2/4) Summary Table of Mean Monthly Flow

(in Arghakhanchi District) — Predicted Hydrograph m3/sec

No.	Name of the River	C.A. (Km2)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1.\	Rapti Khola *1	-	31.70	26.30	21.40	18.20	22.80	60.30	192.00	259.00	268.00	117.00	58.60	39.80	92.93
2.\	Jhimruk Khola *2	-	6.31	5.29	4.76	3.70	3.34	15.50	64.90	85.20	72.60	34.40	13.10	7.70	26.40
3.\	Wakle Khola	25	0.27	0.20	0.16	0.12	0.15	0.87	2.18	3.27	2.51	1.08	0.47	0.36	0.97
4.\	Sisne Khola	76	0.42	0.32	0.25	0.19	0.23	1.38	3.45	5.18	3.97	1.72	0.75	0.58	1.54
5.\	Durga Khola	35	0.22	0.17	0.13	0.10	0.12	0.73	1.82	2.73	2.09	0.91	0.39	0.30	0.81
6.\	Kedua Khola	40	0.25	0.19	0.15	0.11	0.13	0.80	2.00	3.00	2.30	1.00	0.43	0.33	0.89
7.\	Kharjyang Khola	30	0.34	0.26	0.20	0.15	0.18	1.11	2.79	4.18	3.21	1.39	0.60	0.46	1.24
8.\	Panere Khola	-	0.03	0.02	0.02	0.01	0.02	0.10	0.24	0.36	0.28	0.12	0.05	0.04	0.11
9.\	Pahilapani Khola	-	0.05	0.04	0.03	0.02	0.03	0.16	0.41	0.62	0.47	0.21	0.09	0.07	0.18
10.\	Bangi Khola	50	0.38	0.29	0.23	0.17	0.20	1.24	3.09	4.64	3.55	1.55	0.67	0.52	1.38
11.\	Gachhe Khola	22	0.10	0.07	0.06	0.04	0.05	0.32	0.79	1.18	0.91	0.39	0.17	0.13	0.35
12.\	Ghoche Khola	22	0.06	0.04	0.03	0.02	0.03	0.18	0.46	0.69	0.53	0.23	0.10	0.08	0.20
13.\	Khanchi Khola	125	0.57	0.43	0.34	0.25	0.31	1.84	4.61	6.91	5.30	2.30	1.00	0.77	2.05
14.\	Mathura Khola	85	0.34	0.25	0.20	0.15	0.18	1.09	2.73	4.09	3.14	1.36	0.59	0.45	1.21
15.\	Chauwa Khola	22	0.18	0.14	0.11	0.08	0.10	0.58	1.45	2.18	1.67	0.73	0.32	0.24	0.65
16.\	Pharjeng Khola	-	0.07	0.05	0.04	0.03	0.04	0.22	0.54	0.82	0.63	0.27	0.12	0.09	0.24
17.\	Duware Khola	15	0.25	0.19	0.15	0.11	0.13	0.80	2.00	3.00	2.30	1.00	0.43	0.33	0.89
18.\	Sirling Khola	38	0.23	0.18	0.14	0.1	0.13	0.76	1.89	2.84	2.17	0.94	0.41	0.32	0.84
19.\	Bongseri Khola	37	0.14	0.11	0.08	0.06	0.08	0.46	1.16	1.74	1.34	0.58	0.25	0.19	0.52
20.\	Sit Khola	160	0.81	0.62	0.48	0.36	0.44	2.64	6.60	9.90	7.59	3.30	1.43	1.10	2.94
21.\	Soile Khola	-	0.04	0.03	0.03	0.02	0.02	0.14	0.36	0.54	0.42	0.18	0.08	0.06	0.16
22.\	Kusum Khola	-	0.15	0.12	0.09	0.07	0.08	0.49	1.24	1.85	1.42	0.62	0.27	0.21	0.55
23.\	Kathe Khola	-	0.03	0.02	0.02	0.01	0.02	0.10	0.24	0.36	0.28	0.12	0.05	0.04	0.11
24.\	Siling Khola	52	0.07	0.05	0.04	0.03	0.04	0.23	0.58	0.87	0.67	0.29	0.13	0.10	0.26
25.\	Rangsing Khola	-	0.18	0.14	0.11	0.08	0.10	0.58	1.45	2.18	1.67	0.73	0.32	0.24	0.65
26.\	Mandre Khola	25	0.31	0.24	0.19	0.14	0.17	1.02	2.54	3.82	2.93	1.27	0.55	0.42	1.13
27.\	Ganga Khola (Ban Ganga)	200	1.1	0.84	0.65	0.49	0.60	3.58	8.95	13.42	10.29	4.48	1.94	1.49	3.99
28.\	Riste Khola	-	0.09	0.07	0.05	0.04	0.05	0.29	0.73	1.09	0.84	0.36	0.16	0.12	0.32
29.\	Ridi Khola	400	2.73	2.07	1.62	1.22	1.48	8.87	22.18	33.27	25.51	11.09	4.81	3.70	9.88
30.\	Areli Khola and Masanc Khola	-	0.04	0.03	0.03	0.02	0.02	0.14	0.36	0.54	0.42	0.18	0.18	0.06	0.17
31.\	Chidika Khola	-	0.05	0.04	0.03	0.02	0.03	0.16	0.41	0.62	0.47	0.21	0.09	0.07	0.18
32.\	Pangrapani Khola a Paudi Khola	-	0.04	0.03	0.03	0.02	0.02	0.14	0.36	0.54	0.42	0.18	0.08	0.06	0.16
33.\	Seri Khola, Samu K and Bad Khola	-	0.06	0.04	0.03	0.02	0.03	0.18	0.46	0.69	0.53	0.23	0.10	0.08	0.20
34.\	Dhod Khola	-	0.04	0.03	0.02	0.02	0.02	0.12	0.30	0.45	0.35	0.15	0.06	0.05	0.13
35.\	Jore Khola	-	0.02	0.02	0.01	0.01	0.01	0.07	0.18	0.27	0.21	0.09	0.04	0.03	0.08
36.\	Bhadri Khola	-	0.01	0.01	0.01	0.01	0.01	0.05	0.12	0.18	0.14	0.06	0.03	0.02	0.05
37.\	Lewase Khola	-	0.07	0.05	0.04	0.03	0.04	0.22	0.54	0.82	0.63	0.27	0.12	0.19	0.25

*1: Average of 10 years from 1976 to 1985 at Bagasoli Gaon near Bhaluwang
*2: Average of 18 years from 1965 to 1984 at Tigra Village

Table 2.2.4 (3/4) Summary Table of Mean Monthly Flow

(in Kapilvastud District) Predicted Hydrograph m3/sec

No.	Name of the River	C.A. (Km2)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1.\	Banganga river	340	1.09	0.73	0.46	0.33	1.16	1.98	4.62	11.55	11.22	3.96	2.48	1.65	3.44
2.\	Murthi river	195	0.13	0.09	0.06	0.04	0.14	0.24	0.56	1.40	1.36	0.48	0.30	0.20	0.42
3.\	Kothi river	125	1.02	0.68	0.43	0.31	1.08	1.86	4.34	10.85	10.54	3.72	2.32	1.55	3.23
4.\	Jamuwar Nala	92	0.10	0.07	0.04	0.03	0.10	0.18	0.42	1.05	1.02	0.36	0.22	0.15	0.31
5.\	Beti Nadi	95	0.10	0.07	0.04	0.03	0.10	0.18	0.42	1.05	1.02	0.36	0.22	0.15	0.31
6.\	Kaila Khola	123	0.79	0.52	0.33	0.24	0.84	1.43	3.34	8.40	8.12	2.87	1.79	1.19	2.49
7.\	Gurumuwa Khola	99	0.33	0.22	0.14	0.10	0.35	0.60	1.40	3.50	3.40	1.20	0.75	0.50	1.04
8.\	Kanchani river	80	0.16	0.11	0.07	0.05	0.18	0.30	0.70	1.75	1.70	0.60	0.38	0.25	0.52
9.\	Surahi river	70	0.16	0.11	0.07	0.05	0.18	0.30	0.70	1.75	1.70	0.60	0.38	0.25	0.52
10.\	Jawai river	-	0.41	0.28	0.18	0.12	0.44	0.75	1.75	4.38	4.25	1.50	0.94	0.62	1.30
11.\	Arra Nala	118.0	0.82	0.55	0.35	0.25	0.88	1.50	3.50	8.75	8.50	3.00	1.88	1.25	2.60

Table 2.2.4 (4/4) Summary Table of Mean Monthly Flow

(in Rupandehi District) Predicted Hydrograph m3/sec

No.	Name of the River	C.A. (Km2)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1.\	Tinau Khola *1	554	4.36	3.03	2.36	2.16	2.35	15.10	58.30	108.00	46.70	24.70	7.61	4.94	23.30
2.\	Dano Khola	502	2.58	measured at intake site of Marchawar Lift Irrigation Project (Jan. 31 '84)											
3.\	Rohini Khola	193	0.98	measured at Baikunthapur (Dhakdhai Panchayat) (Jan. 28 '84)											

*1: Average of 6 years from 1964 to 1969 at suspension bridge, 4.2 km downstream from Dobhan Khola at Butwal

Table 2.2.5 Results of Study on Possibility of Groudwater Exploitation

Type of Well \ Potential Area	High (T^{135} = 3.74 x 10^{-2} m^2/sec)			Moderate (T^{135} = 3.94 x 10^{-3} m^2/sec)			Low (T^{135} = 4.01 x 10^{-4} m^2/sec)			Remarks
Deep (Depth: 200 m, Diameter: 8")	T^{200} = 6.4 x 10^{-2} m^2/sec S^{SH} = 5.0 x 10^{-3}			T^{200} = 6.7 x 10^{-3} m^2/sec S^{SH} = 5.0 x 10^{-4}			T^{200} = 6.9 x 10^{-4} m^2/sec S^{SL} = 5.0 x 10^{-5}			Pumping hour: 12 hrs/day
	Discharge (l/sec)	50	40	Discharge (l/sec)	50	40	Discharge (l/sec)	25	10	
	Drawdown (m)	1.12	0.90	Drawdown (m)	10.7	8.55	Drawdown (m)	51.9	20.8	
	Radius of Influence (m)	900	900	Radius of Influence (m)	900	900	Radius of Influence (m)	900	900	
Shallow (Depth: 70 m, Diameter: 8")	T^{70} = 1.1 x 10^{-2} m^2/sec S^{SH} = 1.0 x 10^{-3}			T^{70} = 1.2 x 10^{-3} m^2/sec S^{SH} = 1.0 x 10^{-4}			T^{70} = 1.2 x 10^{-4} m^2/sec S^{SL} = 1.0 x 10^{-5}			Pumping hour: 12 hrs/day
	Discharge (l/sec)	50	40	Discharge (l/sec)	15	10	Discharge (l/sec)	10	5	
	Drawdown (m)	6.51	5.21	Drawdown (m)	17.9	11.9	Drawdown (m)	119.4	59.7	
	Radius of Influence (m)	900	900	Radius of Influence (m)	900	800	Radius of Influence (m)	900	900	
Hand Pump (Depth: 30 m, Diameter: 4")	T = 1.0 x 10^{-6} m^2/sec S (Effective Porosity) = 0.25									Pumping hour: 12 hrs/day
	Discharge (l/sec)	1.0	0.2							
	Drawdown (m)	59.7	11.9							
	Radius of Influence (m)	22	90							
Remarks	Discharge of more than 50 l/sec could be obtained from both a deep and a shallow tubewell in high potential area. In this case, however, larger diameter well will be required.						Low potential area is not suitable for deep and shallow tubewell.			

Table 2.2.6 Number of Wells and Prospective Quantity of Water

		Pumping (l/sec / hrs. cycle)	Area (km^2)	Radius of Influence (km)	Influence Area (km^2)	Well Number to be Constructed (nos.)	Existing Well (nos.)	Proposed Well Number (nos.)	Proposed Discharge (m^3/day)	Total Discharge (m^3/day)	Remarks
High Potential Area	North Banganga R. Area	50 / 12	30.6	0.9	2.54	12	4	8	17,000+	25,000+	
		50 / 12		0.9	2.54	12		8	17,000+	25,000+	
Moderate Potential Area	South Banganga R. Area	50 / 12	19.4	0.9	2.54	7	19	-	-	15,000	* There is no space for proposed well. * Total discharge is calculated with 7 deep tubewells and 9 shallow tubewells respectively.
		10 / 12		0.8	2.01	9		-	-	3,000	
	Western Area	50 / 12	40.0	0.9	2.54	15	7	8	17,000	30,000	
		10 / 12		0.8	2.01	19		12	5,000	8,000	
	South-Western Area (Krishnanagar Area)	50 / 12	29.2	0.9	2.54	11	5	6	12,000	20,000	
		10 / 12		0.8	2.01	14		9	3,000	6,000	
	Harchawar Area	50 / 12	22.8	0.9	2.54	8	1	7	15,000	17,000	* Area is only inside the study area.
		10 / 12		0.8	2.01	11		10	4,000	4,000	
Low Potential Area	Remained Area	Hand Pump					67+				
Total						53	103+	29	61,000+	107,000+	
						65		39	29,000+	46,000+	

Note: 1) "Existing Well" includes both deep and shallow tubewells.

2) In "High Potential Area", "Moderate Potential Area" and "Total" columns, a case of deep tubewell is indicated in upper part and a case of shallow tubewell is in lower part respectively.

3) In "Proposed Discharge" and "Total Discharge" columns, any fractional sum less than 1,000 m^3/day discharge shall be discarded.

4) Existing wells are assumed to be arranged and pumped as proposed wells.

Table 2.3.1 Population and the Growth Rate

District	1971 Total Population	1981 Total Population	1981 Male	1981 Female	1987 Total Population	Annual Growth Rate 1981-87 (%)
Gulmi	227,746	238,113	125,644	112,469	250,605	0.9
Arghakhanchi	130,212	157,304	86,515	70,789	170,996	1.4
Kapilvastu	205,216	270,045	143,400	126,645	309,897	2.3
Rupandehi	243,346	379,096	196,783	182,313	472,346	3.7
(Marchawar)	(N.A.)	69,390	36,430 /1	32,960 /1	89,700 /2	(3.7)
Total 4 districts	806,520 (100.0%)	1,044,558 (52.9%)	552,342 (47.1%)	492,216	1,203,844	2.4
Study Area	(N.A.) (100.0%)	734,852 (53.3%)	391,989 (46.7%)	342,863	821,198	1.9

Source: CBS, Population Census

Remarks: /1: Estimated based on the available population data of panchayats in Marcharwar area.
/2: Estimated based on the annual growth rate of Rupandehi District.

Table 2.3.2 Distribution of Land Holding Sizes of the Farmers

Land Holding Size	Gulmi District		Arghakhanchi District		Kapilvastu District		Rupandehi District	
	No. of Farm Households	Area	No. of Farm Households	Area	No. of Farm Households	Area	No. of Farm Households	Area
(ha)		(ha)		(ha)		(ha)		(ha)
0.0 - 0.5	20,314 (60%)	5,401 (29%)	14,370 (66%)	3,639 (35%)	11,113 (28%)	1,530 (2%)	9,102 (17%)	2,626 (3%)
0.5 - 1.0	11,476 (34%)	8,164 (44%)	5,677 (26%)	4,446 (43%)	6,312 (16%)	4,847 (6%)	12,253 (23%)	8,686 (10%)
1.0 - 2.0	1,342 (4%)	1,837 (10%)	1,573 (7%)	1,987 (19%)	9,903 (25%)	14,578 (18%)	18,360 (34%)	24,371 (29%)
2.0 - 3.0	320 (1%)	743 (4%)	95 (0%)	229 (2%)	4,989 (13%)	12,411 (15%)	8,052 (15%)	18,937 (22%)
3.0 - 4.0	225 (1%)	795 (4%)	13 (0%)	48 (0%)	2,532 (6%)	8,875 (11%)	2,411 (5%)	8,136 (10%)
4.0 - 5.0	95 (0%)	437 (2%)	13 (0%)	61 (1%)	1,776 (4%)	7,950 (10%)	1,361 (3%)	5,910 (7%)
5.0 - 10.0	71 (0%)	429 (2%)	6 (0%)	46 (0%)	1,761 (4%)	12,122 (15%)	1,470 (3%)	9,643 (11%)
Above 10.0	23 (0%)	881 (5%)	0 (0%)	0 (0%)	1,149 (3%)	19,847 (24%)	435 (1%)	6,622 (8%)
Total	33,866 (100%)	18,687 (100%)	21,747 (100%)	10,456 (100%)	39,535 (100%)	82,210 (100%)	53,444 (100%)	84,931 (100%)

Source: National Sample Census of Agriculture (1981/82)

Table 2.3.3 Land Holding Status

Hill Area

	Gulmi				Arghakhanchi			
	No. of Farmers	(%)	Area	(%)	No. of Farmers	(%)	Area	(%)
			(ha)				(ha)	
(A) Land Tenure Form								
Cultivated by Owner	33,618	(99)	18,530	(99)	21,133	(97)	10,045	(96)
Owner Cum Tenant	248	(1)	157	(1)	573	(3)	406	(4)
Cultivated by Tenant	-	(-)	-	(-)	41	(0)	5	(0)
(B) Sampled Panchayats								
Cultivated by Owner	-	96.6	-	97.3	-	99.8	-	99.9
Cultivated by Tenant	-	3.4	-	2.7	-	0.2	-	0.1

Terai Area

	Kapilvastu				Rupandehi			
	No. of Farmers	(%)	Area	(%)	No. of Farmers	(%)	Area	(%)
			(ha)				(ha)	
(A) Land Tenure Form								
Cultivated by Owner	35,368	(89)	73,848	(90)	52,809	(99)	83,943	(99)
Owner Cum Tenant	3,376	(9)	7,244	(9)	558	(1)	1,002	(1)
Cultivated by Tenant	791	(2)	1,118	(1)	77	(0)	171	(0)
(B) Sampled Panchayats								
Cultivated by Owner	-	88.6	-	87.3	-	87.6	-	88.8
Cultivated by Tenant	-	11.4	-	12.7	-	12.4	-	11.2

Source; (A): National Sample Census of Agriculture (1981/82)
(B): Rural Socio-economic Survey on IRDP in Lumbini Zone (1988)

Table 2.3.4 Present Socio-economic Condition of the Project Area (1/2)

Item	Unit	Hill Area		Terai Area		Whole Nation
		Gulmi	Arghakhanchi	Kapilvastu	Ruphandehi	
1. Socio-economy						
1.1 Area		1,078	1,233	1,757	1,414	147,200
1.2 Population						
Population (1987)	(10^3)	251	171	310	472	17,000
Popu. density (1987)	(Persons/km2)	231	139	176	334	115
Growth rate (1981-87)	(%/year)	0.9	1.4	2.3	3.7	2.2
Projected popu. (2005/1987)	(times)	1.18	1.28	1.51	1.92	1.48
Ratio of active population (1981)	(%)	48	57	67	54	59
Agri. related population (1981)	(%)	96	97	95	85	91
1.3 Household						
Total household (1981)	(10^3)	42.0	27.5	46.4	61.2	2,585
Farm household (1981/82)	(10^3)	33.9	21.8	39.5	53.4	2,194
% of farm household	(%)	80.7	79.3	85.1	87.3	84.9
2. Agriculture (1981/82)						
2.1 Farm Area	(10^3 ha)	25.6	20.0	84.7	87.2	2,464
Paddy	(10^3 ha)	4.0	4.1	74.9	76.1	1,418
Upland crops	(10^3 ha)	21.6	15.9	9.8	11.1	1,046
2.2 Farm Area per Household	(ha)	0.78		1.52		1.12
Paddy	(ha)	0.14		1.34		0.65
Upland	(ha)	0.64		0.18		0.47
2.3 Main Crops (#1)						
a) Paddy						
Cultivated area	(ha)	4,110	3,400	69,900	69,120	1,423,000
Change	(%)	132	216	102	98	112
Unit yield	(kg/ha)	1,830	1,860	1,660	2,060	2,100
Change	(%)	78	83	121	127	114
Production	(ton)	7,530	6,340	116,380	142,500	2,982,000
Change	(%)	102	179	125	125	127
b) Maize						
Cultivated area	(ha)	20,590	9,240	810	850	673,000
Change	(%)	234	112	24	22	148
Unit yield	(kg/ha)	1,150	1,330	1,720	1,930	1,340
Change	(%)	55	63	93	90	82
Production	(ton)	23,630	12,300	1,390	1,640	745,000
Change	(%)	130	71	23	20	121
c) Wheat						
Cultivated area	(ha)	4,250	2,920	24,610	23,010	59,700
Change	(%)	319	588	161	111	168
Unit yield	(kg/ha)	1,020	1,030	1,340	1,370	1,250
Change	(%)	83	100	111	109	107
Production	(ton)	4,320	3,010	32,860	31,430	902,000
Change	(%)	265	587	179	121	168
d) Others						
Millet	(ha)	3,130	1,100	-	-	-
Oil crops	(ha)	420	190	2,240	3,880	151,500
Potato	(ha)	480	210	1,740	640	80,200
Pulses	(ha)	1,340	1,090	7,050	6,300	
Sugarcane	(ha)	-	-	1,470	1,790	29,500

#1 Area, unit yield and production are averaged figures for last three years (1985/86-87/88).
Change means the ratio between the averaged figures mentioned above and the data in 1977/78.

Table 2.3.4 Present Socio-economic Condition of the Project Area (2/2)

Item	Unit	Hill Area		Terai Area		Whole Nation
		Gulmi	Arghakhanchi	Kapilvastu	Ruphandehi	
2.4 Food Balance (Grains, pulses and potato)						
a) Present situation		Shortage of 31%	Shortage of 22%	Surplus of 47%	Shortage of 21%	Balanced
Per capita consumption (1986/87)	(kg/year)	148	132	172	195	153
b) Projection (2005) (#2)						
Production	(ton)	91,700		429,900		5,746,000
Per capita cunsumption	(kg/year)	248		248		248
Demand	(ton)	107,820		276,040		5,746,000
Balance	(ton)	-16,120		153,860		0
		(-15%)		(+56%)		Balanced
2.5 Ratio of Irrigated area	(%)	7.2	11.3	29.9	36.2 Terai	21
					Hill	11
2.6 Typical Farm Budget						
Farm Area	(ha)	0.78		1.52		
Family Size	(persons)	7.0		7.0		
Gross Income	(Rs.)					
Farm Income	(Rs.)	13,500		18,800		
Non-farm Income	(Rs.)	4,000		300		
Total	(Rs.)	17,500		19,100		
Gross Income after the Project	(Rs.)	35,100		35,600		
3. Road Condition						
3.1 Total Length						
National Road	(km)	0	0	61	79	1,963
Feeder Road	(km)	45	41	73	30	1,988
District Road	(km)	177	131	87	56	1,320
4. Living Condition						
4.1 Coverage of Water Supply Systems	(%)	35	35	9	21	40
4.2 Coverage of sewage	(%)	0	0	0	0	-
4.3 Education						
Literacy Ratio	(%)	32	25	13	28	23
Primary Scholl Attendance Rate	(%)	109	113	70	52 Male	105
					Female	48
4.4 Health						
No. of Hospital	(Nos.)	1	-	2	3	73
No. of Health Center	(Nos.)	1	1	-	-	
No. of Health Post	(Nos.)	13	2	4	11	644

Remarks : #2 : Figures show by the case of medium population growth rate, and case 2 irrigated area in the Annex A.1.10 food balance.
#3 : About 26 % of the attendances are over the school age.

Table 2.4.1 Estimated Crop Yield and Production in the Project Area

Area	Crop		Cropped Area (ha)	Unit Yield (ton/ha)	Production (ton)
Hill Area					
	Paddy field (irrigated)				
		Paddy	4,900	2 .23	10,940
		Wheat	4,100	1 .23	5,030
	Paddy field (rainfed)				
		Paddy	4,000	1 .32	5,260
		Wheat	2,830	0 .72	2,040
	Upland				
		Maize	34,990	1 .19	41,640
		Millet	4,960	0 .91	4,510
		Other cerals	690	0 .86	590
		Pulses	2,440	0 .53	1,290
		Sweet potatoes	1,890	4 .52	8,540
		Oil seeds	700	0 .52	360
	Total	Paddy	8,900	1 .82	16,200
		Wheat	6,930	1 .02	7,070
		Maize	34,990	1 .19	41,640
		Millet	4,960	0 .91	4,510
		Other cereals	690	0 .86	590
		Pulses	2,440	0 .53	1,290
		Sweet potatoes	1,890	4 .52	8,540
		Oil seeds	700	0 .52	360
Terai Area					
	Paddy field (irrigated)				
		Paddy	25,400	2 .04	51,820
		Wheat	24,580	1 .39	34,170
		Oil seed	2,200	0 .57	1,250
	Paddy field (rainfed)				
		Paddy	61,000	1 .85	112,850
		Pulses	1,600	0 .89	1,420
	Upland				
		Maize	1,170	1 .78	2,080
		Pulses	7,100	0 .53	3,760
		Sugar cane	1,700	27 .60	46,920
	Total	Paddy	86,400	1 .91	164,670
		Wheat	24,580	1 .39	34,170
		Maize	1,170	1 .78	2,080
		Pulses	8,700	0 .60	5,180
		Sugar cane	1,700	27 .60	46,920
		Oil seeds	2,200	0 .57	1,250