Topographical, meteorological and hydrological characteristics were carefully studied for each proposed site. Based on these results, potential water use and the incidental facilities required to develop water resources are tabulated in TABLE 9.2-1.

1) Irrigation

Maintenance of a stable yield is difficult under Barani agriculture due to traditional farming methods and fluctuating weather patterns in the Study Area. During the winter crop only 1t/ha of wheat, one of the major grains, is harvested due to extremely low rainfall. Accordingly, yield increase and stability should be planned around irrigation. Furthermore, since available cultivated land is limited in this area, increases in agricultural income will depend on the introduction of multiple cropping through irrigation.

2) Fish Ponds

Although the reservoirs of the Simly and Rawal dams are utilized for fisheries, yield does not meet the market demands of Islamabad and Rawalpindi. Therefore, to increase farm income and supply a source of protein to rural inhabitants, a combination of duck breeding and fishery using stored river water is proposed.

Candidate sites for reservoirs which could also be utilized as fish ponds are limited to those which guarantee a year round capacity, or are located on perennial flows. There are ten dam sites suitable according to the above criteria in the Study Area. Sites are classified by scale into the following two types:

A type; Dams with large lake surfaces to prevent fish escaping during the flooding period.

B type; Dams with small lake surfaces from which fish may escape during flooding. In this case, the fish pond is located downstream with a

perennial supply of water provided from the reservoir.

The following table shows the available lake surface and type of the proposed dams.

River and Location	Mark	Name of Village	Available Lake Surface (m^2)	Dam Type
Gumreh Kas	G - 1	Athal	16,000 - 11,000	B
"	G - 3	Sihali	172,000 - 40,000	A
"	G - 5	Muhrian	53,000 - 13,000	B
Malal Kas	M - 1	Tamair	120,000 - 28,000	A
"	M - 2	Jhang Sayaddan	20,000 - 85,000	B
Mountains & Hilly Area	H - 2	Shah Darah	200,000 - 36,000	A
Soan River	S - 1	Charah	560,000 - 120,000	A
Kurang River	K - 1	Sikrila	3,400,000 - 1,450,000	A
"	K - 2	"	11,700,000 - 3,300,000	A
"	Kc- 2	Koral	200,000 - 25,000	A

3) Washing Area

In general, exposed rocks along the water's edge of rivers and torrents and at village ponds are used for washing in the rural area. This location also provides an opportunity for communication and accordingly facilities for a meeting place are planned beside reservoirs. These facilities will also be used for extending the community activites of the farmers.

4) Livestock Drinking Water Supply

Since percolation of ground water from the reservoir into immediately adjacent area may be expected, afforestation and grassland reclamation can be carried out around the reservoir to create a watering and grazing spot for livestock.

5) Mini-Hydropower

About 65% of all villages in the Study Area are electrified at present and continued electrification by WAPDA is now in progress. Electric power, however, extends only to lighting in houses and is insufficient for operation of flour mills, pumps, etc. Development of mini-hydropower would help compensate for this situation and subsequently stimulate rural agricultural development. Power is urgently required during the drought period in winter in order to operate pumps for irrigation. As for the proposed dam with regulating reservoir, the site must be located where river discharge can be obtained during the winter period until just before the monsoon. Though there are several dam sites in the Study Area, a detailed study is necessary to determine dam scale and facilities (See Illustration No.7 on the title page for Part V).

6) Use of Surface Water

Dams which will store water year-round are planned at several sites in the Study Area. Ground water will thus be provided around the dams and trees and grass will grow in these areas even in the dry season. Village parks are also planned around the dams as recreation areas for the rural population.

7) Rural Roads

In addition to the existing ford crossings at rivers, transportation will be made possible even during floods in the rainy season by using dam crests as bridges.

Furthermore, since dam construction will be carried out on an extensive scale, the access roads may be converted into village link roads in future (See Illustration No.5 on the title page for Part IV).

(3) Proposed Facilities for Surface Water Use

Facilities for surface water use are proposed as mentioned below and as shown in FIG.9.2-6.

1) Dams on Rivers and Torrents

In order to use surface water of rivers and torrents effectively, dam sites were selected through detailed investigation of the following items:

- Effective and safe storage of rainfall in the rainy season;
  - Sufficient catchment area and proportionate dam capacity;
  - Adequate bearing capacity of the rock foundation and geological stability;
  - Topographic and geological conditions which allow safe release of large discharge during floods;
  - Narrow river width for economical dam construction works;
- Relation with planned water use for irrigation, etc. -
  - Potential for establishment of concentrated areas of farmland surrounding proposed dam site;
  - Potential for supply of irrigation water by gravity from reservoir and/or by simple pump having a low head capacity; and,
  - Situated near villages, with potential for multiple water use.

Dam features were determined for each site selected by the above criteria, and are shown in TABLE 9.2-2. Dams are classified into three types as illustrated in FIG. 9.2-7.

2) Storage of River Water by Weirs

Weirs for storing river water are planned at suitable sites with the following conditions:

- Year-round flow
- Farmland with irrigation potential located near the facilities with easy access to river water
- Stable water route
- Minimal disturbance of river course both above and below the weir site.
- Topographic and geologic stability of the site

There are six weir sites in the Study Area and the features of each are presented in TABLE 9.2-3.

Furthermore, where there is a large catchment area at the proposed site, it is necessary to keep in check the rising river level during floods. The diversion weir should therefore be installed to prevent farmland close to the river from being damaged by flood.

3) Small-scale Facilities For Torrents

Mini-dams are effective small-scale facilities for harnessing the flow of torrents, and are planned and constructed by the Soil Conservation Department, Punjab. Installation of these facilities is planned in small torrents which have flow for several days only or just after rainfall in the rainy season.

Proposed dam height is about 3m with the capacity to irrigate only the farmland of several farmers. The structure is made of masonry and construction works are relatively simple and appropriate for the technological level of farmers living in the Study Area. However, expert advice is required for site selection.

4) Mini-hydropower Station

Mini-hydropower is planned for generation at multipurpose small and mini dams. Accordingly, minimum conditions for installing mini-hydropower facilities such as discharge, water head etc. are as outlined below.

Condition

a) A discharge is required of more than 0.05 m^3/s; therefore, facilities adopted should have access to a discharge during periods of power demand which is equivalent to $0.05m^3/s$ or more.

b) A water head is required of more than 3 m.

Hydropower generation using the above facilities is as outlined in TABLE 9-2-4.

9.2.2 Development of Other Surface Water Resources

(1) Small Rivers

There are many small rivers and torrents which flow for several days and/or just after rainfall in rainy season, but dry up in the dry season. It is possible to develop the available surface water by adapting appropriate sites and develpment schemes. Existing and planned irrigation facilities are mentioned below.

These facilities can be constructed by one and/or several families due to their smaller scale in comparison with those facilities previously mentioned. However, although the works are small, they are engineering works, and a plan based on wide investigation, study and careful judgment is required. Lack of planning in the past has resulted in destruction of facilities by flood. The proposed facilities are furthermore planned as multipurpose rather than single purpose. They encourage the cooperation of farmers in maintenance and operation and ensuring long-term benefits. Effective utilization of water resources and land conservation are the basic objectives of multipurpose facilities while construction of access roads is an additional benefit. Construction of reservoirs also results in the numerous benefits as previously mentioned.

The above facilities are located in the upper reaches with a small river course that leads directly to the farm area thus increasing the effects of land conservation.

(2) Gully Erosion

There are many gully erosion sites in the Study Area. A number of facilities to prevent further gully erosion can be

planned in the area, including a debris barrier, chute works and terracing combined with small-scale village ponds. These structures which temporarily store runoff discharge from rainfall without releasing it directly downstream serve to increase soil moisture content by providing ground water in the gully area. This will result in resuscitation of plant life around the eroded area. In addition, the alluvial plain will be expanded upstream after construction, providing land suitable for vegetation.

(3) Village pond

Floods caused by heavy precipitation concentrated in the rainy season inundate farmland for short durations and lowlands for long durations. Overflow from the drainage canals aggravates gully erosion by washing away soil and eroding the land. Village ponds are effective for collecting rainfall in villages isolated from river and dam construction. There are a number of such ponds of various sizes in the Study Area. However, the majority of ponds were formed in natural depressions rather than being planned and constructed. Village ponds should be constructed to maximize water use and land conservation.

Although land is required for making ponds, the long-term benefits of water use and land conservation will offset the initial loss. The water in the reservoir cannot be used for drinking water but there are other merits and in particular the link between ponds and aquifer replenishment would prove very beneficial. As for pond construction, the scale and site will be determined through study of among other things, improvements to the village and surrounding farmland.

9.3 Ground Water Development

9.3.1 Ground Water Development Potential

The hydrogeologic structure of the area is determined by features of the sandstone and Nimadrics shale bedrock. Quaternary deposits are discontinuous due to occurrence of numerous detached bedrock outcrops (FIG. 9.3-1). The deposits are thin and can be regarded as low productive aquifers except on both sides of the rivers.

Sand and gravel layers have generally high productive yield. In the Study Area, these layers are equivalent to Quaternary sand and gravel layers on both sides of the Kurang, Gumreh Kas, and Soan Rivers (FIG. 9.3-2A) and form highly productive unconfined aquifers. Highly productive confined aquifers are formed in Quaternary sand and gravel layers more than 100m thick in the National Park area and the lower part of the Soan River including UC Sihala. Relatively high productive confined aquifers are formed in Quaternary sand and gravel layers more than 50m thick on the northeastern side of Rawal Lake. Bedrock is exposed and percolation to Quaternary sand and gravel layers is impeded (FIG.9.3-2B) along the riverbeds of the Kurang and Gumreh Kas at an elvation exceeding 549m (1,800ft) and along the riverbed of the Soan River at an elevation above 503m(1,650ft). On both sides of Malal Kas, bedrock is exposed in a large portion of the riverbed and Quaternary deposits are localized, thinner and clayey.

In loessic uplands, clay and silt layers about 20m thick are widely distributed. An unconfined aquifer is formed in weathered portions of the upper part of the bedrock and the lower part of the loessic deposits. Percolation from rivers to aquifers is impeded. Ground water in loessic uplands is thus only recharged by precipitation.

As ground water flow is governed by the contour of the upper bedrock portion, there is little ground water in areas of exposed bedrock and bedrock ridges.

Percolation from Rawal Lake to the Quaternary layers is rapid while that from Simly Lake is much slower.

There are springs in Shah Allah Ditta, Shah Darah and Maira Begwal villages and water mills for milling as well as for bathing and washing facilities have been installed.

9.3.2 Multipurpose Ground Water Development

Ground water is used for domestic and micro-scale irrigation purposes. Rural inhabitants haul about 5gal/man-day of water for domestic use from small shallow wells near their settlements and about half the wells run dry in dry season in April, May and June. Wells are used for irrigation of crop fields on alluvial terraces in the UC Sohan and of

household vegetable gardens. There are some springs in Shah Allah Ditta, Shah Darah and Maira Begwal villages which are used for domestic water supply.

Based on the features of ground water use, water supply facilities which ensure quantity and quality of domestic water will greatly enhance the health and living conditions of the rural populace. Moreover, use of ground water for irrigation will result in increased crop production and thereby increased farm income.

CHAPTER X

DEVELOPMENT OF AGRICULTURAL SECTOR

10.1 Problems and Present Development Efforts

10.1.1 Problems of the Agricultural Sector

The Study Area receives greater rainfall than other Barani areas and has a relatively high agricultural potential for this climatic zone. Agricultural development however, is restricted by a variety of factors which are outlined below.

(1) Land Use and Conservation of Land and Water Resources

Problems concerning land use and conservation are delineated as follows and include large tracts of waste land, degradation of mountain and farm land, and inadequate land use accompanying urban development.

1) Land Use

- Wide expanses of undeveloped or underdeveloped wasteland.
- Lack of vegetation cover in mountain areas and consequent low water conservation capacity.
- Low cropping intensity rate due to fallow.
- Use of good farmland for other purposes.
- Land acquisition by CDA and friction between farmers and CDA.

2) Conservation of Land and Water Resources

- Loss of farmland due to encroachment of waste lands and erosion hazard in cultivated land.
- Degradation of waste land and mountain areas and reduction of the water conservation capacity.

3) Village Natural Environment

- Lack of water bodies and greenery.
- Lack of recreation facilities.

(2) Crop Sector

Various factors delineated below contribute to low agricultural productivity, particularly in relation to the natural

environment, technology and socioeconomic conditions. However, it is considered that these problems are perpetuated primarily due to lack of water resource development, delay in farmer training and the existing socioeconomic conditions.

1) Natural Environment and Technology

- Irregular distribution and shortage of rainfall.
- Lack of water resource development.
- Soil erosion and low soil fertility.
- Traditional, extensive dry farming system (farming practices and cropping patterns).
- Lack of farm machinery and inappropriate land preparation methods.
- Delay in road development.

2) Socioeconomy

- Extremely small farm size.
- Fragmented farmland.
- Increasing trend towards part-time farming and dependence on women, children and the elderly for farming operations and lack of incentive among farmers.
- Lack of adequate support services such as farm input (improved seed, fertilizer, agro-chemicals) supply system, agricultural extension services and agricultural credit systems.
- Difficulty in organizing farmers.
- Inadequate education and training systems for farmers.
- Lack of a marketing system.

(3) Livestock Sector

Livestock sector in the Study Area consists of traditional livestock raising in which draft power and ownership of animals itself are emphasized. Under the present farming system which stresses food production, livestock feeding is predominantly dependent on grazing and crop residue, resulting in low productivity. Accordingly, various constraints in feed supply, livestock breeds, animal health, and the livestock raising system delineated below should be overcome.

1) Feed Supply

- Basic shortages of feed; i.e., over stocking of animals.
- Seasonal fluctuations in availability of feed.
- Poor quality of available feed.
- Lack of adequate range management system.

2) Livestock Breeds

- Stocking of cattle breed with low productivity due to emphasis on draft power and poor genetic quality.
- Lack of a livestock improvement system.

3) Animal Health

- Inadequacy of health service facilities and system.
- Lack of health research facilities.

4) Livestock Raising System

- Traditional livestock raising practices and over stocking.
- Stocking of cattle for dual purposes of milk production and draft power.
- Under development of raising systems appropriate to the Study Area and inadequate technology extension system.

The various types of problems outlined above are mostly related to lack of basic knowledge of farmers and an appropriate livestock development system including education and training of farmers.

(4) Inland Fisheries

Development of inland fisheries in the Study Area is still in the initial stages and facilities and a system required for promotion of the same have not yet been established. Moreover, the majority of existing fish farming is managed by the government with very little being conducted by the ordinary farmer. The following problems must be dealt with for promotion of inland fisheries including extention of fish farming to the farmers.

- Shortage of fish fry or unstable supply system (there are no facilities for fish fry production).
- Shortage of water bodies for fish farming.
- Lack of fishery technology appropriate to the area.
- Lack of facilities and system for extension of technology.
- Low demand and seasonal fluctuations in demand.

10.1.2 Present Development Efforts

Most agricultural development in the Study Area depends on the efforts of individual farmers and agricultural production is conducted under the support and guidance of the agencies and organizations mentioned in CHAPTER V section 5.10. Development efforts are also being made by foreign aid, international organizations, NARC, CDA, etc. Major development efforts presently being undertaken are outlined below.

(1) Crop Maximization Project

This project commenced with the summer cropping in 1985 under cooperation from the Government of Italy. The project aims at strengthening of wheat and maize production including supply of farm machinery, seeds, fertilizer and agro-chemicals. A total of 8 demonstration farms, 2 in Tarlai, 2 in Bhara Kau, and 1 each in Kirpa, Koral, Phulgran and Sihala are in operation. Large scale expansion of the project is planned and substantial contributions to improvement of crop production is envisioned.

(2) Barani Agricultural Research and Development Project (BARD) and NARC Technology Development

The BARD project which commenced in 1982 aims to research and develop farming in Barani areas and is being implemented by NARC with cooperation from Canada. The project covers various fields such as farming system, oil seeds, range management, and farm machinery development, and research on farming systems and growing tests are being conducted in the Study Area. In addition, experiments for technology development and farming practices are being implemented by NARC alone or with cooperation from CIMMYT.

The major fields of technology development for dry farming presently being implemented by NARC are as follows:

- Tests on land preparation methods.
- Development of cultivation technology for soil moisture conservation.
- Rotation system.
- Progeny test for artificial insemination of dairy cows (practical experiments).

(3) Vegetable and Poultry Schemes

In response to increased demand for vegetable, eggs and poultry, in Islamabad, Vegetable and Poultry Schemes were started in three locations by CDA in 1968. At present, four schemes (about 700 ha) are in operation and these have greatly increased production of eggs and poultry in the Study Area. In the case of vegetable production on the other hand, substantial results have yet to be obtained. Moreover, this scheme has fostered the development of commercial farmers resulting in the division of farmers into classes.

(4) Range Research Project Pothwar

This project was began by PARC under the cooperation of the Department of Forestry of Punjab Province and aims to develop a research and demonstration area in Rakh Lohi Bher of UC Koral. Main fields included within the project are:

- Development of a model range management system.
- Analysis of range vegetation in response to range management methods and range improvement.
- Development of scientific grazing methods.

Based on results of experiments to date, promising varieties of trees and grasses have been selected.

10.2 Objectives of Agricultural Sector Development

Development of agricultural sector must be planned in accordance with natural and socioeconomic conditions of the Study Area. Improved productivity, increased farmers' income, economic independence of farmers and food supply to the urban area are envisioned with promotion of

agriculture in the Study Area which is located in the rural area surrounding the capital of Islamabad. Creation of the improved natural environment for both the rural and urban populace is also anticipated through development of the agriculture sector. However, social factors such as the small farming scale place constraints on development. Accordingly a short-term approach including immediate economic benefits must be integrated with a long term approach envisaging overall improvement of the living envoronment.

1) Short Term Objectives

- Improvement of agricultural production and increased farmers' income with particular focus on small-scale farmers.
- Development of agriculture in order to establish the area as a food supply base (vegetables, fruit, meat and dairy) for the expanding cities of Islamabad and Rawalpindi.
- Development of rural area with a wealthy natural environment based on rational use and conservation of land resources.

2) Long Term Objectives

Establishment of an agricultural system which fosters the economic independence of individual farmers is an important objective in promotion of agricultural development in the Study Area. Accordingly, the long term objectives are training of key farmers who will play an important role in future improvement of the agricultural structure, and creation of a prosperous rural area.

In summary, short term objectives under the present agricultural system will aim for establishment of agriculture which will fullfil the functions expected for the suburban rural area, improving agricultural productivity while at the same time conserving the natural environment. Long term objectives on the other hand, will aim for economic independence of the farmer.

10.3 Development Countermeasures in Each Field

Agricultural development will be achieved through integrated implementation of development countermeasures in each agricultural subsector. The development strategies for each field and the practical countermeasures formulated to meet them will therefore form the basis of overall development of the agricultural sector in the Study Area. Such countermeasures and strategies were formulated in consideration of the problems of the agricultural sector, the results of questionnaire surveys and the development objectives as summarized hereunder.

10.3.1 Land Use and Land and Water Resource Conservation

(1) Strategies

Conservation and effective use of land and water resources which are the foundation of agriculture and the natural environment is the key to agricultural development. Strategies for the same are: 1) effective land use, 2) conservation of farmland, and 3) conservation and effective utilization of wasteland.

(2) Proposed Countermeasures

1) Proposed Land Use Plan

Measures in order to ensure appropriate and effective land use and conservation of resources are proposed below,

Present Land Use	Proposed Land Use
Cultivated Land	Continuous use as cultivated land with relevant soil conservation measures is proposed. Increased land use intensity will be envisaged through irrigation development and improvement of cropping pattern.
Wasteland[1/]	Establishment of green areas as pasture land, forest, range land or vegetation reserved area are proposed through land and water conservation measures.

- to be cont'd -

Mountain and Hilly Area[2/]	Land and water conservation is proposed in the area by restricting land use through designation as vegetation reserved area
Other	Afforestation in villages and along roadsides is proposed for environmental improvement

1/ Culturable wasteland and unculturable wasteland in the plains.

2/ Include reserved forests.

2) Land and Water Conservation

The following countermeasures based on the present land use are considered essential.

a) Conservation of Farmland

Two different approaches of countermeasures are required in conservation of farmland; one which deals with soil erosion in cultivated lands and one which prevents loss of farm land caused by the encroachment of neighbouring wasteland.

i) Control of Soil Erosion:

Culivated land in the Study Area is terraced or levelled to some extent to prevent soil erosion and conserve rainfall. These conservation works however are incomplete and topsoil is washed away during heavy rain in rainy season. Accordingly, countermeasures are required which allow temporary storage of rainwater within fields, including restriction of surface flow velocity.

In addition, regular and extensive rat control, and erosion control through appropriate farming practices are to be introduced, and training, education and supervision of farmers by the Markaz or concerned extension body are required.

ii) Prevention of Encroachment:

Encroachment of neighbouring wasteland on farmland is significant as a result of overgrazing, erosion and runoff. Long-term measures as well as emergency measures involving engineering and vegetative measures should be implemented.

b) Conservation and Utilization of Wasteland

Countermeasures involving conservation and utilization of wasteland should be implemented in conjunction with land classification based on soil

conditions, susceptibility to erosion and present degree of devastation. As data concerning the above and air photographs were unobtainable during the Study period, the following conservation countermeasures primarily aiming at prevention of further degradation of land resources are proposed on the basis of wasteland classification by the Land Revenue Department (culturable wasteland and unculturable wasteland).

i) Conservation and Utilization of Culturable Wasteland:

This land is culturable with implementation of earthworks, however, the risk of erosion is also great. Land conservation should therefore be emphasized and use for grazing land or grassland through grassland reclamation is proposed.

ii) Conservation and Utilization of Unculturable Wasteland:

The proposed area for conservation measures is about 9,000ha of eroded land, unculturable wasteland in the plains excluding mountain and hilly area. This is further subdivided into areas which can be used for range land and those which are either too badly eroded or too rocky for use and separate countermeasures are required for each type as follows.

iii) Conservation of Unculturable Wasteland with Potential for Range Land Development:

Those areas of range land development potential can be used for a variety of purposes such as grazing, grassland, fuel wood forest and other forests with reseeding, afforestation and protection of existing useful tree species. To avoid further devastation of land, conservation countermeasures based on vegetative measures without land shaping are proposed.

iv) Conservation of Unculturable Wasteland with No Potential for Range Land Development:

Use of unculturable wasteland which cannot be developed for range land should be restricted as vegetation reserved area and the recovery of natural vegetation should be planned.

c) Conservation of Mountain and Hilly Area

Mountain and hilly area should be conserved as vegetation reserved area in order to promote recovery of the natural vegetation.

10.3.2 Promotion of Crop Production

(1) Objectives

Agriculture in the Study Area consists of crop production and livestock raising under the dry farming system. The greatest constraints to rainfed farming is shortage of water and introduction of irrigation through development of water resources is therefore considered the most effective means to enhance crop production. Potential water resources for irrigaiton development however, are limited, and rainfed farming is expected to remain central to crop production in the Study Area. Development of rainfed farming is an important goal of the Sixth Five Year Plan and various efforts as mentioned in section 10.1.2 towards the same are being made in the Study Area. The Crop Maximization Project for example, aims at extension of packaging technology directly to the farmer and development of rainfed farming technology is emphasized in research and experimental activities. Extension of these development efforts in the Study Area is to be promoted in the future and for this purpose the strengthening of extension system of farming technology, supply system of farm inputs as well as establishment of farmers incentives should be planned. For example, inadequate hiring service of farm machinery is one reason for existence of fallow land comprising about half of the cultivated area every cropping season. Expansion of the hiring service will promote the introduction of such technologies as improved land preparation methods and timely sowing which will bring about increased productivity. Therefore expanded hiring services should be planned for promotion of crop production.

On the basis of the above, the strategies for promotion of crop production are summarized as follows:

- development of irrigation farming
- development of rainfed farming
- expansion of the farm machinery hiring service

(2) Proposed Countermeasures

1) Development of Irrigation Farming

Irrigation farming is rarely practiced in the Study Area and there is much undeveloped potential for introducing irrigation farming technology. Year-round, supplementary and water saving irrigation methods will promote maximum utilization of water resources. Irrigation schemes are essential from the standpoint of removing constraints on new crop and technology introduction into the Area.

a) Selection of Crops

In selecting crops for introduction, the following items specific to the Study Area should be considered, as well as regular study items such as profitability and marketability.

- In consideration of strong insistance of farmers on self-supply of food and the present cropping system which emphasizes production of wheat, an increase in wheat production is required.
- Introduction of new crops should be planned after the establishment of farmers' technical skill with regards to irrigation, and development of cultivation technology in experimental or research agencies. Therefore, production of extensively cultivated crops which are popular with farmers should be considered primarily.
- Introduction of vegetable and fruit crops is required in consideration of the area's envisioned role as a food supply base for urban areas. However, vegetable crops should be introduced in stages which correspond to actual demand.
- Expansion of fodder crop cultivation is required in correspondence with development of the livestock sector.
- In the future, establishment of crop rotation systems with introduction of leguminous crops and pasture is necessary.

In consideration of the above factors and availablity of irrigation water, and in accordance with conditions of the proposed irrigation areas, crops to be introduced are proposed as presented in the following table.

Conditions of Irrigation Areas	Proposed Crops
Areas close to markets and villages where farm management is relatively easy (including proposed irrigation area by ground water)	Vegetables and field crops[1/]
Areas located in slopeland or stony soil lands	Fruit[2/]
Areas with limited irrigation water supply and areas far from villages where farm management is difficult	Upland crops[1/]

1/ Proposed upland crops include wheat, maize, pulses, and fodder crops while crops such as soybeans and sunflower could be introduced in the future.

2/ Citrus etc.

b) Introduction of Irrigation Farming Technology

The majority of farmers in the Study Area have had no experience with irrigation farming and therefore introduction of irrigation farming techniques must accompany irrigation development. Considering the farmers' present farming level and management conditions appropriate technology which can be easily assimilated by the farmers should be introduced. Extensive introduction of irrigation technology with cooperation from NARC is preferable and the following countermeasures are proposed.

i) Extension of Irrigation Farming Technology:

Establishment of demonstration farms using farmers fields is proposed in order to ensure direct dissemination of technology to the surrounding farmers. At least one demonstration farm should be in each proposed irrigation area.

ii) Extension of Intensive Irrigation Farming Technology:

Establishment of pilot farms for intensive irrigation farming are proposed for extension of intensive vegetable cultivation techniques which deal with various objectives such as water saving, high profitability and intensive utilization of farm land.

To facilitate technology transfer, establishment and extension of technologies and training of farmers will be undertaken through practical training, demonstration and production. Technology to be transferred will be appropriate to the needs and capacity of the farmers.

2) Rainfed Dry Farming Development

The majority of farmers in the Study Area are dependent on rainfed farming and development of the same is essential for improvement of farm income. As indicated in section 10.1.1, there are numerous problems with respect to existing rainfed farming and the farm management level of farmers in the Area is very low.

Major crops in the Area are wheat, maize, and pulses and present yield level is as low as 20 to 30% of the yield achieved in experimental cultivations. Therefore, potential for productivity improvement will be high. Although introduction of some new crops has been attempted, promotion of rainfed farming development is envisaged to be based on strengthening of production of the current major crops cultivated in the Area for the following reasons.

- The farmers are mainly concerned with self-supply of food and have a marked preference for these crops.
- Farmers are familiar with cultivation practices for these crops and potential for productivity increase of the same is sufficient.
- On consideration of technical level of farmers, introduction of new crops would be difficult and the same should be planned as a long term objective.

The Crop Maximization Project which aims at development of rainfed farming is already underway with foreign cooperation and the same is expected to affect farmers in portions of the Area. However, the level of technology to be introduced under this project is comparatively higher than the present technical level of the farmers and thus extension to farmers other than those in the benefit area will be

difficult. Therefore, for the development of rainfed farming in the entire Study Area, introduction of appropriate technology which will be easily accepted by farmers should be aimed at to optimize crop production.

On the basis of the above understandings, countermeasures for rainfed farming development in the Study Area are proposed as presented below.

a) Improvement of Cropping System

The present cropping systems prevailing in the Area include a half-year to one year fallow period and, on the basis of their long history in the region can be considererd as viable systems for subsistence level farming at low risk. With changes in socioeconomic conditions however, the demand for higher land productivity is increasing and improvements on the cropping systems which are compatible with present technological levels are required. For example, although fallowing is practiced aiming for conservation of soil moisture and improvement of soil fertility, these practices have no scientific basis. Moreover, the effectiveness of tilling practiced several times in the fallow period during rainy season is also uncertain. Increase of cropping intensity through improvement of cropping systems is an important objective in order to improve the productivity of small-scale rainfed farming.

Accordingly, the following items should be studied for improvement of the present dry farming system, as well as experiments being conducted by NARC and other agencies.

- Comparative study on cropping systems.
- Relationship between soil moisture and cropping systems, land preparation methods and cultivation practices.
- Cropping system emphasizing summer crops; and cropping system including soybean and legumes.

Cultivated area in the Study Area is divided into "lepara" land located near villages under intensive management with application of organic matters such as farm yard manure, and "mera" land located at considerable distance from villages and under extensive cultivation. Double cropping is usually practiced in the former. Therefore, the study on effect of organic matters is also an important subject for improvement of cropping system in the Study Area.

In view of farming practices and farm management levels of farmers, as well as the lack of experimental and research results, possibility for improvement of cropping system is presently faced with constraints; however, improvement of cropping intensity through introduction of fodder crops is considered feasible.

Through introduction of fodder crops during the winter fallow period cropping intensity will be raised considerably. Thus, green fodder can be obtained in winter and mixed cropping of wheat and rape seed will also be prevented.

b) Improvement of Farming Practices

On the basis of present technical levels and farmers incentives, introduction of appropriate technology should be planned. Such technology should bear obvious results, not be greatly different from present technology, and practicable by family labor. Moreover, as the majority of rainfall is lost through runoff despite the importance of rainfall conservation for rainfed farming, levelling of cultivated land is an essential countermeasure for soil and water conservation.

Based on the above, early introduction of the following measures is envisioned to have substantial effect.

- Improvement of tilling methods such as deep plowing once every one or two years and improvement of seed bed preparation.
- Levelling of cultivated land.
- Use of improved seeds and fertilizers.
- Row planting and manual weeding.

Farming practices for which gradual introduction is particularly necessary are: application of organic matters; crop protection measures; and, mechanization of farming operations such as sowing.

c) Strengthening of Technical Extenion

Agricultural extension activities in the Study Area are under the jurisdiction of the Technology Transfer Unit (TTU) of NARC. The Crop Maximization Project discussed in section 10.1.2 is being implemented with TTU acting as the direct counterpart and is one of major undertakings of the same. Although the scope of activities is wide ranging from technology transfer to farmers to supply of farm inputs, extension workers are few in number and extension activities involving individual

farmers are limited. Promotion of extension activities covering as many farmers as possible is essential for development of rainfed farming. This requires strengthening of extension workers and improvement of transportation supply. Moreover, long term planning for training of key farmers and promotion of cooperative farming opperations should be undertaken as soon as possible.

3) Expansion of Farm Machinery Hiring Service

Farm machinery hiring services are provided by both public and private sectors, the public service being provided at each Markaz. The scale of public services offered is smaller in comparison with that of the private sector and therefore extension of public services is necessary to ensure fair distribution of service and extension of appropriate land preparation methods. Constraints with regards to the Markaz hiring service are as follows:

- Shortage of tractors during peak demand period.
- Lack of services for areas located at a distance from the Markaz and for small-scale farmers.
- Long time required for repair and maintenance due to lack of workshops.

Farmers demand for extension of Markaz hiring service is high and the following countermeasures are required for the same.

a) Establishment and Strengthening of a Service System

Countermeasures include establishment of a service system which covers the entire Study Area as well as an increase in the number of tractors and maintenance facilities.

b) Improvement of Land Preparation Method

Farmland is usually tilled five times or more during the fallow period in the Study Area. This is a traditional farming practice aimed at conservation of soil moisture and weeding; however, its actual effectiveness in conserving soil moisture is unclear. According to results of tests conducted by NARC, plowing can be reduced to three times with the introduction of deep tilling. Improvement of the land preparation method through introduction of appropriated machinery is a countermeasure urgently required.

c) Training of Farmers

Countermeasures for machinery hiring service expansion should also include training of farmers in driving and maintenance of tractors as a part of fostering development of key farmers who will lead agricultural development in future.

10.3.3 Livestock Development Promotion

(1) Strategies

Livestock sector is a traditional industry in the Study Area and development potential of the same as a supply base of livestock products to Islamabad and Rawalpindi is considered to be substantial due to the present large livestock population and familiarity of farmers with livestock raising practices. On the other hand, emphasis on number of stock over productivity has led to surplus stocking aggravating shortage of fodder as a serious problem. Livestock development is an important part of agricultural development and should be planned to achieve the following objectives.

1) Improvement of Feed Supply

Present supply of feeds such as crop residues from cultivated area in the Study Area is estimated to account for about 30% of the maintenance nutritional requirement for livestock in terms of TDN and dry matter or about 15% if DCP, and accordingly drastic improvements in feed supply are required.

2) Genetic Improvement of Livestock

Poor genetic quality of animals is a major cause of low productivity and therefore improvement of the same is an important strategy.

3) Strengthening of Animal Health Services

Due to lack of facilities, existing health services offer incomplete coverage of the Study Area. Improvement in hygienic conditions for livestock will have a prompt and beneficial effect on productivity, and accordingly the same requires urgent implementation.

4) Improvement of the Livestock Raising System

Livestock raising in the Study Area is based on traditional raising methods and extension of an economic and scientific raising system is therefore urgently required.

5) Training of Farmers

For smooth extension of improvements in animal health, breed and raising system, farmers must sufficiently understand the need and effect of these elements. Training and education of farmers accordingly forms the basis of future livestock development.

6) Establishment of Marketing System

Distribution of livestock products is predominantly in the hands of individuals, without systematic distribution. Establishment of a distribution system corresponding to future increases in livestock production is thus required.

(2) Proposed Countermeasures

Livestock development will be promoted through integrated implementation of each countermeasure as outlined below.

1) Feed Supply Improvement

Both quality and quantity of feed supply must be improved. Most of the components for feed supply improvement, as shown below, will be achieved through the integration of countermeasures proposed in various fields such as promotion of crop production etc.

Countermeasures	Practical Measure	Related Activities in Other Fields
Increased production of fodder crops and crop residues	Expansion of cropped area and yield improvement	Irrigation development, Rainfed farming development
Afforestation	Planting of fodder trees	Land and water conservation
Range land development	Reclamation of waste-land to grassland	Land and water conservation

Improvement of feed quality	Inexpensive concentrated feed (use of molasses and urea)	Small- scale industry development
Use of presently unutilized feed material	Raising of waterfowl (duck etc.)	Inland fishery development

2) Genetic Quality Improvement

The introduction of artificial insemination and distribution of improved livestock breeds are proposed for genetic quality improvement. The results of artificial insemination are evident from actual implementation in Punjab Province and farmers expectations are high. Frozen semen may be supplied from the existing semen production unit in Punjab Province or the proposed unit in Rawalpindi. Distribution of qualified livestock is anticipated to provide farmers with incentives to livestock improvement.

3) Strengthening of Animal Health Services

The strengthening of the service system including facilities and research activities is required. Moreover education of farmers in the importance of animal health is essential.

4) Improvement of the Livestock Raising System

In order to increase productivity of livestock, it is necessary to establish and extend a livestock raising system appropriate to the area including use of concentrated feed, etc. Establishment of livestock holding scale corresponding with the quality and quantity of feed procurable by the farmers is also necessary.

5) Training of Farmers

Training and education of farmers is vital to promotion of livestock development and establishment of extension facilities and extension system is therefore required.

10.3.4 Inland Fishery Development

(1) Strategies

At present development efforts for inland fisheries are mainly focused on the Rawal and Simly lakes while extension of inland fisheries for farmers is limited. Strategies for inland fishery development which primarily aims for participation of farmers are as delineated hereunder.

1) Supply of Fish Fry

A large percentage of fish fry are procured outside the Study Area to fulfill annual demand, and supply is unreliable. Stable supply of fish fry, in sufficient quantity and quality, is therefore an essential element for inland fishery development.

2) Provision of Water Bodies for Fish Farming

Provision of water bodies is a prerequisite to extension of fish farming among farmers. Use of community water bodies is of course possible; however, provision for extension of small private fish ponds is also necessary.

3) Extension of Fish Farming to Farmers

Small-scale fish farming in ponds is profitable and is envisioned to improve the diet of rural residents. Duck raising combined with fish farming will supply eggs and meat while at the same time eliminating distomia hosts. Bird droppings may be used as feed for fish. Fish farming however, is rarely practiced among farmers at present and therefore extension of the same is an important part of inland fishery development.

4) Demand Development

The majority of people in Pakistan are not traditional fish eaters and thus demand for fish is not large. However, as fish are an inexpensive source of protein which would contribute to nutritional improvement, potential demand is considered large. Development of demand as well as establishment of a marketing system including refrigeration

facilities is accordingly a key to inland fishery development.

(2) Proposed Countermeasures

1) Fish Fry Supply

Establishment of fish fry production facilities is required to ensure stable supply of sufficient fry both in quantity and quality.

2) Provision of Water Bodies for Fish Farming

Ten reservoirs will be available for inland fish farming with implementation of the irrigation development scheme proposed in this Master Plan. Moreover, small-scale ponds proposed in other schemes will be used for the same.

3) Extension of Fish Farming to Farmers

Establishment of demonstration facilities, construction of community ponds, excavation of small ponds for individual management and distribution of fish fry are among the activities required for extension. In addition, selection of fish species and establishment of fish farming technology which is suitable for the locality are also essential.

4) Demand Development

One reason for the low fish demand is lack of opportunities to eat fish. It is therefore necessary to provide opportunities for inhabitants to taste fish and also to learn cooking methods, etc. in order to increase demand. In addition, the establishment of a marketing system will also become necessary to handle future production increase including storages and transportation facilities.

10.3.5 Promotion of Marketing and Processing of Agricultural Products

The present marketing system in the Study Area is inadequate, lacking sufficient facilities and roads. Moreover, processing of agricultural products produced within the area is limited to those for self consumption. With implementation of the Master Plan, expansion of

marketing volume and surplus production are forcasted and therefore establishment of a marketing system and facilities will be of vital importance in the future. Utilization of existing facilities such as cold storages and milk plants should also be promoted.

10.4 Development Plan for Agriculture Sector

A development plan for the agriculture sector was studied from a wide angle including physical conditions, needs of rural people, degree of urgency, technical levels, government policies, adminsitrative capacity and manpower resources. On this basis and including the proposed countermeasures for development as described in the previous sections, proposed development schemes for the agricultural sector are formulated as presented below.

Proposed Development Schemes	Countermeasures Included
Land and Water Conservation Scheme	- Control of soil erosion - Prevention of encroachment of wasteland - Conservation and utilization of wasteland
Irrigation Scheme	- Surface water development - Water intake facilities - Irrigation facilities - Introduction of irrigation farming
Ground Water Multipurpose Development Scheme	- Ground water development - Water distribution facilities - Irrigation facilities
Intensive Horticulture Promotion Scheme	- Establishment of pilot farms - Technical extension - Manpower development
Agricultural Machinery Station Scheme	- Establishment and strengthening of farm machinery hiring service - Training of farmers - Improvement of land preparation methods
Livestock Development Promotion Scheme	- Extension of artificial insemination and distribution of qualified livestock

	- Establishment of facilities and strengthening of animal health services - Establishment and extension of livestock raising system - Establishment of extension facilities and system
Inland Fishery Development Scheme	- Establishment of fish fry production facilities - Extension of fish farming (demonstration ponds, village community ponds, distribution of fish fry) - Use of proposed water bodies in the Master Plan

Development of rainfed farming was not included within the development plan as such development is considered attainable through present development efforts, and improvement and strengthening of support services.

CHAPTER XI

DEVELOPMENT OF RURAL INFRASTRUCTURES

11.1 Existing Conditions and Problems

Karachi was temporarily designated as the capital of new Pakistan in 1947. A Site Selection Commission was appointed to prepare a report on the location of the capital in 1959, and the Government decided in favour of the Pothwar area on the basis of the recommendations made by this Commission. The Government gave the new capital the name of Islamabad in 1960, and construction work commenced in 1961. As mentioned before, Islamabad is divided into two portions: the urban area and rural area, the latter of which is Study Area of the Master Plan. Construction works and development in the new capital territory have mainly been concentrated in the urban area.

In the rural area, on the other hand, very little development has taken place. Basic facilities and services required for improvement of living conditions are lacking, including roads, bridges, transportation capacity, mail services, telephones, electrification, fuel gas, drinking water, irrigation and drainage facilities, land conservation, storage and market facilities, education facilities, vocational training, medical and health services, social welfare, housing, community centres, recreation facilities, security services such as police and fire brigade, etc.

These problems and difficulties must be overcome for well-balanced development of Islamabad and to provide better living conditions and environment on an equitable basis for the population in both urban and rural areas.

11.2 Transportation & Communications

Adequate transportation and communications are essential elements for a satisfactory living environment. It is also crucial that these elements be developed at a level in keeping with the desired standard of living of an area. If transportation and communication networks are substandard, they constitute a serious impediment to further socio-economic progress. In this frame of thinking it is crucial to upgrade these systems in the Study Area.

11.2.1 Transportation

Transportation in the ICT and its environs consists of:

- National, provincial and municipal roads;
- Pakistan Railway (Main Line) Rawalpindi, Sihala and Sang Jani Stations;
- Islamabad International Airport (Rawalpindi); and
- Public buses, private buses (mini-buses, wagon taxis, light trucks, etc.).

Of the above, roads and vehicles pertain to the daily life and activities of the rural people.

Motorization in Pakistan has gradually extended with 2.9 times the number of registered vehicles, and 2.2 times the ownership rate of ten years ago (See table below). In addition, the average increase in registered vehicles in the ICT indicates 6.7 vehicles per year per 1,000 persons which is about four (4) times the national level of 1.7. This indicates development of motorization (See Annex).

NUMBER OF MOTOR VEHICLES REGISTERED IN PAKISTAN

Year	Registered Vehicles (x 1,000 Nos)	Population (x 1,000 Persons)	Number of Vehicles per 1,000 Persons
1973	458	66,879	6.85
1978	873	77,572	10.76
1982	1,338	87,758	15.25

Source: "Pakistan Statistical Yearbook 1985"
Statistics Division, Government of Pakistan

The road network in the urban area is now being constructed by CDA based on the master plan issued in 1960. Rights-of-way are in relatively good condition with adequate space on metalled roads to accomodate traffic demand. The road network in the rural area on the other hand, totals about 390km with a density higher than the national level. The rural area is served by national, provincial and capital roads; however, these are located disproportionately close to the urban area. Municipal roads total about 190km in length; however, 65% of these are Katcha roads which are unmetalled roads in poor condition only passable by tractor. In the rainy season from July to September, the base course becomes soft and passage of motor vehicles is very difficult. As the Katcha roads were originally

developed for transport of farm produce by donkey or camel, the average width is about 3m, posing a major obstacle for transportation in the rural area. There are 133 villages in the Study Area, of which only around 40% are linked by metalled and shingle roads while the remainder are connected by non-motorable Katcha roads and paths.

Rural roads are undeveloped in UCs located in hilly and mountainous zones such as Bhara Kau, Shah Allah Ditta and Kirpa, in comparison with those located near the urban area. Improvement of the road network is highly desired by the above mentioned UCs.

Living standards in the urban area including motorization are quite modern at present, while the rural and mountainous areas remain little changed. However, as light trucks travel all passable roads, motorization is now spreading into the rural area. Rural roads, which are fundamental to the lives and activities of rural people, should be urgently developed.

Roads in the Study Area consist of main trunk, trunk, village link and branch roads. The main trunk roads of Islamabad and Rawalpindi link the cities to the provinces. Trunk roads join village link roads to main trunk routes. Village link roads connect the villages and farmland facilitating communication between villages and transportation of agricultural materials and products. Branch roads connect settlements to the villages.

The improvement plan for the rural road network should consider the following:

- physical and social conditions of the rural area;
- present transportation and road network;
- introduction of agricultural machinery for higher productivity;
- increases in hauled tonnage and size of vehicles due to expansion of distribution system; and
- increased traffic due to general rise in rural area activity.

11.2.2 Mail Service

As mentioned in Section 4.6.2 there are no mail boxes in the rural area while there are 1,382 mail boxes in the urban area. At present there are only 12 sub-post offices, 26 branch post offices and 11 postmen in the rural area. These conditions should be improved due to the increased volume of mail accompanying the envisioned increase in literacy rate, and improved economic conditions as well as the scattered

distribution of villages in the vast rural area. A minimum target of one mail box and one stamp outlet in each village where there is no sub-post office and/or branch post office should be designated. Furthermore, appointment of a postman should be considered for each branch post office.

11.2.3 Telephones

Projects for expansion of telephone lines and facilities are being implemented in the rural area. As in the case of mail services, increased demand for telephone services is expected with envisioned increases in economic activities, increased number of laborers in the urban area and improved living conditions. At present, only one of the 160 schools in the rural area, a boys high school, has a telephone.

A development plan for telephone communication is required and should include installation of telephones at UC offices, schools and other public facilities, and installation of public telephones in each village center. At present, there are no public telephones even in the urban area of Islamabad due to the difficulties of collecting public telephone charges aggravated by frequent changes in rates as a result of inflation. These problems could possibly be solved by entrusting telephones to selected shops or community leaders for public use. Installation of public telephones in the rural area, however, is the most urgent need due to the present lack of efficient communication methods. Furthermore, simplified telephone communication system could be introduced due to economic and simple operations.

11.3 Electric Power Development

11.3.1 Electrification Backgrouund and Demand

(1) Background

The electrification plan of WAPDA in the Study Area will be completed in the near future and electrification of the Area is progressing. The electricity however, is used almost entirely for lighting of houses. From the view point of rural integrated development, mini-hydropower stations for providing electricity to as many homes as possible should be directly attatched to the dams and weirs to be constructed in the Study

Area. It is also necessary to ensure electric power for irrigation pumps as well as rural electrification.

It is envisioned that mini-hydropower stations along the Soan and the Kurang rivers will have a sufficient flow throughout the year, and hydropower can be developed on the Malal and Gumreh Kas as well by constructing mini-dams. Mini-hydropower is also considered for the Nala Nilan located in the valley as it has a rapid stream with little flow in dry season.

(2) Electric Power Demand

Future demand for electric power was estimated for each of the following facilities (See Annex):

- Residence
- Pump Station (Irrigation)
- Tubewell
- Rural Development Station
- Livestock Development Station
- Livestock Development Pilot Farm
- Veterinary Hospital
- Veterinary Dispensary
- Intensive Horticulture Pilot Farm
- Fish Hatchery
- Nursery Station
- Agricultural Machinery Station
- Small-scale Industry
- Vocational Training Station
- Maternity Home

11.3.2 Electrification Scheme

(1) Transmission plan

WAPDA intends to transmit electricity until 1990 by supplying 1kW per house within the area; however, this scheme is still under planning. Accordingly, in consideration of the road scheme and the location of facilities mentioned in this Master Plan, a transmission plan should be studied (See Annex).

The electric power supply scheme should be planned as follows:

1) Power station

The equipment capacity of Mangla and Tarbela dam power stations supplying electricity to the Study Area, should be reinforced.

According to WAPDA, the capacity of equipment is as given in the following table.

Power Station	Existing Capacity (MW)	Planning Capacity (MW)
Mangla Dam	800	1,000
Tarbela Dam	1,575	2,100

2) Power Line

In case of power line deficiency due to increasing electricity demand, it will be necessary to exchange the present single line with a double line along appropriate sections (See Annex).

11.4 Security and Health Services

11.4.1 Police Service

The Islamabad Police force covers the ICT with special sectors such as the Foreign Mission, VIP, Reserves Platoon, etc. There are a total of 4,200 police service men under this force which is a rather large number considerating the total ICT population of about 340,000. In the rural area, on the other hand, there are only two police stations at Bhara Kau and Sihala, each required to cover a wide area of jurisdiction (FIG.11.4-1). Although the crime rate is not as high, establishment of police boxes in each UC is desirable in the near furture to ensure security in the rural area. A total of 11 policemen to 11 police boxes could be sent from the metropolitan police force without causing any budgetary loss.

In addition, the number of traffic accidents is increasing with the corresponding increase in registered vehicles. Road improvement, and installation of road signs, centre lines, prohibited zones, traffic signals, etc. are therefore necessary.

11.4.2 Fire Brigade

There is virtually no effective fire fighting system in the rural area at present (TABLE 11.4-1, FIG.11.4-2). Implementation of fire fighting and fire brigade activities at each Markaz office (3 places)

should therefore be considered. In consideration of road conditions and lack of water resources in the rural area, the Markaz facilities should include one small fire engine and two water tank lorries.

11.4.3 Sanitation and Health

The problems facing medical and health services in the Study Area stem from poverty, low income particularly in the agriculture sector, food taboos, illiteracy, poor environmental sanitation, close living quarters for children of large families and cultural patterns favoring males.

In addition, distribution of technical staff in the rural area for medical and health is uneven due to insufficiencies in transportation, communication facilities, electricity, schools and potable water supply and generally unattractive employment conditions. Lack of transport and communication prevents medical officers from visiting BHU and lady health visitors (LHVs) from visiting villages. Even where infrastructures are available, they cannot be fully utilized because of shortage of funds for personnel, medicine and maintenance. Three medical service cars have been supplied to RHC and BHU recently.

There are no sewage facilities in the rural villages creating the presence of waste effluence from more than 90% of the houses. Home refuse is also discarded at random from most houses. Furthermore, more than 97% of the houses have no toilets (UNICFF, 1985).

11.5 Village Environmental Improvement

Residents in Islamabad rural area consist of farmers engaged in farming in the rural area and commuters to the urban area. Namely, residents who have both a production base and living base in the rural area and those who have only a living base in the rural area but work in the urban area. The rate of population increase is estimated at 2.5 -3.0%. The villages in the rural area absorb this increasing population and the majority of farms are consequently being transformed into part-time farming concerns due to urban area development and restriction of farmland. Measures for village environmental improvement should include improvement of existing villages and consider the increasing population and increased number of families. Although village improvement varies

according to physical and social conditions from location to location, countermeasures can be studied through the analysis of questionnaires and hearings held with residents of each village.

(1) Housing Improvement

Traditional farm housing requires sufficient labor and time for housing construction. There are many aspects which should be considered in respect to housing improvements in order to maintain a suitable standard of living. Among them, kitchen and toilet equipment which have heretofore been neglected should be given priority.

(2) Reduction of Labor

Although there are differences to some extent between form families, excessive time and labor is expended in the acquisition of drinking water and firewood.

The following countermeasures are therefore recommended.

a) Improvement of access roads to make them passable by carts to the water sources and forests where fuelwood is gathered, thereby reducing labor required for water hauling and collection of fuelwood.

b) Development of wells near the village to provide clean water sources.

c) Tree planting near the villages for future supply of fuelwood.

d) Water distribution through pipes from water tanks supplied with water from scattered wells by pumps.

e) Substitution of fuelwood with other fuels. Implementation of the above would reduce the amount of time women spend on their daily tasks and contribute significantly to modernization of the rural area.

(3) Improvement of Roads

Villages are generally made up of agglomerated and dispersed settlements. The roads between houses are narrow and unpaved, especially in and around agglomerated settlements.

1) Access Roads from the Villages to Village Link Road

Access road from villages to link roads require a suitable width and grade enabling local small vehicle traffic and conveyance of daily necessities. Drainage ditches on both sides of the road should be planned with pervious collecting pits provided at intervals of 3-5m to provide water for afforestation along roads.

2) Inner Village Roads

Roads between densely populated areas within each village are narrow and unpaved. These roads also have few side ditches, necessitating road improvement for road maintenance and sanitation.

Inner village road improvements are constrained by the need to relocate some dwellings. This, however, should be considered only as an option after the full consent of the residents concerned has been obtained.

(4) Electrification

Electrification in the rural area plays an important part towards the improvement of living conditions as well as of agricultural facilities and agricultural production.

Some villages have yet to be electrified and the first priority for rural electrification is domestic electrification. At present, electricity in Islamabad rural area is used almost entirely in the home, rather than for irrigation and mill purposes.

Although electrification in Islamabad rural area is progressing somewhat more than in other rural districts, electrification in the rural area is still not adequate, with an electrification rate of 65% of all villages. Electrification of all homes is required and is expected to be undertaken by WAPDA in the future.

(5) Water and Greenery

The Study Area is situated in a semi-arid climatic zone with a subsequent paucity of water bodies and greenery, especially during the dry season. Rain is the most important water source and measures to conserve and effectively utilize precipitation must be considered.

Presently almost all precipitation washes into the rivers. It is important that this precipitation be reserved in or near the villages. Afforestation is possible around reserved water bodies.

Suitable sites for reservoirs are planned for incorporation into irrigation schemes proposed under MIRAD[1/] in the Master Plan. Run-off collected will be checked by a small weir in depressions near the villages and, in addition to irrigation purposes, trees will be planted around these depressions in order to create small ponds as a resort zone for residents.

1/ Model Integrated Rural Area Development Project

CHAPTER XII

DEVELOPMENT OF MANPOWER AND RURAL INDUSTRY

12.1 Existing Job Opportunities

12.1.1 Labor Force and Employment Rate

As described in section 4.3.2, the labor force in the rural area numbers 35,500 which is about 37% of the total population over 10 years of age and 26% of the total population. About 33.6% of the labor force in the Study Area is engaged in agriculture, 17.2% in public and private services, 7.9% in manufacturing, 7.5% in construction, 5.1% in wholesale and retailing and 5.1% in transport and communication. Another 23.6% of the labor force is engaged in industries, electric, gas, water supply, finance agencies, insurance agencies and other services, while the remaining 13.5% is unemployed.

12.1.2 Women in the Labor Force

In general, the social status of women in rural ICT is quite low compared with other parts of the country. Labor force participation rate of women in rural ICT represent only 1% of the labor force versus the national average of 2%.

Study results indicate that the rural male populace is willing to accept the participation of women in industry, cottage industries and other jobs if facilities are provided. However, at present, such facilities do not exist in either the public or private sector of the rural area.

12.1.3 Unemployment Ratio

The unemployment rate in rural ICT is as high as 13.5%. In the case of males, the unemployment rate is 13% or 6 times the national average while the unemployment rate for women who seek jobs is estimated at 38.6% or 5.4 times the national average.

12.1.4 Job Opportunities and Constraints

Since the capital of Pakistan was shifted from Karachi to Islamabad, the socioeconomic structure of the rural area has changed, particularly with regards to increased job opportunities for construction of both public and private facilities. Another source of employment since the late 1970's is jobs in the Middle East. From 1971 to 1981, 4,438 people from rural ICT worked abroad which is equivalent to about 12% of the total labor force. The labor market has thus gradually expanded during the last two decades. At the same time, however, the Team found that there are still many constraints with regards to employment opportunities as summarized below:

(1) Only 30% of job seekers registered with the Employment Exchange Department, IA are from ICT.

(2) The Employment Exchange Department was able to provide jobs for only 20% of those registered during 1982.

(3) Casual day laborers must pay for their own transportation which ranges from Rs 10 to 15 for bus and light truck depending on the distance. Daily income for unskilled labor, however, is only around Rs 30 while that for skilled labor is only Rs 50.

(4) There are few rural industries or other facilities which provide job opportunities to either male or female laborers in rural ICT.

(5) Training facilities in specialized skills for the rural populace are lacking and consequently many laborers who wish to take advantage of overseas job opportunities are unable to do so due to lack of skill.

12.2 Manpower Development

12.2.1 Vocational Training

Opportunities for technical education, for both men and women are very limited. The labor force in the rural area is large; however, the majority must work for low incomes as unskilled labor due to lack of training, thereby missing out on job-opportunities not only in the rural

area but also in Islamabad and foreign countries. The Government and the rural people therefore are keenly aware of the need for vocational training. In consideration of job opportunities available both inside and outside the rural area of Islamabad and foreign countries, vocational courses in agriculture, ceramics, casting, mechanics, electrical mechanics, driving of vehicles, etc., should be established.

12.2.2 School Education

Primary education remains non-obligatory, and the illiteracy rate is high. Schools are ill-equipped, with only 20% of primary schools having desks and chairs. Some schools also are shelterless. Only ten percent of primary schools possess toilet facilities (See Section 4.6.5). Schools are often located at considerable distance from villages. As education forms the bases for sound nation-building, it is recommended that at least primary education be made mandatory. Schools should accordingly be properly equipped with shelter, desks, chairs, toilet facilities, etc.

Four courses in agriculture, electrical mechanics, metalworks and woodworks are offered in the three boys high schools in the rural area. However, each course has only one teacher and one assistant. Accordingly, small-scale agricultural high schools and industrial high schools should be established for providing technical training to students.

12.3 Development of Rural Industries

Small-scale cottage industries or agro-based industries are very important in rural development as they encourage employment opportunities and generate income while at the same time discouraging migration to urban areas. However, development of rural industries is very difficult, requiring supply of suitable raw materials, investment capital and technical and management manpower, and also considerable market development efforts.

Even in the presence of a strong farmers organization, available investment capital, good supply of raw materials and available technical manpower, the establishment of new rural industries would be faced with substantial restraints. However, members of the recently organized

Islamabad Chamber of Commerce and Industries are seeking new investment fields. Accordingly, promoting construction of factories in the rural area by such entrepreneurs may be possible for creation of job opportunities and income generation.

In consideration of the above factors and the supply of raw materials the encouragement of certain small- scale industries should be studied.

(1) Gabion Manufacturing

Gabions have long been used for river bank protection, erosion prevention, afforestation, road construction, housing, dam construction and landslide protection. Wire, the basic material, is available in the area and plant construction and manufacturing technology are relatively simple. Government demand for construction works indicates the presence of a viable market.

(2) Livestock Feed Manufacturing

A large amount of livestock feed is required in and around the Study Area. Livestock feed can be conveniently made from available materials such as paddy and wheat straw which are enriched with molasses and urea. Straw, molasses and urea are available within a 100-150km radius of the Study Area.

(3) Match Manufacturing

Match making technology is a relatively inexpensive and uncomplicated light industry. Promotion of this industry is highly favored by people in the rural area as revealed through the questionnaire survey. However, a marketing study concerning competition with existing factories is necessary and establishment of a timber supply forest for raw materials is also essential.

Climate is suitable for production of poplar which is highly suited to manufacture of match sticks.

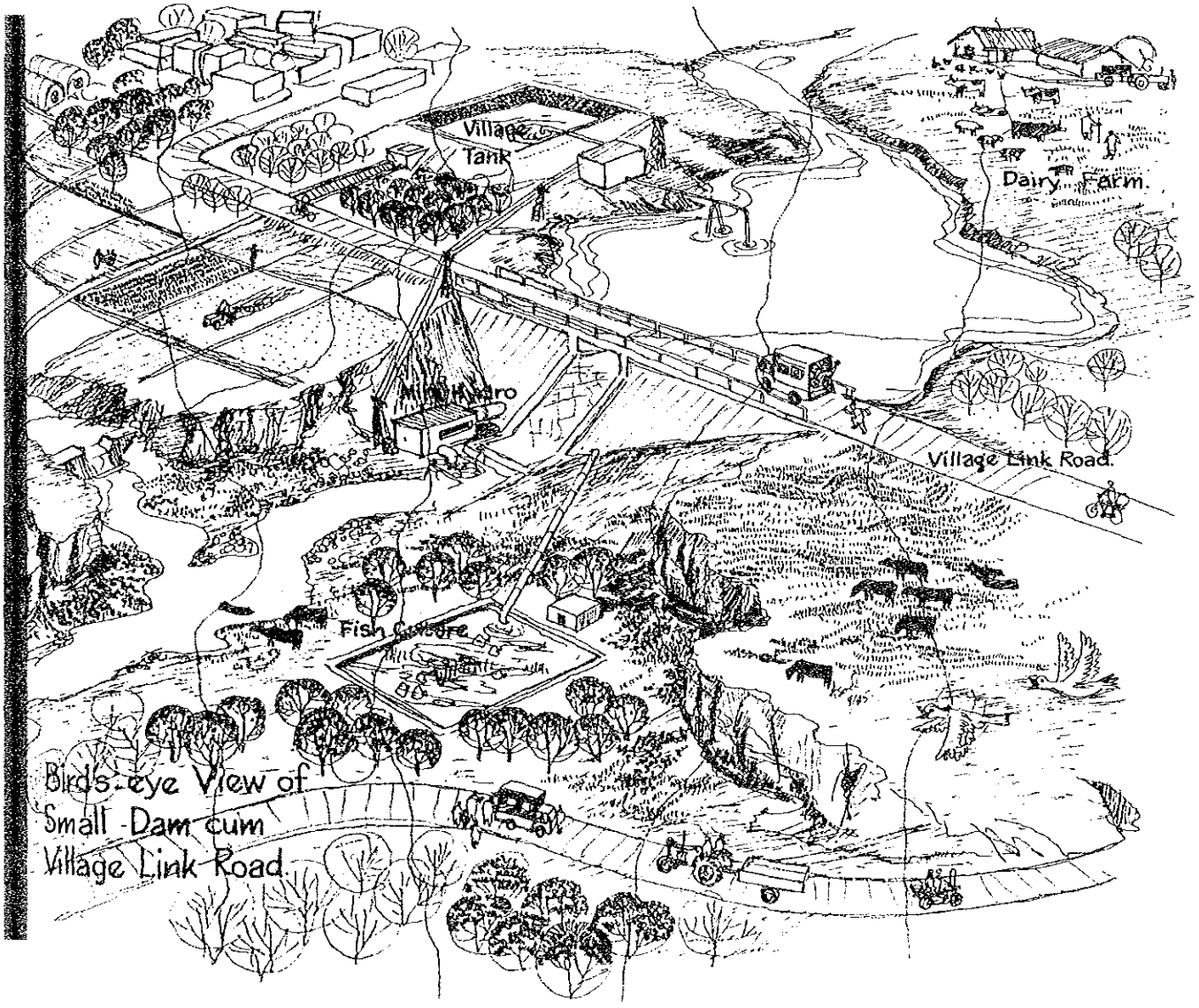
Rural industries will be reliant on investment from the private sector for their success. Effective introduction of industries into the Study Area will depend on careful selection of viable industries as well as the presence of competent management to run them.

Nevertheless, the introduction of such industry is considered an important strategy for rural modernization and expansion of the income base. Planning and implementation must be conducted in close concert with Government experts and local entrepreneurs with a thorough grasp of conditions prevailing within the Study Area.

PART V

THE MASTER PLAN

ILLUSTRATION No.7



Who has made the earth your couch,
And the heavens your canopy;
And sent down rain from the heavens;
And brought forth therewith
Fruits for your sustenance;
Then set not up rivals "unto God
When ye know (the truth).

Baqara (II-22)

CHAPTER XIII

SELECTION OF MAIN DEVELOPMENT SCHEMES

13.1 Basic Concept and Selection of Schemes

Principal objectives of the Master Plan are to strengthen the production, employment and income generating base and to improve the living conditions of rural people in the Study Area, thus reducing socioeconomic imbalance among developed and underdeveloped areas. Direct participation of rural people in development activities is one of the most important factors for the execution of a rural development program.

For the formulation of the Master Plan, various development schemes were identified taking into account physical conditions and development potentials of the Study Area. From these schemes, only major ones were selected as primary main development components of the Master Plan.

The criteria for selection of main development schemes are as follows:

- Consistency with government policy
- Satisfaction of people's demands
- Income and employment generating effects
- Satisfaction of minimum basic needs
- Investment scale and ability

13.2 Criteria for Selection

13.2.1 Consistency with Government Policy

The central and provincial governments have decided to continue the policy of developing rural areas, according priority to such items as: i) construction of farm-to-market roads; ii) provision of hygenic drinking water; iii) rural electrification; iv) primary, middle and secondary education; v) health; and vi) small farm technology.

These aspects were likewise given high priority in Master Plan formulation.

13.2.2 Fulfillment of People's Aspirations

It is very difficult to meet all the demands of the people residing in the Study Area. However, efforts were made to incorporate as many of the residents aspirations as possible in the proposed development schemes so as to make the Master Plan as realistic as possible. For the purpose of identifying the development needs of the people, a socioeconomic survey of 450 households and a questionnaire survey of 68 Panchayat were conducted and a series of meetings were held in 11 UC offices. As a result of these surveys and meetings, water resource development for both irrigation and drinking water constituted the strongest aspiration of the local population, followed by such other aspects as agricultural machinery hiring system, health services, road construction, livestock development, vocational training, rural industries, and rural electrification. Development schemes reflecting these priorities constituted the basis for formulation of the Master Plan (See Section 6.4).

13.2.3 Income and Employment Generating Effects

One of the major objectives of the Master Plan is to reduce regional imbalance in socioeconomic conditions. Employment generation and resultant income enhancement will play an important role in the reduction of socioeconomic imbalance in the ICT. Therefore, priority was given to schemes which would increase employment opportunities and raise the income level of the rural population. In light of this criterion, directly productive components such as irrigation development, livestock development, inland fishery, agricultural machinery hiring system, rural industries development, and ground water development for irrigation, were given high priority.

13.2.4 Satisfaction of Minimum Basic Needs

Most development schemes in the past have aimed to achieve higher economic growth solely through providing directly productive components such as irrigation facilities, agricultural machinery, livestock production and fruit production facilities, land clearing machinery and others. Such an approach, however, has not always been satisfactory for developing countries.

The recently accepted philosophy underlying rural development is that much additional emphasis should be given as well to the promotion of social facilities and welfare services as a basis for development in rural areas. The Sixth Five Year Plan of Pakistan has also focused on the importance of providing infrastructure and services for satisfying the minimum basic living needs of the rural population. Social facilities and services in this context include health, sanitation, education, and security (police, fire fighting, etc.). The schemes related to these fields were given high priority and are included in the Master Plan.

13.2.5 Investment Scale

From an idealistic viewpoint, a huge amount of investment would be necessary to carry out all the schemes considered for the development of Islamabad rural area. In addition to the schemes considered in PART IV, various other schemes such as river improvement, reconstruction of villages, improvement of farm houses, construction and rehabilitation of bridges, installation of filtration plants, plantation in the hilly areas, rehabilitation of UC offices, etc., are also required to achieve better rural living conditions for the people. However, the investment costs to carry out all these schemes are estimated to exceed Rs.15.6 billion (See table attached to Section 8.3). Considering the improbability of investing such a huge amount in the rural area of Islamabad, those schemes considered to have a lesser priority in light of the selection criteria discussed above were not included in the Master Plan.

13.3 Selected Main Development Schemes

All the schemes considered for betterment of rural life in the Study Area were carefully reviewed and screened using the selection criteria as mentioned in the preceeding section. The 13 selected main schemes are listed below.

Direction of Development	Selected Scheme
I. Development of Agricultural Sector	- Land & Water Conservation* - Irrigation (surface water) - Ground Water Multipurpose Development (irrigation) - Intensive Horticulture Promotion - Agricultural Machinery Station - Livestock Development Promotion - Inland Fishery Development
II. Improvement of Living Conditions	- Village Environmental Improvement - Land & Water Conservation* - Medical and Health Services Improvement - Rural Development Supporting Services - Ground Water Multipurpose Development (drinking water) - Transportation and Communication Improvement
III. Manpower Development	- Manpower Development
IV. Industrial Development	- Small-scale Industry Development

* Indicates the same scheme.

CHAPTER XIV

PROPOSED DEVELOPMENT SCHEMES

14.1 Irrigation Scheme

14.1.1 Basic Concept of Irrigatión Scheme

There is no alternative to Barani agriculture in the Study Area due to the present lack of irrigation water. However, farmers exhibit a strong desire for the introduction of irrigated agriculture.

In this Master Plan, the irrigation scheme is designed to utilize the water resources developed as discussed in Chapter IX for the Study Area (FIG. 14.1-1). The basic study items for this scheme are:

- Existing water resources and proposed development sites;
- Proposed irrigation area;
- Selection of crop to be cultivated;
- Irrigation water requirement;
- Method of water supply; and
- Method of irrigation in the field.

(1) Water Resources

Surface water which can be developed in the Study Area will be stored by dams and weirs constructed in the rivers or streams. There are 14 dams and 6 weirs proposed for the Area. Total effective storage capacity to be produced by the dam is estimated at about 22 x $10^6 m^3$(17,700 A.F) and the effective storage capacity of each water resource is shown in TABLE 14.1-1. The discharge of intake by the weir is given at 85 % of the low average flow and is shown in TABLE 14.1-2.

(2) Proposed Irrigation Area

Potential water resources for irrigation development are limited in the Study Area in comparison with the total cultivated area of about 23,000ha. Accordingly, in the present Study proposed irrigation area of each available water resource was delineated to satisfy the following criteria:

a) Area located close to water source

b) Area located close to villages or roads where irrigation management can be easily performed

c) Area where conveyance of irrigation water is uncomplicated

d) Area involving as many beneficiary farmers as possible

Proposed areas for irrigation selected based on the above criteria are classified into three types as outlined below (TABLE 14.1-3).

A Type: Benefit areas are located adjacent to both water sources and villages and access roads facilitating both water and farm management and also marketing of products.

B Type: Benefit areas are close to water sources, but are situated on sloping land or land distributed with stony soils.

C Type: Benefit areas are located considerably far from both water sources and villages where intensive water and farm management is difficult.

In accordance with the basic principles for irrigation development and natural and socioeconomic conditions of the benefit areas, irrigation methods for each type of area are proposed as follows:

A, B Type: Development of intensive irrigated farming is proposed through year-round irrigation water supply.

C Type: Supplemental irrigation during winter cropping season is proposed in order to stabilize and increase productivity of wheat, the principal crop in the Study Area, and to increase the number of beneficiary farmers.

(3) Cropping Pattern

According to topographic conditions, the cropping pattern is proposed to be carried out as outlined below and as shown in FIG. 14.1-2.

A type area .... Based on the farming scale, a combination of vegetable and dry field crop production is proposed. In response to market growth, vegetable cultivation should be promoted in stages. Pasture should also be introduced and the establishment of crop rotation is desirable (See FIG.14.1-2, Cropping pattern II).

B type area .... The introduction of fruit should be planned where consistent with the land conditions. Orchard with pasture is proposed amiming at soil conservation and livestock promotion (FIG14.1-2,Cropping Pattern IV).

C type area .... Main cereals such as wheat, corn and beans are planned, as consistent with land conditions. High quality fodder also are secured by the introduction of leguminous crops.

(4) Irrigation Water Requirement

The calculation of evapotranspiration (ETo) is based on the Modified Penman Method using climatological data such as temperature, humidity and sunshine hours. Crop evapotranspiration (ETcrop) is derived from the above ETo multiplied by crop coefficients (TABLE 14.1-4).

Monthly ETcrop

ETcrop = ETo x KC

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ETo(mm)	1.9	2.5	3.9	5.8	7.7	8.7	6.7	5.6	4.9	3.8	2.2	1.6

Crop evapotranspiration values for major crops (wheat, vegetables, fruits) are given below according to the type of benefit area.

ETcrop BY CROPS

Month	A type Vegetable	B type Fruit	C type Wheat	
Jan	54	48	78	
Feb	40	69	102	
Mar	39	99	126	
Apr	93	147	112	
May	188	195	-	
Jun	259	222	-	
Jul	138	171	-	)Rainy Season
Aug	40	144	-	
Sep	97	126	-	
Oct	39	-	-	
Nov	45	57	58	
Dec	41	42	50	

Based on the results in the above table, crop water requirement per unit area for each type is shown in the table below. During the rainy season from July to August, effective rainfall is taken into account while for the other remaining months rainfall is too unpredictable to be considered.

CROP WATER REQUIREMENT

	Monthly Average ETcrop (mm)	Daily Average ETcrop (mm)	Daily Maximum ETcrop (mm)	Unit water requirement		
				Mean(ℓ/s)	Peak(ℓ/s)	Total(m^3/ha)
Wheat	88	3.0	4.2	0.53	0.75	8,307
Vegetable	90	3.0	8.6	0.53	1.5	13,846
Fruit	110	3.7	7.4	0.66	1.3	17,077
Wheat (short)	-	3.0	4.2	0.53	0.75	4,154

Total water requirement
= daily average(mm) x unit area(ha) ÷ irrigation efficiency x irrigation period
Mean water requirement
= daily average(mm) x unit area(ha) ÷ irrigation efficiency x 86,400(sec)
Peak water requirement
= daily maximum(mm) x unit area(ha) ÷ irrigation efficiency x 86,400 (sec)

Based on the water requirement of the above table, the proposed irrigation area of each water resource is calculated as shown in TABLE 14.1-5 and 14.1-6 and summarized as shown in the following table.

PROPOSED IRRIGATION AREA

Type	Crop	Irrigation Area (ha)
A	Vegetable	344
B	Fruit	227
C	Wheat	7,981
Total		8,552 ha

(5) Water Supply

It is important for water supply to be conveyed safely and economically from the water source to the irrigation area. Factors such as elevation of the reservoir, location of the irrigation area and irrigation discharge must be taken into account. The water supply scheme is affected by the method, type of facility and canal route.

The relation between the reservoir and irrigation area is classified into the following cases.

a) The irrigation area is located not only near the reservoir but also at a lower elevation. Accordingly, gravity irrigation by canal is possible.

b) The irrigation area is located near the reservoir, but pumping will be necessary because of the benefit area's higher elevation than the reservoir.

c) The irrigation area is situated at both lower and higher elevations compared with the reservoir, thus requiring use of both canal and pump.

The canal connecting the water source and irrigation area will be of the open channel type lined with half-sections of concrete pipe, or brick.

However, with the potential introduction of sprinkler irrigation in the future, it will be necessary to establish a pipeline system at such locations.

On the basis of the above, a water supply scheme was made for each water source as shown in TABLE 14.1-7.

The pump power source is electric power produced by the mini-hydropower station at the water source. In the event that mini-hydropower is impossible, it will be necessary to use electric power from WAPDA or solar batteries. Use of electric power is shown in TABLE 14.1-8.

(6) Irrigation Method

The irrigation method affects the cost of facilities and management. Accordingly, the most suitable method of surface irrigation is determined from the results of study on topography, farming practices and utilization of water.

14.1.2 Proposed Scheme

Irrigation schemes developed on the basis of data described in the preceeding section are divided into two types as outlined below.

(1) Upper Kurang Irrigation Scheme

There is an excellent dam site in the upper stream and two weir sites downstream of the Rawal Dam constructed in 1962 (FIG.14.1-3). In the irrigation scheme, use of water from the Rawal Dam and the new dam or weirs will be coordinated to develop an irrigation area of about 6,400ha. The irrigation area of each structure is shown in the following table.

IRRIGATION AREA BY STRUCTURES

Mark	Location	Irrigation area (ha)
K - 1	Sikrila	481
K - 2	Sikrila	2,118
Kc- 1	Khana Dak	2,415
Kc- 2	Koral	1,150
Gc- 2	Tarlai Khurd	200
Total		6,364

Potential diversion from the reservoir (K-1) to Gumreh Kas would allow for additional irrigated benefit area of approximately 500ha.

Moreover, replenishment of ground water due to operation improvements in the Rawal Dam and the weir constructed on the downstream side of Rawal Dam will create a potential irrigation area of about 50ha to be irrigated by wells.

(2) Irrigation Schemes for Other Locations

Except for sites along the Kurang River, water resources are dispersed and have low capacities. An integrated irrigation plan is thus difficult, and independent irrigation schemes suitable to the peculiar needs and requirements of each site should be carried out.

The irrigated area to be developed by these schemes would encompass about 2,200ha.

IRRIGATION AREA BY SCHEME

Mark	Location	Irrigation Area (ha)
G -1	Athal	5
G -2	Athal	46
G -3	Siali	231
G -4	Pind Begwal	14
G -5	Muhrian	8
M -1	Tamair	17
M -2	Jhang Sayaddan	96
H -1	Shah Allah Ditta	15
H -2	Shah Darah	91
H -3	Shah Darah	32
H -4	Subhan	49
S -1	Charah	1,444
Gc-1	Kuri	100
Nc-1	Gokina	20
Nc-2	Gokina	20
Total		2,188ha

14.1.3 Operation and Management

In Islamabad rural area, dry farming predominates. The introduction of irrigation has just started and accordingly a water management system has yet to be established as farmers lack experience in irrigated farming. Fields are not consolidated and farmers also lack horiticulture skills and financial resources. In the future, however, the promotion and strengthening of irrigated farming skills, economic resources and management ability of farmers will enable them to organize and manage water users associations.

14.2 Ground Water Multipurpose Development Schemes

Excluding areas of exposed bedrock, ground water resources are available to some extent for development as mentioned in Section 9.3. Domestic water supply obtained from small shallow wells is limited in dry season while irrigation water is in even greater demand in the same period limiting the amount of ground water available for further development.

Plans are classified into three types: (1) installment of rural water supply facilities and stable domestic water supply for farmers in villages by the end of the year 2001, (2) provision of water supply for proposed public facilities such as Rural Development Stations and Livestock Development Stations etc., and (3) provision of stable irrigation water supply for intensive vegetable farming.

Ground water development schemes would consist mainly of shallow wells as mentioned in Section 9.3.

Incidental plans include: (1) installation of hand pumps in existing 200 shallow wells in order to reduce labor, and (2) construction of water supply facilities for wash stands, lavatories and washing rooms at proposed public facilities in order to promote sanitation (FIG.14.2-1).

The objectives of the ground water development schemes are to ensure a stable and adequate supply of clean domestic water, irrigation water, and water for public facilities thereby improving the living standards and environment of the rural people.

PROPOSED WELLS AND SPRING WATER CATCHMENT SYSTEM

Purpose	Irrigation		Domestic Use		
Type	Only Irrigation	Common Use with Public Facilities	Only Domestic Use	Common Use with Public Facilities	Only for Public Facilities
Tubewell	-	1 (6)	1	4	1
Shallow well	12 (66)	7 (50.5)	12	14	-
Spring water catchment System	-	-	-	1	-
Total	20 (122.5)			33	1

Note: Numbers in brackets indicate irrigation area (ha).

14.3 Intensive Horticulture Promotion Scheme

14.3.1 Background and Objectives

At present, traditional rainfed farming methods under semi-arid conditions in the rural area result in very low productivity. The Study Area is adjacent to large cities such as Rawalpindi (population: about 800,000) and Islamabad (urban area population: about 200,000). For this reason, promotion of intensive horticulture has been proposed through establishment of Pilot Farms to introduce intensive horticulture techniques . This would increase productivity, and thereby contribute to improved living conditions for farmers. The irrigation schemes included in the Master Plan will facilitate implementation of intensive horticulture techniques by providing a stable irrigation water supply.

14.3.2 Function of the Pilot Farm

The Pilot Farm will have three functions: production, training and demonstration.

(1) Production

Selected vegetables, flowers, shrubs and ornamental plants will be cultivated and sold by landless farmers and /or farmers from non-irrigated areas.

(2) Training

Training in intensive horticulture techniques will be offered to interested farmers and will provide practice in appropriate techniques which can be applied by the farmers independently after training.

(3) Demonstration

A demonstration plot will be provided on the pilot farm to illustrate modern agriculture and to provide opportunities to learn improved techniques. Demonstration could include, for example, small solar pumps, the drip irrigation system for water conservation and aqua-culture methods.

14.3.3 Facilities

The Pilot Farm will cover a total area of 4.5ha which will be delineated as follows:

Facility	Area
Central Buildings: (office, training room, meeting room, etc.)	0.2ha
Practice Building: (work yard, material storage, water tower, etc.)	0.2ha
Dormitory: (dormitory rooms with 30 beds, sports yard, etc.)	0.1ha
Production Farm: (greenhouse, etc.)	3.0ha
Training Farm: (greenhouse, glasshouse, etc.)	0.5ha
Demonstration Farm: (solar pump, irrigation system aqua-culture systems etc.)	0.5ha
Total	4.5ha

14.3.4 Site

Two locations, one in UC Tarlai and one in UC Sihala are proposed in consideration of irrigation water sources and access roads.

14.4 Transportation and Communication Improvement Scheme

14.4.1 Farm-to-Market Road Scheme

The improvement scheme for the rural road network encompasses village link roads, inner village roads and maintenance roads.

The road structure and width are designed in consideration of the existing road network and proposed agricultural machinery to ensure safe and smooth vehicle flow and proper execution of farm activities. Roads will be planned from the viewpoints of easy maintainenance and suitable construction cost, as well as the standpoint of land conservation and afforestation.

(1) Village Link Road

Village link roads connecting trunk roads to villages and farm lands are arranged as illustrated in FIG.14.4-1. The proposed road network is basically designed to link all villages of the Study Area together. Existing and planned roads are compared below. The length of proposed asphalt road is two times that of the present road network (See Illustration No.8 on the title page for TABLES AND FIGURES).

COMPARISON OF IMPROVEMENT LEVEL

Item	Road	Existing Road	Planned Road	Remarks
Road Length (km)	Metalled	229.4	453.6	
	Total	388.0	534.2	
Road Density (km/km^2)	Metalled	0.39	0.76	Study Area
	Total	0.65	0.90	A = 595 km^2

Proposed roads are based on the IA standard design which consists of two types, i.e. Type I with a width of 6.10m (20ft) and Type II with a width of 7.32m (24ft).

- Inner Village Roads

While villages are comprised of two or three settlements, they are rarely served by inner village roads. Road

pattern selection should be based on the desires of the village residents themselves. The above is described in Section 14.8.

General road width will be more than 3.0m; however this width should be no more than 2.0m near housing areas. The utilization of roads for through traffic should be firmly avoided.

- Maintenance Roads

Maintenance roads are used to construct and subsequently maintain and operate agricultural facilities. Road width should be 6.10m (20ft) to accomodate large construction equipment. After construction of facilities, the road will be paved with asphalt.

Proposed road length for operation and maintenance of irrigation facilities totals 15.2km and is the same as Type-I indicated below.

(2) Design of Farm-to-Market Road

1) Road Width

The road width is given by the standard design of LGRD, IA and consists of two types as illustrated in the table below.

SIZE OF FARM-TO-MARKET ROADS

Type	Design Traffic Volume per day	Carriage Way	Traveled Way
I	Up to 500 vehicles	6.10m(20ft)	3.05m(10ft)
II	More than 500 vehicles	7.32m(24ft)	3.66m(12ft)

These roads are envisiond to also facilitate conservation of farmland by controlling erosion through construction of causeways at torrents and gullies. Both sides of the road will be afforested to protect shoulders from erosion. Road side ditches will also be dug to protect the shoulders.

2) Road Alignment

Routing of farm-to-market roads will be determined mainly for the purpose of improving the present road network such as the Katcha roads connecting villages and farm paths. The planned road length totals 200km. There are 133 villages in the Study Area. One hundred nine (109) villages are included in the road improvement plan. According to the road network plan, 108 villages will all be serviced by metalled roads, with the exception being one village in Shah Allah Ditta.

3) Design Traffic Volume

On the basis of estimated design traffic volume in accordance with the village populations concerned, the proposed road lengths are 165.3km of Type I with 6.10m (20ft) width and 34.7km of Type II with 7.32m (24ft) width.

4) Road Network Plan

The road network following implementation is as shown in TABLE 14.4-1. Regarding the improvement level after achievement of the road network plan, the average road density would be 0.90km/km^2, of which 0.76 is metalled and 0.14 is Katcha road. The road length per person of each UC varies from 1.8m to 3.2m, and averages 2.4. This indicates little disparity in design road density throughout the Study Area.

5) Incidental Facilities

Incidental facilities include bridges, causeways, culverts, retaining walls, side ditches, etc. The standard sections of these facilities are illustrated in FIG. 14.4-3, based on principally on LGRD specifications.

(3) Maintenance of Rural Roads

Field survey and design for rural roads is conducted by LGRD, IA. Road construction is conducted under the supervision of the Markaz concerned. Maintenance is entrusted to the relevant UC.

14.4.2 Telephone Installation Scheme

Telephone communication facilities in the rural area are very poor, and installation of telephone facilities for supporting administrative and socioeconomic activities is particularly urgent. In view of this fact, and based on public institutions and public use, an estimated 300 telephone units are required in conjunction with construction of telephone stations at Sihala (100 lines), Hummak (300 lines) and Bhara Kau (100 lines).

Installation Sites	Number of Telephone	Remarks
Sub-Post Office	12	
Branch Post Office	26	
UC Office	11	
Secondary School	43	
Sarpanch 1/	68	Private
Populated Village	121	Entrusted public telephones
Others	19	New public facilities, etc.
Total	300	

1/ See Section 4.1.2 Panchayat

Estimated total cable line required for proposed telephone lines is about 100km, with about 30km each for Sihala, Hummak and Bhara Kau stations and about 10km for others.

14.4.3 Simplified Telephone Communication System (Broadcast System)

This proposed system is one of the most economic and simple communication systems for a rural area. The telephone lines could be utilized jointly with more than 10 houses connected to one address system, due to low frequency of telephone use. Key stations will be placed at each Rural Development Station to be established under the Master Plan.

In 2001, an estimated total population of 230,000 in 33,000 households is anticipated in the rural area.

According to initial calculations, if broadcast stations are established at each of the proposed 13 Rural Development Stations, about 2,500 households will exist per one station. If the above system is installed at one fifth of the 2,500 houses, about 500 houses would be covered by one broadcast station, with 10 households per line.

PROPOSED FACILITIES OF THE SYSTEM

Place/Facility		No. of Units	
Key station	Rural Development Station	13	stations
Switchboard	"	13	units
Telephone	500 units x 13 stations	6,500	units
Telephone line	50 circuit x 1.5 km x 13	1,000	km
Telephone pole	1,000 km ÷ 20 m	50,000	poles

14.5 Agricultural Machinery Station (AMS) Scheme

14.5.1 Outline

Agricultural machinery hire services were given high priority by farmers. Accordingly, establishment of an Agricultural Machinery Station (hereinafter referred to as AMS) is planned to meet local demands with respect to mechanization of agriculture. Under this plan, hire services offered by the Markaz are to be reinforced to handle peak demand for tractors in July, and a system will be provided to extend hire services throughout the Study Area. The station will provide small and medium tractors and related implements as well as grain and corn mechanization systems, and will also provide medium bulldozers for land leveling works and maintenance works for village link roads within the rural area. The main station will be located at Tarlai, with substations at Shihala and Bhara Kau. Main and substations will comprise a tractor shed and workshop including spare parts stores, while a training center will be provided at Tarlai in order to instruct personnel in repair and maintenance, and in machine operation. In addition, tractor sheds for AMS service will also be constructed in areas where machinery is used. These will be at suitable locations within the Study Area to provide services to people living at a distance from the main and substations (See Illustration No.6 on the title page for Part IV).

14.5.2 Proposed Machinery

In the Study Area, tractor-drawn machinery is presently used for land preparation by cultivators and as prime movers for threshers and trailers. Cultivators, however, form shallow 10-15cm furrows which do not reach below the sole pan soil. At NARC, deep plowing not only aerates the soil, but also has resulted in 1.5 to 2 times the present yield in experiments when coupled with the application of fertilizer and suitable planting. Based on this experience, plows should be the major implements provided by the AMS, and other implements should facilitate systematic mechanization for timely planting, fertilization and the harvesting of grains (TABLE 14.5-1).

Horsepower of proposed tractors will mainly be around 40-50HP, the same as those presently used in the area. In addition, tractors of 30HP or less will also be introduced and used in small farm plots where they are easily manoeuvred. Peak tractor demand occurs after the first rainfall in July when they are used for both cultivation of corn which is the kharif crop, and to secure water for the Rabi crop. In order to meet this demand, a system is required to coordinate timely tilling and planting of corn, after which land preparation for the Rabi crop would commence. This would require approximately five hundred 40-50HP tractors within the Study Area. If the target year for completion of the mechanization system is 1995, it is estimated that the AMS will require about 90 tractors of the 40-50HP class (See Annex). Based on this estimate indroduction of seventy 40-50 HP and thirty 30HP tractors will be planned. The objective totals of implements for tractors are shown in TABLE 14.5-2.

Bulldozers will be used for land protection works, land levelling and consolidation, and for construction of farm-link roads. In addition to the six bulldozers existing at Markaz, provision of thirty 120-140 HP bulldozers at the main and substations is proposed (See Annex). A trailer for transportation of the bulldozers will be stationed at each station from which bulldozers can be quickly dispatched.

14.5.3 Maintenance Facility

For smooth management of the agricultural machinery hire service, parts stores, maintenance facilities and tractor shed will be constructed in the AMS. Ten tractor shed facilities will also be provided to serve people remote from AMS. Proposed sites for these sheds are Rawat, Kirpa, Charah, Tamair, and Shah Allah Ditta, etc. A comprehensive maintenance facility will be located in the main station at Tarlai to dismantle and process repairs for medium and large scale machines. Smaller scale maintenance facilities are planned for substations at Sihala and Bhara Kau for simple processing and maintenence. The tractor sheds will be provided with simple inspection and adjustment facilities for periodic inspections and parts replacement (See Annex).

An education and training center will also be incorporated into the facility at Tarlai to train farmers in bulldozer and tractor operation and to train skilled laborers in welding, lathe work and electrical work at each maintenance facility. Training will be undertaken by the management.

14.5.4 Agricultural Machinery Station Management

The present hire service is run by the Bureau of Soil Protection under the NARC, and is located at Tarlai Markaz. For smooth implementation of the plan, the cooperation of the Ministry of Education, currently promoting the Metal Workshop Plan and related government agencies of IA and NARC is required to reinforce AMS staff and provide an operation and management system in the Markaz. It is also necessary to review present new hiring charges, and set hiring charges in view of depreciation and management expenses. A licensing system should also be established for those trained as tractor operators, etc., at the training facilities, as well as a system for operation and maintenance of tractors of the private level.

AGRICULTURAL MACHINERY STATION SCHEME

	Main Station	Sub-station	Tractor Shed
Nos.	1	2	10
Facility	Tractor, implements bulldozer, trailor for bulldozer	Tractor, implements bulldozer, trailor for bulldozer	Tractor, implements
Workshop	320m^2	160m^2	70m^2
Tractor shed	1,400m^2	1,000m^2	400m^2
Training room	200m^2	-	-
Office	100m^2	50m^2	-

14.6 Livestock Development Promotion Scheme

14.6.1 Objectives

The objectives of the scheme are to establish a livestock development station, livestock development pilot farms and veterinary service facilities with a view to integrated promotion of the following important strategies for livestock development in the Study Area:

a) Improvement of genetic quality;

b) Strengthening of veterinary services;

c) Development of appropriate livestock raising systems and range management systems; and

d) Training and education of farmers.

14.6.2 Outline of the Scheme

The scheme will be carried out in two phases. The first phase will be for three years in which the establishment of Livestock Development Pilot Farms will be planned. In the second phase, livestock development promotion activities in the Stduy Area will be proposed with establishment of a Livestock Development Station as a regional center.

(1) First Phase: Establishment of Livestock Development Pilot Farms

In the first phase, Livestock Development Pilot Farms will be established to: i) formulate range land development and management systems and to demonstrate the same; and, ii) develop and demonstrate livestock raising systems. In the present scheme, establishment of three Pilot Farms is proposed considering the existence of a large area available for range land development and the necessity of widespread demonstration.

After establishment of the Livestock Development Station in the second phase, the Pilot Farms will operate as branches of the Station.

(2) Second Phase: Livestock Development Promotion Based on the Livestock Development Station

In the second phase, the establishment of a Livestock Development Station as the nucleus of integrated livestock development is planned and the following development activities are proposed:

a) Establishment of a breeding farm and distribution of qualified livestock to farmers;

b) Extension of artificial insemination;

c) Strengthening of veterinary services through construction of veterinary facilities;

d) Establishment of a livestock extension system and extension of technology to farmers; and

e) Experiment and demonstration.

In addition, emphasis will be placed on education and training for young farmers as a function of the station in order to train key farmers for future livestock development in the Study Area. UC Sihala is proposed as the station site taking into account the importance of the station as a training facility and of the future road construction plan.

(3) General Description of Proposed Facilities

Proposed facilities for the Pilot Farms and Station are as follows:

	Pilot Farm	Station
Location	UC Kirpa, UC Tamair, UC Charah	UC Sihala
Major Facilities	Animal shed, office building & demonstration field (2ha) for each pilot farm	Main buildings, breeding farm (animal sheds etc.), training facilities, veterinary facilities (4 veterinary hospitals, 5 veterinary dispensaries)
Affiliated Range Land	20ha/farm	50ha
Animals Stocked	Goats, cattle & buffalo	Breeding animals: cow-100 head nanny goats-100 head other animals: bulls, buffalo, billy goats

14.6.3 Organization and Operation

(1) Organization

The scheme will be implemented under jurisdiction of IA, while actual management and operation of the same will be carried out by the Livestock and Dairy Development Department. Management and operation in the first phase will be executed under the present organization of the same department, while in the second phase an organization system which will integrate livestock development activities into the Station will be established as in the proposed organization chart (FIG. 14.6-1).

(2) Operation

The following should also be considered for smooth operation and management of the scheme and to reduce the cost of the same.

a) Establishing a marketing system for products produced in the Station such as milk.

b) Collecting service costs for distribution of qualified livestock and artificial insemination.

c) Developing manpower required for the second phase during the first phase.

14.6.4 Facilities

Facilities required for implementation of the scheme are shown in TABLE 14.6-1.

14.7 Inland Fishery Development Scheme

14.7.1 Objectives

Inland fisheries are envisioned to generate income for farmers, diversify the agricultural sector and provide a source of inexpensive protein. Development of the same in the Study Area is presently at the initial stage and fish farming is rare among farmers. The objective of the scheme, therefore, is to promote inland fishery development emphasizing participation of farmers through; i) the establishment of a fish hatchery, ii) construction of village community ponds, iii) promotion of construction of mini-size fish ponds by farmers; and iv) utilization of reservoirs planned in the present Master Plan Study.

14.7.2 Outline of the Scheme

The objectives of the scheme will be achieved by integrated implementation of facility establishment and development activities.

(1) Fish Hatchery

The establishment of a small-scale fish hatchery and rearing facilities with production capacity of 0.5 million fry per year is planned in order to promote stocking of fish in existing water bodies in the Study Area such as at mini-dams and reservoirs and also at the proposed reservoirs and small ponds in the present Master Plan. Surplus production of fish fry will be stocked in Rawal Lake and Simly Lake or supplied to neighbouring districts such as Rawalpindi District. Proposed fish species are:

Local Species

Labeo rohita (Rohu), *Cirrhina mrigala* (Mori),
Catla catla (Thaila)

Exotic Species

Cyprinous carpio (Gulfam),
Ctenopharyngodon idellus (Grass carp)

(2) Development of Village Community Fish Ponds

Construction of small-scale fish ponds at each UC is proposed for extension of fish farming to farmers in the Study Area. Proposed sites for the ponds are community meeting places such as the Rural Development Station proposed in the Master Plan in order to promote demonstration effects. Fish ponds will be operated by each UC with participation of the rural people, and the latter will receive technical guidance and training from the Fishery Department.

(3) Inland Fishery Development of Water Bodies in the Study Area

Improvements in fish stocking practices in existing water bodies in the Study Area and development of water bodies proposed for inland fisheries under the Irrigation Scheme will be promoted. For the development of the proposed water bodies, participation of landless farmers and non-beneficiaries of the Irrigation Scheme will be planned with a view to increasing the income of those farmers. In addition, fish farming in small ponds proposed under the Master Plan such as Ground Water Multipurpose Development Scheme will be promoted. Similary, for the purpose of popularizing fish farming, fish fry will be supplied free of charge to farmers who dig a mini-size pond (10-20m^2 x 2m) to meet their domestic fish requirement. Duck raising is also considered for effective utilization of the water surface and enrichment of nutrient levels in the ponds.

(4) General Description of the Scheme

The scale and major facilities of each plan of the scheme are as follows:

Plan	Location	Scale	Major Facilities 2/
Establishment of Fish Hatchery	South of Rawal Lake	Annual prodution of fish fry: 0.5million	Brooder fattening tanks, Nursery tanks, Raceway tank, Demonstration Ponds
Development of Community Fish Ponds	One at each UC (11 ponds total)	0.4ha/pond 4.4ha in total	Fish ponds, Water supply facilities
Inland Fishery Development 1/	Proposed reservoirs for irrigation schemes	10reservoirs	
	Existing water bodies Rawal Lake, Simly Lake etc.	1,770ha	

1/ Fish farming in small private ponds and proposed small ponds is also promoted.
2/ See TABLE 14.7-1.

14.7.3 Operation

The scheme will be implemented under the jurisdiction of IA, while actual management and operation of the scheme will be undertaken by the Fishery Department. In operation, development of appropriate fish farming technology and extension activities making use of the proposed facilities should be aimed at emphasizing dissemination of fish farming to farmers in the Study Area.

14.7.4 Facilities and Equipment

Proposed facilities and equipment for the scheme are indicated in TABLE 14.7-1.

14.8 Village Environmental Improvement Scheme

14.8.1 Objectives

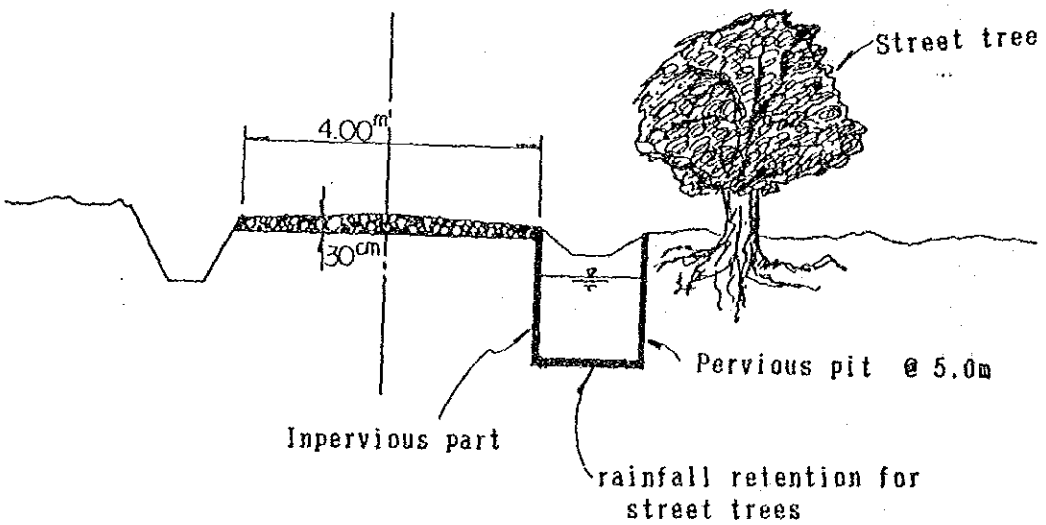
In the Study Area, supply of fuel wood is limited due to poor vegetation, and it is extremely difficult for rural people to secure fuel. Gathering of fuel wood places an extreme burden upon the women. The roads in the villages are very narrow without pavement and adequate drainage ditches, and sanitary condition of the roads is very poor because of domestic sewage and dust. In addition, traffic of people, animal and carts is hampered due to poor road conditions. Accordingly, the following countermeasures are proposed for improvement of the living environment of villages.

14.8.2 Outline of Scheme

(1) Improvement of Access Road from Village to Link Road

Access roads from villages to link roads will be improved in order to facilitate commuting and transportation.

Road length : 24.2km (200m/village x 121 villages)
Road width : 4.0m (passable for small trucks)
Road structure: shingle road with roadside trees



(2) Development of Access Roads to Forest

To reduce working hours for carrying fuel wood, roads from villages to fuel forests will be developed.

Road length : 60.5km (500m/village x 121 villages)
Road width : 2.0m (passable for oxcart)
Road structure : shingle road with roadside trees

(3) Inner Village Road Improvement

To reduce the labor of hauling drinking water and fuel wood and to improve the drainage system, existing roads will be widened and paved. In addition, location of housing will be planned in order to expand existing roads as proposed.

Proposed length of roads for improvement:
60.5km (500m/village x 121 villages)
Relocation of houses - about 5% of total houses in the Study Area

(4) Development of Fuel Wood Forest

For production of fuel wood and labor reduction, fuel wood forests will be reclaimed by utilizing the wasteland around each village.

Afforestation Area: 605ha (5ha/village x 121 villages)

(5) Construction of Ponds and Tree Planting

Leisure areas for residents will be developed through construction of ponds and tree planting around the same in each village.

Number of ponds: 605 ponds (5 ponds x 121 village)
Scale of pond : $600m^3$/pond ($400m^2$ x 1.5m)
Tree planting : 100 trees/pond
(10m width around pond. 1 tree per $9m^2$)

Recreation Parks will be constructed in eight places to serve the area population as places of communication and gatherings.

14.8.3 Operation and Management of Scheme

Operation and management of the scheme will be carried out by collaboration of village people under Markaz direction.

14.9 Land and Water Conservation Scheme

14.9.1 Objectives

Land protection and water control, constitute the basis of the land and water conservation schemes.

Islamabad rural area has a number of rivers and tributaries, and the land is cross-hatched by gully erosion. Cultivated land and villages are situated along narrow patches sandwiched among the tributaries and gullied land. Protection of this area from further erosion is extremely important. The present scheme aims at conservation and effective utilization of cultivated land as well as wasteland.

14.9.2 Outline of the Scheme

(1) Control of Soil Erosion in Cultivated Land

Losses of fertile surface soils by erosion will be prevented by the following countermeasures in order to conserve cultivated land.

1) Levelling of Cultivated Land

The area targetted for levelling is cultivated land in the Study Area totalling 23,120ha. Levelling will be carried out by a combination of bulldozers and manual labor.

2) Improvement of Levees

Levees will be improved in order to decrease the flow velocity of runoff from rainfall by storing temporarily in fields. Levees will be made of masonry or brick. The height of levees will be 12cm considering a rainfall intensity of about 100mm per day. Rainfall over 120mm will overflow the masonry levee, and be directed into drainage ditches.

Considering allowable inundation depth for crops, a drainage outlet will be provided in the levee in order to control the depth of flooding water.

Length of levees requiring improvement amounts to the total length of existing levees in the 23,120ha of cultivated land. Improvement of levees will be carried out simultaneously with land levelling.

3) Drainage Works

Discharge from fields will be directed into the present earthen ditches which are to be improved through masonry or brick lining.

The capacity of improved drainage ditches will be dependent on the scale of their catchment area. However, it is roughly estimated to be about $0.2m^3/sec$ per ha of catchment area. Construction of drainage ditches will be carried out simultaneously with improvement of levees as stated above.

(2) Prevention of Cultivated Land from Encroachment

Cultivated land has been degraded into wasteland by encroachment every year at the boundary between wasteland and cultivated land. Both engineering measures using retaining walls and use of vegetation are proposed as shown hereunder in order to prevent further losses of cultivated land by encroachment.

PREVENTION OF ENCROACHMENT

Drainage Basin	Length (km)	No. of Site for Engineering Measures	Area for Vegetation Measures (ha)
Soan River	110	110	110
Kurang River	2	2	2
Gumreh Kas	65	65	65
Malal Kas	115	115	115
Total	292	292	292

1) Engineering Measures

Small retaining walls with a small notch outlet and weir are planned at depressions created by gully erosion. Dimensions of the planned retaining walls vary according to topographic and geological conditions and standardization of

structure is difficult. However, retaining walls and weirs constructed by rubble works bound with cement are proposed. A concrete pipe of 30cm in diameter should be attached at the upper part of the retaining wall in order to avoid water flow over soil surface.

Retaining walls will be constructed at 292 sites as depressions caused by gully erosion are estimated to occur at intervals of 1 site per 1.0km of boundary between cultivated area and wastedland.

2) Vegetation Measures

Afforestation of 10m in width along the boundary between cultivated land and wasteland is planned. Total area for afforestation will be 292ha. Seedlings will be supplied from the proposed Nursery Station as mentioned hereunder. Proposed planting density is 1 tree per $9m^2$.

(3) Conservation and Utilization of Culturable Wasteland

Objective : Reclamation and utilization of culturable wasteland for grazing land or grassland.

Proposed Area for Reclamation : 3,630ha

Countermeasures : Land reclamation (terracing) by mechanical means and establishment of permanent pasture.

Proposed Grass Species to be introduced:

Cenchrus ciliaris, Panicum antidotale, Chrysopogon aucheri, etc.

(4) Conservation and Utilization of Unculturable Wasteland

Objective : Prevention of further degradation of unculturable wasteland and development of range land.

Proposed Area for Development : 5,000ha of unculturable wasteland in the plains

Countermeasures : Afforestation of fodder trees and fuel wood and grassland establishment by reseeding.

Proposed Species to be introduced:

Tree Species - Acacia modesta, Robinia pseudoacacia, Leucaena leucocephala, Dalbergia sisso, Acacia arabica, etc.

Grass Species - Cenchrus ciliaris, Panicum antidotale, Degitaria decumbens, etc.

14.9.3 Establishment of Nursery Station

Tree seedlings required for the implementation of the present scheme will be produced at 4 Nursery Stations established in the Study Area. In addition, seedlings required for Village Environmental Improvement Scheme (Section 14.8) will be supplied by the same. The establishment of the Stations are planned as shown in the following table. The following tree species suitable for local conditions are proposed for planting.

Acacia modesta, Leucaena leucocephala (Ipil ipil), Eucalyptus camaldulensis, Olea cuspidata, Acacia arabica

OUTLINE OF PROPOSED NURSERY STATIONS 1/

	UC				
	Kirpa (1)	Kirpa (2)	Koral	Bhara Kau	Total
Nursery Area (ha)	0.5	0.5	0.5	0.5	2.0
Production of Seedlings/year (Seedlings)	50,000	50,000	50,000	50,000	200,000
Sprinkler Facilities (set)	1	1	1	1	4
Station Office (building)	1	1	1	1	4
Workshop (building)	1	1	1	1	4
Tractor (set)	1	1	1	1	4

1/ Details are shown in TABLE 14.9-1

14.10 Medical and Health Services Improvement Scheme

Medical and health services represent one of the most underdeveloped sectors in the rural area. In addition to lack of facilities, there also exists a serious inadequency of doctors, nurses, mid-wives, and medical staff. The problem is further aggravated by insufficient budget for pharmaceuticals and utilities. The scheme for improvement of medical and health services has formulated with due consideration to these constraints.

14.10.1 Ambulance Station

Medical and health services are being improved by the Health Department, IA through establishment of Rural Health Centers (RHCs), Basic Health Units (BHUs) and mobile clinic cars. However, there are no emergency facilities for serious illnesses or sudden accidents, etc. For this reason, at least one ambulance car will be stationed at the RHC or BHU in each Markaz.

14.10.2 Establishment of Maternity Homes

According to a UC representative, maternal and infant deaths caused by complications during pregnancy and delivery are very high due to lack of skilled birth attendants. This fact is substantiated in the unusually high crude death rate of infants in the area (21.9% according to UNICEF estimates). To overcome this problem a maternity home with 25 beds will be attached to the RHC or BHU in each Markaz.

According to simple calculations based on the total population of 150,000 and the population growth rate of 2.5% in the rural area, the number of births is about 3,750 per year, or about 300 per month, with about 100 births per Markaz. Assuming a convalescence period of one week, 25 beds is considered suficient to meet the minimum requirement of the maternity home.

14.11 Manpower Development Scheme

14.11.1 Vocational Training Scheme

One Vocational Training Station with courses suited to the requirements of the rural area, will be established. However, in addition to construction of facilities, success of a vocational training scheme will depend on availability of capable instructors and administrative staff as well as procurement of adequate budget to cover training center operation.

(1) Training Course

The training course will be planned for short term training and the subjects, number of students and period of each course are as follows:

Subject	No. of Students	Period
Agriculture	10	6 months
Ceramics	10	5 "
Blacksmithing	10	5 "
Metalworking	10	5 "
Woodworking	10	5 "
Electric/Electronics	10	5 "
Auto Mechanics	10	5 "
Vehicle License	30	2 "

The annual training schedule is as follows:

Course Month	1	2	3	4	5	6	7	8	9	10	11	12	total
Agriculture	---------(I)-------											----	10
Ceramics		---------(I)---------						----------(II)----------					20
Blacksmithing		---------(I)---------						----------(II)----------					20
Metalworking		---------(I)---------						----------(II)----------					20
Woodworking		---------(I)---------						----------(II)----------					20
Electric/Ele.		---------(I)---------						----------(II)----------					20
Mechanics		---------(I)---------						----------(II)----------					20
License		--(I)---			--(II)---			--(III)--			---(IV)----		120

(2) Site and Facilities

The vocational training center has a total area of 3.0ha and will be delineated as follows:

Facility	Area
Central Buildings: (office, classrooms, experimental laboratories, auditorium, water tower, etc.)	0.2ha
Practice Building: (ceramics, blacksmith, metalworks, woodworks, electric/electronics, auto mechanics, meeting room, etc.)	0.3ha
Training Farm: (work yard, garage, material storage, workshop, meeting room etc.)	1.0ha
Training Course: (driving course, garage, meeting room, etc.)	1.0ha
Dormitory: (lodge rooms with 100 beds, dining room, kitchen, meeting room etc.)	0.5ha
Total	3.0ha

(3) Site

Based on the availability of water and electricity, convenience of access roads, available site area etc., the proposed location is UC Sohan.

14.11.2 Improvement for Primary Education Facilities

Primary education, a fundamental part of national development, is not yet compulsory. A 5 year primary school course is presently implemented; however, conditions of school houses and other teaching facilities need improvement.

At present, boys and girls primary schools are separated. According to a report from 104 primary schools on classroom conditions 15% of schools have no classrooms and instead use rented rooms, 25% have two (2) class rooms, 18% have three (3) classrooms, 30% four (4) classrooms, and almost no school has staff rooms.

(1) Proposed Improvements

Reconstruction of 114 existing primary schools in the rural area which have poor facilities and/or no buildings should be considered. Taking into consideration the future population and Master Plan stage, schools are classified into two (2) standard types of 2 classroom schools (40%) and 4 classroom schools (60%). Accordingly, in the Basic Design stage, school structure should be based on actual conditions.

(2) Facilities Required

Considerable facilities will be required as follows:

CONSTRUCTION OF SCHOOL BUILDINGS

(Unit: m^2)

Type	No. of Schools	Classrooms	Staff Rooms	Teaching Kit Rooms	Storage Rooms	Audito-riums	Toilets	Total
2 class-rooms	46	100(50x2)	25	25	25	100	10	285
4 class-rooms	68	200(50x4)	25	25	25	150	20	445

The classrooms, staff rooms and auditoriums include chairs, desks and blackboards etc.; and teaching kit rooms and storage rooms are to be equipped with shelves etc. One set of teaching kits is proposed for each school.

(3) Place

School buildings or facilities for the schools which have no classrooms or use rented space will be constructed near the existing school sites. Availability of electricity, water and telephones should be given preferential consideration.

14.12 Small-scale Industry Development Scheme

As described in Section 12.3, the following small-scale industries were selected.

14.12.1 Gabion Factory

(1) Production Method

Galvanized iron wire is set on an automatic wire netting machine and knitted into diamond shaped wire netting. In order to shape the wire netting into the designated tubular form or rectangular cube form, the backbone framework is made. This backbone framework is inserted in the central portion and outer edge of the wire netting to produce the desired tubular or rectangular cube form.

There are two types of automatic machine; the fully automatic type and the semi-automatic chain-link wire netting machine. The latter type is for labor intensive jobs, but as it requires considerable skill, some loss in productivity will be incurred at the initial stage. Therefore, the fully automatic type is recommended for its low cost and mass production capacity. The automatic type will also enable knitting of large or small mesh fence netting and rockslide (landslide) prevention netting of various lengths.

(2) Manufacturing Machinery and Equipment

Although the machinery and equipment required will differ depending on the type of product and total output, the machinery and equipment in the following list are for one set of automatic machinery used in combination to knit tubular and rectangular cube gabion. A different combination is possible, depending on requirements.

Machine	Capacity	Set
Fully automatic	3 t/day (8 hrs) x 25 days = 75 ton	1
Semi-automatic	2 t/day (8 hrs) x 25 days = 50 ton	1
Rectangular machine	.....	1
Circular ring frame	.....	1
Frame twisting	.....	2
Frame fixing	.....	2
Straightening	.....	1
Others	(Motors, cranes, transportation equipment)	

(3) Area

Including the products and materal storehouse, an area of about 660m^2 for buildings with an additional 2,000m^2 land area will be required. An access road and electric power receiving station with capacity of over 50kW will also be required (See Annex).

14.12.2 Livestock Feed Factory

A large amount of livestock feed is required in and around the rural area.

(1) Raw materials

Paddy and wheat straw enriched with 8% molasses and 2% urea is convenient fodder. Forty kilograms (40kg) of such enriched straw can feed 4 cattle per day (maximum diet) or 8 cattle per day (minimum requirement).

Straw can be directly purchased from individual farmers or farmers' organizations and is available within a 100-150km radius of the Study Area. Molasses is available in Peshawar Area, while urea is manufactured in the countryside (See Annex).

(2) Feed Plant

Optimum plant capacity is estimated at 20,000t/per year, for which the following will be required:

Equipment for one unit (Life: five years)

- mobile press for straw with a pressing capacity of 8t/hr: 1

- 60HP tractor for straw transportation, 10t towing capacity: 1
- 60HP tractor for operation of the press: 1
- lorry (5 ton) for transportation of molasses, urea and general transportation: 1

Personnel for one unit

- foreman: 1
- drivers: 3
- laborers: 20

Raw material

- straw: 20,000t
- molasses: 1,600t
- urea: 400t

14.12.3 Match Factory

Match manufacture is a light industry considered particularly suited to the Study Area according to criteria of required technology levels, raw materials and demand (See Annex).

(1) Production Method

The capacity of the minimum economic production unit of match making machines is 500 gross[1/] (72,000 boxes) per day (8 hour generation).

Assuming that a match box contains 40 sticks, that production scale is 500 gross per day or 21,600,000 boxes per year (500 gross x 144 x 300 days), and that the average consumption per person per day is 3 sticks, the servicible market population is as follows:

21,600,000 boxes x 40 sticks ÷ 365 days ÷ 3 sticks
= 789,041 ≒ 800,000

The manufacturing system is roughly classified into two types; the automatic system and the semi-automatic system. The automatic system is suitable for a production scale of 1,000 gross per day or more, from the viewpoint of operation efficiency and economy. The semi-automatic requires more labor; however this

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1/ 1 gross = 144 boxes.

system is most appropriate for adoption considering the planned scale of production (500 gross boxes), and the need to provide employment opportunities.

(2) Raw materials

Raw materials required for match production are as follows:

- Match sticks (may be poplar); diameter 30-50cm
- Potassium chlorate, sulphur powder, glass powder, paraffin, etc.
- Packaging papers for boxes and others
- Electricity (400V/3ph/60Hz, 230V/1ph/60Hz)
- Others (kerosene, water etc.)

(3) Factory

Basic facilities and equipment required for the factory include:

- Building (Floor space about 2,000m^2)
- Match wood machinery 1 set (6 types)
- Match making machinery 1 set (9 types)
- Match box making machinery 1 set (4 types)
- Match filling, side phospher coating, packing (8 types)
- manpower (40-50 persons)

14.13 Rural Development Supporting Services Scheme

Under this scheme, facilities and activities of the existing Markaz (Bhara Kau, Tarlai and Sihala) will be strengthened. The twelve schemes mentioned above will be closely inter-related with the activities of the Markaz. Strengthening of Markaz activities at the grassroots level will require establishment of Markaz branches consisting of Rural Development Stations in selected areas due to the scattered distribution of villages.

Each Rural Development Station will function as a community complex and will include income generating facilities (Community Work Centre), nursery school, library, meeting rooms, small communal flour mill, public warehouse, marketing facilities, wash place, AMS branch, medical facilities, a small fire station, etc. Income generating facilities could include a work place for sewing and knitting machines etc. and would offer employment opportunity for unemployed girls and women, to be trained for skilled labor at the Women's Education Center under the READ program of the Ministry of Education. The attached nursery school would serve as a day care center for these working women. A library, meeting room and class room facilities will contribute to training and education of rural people, and can also be utilized for the READ program, UNICEF Rural Women's Development Program and other activities.

Small joint flour mills will provide flour for home consumption and a communal washing area could be utilized by village women particularly in the dry season. The medical facilities and small fire engines will be available for emergencies and the branch agricultural machinery station will provide more prompt service than the Markaz due to shorter distances.

CHAPTER XV

SUMMARY OF COST ESTIMATES

15.1 Estimation of Cost

Preliminary cost estimates were prepared for all the schemes considered for the Master Plan based on unit prices prevailing in September 1985. The monetary measurement used for the evaluation of costs is Pakistan Rupees (Rs). A foreign exchange rate of Rs 15.60 to US$1 and ¥215 (Japanese Yen) was fixed on the basis of the official exchange rate in September 1985.

Construction cost estimates were prepared for each scheme based on calculated schedules of quantities and unit cost rates (See Annex). To these were added the costs for land acquisition, machinery and equipment, government administration, engineering services and physical contingency. No allowance was made in the estimates for: (i) import duties on machinery, equipment and materials, and (ii) cost escalation during the construction period.

A detailed estimate of foreign and local currency requirements for each scheme was not made at this stage; however, a preliminary assessment of the availability of local labor and materials and government administration costs, shows that the local currency component could amount to approximately 20% of total project cost.

15.2 Project Costs

Project costs of the Master Plan over the fifteen-year period (1986-2001) are estimated at Rs 4,534.89 million (Japanese Yen 62,490.81 million). Following table provides the total project costs and TABLE 15.2-1 the breakdowns of each scheme. Detailed calculation of project costs is presented in the Annex.

SUMMARY OF THE PROJECT COSTS OF THE MASTER PLAN

Project Component	Total Costs mln. Rs	Total Costs mln. Yen	Proportion(%)
1. Irrigation	792.30	10,918.05	17.5
2. Ground water multipurpose development	251.46	3,465.00	5.5
3. Intensive horticulture promotion	254.01	3,500.25	5.6
4. Transportation and communication improvement	310.16	4,274.25	6.8
5. Agricultural machinery station	207.41	2,858.25	4.6
6. Livestock development promotion	195.56	2,694.75	4.3
7. Inland fishery development	18.51	255.06	0.4
8. Village environmental improvement	633.92	8,735.40	14.0
9. Land and water conservation	686.90	9,465.30	15.1
10. Medical and health services improvement	69.21	953.55	1.5
11. Manpower development	887.84	12,234.45	19.6
12 Small-scale industry development	51.00	702.90	1.1
13. Rural development supporting services	176.61	2,433.60	4.0
Total Project Costs:	4,534.89	62,490.81	100.0

Note: (1) Project costs consist of direct costs and indirect costs. Direct costs include direct construction costs and machinery and equipment costs. Indirect costs include the costs for land acquisition (5% of direct costs), administration (10%), engineering services (15%) and physical contingency (20%).

(2) Cost estimates for 13 development schemes are presented in TABLE 15.2-1 and the detailed cost estimates are provided in the Annex.

15.3 Summary of Each Development Scheme

Following table shows the brief quantitative description of 13 development schemes mentioned before.

SUMMARY OF DEVELOPMENT SCHEMES

Schemes	Brief Description
Irrigation	- Kurang River System dam (2 sites), weir (3 sites), irrigable area (6,364ha) - Other Sources dam (12 sites), weir (3 sites), irrigable area (2,188ha) - Total Irrigable Area: 8,552ha
Ground Water Multipurpose Develoment	Deep well (7 sites), shallow well (45 sites), spring (1 site), beneficiary (32 villages), irrigable area (123ha)
Intensive Horticulture Promotion	Pilot farm (5 sites)
Transportation and Communication Improvement	Road paving (200km), telephone installation (300 places), simplified telephone communication system (13 places) beneficiary (6,500 households)
Agricultural Machinery Station	Main station (1 site), sub-station (2 sites), tractor shed (10 sites)
Livestock Development Promotion	Pilot farm (3 sites), development station (1 site), veterinary hospital (4 sites), veterinary dispensary (5 sites)
Inland Fishery Development	Fish hatchery (1 site), community pond (11 sites)
Village Environmental Improvement	Connecting road to main roads (24.2km), connecting road to forest (60.5km), village road (60.5km), afforestation (605ha), pond (605 sites), recreation park (8 sites)

- cont'd -

Schemes	Brief Description
Land and Water Conservation	Control of soil erosion (23,120ha), prevention of encroachment (292 sites), conservation and utilization of culturable wasteland (3,630ha), same of unculturable wasteland (5,000ha), nursery station(4 sites)
Medical and Health Services Improvement	Ambulance car (3 units), Maternity homes (3 sites)
Manpower Development	Vocational station (1 site), primary school construction/reconstruction (114 sites)
Small-scale Industry Development	Gabion factory (1 site), livestock feed factory (1 site), match factory (1 site)
Rural Development Supporting Services	Rural development station (13 sites)

The UC-wise distribution of above schemes is presented in the following table.

UC-WISE DISTRIBUTION OF DEVELOPMENT SCHEMES

Facility	Total Q'ty	Koral	Rawat	Kirpa	Charah	Tarlai Kalan	Sohan	Phulgran	S.Allah Ditta	Sihala	Bhara Kau	Tamair
IRRIGATION SCHEME												
Dams	14nos. (4,647ha)	-	-	1 (96)	2 (1,452)	-	-	4 (2,650)	1 (15)	-	3 (172)	3 (262)
Weirs	6nos. (3,905ha)	-	-	-	-	2 (1,350)	2 (2,515)	- -	2 (40)	- -	- -	- -
Mini-hydropower	10nos.	-	-	1	2	1	-	2	2	-	1	1
GROUND WATER MULTIPURPOSE DEVELOPMENT SCHEME												
Shallow Well	45nos.	-	-	6	8	3	4	4	2	6	4	8
Deep Well	7nos.	2	1	-	1	-	-	-	-	2	1	-
Spring	1no.	-	-	-	-	-	-	-	1	-	-	-
INTENSIVE HORTICULTURE PROMOTION SCHEME												
Pilot Farm	5nos.	-	-	-	-	1	-	-	1	1	1	1
TRANSPORTATION AND COMMUNICATION IMPROVEMENT SCHEME												
Road	200km	6.2	12.8	46.0	24.1	12.7	5.6	21.0	6.4	11.3	25.5	28.4
Telephone	300nos.	10	30	35	30	30	10	25	20	40	30	40
Simplified Telephone System	6,500nos.	500	500	500	500	500	500	500	1,000	500	500	1,000
AGRICULTURAL MACHINERY STATION SCHEME												
Main & Sub-station	3nos.	-	-	-	-	1	-	-	-	1	1	-
Tractor Shed	10nos.	1	1	2	1	-	1	1	1	-	1	1
LIVESTOCK DEVELOPMENT PROMOTION SCHEME												
Development Station	1no.	-	-	-	-	-	-	-	-	1	-	-
Pilot Farm	3nos.	1	-	-	2	-	-	-	-	-	-	-
Veterinary Hospital	4nos.	-	-	-	-	1	-	-	1	1	1	-
Veterinary Dispensary	5nos.	1	1	1	1	-	-	-	-	-	-	1
INLAND FISHERY DEVELOPMENT SCHEME												
Fish Hatchery/Pond	12nos.	1	1	1	1	1	2	1	1	1	1	1
VILLAGE ENVIRONMENTAL DEVELOPMENT SCHEME												
Recreation Park	8nos.	-	-	1	2	1	-	1	-	-	1	2
LAND AND WATER CONSERVATION SCHEME												
Nursery Station	4nos.	1	-	2	-	-	-	-	-	-	1	-
MEDICAL AND HEALTH SERVICES IMPROVEMENT SCHEME												
Maternity Home/Ambulance Car	3nos.	-	-	-	-	1	-	-	-	1	1	-
MANPOWER DEVELOPMENT SCHEME												
Vocational Training St.	1no.	-	-	-	-	-	1	-	-	-	-	-
Primary School Construction/Reconstruction	114nos.	4	12	13	11	10	3	10	7	17	10	17
SMALL-SCALE INDUSTRY DEVELOPMENT SCHEME												
Factories	3nos.	-	3	-	-	-	-	-	-	-	-	-
RURAL DEVELOPMENT SUPPORTING SERVICES SCHEME												
Rural Development Station	13nos.	1	1	1	1	1	1	1	2	1	1	2

CHAPTER XVI

IMPLEMENTATION SCHEDULE FOR INTEGRATED RURAL DEVELOPMENT

Integrated rural development programs are designed to yield maximum benefits with minimum investments through optimum combinations of project components which complement and reinforce one another. Based on this concept, combinations of development schemes were studied on a practical basis and an implementation schedule was planned.

16.1 Combination of Priority Schemes

As mentioned in Chapter XIII, thirteen priority schemes were selected on the basis of selection criteria. These schemes were carefully reviewed for the purpose of determining the implementaion sequence from the standpoint of: (i) consistency with government policy; (ii) consistency with people's demands; (iii) necessity of urgent implementation; (iv) financial acceptability; and (v) ease of implementation. As a result, the following two combinations of schemes were identified as the first and second priority projects for early implementation.

16.1.1 First Priority Schemes (MIRAD)

A combination of high priority schemes affecting agriculture, living environment, income, welfare services and other aspects of the overall wellbeing of the rural population was prepared for early implementation. These schemes consist specifically of such measure as domestic water supply, irrigation, village link roads, agricultural machinery hiring system, and rural development supporting services. Main features of the project are outlined in the following table on the next page.

16.1.2 Upper Kurang Irrigation Project (UKIP)

One of the farmers' greatest demands is irrigation water supply. To meet this demand, the Upper Kurang Irrigation Project (UKIP) plans effective use of surplus water in rainy season to irrigate about 6,400ha of farmland in the Study Area. With the implementation of this project, agricultural production in the project area will be substantially

increased and living conditions will be further improved by the induced effect of ground water in downstream areas and improvement of vegetation and rural environment.

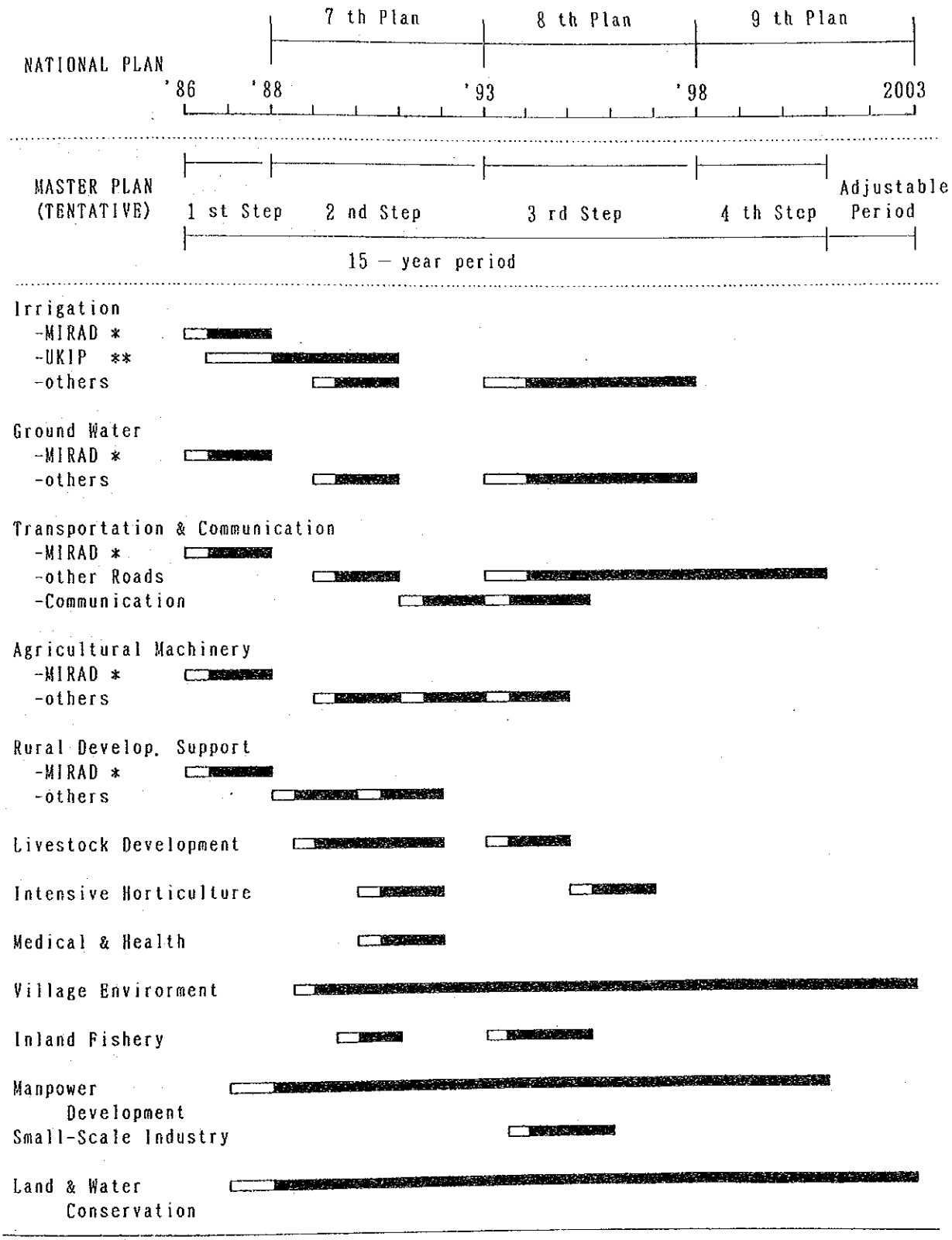
MIRAD PROJECT (EXAMPLE)

Project Component	Sub-Component
Ground Water Multipurpose Development	(a) Rural water supply from deep wells - 5 units
	(b) Village wells - 20 units
	(c) Rehabilitation of existing wells - 40 units
Irrigation	(a) Dams/weirs - 5 units Irrigable area: 1,500ha
	(b) Groundwater irrigation - 7 sites Irrigable area: 140ha
	(c) Village pond - 25 units Irrigable area: 300ha
Transportation and Communication Improvement	(a) New construction - 23km
	(b) Rehabilitation - 12km Total length: 35km
Agricultural Machinery Station	(a) Main Station: 1
	(b) Sub-Station: 2
	(c) Workshop: 3
	(d) Tractor shed: 5
Rural Development Supporting Services	R.D.station: 6

16.2 Implementation Schedule

The Master Plan is designed to be implemented over a seventeen-year period, including a two-year adjustable period, from 1986 to 2003 Implementation is divided into four phases to keep pace with future national development plans. First priority schemes (MIRAD Project) were planned to be implemented during the first phase from 1986-1988. The overall implementation schedule of the Master Plan is presented hereunder.

PROPOSED IMPLEMENTATION SCHEDULE (TENTATIVE)



* MIRAD : = Model Integrated Rural Development Project
** UKIP : = Upper Kurang Irrigation Project

16.3 Project Organization

16.3.1 Basic Approach

For effective implementation of the Master Plan, it is essential to strengthen the implementing capability of development agencies and the channels of communication linking them. These agencies include ministries at the national level, RACC at the district level, nation-building departments of IA, CDA (See Annex for its Organization chart), NARC and other institutions.

16.3.2 Coordination and Execution

A possible approach for administering project implementation is discussed below. Overall responsibility for coordination and implementation of the projects would be vested in the Administrator and prior to project implementation, a Project Coordination Committee (PCC) would be established under his chairmanship. The PCC will include senior officers from concerned agencies and departments, including the Ministry of Finance. The PCC will hold regular meetings to set guidelines for implementation, coordinate the participating ministries, departments and agencies, and review and monitor the progress of the project.

For project execution, a public corporation would be established by the Administrator and a Project Coordinator and other staff with engineering as well as clerical skills would be appointed on a full-time basis.

CHAPTER XVII

JUSTIFICATION OF THE MASTER PLAN

17.1 General

The proposed Master Plan aims to strengthen the production, employment and income generating base and to improve the living conditions of the rural population in ICT. In order to achieve these objectives, the Master Plan, consisting of various development schemes, was formulated through a broad-based integrated development approach.

The proposed Plan would increase agricultural production, raise income and improve living standards in the rural area of ICT. The Plan would also enable higher productivity in existing agricultural land, degraded marginal lands, and areas with under-developed ground water potential and under-utilized livestock resources. Infrastructures in the benefit area would be improved thus enhancing the living standards of the rural population. Benefits can be expected to emerge almost immediately after investments made during the initial stage of the Plan. The majority of the rural population would benefit directly through improvement of transportation, electricity services, agricultural extension services, rural institutions, marketing, social services and facilities.

Overall effects to be derived from the proposed Plan consist of tangible and intangible benefits. Tangible benefits arise from an increased value of production (e.g. increased agricultural production by way of a new irrigation system). Valuation of tangible benefits is not difficult in most cases. Intangible benefits, however, cannot be readily measured in a quantitative manner. These may include creation of new job opportunities, better health, better nutrition, reduced incidence of water-borne diseases, reduced infant mortality, etc. Although numerical valuation of intangible benefits is impossible, every effort was made to assess these factors as far as possible, given their central importance to the proposed integrated rural development.

17.2 Effects on Agricultural Production

Agricultural production would be substantially increased by introducing new irrigated agricultural technology. Experimental results indicate that yields of wheat can be doubled by providing irrigation water as compared to the present yield under traditional Barani farming. In addition, the Intensive Horticultural Development Scheme would have favorable effects in increasing production of vegetables and enabling higher productivity in the existing land where several kinds of fruit trees could be planted. The livestock development scheme would increase the value-added of livestock production through improvement of fodder and introduction of improved livestock varieties.

The cropped area would be increased by levelling of culturable wasteland, where small farmers and landless farmers would be given priority of use and would receive extension services for new farming technology and agricultural credit services.

17.3 Employment and Income Effects

Overall employment would be raised substantially as a result of more intensive land use, thereby helping to alleviate high unemployment particularly during the dry season. In addition to increased family employment in on-farm activities, hired labor is also expected to increase. Civil works for the plan would create new jobs for skilled and unskilled labor during the implementation period. After project completion, jobs would be generated by maintenance of facilities, vocational training, and introduction of small-scale industries.

About 4,500 farm families comprising roughly 33,600 people would enjoy higher levels of income and other benefits. The gross farm income of a typical farm holding of 1.0ha is estimated to increase from Rs 12,123 to Rs 24,896 in the case of C-type land and to 43,766 in the case of A-type land, as a result of irrigation facilities and improved agricultural services. TABLE 17.2-1 and 17.2-2 present budgets of typical small farms, 1.0ha in size.

17.4 Improved Standards of Living

Expansion and improvement of social infrastructures will favorably effect improvement of living standards for the rural population as outlined below.

Improvement	Related Schemes
1. Reduction in Labor	
- improved water supply eliminating need for water hauling	Ground Water Multipurpose Development Scheme
- farm mechanization	Agricultural Machinery Station Scheme
- improved transportation saving time spent on travel	Transportation and Communication Improvement Scheme
2. Employment Generation	
- vocational training	Manpower Development Scheme
- job generation	Small-Scale Industry Development Scheme
- generation of job opportunities for women	Rural Development Supporting Services Scheme
3. Health and Sanitation	
- decrease in infant mortality	Medical and Health Service Improvement Scheme
- decrease in water-borne diseases	Ground Water Multipurpose Development Scheme
- nutrition	Rural Development Supporting Services Scheme
4. Social Welfare	
- increase in recreational opportunities	Rural Development Supporting Services Scheme
5. Environment	
- soil and land conservation	Village Environmental Improvement Scheme

17.5 Environmental Impact

By promoting forestry activities on degraded and marginal lands and in upper catchment areas, the Plan would have an important positive impact

on the general environment of the benefit area. It would also help to arrest deforestation, thereby relieving the pressures caused by extraction of wood from erosion-prone water catchment areas. Reforestation and soil conservation of denuded areas including hill terraces and mountain slopes would help control erosion, reduce flooding and save agricultural lands.

By improving feeder roads from each village to forests and from each village to link roads and by promoting forestation near village ponds, the villagers would enjoy a healthy and comfortable environment in and around their villages.

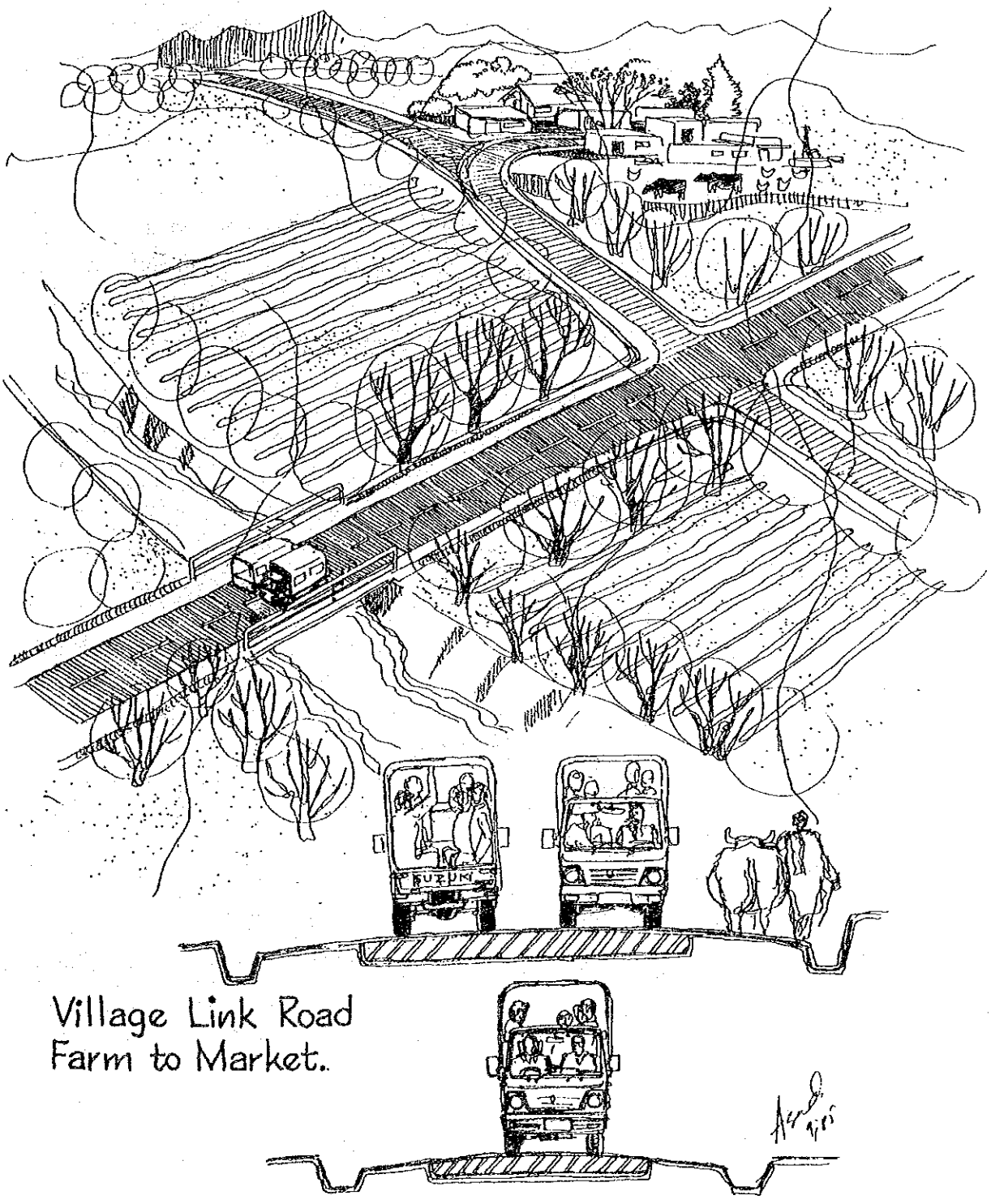
17.6 Other Socioeconomic Impacts

In addition to the effects described above, various socioeconomic effects are expected to be derived from the plan as mentioned below.

- Higher standard of living for farmers by increased farm production and multiple effects on the surrounding region;
- Dissemination of improved modern farming technology to the farmers in the vicinity of the plan;;
- Improved communication among the inhabitants by provision of an improved road system, telecommunication, establishment of community facilities, etc.;
- Activation of economic activities by increased agricultural input; and,
- Increased job opportunities in marketing services through increased production of vegetables.

TABLES AND FIGURES

ILLUSTRATION No.8



And the shades of the (Garden)
Will come low over them,
And the bunches (of fruit),
There, will hang low
In humility.

Dahr (LXX VI-14)

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Attached Drawings (1/100,000)

TABLE 3.2-1

GEOLOGIC STRATIGRAPHY IN ISLAMABAD AREA

Era	Period	Epoch	Name	Column	Sort	Quality	Thickness	Structure	Distribution
Cenozoic	Quaternary	Recent	Alluvium		gravel, sand, silt and clay	unconsolidated gravel in discontinuous lenses with silty clay or clay.	150m (max.)		present stream and river beds.
			Loess		silt and clay	brownish grey and earthy grey silt and clay.	12m (max.)		Rawalpindi-Saidpur road near Shakar Parian. Grand Trunk road near Sihala. Soan river Bluffs. South of the Rawal dam near the Kurang river and Qumreh Kas.
		Pleistocene	Terrace gravels		gravel, sand, silt and clay	limestone pebbles and sandstone gravels.	60m (max.)	different levels in different valleys	north-east and west of Malpur village. north of Sihala at the confluence of the Soan and Kurang rivers. south of Jhongi Saiydan. north-east and west of Sangjani village.
		Lower Pleistocene	Nimdirics: Upper Siwaliks, Middle Siwaliks, Lower Siwaliks		sandstone and claystone	light coloured and coarse-grained stones.	210 to 2400m	dip at gentle to steep angles. strike direction (east-north-east). folded and faulted.	south of Sihala
	Tertiary	Pliocene							
		Miocene	Nimdirics: Upper Murrees, Lower Murrees		sandstone and shale	fine-grained, massive and indurated sandstones and red and purple shales.		dip at steep angles. strike direction (east-north-east). folded and faulted.	north of Sihala
		Eocene	Laki series		limestone	grey, reddish and dark grey in colour. fossiliferous. gypsum veins. interbeded with calcareous shales of grey and greenish grey colour.	300m (max.)	dip at steep angles. strike direction (east-north-east). folded and faulted.	a major part of the Margalla Hills.
Mesozoic	Cretaceous				sandstone and limestone	dark coloured.			a part of the Margalla Hills.