ANNEX–G

IRRIGATION

ANNEX - G

IRRIGATION

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ANNEX-G IRRIGATION

G.1 INTRODUCTION

This ANNEX presents the results of studies on irrigation, irrigation water demand and preliminary O&M costs estimate of wells.

The main objective of the project is to augment irrigation water through recharge to groundwater in the basin by construction of dam(s) on the Mol and Khadeji rivers, tributaries of the Malir river. Preliminary water resources development plan is determined based on the water balance studies as described in ANNEX-D. Irrigation water demand for present and future conditions is estimated to derive materials for the water balance simulation, and operation and maintenance costs of wells under the without-project condition is also studied in this ANNEX.

G.2 IRRIGATION AREA

G.2.1 General

There are about 6,000 ha of agricultural land in the project area which are almost depending on groundwater. As clearly projected in the previous study in 1982, groundwater table is decreasing year by year due to overdraft of groundwater and it is proved that about 8 m drop of groundwater table for last 13 years is observed as described in ANNEX-D.

In the previous WAPDA report, it indicates that there were 514 wells in the area, and out of them, 406 wells were utilized for irrigation and domestic water supply. Since 1980, the Agricultural Engineering Department has proceeded with development of tubewells in and around the study area. Total tubewells drilled for last 10 years are 52 under the assistance of the Department. At the same time, tube/dug well construction in Konkar and Gadap Union Councils has been executed for poultry and cattle grazing as well as irrigation purposes.

Meanwhile, the agricultural electric consumers records in Karachi Electric Supply Corporation (KESC) show that there exist about 510 wells which are receiving electric supply in 1987/88. Existing well inventory surveys, groundwater level measurement and water quality survey at the same time were carried out during the period of the field works. Based on these results of field surveys, present irrigation condition in the project area is clarified in this Chapter.

G.2.2 Inventory of Existing Wells

Inventory survey on existing wells was conducted in 1977 as described in the WAPDA Report. Out of 514 wells observed, 406 production wells were utilized for irrigation and potable water supply. However, there are no such data available in Karachi and Lahore, as well as in the report and even there is no clear boundary of the project area. Therefore, well inventory survey was carried out in the study area.

The inventory of existing production wells is presented in Tables G.2.5 and G.2.6. The summary is presented in Tables G.2.1, G.2.2 and G.2.3 and illustrated in Fig. G.2-1. According to the well inventory survey, there are about 516 dug and tube production wells (see Table G.2.5) in the study area, and about 110 wells (see Table G.2.6) were abandoned due to mainly decreased groundwater table and deterioration of water quality especially in downstream area as shown in Figs. G.2-2 and G.2-3. Moreover, about 80 wells exist in the outside of the project area located in the downstream of the Malir basin.

As studied in ANNEX-D, aquifer in the basin to which recharge will be augmented by construction of dam(s) lies both banks along the Malir river, and is about 30 km long, 5 km wide, and 30 m depth. Almost all of production wells exist mainly along the Malir river, since the main recharge sources to the aquifer is the Malir river as seen in Fig. G.2-4 and DRAWINGS. As seen in Fig. G.2-2 and Table G.2.1, well construction was accelerated in the 1960's and it was continued in the 1970's and 1980's. High well distribution density is

observed in the downstream area and along the river (see Fig. G.2-4). Due to excessive withdrawal of groundwater, groundwater table was lowered year by year, and depth of dug wells was deeper and deeper according to drop of groundwater table as shown in Table G.2.2 and illustrated in Fig. G.2-3.

As discussed in ANNEX-D, the benefited area (hereinafter referred to as the project area) is delineated based on the hydrogeological condition and its recharge mechanism in the study area. In the project area, there are 466 production wells and its distribution is shown in DRAWINGS. Union Council-wise and Deh-wise existing wells are summarized in Table G.2.1, and the summary of production wells is shown below:

Dia. of Discharge P. mm (inch)	Nos. of Production Wells				
	Project Area	Darsano Chano U.C.	Konkar U.C.	Laundhi U.C.	Thano U.C.
50 (2.0)	92	-	76	11	5
75 (3.0)	246	44	97	89	16
100 (4.0)	121	52	28	16	25
125 (5.0 -)	7	6	-	-	1
Total	466	102	201	116	47

The above number of existing wells are also confirmed by the agricultural electric consumer's record in 1987/88 of Karachi Electric Supply Corporation (KESC) as summarized in Table G.2.1. Total existing number of wells is similar to the results of inventory survey in 1989. However, there is some difference of well numbers in each Deh, because sometimes an electric power distribution line covers several Dehs.

Figure G.2-4 shows its density of existing wells in the project area. In Konkar and Thano Union Councils located in southern (lower) part of the project area, more than 10 wells within one (1) km^2 exist, and each well is interfering each other due to overdraft of groundwater.

Depth of dugwells in each decade from 1940's to 1980's is illustrated in Fig. G.2-3. As seen in Fig. G.2-3, depth of dug wells is deeper and deeper every decade and this fact shows that the groundwater table is lowering at the rate of about 5 - 7 m per decade. Specially in the areas of Thano and Laundhi Union Councils, drop of groundwater table is remarkable, and abandoned wells are increasing sharply, as shown in Table G.2.2 and Fig. G.2-3.

G.2.3 Irrigation Area

In this study period, survey on irrigation area was also carried out in parallel to the well inventory survey as well as groundwater table and water quality measurements described in ANNEX-D. As delineated in ANNEX-D on the basis of hydrogeological conditions in the Malir river basin, the project area is limited to only the area along the Malir river. In the project area, there exist 466 production wells, and ø50 - ø125 mm (2 - 5 inches) discharge

pipes with pumps are installed in the wells. Depending on well yield, irrigation area is differed. In the lower basin, well yield is less compared to the upper basin as illustrated in Fig. G.2-5.

Net irrigation area in 1989 is estimated at 2,600 ha on the basis of the results of the above survey. Irrigation area covered by each well is deferred depending on diameters of its installed discharge pipes and well yields. The following table shows net irrigation area and well yields for each discharge pipe diameter, calculated by adopting unit irrigation water withdrawal in 1987/88:

Discharge Pipe Dia. mm (inch)	Nos. of Well Nos.	Net Irri. Area ha	Ave. Irri. Area/Well ha/well	Estimated Average Well Yield in 1987/88 1,000 m^3/year
50 (2)	92	210	2.3	31
75 (3)	246	1,220	4.9	67
100 (4)	121	1,100	9.1	124
125 (5)	7	100	14.3	195
Total/Ave.	466	2,630 Say 2,600 ha	5.7	77

Moreover, the results of water table measurement and water quality surveys in representative wells located in the project area are also used in estimating irrigation area for cross checking. Based on survey results of the representative 141 wells, net irrigation area is also estimated to be about 2,600 ha, as calculated in Tables G.2.8 and G.2.9.

G.2.4 Present Irrigation Practices

In the project area, soils are categorized into sandy loam with high infiltration rate of 40 mm - 50 mm/hr measured in this study period. Due to limitation of supply water and high infiltration, very limited basin irrigation method (less than about 20 m x 20 m) is predominant in the basin for common crops. However, areas such as water melon, gourd and onion etc., are irrigated by furrow irrigation method to only root zone to save water as much as possible.

All farmers acquaint with shortage of irrigation water and unreliable electric supply. Therefore, intensive irrigation water control is practical in the area. Wells are located within the irrigation area aligned to near the Malir river to increase well yields.

G.2.5 Irrigation Water Withdrawal in 1987/88

In the project area, there are 2,600 ha of net irrigation area which are irrigated by 466 production wells. Based on the agricultural electric consumer's record in 1987/88 (KESC), pumped water from the production wells is estimated to be about 35 MCM in 1987/88 and summarized below:

Unit: MCM

Year	Actual Water Demand Estimated by Method-(1) Operation Hours	Actual Water Demand Estimated by Method-(2) Energy Consumption	Diversion Water Requirement
Refer to	Table G.2.10	Table G.2.13	Table G.3.3
1. Average in 1987/88	35.2 (80%)	35.5 (80%)	44.3 (100%)
2. 1987	37.3 (81%)	37.8 (82%)	45.9 (100%)
3. 1988	33.0 (77%)	33.2 (78%)	42.7 (100%)

As seen in the above table, actual irrigation water supply in 1987/88 is limited at about 80% of necessary irrigation water requirement as calculated in Section G.3.9. This means that crops and plants in the project area were used to face shortage of irrigation water supply, due to long drought for last 20 years.

G.2.6 Existing Flood Detention Facilities

There are three (3) flood detention weirs in the project area as shown in Fig. G.2-6, and their salient features are presented in Table G.2.14. These weirs were constructed for the purpose of increasing groundwater recharge to the aquifer by detaining flood water during the Kharif (monsoon) season. There exist two weirs on the Malir river. The lower weir is located in Thano Union Council at 4.0 km upstream of the National Highway Bridge, and the upper weir in Konkar Union Council at 6.4 km from the Bridge, respectively. One weir is located in Laundhi Union Council at 7.5 km upstream of the confluence of the Malir and Sukkan rivers.

After completion of the project, these two weirs on the Malir river (lower and upper weirs) will play an important role as control devices to release water from the proposed dam(s), and will increase recharge to groundwater by creating spreading ponds.

G.3 IRRIGATION WATER DEMAND

G.3.1 General

In the planning of an irrigation project, a full knowledge of irrigation requirements of crops is needed from the time of seeding until harvest. Total irrigation water demand and peak irrigation water requirement of crops are essential in order to determine possible development area, water resources development, and capacity of irrigation system.

In order to determine water requirements, empirical and theoretical formulas are employed together with data obtained through the field tests and information from previous studies carried out by various agencies. Calculation formulas to estimate irrigation water requirement are expressed as follows:

$$FR = CU + Lp - Ep$$
$$CU = kc \times ETo$$
$$WD = FR/Ef$$

where,
- FR : Farm water requirement (mm)
- CU : Consumptive use (mm)
- Lp : Land preparation or pre-irrigation (mm)
- Ep : Effective rainfall (mm)
- ETo : Reference crop evapotranspiration (mm)
- kc : Crop coefficient
- Ef : Irrigation efficiency
- WD : Irrigation water demand (mm)

Irrigation water demand is calculated by using a computer model in this study. The parameters employed in the computer model are mentioned in the following Sub-sections and presented in Tables G.14 to G.16.

G.3.2 Previous Studies on Irrigation Water Demand

In WAPDA report, irrigation water demand was calculated on the basis of total consumptive use of water which was derived from the "Evaporation Index". Consumptive use of crops was calculated by adopting this Evaporation Index and pan-evaporation in the area. Annual total water requirement was estimated to be 62 MCM (50,300 A.F.) for 5,700 ha of the cropping area in 1977. As described in the latter Sub-section, this figure shows similar to the results of JICA study.

G.3.3 Cropping Calender and Pattern

The present cropping pattern in the project area is studied in ANNEX-E as illustrated in Fig. G.3-1. Main crops in the project area are vegetables and orchard.

Future cropping pattern without project is considered to be the same proportion of crops, but total irrigable area is decreased due to decreasing groundwater table, as studied in ANNEX-D. For assuming future cropping pattern with the project condition, factors considered are present cropping pattern, availability of groundwater, location, climate, soils, marketability, etc. In this study, it is assumed tentatively that orchards area is kept at the present level, and augmented irrigation water under with-project condition is utilized for vegetables cultivation. Future cropping area is presented in Fig. G.3-2.

G.3.4 Basic Meteorological Data

Meteorological data are available at Karachi airport and near the Super Highway bridge crossing the Malir river. The meteorological station at Karachi airport which is located at south-west of the project area within a distance of 5 km has long enough records and data to estimate the reference crop evapotranspiration. Therefore, meteorological data observed at Karachi airport are utilized for the calculation.

The meteorological data adopted are monthly rainfall during the period from 1929 to 1988 and the long observed mean monthly meteorological data of max. and min. air temperature, max. and min. relative humidity, 24 hours wind speed, day/night wind speed ratio, and sunshine hours as summarized in Table G.3.2.

G.3.5 Reference Crop Evapotranspiration (ETo)

There are so many methods to estimate crop evapotranspiration. Among these, the modified Penman method is introduced in this study, since the Penman method is likely to provide the most satisfactory results and utilized for so many projects in estimating reference crop evapotranspiration.

The original Penman (1948) equation predicted evaporation losses from an open water surface (Eo). Experimentally determined crop coefficients ranging from 0.6 in winter months to 0.8 in summer months relate Eo to grass evapotranspiration for the climate in England. The Penman equation consists of two terms; the energy (radiation) term and the aerodynamic (wind and humidity) term. The relative importance of each term varies with climatic conditions. Under calm weather conditions, the aerodynamic term is usually less important than the energy term. In such conditions the original Penman Eo equation using a crop coefficient of 0.8 has been shown to predict ETo closely not only in cool, humid regions as in England but also in very hot, and semi-arid regions. It is under windy conditions that errors can result in predicting ETo when using 0.8 Eo.

A slightly modified Penman equation is suggested here to determine ETo, involving a revised wind function term. The method uses mean daily climatic data, since day and night time weather conditions considerably affect the level of evapotranspiration, and adjustment for this is included.

The procedure to calculate ETo may seem to be rather complicated. This is due to the fact that the formula contains components which need to be derived from measured related climatic data when no direct measurements of the needed variables are available, for instance, for places where no direct measurements of net radiation are available, or cloudiness observations together with measured humidity and temperature. The modified Penman equation is given below:

$$ETo = c \times \underbrace{[W \times Rn}_{\text{radiation term}} + \underbrace{(1 - W) \times f(u) \times (ea - ed)]}_{\text{aerodynamic term}}$$

where, ETo : Reference crop evapotranspiration in mm/day
W : Temperature-related weighting factor
Rn : Net radiation in equivalent evaporation in mm/day
f(u) : Wind-related function
(ea-ed) : Difference between the saturation vapor pressure at mean air temperature and the mean actual vapor pressure of the air, both in mbar
c : Adjustment factor to compensate for the effect of day and night weather conditions

The details are described in FAO Paper No. 24. By using the above equation, reference crop evapotranspiration (ETo) was calculated using the meteorological data at Karachi airport as shown in Table G.3.2 and as summarized below:

(Unit: mm/month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
110	125	192	224	253	233	193	176	179	166	123	101	2,075

G.3.6 Consumptive Use

The consumptive use of water is the sum of the volume of water used by vegetative growth at a given stage and can be calculated by the following formula:

$$CU = ETo \times kc$$

where, CU : Consumptive use of water (mm)
ETo : Reference crop evapotranspiration (mm)
kc : Crop coefficient at given growing stage

Crop coefficient (kc) for each crop is determined on the basis of the recommendation by FAO Paper No. 24, the "kc" value for each crop is presented in Table G.3.3.

In order to create suitable soil moisture conditions before the sowing of seeds, pre-irrigation water is required. The quantity of water required for pre-irrigation is estimated to be 50 mm as shown below:

- Soil depth : 250 mm
- Void ratio of soil (sandy loam) : 40%
- Soil vapor phase after irrigation : 10%
- Soil moisture before water supply : 10%
- Water required for first irrigation : 50 mm

G.3.7 Effective Rainfall

Effective rainfall for upland crops varies with rainfall intensity and distribution, soils, crops, etc. In this study, it is assumed that effective rainfall for upland crops is computed using a standard method proposed by the US Department of Agriculture (USDA) (Ref. 3).

The U.S. Department of Agriculture, Soil Conservation Service has developed a procedure for estimating effective rainfall by processing long term climatic and soil moisture data for 50 years of precipitation records at 22 experimental stations. Daily water balance in soil profile was carried out and derived the following relationship between monthly rainfall and crop consumptive use:

$$ER = 0.2 \times R^{0.95} \times Cu^{0.31}$$

where, ER : Effective rainfall (mm)
R : Monthly rainfall (mm)
CU : Crop water requirement (mm)

The monthly effective rainfall can not exceed crop water requirement, and is the lower value of either the calculated ER or CU.

G.3.8 Irrigation Efficiency

After determining crop irrigation water requirements, the field irrigation efficiency is necessary to determine diversion irrigation water requirements at the on-farm level. No irrigation system is capable of applying an exact amount of water with perfectly uniformity. In addition, some water will be lost by evaporation during application, especially with sprinkler systems. Surface runoff, water spillage and leakage from the on-farm water distribution system also affect the expected farm irrigation efficiency. Seepage from unlined farm ditches and deep percolation through the soil profile due to non-uniform and excessive water applications usually cannot be recovered for use on a given farm. This affects the design irrigation efficiency.

The overall farm irrigation efficiency to be used in design should be estimated in consideration of all components that affect irrigation efficiency. In order to determine such

irrigation efficiency, however, empirical data are obtained through the field tests as well as information from previous studies carried out by various agencies.

The following table gives the recommendable irrigation efficiencies for different irrigation methods as stated in FAO Paper No. 24 and adopted total irrigation efficiencies in this study are shown below:

Irrigation Method		Field Application Efficiency	Adopted Total Irrigation Efficiency
Upland	(furrow, or basin)	60 - 70%	60%
	(sprinkler)	70 - 80%	70%
	(drip)	80 - 90%	80%

In the project area, average commanding area of each well is less than 20 ha. Therefore, only field application efficiency is considered as total irrigation efficiency in estimating the irrigation water requirements.

G.3.9 Irrigation Water Demand

Irrigation water demand in various conditions is estimated during the period from 1929 to 1989 by using the computer programme taking into account all the assumption and conditions as stated in the previous Sub-sections. The calculation results of the irrigation water demands in the present and future cases, which are incorporated in the water balance studies and studies on groundwater movement described in ANNEX-D, are presented in Tables G.3.3 to G.3.5, together with sample intermediate outputs of calculation of irrigation water requirement. The summary of irrigation water demands for the respectives are shown in Table G.3.1. The following table shows the summary of irrigation water demands for respective cases:

Cropping Pattern	Irrigation Area ha	Cropping Intensity -	Irrigation Water Demand		
			Surface MCM	Sprinkler MCM	Drip MCM
1. Cropping Pattern in 1977*	4,100	1.45	65.3	-	-
2. Present Cropping Pattern in 1989	2,600	1.1	42.0	36.0	31.5
3. Future Cropping Pattern	4,350	1.5	70.1	60.1	52.6

Remarks: * Ref. 01

G.3.10 Deep Percolation

Irrigation water demand includes various kind of unavoidable irrigation, operation and percolation losses. A certain amount of the above irrigation losses is expected to recharge to groundwater as deep percolation. For the water balance study, the amount of deep percolation should be considered as an usable water source. Since there is no actual measurement, it is assumed that 15% of diversion water requirement may recharge into groundwater as adopted in WAPDA report in 1982. Deep percolation for the proposed cropping pattern is presented in Tables G.3.3(1/3) and 3.5(6/6).

G.4 PILOT DEMONSTRATION FARM

G.4.1 General

As discussed in ANNEX-E, a pilot demonstration farm will play an important role in the project to achieve the project target by demonstrating an advanced irrigation and farming technique as well as research works. Preliminary basic plan, design and cost estimate are described in the following Subsections.

G.4.2 Proposed Pilot Demonstration Farm

(1) Objectives

Principal objectives of the pilot demonstration farm are:

1. to demonstrate an advanced irrigation technique (specially sprinkler and drip irrigation methods) in order to save irrigation water which results in increase of irrigation area,
2. to demonstrate an advanced farming technique, and
3. to carry out research works especially for vegetables.

(2) Location

The pilot demonstration farm is proposed to construct within the Plant Introduction Center at Saleh Mohammed Goth, Laundhi Union Council, which is situated at the southern part of the project area. This center is operated by the Federal Government of Pakistan, though it was initially established by the Sindh Government as a research center of horticulture. Then its function was transferred to another research center in the Indus river basin.

Out of 10 ha (25 acres), only 2.4 ha (6 acres) are used as orchard research fields and the remaining 7.6 ha (19 acres) are fallow due to limited irrigation water supply. Moreover, there is a section of extension services which belongs to the Agriculture, Livestock and Fisheries Department of the Sindh Government. Therefore, the most favorable circumstance is available in the center to establish a pilot demonstration farm.

(3) Available Water Sources

There are two dugwells in the center area as shown in Fig. G.4-1. A new dugwell was constructed in 1988, and old one is not in use. Well yield is estimated to be about 50,000 m^3/year based on average well yield in Thano and Laundhi Union Councils, and irrigation water requirement of orchard for 2.4 ha.

Therefore, it is necessary to construct a new tubewell, located at far a place from the new existing dugwell to minimize well interference. Proposed depth of the tubewell is tentatively estimated to be 120 m (400 feet), and a borehole pump will be installed. Anticipated well production is also about 50,000 m^3 per annum.

(4) Irrigation Water Requirement

In the pilot demonstration farm, so many kinds of crops and orchards will be planted for its demonstration and research purposes. Therefore, crop water requirement will differ and unit diversion water requirement for respective irrigation methods also be different as shown in Table G.4.1. Based on calculation of unit diversion requirement and area, maximum demonstration area will be 6.3 ha including the existing orchard fields of 2.4 ha.

(5) Plan of Plots Layout and Design

Basic alignment of the existing experimental plots is basically utilized. Three (3) irrigation methods, i.e. basin (prevailing irrigation method in the project area), sprinkler and drip irrigation will be introduced into the demonstration farm for its demonstration purpose. Drip irrigation will be applied mainly for the existing orchard field, and basin and sprinkler for other crop demonstration and research. A preliminary plan of field layout is presented in Fig. G.4-1.

The existing dugwell and a new tubewell to be constructed will be connected to a storage tank of about 400 m^3 (2 x 20 x 10 m). A booster pump station will be constructed beside the storage tank and a pressure steel tank will be provided to the booster station in order to absolve water hammer and provide automatic operation. Two main lines for high and low pressure will be aligned along the existing roads in the center.

(6) Preliminary Cost Estimate

The principal features of the demonstration farm is shown in Table G.4.2 together with its preliminary cost estimate. The following shows the summary of construction costs of the farm:

Work Item	Costs (1,000 Rs.)
1. Tubewell construction with pump and motor	3,184
2. Irrigation system	7,497
3. Laboratory and warehouse	650
4. Operation equipment	1,930
Total	13,261

G.5 OPERATION AND MAINTENANCE OF WELLS

G.5.1 General

There are 466 production wells in the project area, and depth of wells is deeper and deeper year by year due to drop of groundwater table as shown in Table G.2.2 and illustrated in Fig. G.2-3. Cleaning and deepening of wells are inevitable under the present condition.

Field measurements and interviews on operation and maintenance of wells were performed to assess the present condition of wells. These are surveys on clearing and digging costs, electric energy consumption, efficiency of pump and motor, etc. The results of study on operation and maintenance are described in the following sub-sections.

G.5.2 Operation and Maintenance of Wells

(1) Cleaning Costs

Results of field interviews on cleaning and deepening of wells are presented in Table G.5.1. The following shows summary of the maintenance cost:

Item	Cleaning
Maintenance	4,100 Rs./m
Costs	(1,250 Rs./ft)
Annual Costs	1,300 Rs.

(2) Digging Costs

Field interviews on digging costs were carried out for 25 representative wells as summarized in Table G.5.1. Average digging costs per meter is estimated at 9,100 Rs./m in 1989 price level. Applying an annual average digging depth of 0.6 m/yr as estimated in ANNEX-D, an annual digging cost is calculated to be 5,460 Rs./yr.

(3) Operation Costs

Electric motors are prevailing as prime mover of pumps in the project area. Electric power is supplied by Karachi Electric Supply Corporation Limited (KESC).

Energy consumption of wells were recorded in 1987 and 1988 by KESC to check actual energy consumptions, though almost all of electric energy costs are charged on the monthly sanction load basis. Electric energy consumption in 1987 and 1988 for representative 294 wells is summarized in Table G.2.11, and average daily operation hours are estimated to be 4.4 hours in 1987 and 4.1 hours in 1988. An average

electric energy consumption and sanction load per well are estimated to be 17,400 kWh/yr and 11.4 kW, respectively.

The following table shows an average electric charge in 1987/98 calculated on the Tariff D and Tariff D-1 basis of Karachi Electricity Rates Order 1989:

A.	Electric Energy Consumption in 1987/88 (refer to Table G.2.11)		
	Sanction Load	:	5,330 kW
	Electric Energy Consumption	:	8,100,000 kWh
B.	KESC Tariff		
	Tariff-D for private tubewell	:	Fixed charges at Rs. 35.0 per kW of the sanction load per month plus energy charges at Rs. 0.42 per kWh.
	Alternative Tariff-D1	:	Rs. 109 per horse power (149.5 Rs./kW)
C.	Electric Charge - Tariff D base	:	$5,640 \times 10^3$ Rs.
	- Tariff D-1 base	:	$9,560 \times 10^3$ Rs.

Remarks: Karachi Electricity Rates Order 1989, Government of Sindh.

There are two tariff basis for private agricultural tubewells applied by KESC, i.e. (1) actual energy consumption base (Tariff D), and (2) monthly sanction load base (Tariff D-1). In the project area, sanction load base for electric energy charge is prevailing, mainly due to its simplicity of calculation. However, as seen in the above table, electric charge calculated by the sanction load base is much higher than that of the actual energy consumption base.

(4) Efficiency of Pump and Motor

Field measurements of depth of water table, electric energy consumption, diameter of discharge pipe and discharge volume were carried out to assess combined efficiency of pump and motor. The results of the measurement for 7 representative wells are summarized in Table G.2.12, together with observation results by WAPDA in 1977. Average total efficiency of pump and motor is estimated at 29%. One pump shows relative high efficiency of 56% and one shows low efficiency of 17%. This value shows very low efficiency compared to the standard of 45 - 55%. In order to save energy costs, it is necessary to maintain properly pumps, especially impeller of pump.

As seen in Table G.2.12, efficiency calculated by WAPDA shows a little higher efficiency than the present one. This difference may cause mainly from deeper well depth, and deterioration of pump and motor.

(5) Actual pumped water in 1987/88

There are several approaches to estimate withdrawal from wells, i.e. calculation on the basis of (1) operation hours and standard discharge of respective diameter of pipe, and (2) total head, energy consumption and efficiency of pump and motor.

Table G.2.10 shows results of the calculation method (1), and Table G.2.13 of the method (2). Actual withdrawal from the phreatic aquifer by respective methods is summarized below:

Unit: MCM

Year	Actual Water Demand Estimated by Method-(1) Operation Hours	Actual Water Demand Estimated by Method-(2) Energy Consumption	Diversion Water Requirement
Refer to	Table G.2.10	Table G.2.13	Table G.3.5
1. Average in 1987/88	35.2 (80%)	35.5 (80%)	44.3 (100%)
2. 1987	37.3 (81%)	37.8 (82%)	45.9 (100%)
3. 1988	33.0 (77%)	33.2 (78%)	42.7 (100%)

As seen in the above table, actual irrigation water supply in 1987/88 is limited at about 80% of necessary irrigation water requirement as calculated in Subsection G.3.9. This means that crops and plants in the project area were used to face shortage of irrigation water supply, due to long drought for last 20 years.

G.5.3 Projection of Well Depth and O&M Costs

There is no groundwater management system and regulation in the project area. Cropped area is usually determined based on the groundwater level and the weather condition of the cropping season. If there is enough rainfall, it can be expected to increase recharge to the basin aquifer, and to raise groundwater table. In such a case, farmers usually increase cropped area depending on the groundwater table. If there is no management of the basin aquifer and farmers increase their cropped area, groundwater table will drop continuously, as experienced in last several decades.

As discussed in ANNEX-D, water balance in last 13 years from 1977 to 1989 was performed. It shows that the present withdrawal from the basin aquifer is nearly balanced by consuming the existing groundwater potential, i.e. resulting drop of groundwater table. Under the condition of without project, i.e. without groundwater management in the basin aquifer, groundwater table will decline year by year, and it might be accelerated. Table G.5.2 shows projection of well depth in future.

Drop of groundwater table results in increase of electric energy costs and digging costs. Annual incremental costs are calculated as shown in Table G.5.3, and summarized below:

Decade	Annual O&M Cost (x 10^3 Rs.)
1990s	3,290
2000s	4,800

G.5.4 Improvement of Pump Efficiency

The present efficiency of pump and motor is estimated at about 30%, which shows low efficiency compared to the standard of 45% to 55%. In the project area, total annual electric energy consumption in 1987/88 was 8.1 MWh. If the pump efficiency will be improved to 40%, energy saving is estimated to be about 2.0 MWh per annum, or 25% of total annual energy consumption. The following table shows saving of electric energy and charge, if proper maintenance of pump, especially pump impeller be performed:

Efficiency of Pump and Motor	Under Present Constant Head Energy Consumption 10^3 kWh/yr.	Saving	
		Electric Energy 10^3 kWh	Electric Charge 10^3 Rs.
30%	8,100 (100%)		
		2,020	850
40%	6,080 (75%)		
		1,220	510
50%	4,860 (60%)		

As presented in Table G.2.12, pump efficiency observed in 1977 by WAPDA is a little higher percentage than value in 1989 by JICA, mainly due to deterioration of pump and drop of groundwater table. Therefore, it is necessary to demonstrate to farmers how to maintain pumps and to save electric energy costs.

As discussed in Subsection G.5.2(3), electric charge calculated on the sanction load base, regardless to actual energy consumption, is prevailing in the project area. This means that under the constant electric energy charge, farmers want to operate pumps and motors as much as possible, regardless to actual energy consumption, and this fact will accelerate drop of groundwater table.

Under such conditions, it might be so difficult to improve pump efficiency. Because in a case of low pumping efficiency, operation hours of pump and motor will be extended regardless to increase of electric energy costs. However, as explained in Subsection G.5.2(3), electric charge on the sanction load base is much higher than that of actual energy consumption base. Therefore, it is necessary to demonstrate to farmers why to adopt the Tariff D instead of Tariff D-1 for private agricultural tubewells, and how to improve pump efficiency and to save electric energy consumption as a result.

LIST OF REFERENCES

1. WATER RECOURCES DEVELOPMENT IN MALIR BASIN, WAPDA, 1982

2. CROP WATER REQUIREMENT, IRRIGATION AND DRAINAGE PAPER NO. 24, FAO, 1977

3. EFFECTIVE RAINFALL IN IRRIGATED AGRICULTURE, IRRIGATION AND DRAINAGE PAPER NO. 25, FAO, 1974

4. COMPUTER MODEL FOR CALCULATION OF IRRIGATION WATER REQUIREMENT, NIPPON KOEI CO., LTD., JAPAN, 1989

TABLES

Table G.2.1 SUMMARY OF PRODUCTION WELLS IN THE PROJECT AREA

Union No.	Council	Deh	No. of Well shown on map: Production Wells	Abondon. Wells	Total	Well Nos. in Project Area for Sumilation	Agri. Electric. Consummer's Record (KESC)	Study Area: Well Inventory in Oct. 1989: Total	-1940	1950's	1960's	1970's	1980's
1	Darsano Chano	Amilano	21	1	22	27	31	27	3	3	10	7	4
		Chuhar	4	1	5	13	12	13	1		7	2	3
		Kothore	45	8	53	34	4	34		4	17	10	3
		Kotiraro	2	12	14	28	24	28	7	6	6	5	4
		Sub-total	72	22	94	102	71	102	11	13	40	24	14
2	Konkar	Bazar	58	4	62	29	24	29		7	14	4	4
		Darsano Chan	59	7	66	51	60	51	8	5	18	10	10
		Khar Kharo	24	3	27	35	34	35	10	4	13	2	6
		Konkar	12	3	15	0		50	11	1	8	8	22
		Malh	115	4	119	70	133 *	70	24	15	20	10	1
		Thado	1	1	2	9	9	9		1	4		4
		Tore	2		2	7		7					7
		Sub-total	271	22	293	201	260	251	53	33	77	34	54
3	Laundhi	Khakhar	2	2	4	29	30	29	8	4	2	9	6
		Khanto			0	0	7						
		Laundhi	39		39	47	55	47	16	5	11	7	8
		Sanhro	53		53	40	41	40	7	6	19	6	2
		Sub-total	94	2	96	116	133	116	31	15	32	22	16
4	Thano	Thano	27		27	47	47	47	31	7	5	3	1
			464 { 406 }	46 { 108 }	510 { 514 }	466	511	516	126	68	154	83	85

Remarks: * including wells in Konkar and Tore Union Councils.
{ } shows well numbers estimated by WAPDA in 1977.

Table G.2.2 DEPTH OF DUGWELLS IN EACH UNION COUNCIL

Area		Depth From Ground Surface (m)	
1. Whole Project		Constructed Time	Present (1989)
	1940's	-8.5	-36.7
	1950's	-13.3	-33.7
	1960's	-15.2	-30.3
	1970's	-19.7	-29.4
	1980's	-20.0	-24.0
		-14.6	-31.3
2. Darsano Chano U.C.		Constructed Time	Present (1989)
	1940's	-6.7	-20.9
	1950's	-10.3	-26.1
	1960's	-12.1	-26.4
	1970's	-14.0	-25.2
	1980's	-16.7	-20.6
		-12.4	-24.6
3. Konkar U.C.		Constructed Time	Present (1989)
	1940's	-7.9	-32.2
	1950's	-13.0	-32.8
	1960's	-15.2	-28.2
	1970's	-20.0	-27.6
	1980's	-19.1	-24.3
		-14.6	-29.1
4. Laundhi U.C.		Constructed Time	Present (1989)
	1940's	-9.7	-39.1
	1950's	-14.6	-35.2
	1960's	-18.2	-37.3
	1970's	-20.6	-34.3
	1980's	-25.5	-31.3
		-16.7	-36.4
5. Thano U.C.		Constructed Time	Present (1989)
	1940's	-8.5	-48.5
	1950's	-16.7	-46.7
	1960's	-24.3	-45.5
	1970's	-29.7	-46.4
	1980's	0.0	0.0
		-13.3	-47.6

Table G.2.3 SUMMARY OF WELL INVENTORY IN THE STUDY AREA

(Unit: Nos.)

Items	Total	1940's	1950's	1960's	1970's	1980's
1. Production Wells in 1989						
Project area	516	126	68	154	83	85
Darsano	102	11	13	40	24	14
Konkar	251	53	33	77	34	54
Launchi	116	31	15	32	22	16
Thano	47	31	7	5	3	1
2. Abandoned Wells						
Project area	111	44	17	21	13	15
Darsano	15	0	2	4	6	3
Konkar	53	25	4	8	4	12
Launchi	24	8	9	5	1	1
Thano	19	11	2	4	2	0
3. Total Constructed Wells						
Project area	627	170	85	175	96	101
Darsano	117	11	15	44	30	17
Konkar	304	78	37	85	38	66
Launchi	140	39	24	37	23	17
Thano	66	42	9	9	5	1
4. Abandoned Wells in Each Decade						
Project area	111	0	4	13	30	64
Darsano	15	0	0	0	3	12
Konkar	53	0	3	11	10	29
Launchi	24	0	1	1	11	11
Thano	19	0	0	1	6	12

Table G.2.4 · SUMMARY OF NET IRRIGATION AREA IN 1988

Discharge Pipe Dia. inch	Project Area Ave. Irr.Area ha/well	Well No.	Irr. Area ha	Darsano Chano Ave. Irr.Area ha/well	Well No.	Irr. Area ha	Konkar Ave. Irr.Area ha/well	Well No.	Irr. Area ha	Laundhi Ave. Irr.Area ha/well	Well No.	Irr. Area ha	Thano Ave. Irr.Area ha/well	Well No.	Irr. Area ha
2	2.3	92	214	0.0		0	2.0	76	152	5.0	11	55	1.3	5	7
3	4.9	246	1216	8.5	44	374	4.4	97	427	4.0	89	356	3.7	16	59
4	9.1	121	1104	11.8	52	614	9.7	28	272	5.4	16	86	5.3	25	133
5	14.3	7	100	15.8	6	95	0.0		0	0.0		0	5.2	1	5
Ave./Total	5.7	466	2634	10.6	102	1082	4.2	201	850	4.3	116	497	4.3	47	203
	Say :		2600 ha												

Remarks: Summary of net irrigation area taken from Table G.2.5.

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (1/7)

NO.	Union Council	Deh	No. of Well	Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Primer Mover D:dei E:Ele	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Pump: Possible Operation Hours in Rabi (hrs)	Pump: Possible Operation Hours in Kharif (hrs)	Total Commam. Area (ha)	Possible Irri. Area (ha)	Add. Bore Hole (ft)	Remarks	Input Ref. No.
1	Darsano	Amilano		-	1940	-	-	60	18		D	D	7	4						KDA N0.1	11
2	Darsano	Amilano		-	1940	25	-	60	18	30	D	D	7	10						KDA N0.9	15
3	Darsano	Amilano		-	1940	20	5	90	15	20	D	E	20	4	8	12	44	18			20
4	Darsano	Amilano		-	1950	40	10	95	15	18	D	E	20	3	3	8					134
5	Darsano	Amilano		-	1955	40	8	90	15	16	D	E	20	4	6	12	18	16			18
6	Darsano	Amilano		-	1958	35	10	90	10	20	D	E	22	4	2	6	24	16			224
7	Darsano	Amilano		-	1960	40	8	95	20	20	D	E	20	3	8	12	44	16			19
8	Darsano	Amilano		-	1960	40	10	100	10	20	D	E	20	3	1	4	20	16			22
9	Darsano	Amilano		-	1965	40	10	80	10	20	D	E	22	3	1	4					2
10	Darsano	Amilano		-	1966	40	10	60	20	20	D	E	25	5	2	8					387
11	Darsano	Amilano		-	1966	40	10	90	15	20	D	E	22	3	2	12	20	18			388
12	Darsano	Amilano		-	1968	50	12	70	20	18	D	E	15	3							5
13	Darsano	Amilano		-	1968	30	12	70	30	20	D	E	20	6	10	24	44	24			6
14	Darsano	Amilano		-	1968	50	12	70	20	18	D	E	20	4			20	20			8
15	Darsano	Amilano		-	1968	40	10	65	15	20	D	E	20	4	2	6					9
16	Darsano	Amilano		-	1968	45	10	90	15	20	D	E	22	3	2	8					11
17	Darsano	Amilano		-	1970	55	12	70	20	20	D	E	15	3			20	20			9
18	Darsano	Amilano		-	1973	50	8	70	20	20	D	E	20	4	10	24					7
19	Darsano	Amilano		21	1973	30	10	70	20	25	D	E	20	3	2	24	61	8			13
20	Darsano	Amilano		-	1975	50	12	65	70	18	D	E	15	3	8	12				Poultry	16
21	Darsano	Amilano		-	1975	40	10	85	15	20	D	E	20	3	2	12	16	16			17
22	Darsano	Amilano		-	1977	30	10	80	20	20	D	E	15		24	24	12	12			14
23	Darsano	Amilano		-	1978	50	12	80	20	25	D	E	15	3			18	16			17
24	Darsano	Amilano		-	1983	50	10	80	6	20	D	E	-	3	1	3	16	12			316
25	Darsano	Amilano		-	1984	50	10	60	4	20	D	E	15	3		0.75					10
26	Darsano	Amilano		-	1984	50	10	60	8	20	D	E	20	4	-	2	28	8			11
27	Darsano	Amilano		-	1986	70	20	70	20	18	D	E	15	3						Domestic	4
28	Darsano	Chuhar		-	1940	15	5	60	10	20	D	E	20	4	2	8	14	12			21
29	Darsano	Chuhar		-	1961	35	10	100	15	20	D	E	20	4	2	10	24	20	-		114
30	Darsano	Chuhar		106	1965	30	10	60	20	26	D	E	20	3	2	12	20				1
31	Darsano	Chuhar		-	1966	35	10	100	5	20	D	E	20	4	2	5	16	14			389
32	Darsano	Chuhar		-	1966	40	10	70	7	20	D	E	22	4	2	7	14	10			390
33	Darsano	Chuhar		-	1966	40	10	70	10	20	D	E	20	4	2	6	24	16			391
34	Darsano	Chuhar		-	1967	45	10	60	12	20	D	E	25	4	2	7	16	12			132
35	Darsano	Chuhar		-	1969	45	10	65	10	20	D	E	20	4	2	8	24	18			375
36	Darsano	Chuhar		-	1970	50	10	70	10	20	D	E	20	4	2	7					11
37	Darsano	Chuhar		93	1972	20	10	50	30	25	D	D	30	3	3	24	40	16			3
38	Darsano	Chuhar		-	1981	50	6	70	10	20	D	E	15	3	2	8	16	14			346
39	Darsano	Chuhar		-	1983	45	8	70	12	20	D	E	20	4	3	10	12	10			317
40	Darsano	Chuhar		-	1986	40	10	50	10	20	D	E	15	3	3	8	12	10			5
41	Darsano	Kathore		-	1954	30	10	110	8	20	D	E	22	3	1	4	53	2			13
42	Darsano	Kathore		-	1955	35	10	90	Dry	20	D	E	20	4	-	-	49	18			19
43	Darsano	Kathore		-	1958	30	10	110	20	20	D	E	20	3	4	12	16	14			225
44	Darsano	Kathore		-	1958	30	10	110	20	20	D	E	20	3	-	-					227
45	Darsano	Kathore		-	1960	45	10	105	8	20	D	E	20	3	4	8	32	26			23
46	Darsano	Kathore		-	1960	50	10	110	15	20	D	E	20	3	6	10	16	14			24
47	Darsano	Kathore		-	1960	40	10	105	15	20	D	E	20	4	5	10	24	16			26
48	Darsano	Kathore		-	1960	40	10	110	15	20	D	E	20	3	6	10	16	12			27
49	Darsano	Kathore		-	1960	30	10	110	15	20	D	E	20	4	5	10	20	16			28
50	Darsano	Kathore		-	1960	40	10	75	8	20	D	E	15	3	2	8	40	24			29
51	Darsano	Kathore		-	1960	40	10	95	20	20	D	E	20	4	3	16	49	18			30
52	Darsano	Kathore		-	1960	35	10	90	20	20	D	E	22	4	12	24					31
53	Darsano	Kathore		-	1960	40	10	105	15	20	D	E	20	4	5	10	40	40			32
54	Darsano	Kathore		-	1962	40	10	90	30	20	D	E	22	4	8	24	61	49			242
55	Darsano	Kathore		-	1964	40	10	110	15	20	D	E	22	4			22	18			412
56	Darsano	Kathore		-	1964	50	10	110	15	20	D	E	20	3	5	10	14	10			414
57	Darsano	Kathore		-	1965	45	8	110	10	18	D	E	20	3	6	12	12	8			3
58	Darsano	Kathore		-	1966	40	10	90	25	20	D	E	22	5	12	24	42	40			392
59	Darsano	Kathore		-	1967	50	10	110	15	20	D	E	22	4	3	8	49	28			134
60	Darsano	Kathore		-	1567	45	10	90	30	20	D	E	22	4	12	24	49	32			135
61	Darsano	Kathore		-	1968	40	10	110	12	18	D	E	20	3	4	10					12
62	Darsano	Kathore		-	1970	50	10	105	12	20	D	E	20	3	4	12	12	8			14
63	Darsano	Kathore		-	1970	50	10	95	30	20	D	E	22	4	12	24	49	40			15
64	Darsano	Kathore		-	1972	40	10	95	15	20	D	E	20	3	4	8	16	12			4
65	Darsano	Kathore		-	1974	55	10	110	25	20	D	E	20	4	2	16	40	24			49
66	Darsano	Kathore		-	1975	40	10	90	30		D	E	20	4	12	24	40	28			18
67	Darsano	Kathore		-	1976	50	10	80	25	20	D	E	20	4	8	24	44	40			373
68	Darsano	Kathore		-	1978	60	10	105	25	20	D	E	20	4	12	24	24	16			19
69	Darsano	Kathore		-	1978	60	10	95	15	18	D	E	20	3	5	10	24	16			20
70	Darsano	Kathore		-	1978	45	10	100	20	20	D	E	20	3	-	-	15	11			21
71	Darsano	Kathore		-	1978	50	10	110	20	20	D	E	20	3	4	10	40	40		Poultry	22
72	Darsano	Kathore		-	1984	80	10	90	30	20	D	E	22	4	-	24	44	40			12
73	Darsano	Kathore		-	1985	40	10	50	15	20	D	E	20	-	24	24	40				24
74	Darsano	Kathore		-	1988	90	10	95	25	20	D	E	22	4	8	24	32	26			49
75	Darsano	Kotiraro		124	1935	15	5	70	8	20	D	E	15	3	1	3					399
76	Darsano	Kotiraro		108	1940	20	10	70	8	30	D	E	20	4	2	5	20	8			22
77	Darsano	Kotiraro		107	1940	30	10	70	10	20	D	E	20	4	2	4	4	4			23

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (2/7)

NO.	Union Council	Deh	No. of Well	Original Condition: Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Pump: Primer Mover D:del E:Ele	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Pump: Possible Operation Hours Rabi (hrs)	Pump: Possible Operation Hours Kharif (hrs)	Total Comman. Area (ha)	Possible Irri. Area (ha)	Add. Bore Hole (ft)	Remarks	Input Ref. No.
78	Darsano	Kotiraro		90	1940	20	5	70	12	25	D	E	20	4	2	5	24	6			24
79	Darsano	Kotiraro		90	1940	30	5	75	10	20	D	E	20	4	2	6	16	6			25
80	Darsano	Kotiraro		75	1940	25	10	70	10	40	D	E	20	4	3	8	12	6			26
81	Darsano	Kotiraro		47	1945	20	10	60	20	20	D	E	20	4	4	10	41	12			136
82	Darsano	Kotiraro		83	1955	30	5	70	8	30	D	E	20	4	3	8	40	10			20
83	Darsano	Kotiraro		121	1956	35	8	70	10	20	D	E	20	4	2	4	24	16	200		391
84	Darsano	Kotiraro		101	1957	30	10	70	4	20	D	E	15	3	2	4	11	2			222
85	Darsano	Kotiraro		109	1958	30	6	70	12	30	D	E	20	4	3	7	20	8	200	Poultry	228
86	Darsano	Kotiraro		90	1958	40	8	70	8	20	D	E	20	4	2	5	28	12	250		229
87	Darsano	Kotiraro		60	1958	35	8	70	10	20	D	E	20	4	2	6	12	8		Poultry	230
88	Darsano	Kotiraro		99	1962	35	8	75	8	20	D	E	20	4	2	5	24	8		Poultry	243
89	Darsano	Kotiraro		90	1962	40	5	60	5	20	D	E	15	3	1	4	12	6	200		244
90	Darsano	Kotiraro		117	1964	40	8	76	12	20	D	E	20	4	2	6					415
91	Darsano	Kotiraro		91	1965	30	10	65	25	18	D	E	15	4	-	10	24	12			4
92	Darsano	Kotiraro		90	1965	20	Dry	65	1	30	D	E	-	-	-	-	81	20	5x300;200;180		5
93	Darsano	Kotiraro		83	1966	40	5	60	5	16	D	E	15	3	2	6	16	10	200		393
94	Darsano	Kotiraro		81	1970	40	8	60	8	20	D	E	15	3	1.5	4	14	6			16
95	Darsano	Kotiraro		106	1970	50	10	70	12	20	D	E	15	3	2	5	17	4			17
96	Darsano	Kotiraro		90	1970	45	10	70	6	16	D	E	15	3	1	2				Poultry	18
97	Darsano	Kotiraro		90	1971	45	5	65	5	18	D	E	15	3	2	5	16	8	200	Poultry	393
98	Darsano	Kotiraro		121	1978	50	5	65	10	40	D	E	20	4	4	10	40	32			23
99	Darsano	Kotiraro		121	1982	55	5	65	12	30	D	E	20	4	4	8	28	16			55
100	Darsano	Kotiraro		90	1982	50	10	70	15	20	D	E	20	4	3	10	61	20	300		56
101	Darsano	Kotiraro		109	1986	50	5	55	5	20	D	E	15	3	-	2	20	8		Poultry	6
102	Darsano	Kotiraro		90	1987	50	8	60	10	20	D	E	20	4	-	4	24	8			124
103	Konkar	-		-	1964	40	10	80	20	20	D	E	15	3	8	24	20	20			229
104	Konkar	Bazar		214	1950	50	10	90	20	16	D	E	22	4	24	24	20	20			135
105	Konkar	Bazar		84	1950	30	10	90	20	16	D	E	22	4	12	12	20	20			215
106	Konkar	Bazar		54	1950	25	5	80	10	20x18	D	E	10	2.5	1.5	2	6	3			220
107	Konkar	Bazar		50	1955	25	6	95	10	30	D	E	15	3	3	4	16	8		Poultry	224
108	Konkar	Bazar		54	1955	25	10	110	20	30	D	E	10	2.5	5	8	6	6			225
109	Konkar	Bazar		32	1956	25	5	95	10	20x25	D	E	15	3	2	4	12	4			219
110	Konkar	Bazar		117	1958	30	10	110	20	25	D	E	15	3	5	8	24	8			226
111	Konkar	Bazar		26	1960	30	5	60	20	16	D	E	15	2.5	2	4	8	8			33
112	Konkar	Bazar		136	1960	80	10	95	30	16	D	E	22	4	24	24	14	14			34
113	Konkar	Bazar		110	1960	30	5	60	20	16	D	E	15	2.5	2	4	8	8			35
114	Konkar	Bazar		136	1960	80	10	90	30	16	D	E	22	3	24	24	14	14			36
115	Konkar	Bazar		32	1964	20	10	100	40	26	D	E	15	3	6	24	16	16	2x160;2x150g		231
116	Konkar	Bazar		-	1964	50	10	80	10	20	D	E	20	3	-	8	20	8	2x300;200		232
117	Konkar	Bazar		-	1965	30	10	90	25	16	D	E	15	3	12	24			250		6
118	Konkar	Bazar		119	1965	60	10	90	30	16	D	E	22	3	24	24	16	16			214
119	Konkar	Bazar		-	1965	60	10	95	10	20	D	E	10	2.5	2	4	8	8		Poultry	218
120	Konkar	Bazar		-	1965	60	10	100	10	25	D	E	10	2.5	-	1.5	12	12		Poultry	223
121	Konkar	Bazar		-	1965	30	10	80	15	20x22	D	E	20	3	6	12					227
122	Konkar	Bazar		-	1965	40	8	85	20	20	D	E	20	3	8	12	10	10			228
123	Konkar	Bazar		2	1968	60	10	90	20	16	D	E	22	4	24	24	16	16			13
124	Konkar	Bazar		2	1968	60	10	90	20	16	D	E	22	4	24	24	12	12			212
125	Konkar	Bazar		-	1970	40	10	85	25	18	D	E	15	3	8	24	20	20			230
126	Konkar	Bazar		-	1975	60	10	70	10	20	D	E	20	2.5			0	0	250		19
127	Konkar	Bazar		-	1975	70	10	95	10	30	D	E	10	2.5	1	2	12	12		Poultry	222
128	Konkar	Bazar		-	1978	50	10	85	25	20	D	E	15	3	6	12	20	20			231
129	Konkar	Bazar		85	1980	85	10	95	20	16	D	E	22	4	0	12	30	30	437		216
130	Konkar	Bazar		-	1980	65	10	70	10	25	D	E	20	2.5	2	2	0	0			337
131	Konkar	Bazar		-	1980	80	10	95	10	30	D	E	10	2.5	1	4	12	12		Poultry	221
132	Konkar	Bazar		-	1985	90	10	90	15	16	D	E	15	3	8	24	10	10			26
133	Konkar	Darsano Chano		-	1930	15	5	115	5	30x26	D	E	22	4	1	2.5	13	1			77
134	Konkar	Darsano Chano		379	1935	20	10	100	20	24	D	E	15	2.5	0	6	6	2	150g		83
135	Konkar	Darsano Chano		155	1940	20	10	55	15	22	D	E	15	3	1	6	6	3			95
136	Konkar	Darsano Chano		408	1944	40	10	95	25	20x16	D	E	20	4	1	16	24	16	250g		293
137	Konkar	Darsano Chano		179	1944	30	10	90	20	30x26	D	E	15	3	2	12	24	14			294
138	Konkar	Darsano Chano		19	1946	35	10	85	20	20x16	D	E	15	3	1	10	20	10			389
139	Konkar	Darsano Chano		179	1948	30	10	100	25	22	D	E	20	4	2	16	20	16			263
140	Konkar	Darsano Chano		-	1949	30	10	90	20	18	D	E	15	3	2	12	7	4			85
141	Konkar	Darsano Chano		-	1950	35	10	90	20	18	D	E	15	3	6	24	5	5			72
142	Konkar	Darsano Chano		179	1950	50	10	100	25	30	D	E	15	4	1	24	10	10			89
143	Konkar	Darsano Chano		285	1950	60	10	100	25	20	D	E	15	3	3	12	18	13			90
144	Konkar	Darsano Chano		-	1955	30	10	100	20	20	D	E	20	4	3	24	5	5			70
145	Konkar	Darsano Chano		-	1958	60	10	105	6	20	D	E	15	3	1	3	12	2			79
146	Konkar	Darsano Chano		-	1960	36	10	100	20	20	D	E	20	4	2.5	24	4	4	160		66
147	Konkar	Darsano Chano		-	1960	35	10	100	20	20	D	E	20	4	3	10	4	4	150		67
148	Konkar	Darsano Chano		-	1960	35	10	100	20	20	D	E	15	3	3	10	4	4	150		68
149	Konkar	Darsano Chano		-	1960	30	10	100	20	20	D	E	15	3	6	24	4	4			71
150	Konkar	Darsano Chano		-	1960	40	10	80	25	26	D	E	22	4	6	16	12	12			75
151	Konkar	Darsano Chano		123	1960	25	10	100	8	18	D	E	10	3	1	2.25	4	2			98
152	Konkar	Darsano Chano		-	1962	50	10	110	10	20	D	E	15	3	2	5	4	4			76
153	Konkar	Darsano Chano		-	1963	35	10	85	15	20	D	E	15	3	1	6	2	2			63
154	Konkar	Darsano Chano		-	1964	40	10	60	20	20	D	E	15	3	4	24	5	5			58

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (3/7)

NO.	Union Council	Deh	No. of Well	Survey No.	Original Condition Well Const. Year	Original Condition Depth of Well (ft)	Original Condition Water Depth (ft)	P.Condition Depth of Well (ft)	P.Condition Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Pump Primer Mover D:dei E:Ele	Pump Power Pump No.1 (HP)	Pump Discha. Pipe Dia (inch)	Possible Operation Hours in Rabi (hrs)	Possible Operation Hours in Kharif (hrs)	Total Commm. Area (ha)	Possible Irri. Area (ha)	Add. Bore Hole (ft)	Remarks	Input Ref. No.
155	Konkar	Darsano Chano		179	1964	60	10	110	25	45	D	E	10	4	2	24	10	10	2x150g		90
156	Konkar	Darsano Chano		-	1964	55	10	100	20	22x25	D	E	15	4	1.5	24	12	12			91
157	Konkar	Darsano Chano		223	1965	60	12	100	15	20	D	E	15	3	2	5	8	2			99
158	Konkar	Darsano Chano		179	1965	60	10	105	25	22	D	E	20	4	2	16	20	12	200g		100
159	Konkar	Darsano Chano		-	1967	50	10	100	20	20	D	E	15	3	2	6	16	4	100		81
160	Konkar	Darsano Chano		-	1968	50	10	90	20	20	D	E	15	3	3	24	2	2	150		65
161	Konkar	Darsano Chano		-	1968	60	10	100	20	20	D	E	15	3	3	10	4	4	150		69
162	Konkar	Darsano Chano		-	1968	60	10	105	10	18	D	E	15	2.5	1	4					80
163	Konkar	Darsano Chano		179	1968	70	10	100	25	20	D	E	15	3	3	16	18	14			81
164	Konkar	Darsano Chano		285	1970	70	10	95	20	20	D	E	15	3	2	16	20	17			231
165	Konkar	Darsano Chano		179	1970	70	10	100	20	22	D	E	20	4	2	14	16	14			232
166	Konkar	Darsano Chano		285	1970	70	10	95	20	20	D	E	15	3	3	16	20	16			233
167	Konkar	Darsano Chano		410	1970	70	10	95	20	20	D	E	15	3	2	12	20	16			234
168	Konkar	Darsano Chano		285	1972	70	10	100	25	20	D	E	20	4	2	16	18	12	150g		5
169	Konkar	Darsano Chano		-	1973	50	12	50	15	20	D	E	15	3	4	24	5	5			57
170	Konkar	Darsano Chano		179	1975	70	10	100	20	20	D	E	15	3	2	8	10	8			86
171	Konkar	Darsano Chano		-	1975	60	10	80	20	30x35	D	E	15	3	2	24	8	8	2x150,125g		94
172	Konkar	Darsano Chano		-	1978	50	10	70	20	20	D	E	15	3	4	12	18	14			61
173	Konkar	Darsano Chano		-	1979	60	10	60	20	20	D	E	15	3	3	24	3	3	120g		61A
174	Konkar	Darsano Chano		416	1983	75	10	95	15	20	D	E	15	3	2	8	8	3			84
175	Konkar	Darsano Chano		-	1984	65	10	65	25	20	D	E	15	3	2	6	3	3			59
176	Konkar	Darsano Chano		-	1984	70	10	70	20	20	D	E	15	3	2	5	2	2			62
177	Konkar	Darsano Chano		-	1984	50	10	70	25	18x20	D	E	15	3	2	12	5	5			96
178	Konkar	Darsano Chano		19	1985	55	10	70	25	20	D	E	15	3	4	12	18	14			27
179	Konkar	Darsano Chano		-	1985	60	10	75	20	20	D	E	15	3	4	12	16	12			28
180	Konkar	Darsano Chano		-	1986	50	10	60	25	20	D	E	15	3	1.5	24	6	6			56
181	Konkar	Darsano Chano		-	1986	35	5	40	10	16	D	E	10	3	1	3					87
182	Konkar	Darsano Chano		-	1986	40	10	50	15	18	D	E	15	3	2	6	7	4			88
183	Konkar	Darsano Chano		427	1987	78	10	80	35	14	D	E	15	3	1	24	6	6			100
184	Konkar	Khar Kharo		238	1935	15	5	125	20	26x16	D	E	10	2.5	2.5	4	9	9	2x150;2x200g		237
185	Konkar	Khar Kharo		204	1935	20	5	115	50	18	D	E	10	2.5	8	24	7	4			264
186	Konkar	Khar Kharo		102	1935	20	10	115	4	20x40	D	E	15	3	1	3	15	2	225		268
187	Konkar	Khar Kharo		124/123	1940	15	5	125	15	28	D	E	10	2.5	4	12	12	6	2x100g;80;100;400g		238
188	Konkar	Khar Kharo		-	1940	15	5	90	30	20	D	E	10	2.5	6	12	3				263
189	Konkar	Khar Kharo		-	1945	15	10	110	10	25	D	E	22	3	4	12	16	10	300g		257
190	Konkar	Khar Kharo		-	1945	20	10	115	15	20	D	E	10	2.5	2	6	8	2			258
191	Konkar	Khar Kharo		121	1945	20	5	110	20	22	D	E	15	2.5	3	8	12	4			265
192	Konkar	Khar Kharo		-	1947	25	5	90	10	24	D	E	15	3	2	7	20	5	140g		261
193	Konkar	Khar Kharo		-	1948	30	10	80	15	20	D	E	15	3	4	8	8	6			232
194	Konkar	Khar Kharo		-	1950	25	10	100	10	20	D	E	15	2.5	2	4	16	4			242
195	Konkar	Khar Kharo		-	1950	40	10	90	20	22	D	E	10	2.5	2	5	8	2			243
196	Konkar	Khar Kharo		105	1952	65	10	130	5	22x30	D	E	10	2.5	1	3	8	0	2x220		253
197	Konkar	Khar Kharo		101	1952	60	10	125	20	22	D	E	10	2.5	1.5	4	11	1	2x220		254
198	Konkar	Khar Kharo		112	1962	70	10	125	2	30x35	D	E	10	2.5	1	3	10	2			235
199	Konkar	Khar Kharo		52	1963	29	8	115	10	22	D	E	15	3	4	7	3	1	400g;500g;100;125		236
200	Konkar	Khar Kharo		-	1963	30	10	120	15	24	D	E	15	3	2	6	16	4			259
201	Konkar	Khar Kharo		-	1963	50	10	100	6	20	D	E	10	2	0.75	3	4	2			266
202	Konkar	Khar Kharo		-	1964	25	10	90	12	20	D	E	15	2.5	2.5	4	6	3			233
203	Konkar	Khar Kharo		214	1965	50	10	90	20	16	D	E	15	3	6	24	11	11			267
204	Konkar	Khar Kharo		214	1965	60	10	90	20	16	D	E	22	4	24	24	12	12			270
205	Konkar	Khar Kharo		52	1966	46	10	108	6	22	D	E	10	2.5	2.5	5	7	2	125:100:400g		240
206	Konkar	Khar Kharo		210	1967	50	10	85	20	16	D	E	15	3	12	24	18	12			250
207	Konkar	Khar Kharo		207	1968	50	10	85	20	20	D	E	22	4	8	24	20	16			249
208	Konkar	Khar Kharo		214	1968	50	10	85	20	20	D	E	15	3	8	24	22	14			251
209	Konkar	Khar Kharo		214	1968	70	10	90	30	16	D	E	22	4	24	24	32	32			252
210	Konkar	Khar Kharo		214	1968	60	10	90	20	16	D	E	22	4	24	24	20	20			256
211	Konkar	Khar Kharo		-	1970	50	10	90	30	16	D	E	22	4	24	24					269
212	Konkar	Khar Kharo		126	1971	37	7	100	6	22	D	E	10	2.5	1	3	8	2			244
213	Konkar	Khar Kharo		205	1980	80	10	90	25	16	D	E	22	4	12	12	18	18			246
214	Konkar	Khar Kharo		205	1980	80	10	90	25	16	D	E	22	3	12	24	16	16			247
215	Konkar	Khar Kharo		248	1981	50	10	70	5	10	D	E	12	2.5	0.5	2	11	2			560
216	Konkar	Khar Kharo		-	1985	331	Pull	331	Pull		T	E		3		24				Poultry	239
217	Konkar	Khar Kharo		210	1986	80	5	85	20	16	D	E	15	3	-	24	2	2			255
218	Konkar	Khar Kharo		214	1987	90	20	90	20	16	D	E	25	4	24	24	40	32			248
219	Konkar	Konkar		-	1930	20	10	60	10	20	D	E	15	3	5	24	8	6			79
220	Konkar	Konkar		-	1930	30	10	80	-	20	D	E	15	3	-	24	8	6			81
221	Konkar	Konkar		-	1935	20	10	80	-	18	D	E	15	3	-	24	12	10	1x150		270
222	Konkar	Konkar		-	1935	20	10	80	-	20	D	E	15	3	-	24	13	10	1x150		271
223	Konkar	Konkar		-	1935	20	10	80	-	20	D	E	15	3	-	24	10	10	1x200		272
224	Konkar	Konkar		-	1935	20	5	80	-	18x16	D	E	15	3	2	6	8	6			273
225	Konkar	Konkar		-	1940	20	10	80	-	16	D	E	15	3	-	24	6	6	400:160		272A
226	Konkar	Konkar		-	1940	30	10	80	-	18	D	E	15	3	2	6	12	8			273A
227	Konkar	Konkar		-	1940	30	10	80	-	18	D	E	15	3	-	24	12	10			274
228	Konkar	Konkar		-	1940	30	10	80	-	18	D	E	15	3	-	24	12	10			275
229	Konkar	Konkar		67	1945	10	5	30	15	-	D	E				-				Domestic	266
230	Konkar	Konkar		213	1958	30	10	60	15	20	D	D	16	3	-	3	20	8			80
231	Konkar	Konkar		-	1960	40	10	85	10	20	D	E	15	3	1	2	12	8			99

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (4/7)

NO.	Union Council	Deh	No. of Well	Original Condition: Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Primer Mover D:del B:Ele	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Pump: Possible Operation Hours Rabi (hrs)	Pump: Possible Operation Hours Kharif (hrs)	Total Comman. Area (ha)	Possible Irri. Area (ha)	Add. Bore Hole (ft)	Remarks	Input Ref. No.
232	Konkar	Konkar		152	1964	10	5	25	3	12	D	D	1.5	1.5	Dry	2				Domestic	234
233	Konkar	Konkar		-	1964	40	10	60	5	18	D	E	15	3	0.5	1.5	5	2			235
234	Konkar	Konkar		67	1965	15	5	35	5	8	D	D	-	1.5	1	2				Domestic	272
235	Konkar	Konkar		152	1965	21	5	21	5	5	D	D	-	2	-	-				Domestic	273
236	Konkar	Konkar		67	1965	40	10	55	15	20	D	D	10	3	-	3	6	4			274
237	Konkar	Konkar		114	1967	40	10	60	5	20	D	E	15	3	1	4	24	6			251
238	Konkar	Konkar		-	1969	50	10	80	-	20	D	E	15	3	-	24	10	10			376
239	Konkar	Konkar		-	1970	50	10	70	5	20	D	E	10	2.5	1	2	8	8			270
240	Konkar	Konkar		109	1972	30	10	60	10	20	D	E	15	3	1	4	22	6			6
241	Konkar	Konkar		-	1972	70	10	80	-	20	D	E	15	-	-	24	16	12	2x400:160		7
242	Konkar	Konkar		51	1973	40	10	80	12	20	D	E	15	3	-	-	16	12			58
243	Konkar	Konkar		152	1974	20	5	20	10	5	D	D	-	2	1	2				Domestic	50
244	Konkar	Konkar		-	1974	50	10	65	5	20	D	E	15	3	1	2	8	2		Poultry	51
245	Konkar	Konkar		213	1976	400	-	-	-	-	T	E	?	3	-	24	65	65			374
246	Konkar	Konkar		119	1979	70	8	70	15	25	D	E	15	3	24	24	12	12	1x600:300		62
247	Konkar	Konkar		-	1980	65	5	70	3	25	D	E	15	3	0.5	24	6	6	1x600:300		248
248	Konkar	Konkar		-	1980	70	5	70	3	25	D	E	15	3	-	24			1x600		249
249	Konkar	Konkar		213	1980	600	-	-	-	-	T	E	15	3	-	-	10	10	1x350		250
250	Konkar	Konkar		213	1980	70	Dry	-	-	25	D	E	15	3	-	24	162	146	1x450:200		251
251	Konkar	Konkar		213	1980	450	-	-	-	250	T	E	40	3	-	24	30	30			252
252	Konkar	Konkar		112	1981	70	5	85	4	20	D	E	15	3	6	24	6		1x230		561
253	Konkar	Konkar		213	1982	70	10	80	5	15	D	E	10	2	-	2	2	2			58
254	Konkar	Konkar		52	1983	40	10	80	12	16	D	E	15	2.5	5	7	16	12	1x400		85
255	Konkar	Konkar		213	1983	600	-	-	-	-	T	E	15	3	-	24	10	10	1x300		86
256	Konkar	Konkar		213	1983	450	-	-	-	200	T	E	15	3	-	24	162	146	1x200		87
257	Konkar	Konkar		213	1983	80	20	80	20	12	D	E	5	2	-	-	2			Poultry	88
258	Konkar	Konkar		213	1984	450	-	-	-	200	T	E	15	2.5	-	24	6	6			97
259	Konkar	Konkar		213	1985	450	-	-	-	200	T	E	15	3	-	24	162	146			240
260	Konkar	Konkar		213	1985	80	10	90	3	12	D	E	15	2.5	-	2					241
261	Konkar	Konkar		213	1986	450	-	-	-	200	T	E	15	3	-	24	182	146			256
262	Konkar	Konkar		213	1986	450	-	-	-	200	T	E	15	3	-	24	182	146			257
263	Konkar	Konkar		213	1986	80	10	80	10	12	D	E	10	3	-	1			1x800	Poultry	259
264	Konkar	Konkar		213	1987	65	Dry	65	30	15	D	E	-	-	-	7		2			273
265	Konkar	Konkar		213	1988	400	-	-	-	-	T	E	15	3	-	24	20	14			98
266	Konkar	Konkar		167	1988	400	-	-	-	-	T	E	15	3	-	24	13	6			99
267	Konkar	Konkar		67	1988	400	-	-	-	-	T	E	15	3	-	24	20	8	-		100
268	Konkar	Konkar		213	-	450	-	-	-	200	T	E	15	3	-	24	182	146			39
269	Konkar	Malh		425	1920	15	5	80	3	33x34	D	E	15	3		0.2	12	12			273
270	Konkar	Malh		365	1920	20	4	175	8	20	D	E	20	3	3	6	13	5	2x350,300g		305
271	Konkar	Malh		26	1920	25	10	70	2	24x42	D	E	10	2.5	Dry	0.25	33		60		320
272	Konkar	Malh		535	1925	20	10	135	4	30	D	E	15	3	-	4	33	2	450g,2x65g,3x35,2x35		318
273	Konkar	Malh		18	1925	20	10	110	2.5	42x26	D	E	10	2	-	0.5	6		150g		344
274	Konkar	Malh		22	1930	30	10	120	6	22	D	E	10	2.5	0.75	0.5	5	1			285
275	Konkar	Malh		89	1930	20	10	135	5	20x25	D	E	10	2.5	1	2	4	1			286
276	Konkar	Malh		107	1930	30	6	150	4		D	E	15	2.5	3	6	8	3	300,300g		306
277	Konkar	Malh		359	1930	30	10	110	3	20	D	E	10	2	0.5	1	4				317
278	Konkar	Malh		43	1930	25	10	75	2	18	D	E	15	3	0.2	0.5	33	2			319
279	Konkar	Malh		-	1930	25	10	160	5	20	D	E	15	2.5	6	4	8	3			342
280	Konkar	Malh		202	1930	15	10	160			D	E	15	3	-	-	10	4			352
281	Konkar	Malh		36	1935	15	5	110	5	20	D	E	10	2.5	1	2	5				278
282	Konkar	Malh		-	1940	30	10	145	6	32	D	E	15	2.5	1	2.5	13	2	4x200;100g;50g		302
283	Konkar	Malh		97	1940	20	10	150	3	22	D	E	15	3	1	3	10	2	150:200:50g:200:350:2		334
284	Konkar	Malh		-	1940	60	10	155	10	20	D	E	20	3	-	-					336
285	Konkar	Malh		75	1940	25	10	90	4	25	D	E	10	2.5	0.5	1	5				359
286	Konkar	Malh		91	1945	30	5	130	5	22	D	E	10	2.5	0.5	1.5	4	1	80		276
287	Konkar	Malh		283	1945	30	10	120	5	22	D	E	10	2.5	2	4	3	1	40g:25g		277
288	Konkar	Malh		-	1945	35	10	120	15	20	D	E	15	2.5	2	6	12	8			284
289	Konkar	Malh		48	1945	70	10	115	5	18	D	E	15	2.5	2	4	8	2			351
290	Konkar	Malh		549	1948	20	10	110	6	14	D	E	15	2.5	1	3	7	3			341
291	Konkar	Malh		145	1949	50	10	175	5	20	D	E	15	3	3	7	6	3	4x300g,4x300		290
292	Konkar	Malh		19	1949	40	10	100	2	20	D	E	10	2.5	1	2	8				360
293	Konkar	Malh		101	1950	20	5	125	10	20	D	E	15	3	3	6	12	12			283
294	Konkar	Malh		-	1950	40	10	110	4	20	D	E	15	3			6	2			288
295	Konkar	Malh		147	1950	30	10	170	5	22	D	E	15	3	3	6	8	2	4x400g,4x300		298
296	Konkar	Malh		2	1950	30	10	80	4	16	D	E	7.5	2	1.5	3	6	2			362
297	Konkar	Malh		-	1954	70	10	110	7	20	D	E	10	2.5	-	2.25	2	2			289
298	Konkar	Malh		554	1954	60	10	112	1.5	50x20	D	E	15	2.5	-	0.5	3	0			324
299	Konkar	Malh		53	1954	20	10	80	20	-	D	E	15	3	4	12	8	4			339
300	Konkar	Malh		608	1954	30	10	120	17	20	D	E	15	3	15	12					353
301	Konkar	Malh		106	1955	40	10	135	20	20x25	D	E	15	2.5	2	5	3	2			301
302	Konkar	Malh		352	1955	60	10	110	10	20x17	D	E	15	2.5	0.5	4.5	10	2			335
303	Konkar	Malh		-	1958	50	10	150	10	20	D	E	15	3	-	3	9	5			291
304	Konkar	Malh		107	1958	40	10	135	10	25	D	E	15	3	6	12	3	3			300
305	Konkar	Malh		439	1958	70	10	125	3	22	D	E	10	2.5	0.5	1	10	0			304
306	Konkar	Malh		238	1958	80	10	155	7	20	D	E	15	2.5	0.5	1	12	3			328
307	Konkar	Malh		4	1958	80	10	80	4	20	D	E	10	2.5	1	2	6	1			364
308	Konkar	Malh		118	1960	40	10	120	30	22	D	E	15	3	8	12	12	6			279

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (5/7)

NO.	Union Council	Deh	No. of Well	Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Primer Mover D:dei E:Ele	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Pump: Possible Operation Hours in Rabi (hrs)	Pump: Possible Operation Hours in Kharif (hrs)	Total Commun. Area (ha)	Possible Irri. Area (ha)	Remarks: Add. Bore Hole (ft)	Remarks	Input Ref. No.
309	Konkar	Malh		228	1960	70	10	175	5	16	D	E	15	3	2	4	6	2			331
310	Konkar	Malh		46	1960	70	10	110	5	15	D	E	15	2.5	2	4	6	2			355
311	Konkar	Malh		22	1960	60	10	110	6	20	D	E	15	2.5	1	3	8	1			356
312	Konkar	Malh		21	1960	60	10	100	5	20	D	E	10	2	1	2	8	1			358
313	Konkar	Malh		34	1962	60	10	115	3	25	D	E	10	2.5	0.5	1	5	0			316
314	Konkar	Malh		554	1964	60	10	125	4	22	D	E	10	2.5	1	3	2	1	2x100,90,200		312
315	Konkar	Malh		28	1964	70	20	125	5	18	D	E	15	2	2	3	8	4			337
316	Konkar	Malh		-	1965	50	10	110	4	22	D	E	15	2.5	0.5	2	3	0			281
317	Konkar	Malh		540	1965	80	10	110	4	20x22	D	E	10	2.5	0.5	3	5	2			322
318	Konkar	Malh		272	1967	80	10	90	15	18	D	E	15	3	-	0.5	2		150		296
319	Konkar	Malh		59	1967	40	10	110	30	30	D	E	15	4	6	7	16	16	4x400g,300g,2x220		348
320	Konkar	Malh		23	1967	55	10	110	6	25	D	E	15	3	-	7	16	4	4x300,300		357
321	Konkar	Malh		-	1968	40	8	130	10	20x18	D	E	15	3	3	6	8	5			282
322	Konkar	Malh		369	1968	70	10	145	5	35	D	E	15	2.5	-	5	13	4	4x200,3x400g		346
323	Konkar	Malh		3	1968	60	10	80	4	20	D	E	10	2	1	3	8	2			365
324	Konkar	Malh		60	1969	100	10	100	2	16	D	E	10	2.5	1	2	3	1	300		308
325	Konkar	Malh		-	1969	80	10	135	4	18	D	E	10	2.5	0.5	0.5	3	1	150		314
326	Konkar	Malh		315	1970	150	3	150	3	16	D	E	10	3	0.5	0.75	1	0		Poultry	329
327	Konkar	Malh		353	1970	60	10	120	5	22	D	E	15	3	2.5	6	16	6	250g:150		330
328	Konkar	Malh		2	1970	70	10	70	4	18	D	E	10	2	1	2	6	1			363
329	Konkar	Malh		271	1972	80	10	170	5	25	D	E	10	3	0.75	0.75	3	2			295
330	Konkar	Malh		370	1973	90	10	145	10	25	D	E	15	3	3	7	16	4	4x400g,4x200		345
331	Konkar	Malh		528	1973	110	10	135	6	22	D	E	15	3	3	9	18	10	2x300g2x50g,200		347
332	Konkar	Malh		333	1974	100	10	110	10	18	D	E	10	2.5	-	-	3	3	4x300g		321
333	Konkar	Malh		162	1975	100	10	170	10	20	D	E	10	2.5	4	6	4	2	2x300		299
334	Konkar	Malh		4	1975	80	20	80	6	30	D	E	10	2.5	1	1	6	0			361
335	Konkar	Malh		244	1979	60	10	80	5	15	D	E	10	3	0.5	1	4	2	100		333
336	Konkar	Malh		549	1980	95	10	110	4	14	D	E	15	2.5	1	3	7	3			340
337	Konkar	Thado		15	1955	30	5	65	3	20	D	E	15	3	0.5	2	16	2			336
338	Konkar	Thado		4	1960	40	10	69	5	18	D	E	15	3	4	10	28	12	2x250		359
339	Konkar	Thado		3	1960	40	5	65	3	20	D	E	15	3	Dry	1	16	2			360
340	Konkar	Thado		5	1960	30	10	60	10	20	D	E	15	3	1	2	16	4	400:200		556
341	Konkar	Thado		12	1965	45	5	60	3	20	D	E	15	3	Dry	3	12	1	150		326
342	Konkar	Thado		12	1980	30	5	45	3	20	D	E	16	3	0.5	3	20	1			341
343	Konkar	Thado		52	1980	20	10	60	10	20	D	E	15	2.5	1	3	16	5	2x200:300		342
344	Konkar	Thado		52	1987	20	-	-	-	20	D	E	-	-	-	-		16			274
345	Konkar	Thado		12	1988	50	5	50	7	12	D	E	10	3	-	3	12	1	200		101
346	Konkar	Tore		-	1984	60	10	65	10	20	D	E	15	3	1	2	8	4			100
347	Konkar	Tore		-	1984	60	10	70	5	15	D	E	10	1	1	3				Poultry	635
348	Konkar	Tore		-	1985	60	10	60	15	15	D	E	15	2	1	3	2	2			243
349	Konkar	Tore		-	1986	60	10	65	15	15	D	E	10	1.5	1	3				Poultry	260
350	Konkar	Tore		-	1986	70	10	70	8	15	D	E	10	1.5	1	3				Poultry	636
351	Konkar	Tore		-	1988	50	10	-	-	16	D	D	-	1.5	-	0.5				Poultry	102
352	Konkar	Tore		-	1989	450	-	-	-	-	T	E	15	3	-	24	13	10			38
353	Laundhi	Khakhar		-	1930	20	5	100	10	20	D	E	15	3	1	3	5	1			51
354	Laundhi	Khakhar		-	1935	15	5	145	8	20x16	D	E	15	3	0.5	3	16	2			26
355	Laundhi	Khakhar		-	1940	20	5	120	20	20	D	E	15	3	2	12	8	8			49
356	Laundhi	Khakhar		71	1940	30	10	110	10	20	D	E	15	3	4	12					52
357	Laundhi	Khakhar		-	1941	30	10	100	15	20x18	D	E	15	3	3	5	19	4			39
358	Laundhi	Khakhar		-	1945	30	10	120	10	20	D	E	15	3	1	3	25	12	2x150,120		22
359	Laundhi	Khakhar		68	1945	25	5	130	3	20x16	D	E	15	3		1.5	16	1	220		25
360	Laundhi	Khakhar		-	1945	50	10	90	5	16x14	D	E	15	3	2.5	4.5	8	5	2x200;250		42
361	Laundhi	Khakhar		65	1950	60	10	115	10	20x16	D	E	15	2	0.33	2	16	1			24
362	Laundhi	Khakhar		50	1950	60	10	120	20	20	D	E	15	3	-	10					50
363	Laundhi	Khakhar		71	1950	40	8	110	15	20	D	E	15	3	6	12	20				53
364	Laundhi	Khakhar		-	1959	50	10	90	8	25	D	E	15	3	2	2	10	5	240x2;100;150		44
365	Laundhi	Khakhar		-	1964	60	10	145	8	20	D	E	20	3	0.5	2			2x200		21
366	Laundhi	Khakhar		-	1965	40	10	120	10	20	D	E	15	3		4	16	16		Poultry	29
367	Laundhi	Khakhar		-	1970	60	10	90	15	20x22	D	E	20	3	3	8	8	8			36
368	Laundhi	Khakhar		-	1970	70	10	120	15	18	D	E	15	3	-	4	12	8		Poultry	38
369	Laundhi	Khakhar		-	1972	60	10	120	15	18	D	E	15	2.5		5	16	16		Poultry	28
370	Laundhi	Khakhar		-	1973	60	10	90	15	24x20	D	E	20	3	5	8	11			Poultry	46
371	Laundhi	Khakhar		-	1973	50	10	130	20	20	D	E	20	2.5	6	12	16	14			27
372	Laundhi	Khakhar		-	1973	60	10	80	10	20x22	D	E	20	3	2	7	11			Poultry	45
373	Laundhi	Khakhar		-	1975	60	10	120	5	20x22	D	E	15	2.5		3	16	16		Poultry	30
374	Laundhi	Khakhar		-	1976	50	10	75	15	24x26	D	E	15	3	6	24	13			Poultry	33
375	Laundhi	Khakhar		-	1977	60	10	100	15	20	D	E	15	3	4	8	8	6	2x130,180,400,500,2x2		55
376	Laundhi	Khakhar		-	1981	80	10	90	20	20	D	E	20	4	8	12	20	12			54
377	Laundhi	Khakhar		-	1983	65	10	100	13	20	D	E	20	3	3	3	20	12			32
378	Laundhi	Khakhar		65	1984	95	10	115	8	20x16	D	E	15	3	0.33	3	16	1	200		23
379	Laundhi	Khakhar		-	1986	68	10	100	8	16x18	D	E	20	3	1	2.25	20	12			31
380	Laundhi	Khakhar		-	1986	70	10	70	10	12	D	E	15	3	-	2			100	Drinking	35
381	Laundhi	Khakhar		-	1988	65	15	65	15	20x24	D	E	15	3	-	24	16			Poultry	34
382	Laundhi	Laundhi		-	1935	30	10	150	8	20	D	E	20	3	6	2	24	1			27
383	Laundhi	Laundhi		-	1935	30	10	130	6	20	D	E	20	3	1.5	3	11	4			28
384	Laundhi	Laundhi		124	1940	30	10	130	10	16	D	E	15	3	2	4	10	4			53
385	Laundhi	Laundhi		289	1940	60	10	135	10	30	D	E	20	3	3.5	5	16	7	300:200:15	Poultry	54

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (6/7)

NO.	Union Council	Deh	No. of Well	Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Pump: Primer Mover D:dei B:Ble	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Possible Operation Hours in Rabi (hrs)	Possible Operation Hours in Khatif (hrs)	Total Commm. Area (ha)	Possible Irri. Area (ha)	Remarks: Add. Bore Hole (ft)	Remarks	Input Ref. No.
386	Laundhi	Laundhi		-	1940	30	10	155	4	20	D	E	20	3	-	-	15	1			56
387	Laundhi	Laundhi		-	1940	35	10	130	8	20	D	E	20	4	-	-	12	6			57
388	Laundhi	Laundhi		-	1940	30	10	130	8	23	D	E	20	3	6	4	24	1			58
389	Laundhi	Laundhi		152	1940	20	5	160	4	30	D	E	20	3	0.5	1	12	2	200x3;400g;450g		59
390	Laundhi	Laundhi		27	1940	40	5	130	-	20	D	E	15	3	-	-	6			Poultry	60
391	Laundhi	Laundhi		345/346	1940	40	10	150	-	16	D	E	20	4	0.2	0.75	18	2	350		62
392	Laundhi	Laundhi		-	1940	25	10	125	4	26x20	D	E	20	3	1	2	8	2	200		63
393	Laundhi	Laundhi		27	1940	30	10	125	10	20	D	E	20	3	1	3	14	6			64
394	Laundhi	Laundhi		-	1945	40	10	135	5	20	D	E	20	4	-	0.5	16		150gx2;200g		44
395	Laundhi	Laundhi		-	1945	40	10	155	4	20	D	E	20	3	6	1	20	1			45
396	Laundhi	Laundhi		-	1945	30	10	160	4	22x23	D	E	20	3	6	1	20	1			46
397	Laundhi	Laundhi		80	1947	30	8	120	4	25	D	E	20	4	-	1	16			Poultry	262
398	Laundhi	Laundhi		173	1950	70	10	125	8	25	D	E	25	3	1.5	3	14	4	200x3	Poultry	55
399	Laundhi	Laundhi		-	1955	60	10	125	5	20	D	E	20	3	0.5	1.5	7	3			337
400	Laundhi	Laundhi		80	1955	60	10	130	8	20	D	E	20	3	2	5	16			Poultry	338
401	Laundhi	Laundhi		27	1955	40	8	130	5	30	D	E	20	3	1	2	12	12		Poultry	340
402	Laundhi	Laundhi		-	1955	35	10	120	20	20	D	E	15	3	3	10					341
403	Laundhi	Laundhi		27	1960	60	10	130	10		D	E	20	4	2	4	10	6			557
404	Laundhi	Laundhi		-	1960	40	7	150	20	20	D	E	15	3	2	8	12	10			559
405	Laundhi	Laundhi		-	1960	40	10	160	15	20	D	E	15	3	3	8	16	12			560
406	Laundhi	Laundhi		-	1960	40	10	150	10	20	D	E	15	3	4	8	20	12			561
407	Laundhi	Laundhi		239	1962	60	10	135	10	18	D	E	17	3	2	3	6		2x150		317
408	Laundhi	Laundhi		27	1963	60	10	135	4	40	D	E	20	4	3	3	14	3	200gx3;10(	Poultry	312
409	Laundhi	Laundhi		27	1963	60	8	130	10	20	D	E	20	3	1	3	6	2		Poultry	313
410	Laundhi	Laundhi		126	1965	70	10	130	10	25	D	E	20	3	1.75	4	12	4		Poultry	31
411	Laundhi	Laundhi		-	1968	60	10	135	8	14x10	D	E	22	3	0.2	0.4	20	4		Poultry	367
412	Laundhi	Laundhi		345/346	1968	60	10	125	5	20x18	D	E	20	3	0.25	1.5	18	2			368
413	Laundhi	Laundhi		41	1969	80	8	130	4	20	D	E	15	3		1	16	2	2x180g;100		315
414	Laundhi	Laundhi		27	1970	60	10	110	20	25	D	E	20	4	8	12	18	18		Poultry	39
415	Laundhi	Laundhi		371	1971	80	15	120	20	20	D	E	20	4	3	12	13	9	185g;300g;100g		245
416	Laundhi	Laundhi		142	1973	80	10	150	15	20	D	E	15	3	3	5	10	6			47
417	Laundhi	Laundhi		-	1976	70	10	110	10	16	D	E	15	3	3	12	8	4			34
418	Laundhi	Laundhi		27	1978	90	10	140	4	20	D	E	15	3	-	0.5	4	1			63
419	Laundhi	Laundhi		-	1978	50	10	120	15	20	D	E	15	3	3	8	20	12			64
420	Laundhi	Laundhi		478	1979	100	10	130	5	20	D	E	15	3	0.5	2				Poultry	334
421	Laundhi	Laundhi		63	1980	120	5	135	5	20	D	E	20	3	0.5	2			200		343
422	Laundhi	Laundhi		-	1980	60	10	80	10	20	D	E	15	3	3	6	12	10		Poultry	344
423	Laundhi	Laundhi		27	1983	80	10	110	20	20	D	E	20	3	4	12					33
424	Laundhi	Laundhi		-	1983	70	10	80	10	20	D	E	15	2.5		7	12	10		Poultry	34
425	Laundhi	Laundhi		62	1987	-	300	-	-	-	D	E	15	3			6	2			48
426	Laundhi	Laundhi		-	1988	110	-	120	10	22	D	E	15	3						Domestic	35
427	Laundhi	Laundhi		-	1988	125	5	125	5	16	D	E	10	1.5		1				Poultry	36
428	Laundhi	Laundhi		-	1988	420	-	-	-	-	T	E	20	3	-	-	20	14			37
429	Laundhi	Sanhro		339	1935	30	5	150	10	16x18	D	E	15	3	0.75	3	8	4	2x400;400		29
430	Laundhi	Sanhro		-	1940	40	10	95	10	20	D	E	10	3	2.5	3.5	8	2			105
431	Laundhi	Sanhro		90	1940	40	10	100	4	18	D	E	10	2.5	2	2	10	1	100x2		114
432	Laundhi	Sanhro		1	1940	30	10	120	15	26	D	E	17	4	4	8	16	10		Poultry	121
433	Laundhi	Sanhro		-	1944	30	10	130	13	25	D	E	20	3	1	2	20	5	4x150g;12(		135
434	Laundhi	Sanhro		-	1949	30	10	135	15	20	D	E	10	2.5	2	5	8	8			132
435	Laundhi	Sanhro		-	1949	30	10	140	15	20x22	D	E	10	2.5	2	5	6	6	230;300g		133
436	Laundhi	Sanhro		44	1952	40	15	120	15	30	D	E	17	4	4	8	16	10			125
437	Laundhi	Sanhro		-	1955	35	10	125	10	16	D	E	10	2.5	1	3	12	4			101
438	Laundhi	Sanhro		371	1955	60	10	125	5	25	D	E	20	3	0.5	1.5	16	2			119
439	Laundhi	Sanhro		-	1955	40	10	125	8	16	D	E	10	2.5	1	3	8	2			120
440	Laundhi	Sanhro		-	1956	30	10	90	8	20	D	E	15	3	0.1	0.75	12	2	100		220
441	Laundhi	Sanhro		-	1958	45	10	95	8	20	D	E	15	3	1	3	16	6			127
442	Laundhi	Sanhro		-	1960	45	10	100	10	20	D	E	15	3	6	12	40	40	30g		106
443	Laundhi	Sanhro		-	1960	60	10	80	20	20	D	E	20	4	8	24	16	16			113
444	Laundhi	Sanhro		128	1962	60/65	10	120	3	20	D	E	17	4	0	0.75	20	0		Poultry	128
445	Laundhi	Sanhro		-	1964	60	10	90	8	20	D	E	20	4	2	5					104
446	Laundhi	Sanhro		-	1964	60	10	90	10	20	D	E	15	3	-	24	20	20			107
447	Laundhi	Sanhro		-	1964	50	10	130	10	20	D	E	20	3	2	4			180x2		109
448	Laundhi	Sanhro		-	1964	100	10	125	15	20	D	E	22	3	1	3	16	2	125;220gx2;60g;40g		141
449	Laundhi	Sanhro		-	1965	60	10	145	12	20	D	E	20	3	1.5	5			120x2		111
450	Laundhi	Sanhro		-	1965	60	13	120	9	20x16	D	E	15	3	0.5	1	10	2	120;80g		134
451	Laundhi	Sanhro		35/36	1965	70	10	130	5	20	D	E	20	3	1	3	20	8		Poultry	136
452	Laundhi	Sanhro		-	1965	60	10	100	15	18	D	E	15	3	-	-	10	8			140
453	Laundhi	Sanhro		-	1965	60	10	90	15	20	D	E	15	3	6	24					131
454	Laundhi	Sanhro		-	1965	40	10	125	15	20	D	E	20	4	1	6			200;3x200		133
455	Laundhi	Sanhro		-	1965	40	10	125	20	20	D	E	20	3	4	8	32	20			134
456	Laundhi	Sanhro		-	1966	60	10	120	10	20	D	E	15	3	1	3	20	8		Poultry	124
457	Laundhi	Sanhro		372	1967	80	8	140	5	20	D	E	15	3	1	2	6	2	200x2	Poultry	116
458	Laundhi	Sanhro		-	1968	60	10	130	5	20	D	E	20	4	0.2	1	40	8	200x2		110
459	Laundhi	Sanhro		-	1968	60	10	100	10	24	D	E	15	3			2			Poultry	142
460	Laundhi	Sanhro		-	1968	80	10	110	8	20	D	E	17	3	0.5	2.5	12	3	250g;200gx2		143
461	Laundhi	Sanhro		-	1970	70	10	130	6	20	D	E	20	3	-	2		1	2x200		108
462	Laundhi	Sanhro		123	1970	80	10	120	15	20	D	E	17	3	3	8	20	16		Poultry	126

Table G.2.5 INVENTORY OF EXISTING PRODUCTION WELLS IN THE STUDY AREA (7/7)

NO.	Union Council	Deh	No. of Well	Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	P.Condition: Depth of Well (ft)	P.Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Primer Mover D:dei E:Ele	Pump: Power Pump No.1 (HP)	Pump: Discha. Pipe Dia (inch)	Possible Operation Hours: Rabi (hrs)	Possible Operation Hours: Kharif (hrs)	Total Commun. Area (ha)	Possible Irri. Area (ha)	Remarks: Add. Bore Hole (ft)	Remarks	Input Ref. No.
463	Laundhi	Sanhro		152	1974	90	10	120	4	20	D	E	10	3	-	1	6	3		Poultry	115
464	Laundhi	Sanhro		-	1975	70	10	130	8	20	D	E	15	3	1	3	5	2		Poultry	122
465	Laundhi	Sanhro		-	1975	70	10	120	10	18	D	E	15	3	1	3	8	1		Cattle farm	129
466	Laundhi	Sanhro		-	1978	70	10	90	10	20	D	E	15	3	2	5	24	6			103
467	Laundhi	Sanhro		-	1980	90	10	150	6	20	D	E	15	3	1.5	3	10	5			345
468	Laundhi	Sanhro		-	1986	80	10	95	10	20	D	E	15	3	-	2	16	6			123
469	Thano	Thano		-	1925	15	10	160	10	20	D	E	15	4	4	3	24	16			395
470	Thano	Thano		131	1930	20	4	160	15	-	D	E	17	3	6	4	6	15			366
471	Thano	Thano		-	1930	30	8	170	16	16	D	E	-	4	6	12					379
472	Thano	Thano		-	1930	20	10	180	-	20	D	E	-	-	-	-	8				385
473	Thano	Thano		-	1930	20	10	160	3	22	D	E	15	3	4	2	2				394
474	Thano	Thano		-	1930	20	12	165	8	20	D	E	15	4	4	2	5	4			404
475	Thano	Thano		-	1932	20	8	165	10	18	D	E	15	4	-	-	32	12			398
476	Thano	Thano		-	1935	30	10	170	8	20	D	E	15	4	4	2	5	3	170:170		367
477	Thano	Thano		-	1935	10	10	165	8	25	D	E	20	4	6	4	20	12	300:300:300		372
478	Thano	Thano		-	1935	16	4	165	10	18	D	E	15	3	4	3	7	4			377
479	Thano	Thano		-	1935	15	10	160	4	20	D	E	20	3	4	2	3	3			400
480	Thano	Thano		-	1935	30	10	160	8	20	D	E	20	3	-	-	8	3			410
481	Thano	Thano		-	1940	25	10	130	7	40	D	E	20	2.5	-	-	5	2			368
482	Thano	Thano		-	1940	30	10	175	10	18	D	E	15	4	4	2	8	5			370
483	Thano	Thano		-	1940	60	6	160	18	16	D	E	-	4	6	12	16	12			380
484	Thano	Thano		-	1940	25	4	140	Dry	20	D	E	15	4	-	-	24				383
485	Thano	Thano		-	1940	40	10	160	6	16	D	E	15	4	6	2					387
486	Thano	Thano		-	1940	30	12	165	8	20	D	E	15	4	4	2	8	5			393
487	Thano	Thano		-	1940	30	12	170	10	22	D	E	15	4	6	3	24	16	100		396
488	Thano	Thano		-	1940	60	10	155	10	20	D	E	15	4	6	3	24	16			397
489	Thano	Thano		-	1940	30	10	165	4	25	D	E	20	3	4	2	4	4			399
490	Thano	Thano		-	1940	30	12	175	10	15	D	E	15	3	5	3	6	5			401
491	Thano	Thano		-	1940	30	10	155	8	20	D	E	15	4	4	2	8	6			405
492	Thano	Thano		-	1940	30	12	150	10	20	D	E	15	3	6	3	12	10			408
493	Thano	Thano		-	1940	35	10	110	-	16	D	E	-	4	-	-	3				409
494	Thano	Thano		-	1940	20	10	160	8	20	D	E	17	3	6	2	6	2			411
495	Thano	Thano		-	1945	40	12	170	10	16	D	E	15	5	4	2	12	8			369
496	Thano	Thano		-	1945	15	10	150	15	25x15	D	E	20	4	-	24	14	14	450:450:450:450:450:4		373
497	Thano	Thano		-	1945	50	10	160	8	16	D	E	15	4	4	2	15	6			368
498	Thano	Thano		-	1950	60	10	168	8	16	D	E	15	3	6	2	16	12			381
499	Thano	Thano		-	1950	40	12	145	Dry	16	D	E	15	4	8	-	8				391
500	Thano	Thano		-	1950	60	12	160	8	20	D	E	15	3	4	2	3	3			402
501	Thano	Thano		-	1954	60	-	145	Dry	18	D	E	10	2	6	2	8	1	400		382
502	Thano	Thano		-	1955	60	12	165	8	18	D	E	15	4	6	2	15	6			389
503	Thano	Thano		-	1955	45	10	165	8	16	D	E	15	4	6	3	5	4			390
504	Thano	Thano		-	1958	60	10	130	Dry	20	D	E	15	2.5	4	1	10	2	400		375
505	Thano	Thano		-	1965	80	10	140	8	18	D	E	15	3	4	2	3	2			376
506	Thano	Thano		-	1965	80	10	160	8	20	D	E	15	4	4	12	5	3			378
507	Thano	Thano		-	1965	70	10	150	-	20	D	E	-	-	-	-	8				384
508	Thano	Thano		-	1965	80	12	170	10	18	D	E	15	4	6	2	4	3			386
509	Thano	Thano		32	1968	90	10	130	Dry	20x40	D	E	15	2.5	6	3	10	2	350:350		374
510	Thano	Thano		-	1970	80	15	165	8	20	D	E	15	4	4	2	8	4			392
511	Thano	Thano		-	1974	80	15	140	10	25	D	E	15	3	4	2	12	10			407
512	Thano	Thano		-	1975	100	10	145	16	25	D	E	20	-	12	5	20	12			371
513	Thano	Thano		-	1985	130	10	160	8	18	D	E	15	3	4	2	2	2			406
	Study Area					60.5	10.1	103.9	12.6						3.9	8.9	7764	4633 (Gross Area)			
																	5823	3475 (Net Area)			
	Project Area					51.2	10.1	105.7	13.0						3.8	8.4	6423	3534 (Gross Area)			
																	4817	2651 (Net Area)			
																	Say :	2600 ha			

Table G.2.6 ABANDONED WELLS (1/2)

NO.	Union Council	Deh	Original Condition: Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	Present Condition: Depth of Well (ft)	Present Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Remarks
1	Darsano	Amilano	-	1954	40	10	70	5		D	NU/1973
2	Darsano	Kathore	-	1958	40	10	90	Dry	-	D	Not Use
3	Darsano	Amilano	-	1960	40	10	60	Dry	20	D	NU/1973
4	Darsano	Kathore	-	1960	40	10	110	Dry	20	D	NU/1980
5	Darsano	Chuhar	-	1967	45	10	70	Dry	20	D	NU/1979
6	Darsano	Amilano	-	1968	45	10	70	Dry	20	D	NU/1984
7	Darsano	Chuhar	-	1970	50	10	70	Dry	20	D	NU/1981
8	Darsano	Chuhar	-	1970	50	10	70	Dry	20	D	NU/1983
9	Darsano	Chuhar	94	1972	20	10	50	-	22	D	NU/1986
10	Darsano	Chuhar	-	1974	40	10	70	Dry	20	D	NU/1981
11	Darsano	Chuhar	-	1976	40	10	60	Dry	20	D	NU/1982
12	Darsano	Chuhar	-	1979	70	10	90	Dry	20	D	NU/1984
13	Darsano	Kotiraro	90	1980	40	10	40	Dry	15	D	NU/1986
14	Darsano	Kotiraro	57	1985	60	5	60	Dry	20	D	NU/1986
15	Darsano	Kotiraro	90	1987	55	5	55	Dry	20	D	Not Use
16	Konkar	Malh	34/35	1913	15	10	60	Dry	20	D	NU/1955
17	Konkar	Malh	40	1915	15	10	60	Dry		D	NU/1958
18	Konkar	Malh	421	1918	15	10	140	Dry	20	D	NU/1976
19	Konkar	Khar Kharo	114	1920						D	NU/1965
20	Konkar	Malh	25	1930	30	10	-	-		D	NU/1970
21	Konkar	Khar Kharo	90	1930	30	10	60	Dry	20	D	NU/1976
22	Konkar	Konkar	-	1930	20	10	80	Dry	20	D	NU/1986
23	Konkar	Darsano Channo	-	1935	30	10	100	12	20	D	NU/1969
24	Konkar	Malh	57/160	1935	20	10	70	5	20	D	NU/1972
25	Konkar	Khar Kharo	248	1935	20	10	60	Dry	-	D	NU/1980
26	Konkar	Malh	41	1938	40	10	100	Dry	16	D	NU/1978
27	Konkar	Malh	42	1938	40	10	70	Dry	20	D	NU/1978
28	Konkar	Thado	52	1938	30	6	100	Dry	20	D	NU/1978
29	Konkar	Malh	436	1940	20	5	40	Dry		D	NU/1950
30	Konkar	Malh	238	1940	25	10	70	Dry	-	D	NU/1960
31	Konkar	Khar Kharo	511	1940	20	5	65	Dry		D	NU/1963
32	Konkar	Malh	554	1940	30	10	80	Dry		D	NU/1964
33	Konkar	Darsano Channo	-	1940	25	10	50	Dry		D	NU/1965
34	Konkar	Malh	118	1940	30	10	50	Dry	40	D	NU/1968
35	Konkar	Malh	30	1940	25	10	50	-	-	D	NU/1969
36	Konkar	Khar Kharo	214	1940	40	10	90	30	16	D	NU/1989
37	Konkar	Malh	-	1943	55	10	126	Dry	40	D	NU/1966
38	Konkar	Malh	-	1945	52	10	112	Dry	34	D	NU/1966
39	Konkar	Khar Kharo	-	1945	20	10	85	10	15	D	NU/1985
40	Konkar	Malh	91	1949	50	10	120	4	25	D	NU/1986
41	Konkar	Malh	317	1950	60	10	100	Dry		D	NU/1970
42	Konkar	Malh	43	1950	50	10	80	3	25	D	NU/1985
43	Konkar	Bazar	84	1950	30	10	95	25	16	D	NU/1988
44	Konkar	Malh	289	1959	35	5	55	Dry	20	D	NU/1975
45	Konkar	Khar Kharo	104	1961	50	10	104	25	20	D	NU/1971
46	Konkar	Malh	358	1963	60	10	-	-	18	D	NU/1967
47	Konkar	Bazar	4	1964	70	10	90	20	16	D	NU/1988
48	Konkar	Khar Kharo	248	1965	30	10	50	Dry	20	D	Not use
49	Konkar	Malh	241/250	1965	60	10	130	Dry	20	D	NU/1984
50	Konkar	Thado	-	1968	30	10	40	Dry	-	D	Not use
51	Konkar	Darsano Channo	-	1968	40	10	70	0		D	NU/1986
52	Konkar	Bazar	119	1968	70	10	90	20	16	D	NU/1988
53	Konkar	Konkar	215	1970	30	10	60	15	20	D	NU/1980
54	Konkar	Malh	205	1975	120	5	120	Dry	20	D	NU/1980
55	Konkar	Malh	227	1975	90	10	165	-		D	NU/1988
56	Konkar	Konkar	213	1978	40	10	60	20	20	D	NU/1980
57	Konkar	Malh	536	1982	90	5	100	2	20	D	NU/1983
58	Konkar	Konkar	213	1982	70	10	-	-	-	D	NU/1985
59	Konkar	Darsano Channo	-	1983	45	10	70	8	10	D	NU/1985
60	Konkar	Darsano Channo	-	1984	40	10	70	20	20	D	NU/1985
61	Konkar	Konkar	213	1984	80	10	-	-	-	D	NU/1986
62	Konkar	Darsano Channo	-	1984	40	10	90	12	20	D	NU/1986
63	Konkar	Konkar	213	1984	70	10	80	4	12	D	NU/1988
64	Konkar	Konkar	213	1985	70	10	80	5	15	D	NU/1988
65	Konkar	Konkar	213	1986	70	15	70	15	-	D	NU/1987
66	Konkar	Thado	38	1987	30	-	-	-	-	D	Not Use

Table G.2.6 ABANDONED WELLS (2/2)

NO.	Union Council	Deh	Original Condition: Survey No.	Original Condition: Well Const. Year	Original Condition: Depth of Well (ft)	Original Condition: Water Depth (ft)	Present Condition: Depth of Well (ft)	Present Condition: Water Depth (ft)	Dia. of Well (ft)	Dug or Tube	Remarks
67	Konkar	Khar Kharo	214	1987	80	16	80	16	23	D	Not Use
68	Konkar	Malh	404							D	NU/1987
69	Laundhi	Laundhi	300	1930	40	10	115	Dry	30	D	NU/1976
70	Laundhi	Laundhi	2	1930	25	5	120	Dry		D	NU/1979
71	Laundhi	Khakhar	-	1940	20	5	60	-	16	D	NU/1975
72	Laundhi	Sanharo	-	1940	40	10	110	Dry		D	NU/1979
73	Laundhi	Sanharo	-	1940	20	10	120	-	20	D	NU/1980
74	Laundhi	Laundhi	2	1940	30	8	120	Dry		D	NU/1980
75	Laundhi	Laundhi	146	1940	40	10	140	1	30	D	NU/1988
76	Laundhi	Sanharo	-	1948	30	10	120	-		D	NU/1980
77	Laundhi	Khakhar	-	1950	40	10					NU/1958
78	Laundhi	Laundhi	27	1950	40	10	120	Dry		D	NU/1978
79	Laundhi	Khakhar	87	1950	30	10	100	-	-	D	NU/1979
80	Laundhi	Laundhi	67	1950	60	10	110	Dry	16	D	NU/1980
81	Laundhi	Laundhi	-	1950	30	10	100			D	NU/1980
82	Laundhi	Sanharo	-	1955	30/35	10	80	Dry		D	NU/1965
83	Laundhi	Laundhi	80	1955	60	5	130	-		D	NU/1972
84	Laundhi	Sanhro	-	1955	30	10	100	Dry	-	D	NU/1978
85	Laundhi	Sanharo	-	1958	60	10	130	4	22	D	NU/1982
86	Laundhi	Laundhi	-	1960	70	10	120	Dry	20	D	NU/1978
87	Laundhi	Sanharo	-	1965	30	10	100	Dry		D	Not use
88	Laundhi	Sanhro	-	1965	40	10	100	Dry	20	D	NU/1982
89	Laundhi	?	-	1965	40	10	100	Dry	-	D	NU/1985
90	Laundhi	Sanhro	-	1966	40	10	125	Dry	-	D	NU/1976
91	Laundhi	Khakhar	-	1973	70	5	75	-	20	D	NU/1974
92	Laundhi	Khakhar	-	1987	95	5	-	-			Not use
93	Thano	Thano	63	1915	30	10	155	Dry	25	D	NU/1980
94	Thano	Thano	110	1915	20	5	165	Dry	20	D	NU/1981
95	Thano	Thano	34	1915	20	6	130	Dry	20	D	NU/1969
96	Thano	Thano	7	1915	25	5	145	Dry	20	D	NU/1976
97	Thano	Thano	21	1920	20	5	110	Dry	20	D	NU/1975
98	Thano	Thano	183	1920	25	5	160	Dry	20	D	NU/1979
99	Thano	Thano	275	1920	15	5	135	-	20	D	NU/1981
100	Thano	Thano	11	1925	20	5	135	Dry	25	D	NU/1979
101	Thano	Thano	36	1929	25	5	155	Dry	20	D	NU/1974
102	Thano	Thano	-	1930	25	10	170	-	20	D	Not use
103	Thano	Thano	-	1930	25	5	120	Dry	15	D	NU/1980
104	Thano	Thano	197	1955	60	10	140	-	20	D	NU/1984
105	Thano	Thano	195	1958	60	10	145	Dry	20	D	NU/1980
106	Thano	Thano	63	1960	55	15	130	Dry	25	D	NU/1983
107	Thano	Thano	34	1964	65	15	140	Dry	25	D	NU/1981
108	Thano	Thano	98	1966	65	15	130	Dry	20	D	NU/1980
109	Thano	Thano	53	1967	75	15	125	Dry	20	D	NU/1980
110	Thano	Thano	43	1970	90	15	130	Dry	20	D	NU/1979
111	Thano	Thano	-	1970	80	10	130	Dry	20	D	NU/1982
	Average				43.6	9.4	87.9	11.7			

Remarks : NU means ' not in use since '.

Table G.2.7 RESULTS OF GROUNDWATER LEVEL AND QUALITY MEASUREMENTS (1/3)

	Union Council	Deh	Sur. No.	Well No.	Depth of Well (ft)	Outlet Pipe Dia. (inch)	Ref. G. El. (ft)	1977 Water Table Jun-77 (ft)	1977 Water Table Nov-77 (ft)	1977 E.C. x1000 (mmS/cm)	Oct-89 GWL (ft)	Oct-89 EC x1000 (mmS/cm)	Oct-89 PH	Feb-90 GWL (ft)	Feb-90 EC x1000 (mmS/cm)	Feb-90 PH	Input Ref. No.
1	Darsano	Amilano		ND 05	100	3.0	311	260 *	260 *	-	225	4.23	-	223	3.26	-	104
2	Darsano	Amilano		ND 06	35	3.0	353	329 *	320 *	-	-	1.19	-	300	1.40	-	109
3	Darsano	Amilano		ND 07	82	3.0	350	328 *	320 *	-	308	1.59	-	317	1.84	-	110
4	Darsano	Amilano		ND 08	80	4.0	348	325 *	320 *	-	273	1.46	-	312	1.46	-	111
5	Darsano	Amilano		ND 09	70	4.0	310	265 *	270 *	-	262	0.86	-	262	-	-	127
6	Darsano	Amilano		ND 10	80	4.0	323	270 *	270 *	-	267	1.54	-	266	1.63	-	128
7	Darsano	Amilano		W 001	80	3.0	298	270 *	280 *	-	245	1.29	-	236	2.79	-	124
8	Darsano	Amilano		W 002	-	4.0	303	270 *	260	-	-	0.88	-	254	-	-	125
9	Darsano	Amilano		W 003	80	4.0	295	270 *	260 *	1.15	249	1.84	-	242	2.35	-	126
10	Darsano	Amilano		W 007	Abondoned		307	270	260 *	-	-	-	-	222	1.37	-	102
11	Darsano	Amilano		W 008	100	3.0	312	256	255 *	-	232	1.90	-	245	2.45	-	103
12	Darsano	Amilano		W 009	Abondoned		318	254	257	-	-	-	-	252	2.94	-	106
13	Darsano	Amilano		W 010	85	3.0	324	252	265 *	-	259	3.94	-	258	2.97	-	107
14	Darsano	Amilano		W 011	85	3.0	340	254	270	1.55	257	0.95	-	267	0.98	-	105
15	Darsano	Amilano		W 012	Abondoned		332	250	275 *	-	-	0.99	-	-	-	-	108
16	Darsano	Amilano		W 013	65	3.0	367	322	321	-	313	0.78	-	313	5.04	-	123
17	Darsano	Bayal		AG 29	65	4.0	370	340 *	356	-	-	1.36	-	341	1.32	-	120
18	Darsano	Bayal		AG 58	35	3.0	388	358	365 *	-	364	0.72	-	364	-	-	138
19	Darsano	Bayal		ND 04	28	3.0	355	345 *	360 *	-	341	1.67	-	331	1.87	-	122
20	Darsano	Chuhar		L 04	-	-	318	282	275 *	1.00	-	1.72	8.1	262	-	-	181
21	Darsano	Chuhar		L 17	-	-	316	293	270	0.95	269	0.77	8.1	265	-	-	178
22	Darsano	Kathore		AG 01	55	4.0	365	330 *	325 *	-	-	1.65	-	354	1.77	-	121
23	Darsano	Kathore		AG 02	90	5.0	402	348 *	345 *	-	312	0.80	-	318	-	-	134
24	Darsano	Kathore		AG 04	92	5.0	404	355	346	0.75	326	0.74	7.8	320	-	-	139
25	Darsano	Kathore		AG 06	85	4.0	407	358	347	1.20	325	0.90	-	331	-	-	136
26	Darsano	Kathore		AG 08	Abondoned		390	353 *	350 *	-	-	-	-	324	-	-	133
27	Darsano	Kathore		AG 10	125	3.0	357	274 *	285 *	-	261	2.55	7.2	252	-	-	146
28	Darsano	Kathore		AG 11	110	4.0	357	274	286	1.35	256	2.24	7.6	-	-	-	165
29	Darsano	Kathore		AG 14	105	3.0	368	293	305 *	-	268	2.12	7.8	267	-	-	144
30	Darsano	Kathore		AG 22	Abondoned		378	335 *	330 *	-	-	-	-	-	-	-	142
31	Darsano	Kathore		AG 25	110	2.0	388	333	335 *	0.90	286	2.34	7.4	300	-	-	141
32	Darsano	Kathore		AG 28	85	2.0	391	332	340 *	-	294	-	-	303	-	-	140
33	Darsano	Kathore		AG 35	Abondoned		330	262	260 *	-	-	-	-	-		-	119
34	Darsano	Kathore		AG 36	100	3.0	331	260 *	260	2.50	244	2.82	-	244	-	-	118
35	Darsano	Kathore		AG 39	Abondoned		340	265 *	270	3.00	-	-	-	256	-	-	116
36	Darsano	Kathore		AG 40	115	3.0	340	265 *	282	3.35	254	2.87	-	-	-	-	115
37	Darsano	Kathore		AG 41	Abondoned		344	257	270 *	-	-	-	-	244	-	-	117
38	Darsano	Kathore		AG 44	Abondoned		337	266	265 *	-	-	-	-	-		-	114
39	Darsano	Kathore		AG 50	105	3.0	350	280 *	295 *	-	271	1.71	-	272	-	-	112
40	Darsano	Kathore		AG 51	80	4.0	392	363 *	350 *	-	332	0.85	-	320	-	-	132
41	Darsano	Kathore		AG 52	80	3.0	410	380	350 *	-	357	1.38	-	358	-	-	131
42	Darsano	Kathore		AG 57	-	-	422	365 *	360 *	-	-	-	-	-		-	137
43	Darsano	Kathore		AG 62	100	3.0	383	335 *	340 *	-	283	2.43	7.6	309	-	-	143
44	Darsano	Kathore		ND 01	88	4.0	392	360 *	355 *	-	331	2.08	-	338	-	-	135
45	Darsano	Kathore		ND 02	78	4.0	412	362 *	350 *	-	329	-	-	323	-	-	130
46	Darsano	Kathore		ND 03	105	4.0	356	270 *	285 *	-	257	0.92	-	255	-	-	113
47	Konkar	Bazar		ND 11	90	4.0	285	250 *	255 *	-	220	-	-	220	-	-	129
48	Konkar	Bazar		W 028	66	4.0	241	201	229	-	202	0.83	-	184	-	-	51
49	Konkar	Bazar		W 032	64	2.5	227	210	205 *	-	169	2.65	-	192	2.27	-	49
50	Konkar	Bazar		W 033	63	2.0	224	190	204	-	169	3.33	-	189	3.52	-	50
51	Konkar	Bazar		W 035	74	3.0	214	199	195 *	-	176	1.37	-	181	0.66	-	46
52	Konkar	Bazar		W 037	59	3.0	212	200	195 *	1.70	186	1.57	-	181	1.30	-	47
53	Konkar	Bazar		W 040	51	2.5	208	210	195 *	-	165	3.33	-	-	-	-	48
54	Konkar	Bazar		W 045	84	3.0	194	185	185 *	-	141	1.27	-	121	-	-	39
55	Konkar	Bazar		W 047	84	2.5	209	170	175 *	-	144	2.06	-	132	-	-	45
56	Konkar	Bazar		W 048	102	3.0	202	160	172	-	104	4.03	-	103	-	-	44
57	Konkar	Bazar		W 049	107	3.0	199	169	185 *	-	121	4.13	-	110	-	-	37
58	Konkar	Bazar		W 049/1	83	2.0	190	165 *	185 *	-	141	3.84	-	-	-	-	38
59	Konkar	Darsano		T 06	-	-	220	199	205 *	-	178	0.44	8.0	168	-	-	182
60	Konkar	Darsano		T 07	-	-	219	200	207	0.45	177	0.31	7.5	169	-	-	184
61	Konkar	Darsano		T 09	-	-	218	200	205 *	-	178	0.38	8.0	167	-	-	183
62	Konkar	Darsano		T 15	Not used	-	213	181	200 *	-	176	0.50	8.5	-	-	-	192
63	Konkar	Darsano		T 15-1	80	5.0	213	180 *	200 *	-	-	0.87	8.5	-	-	-	193
64	Konkar	Darsano		T 20	75	3.0	206	188	170 *	-	-	0.37	8.4	-	-	-	194
65	Konkar	Darsano		T 59	-	-	193	130	140 *	-	97	1.01	7.7	128	-	-	186
66	Konkar	Darsano		T 63	-	-	190	124	145	-	112	-	-	129	-	-	180
67	Konkar	Darsano		T 68	75	3.0	175	114	120 *	-	66	1.42	8.2	109	-	-	195
68	Konkar	Darsano		W 067	36	3.0	196	166	-	-	172	0.94	-	166	0.88	-	40
69	Konkar	Darsano		W 068	79	3.0	192	167	-	-	164	0.88	-	168	0.65	-	41
70	Konkar	Darsano		W 069	-	-	178	146	145	-	-	0.44	8.0	-	-	-	179
71	Konkar	Darsano		W 070	-	-	185	118	170	-	38	0.40	7.7	149	-	-	187
72	Konkar	Darsano		W 112	-	-	176	134	143	2.40	101	2.06	7.5	106	-	7.2	185
73	Konkar	Kharkharo		LA 11	21	3.0	176	162	170	-	167	2.69	-	-	-	-	23
74	Konkar	Kharkharo		LA 13	450	3.0	190	168	170 *	-	-	6.91	-	183	4.90	-	21
75	Konkar	Kharkharo		T 52	98	2.5	176	138	146	0.60	112	0.70	-	98	-	-	33
76	Konkar	Kharkharo		T 52/1	Abondoned		175	108 *	145 *	-	-	-	-	111	-	-	34
77	Konkar	Kharkharo		T 53	76	2.5	178	146	150 *	-	143	0.40	-	122	-	-	30
78	Konkar	Kharkharo		W 051	81	3.0	192	165	183	-	127	2.11	-	121	-	-	35
79	Konkar	Kharkharo		W 052	44	-	184	193	195 *	-	161	-	-	-	-	-	27
80	Konkar	Kharkharo		W 053	76	3.0	185	159	150 *	-	140	0.87	-	142	0.13	-	42
81	Konkar	Kharkharo		W 054	83	2.5	182	147	150 *	-	110	0.90	-	117	-	-	43
82	Konkar	Konkar		LA 07	31	2.5	198	162	175 *	-	179	5.98	-	177	-	-	22
83	Konkar	Konkar		LA 15	38	2.5	214	188	190 *	-	184	4.80	-	-	2.94	-	26
84	Konkar	Konkar		LA 17	400	4.0	268	162	-	-	-	3.20	-	226	-	-	25
85	Konkar	Konkar		LA 19	60	3.0	269	229	230 *	-	226	2.85	-	236	-	-	13
86	Konkar	Konkar		LA 21	450	3.0	281	249	250 *	-	-	3.07	-	-	-	-	19

Table G.2.7 RESULTS OF GROUNDWATER LEVEL AND QUALITY MEASUREMENTS (2/3)

	Union Council	Deh	Sur. No.	Well No.	Depth of Well (ft)	Outlet Pipe Dia. (inch)	Ref. G. El. (ft)	1977 Water Table Jun-77 (ft)	1977 Nov-77 (ft)	1977 E.C. x1000 (mmS/cm)	Oct-89 GWL (ft)	Oct-89 EC x1000 (mmS/cm)	Oct-89 PH	Feb-90 GWL (ft)	Feb-90 EC x1000 (mmS/cm)	Feb-90 PH	Input Ref. No.
87	Konkar	Konkar		LA 22	400 ,350	3.0 ,2.5	290	260	260 *	-	-	4.51	-	-	-	-	1
88	Konkar	Konkar		LA 23	51	1.5	263	-	-	-	234	9.50	-	-	-	-	14
89	Konkar	Konkar		LA 24	450	4.0	272	-	-	-	-	8.93	-	-	-	-	16
90	Konkar	Konkar		LA 25	460	3.0	272	-	-	-	-	2.69	-	-	-	-	17
91	Konkar	Konkar		LA 26	450	2.0	276	-	-	-	-	2.82	-	-	-	-	18
92	Konkar	Konkar		LA 27	350	3.0	276	-	-	-	-	3.07	-	-	-	-	9
93	Konkar	Konkar		LA 28	400	3.0	276	-	-	-	-	3.74	-	-	-	-	10
94	Konkar	Konkar		LA 29	400	3.0	275	-	-	-	-	3.07	-	142	1.73	-	11
95	Konkar	Konkar		LA 30	400	4.0	117	-	-	-	-	2.98	-	-	-	-	8
96	Konkar	Konkar		LA 31	Abondoned		270	-	-	-	-	-	-	-		-	12
97	Konkar	Konkar		LA 32	400	3.0	271	-	-	-	-	3.17	-	-	-	-	15
98	Konkar	Konkar		LA 33	400	3.0	271	-	-	-	-	1.73	-	-	-	-	2
99	Konkar	Konkar		LA 34	52	3.0	289	-	-	-	231	4.03	-	231	-	-	3
100	Konkar	Konkar		LA 35	44	3.0	281	-	-	-	238	3.65	-	238	-	-	4
101	Konkar	Konkar		LA 36	430	3.0	279	-	-	-	-	6.24	-	-	-	-	5
102	Konkar	Konkar		LA 37/1	52	2.5	285	-	-	-	259	1.44	-	262		-	6
103	Konkar	Konkar		LA 37/2	54	2.5	293	-	-	-	257	5.09	-	251		-	7
104	Konkar	Malh		2	114	2.5	139	51 *	-	-	29	7.21	8.3	33	-	-	60
105	Konkar	Malh		9	-	2.5	135	16	-	-	-	2.18	8.3	12	-	-	66
106	Konkar	Malh		10	128	2.5	135	25	-	-	11	2.94	8.1	11	-	8.1	67
107	Konkar	Malh		12	123	2.5	137	20 *	-	1.55	16	2.69	7.7	17	-	7.7	65
108	Konkar	Malh		19	147	-	137	25	-	-	1	0.63	7.9	-1	-	7.9	64
109	Konkar	Malh		25	Abondoned		136	85	-	-	-	-	-	-		-	63
110	Konkar	Malh		26	72	2.5	137	109	-	-	71	0.39	8.0	68	-	8.0	62
111	Konkar	Malh		30	120	3.0	126	82	100 *	-	30	0.50	-	10	-	-	72
112	Konkar	Malh		31	123	3.0	127	85	100 *	-	23	0.47	-	15	-	-	69
113	Konkar	Malh		32	96	-	126	80 *	100 *	-	34	-	-	43	-	-	71
114	Konkar	Malh		33	134	2.5	125	89	100 *	-	13	0.77	-	-3	-	-	70
115	Konkar	Malh		41	-	3.0	142	20	35	-	-	1.03	-	-17	-	-	74
116	Konkar	Malh		42	147	3.0	143	14	-	-	5	0.86	-	-12	-	-	73
117	Konkar	Malh		43	149	2.5	146	22	-	-	3	2.02	-	-25	-	-	75
118	Konkar	Malh		47	-	3.0	120	7	-	-	-	2.00	-	-5	2.54	-	77
119	Konkar	Malh		48	Abondoned		118	20 *	-	-	-	-	-	-		-	78
120	Konkar	Malh		49	120	-	122	10	-	-	5	-	-	-	-	-	79
121	Konkar	Malh		56	180	3.0	108	-10 *	-	1.80	-31	0.77	7.6	-	-	-	168
122	Konkar	Malh		63	105	2.5	129	33	-	-	33	-	-	36	3.60	-	89
123	Konkar	Malh		64	Abondoned		-	34 *	-	-	-	-	-	-		-	88
124	Konkar	Malh		74	130	2.5	122	29	-	-	-7	2.07	-	-6	2.60	-	81
125	Konkar	Malh		75	131	3.0	130	7	-	-	1	1.73	-	-1	-	-	82
126	Konkar	Malh		76	Abondoned		120	40 *	-	-	-	-	-	-		-	84
127	Konkar	Malh		79	66	2.5	132	86	-	1.20	82	4.64	7.6	81	-	-	55
128	Konkar	Malh		81	50	3.0	135	104	-	-	94	3.54	7.4	89	-	-	56
129	Konkar	Malh		85	87	2.5	121	45 *	-	-	41	3.00	-	78	-	-	76
130	Konkar	Malh		85A	71	2.5	139	110	115 *	-	83	2.02	7.7	79	-	-	57
131	Konkar	Malh		NK 01	89	3.0	127	35 *	-	-	41	1.73	-	-	-	-	85
132	Konkar	Malh		NK 02	-	3.0	123	55 *	-	-	-	-	-	-		-	86
133	Konkar	Malh		NK 03	91	3.0	121	29 *	-	-	37	-	-	38	-	-	87
134	Konkar	Malh		NK 04	Abondoned		120	34	-	-	-	-	-	-		-	80
135	Konkar	Malh		NK 05	Abondoned		136	60 *	-	-	-	-	-	-		-	83
136	Konkar	Malh		NK 06	125	2.5	125	100 *	100 *	-	45	-	-	-	-	-	68
137	Konkar	Malh		T 23	95	2.5	145	100	100 *	-	78	0.39	8.3	-	-	-	58
138	Konkar	Malh		T 24	96	2.5	148	100	100 *	-	53	0.43	8.3	54	-	-	59
139	Konkar	Malh		T 33	67	2.5	149	110	-	-	92	0.91	8.0	99	-	-	52
140	Konkar	Malh		T 38	89	2.0	154	95 *	-	-	69	1.40	8.0	69	-	-	54
141	Konkar	Malh		T 40	-	2.5	153	130	-	-	-	1.15	8.3	53	-	-	61
142	Konkar	Malh		T 41	93	3.0	157	140	128	1.60	96	0.55	8.3	74	-	-	53
143	Konkar	Malh		T 42	91	2.0	153	115 *	-	-	81	2.35	-	79	-	-	29
144	Konkar	Malh		T 47	63	2.0	161	124	-	-	113	1.08	-	97	-	-	36
145	Konkar	Malh		T 49	102	3.0	171	124	-	-	142	0.74	-	-	-	-	32
146	Konkar	Malh		W 059	53	6.0	167	102	104	-	120	0.49	-	113	-	-	31
147	Konkar	Malh		W 063	65	3.0	148	100 *	105 *	-	90	-	-	91	-	-	28
148	Konkar	Thado		W 086	66	2.0	136	125 *	-	-	82	3.00	-	84	-	-	24
149	Konkar	Thado		W 087	49	2.5	152	-	-	-	106	0.95	-	124	-	-	20
150	Landhi	Khakhar		NL 07	145	3.0	137	110 *	-	-	-	1.92	-	-	-	-	97
151	Landhi	Khakhar		NL 09	-	-	150	85 *	-	-	64	-	-	69	-	-	174
152	Landhi	Khakhar		NL 10	-	-	146	100 *	-	-	50	0.85	7.5	62	-	-	172
153	Landhi	Khakhar		W 65	-	-	177	152	160 *	-	107	0.38	8.3	-	-	-	173
154	Landhi	Landhi		D 24	140	3.0	124	15	25 *	-	6	-	-	8	0.81	-	101
155	Landhi	Landhi		D 29	140	3.0	121	15	13	-	3	1.91	7.5	8	-	-	99
156	Landhi	Landhi		LA 29	145	4.0	117	7	13	-	-1	1.86	8.2	-	-	-	91
157	Landhi	Landhi		LA 41	-	-	102	10	-	-	-18	1.68	7.3	-19	1.62	-	171
158	Landhi	Landhi		LA 43	-	-	98	25	-	-	-26	2.35	-	-30	1.88	-	170
159	Landhi	Landhi		NL 01	-	4.0	96	20 *	-	-	-	1.41	-	-8	-	-	96
160	Landhi	Landhi		NL 02	110	3.0	104	21	10 *	-	-	-	7.5	-12	-	-	98
161	Landhi	Landhi		NL 04	110	-	95	30 *	-	-	-	2.54	-	0	1.92	-	93
162	Landhi	Landhi		NL 06	120	3.0	140	25 *	10 *	-	-	1.08	7.7	-	-	-	95
163	Landhi	Sanhro		D 10	130	4.0	142	69	50 *	-	-	-	-	44	-	-	92
164	Landhi	Sanhro		D 11	130	4.0	139	65 *	50 *	-	33	1.01	7.6	46	-	-	90
165	Landhi	Sanhro		D 32	120	4.0	120	45	27	-	3	1.04	7.4	1	1.08	-	100
166	Landhi	Sanhro		D 33	-	-	124	44	30 *	-	4	1.08	7.7	4	1.10	-	176
167	Landhi	Sanhro		D 36	-	-	122	42	55 *	-	27	2.01	7.3	-	-	-	175
168	Landhi	Sanhro		D 40	175	5.0	136	53	55 *	-	36	1.41	7.9	-	-	-	188
169	Landhi	Sanhro		D 41	Abondoned		132	78	59	-	-	-	-	-		-	189
170	Landhi	Sanhro		NL 05	-	-	'27	30 *	35 *	-	9	2.30	-	-	-	-	177
171	Landhi	Sanhro		NL 08	96	2.5	150	80 *	90 *	-	-	-	-	-		-	94
172	Landhi	Sanhro		W 82	95	3.0	160	103	108	-	-	4.02	7.7	-		-	190

Table G.2.7 RESULTS OF GROUNDWATER LEVEL AND QUALITY MEASUREMENTS (3/3)

	Union Council	Deh	Sur. No.	Well No.	Depth of Well (ft)	Outlet Pipe Dia. (inch)	Ref. G. El. (ft)	1977 Water Table Jun-77 (ft)	1977 Water Table Nov-77 (ft)	1977 R.C. x1000 (mmho)	Oct-89 GWL (ft)	Oct-89 EC x1000 (mmho)	Oct-89 PH	Feb-90 GWL (ft)	Feb-90 EC x1000 (mmho)	Feb-90 PH	Input Ref. No.
173	Landhi	Sanhro		W 83	90	3.0	160	85 *	105 *	-	81	3.82	7.2	-	-	-	191
174	Thano	Thano		NT 07	165	3.0	80	15 *	-	-	-59	1.47	-	-49	1.50	-	153
175	Thano	Thano		NT 08	150	3.0	92	-5 *	-	-	-55	0.59	-	-59	-	-	154
176	Thano	Thano		NT 11	140	3.0	97	-30 *	30 *	-	-29	2.18	-	-	-	-	157
177	Thano	Thano		NT 12	165	3.0	90	-40 *	30 *	-	-40	4.05	-	-36	-	-	158
178	Thano	Thano		NT 13	160	3.0	89	-30 *	30 *	-	-32	3.83	-	-18	3.80	6.5	159
179	Thano	Thano		NT 14	170	3.0	87	-5 *	-	-	-15	5.61	-	-3	4.76	6.3	160
180	Thano	Thano		NT 15	160	3.0	83	-10 *	-	-	-2	6.27	-	7	4.44	6.3	161
181	Thano	Thano		NT 16	168	3.0	82	-10 *	-	-	-17	4.34	-	-13	3.97	6.6	162
182	Thano	Thano		W 088	145	1.0	108	-7	14	-	-37	1.13	-	-	-	-	163
183	Thano	Thano		W 089	180	-	105	-5 *	-	-	-	-	-	-		-	166
184	Thano	Thano		W 090	130	2.5	103	-12 *	10 *	-	-27	-	-	-	-	-	156
185	Thano	Thano		W 091	130	2.5	98	-12	15	-	-32	0.87	-	-	-	-	155
186	Thano	Thano		W 095	190	3.0	94	-20 *	-	-	-	0.86	-	-43	2.15	-	169
187	Thano	Thano		W 096	148	-	87	-12 *	-20 *	-	-61	1.22	-	-36	2.10	-	152
188	Thano	Thano		W 099	170	3.0	89	-28 *	-20 *	-	-54	2.69	7.0	-79	1.91	-	148
189	Thano	Thano		W 100	160	3.0	88	-28 *	-30 *	1.90	-31	3.13	8.2	-	-	-	147
190	Thano	Thano		W 101	175	3.0	87	-30 *	-	-	-25	3.54	6.8	-8	3.74	-	151
191	Thano	Thano		W 102	130	2.5	89	-30 *	-	-	-32	1.58	7.3	-33	-	-	149
192	Thano	Thano		W 104	170	3.0	85	-35 *	-	2.20	-29	3.26	6.6	1	3.30	6.9	150
193	Thano	Thano	-	WR 03	170	3.0	100	-1	-	-	-38	0.81	-	-36	-	-	167
194	Thano	Thano		WR 05	117	-	99	-5 *	-	-	-18	-	-	-	-	-	165
195	Thano	Thano		WR 06	117	3.0	96	-30 *	-	-	Dry	-	-	-	-	-	164

Remarks: * shows reading on ground watwer contour map in 1977

Table G.2.8 ESTIMATE OF IRRIGATION AREA (BASED ON DISCHARGE PIPE DIAMETER)

Union Council	Outlet P. Dia. (inches)	Average Total Commanding Area (ha)	Max. Irrigable Area (ha)	Nos. of Wells (Nos.)	(%)	Estimat. No. of Wells	Total Command. Area (ha)	Max. Irrigable Area (ha)
1 Darsano	2.0	65.8	6.3	2	6%	6	383	37
	3.0	39.1	8.0	17	49%	49	1917	391
	4.0	31.4	19.3	14	40%	41	1280	789
	5.0	82.6	50.6	2	6%	6	481	295
	Ave.	61.2	21.0	35	100%	102	4061	1511
2 Konkar	2.0	7.6	3.5	8	11%	21	161	74
	3.0	9.0	3.3	28	37%	74	667	241
	4.0	12.7	7.7	35	47%	93	1174	709
	5.0&6.0	25.7	9.7	5	5%	13	340	128
	Ave.	31.2	17.0	76	100%	201	2343	1153
3 Landhi	2.5	8.1	2.0	1	9%	11	85	21
	3.0	6.9	3.7	5	46%	52	358	194
	4.0	20.4	4.8	5	45%	53	1075	251
	Ave.	13.6	4.2	11	100%	116	1519	466
4 Thano	2.5	8.1	2.0	4	20%	9	76	19
	3.0	10.6	6.5	16	80%	38	400	245
	Ave.	9.4	4.3	20	100%	47	476	264
Weighted Average		19.5	8.2	142		466	8398	3393
			Estimated Net Irr. Area (ha)			75%	6299	2545
						Say	6300	2600

Remarks: Estimated based on the representative.

Table G.2.9 ESTIMATE OF IRRIGATION AREA IN 1987/88 (1/3)

Union Council	Deh	Well No.	Depth of Well (ft)	Outlet P. Dia. (inches)	Total Commanding Area (ha)	Max. Irrigable Area (ha)	Average Total Commanding Area (ha)	Average Max. Irrigable Area (ha)	Input Ref. No.
Darsano	Kathore	AG 25	110	2.0	70.8	6.5			141
Darsano	Kathore	AG 28	85	2.0	60.7	6.1	65.8	6.3	140
Darsano	Amilano	W 001	80	3.0	16.2	4.0			124
Darsano	Amilano	W 008	100	3.0	80.9	8.1			103
Darsano	Amilano	W 010	85	3.0	80.9	8.1			107
Darsano	Amilano	W 011	85	3.0	80.9	8.1			105
Darsano	Amilano	W 013	65	3.0	16.2	4.0			123
Darsano	Bayal	AG 58	35	5.0	4.0	2.8			138
Darsano	Kathore	AG 10	125	3.0	38.4	1.6			146
Darsano	Kathore	AG 14	105	3.0	10.5	4.9			144
Darsano	Kathore	AG 36	100	3.0	24.3	2.8			118
Darsano	Kathore	AG 40	115	3.0	34.4	5.3			115
Darsano	Kathore	AG 50	105	3.0	10.5	1.6			112
Darsano	Kathore	AG 52	80	3.0	56.7	36.4			131
Darsano	Kathore	AG 62	100	3.0	16.2	8.1			143
Darsano		ND 04	28	3.0	60.7	10.1			122
Darsano		ND 05	100	3.0	80.9	8.1			104
Darsano		ND 06	35	3.0	12.5	1.2			109
Darsano		ND 07	82	3.0	40.5	20.2	39.1	8.0	110
Darsano	Amilano	W 002		4.0					125
Darsano	Amilano	W 003	80	4.0	22.3				126
Darsano	Bayal	AG 29	65	4.0	60.7	10.1			120
Darsano	Kathore	AG 01	55	4.0	20.2				121
Darsano	Kathore	AG 06	85	4.0	36.4	36.4			136
Darsano	Kathore	AG 11	110	4.0	12.1	4.0			145
Darsano	Kathore	AG 51	80	4.0	56.7	36.4			132
Darsano		ND 01	88	4.0	36.4	36.4			135
Darsano		ND 02	78	4.0					130
Darsano		ND 03	105	4.0	23.5	8.1			113
Darsano		ND 08	80	4.0	40.5	20.2			111
Darsano		ND 09	70	4.0					127
Darsano		ND 10	80	4.0	16.2	10.1			128
Darsano		ND 11	90	4.0	20.2	12.1	31.4	19.3	129
Darsano	Kathore	AG 02	90	5.0	43.7	40.5			134
Darsano	Kathore	AG 04	92	5.0	121.4	60.7	82.6	50.6	139
					Total/Ave.	in Unoin C.	48.0	21.0	
Konkar	Kharkhiro	LA 23	51	1.5	20.2	12.1			14
Konkar	Bazar	W 033	63	2.0	3.2	1.6			50
Konkar	Bazar	W 049/1	83	2.0					38
Konkar	Malh	T 42	91	2.0	10.1	0.4			29
Konkar	Malh	T 47	63	2.0	4.5	4.0			36
Konkar	Thado	W 086	66	2.0	4.5	2.0			24
Konkar	Tore	LA 26	450	2.0	7.3				18
Konkar			89	2.0	3.6	0.8	7.6	3.5	54
Konkar	Bazar	W 032	64	2.5	20.2	10.1			49
Konkar	Bazar	W 047	84	2.5	12.1	2.4			45
Konkar	Kharkharo	W 054	83	2.5	8.1	8.1			43
Konkar	Konkar	LA 07	31	2.5	10.1	2.4			22
Konkar	Konkar	LA 15	38	2.5	4.9				26
Konkar	Konkar	LA 37/1	52	2.5	3.2	3.2			6
Konkar	Konkar	LA 37/2	54	2.5	4.9	4.0			7
Konkar	Malh	9	-	2.5					66
Konkar	Malh	10	128	2.5					67
Konkar	Malh	12	123	2.5					65
Konkar	Malh	26	72	2.5	4.0	2.0			62
Konkar	Malh	33	134	2.5	6.5	3.2			70
Konkar	Malh	43	149	2.5	8.1	8.1			75
Konkar	Malh	79	66	2.5	26.3	3.2			55

Table G.2.9 ESTIMATE OF IRRIGATION AREA IN 1987/88 (2/3)

Union Council	Deh	Well No.	Depth of Well (ft)	Outlet P. Dia. (inches)	Total Commanding Area (ha)	Max. Irrigable Area (ha)	Average Total Commanding Area (ha)	Average Max. Irrigable Area (ha)	Input Ref. No.
Konkar	Malh	85	87	2.5	6.5	4.0			76
Konkar	Malh	85A	71	2.5	4.0	1.2			57
Konkar	Malh	NK 06	125	2.5	1.2	0.8			68
Konkar	Malh	T 23	95	2.5	6.5	3.2			58
Konkar	Malh	T 24	96	2.5					59
Konkar	Malh	T 33	67	2.5	6.1	0.8			52
Konkar	Malh	T 40	-	2.5					61
Konkar	Malh	T 52	98	2.5	16.2	4.0			33
Konkar	Malh	T 53	76	2.5	8.9	1.2			30
Konkar	Malh		114	2.5					60
Konkar	Thado	W 087	49	2.5	12.1	1.6			20
Konkar	Bazar	W 040	51	2.5	22.3	1.6			48
Konkar	Malh	63	105	2.5	2.8	1.6			89
Konkar	Malh	74	130	2.5	3.2	1.2	9.0	3.3	81
Konkar	Bazar	W 035	74	3.0	12.1	12.1			46
Konkar	Bazar	W 037	59	3.0	2.4	1.2			47
Konkar	Bazar	W 048	102	3.0					44
Konkar	Bazar	W 049	107	3.0					37
Konkar	Darsano C.	W 067	36	3.0	10.1	5.3			40
Konkar	Darsano C.	W 068	79	3.0	6.5	2.8			41
Konkar	Kathore	LA 11	21	3.0	12.1	0.4			23
Konkar	Kathore	LA 13	450	3.0	12.1	8.1			21
Konkar	Kharkharo	W 051	81	3.0	5.3	2.0			35
Konkar	Kharkharo	W 053	76	3.0	19.4	4.9			42
Konkar	Kharkhiro	LA 25	460	3.0	9.7	7.3			17
Konkar	Kharkhiro	LA 29	400	3.0	50.6	20.2			11
Konkar	Kharkhiro	W 045	84	3.0	24.3	24.3			39
Konkar	Konkar	LA 19	60	3.0	16.2	8.1			13
Konkar	Konkar	LA 21	450	3.0	8.1	8.1			19
Konkar	Konkar	LA 32	400	3.0	13.0	8.1			15
Konkar	Konkar	LA 33	400	3.0	2.8	2.8			2
Konkar	Konkar	LA 34	52	3.0	12.1	12.1			3
Konkar	Konkar	LA 35	44	3.0	20.2	10.1			4
Konkar	Konkar	LA 36	430	3.0	40.5	20.2			5
Konkar	Malh	30	120	3.0	8.1	4.0			72
Konkar	Malh	31	123	3.0	3.2	2.4			69
Konkar	Malh	41	-	3.0	8.9	5.3			74
Konkar	Malh	42	147	3.0	8.1	6.5			73
Konkar	Malh	47	-	3.0	2.8	0.4			77
Konkar	Malh	81	50	3.0	8.1	4.9			56
Konkar	Malh	T 49	102	3.0	7.3	7.3			32
Konkar	Malh	W 063	65	3.0	12.1				28
Konkar	Malh		93	3.0	20.2	20.2			53
Konkar	Thado	LA 27	350	3.0	12.1	8.1			9
Konkar	Thado	LA 28	400	3.0	13.0	8.1			10
Konkar	Malh	75	131	3.0	1.2	1.2			82
Konkar	Malh	NK 01	89	3.0	3.2	3.2			85
Konkar	Malh	NK 02	-	3.0	16.2				86
Konkar	Malh	NK 03	91	3.0	16.2		12.7	7.7	87
Konkar	Bazar	W 028	66	4.0	8.1	4.9			51
Konkar	Kharkhiro	LA 24	450	4.0	6.5	6.5			16
Konkar	Konkar	LA 17	400	4.0	80.9	24.3			25
Konkar	Konkar	LA 30	400	4.0	7.3	3.2			8
Konkar	Malh	W 059	53	6.0			25.7	9.7	31
Konkar	Konkar	LA 22	400-350	3.0,2.5	101.2	60.7	101.2	60.7	1
					Total/Ave in Union C.		31.2	17.0	
Landhi	Sahro		96	2.5	8.1	2.0	8.1	2.0	94
Landhi	Khakhar		145	3.0	14.2	10.1			97
Landhi	Landhi	D 24	140	3.0	6.1	3.2			101

Table G.2.9 ESTIMATE OF IRRIGATION AREA IN 1987/88 (3/3)

Union Council	Deh	Well No.	Depth of Well (ft)	Outlet P. Dia. (inches)	Total Commanding Area (ha)	Max. Irrigable Area (ha)	Average Total Commanding Area (ha)	Average Max. Irrigable Area (ha)	Input Ref. No.
Landhi	Landhi		120	3.0	2.0	1.6			95
Landhi	Landhi		110	3.0	8.1	2.8	6.9	3.7	98
Landhi	Landhi	LN 01	145	4.0	6.1	4.0			91
Landhi	Landhi			4.0	16.2				96
Landhi	Sanhro	D 10	130	4.0	32.4	4.0			92
Landhi	Shanro	D 32	120	4.0	15.0	6.9			100
Landhi			130	4.0	32.4	4.0	20.4	4.8	90
					Total Ave.	in Union C.	13.6	4.2	
Thano	Thano	W 088	145	1.0	8.1	0.8			163
Thano	Thano	W 090	130	2.5	9.7	2.4			156
Thano	Thano	W 091	130	2.5	9.7	2.4			155
Thano	Thano	W 102	130	2.5	4.9	2.4	8.1	2.0	149
Thano	Thano	NT 07	165	3.0	20.2	12.1			153
Thano	Thano	NT 08	150	3.0	14.2	14.2			154
Thano	Thano	NT 11	140	3.0	3.2	2.4			157
Thano	Thano	NT 12	165	3.0	7.3	4.9			158
Thano	Thano	NT 13	160	3.0	4.9	3.2			159
Thano	Thano	NT 14	170	3.0					160
Thano	Thano	NT 15	160	3.0	16.2	12.1			161
Thano	Thano	NT 16	168	3.0	16.2	12.1			162
Thano	Thano	W 088B	180	3.0	3.2	2.0			168
Thano	Thano	W 095	190	3.0	5.7	2.4			169
Thano	Thano	W 099	170	3.0	4.9	3.2			148
Thano	Thano	W 100	160	3.0	15.0	6.1			147
Thano	Thano	W 101	175	3.0	8.1	4.9			151
Thano	Thano	W 104	170	3.0	12.1	8.1			150
Thano	Thano	WR 003	170	3.0	4.0	3.2			167
Thano	Thano	?	117	3.0	24.3		10.6	6.5	164
					Total/Ave.	in Union C.	9.4	4.3	
Grand Total/Average							19.5	8.2	

Table G.2.10 CALCULATION OF PUMPED WATER IN 1987/88

	Union Council	Outlet P. Dia. (inches)	Inventry Nos. of Wells (Nos.)	Estimated Nos. of Wells (Nos.)	Unit*1 Pump. Dis. (m3/min)	1987 Ope.*2 Hrs. (hrs)	1987 Total (1000m3)	1988 Ope.*2 Hrs. (hrs)	1988 Total (1000m3)	1987/88 Ope.*2 Hrs. (hrs)	1987/88 Total (1000m3)
1	Darsano	2.0	2	6	0.30	4.4	168	4.1	157	4.3	165
		3.0	17	49	0.70	4.4	3,305	4.1	3,080	4.3	3,230
		4.0	14	41	1.10	4.4	4,325	4.1	4,030	4.3	4,226
		5.0	2	6	1.70	4.4	955	4.1	890	4.3	933
		Subtotal	35	102			8,753		8,156		8,554
2	Konkar	2.0	8	21	0.25	4.8	556	4.0	463	4.4	510
		3.0	28	74	0.60	4.8	4,671	4.0	3,892	4.4	4,281
		4.0	35	93	1.10	4.8	10,704	4.0	8,920	4.4	9,812
		5.0	4	10	1.70	4.8	1,787	4.0	1,489	4.4	1,638
		6.0	1	3	2.50	4.8	695	4.0	579	4.4	637
		Subtotal	76	201			18,412		15,344		16,878
3	Landhi	2.5	1	10	0.30	3.7	243	3.5	230	3.6	237
		3.0	5	53	0.60	3.7	2,563	3.5	2,425	3.6	2,494
		4.0	5	53	1.10	3.7	4,700	3.5	4,446	3.6	4,573
		Subtotal	11	116			7,506		7,101		7,303
4	Thano	2.5	4	9	0.30	4.7	290	4.3	266	4.5	278
		3.0	16	38	0.60	4.7	2,322	4.3	2,124	4.5	2,223
		Subtotal	20	47			2,612		2,390		2,501
5	Weighted Average		142	466			37,284		32,990		35,237
6	Estimate by JICA (Refer to Table G.3.5)						45,900		42,700		44,300
7	(5)/(6)*100 %						81%		77%		80%

Remarks : *1 Standerd disdcharge for respective delivery pipe diameter.
(Irrigation and Dranage Handbook, MAFF, Japan)
*2 Refer to Table G.2.11.

Table G.2.11 RECORDED ELECTRIC ENERGY CONSUMPTION AND AVERAGE DAILY OPERATION HOURS

Union C.	Item		Energy Consumption (kWh) 1987 Total	1987 Rabi	1987 Karif	1988 Total	1988 Rabi	1988 Karif	1987/1988 Total	1987/1988 Rabi	1987/1988 Karif
Darsano	Energy Con.	(1000kWh)	627	319	308	577	297	280	1,203	616	588
(30 wells)	Sanction Load	(kW)	393	393	393	381	381	381	774	774	774
	Theoritical Consump.	(1000Kwh)	3,443	1,721	1,721	3,338	1,669	1,669	6,780	3,390	3,390
	Operation	(%)	18%	19%	18%	17%	18%	17%	18%	18%	17%
	Ave. Daily Ope.hrs	(hrs)	4.4	4.4	4.3	4.1	4.3	4.0	4.3	4.4	4.2
Konkar	Energy Con.	(1000kWh)	2,888	1,435	1,454	2,462	1,328	1,134	5,350	2,763	2,588
(162 wells)	Sanction Load	(kW)	1,650	1,650	1,650	1,686	1,670	1,686	3,336	3,320	3,336
	Theoritical Consump.	(1000Kwh)	14,454	7,227	7,227	14,769	7,315	7,385	29,223	14,542	14,612
	Operation	(%)	20%	20%	20%	17%	18%	15%	18%	19%	18%
	Ave. Daily Ope.hrs	(hrs)	4.8	4.8	4.8	4.0	4.4	3.7	4.4	4.6	4.3
Laundhi	Energy Con.	(1000kWh)	1,204	632	571	1,055	561	494	2,259	1,193	1,066
(70 wells)	Sanction Load	(kW)	892	892	892	821	821	821	1,713	1,713	1,713
	Theoritical Consump.	(1000Kwh)	7,814	3,907	3,907	7,192	3,596	3,596	15,006	7,503	7,503
	Operation	(%)	15%	16%	15%	15%	16%	14%	15%	16%	14%
	Ave. Daily Ope.hrs	(hrs)	3.7	3.9	3.5	3.5	3.7	3.3	3.6	3.8	3.4
Thano	Energy Con.	(1000kWh)	629	316	313	541	299	242	1,170	615	555
(32 wells)	Sanction Load	(kW)	364	364	364	346	346	346	710	710	710
	Theoritical Consump.	(1000Kwh)	3,189	1,594	1,594	3,031	1,515	1,515	6,220	3,110	3,110
	Operation	(%)	20%	20%	20%	18%	20%	16%	19%	20%	18%
	Ave. Daily Ope.hrs	(hrs)	4.7	4.8	4.7	4.3	4.7	3.8	4.5	4.7	4.3
Study	Energy Con.	(1000kWh)	5,348	2,702	2,646	4,634	2,484	2,150	9,982	5,186	4,796
Area	Sanction Load	(kW)	3,299	3,299	3,299	3,234	3,218	3,234	6,533	6,517	6,533
(294 wells)	Theoritical Consump.	(1000Kwh)	28,899	14,450	14,450	28,330	14,095	14,165	57,229	28,544	28,615
	Operation	(%)	19%	19%	18%	16%	18%	15%	17%	18%	17%
	Ave. Daily Ope.hrs	(hrs)	4.4	4.5	4.4	3.9	4.2	3.6	4.2	4.4	4.0

Remarks : Theoritical energy consumption (kWh / yr) = Sanction load (kW) x 24 Hrs/day x 365 day/yr.
Parentheses show sample numbers recorded by KESC.

Table G.2.12 ESTIMATED TOTAL EFFICIENCY OF PUMPING FACILITIES

1. Measured by JICA in 1990

No.	Well No.	Measured Electric Consumption (kWh)	Actual Pumping Head (m)	Length of Delivery Pipe (m)	Diameter of Delivery Pipe (mm)	Pumping Discharge (m3/min)	Estimated Total Head (m)	Total Effi. of Pumping Facilities (%)
1	W-01	11.4	19	27	100	0.88	20.9	26
2	T-41	6.4	23	33	85	0.40	24.0	24
3	NK-6	12.5	31	40	75	0.53	34.7	24
4	T-24	4.8	30	37	60	0.44	37.4	56
5	30	16.7	35	40	75	0.47	37.9	17
6	31	19.4	34	40	75	0.79	42.3	28
7	33	14.7	40	45	60	0.50	51.2	28
	Average							29

Remarks : Including headloss of Hf =a * L/D * V*V/2g + 3*V*V/2g.
where a=(0.02 + 0.0005/D), L: lenght of delivery pipe,
D: Diameter of pipe(m), V: velocity (m/sec)

2. Measured by WAPDA in 1977

Sr. No.	Tubwell No.	H.P. of Motor (H.P.)	Dia of Delivery Pipe (Inches)	Actual Discharge (cusec)	Calculated Total Head * 1 (m)	Efficiency (%)
1	V-9	25	4	1.20	25.3	46
2	V-11	15	3	0.60	20.3	31
3	V-17	22	4	0.72	26.2	32
4	R-7	30	4	1.44	20.9	38
5	W-1	10	3	0.48	17.7	32
	Average				22	36

Source : WAPDA Report, 1979 (Table 8-1) (Ref. 01)
Remarks : *1 Calculated based on those figures

Table G.2.13 ELECTRIC ENERGY CONSUMPTION AND ESTIMATE OF PUMPED WATER

	Union Council	Recorded by KESC			Project Area			Average	Estimated
		Sample W. Number No.	Sanction Load kWh	Energy Consump. x1000kWh	Estimated Number No.	Sanction Load kWh	Energy Consump. x1000kWh	Depth of Well m	Pumped Volume x1000m3
A.	Average in 1987/88								
1	Darsano Chano	30	387	602	102	1,316	2,047	24.6	11,508
2	Konkar	162	1,668	2,675	201	2,070	3,319	29.1	15,177
3	Laundhi	70	857	1,130	116	1,419	1,873	36.4	6,572
4	Thano	32	355	585	47	521	859	47.6	2,223
5	Total	294	3,267	4,992	466	5,326	8,098	31.3	35,480
	Average					11kW	17,377 kWh		
B.	1987								
1	Darsano Chano	30	393	627	102	1,336	2,132	24.6	11,986
2	Konkar	162	1,650	2,888	201	2,047	3,583	29.1	16,385
3	Laundhi	70	892	1,204	116	1,478	1,995	36.4	7,003
4	Thano	32	364	629	47	535	924	47.6	2,390
5	Total	294	3,299	5,348	466	5,396	8,634	31.3	37,764
	Average						18,528 kWh		
C.	1988								
1	Darsano Chano	30	381	577	102	1,295	1,962	24.6	11,031
2	Konkar	162	1,686	2,462	201	2,092	3,055	29.1	13,968
3	Laundhi	70	821	1,055	116	1,361	1,748	36.4	6,136
4	Thano	32	346	541	47	508	795	47.6	2,056
5	Total	294	3,234	4,635	466	5,256	7,559	31.3	33,191
	Average						16,222 kWh		

Remarks: Irrigation Area : 2,600 ha
Estimated by the following equation :
P(kWh)=0.163*r*Q*H / Ef
where, Ef : refer to Table G.2.12
H : (well depth - 5) m

Table G.2.14 SALIENT FEATURES OF EXISTING WEIRS

			Crest		Flood Water Leuel	
			Height	Length	Upstream	Downstream
	Location *1	River	EL.m	m	EL.m	EL.m
1. Upper *2	Menon G.	Malir	45.1	470	47.2	46.3
2. Lower	Thano	Malir	25.9	152	28.7	n.a
3. Sukkan	Jam Kanda	Sukkan	n.a.	98	n.a	n.a

Remarks: *1 Location of the weirs is shown in Fig. G.2-6.
*2 Under construction and to be completed in the late 1990.
n.a. Data are not available.

Table G.3.1 SUMMARY OF IRRIGATION WATER DEMAND

Unit: MCM

	Item	Irrigation Water Demand	
		WAPDA Report*1	JICA Estimate*2
			(1929 - 1988)
1	WAPDA Report (1982) (Without Project Condition)		
	- Condition in 1977 (Refer to Table G.3.4)	62.0	65.3 *3
	- Projection in 1987	-	53.1 *3
	- Projection in 2002	-	35.6 *3
2	Present Cropping Pattern in 1987/88 (Refer to Table	-	42.0
3	Pumped Volume in 1987/88 Estimated based on KESC's Data (Refer to Table G.2.13)	-	35.5

Remarks: *1 Pan evaporation data (1960-1966) were used in estimating irrigation demand.
*2 Only field application efficiency of 60% is considered, since irrigation area is limited to only 5-20 ha.
*3 Shows average irrigation water demand (1929 - 1988).

1.Irrigation Area (ha)	4,350	4,100	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900	5,000
Orchard Field	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Monsoon Season	3,350	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900	4,000
Winter Season	2,150	2,050	2,100	2,150	2,200	2,250	2,300	2,350	2,400	2,450	2,500
Total	6,500	6,150	6,300	6,450	6,600	6,750	6,900	7,050	7,200	7,350	7,500
(Cropping Intensity = 1.5)											
2.Cropping Area											
Crucifers	600	555	573	591	609	627	645	663	681	699	716
Tomatoes	1,500	1,388	1,433	1,478	1,522	1,567	1,612	1,657	1,701	1,746	1,791
Raddish	500	463	478	493	507	522	537	552	567	582	597
Fodder(maize)	50	46	48	49	51	52	54	55	57	58	60
Alphalfa	100	93	96	99	101	104	107	110	113	116	119
Beans(green)	600	555	573	591	609	627	645	663	681	699	716
Orchard	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Cucumber	1,400	1,343	1,376	1,409	1,441	1,474	1,507	1,540	1,572	1,605	1,638
Tomatoes	350	330	338	346	354	362	370	378	386	394	402
Fodder(maize)	50	47	48	49	51	52	53	54	55	56	57
Beans(green)	350	330	338	346	354	362	370	378	386	394	402
3 Water Requirement (MCM)	70.1	67.1	68.4	69.8	71.0	72.3	73.6	74.9	76.2	77.5	78.8
4 Net Withdrawal (MCM)	59.6	57.1	58.2	59.3	60.3	61.5	62.6	63.7	64.8	65.9	67.0
5 Net Withdrawal per 1000ha (MCM)	13.7	13.9	13.9	13.8	13.7	13.7	13.6	13.5	13.5	13.4	13.4

Table G.3.2 REFERENCE CROP EVAPOTRANSPIRATION (ETo)

Station : Karachi Airport Lat. :24-21' N Long : 67-08' E Barometer : El.24m
Anemometer : 6m high

	Description		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total/ Ave.
1	Given Condition*1														
	-1 Mean max. Temp., Tmaz. (oC)	*	25.7	27.7	31.6	34.3	35.2	34.8	33.1	31.7	32.8	34.7	31.7	27.3	31.7
	-2 *Mean min. Temp. Tmin .* (oC)	*	10.1	12.6	17.6	22.3	25.8	27.9	27.5	26.3	25.2	21.1	15.9	11.5	20.3
	-3 Mean Temp., Tmean (oC)		17.9	20.2	24.6	28.3	30.5	31.4	30.3	29.0	29.0	27.9	23.8	19.4	26.0
	-4 Mean max.Relative Humidity,RHmin.(%)	*	65.8	71.3	77.8	83.1	84.3	83.1	84.9	85.6	85.1	80.5	70.3	66.9	78.2
	-5 Mean min. Relative Humidity,RHmin.(%)	*	36.2	38.4	44.3	49.5	59.9	65.6	71.1	72.8	65.8	48.0	40.0	38.3	52.5
	-6 Mean Relative Humidity,RHmean (%)		51.0	54.9	61.1	66.3	72.1	74.4	78.0	79.2	75.5	64.3	55.2	52.6	65.4
	-7 Wind Speed, U(m/sec)	*	1.5	1.9	2.6	3.2	4.3	4.7	4.6	4.4	3.5	2.0	1.4	1.4	3.0
	-7 Wind Speed, Uday (m/sec)	*	2.2	2.6	3.5	4.3	5.7	5.7	5.5	5.2	4.5	2.7	2.1	1.9	3.8
	-8 Wind Speed, Uday/Unight	*	2.0	1.7	1.8	1.6	1.6	1.4	1.3	1.3	1.5	1.9	2.1	1.7	1.7
	-9 Sunshine Hour, n (hr/day)	*	8.8	9.0	8.9	9.5	9.7	7.9	4.8	4.8	7.2	9.2	9.2	8.1	8.1
2	Calculation														
	-1 Vapour Pressure,(ea-ed)														
	(i) ea at Tmean (m bar) (Table5)	*	20.5	23.7	30.9	38.5	43.7	46.0	43.2	40.1	40.1	37.6	29.5	22.6	
	(ii) ed=ea * RHmean/100 (m bar)		10.5	13.0	18.9	25.5	31.5	34.2	33.7	31.8	30.3	24.2	16.3	11.9	
	(iii) (ea-ed) (mbar)		10.0	10.7	12.0	13.0	12.2	11.8	9.5	8.3	9.8	13.4	13.2	10.7	
	-2 Wind Function, f(u)														
	(i) Wind Speed,U(km/day)		130	164	225	276	372	406	397	380	302	173	121	121	
	(ii) Correction Factor (Table)	*	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	
	(iii) Adjusted Wind Speed (km/day)		108	136	186	229	308	337	330	316	251	143	100	100	
	(iv)f(u)= 0.27 (1+U/100)		0.56	0.64	0.77	0.89	1.10	1.18	1.16	1.12	0.95	0.66	0.54	0.54	
	-3 Weighting Factor (W)														
	(i) W at Tmean (Table 9)	*	0.66	0.69	0.73	0.77	0.78	0.79	0.78	0.78	0.78	0.77	0.73	0.68	
	(ii) (1- W) (Table 8)		0.34	0.31	0.27	0.23	0.22	0.21	0.22	0.22	0.22	0.23	0.27	0.32	
	-4 Net Radiation, (Rn)														
	(i) Absolute Sunshine Hour, N (hr/day) (Table 11)	*	10.7	11.3	12.0	12.7	13.3	13.7	13.5	13.0	12.3	11.6	10.9	10.6	
	(ii) n/N		0.82	0.80	0.74	0.75	0.73	0.58	0.36	0.37	0.59	0.79	0.84	0.76	
	(iii) (0.25 +0.5. n/N)		0.66	0.65	0.62	0.62	0.61	0.54	0.43	0.43	0.54	0.65	0.67	0.63	
	(iv)Extra Terrestrial Radiation, Ra (mm/day) (Table 10)	*	10.2	11.9	13.9	15.4	16.4	16.6	16.5	15.8	14.5	12.6	10.7	9.7	
	(v) Rs= (0.25+0.5.n/N)* Ra (mm/day)		5.74	7.71	8.63	9.61	10.08	8.94	7.06	6.87	7.87	8.15	7.19	6.13	
	(vi) Rns=0.75.Rs (mm/day)		5.06	5.79	6.47	7.21	7.56	6.70	5.29	5.15	5.90	6.11	5.39	4.60	
	(vii) Rnl=f(Tmean) *f(ed)*f(n/N)		2.36	2.16	1.77	1.49	1.18	0.88	0.60	0.66	1.01	1.64	2.15	2.15	
	f(Tmean) (Table 13)	*	14.2	14.6	15.5	16.4	16.8	17.1	16.8	16.5	16.5	16.3	15.4	14.5	
	f(ed)=0.34-0.044*(ed)^ 0.5		0.20	0.18	0.15	0.12	0.09	0.08	0.08	0.09	0.10	0.12	0.16	0.19	
	f(n/N)=0.1+0.9n/N		0.84	0.82	0.77	0.77	0.76	0.62	0.42	0.43	0.63	0.81	0.86	0.79	
	(viii) Rn= Rns -Rnl mm/day)		2.70	3.62	4.70	5.71	6.38	5.83	4.70	4.49	4.89	4.47	3.24	2.45	
	-5 Adjustment Factor, (C) (Table 16)	*	0.96	0.97	1.04	1.06	1.03	1.03	1.02	1.02	1.02	0.98	0.95	0.93	
	-6 Potential Evapotranspiration (mm/day) ETo=C {W*Rn+ (1-W)*f(u)*(ea-ed) }		3.55	4.48	6.18	7.48	8.17	7.75	6.21	5.68	5.98	5.36	4.08	3.27	
3	Potential Evapotranspiration (mm/month)		110	125	192	224	253	233	193	176	179	166	123	101	2075

Remarks: * Refer to ANNEX-B.

Table G.3.3 IRRIGATION WATER DEMAND - PRESENT CONDITION (1/4)

Summary of Crop and Basic Assumption

No.	Crop	Application Efficiency	Percolation Loss Code	Land prepartion Code	Pre-irrigation Code	Growing Stages
1	1 Crucifers	0.60	0	0	1	6
2	2 Cucumber	0.60	0	0	1	8
3	3 Tomatoes	0.60	0	0	1	9
4	4 Melon	0.60	0	0	1	8
5	5 Raddish	0.60	0	0	1	6
6	6 Fodder (Maize)	0.60	0	0	1	6
7	7 Alphalfa	0.60	0	0	1	24
8	8 Chillies	0.60	0	0	1	9
9	9 Beans (green)	0.60	0	0	1	6
10	10 Orchard (Citrus) 70%	0.60	0	0	0	24
11	11 Orchard (citrus) 20%	0.60	0	0	0	24
12	12 Upland Crops	0.60	0	0	1	6

No.	Crop	Crop Coefficient (by growing stage)											
1	1 Crucifers	0.42	0.50	0.70	0.95	0.95	0.85						
2	2 Cucumber	0.40	0.45	0.70	0.90	0.92	0.92	0.92	0.85				
3	3 Tomatoes	0.42	0.42	0.55	0.80	1.00	1.05	1.05	0.95	0.70			
4	4 Melon	0.38	0.40	0.60	0.90	0.98	0.98	0.98	0.90				
5	5 Raddish	0.45	0.55	0.80	1.05	1.05	0.75						
6	6 Fodder (Maize)	0.45	0.55	0.85	1.05	1.05	0.95						
7	7 Alphalfa	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
		0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
8	8 Chillies	0.65	0.75	0.85	0.95	1.00	1.00	1.00	0.95	0.90			
9	9 Beans (green)	0.45	0.52	0.75	0.95	0.95	0.90						
10	10 Orchard (Citrus) 70%	0.75	0.75	0.75	0.75	0.70	0.70	0.70	0.70	0.70	0.70	0.65	0.65
		0.65	0.65	0.65	0.65	0.65	0.65	0.70	0.70	0.70	0.70	0.70	0.70
11	11 Orchard (citrus) 20%	0.55	0.55	0.55	0.55	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.45
		0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.50	0.50	0.50	0.50
12	12 Upland Crops	1.00	1.00	1.00	1.00	1.00	1.00						

Remarks; 1 growing stage = 15 days

Summary of crop and basic assumption in Malir Project (Present Condition 1988, JICA)

No.	Crop	Cultiva. Area(ha)	Date of Water Issue	Land Preparation Period (stages)
1	1 Crucifers	150.	8/ 1	6
1	1 Crucifers	50.	2/ 1	4
2	2 Cucumber	270.	7/ 1	6
2	2 Cucumber	55.	2/ 1	4
3	3 Tomatoes	480.	7/ 1	8
3	3 Tomatoes	90.	2/ 1	4
5	5 Raddish	90.	8/ 1	6
5	5 Raddish	55.	2/ 1	4
6	6 Fodder (Maize)	190.	6/ 1	6
6	6 Fodder (Maize)	40.	2/ 1	4
7	7 Alphalfa	150.	7/ 1	12
9	9 Beans (green)	90.	8/ 1	4
9	9 Beans (green)	10.	2/ 1	4
10	10 Orchard (Citrus) 70%	1180.	7/ 1	12
	Total Project Area	2600.		

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Potential ET (mm)	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Conveyance Efficiency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Return Flow Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Unit:mm

Code	1	2	3	4	5	6	7	8	9	10
Land Preparation	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Percoration Losses	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Pre-irrigation	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Table G.3.3 IRRIGATION WATER DEMAND - PRESENT CONDITION (2/4)

Sample Intermediate Output in 1929
Summary of Water Demand for Each Crop
Unit Diversion Water Requirement

Unit:mm

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 Crucifers	34.5	0.0	0.0	0.0	0.0	0.0	0.0	48.0	117.1	183.7	106.5	66.1
1 Crucifers	0.0	59.2	175.7	289.3	261.4	102.9	0.0	0.0	0.0	0.0	0.0	0.0
2 Cucumber	34.1	0.0	0.0	0.0	0.0	0.0	40.7	108.8	191.0	221.8	119.4	67.3
2 Cucumber	0.0	57.3	169.7	281.5	374.0	244.6	69.6	0.0	0.0	0.0	0.0	0.0
3 Tomatoes	86.0	50.3	12.4	0.0	0.0	0.0	31.8	77.2	144.0	198.1	130.0	95.2
3 Tomatoes	0.0	57.5	156.2	272.1	392.1	330.1	111.3	20.2	0.0	0.0	0.0	0.0
5 Raddish	33.2	0.0	0.0	0.0	0.0	0.0	0.0	50.3	126.9	196.7	113.9	69.6
5 Raddish	0.0	61.5	190.5	312.8	274.1	99.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Fodder (Maize)	0.0	0.0	0.0	0.0	0.0	61.1	108.5	207.8	206.2	137.3	38.9	0.0
6 Fodder (Maize)	0.0	61.5	193.7	324.0	293.1	114.6	0.0	0.0	0.0	0.0	0.0	0.0
7 Alphalfa	157.9	177.1	272.0	317.3	358.4	330.1	212.6	255.8	267.5	249.1	156.3	135.7
9 Beans (green)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.4	172.6	223.2	110.3	41.9
9 Beans (green)	0.0	60.8	182.1	297.5	267.8	106.8	0.0	0.0	0.0	0.0	0.0	0.0
10 Orchard (Citrus) 70%	127.1	142.6	214.8	249.8	282.2	260.6	154.4	198.5	211.7	197.9	117.1	99.9

Sample Intermediate Output in 1929
Summary of Water Demand for Each Crop
Diversion Water Requirement

Unit : MCM

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 Crucifers	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.18	0.28	0.16	0.10
1 Crucifers	0.00	0.03	0.09	0.14	0.13	0.05	0.00	0.00	0.00	0.00	0.00	0.00
2 Cucumber	0.09	0.00	0.00	0.00	0.00	0.00	0.11	0.29	0.52	0.60	0.32	0.18
2 Cucumber	0.00	0.03	0.09	0.15	0.21	0.13	0.04	0.00	0.00	0.00	0.00	0.00
3 Tomatoes	0.41	0.24	0.06	0.00	0.00	0.00	0.15	0.37	0.69	0.95	0.62	0.46
3 Tomatoes	0.00	0.05	0.14	0.24	0.35	0.30	0.10	0.02	0.00	0.00	0.00	0.00
5 Raddish	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.18	0.10	0.06
5 Raddish	0.00	0.03	0.10	0.17	0.15	0.05	0.00	0.00	0.00	0.00	0.00	0.00
6 Fodder (Maize)	0.00	0.00	0.00	0.00	0.00	0.12	0.21	0.39	0.39	0.26	0.07	0.00
6 Fodder (Maize)	0.00	0.02	0.08	0.13	0.12	0.05	0.00	0.00	0.00	0.00	0.00	0.00
7 Alphalfa	0.24	0.27	0.41	0.48	0.54	0.50	0.32	0.38	0.40	0.37	0.23	0.20
9 Beans (green)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.20	0.10	0.04
9 Beans (green)	0.00	0.01	0.02	0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
10 Orchard (Citrus) 70%	1.50	1.68	2.53	2.95	3.33	3.08	1.82	2.34	2.50	2.34	1.38	1.18
Total	2.32	2.37	3.52	4.30	4.85	4.28	2.75	3.98	4.94	5.17	3.00	2.22

Table G.3.3 IRRIGATION WATER DEMAND - PRESENT CONDITION (3/4)

Diversion Water Requirement for Malir Project (Present Condition 1988, JICA)
(Total Area : 2600. ha)

Unit : MCM

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	2.32	2.37	3.52	4.30	4.85	4.28	2.75	3.98	4.94	5.17	3.00	2.22	43.71
1930	2.14	2.37	3.52	4.25	4.85	3.22	0.00	4.08	4.94	5.17	3.67	2.60	40.83
1931	2.32	2.28	3.42	4.30	4.85	4.28	3.69	4.08	4.94	5.17	3.67	2.60	45.60
1932	2.25	2.37	3.52	4.30	4.85	4.28	0.05	3.47	4.94	5.17	3.67	2.60	41.48
1933	2.32	2.35	3.52	4.27	4.73	4.28	0.00	2.45	4.09	5.17	3.67	2.60	39.47
1934	2.34	2.37	3.48	4.30	4.85	3.62	0.77	3.98	4.94	5.17	3.67	2.40	41.92
1935	2.05	1.88	3.52	3.64	4.85	4.28	3.62	4.01	4.94	5.17	3.67	2.60	44.25
1936	2.32	2.12	3.50	4.30	4.85	3.90	2.49	4.11	4.94	5.17	3.67	2.55	43.94
1937	2.34	1.96	3.52	4.30	4.85	4.28	0.27	4.11	4.94	5.17	3.67	1.33	40.75
1938	2.34	2.37	3.52	4.27	4.78	4.26	2.95	2.68	4.94	5.17	3.67	2.49	43.45
1939	2.34	1.53	2.46	4.25	4.85	4.28	3.77	4.11	4.94	5.17	3.56	2.60	43.87
1940	1.20	1.83	2.64	4.30	4.85	4.06	2.75	2.93	4.94	5.17	3.67	2.40	40.75
1941	2.30	2.37	3.52	4.30	4.85	4.28	2.90	4.11	4.94	5.17	3.67	2.60	45.02
1942	2.07	1.91	3.44	4.30	4.85	4.28	0.11	3.69	4.94	5.17	3.67	2.38	40.83
1943	2.02	2.37	3.52	4.30	4.85	4.21	2.80	4.06	4.94	5.17	3.67	2.60	44.52
1944	2.25	1.59	3.52	4.30	4.85	4.28	0.05	0.00	4.94	5.17	3.67	2.57	37.21
1945	1.47	2.37	3.52	4.30	4.85	4.28	1.79	4.06	4.85	5.17	3.67	2.55	42.89
1946	2.34	2.37	3.52	4.30	4.85	4.23	2.71	3.20	4.94	5.17	3.67	2.60	43.92
1947	2.34	2.35	3.52	4.30	4.85	4.28	3.77	3.07	4.88	5.17	3.67	2.44	44.67
1948	2.34	1.93	2.93	4.30	4.85	3.45	3.08	4.11	4.94	5.17	3.67	2.44	43.23
1949	2.34	2.37	3.52	4.30	4.85	4.28	1.23	0.39	4.94	5.17	3.67	2.60	39.67
1950	2.14	2.37	3.52	4.30	4.85	4.28	2.38	4.11	4.94	5.17	3.67	2.60	44.34
1951	2.34	2.37	3.52	4.25	4.85	4.28	3.01	3.37	4.91	5.17	3.67	2.60	44.35
1952	2.34	1.78	3.52	4.30	4.85	4.28	0.84	4.11	4.29	5.17	3.67	2.53	41.70
1953	2.32	2.37	3.52	4.30	4.85	3.45	3.75	0.21	4.94	5.17	3.67	2.44	41.00
1954	2.02	1.86	3.52	4.30	4.85	4.28	2.71	3.35	1.25	5.17	3.67	2.60	39.59
1955	2.16	2.16	3.52	4.30	4.85	4.28	3.77	3.43	2.52	5.17	3.67	2.53	42.37
1956	1.97	2.37	3.52	4.20	4.85	3.41	0.89	2.21	4.94	2.45	3.67	2.60	37.09
1957	2.28	2.37	3.52	4.18	4.85	4.28	3.44	3.96	4.94	5.17	3.56	2.49	45.05
1958	2.23	2.33	3.52	4.30	4.85	4.28	1.35	4.11	4.09	5.17	3.64	1.57	41.45
1959	2.28	2.33	3.52	4.30	4.85	4.28	0.17	3.09	0.00	5.17	1.64	2.57	34.21
1960	2.30	2.37	2.90	4.30	4.85	4.28	2.93	3.47	4.94	5.17	3.67	2.14	43.34
1961	2.04	1.50	3.52	4.05	4.85	3.94	0.70	0.37	0.87	5.17	3.67	2.57	33.27
1962	2.34	2.37	3.52	4.30	4.85	4.28	2.24	3.18	1.29	5.17	3.67	2.46	39.69
1963	2.34	2.37	3.52	4.27	4.85	4.28	3.75	3.89	4.94	5.17	2.90	2.60	44.90
1964	2.30	2.28	3.52	4.30	4.85	4.23	2.31	3.03	4.85	5.17	3.67	2.60	43.13
1965	2.34	2.37	3.52	4.23	4.85	4.28	1.77	3.69	4.94	5.17	3.67	2.60	43.44
1966	2.34	2.37	3.50	4.30	4.85	4.28	2.47	4.11	4.94	5.17	3.67	2.60	44.61
1967	2.34	2.37	1.15	3.77	4.85	4.04	0.00	2.03	4.94	5.17	3.53	2.30	36.50
1968	2.14	2.29	3.52	4.30	4.85	4.28	3.77	3.98	4.94	5.17	3.67	2.46	45.40
1969	2.34	2.35	3.52	4.30	4.85	4.28	3.03	4.11	4.94	5.17	3.67	2.60	45.17
1970	2.21	2.24	2.35	4.30	4.85	4.17	1.00	0.89	2.76	5.17	3.67	2.60	36.22
1971	2.28	2.37	3.52	4.30	4.85	4.28	3.12	3.43	4.94	5.17	3.67	2.57	44.52
1972	2.34	2.31	3.52	4.30	4.85	3.86	3.44	4.11	4.94	5.17	3.67	2.51	45.04
1973	2.34	2.37	3.52	4.30	4.85	4.28	0.43	3.65	4.94	5.17	3.67	2.42	41.95
1974	2.34	2.37	3.52	4.30	4.85	4.28	3.77	4.11	4.94	5.17	3.67	2.49	45.82
1975	2.11	2.01	2.93	4.30	4.85	4.28	3.77	2.47	4.37	5.17	3.67	2.60	42.54
1976	1.23	2.19	2.93	4.30	4.85	4.28	0.22	3.30	3.79	5.17	3.67	2.60	38.55
1977	2.16	2.37	3.52	4.25	4.85	3.59	0.04	3.14	2.72	5.17	3.53	2.60	37.93
1978	2.09	2.29	3.52	4.30	4.85	4.15	0.51	0.50	4.94	5.17	3.67	2.60	38.60
1979	2.32	0.84	3.52	4.30	4.85	4.21	3.77	0.04	4.94	5.07	3.67	2.32	39.87
1980	2.34	2.37	3.32	4.30	4.85	3.41	2.90	4.11	4.94	4.49	3.51	1.36	41.89
1981	2.34	1.94	2.15	4.23	4.85	4.28	2.99	3.16	4.94	5.17	3.67	2.60	42.33
1982	2.30	1.96	3.52	4.30	4.85	4.28	3.23	1.89	4.94	5.17	3.67	2.57	42.70
1983	2.34	2.31	3.52	3.47	4.85	4.28	2.73	0.81	4.27	5.17	3.67	2.60	40.04
1984	2.34	2.37	3.52	4.30	4.85	4.28	3.39	0.05	4.82	5.17	3.67	2.60	41.37
1985	2.34	2.37	3.52	3.29	4.85	4.28	2.26	3.54	4.94	5.17	3.67	2.60	42.84
1986	2.34	2.37	3.30	4.30	4.85	3.92	3.77	2.76	4.94	5.17	3.67	2.60	44.00
1987	2.34	2.37	3.52	4.30	4.85	4.28	3.77	4.11	4.94	5.17	3.67	2.60	45.93
1988	2.32	2.37	3.52	4.30	4.85	4.28	2.36	2.29	4.94	5.17	3.67	2.60	42.69
Ave.	2.22	2.20	3.36	4.23	4.85	4.14	2.24	3.05	4.47	5.11	3.60	2.48	41.96

Table G.3.3 IRRIGATION WATER DEMAND - PRESENT CONDITION (4/4)

Return Flow of Malir Project (Present Condition 1988, JICA)
(Total Area : 2600. ha)

Unit : MCM

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	0.35	0.36	0.53	0.64	0.73	0.64	0.41	0.60	0.74	0.78	0.45	0.33	6.56
1930	0.32	0.36	0.53	0.64	0.73	0.48	0.00	0.61	0.74	0.78	0.55	0.39	6.12
1931	0.35	0.34	0.51	0.64	0.73	0.64	0.55	0.61	0.74	0.78	0.55	0.39	6.84
1932	0.34	0.36	0.53	0.64	0.73	0.64	0.01	0.52	0.74	0.78	0.55	0.39	6.22
1933	0.35	0.35	0.53	0.64	0.71	0.64	0.00	0.37	0.61	0.78	0.55	0.39	5.92
1934	0.35	0.36	0.52	0.64	0.73	0.54	0.12	0.60	0.74	0.78	0.55	0.36	6.29
1935	0.31	0.28	0.53	0.55	0.73	0.64	0.54	0.60	0.74	0.78	0.55	0.39	6.64
1936	0.35	0.32	0.53	0.64	0.73	0.59	0.37	0.62	0.74	0.78	0.55	0.38	6.59
1937	0.35	0.29	0.53	0.64	0.73	0.64	0.04	0.62	0.74	0.78	0.55	0.20	6.11
1938	0.35	0.36	0.53	0.64	0.72	0.64	0.44	0.40	0.74	0.78	0.55	0.37	6.52
1939	0.35	0.23	0.37	0.64	0.73	0.64	0.57	0.62	0.74	0.78	0.53	0.39	6.58
1940	0.18	0.27	0.40	0.64	0.73	0.61	0.41	0.44	0.74	0.78	0.55	0.36	6.11
1941	0.35	0.36	0.53	0.64	0.73	0.64	0.43	0.62	0.74	0.78	0.55	0.39	6.75
1942	0.31	0.29	0.52	0.64	0.73	0.64	0.02	0.55	0.74	0.78	0.55	0.36	6.12
1943	0.30	0.36	0.53	0.64	0.73	0.63	0.42	0.61	0.74	0.78	0.55	0.39	6.68
1944	0.34	0.24	0.53	0.64	0.73	0.64	0.01	0.00	0.74	0.78	0.55	0.39	5.58
1945	0.22	0.36	0.53	0.64	0.73	0.64	0.27	0.61	0.73	0.78	0.55	0.38	6.43
1946	0.35	0.36	0.53	0.64	0.73	0.64	0.41	0.48	0.74	0.78	0.55	0.39	6.59
1947	0.35	0.35	0.53	0.64	0.73	0.64	0.57	0.46	0.73	0.78	0.55	0.37	6.70
1948	0.35	0.29	0.44	0.64	0.73	0.52	0.46	0.62	0.74	0.78	0.55	0.37	6.48
1949	0.35	0.36	0.53	0.64	0.73	0.64	0.18	0.06	0.74	0.78	0.55	0.39	5.95
1950	0.32	0.36	0.53	0.64	0.73	0.64	0.36	0.62	0.74	0.78	0.55	0.39	6.65
1951	0.35	0.36	0.53	0.64	0.73	0.64	0.45	0.51	0.74	0.78	0.55	0.39	6.65
1952	0.35	0.27	0.53	0.64	0.73	0.64	0.13	0.62	0.64	0.78	0.55	0.38	6.26
1953	0.35	0.36	0.53	0.64	0.73	0.52	0.56	0.03	0.74	0.78	0.55	0.37	6.15
1954	0.30	0.28	0.53	0.64	0.73	0.64	0.41	0.50	0.19	0.78	0.55	0.39	5.94
1955	0.32	0.32	0.53	0.64	0.73	0.64	0.57	0.51	0.38	0.78	0.55	0.38	6.36
1956	0.30	0.36	0.53	0.63	0.73	0.51	0.13	0.33	0.74	0.37	0.55	0.39	5.56
1957	0.34	0.36	0.53	0.63	0.73	0.64	0.52	0.59	0.74	0.78	0.53	0.37	6.76
1958	0.33	0.35	0.53	0.64	0.73	0.64	0.20	0.62	0.61	0.78	0.55	0.24	6.22
1959	0.34	0.35	0.53	0.64	0.73	0.64	0.02	0.46	0.00	0.78	0.25	0.39	5.13
1960	0.35	0.36	0.43	0.64	0.73	0.64	0.44	0.52	0.74	0.78	0.55	0.32	6.50
1961	0.31	0.23	0.53	0.61	0.73	0.59	0.11	0.06	0.13	0.78	0.55	0.39	4.99
1962	0.35	0.36	0.53	0.64	0.73	0.64	0.34	0.48	0.19	0.78	0.55	0.37	5.95
1963	0.35	0.36	0.53	0.64	0.73	0.64	0.56	0.58	0.74	0.78	0.43	0.39	6.73
1964	0.35	0.34	0.53	0.64	0.73	0.64	0.35	0.45	0.73	0.78	0.55	0.39	6.47
1965	0.35	0.36	0.53	0.63	0.73	0.64	0.27	0.55	0.74	0.78	0.55	0.39	6.52
1966	0.35	0.36	0.53	0.64	0.73	0.64	0.37	0.62	0.74	0.78	0.55	0.39	6.69
1967	0.35	0.36	0.17	0.56	0.73	0.61	0.00	0.30	0.74	0.78	0.53	0.35	5.47
1968	0.32	0.34	0.53	0.64	0.73	0.64	0.57	0.60	0.74	0.78	0.55	0.37	6.81
1969	0.35	0.35	0.53	0.64	0.73	0.64	0.45	0.62	0.74	0.78	0.55	0.39	6.77
1970	0.33	0.34	0.35	0.64	0.73	0.63	0.15	0.13	0.41	0.78	0.55	0.39	5.43
1971	0.34	0.36	0.53	0.64	0.73	0.64	0.47	0.51	0.74	0.78	0.55	0.39	6.68
1972	0.35	0.35	0.53	0.64	0.73	0.58	0.52	0.62	0.74	0.78	0.55	0.38	6.76
1973	0.35	0.36	0.53	0.64	0.73	0.64	0.06	0.55	0.74	0.78	0.55	0.36	6.29
1974	0.35	0.36	0.53	0.64	0.73	0.64	0.57	0.62	0.74	0.78	0.55	0.37	6.87
1975	0.32	0.30	0.44	0.64	0.73	0.64	0.57	0.37	0.66	0.78	0.55	0.39	6.38
1976	0.18	0.33	0.44	0.64	0.73	0.64	0.03	0.50	0.57	0.78	0.55	0.39	5.78
1977	0.32	0.36	0.53	0.64	0.73	0.54	0.01	0.47	0.41	0.78	0.53	0.39	5.69
1978	0.31	0.34	0.53	0.64	0.73	0.62	0.08	0.07	0.74	0.78	0.55	0.39	5.79
1979	0.35	0.13	0.53	0.64	0.73	0.63	0.57	0.01	0.74	0.76	0.55	0.35	5.98
1980	0.35	0.36	0.50	0.64	0.73	0.51	0.43	0.62	0.74	0.67	0.53	0.20	6.28
1981	0.35	0.29	0.32	0.63	0.73	0.64	0.45	0.47	0.74	0.78	0.55	0.39	6.35
1982	0.35	0.29	0.53	0.64	0.73	0.64	0.48	0.28	0.74	0.78	0.55	0.39	6.41
1983	0.35	0.35	0.53	0.52	0.73	0.64	0.41	0.12	0.64	0.78	0.55	0.39	6.01
1984	0.35	0.36	0.53	0.64	0.73	0.64	0.51	0.01	0.72	0.78	0.55	0.39	6.21
1985	0.35	0.36	0.53	0.49	0.73	0.64	0.34	0.53	0.74	0.78	0.55	0.39	6.43
1986	0.35	0.36	0.49	0.64	0.73	0.59	0.57	0.41	0.74	0.78	0.55	0.39	6.60
1987	0.35	0.36	0.53	0.64	0.73	0.64	0.57	0.62	0.74	0.78	0.55	0.39	6.89
1988	0.35	0.36	0.53	0.64	0.73	0.64	0.35	0.34	0.74	0.78	0.55	0.39	6.40
Ave.	0.33	0.33	0.50	0.64	0.73	0.62	0.34	0.46	0.67	0.77	0.54	0.37	6.29

Table G.3.4 IRRIGATION WATER DEMAND - CROPPING PATTERN IN 1977, WAPDA (1/2)

No.	Crop	Application Efficiency	Percolation Loss Code	Land prepartion Code	Pre-irrigation Code	Growing Stages
1	Cruciters	0.60	0	0	1	6
2	Cucumber	0.60	0	0	1	8
3	Tomatoes	0.60	0	0	1	9
4	Melon	0.60	0	0	1	8
5	Raddish	0.60	0	0	1	6
6	Fodder (Maize)	0.60	0	0	1	6
7	Alphalfa	0.60	0	0	0	24
8	Chillies	0.60	0	0	1	9
9	Orchard (Citrus) 70%	0.60	0	0	0	24
10	Orchard (citrus) 20%	0.60	0	0	0	24
11	Upland Crops	0.60	0	0	1	6

No.	Crop	Crop Coefficient (by growing stage)											
1	Cruciters	0.42	0.50	0.70	0.95	0.95	0.85						
2	Cucumber	0.40	0.45	0.70	0.90	0.92	0.92	0.92	0.85				
3	Tomatoes	0.42	0.42	0.55	0.80	1.00	1.05	1.05	0.95	0.70			
4	Melon	0.38	0.40	0.60	0.90	0.98	0.98	0.98	0.90				
5	Raddish	0.45	0.55	0.80	1.05	1.05	0.75						
6	Fodder (Maize)	0.45	0.55	0.85	1.05	1.05	0.95						
7	Alphalfa	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
		0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
8	Chillies	0.65	0.75	0.85	0.95	1.00	1.00	1.00	0.95	0.90			
9	Orchard (Citrus) 70%	0.75	0.75	0.75	0.75	0.70	0.70	0.70	0.70	0.70	0.70	0.65	0.65
		0.65	0.65	0.65	0.65	0.65	0.65	0.70	0.70	0.70	0.70	0.70	0.70
10	Orchard (citrus) 20%	0.55	0.55	0.55	0.55	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.45
		0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.50	0.50	0.50	0.50
11	Upland Crops	1.00	1.00	1.00	1.00	1.00	1.00						

Remarks; 1 growing stage = 15 days

Summary of crop and basic assumption
in Malir Area (Condition in 1977 WAPDA)

No.	Crop	Cultiva. Area(ha)	Date of Water Issue	Land Preparation Period (stages)
1	Cruciters	800.	7/ 1	8
2	Cucumber	330.	7/ 1	6
3	Tomatoes	700.	7/ 1	7
6	Fodder (Maize)	600.	7/ 1	4
8	Chillies	290.	7/ 1	4
9	Orchard (Citrus) 70%	1390.	7/ 1	8
1	Cruciters	290.	2/ 1	4
4	Melon	640.	1/ 1	6
5	Raddish	490.	2/ 1	6
6	Fodder (Maize)	370.	1/ 1	4
	Total Project Area	4100.		

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Potential ET (mm)	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Conveyance Efficiency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Return Flow Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Unit:mm

Code	1	2	3	4	5	6	7	8	9	10
Land Preparation	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Percoration Losses	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Pre-irrigation	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Table G.3.4 IRRIGATION WATER DEMAND - CROPPING PATTERN IN 1977, WAPDA (2/2)

Diversion Water Requirement for Malir Area (Condition in 1977 WAPDA)
(Total Area : 4100. ha)

Unit : MCM

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	3.65	3.84	6.03	7.13	7.09	5.16	3.82	6.13	8.33	8.45	4.80	3.44	67.87
1930	3.38	3.84	6.03	7.05	7.09	3.95	0.09	6.27	8.33	8.45	5.80	3.98	64.26
1931	3.65	3.71	5.86	7.13	7.09	5.16	4.96	6.27	8.33	8.45	5.80	3.98	70.37
1932	3.54	3.84	6.03	7.13	7.09	5.16	0.31	5.39	8.33	8.45	5.80	3.98	65.04
1933	3.65	3.81	6.03	7.09	6.92	5.16	0.00	3.90	6.92	8.45	5.80	3.98	61.72
1934	3.68	3.84	5.96	7.13	7.09	4.41	1.43	6.13	8.33	8.45	5.80	3.70	65.94
1935	3.26	3.11	6.03	6.08	7.09	5.16	4.89	6.17	8.33	8.45	5.80	3.98	68.33
1936	3.65	3.48	5.99	7.13	7.09	4.73	3.51	6.31	8.33	8.45	5.80	3.91	68.37
1937	3.68	3.23	6.03	7.13	7.09	5.16	0.76	6.31	8.33	8.45	5.80	2.15	64.11
1938	3.68	3.84	6.03	7.09	6.98	5.13	4.07	4.23	8.33	8.45	5.80	3.82	67.45
1939	3.68	2.58	4.29	7.05	7.09	5.16	5.07	6.31	8.33	8.45	5.63	3.98	67.61
1940	2.02	3.04	4.58	7.13	7.09	4.91	3.82	4.59	8.33	8.45	5.80	3.70	63.46
1941	3.62	3.84	6.03	7.13	7.09	5.16	4.00	6.31	8.33	8.45	5.80	3.98	69.74
1942	3.28	3.16	5.89	7.13	7.09	5.16	0.49	5.71	8.33	8.45	5.80	3.67	64.15
1943	3.21	3.84	6.03	7.13	7.09	5.08	3.89	6.24	8.33	8.45	5.80	3.98	69.06
1944	3.54	2.68	6.03	7.13	7.09	5.16	0.33	0.00	8.33	8.45	5.80	3.94	58.47
1945	2.42	3.84	6.03	7.13	7.09	5.16	2.66	6.24	8.18	8.45	5.80	3.91	66.91
1946	3.68	3.84	6.03	7.13	7.09	5.11	3.78	4.99	8.33	8.45	5.80	3.98	68.20
1947	3.68	3.81	6.03	7.13	7.09	5.16	5.07	4.80	8.23	8.45	5.80	3.76	69.01
1948	3.68	3.18	5.07	7.13	7.09	4.21	4.23	6.31	8.33	8.45	5.80	3.76	67.22
1949	3.68	3.84	6.03	7.13	7.09	5.16	1.98	0.83	8.33	8.45	5.80	3.98	62.29
1950	3.38	3.84	6.03	7.13	7.09	5.16	3.38	6.31	8.33	8.45	5.80	3.98	68.88
1951	3.68	3.84	6.03	7.05	7.09	5.16	4.14	5.23	8.28	8.45	5.80	3.98	68.72
1952	3.68	2.96	6.03	7.13	7.09	5.16	1.51	6.31	7.26	8.45	5.80	3.88	65.26
1953	3.65	3.84	6.03	7.13	7.09	4.21	5.04	0.47	8.33	8.45	5.80	3.76	63.80
1954	3.21	3.08	6.03	7.13	7.09	5.16	3.78	5.20	2.24	8.45	5.80	3.98	61.15
1955	3.41	3.53	6.03	7.13	7.09	5.16	5.07	5.33	4.34	8.45	5.80	3.88	65.21
1956	3.13	3.84	6.03	6.98	7.09	4.17	1.57	3.55	8.33	4.21	5.80	3.98	58.68
1957	3.59	3.84	6.03	6.94	7.09	5.16	4.67	6.10	8.33	8.45	5.63	3.82	69.65
1958	3.51	3.79	6.03	7.13	7.09	5.16	2.13	6.31	6.92	8.45	5.76	2.50	64.77
1959	3.59	3.79	6.03	7.13	7.09	5.16	0.61	4.84	0.00	8.45	2.79	3.94	53.41
1960	3.62	3.84	5.01	7.13	7.09	5.16	4.05	5.39	8.33	8.45	5.80	3.33	67.18
1961	3.23	2.54	6.03	6.73	7.09	4.77	1.34	0.80	1.62	8.45	5.80	3.94	52.34
1962	3.68	3.84	6.03	7.13	7.09	5.16	3.21	4.96	2.31	8.45	5.80	3.79	61.44
1963	3.68	3.84	6.03	7.09	7.09	5.16	5.04	6.00	8.33	8.45	4.66	3.98	69.34
1964	3.62	3.71	6.03	7.13	7.09	5.11	3.29	4.74	8.18	8.45	5.80	3.98	67.12
1965	3.68	3.84	6.03	7.01	7.09	5.16	2.64	5.71	8.33	8.45	5.80	3.98	67.71
1966	3.68	3.84	5.99	7.13	7.09	5.16	3.49	6.31	8.33	8.45	5.80	3.98	69.25
1967	3.68	3.84	2.15	6.28	7.09	4.89	0.00	3.28	8.33	8.45	5.59	3.55	57.13
1968	3.38	3.73	6.03	7.13	7.09	5.16	5.07	6.13	8.33	8.45	5.80	3.79	70.09
1969	3.68	3.81	6.03	7.13	7.09	5.16	4.16	6.31	8.33	8.45	5.80	3.98	69.93
1970	3.48	3.65	4.11	7.13	7.09	5.03	1.70	1.63	4.74	8.45	5.80	3.98	56.79
1971	3.59	3.84	6.03	7.13	7.09	5.16	4.28	5.33	8.33	8.45	5.80	3.94	68.97
1972	3.68	3.76	6.03	7.13	7.09	4.68	4.67	6.31	8.33	8.45	5.80	3.85	69.77
1973	3.68	3.84	6.03	7.13	7.09	5.16	1.00	5.64	8.33	8.45	5.80	3.73	65.88
1974	3.68	3.84	6.03	7.13	7.09	5.16	5.07	6.31	8.33	8.45	5.80	3.82	70.70
1975	3.33	3.30	5.07	7.13	7.09	5.16	5.07	3.93	7.39	8.45	5.80	3.98	65.69
1976	2.07	3.58	5.07	7.13	7.09	5.16	0.70	5.14	6.43	8.45	5.80	3.98	60.59
1977	3.41	3.84	6.03	7.05	7.09	4.37	0.24	4.90	4.66	8.45	5.59	3.98	59.60
1978	3.31	3.73	6.03	7.13	7.09	5.01	1.11	1.06	8.33	8.45	5.80	3.98	61.02
1979	3.65	1.55	6.03	7.13	7.09	5.08	5.07	0.01	8.33	8.29	5.80	3.58	61.60
1980	3.68	3.84	5.69	7.13	7.09	4.17	4.00	6.31	8.33	7.38	5.55	2.20	65.37
1981	3.68	3.20	3.79	7.01	7.09	5.16	4.12	4.93	8.33	8.45	5.80	3.98	65.52
1982	3.62	3.23	6.03	7.13	7.09	5.16	4.41	3.08	8.33	8.45	5.80	3.94	66.27
1983	3.68	3.76	6.03	5.82	7.09	5.16	3.80	1.52	7.22	8.45	5.80	3.98	62.29
1984	3.68	3.84	6.03	7.13	7.09	5.16	4.60	0.08	8.13	8.45	5.80	3.98	63.97
1985	3.68	3.84	6.03	5.53	7.09	5.16	3.23	5.48	8.33	8.45	5.80	3.98	66.59
1986	3.68	3.84	5.66	7.13	7.09	4.75	5.07	4.35	8.33	8.45	5.80	3.98	68.12
1987	3.68	3.84	6.03	7.13	7.09	5.16	5.07	6.31	8.33	8.45	5.80	3.98	70.86
1988	3.65	3.84	6.03	7.13	7.09	5.16	3.36	3.67	8.33	8.45	5.80	3.98	66.48
Ave.	3.50	3.59	5.76	7.03	7.08	5.00	3.17	4.75	7.55	8.35	5.70	3.81	65.28

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (1/6)

Summary of Crop and Basic Assumption

No.	Crop	Application Efficiency	Percolation Loss Code	Land prepartion Code	Pre-irrigation Code	Growing Stages
1	1 Crucifers	0.60	0	0	1	6
2	2 Cucumber	0.60	0	0	1	8
3	3 Tomatoes	0.60	0	0	1	9
4	4 Melon	0.60	0	0	1	8
5	5 Raddish	0.60	0	0	1	6
6	6 Fodder (Maize)	0.60	0	0	1	6
7	7 Alphalfa	0.60	0	0	1	24
8	8 Chillies	0.60	0	0	1	9
9	9 Beans (green)	0.60	0	0	1	6
10	10 Orchard (Citrus) 70%	0.60	0	0	0	24
11	11 Orchard (citrus) 20%	0.60	0	0	0	24
12	12 Upland Crops	0.60	0	0	1	6

No.	Crop	Crop Coefficient (by growing stage)											
1	1 Crucifers	0.42	0.50	0.70	0.95	0.95	0.85						
2	2 Cucumber	0.40	0.45	0.70	0.90	0.92	0.92	0.92	0.85				
3	3 Tomatoes	0.42	0.42	0.55	0.80	1.00	1.05	1.05	0.95	0.70			
4	4 Melon	0.38	0.40	0.60	0.90	0.98	0.98	0.98	0.90				
5	5 Raddish	0.45	0.55	0.80	1.05	1.05	0.75						
6	6 Fodder (Maize)	0.45	0.55	0.85	1.05	1.05	0.95						
7	7 Alphalfa	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
		0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
8	8 Chillies	0.65	0.75	0.85	0.95	1.00	1.00	1.00	0.95	0.90			
9	9 Beans (green)	0.45	0.52	0.75	0.95	0.95	0.90						
10	10 Orchard (Citrus) 70%	0.75	0.75	0.75	0.75	0.70	0.70	0.70	0.70	0.70	0.70	0.65	0.65
		0.65	0.65	0.65	0.65	0.65	0.65	0.70	0.70	0.70	0.70	0.70	0.70
11	11 Orchard (citrus) 20%	0.55	0.55	0.55	0.55	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.45
		0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.50	0.50	0.50	0.50
12	12 Upland Crops	1.00	1.00	1.00	1.00	1.00	1.00						

Remarks; 1 growing stage = 15 days

Summary of crop and basic assumptionin Malir Project (Proposed Cropping P., C.I=1.50)

No.	Crop	Cultiva. Area(ha)	Date of Water Issue	Land Preparation Period (stages)
1	1 Crucifers	600.	7/ 1	6
3	3 Tomatoes	1500.	7/ 1	6
5	5 Raddish	500.	8/ 1	6
6	6 Fodder (Maize)	50.	8/ 1	4
7	7 Alphalfa	100.	7/ 1	12
9	9 Beans (green)	600.	8/ 1	6
10	10 Orchard (Citrus) 70%	1000.	7/ 1	12
2	2 Cucumber	1400.	1/ 1	8
3	3 Tomatoes	350.	1/ 1	8
6	6 Fodder (Maize)	50.	1/ 1	4
9	9 Beans (green)	350.	1/ 1	8
	Total Project Area	4350.		

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Potential ET (mm)	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Conveyance Efficiency	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Return Flow Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15

Unit:mm

Code	1	2	3	4	5	6	7	8	9	10
Land Preparation	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Percoration Losses	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Pre-irrigation	50.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (2/6)

Rainfall Data for Malir Project (Proposed Cropping P., C.I=1.50)
Rianfall at Karachi Airport

Unit:mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	1	0	0	0	0	0	53	5	0	0	26	18	103
1930	11	0	0	2	0	53	339	1	0	0	0	0	406
1931	1	5	5	0	0	0	4	1	0	0	0	0	16
1932	5	0	0	0	0	0	290	28	0	0	0	0	323
1933	1	1	0	1	5	0	392	77	32	0	0	0	509
1934	0	0	2	0	0	32	164	5	0	0	0	9	212
1935	16	29	0	30	0	0	7	4	0	0	0	0	86
1936	1	14	1	0	0	18	67	0	0	0	0	2	103
1937	0	24	0	0	0	0	206	0	0	0	0	65	295
1938	0	0	0	1	3	1	42	66	0	0	0	5	118
1939	0	51	56	2	0	0	0	0	0	0	4	0	113
1940	68	32	46	0	0	10	53	54	0	0	0	9	272
1941	2	0	0	0	0	0	45	0	0	0	0	0	47
1942	15	27	4	0	0	0	256	18	0	0	0	10	330
1943	18	0	0	0	0	3	50	2	0	0	0	0	73
1944	5	47	0	0	0	0	286	335	0	0	0	1	674
1945	51	0	0	0	0	0	106	2	3	0	0	2	164
1946	0	0	0	0	0	2	55	41	0	0	0	0	98
1947	0	1	0	0	0	0	0	47	2	0	0	7	57
1948	0	26	30	0	0	41	35	0	0	0	0	7	139
1949	0	0	0	0	0	0	138	183	0	0	0	0	321
1950	11	0	0	0	0	0	73	0	0	0	0	0	84
1951	0	0	0	2	0	0	39	33	1	0	0	0	75
1952	0	35	0	0	0	0	160	0	24	0	0	3	222
1953	1	0	0	0	0	41	1	210	0	0	0	7	260
1954	18	30	0	0	0	0	55	34	150	0	0	0	287
1955	10	12	0	0	0	0	0	30	96	0	0	3	151
1956	21	0	0	4	0	43	157	89	0	98	0	0	412
1957	3	0	0	5	0	0	16	6	0	0	4	5	39
1958	6	2	0	0	0	0	131	0	32	0	1	52	224
1959	3	2	0	0	0	0	234	46	315	0	83	1	684
1960	2	0	32	0	0	0	43	28	0	0	0	22	127
1961	17	53	0	11	0	16	168	185	166	0	0	1	617
1962	0	0	0	0	0	0	81	42	148	0	0	6	277
1963	0	0	0	1	0	0	1	9	0	0	30	0	41
1964	2	5	0	0	0	2	77	49	3	0	0	0	138
1965	0	0	0	3	0	0	107	18	0	0	0	0	128
1966	0	0	1	0	0	0	68	0	0	0	0	0	69
1967	0	0	130	24	0	11	429	98	0	0	5	14	711
1968	11	4	0	0	0	0	0	5	0	0	0	6	26
1969	0	1	0	0	0	0	38	0	0	0	0	0	39
1970	7	7	62	0	0	5	151	155	86	0	0	0	473
1971	3	0	0	0	0	0	33	30	0	0	0	1	67
1972	0	3	0	0	0	20	16	0	0	0	0	4	43
1973	0	0	0	0	0	0	184	20	0	0	0	8	212
1974	0	0	0	0	0	0	0	0	0	0	0	5	5
1975	13	21	30	0	0	0	0	76	21	0	0	0	161
1976	66	10	30	0	0	0	217	36	44	0	0	0	403
1977	10	0	0	2	0	34	302	44	88	0	5	0	485
1978	14	4	0	0	0	6	179	175	0	0	0	0	378
1979	1	96	0	0	0	3	0	262	0	3	0	13	378
1980	0	0	10	0	0	43	45	0	0	23	6	63	190
1981	0	25	73	3	0	0	40	43	0	0	0	0	184
1982	2	24	0	0	0	0	27	105	0	0	0	1	159
1983	0	3	0	38	0	0	54	159	25	0	0	0	279
1984	0	0	0	0	0	0	19	245	4	0	0	0	268
1985	0	0	0	47	0	0	80	25	0	0	0	0	152
1986	0	0	11	0	0	17	0	62	0	0	0	0	90
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	1	0	0	0	0	0	74	85	0	0	0	0	160
Ave.	6	9	8	2	0	6	98	54	20	2	2	5	219

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (3/6)

Sample Intermediate Output in 1929

Crop : 1 Crucifers
Land Preparation Requirement : 0. mm
Percolation Losses : 0. mm
Pre-irrigation : 50. mm
Growing Stages : 6 stages
Date of Water Issue : 7/ 1

Unit:mm

I t e m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crop Coefficient	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30	0.56	0.59	0.44	0.19
Potential ET	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Crop ET	0.0	0.0	0.0	0.0	0.0	0.0	18.5	52.7	100.9	98.7	54.5	19.1
Rainfall	1.0	0.0	0.0	0.0	0.0	0.0	53.0	5.0	0.0	0.0	26.0	18.0
Effective Rainfall	0.0	0.0	0.0	0.0	0.0	0.0	5.4	1.7	0.0	0.0	7.6	1.7
Pre-irrigation	0.0	0.0	0.0	0.0	0.0	0.0	12.5	16.7	16.7	4.2	0.0	0.0
Percoration Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Water Req.	0.0	0.0	0.0	0.0	0.0	0.0	25.6	67.6	117.5	102.8	46.8	17.5
Overall Efficiency	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Diversion Water Req.	0.0	0.0	0.0	0.0	0.0	0.0	42.6	112.7	195.9	171.4	78.1	29.1

Sample Intermediate Output in 1929

Crop : 3 Tomatoes
Land Preparation Requirement : 0. mm
Percolation Losses : 0. mm
Pre-irrigation : 50. mm
Growing Stages : 9 stages
Date of Water Issue : 7/ 1

Unit:mm

I t e m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crop Coefficient	0.31	0.05	0.00	0.00	0.00	0.00	0.09	0.26	0.53	0.79	0.83	0.61
Potential ET	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Crop ET	34.2	6.2	0.0	0.0	0.0	0.0	17.4	45.0	95.0	131.7	102.4	61.3
Rainfall	1.0	0.0	0.0	0.0	0.0	0.0	53.0	5.0	0.0	0.0	26.0	18.0
Effective Rainfall	0.2	0.0	0.0	0.0	0.0	0.0	5.3	1.7	0.0	0.0	17.2	7.2
Pre-irrigation	0.0	0.0	0.0	0.0	0.0	0.0	12.5	16.7	16.7	4.2	0.0	0.0
Percoration Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Water Req.	34.0	6.2	0.0	0.0	0.0	0.0	24.5	60.0	111.7	135.9	85.1	54.1
Overall Efficiency	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Diversion Water Req.	56.6	10.4	0.0	0.0	0.0	0.0	40.9	100.0	186.1	226.5	141.9	90.2

Sample Intermediate Output in 1929

Crop : 5 Raddish
Land Preparation Requirement : 0. mm
Percolation Losses : 0. mm
Pre-irrigation : 50. mm
Growing Stages : 6 stages
Date of Water Issue : 8/ 1

Unit:mm

I t e m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crop Coefficient	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.33	0.61	0.63	0.46
Potential ET	110.0	125.0	192.0	224.0	253.0	233.0	193.0	176.0	179.0	166.0	123.0	101.0
Crop ET	20.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2	59.5	101.4	77.8	46.9
Rainfall	1.0	0.0	0.0	0.0	0.0	0.0	53.0	5.0	0.0	0.0	26.0	18.0
Effective Rainfall	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	13.6	5.1
Pre-irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	16.7	16.7	4.2	0.0
Percoration Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Water Req.	19.9	0.0	0.0	0.0	0.0	0.0	0.0	30.2	76.1	118.0	68.3	41.8
Overall Efficiency	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Diversion Water Req.	33.2	0.0	0.0	0.0	0.0	0.0	0.0	50.3	126.9	196.7	113.9	69.6

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (4/6)

Sample Intermediate Output in 1929

Summary of Water Demand for Each Crop

Unit Diversion Water Requirement

Unit:mm

C r o p	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 Crucifers	0.0	0.0	0.0	0.0	0.0	0.0	42.6	112.7	195.9	171.4	78.1	29.1
3 Tomatoes	56.6	10.4	0.0	0.0	0.0	0.0	40.9	100.0	186.1	226.5	141.9	90.2
5 Raddish	33.2	0.0	0.0	0.0	0.0	0.0	0.0	50.3	126.9	196.7	113.9	69.6
6 Fodder (Maize)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.3	183.4	242.8	122.0	45.2
7 Alphalfa	157.9	177.1	272.0	317.3	358.4	330.1	212.6	255.8	267.5	249.1	156.3	135.7
9 Beans (green)	35.8	0.0	0.0	0.0	0.0	0.0	0.0	49.6	121.3	188.6	110.3	67.9
10 Orchard (Citrus) 70%	127.1	142.6	214.8	249.8	282.2	260.6	154.4	198.5	211.7	197.9	117.1	99.9
2 Cucumber	28.2	67.1	157.0	254.6	279.8	209.7	91.8	42.0	0.0	0.0	0.0	0.0
3 Tomatoes	28.3	62.3	152.9	260.0	320.5	251.3	122.6	69.5	11.6	0.0	0.0	0.0
6 Fodder (Maize)	57.5	140.6	279.2	259.5	124.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 Beans (green)	30.0	71.6	165.5	208.3	206.4	137.0	42.3	0.0	0.0	0.0	0.0	0.0

Sample Intermediate Output in 1929

Summary of Water Demand for Each Crop

Diversion Water Requirement

Unit : MCM

C r o p	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 Crucifers	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.68	1.18	1.03	0.47	0.17
3 Tomatoes	0.85	0.16	0.00	0.00	0.00	0.00	0.61	1.50	2.79	3.40	2.13	1.35
5 Raddish	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.63	0.98	0.57	0.35
6 Fodder (Maize)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.12	0.06	0.02
7 Alphalfa	0.16	0.18	0.27	0.32	0.36	0.33	0.21	0.26	0.27	0.25	0.16	0.14
9 Beans (green)	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.73	1.13	0.66	0.41
10 Orchard (Citrus) 70%	1.27	1.43	2.15	2.50	2.82	2.61	1.54	1.98	2.12	1.98	1.17	1.00
2 Cucumber	0.40	0.94	2.20	3.56	3.92	2.94	1.29	0.59	0.00	0.00	0.00	0.00
3 Tomatoes	0.10	0.22	0.54	0.91	1.12	0.88	0.43	0.24	0.04	0.00	0.00	0.00
6 Fodder (Maize)	0.03	0.07	0.14	0.13	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9 Beans (green)	0.10	0.25	0.58	0.73	0.72	0.48	0.15	0.00	0.00	0.00	0.00	0.00
T o t a l	3.29	3.24	5.87	8.15	9.00	7.23	4.49	5.83	7.85	8.89	5.22	3.44

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (5/6)

Diversion Water Requirement for Malir Project (Proposed Cropping P., C.I=1.50)
(Total Area : 4350. ha)

Unit : MCM

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	3.29	3.24	5.87	8.15	9.00	7.23	4.49	5.83	7.85	8.89	5.22	3.44	72.50
1930	3.07	3.24	5.87	8.06	9.00	5.66	0.03	5.96	7.85	8.89	6.31	3.95	67.89
1931	3.29	3.13	5.71	8.15	9.00	7.23	5.71	5.96	7.85	8.89	6.31	3.95	75.17
1932	3.20	3.24	5.87	8.15	9.00	7.23	0.29	5.17	7.85	8.89	6.31	3.95	69.15
1933	3.29	3.21	5.87	8.10	8.79	7.23	0.01	3.84	6.55	8.89	6.31	3.95	66.06
1934	3.31	3.24	5.80	8.15	9.00	6.26	1.92	5.83	7.85	8.89	6.31	3.69	70.25
1935	2.97	2.64	5.87	7.02	9.00	7.23	5.63	5.86	7.85	8.89	6.31	3.95	73.23
1936	3.29	2.94	5.84	8.15	9.00	6.67	4.15	5.99	7.85	8.89	6.31	3.89	72.96
1937	3.31	2.74	5.87	8.15	9.00	7.23	1.16	5.99	7.85	8.89	6.31	2.23	68.74
1938	3.31	3.24	5.87	8.10	8.87	7.20	4.75	4.14	7.85	8.89	6.31	3.80	72.33
1939	3.31	2.22	4.27	8.06	9.00	7.23	5.82	5.99	7.85	8.89	6.12	3.95	72.72
1940	1.96	2.58	4.54	8.15	9.00	6.91	4.49	4.46	7.85	8.89	6.31	3.69	68.83
1941	3.26	3.24	5.87	8.15	9.00	7.23	4.68	5.99	7.85	8.89	6.31	3.95	74.43
1942	2.99	2.68	5.74	8.15	9.00	7.23	0.63	5.45	7.85	8.89	6.31	3.66	68.59
1943	2.93	3.24	5.87	8.15	9.00	7.13	4.56	5.93	7.85	8.89	6.31	3.95	73.80
1944	3.20	2.30	5.87	8.15	9.00	7.23	0.33	0.07	7.85	8.89	6.31	3.92	63.11
1945	2.28	3.24	5.87	8.15	9.00	7.23	3.24	5.93	7.71	8.89	6.31	3.89	71.74
1946	3.31	3.24	5.87	8.15	9.00	7.16	4.44	4.81	7.85	8.89	6.31	3.95	72.98
1947	3.31	3.21	5.87	8.15	9.00	7.23	5.82	4.65	7.75	8.89	6.31	3.74	73.95
1948	3.31	2.70	4.99	8.15	9.00	6.00	4.92	5.99	7.85	8.89	6.31	3.74	71.85
1949	3.31	3.24	5.87	8.15	9.00	7.23	2.51	1.14	7.85	8.89	6.31	3.95	67.45
1950	3.07	3.24	5.87	8.15	9.00	7.23	4.01	5.99	7.85	8.89	6.31	3.95	73.57
1951	3.31	3.24	5.87	8.06	9.00	7.23	4.82	5.03	7.80	8.89	6.31	3.95	73.52
1952	3.31	2.53	5.87	8.15	9.00	7.23	2.01	5.99	6.86	8.89	6.31	3.86	70.02
1953	3.29	3.24	5.87	8.15	9.00	6.00	5.79	0.74	7.85	8.89	6.31	3.74	68.87
1954	2.93	2.62	5.87	8.15	9.00	7.23	4.44	5.00	2.24	8.89	6.31	3.95	66.64
1955	3.09	2.98	5.87	8.15	9.00	7.23	5.82	5.12	4.18	8.89	6.31	3.86	70.50
1956	2.87	3.24	5.87	7.98	9.00	5.94	2.08	3.53	7.85	4.29	6.31	3.95	62.90
1957	3.24	3.24	5.87	7.94	9.00	7.23	5.39	5.80	7.85	8.89	6.12	3.80	74.39
1958	3.18	3.19	5.87	8.15	9.00	7.23	2.67	5.99	6.55	8.89	6.26	2.56	69.55
1959	3.24	3.19	5.87	8.15	9.00	7.23	0.85	4.68	0.01	8.89	3.02	3.92	58.06
1960	3.26	3.24	4.93	8.15	9.00	7.23	4.73	5.17	7.85	8.89	6.31	3.33	72.10
1961	2.95	2.18	5.87	7.71	9.00	6.73	1.83	1.11	1.68	8.89	6.31	3.92	58.17
1962	3.31	3.24	5.87	8.15	9.00	7.23	3.82	4.78	2.31	8.89	6.31	3.77	66.70
1963	3.31	3.24	5.87	8.10	9.00	7.23	5.79	5.71	7.85	8.89	5.06	3.95	74.01
1964	3.26	3.13	5.87	8.15	9.00	7.16	3.92	4.59	7.71	8.89	6.31	3.95	71.95
1965	3.31	3.24	5.87	8.02	9.00	7.23	3.22	5.45	7.85	8.89	6.31	3.95	72.35
1966	3.31	3.24	5.84	8.15	9.00	7.23	4.13	5.99	7.85	8.89	6.31	3.95	73.89
1967	3.31	3.24	2.31	7.24	9.00	6.88	0.00	3.29	7.85	8.89	6.08	3.55	61.63
1968	3.07	3.15	5.87	8.15	9.00	7.23	5.82	5.83	7.85	8.89	6.31	3.77	74.95
1969	3.31	3.21	5.87	8.15	9.00	7.23	4.85	5.99	7.85	8.89	6.31	3.95	74.62
1970	3.16	3.08	4.11	8.15	9.00	7.06	2.21	1.81	4.54	8.89	6.31	3.95	62.28
1971	3.24	3.24	5.87	8.15	9.00	7.23	4.97	5.12	7.85	8.89	6.31	3.92	73.78
1972	3.31	3.17	5.87	8.15	9.00	6.61	5.39	5.99	7.85	8.89	6.31	3.83	74.37
1973	3.31	3.24	5.87	8.15	9.00	7.23	1.47	5.40	7.85	8.89	6.31	3.71	70.43
1974	3.31	3.24	5.87	8.15	9.00	7.23	5.82	5.99	7.85	8.89	6.31	3.80	75.47
1975	3.03	2.80	4.99	8.15	9.00	7.23	5.82	3.87	6.98	8.89	6.31	3.95	71.02
1976	2.00	3.02	4.99	8.15	9.00	7.23	1.04	4.95	6.10	8.89	6.31	3.95	65.63
1977	3.09	3.24	5.87	8.06	9.00	6.20	0.18	4.73	4.47	8.89	6.08	3.95	63.77
1978	3.01	3.15	5.87	8.15	9.00	7.03	1.58	1.30	7.85	8.89	6.31	3.95	66.09
1979	3.29	1.38	5.87	8.15	9.00	7.13	5.82	0.33	7.85	8.72	6.31	3.58	67.43
1980	3.31	3.24	5.56	8.15	9.00	5.94	4.68	5.99	7.85	7.73	6.04	2.28	69.77
1981	3.31	2.72	3.81	8.02	9.00	7.23	4.80	4.76	7.85	8.89	6.31	3.95	70.65
1982	3.26	2.74	5.87	8.15	9.00	7.23	5.12	3.11	7.85	8.89	6.31	3.92	71.45
1983	3.31	3.17	5.87	6.74	9.00	7.23	4.46	1.71	6.82	8.89	6.31	3.95	67.47
1984	3.31	3.24	5.87	8.15	9.00	7.23	5.32	0.40	7.67	8.89	6.31	3.95	69.34
1985	3.31	3.24	5.87	6.42	9.00	7.23	3.85	5.26	7.85	8.89	6.31	3.95	71.17
1986	3.31	3.24	5.53	8.15	9.00	6.70	5.82	4.24	7.85	8.89	6.31	3.95	72.99
1987	3.31	3.24	5.87	8.15	9.00	7.23	5.82	5.99	7.85	8.89	6.31	3.95	75.62
1988	3.29	3.24	5.87	8.15	9.00	7.23	3.99	3.63	7.85	8.89	6.31	3.95	71.40
Ave.	3.17	3.04	5.62	8.04	9.00	7.03	3.73	4.59	7.12	8.79	6.20	3.79	70.10

Table G.3.5 IRRIGATION WATER DEMAND - PROPOSED CROPPING PATTERN (6/6)

Return Flow of Malir Project (Proposed Cropping P., C.I=1.50)
(Total Area : 4350. ha)

Unit : MCM

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1929	0.49	0.49	0.88	1.22	1.35	1.08	0.67	0.88	1.18	1.33	0.78	0.52	10.87
1930	0.46	0.49	0.88	1.21	1.35	0.85	0.00	0.89	1.18	1.33	0.95	0.59	10.18
1931	0.49	0.47	0.86	1.22	1.35	1.08	0.86	0.89	1.18	1.33	0.95	0.59	11.28
1932	0.48	0.49	0.88	1.22	1.35	1.08	0.04	0.78	1.18	1.33	0.95	0.59	10.37
1933	0.49	0.48	0.88	1.22	1.32	1.08	0.00	0.58	0.98	1.33	0.95	0.59	9.91
1934	0.50	0.49	0.87	1.22	1.35	0.94	0.29	0.88	1.18	1.33	0.95	0.55	10.54
1935	0.45	0.40	0.88	1.05	1.35	1.08	0.84	0.88	1.18	1.33	0.95	0.59	10.98
1936	0.49	0.44	0.88	1.22	1.35	1.00	0.62	0.90	1.18	1.33	0.95	0.58	10.94
1937	0.50	0.41	0.88	1.22	1.35	1.08	0.17	0.90	1.18	1.33	0.95	0.33	10.31
1938	0.50	0.49	0.88	1.22	1.33	1.08	0.71	0.62	1.18	1.33	0.95	0.57	10.85
1939	0.50	0.33	0.64	1.21	1.35	1.08	0.87	0.90	1.18	1.33	0.92	0.59	10.91
1940	0.29	0.39	0.68	1.22	1.35	1.04	0.67	0.67	1.18	1.33	0.95	0.55	10.32
1941	0.49	0.49	0.88	1.22	1.35	1.08	0.70	0.90	1.18	1.33	0.95	0.59	11.16
1942	0.45	0.40	0.86	1.22	1.35	1.08	0.10	0.82	1.18	1.33	0.95	0.55	10.29
1943	0.44	0.49	0.88	1.22	1.35	1.07	0.68	0.89	1.18	1.33	0.95	0.59	11.07
1944	0.48	0.34	0.88	1.22	1.35	1.08	0.05	0.01	1.18	1.33	0.95	0.59	9.47
1945	0.34	0.49	0.88	1.22	1.35	1.08	0.49	0.89	1.16	1.33	0.95	0.58	10.76
1946	0.50	0.49	0.88	1.22	1.35	1.07	0.67	0.72	1.18	1.33	0.95	0.59	10.95
1947	0.50	0.48	0.88	1.22	1.35	1.08	0.87	0.70	1.16	1.33	0.95	0.56	11.09
1948	0.50	0.41	0.75	1.22	1.35	0.90	0.74	0.90	1.18	1.33	0.95	0.56	10.78
1949	0.50	0.49	0.88	1.22	1.35	1.08	0.38	0.17	1.18	1.33	0.95	0.59	10.12
1950	0.46	0.49	0.88	1.22	1.35	1.08	0.60	0.90	1.18	1.33	0.95	0.59	11.04
1951	0.50	0.49	0.88	1.21	1.35	1.08	0.72	0.75	1.17	1.33	0.95	0.59	11.03
1952	0.50	0.38	0.88	1.22	1.35	1.08	0.30	0.90	1.03	1.33	0.95	0.58	10.50
1953	0.49	0.49	0.88	1.22	1.35	0.90	0.87	0.11	1.18	1.33	0.95	0.56	10.33
1954	0.44	0.39	0.88	1.22	1.35	1.08	0.67	0.75	0.34	1.33	0.95	0.59	10.00
1955	0.46	0.45	0.88	1.22	1.35	1.08	0.87	0.77	0.63	1.33	0.95	0.58	10.58
1956	0.43	0.49	0.88	1.20	1.35	0.89	0.31	0.53	1.18	0.64	0.95	0.59	9.43
1957	0.49	0.49	0.88	1.19	1.35	1.08	0.81	0.87	1.18	1.33	0.92	0.57	11.16
1958	0.48	0.48	0.88	1.22	1.35	1.08	0.40	0.90	0.98	1.33	0.94	0.38	10.43
1959	0.49	0.48	0.88	1.22	1.35	1.08	0.13	0.70	0.00	1.33	0.45	0.59	8.71
1960	0.49	0.49	0.74	1.22	1.35	1.08	0.71	0.78	1.18	1.33	0.95	0.50	10.81
1961	0.44	0.33	0.88	1.16	1.35	1.01	0.27	0.17	0.25	1.33	0.95	0.59	8.73
1962	0.50	0.49	0.88	1.22	1.35	1.08	0.57	0.72	0.35	1.33	0.95	0.57	10.00
1963	0.50	0.49	0.88	1.22	1.35	1.08	0.87	0.86	1.18	1.33	0.76	0.59	11.10
1964	0.49	0.47	0.88	1.22	1.35	1.07	0.59	0.69	1.16	1.33	0.95	0.59	10.79
1965	0.50	0.49	0.88	1.20	1.35	1.08	0.48	0.82	1.18	1.33	0.95	0.59	10.85
1966	0.50	0.49	0.88	1.22	1.35	1.08	0.62	0.90	1.18	1.33	0.95	0.59	11.08
1967	0.50	0.49	0.35	1.09	1.35	1.03	0.00	0.49	1.18	1.33	0.91	0.53	9.24
1968	0.46	0.47	0.88	1.22	1.35	1.08	0.87	0.88	1.18	1.33	0.95	0.57	11.24
1969	0.50	0.48	0.88	1.22	1.35	1.08	0.73	0.90	1.18	1.33	0.95	0.59	11.19
1970	0.47	0.46	0.62	1.22	1.35	1.06	0.33	0.27	0.68	1.33	0.95	0.59	9.34
1971	0.49	0.49	0.88	1.22	1.35	1.08	0.75	0.77	1.18	1.33	0.95	0.59	11.07
1972	0.50	0.48	0.88	1.22	1.35	0.99	0.81	0.90	1.18	1.33	0.95	0.57	11.16
1973	0.50	0.49	0.88	1.22	1.35	1.08	0.22	0.81	1.18	1.33	0.95	0.56	10.56
1974	0.50	0.49	0.88	1.22	1.35	1.08	0.87	0.90	1.18	1.33	0.95	0.57	11.32
1975	0.45	0.42	0.75	1.22	1.35	1.08	0.87	0.58	1.05	1.33	0.95	0.59	10.65
1976	0.30	0.45	0.75	1.22	1.35	1.08	0.16	0.74	0.91	1.33	0.95	0.59	9.84
1977	0.46	0.49	0.88	1.21	1.35	0.93	0.03	0.71	0.67	1.33	0.91	0.59	9.57
1978	0.45	0.47	0.88	1.22	1.35	1.05	0.24	0.20	1.18	1.33	0.95	0.59	9.91
1979	0.49	0.21	0.88	1.22	1.35	1.07	0.87	0.05	1.18	1.31	0.95	0.54	10.11
1980	0.50	0.49	0.83	1.22	1.35	0.89	0.70	0.90	1.18	1.16	0.91	0.34	10.46
1981	0.50	0.41	0.57	1.20	1.35	1.08	0.72	0.71	1.18	1.33	0.95	0.59	10.60
1982	0.49	0.41	0.88	1.22	1.35	1.08	0.77	0.47	1.18	1.33	0.95	0.59	10.72
1983	0.50	0.48	0.88	1.01	1.35	1.08	0.67	0.26	1.02	1.33	0.95	0.59	10.12
1984	0.50	0.49	0.88	1.22	1.35	1.08	0.80	0.06	1.15	1.33	0.95	0.59	10.40
1985	0.50	0.49	0.88	0.96	1.35	1.08	0.58	0.79	1.18	1.33	0.95	0.59	10.68
1986	0.50	0.49	0.83	1.22	1.35	1.00	0.87	0.64	1.18	1.33	0.95	0.59	10.95
1987	0.50	0.49	0.88	1.22	1.35	1.08	0.87	0.90	1.18	1.33	0.95	0.59	11.34
1988	0.49	0.49	0.88	1.22	1.35	1.08	0.60	0.54	1.18	1.33	0.95	0.59	10.71
Ave.	0.47	0.46	0.84	1.21	1.35	1.05	0.56	0.69	1.07	1.32	0.93	0.57	10.52

Table G.4.1 WATER REQUIREMENT OF PILOT DEMONSTRATION FARM

A. Crop Water Requirement (m3/ha)

Vegetable	Kharif	3,000 - 5,000 m3/ha
	Rabi	5,500 - 7,000 m3/ha
Orchards		13,600 m3/ha

B. Unit Irrigation Water Requirement (m3/ha)

		Basin	Sprinkler	Drip
Vegetable	Kharif	8,300	7,200	6,300
	Rabi	11,700	10,000	8,800
Orchards		22,600	19,500	17,000

C. Anticipated Cropped Area (ha)

		Basin	Sprinkler	Drip
Vegetable	Kharif	1.1 (3)*	1.4 (4)	1.4 (4)
	Rabi	0.7 (2)	1.1 (3)	1.1 (3)
Orchards		-	-	2.4 (Existing)

D. Diversion Water Requirement (m3/yr.)

		Basin	Sprinkler	Drip	
Vegetable	Kharif	9,200	10,100	8,900	
	Rabi	8,200	11,000	9,700	
Orchards		-	-	40,800	
Total		17,400	21,100	59,400	97,900

Remarks: * Parenthesis show irrigation plot numbers.

Table G.4.2 PRELIMINARY COST ESTIMATE OF PILOT DEMONSTRATION FARM

Description		Amount (1000Rs.) F/C	L/C	Total
I. Construction Cost				
1. Tubewell				
i) Digging of tubewell (d=120 m)		176	411	588
ii) Pump & motor, including installation & electric power supply		1,186	209	1,396
iii) Pipeline from tubewell to storage tank (ø150, l= 950m)		841	360	1,201
Sub-total		2,203	981	3,184
2. Irrigation System				
i) Pump sets(2 nos.) with pressure tank		1,684	722	2,405
ii) Pump house (4 x 5 m)		19	43	62
iii) Pipeline system including sprinkler and drip system		4,113	578	4,691
iv) Electric power supply		70	30	100
v) Storage tank (2.5 x 25 x 15 m)		194	65	239
vi) Laboratory (20 x 10 m)		158	368	525
vii) Warehouse(10 x 6 m)		38	88	125
Sub-total		6,260	1,888	8,147
II. EQUIPMENT AND MATERIALS				
O/M Equipment				
i) Tractor with Accessories (34 HP)	1 no.	440	0	440
ii) Station Wagon, 4WD	1 no.	360	0	360
iii) Pick-up 4WD	1 no.	230	0	230
iv) Motorcycle 90cc	4 nos.	170	0	170
v) Laboratory Equipment	L.S.	730	0	730
Sub-total		1,930	0	1,930
Total		10,393	2,869	13,261

Table G.5.1 DIGGING AND CLEANING COSTS

No.	Location Union Council	Deh	Well No.		Condition of Well Constructed time in	depth ft	Dia. of Well ft	Depth in 1990 ft	Cleaning Interval of Cleaning year	Cleaning Depth ft	Costs of Cleaning Rs.	Digging Dig. Dep. ft	Digging Didding Costs Rs.	Last Digging Time
1	Konkar	Malh	43		1900	40	20	170	1	2	3,000	4	16,000	1989
2	Thano	Thano	W-88		1930	50	22	150	1	2	3,000	5	12,000	1989
3	Thano	Thano	NT-15		1890	25	40	175	-	-	-	-	-	1970
4	Thano	Thano	93	*	1925	25	20	125	3	2	3,000	6	19,600	1988
5	Thano	Thano	132	*	1920	20	20	130	-	-	-	3	18,000	1987
6	Thano	Thano	151	*	1920	15	26	135	2	2	2,600	5	12,000	1988
7	Landhi	Landhi	LA-29		1965	40	22	145	3	2	2,000	5	12,000	1989
8	Landhi	Landhi	NL-2		1965	130	20	150	2	2	2,000	-	-	1987
9	Landhi	Sanhro	D-32		1964	75	30	117	1	1.5	2,500	3	12,000	1989
10	Landhi	Sanhro	DK-1		1971	85	18	122	2	2	2,200	6	12,000	1988
11	Landhi	Khakhar	W-65		1956	70	28	125	2.5	2	3,000	16	56,000	1988
12	Landhi	Khakhar	NDK-1		1956	72	28	120	1	2	3,000	10	35,000	1989
13	Konkar	Bazar	W-49/I		1965	80	25	100	2	1.5	1,500	-	-	1984
14	Konkar	Bazar	W-28		1942	40	20	100	-	-	-	6	6,000	1988
15	Konkar	Kharkharo	LA-11		1944	18	16	50	7	10	12,000	-	-	1984
16	Konkar	Kharkharo	W-53		1945	33	18	93	-	-	-	14	30,800	1988
17	Konkar	Darsano C	W-70		1959	70	22	85	-	-	-	8	9,600	1988
18	Konkar	Darsano C	T-7		1969	55	25	65	1	2.5	3,000	-	-	-
19	Konkar	Malh	161	*	1925	30	18	140	2	3	3,600	7	19,500	1989
20	Konkar	Malh	163	*	1930	30	20	135	3	2	2,600	3	10,500	1989
21	Konkar	Thado	W-86		1962	50	28	90		-	-	-		-
22	Darsano C	Amilano	ND-7		1956	35	22	85	-	-	-	5	12,500	1988
23	Darsano C	Amilano	W-3		1954	45	17	80	3	1	1,000	-	-	-
24	Darsano C	Kathore	AG-10		1952	40	22	120	5	5	6,000	4	10,000	1989
25	Darsano C	kathore	AG-6		1983	85	20	90	2	2	2,000	-	-	1988
							ft	116	43.5	46.5	58,000	110	303,500	

		Clearing	Digging
Annual cleaning depth (ft)		1.1	
Average : Rs./ft		1,247	2,759
Annual cl. cost		1,333	-
	say	1,300	2,800
	Rs./m	4,092	9,052
	say	4,100	9,100

Remarks : * shows cadastral survey No.

Table G.5.2 DEPTH OF EXISTING WELLS AND PROJECTION OF WELL DEPTH

Year	Nos. of Wells	Depth From Ground Surface (m)		Projection in 2000
		Constructed Time	In 1989	
1940's	115	-8.5	-36.7	-45
1950's	67	-13.3	-33.7	-41
1960's	146	-15.2	-30.3	-37
1970's	75	-19.7	-29.4	-36
1980's	63	-20.0	-24.0	-29
Total/Ave.	466	-14.6	-31.3	-38

Remarks : Average depth of wells will be limited to about 40m based on actual thickness of the basin aquifer which is described in detail in ANNEX-D.

Table G.5.3 INCREMENTAL O&M COSTS OF WELLS

Description	Projection 1989	2000	2010
1. Depth of Well (m)	31.3	38	47
2. Incremental Depth (m)	6.7	9	
3. Annual Incremental Depth (m)	0.61	0.9	
4. Annual Digging Costs (Rs.)	5,500	8,200	
5. Incremental Electric Energy*1 (kWh)	3,700	5,000	
6. Electric Energy Costs*2 (Rs.)	1,550	2,100	
7. Incremental O&M Costs (4 + 6) (Rs.)	7,050	10,300	
Total Incremental O&M Costs (1,000 Rs.)	3,290	4,800	

Remarks: *1 Estimated on the basis of annual energy consumtion in 1987/88 (refer to Table G.2.13).
17,400 kWh/31.3 m = 556 kWh/m/yr.

*2 Estimated by adopting 42 paisa per kWh (Tarif base of the Government of Sindh)

Item		Projection 1989	1995	2000	2005
1. Annual Digging Cost	Rs./yr	5,550	5,550	8,200	
2. Average Projected Well Depth	m	31.3	34.7	38.0	42.5
3. Average Well Depth	m	-	36.4	40.3	
4. Incremental Well Depth from 1989	m	-	1.7	5.6	
5. Annual Average Electric Energy Consumption	kWh/well/yr	-	950	3,110	
6. Annual Energy Cost	Rs./well/yr	-	400	1,310	
7. Annual Digging Costs in the Project Area	1,000Rs.	-	2,560	3,820	
8. Annual Electric Cost in the Project Area	1,000Rs.	-	190	610	

FIGURES

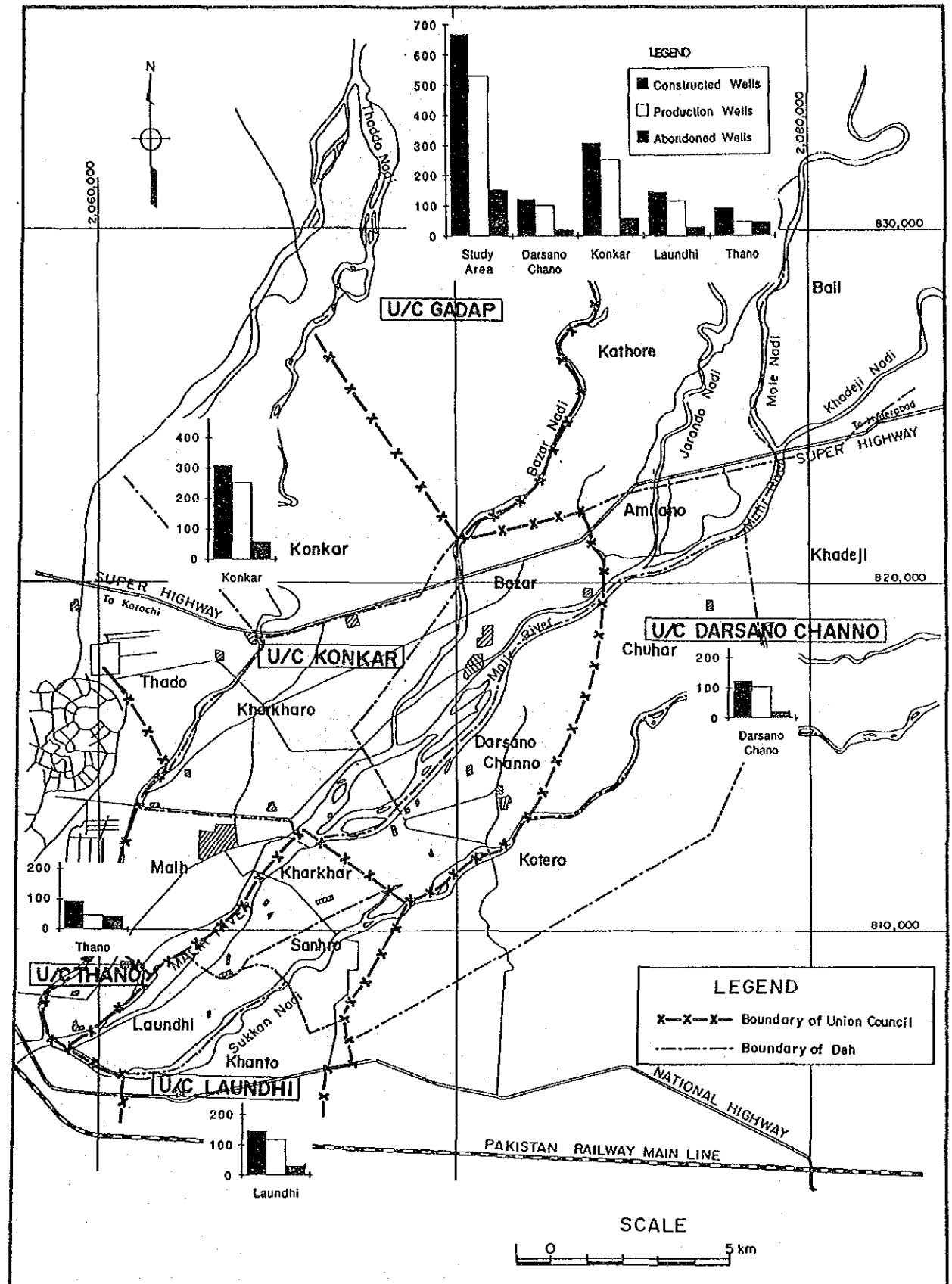

Fig. G.2-1 Constructed, Production and Abandoned Wells in Each Union Council

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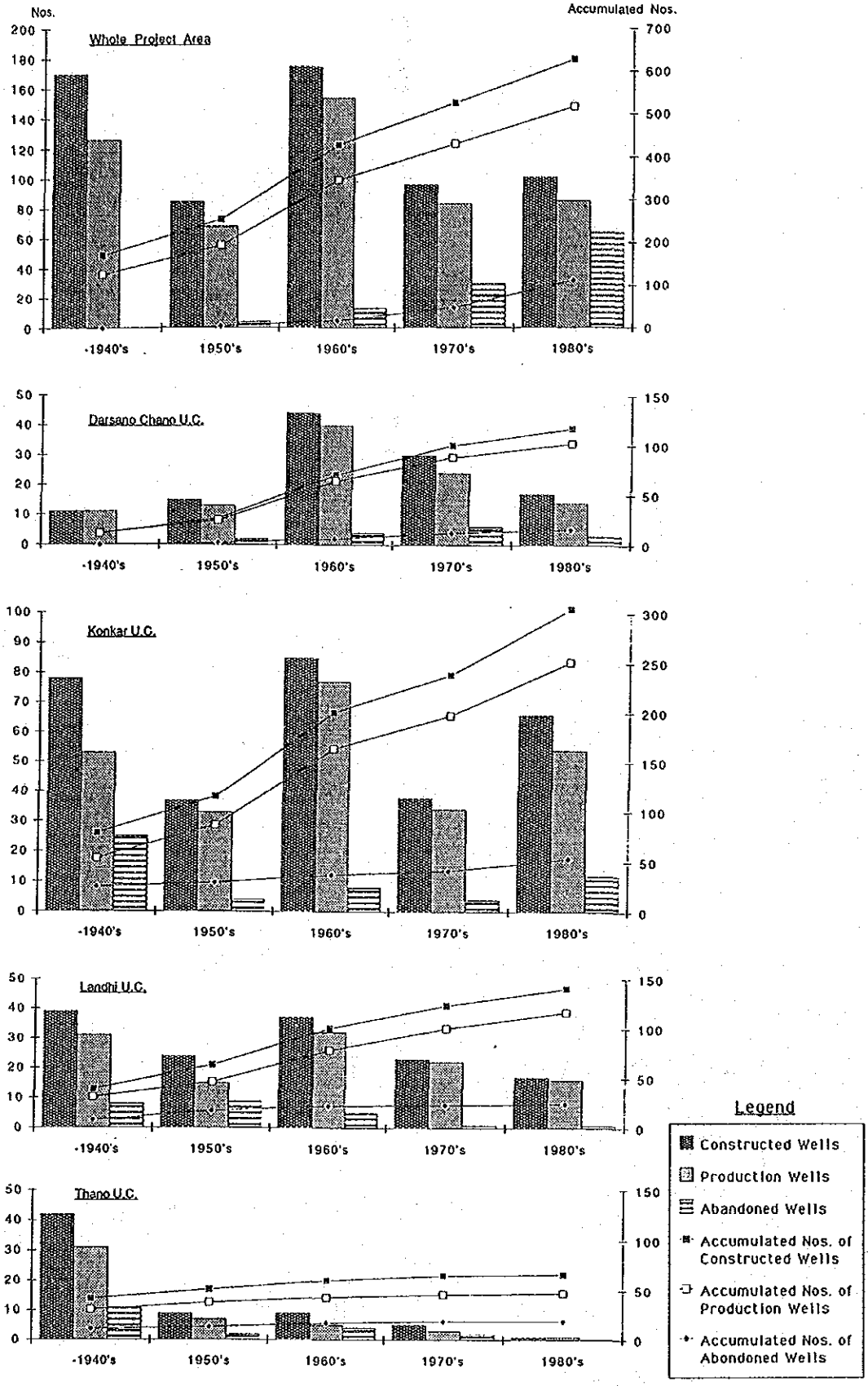

Fig. G.2-2 History of Well Construction in the Study Area

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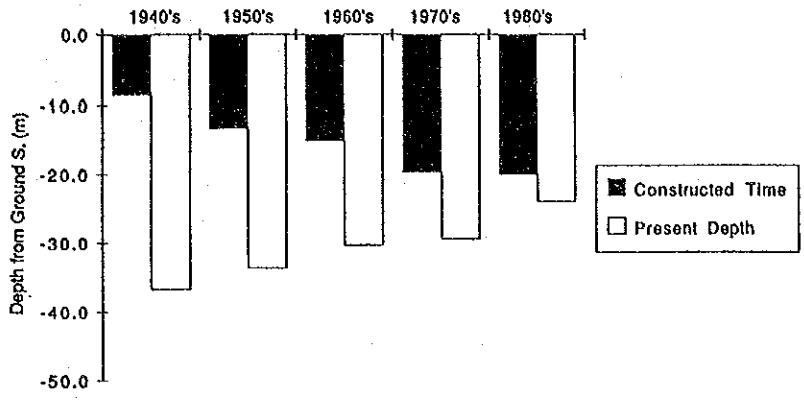
1. Whole Project Area



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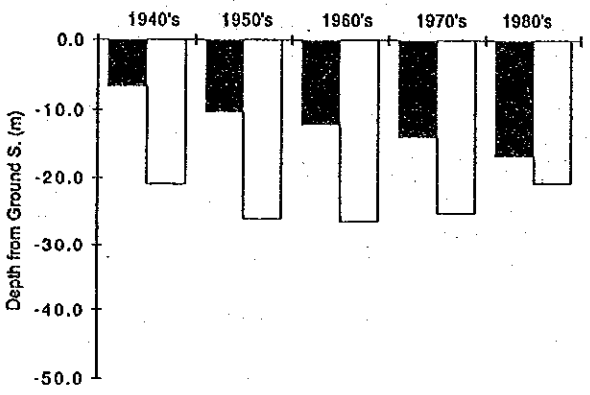
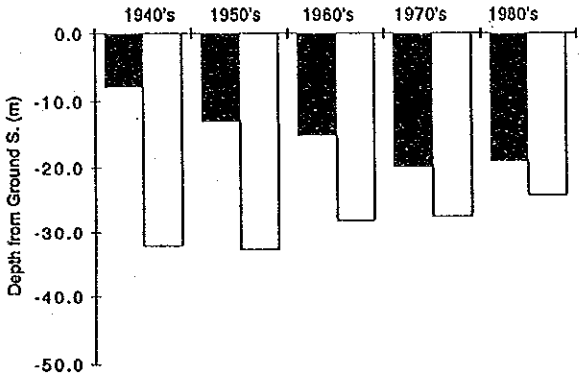
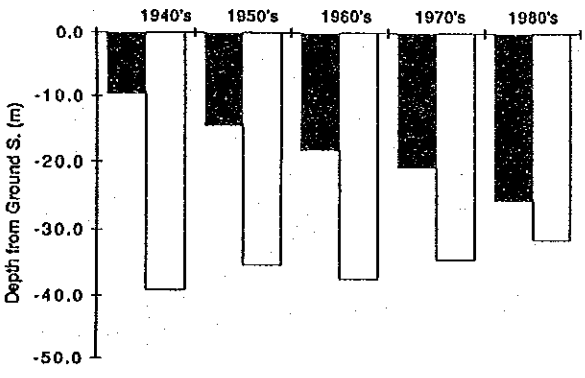


3. Konkar U.C.



4. Laundhi U.C.



5. Thano U.C.

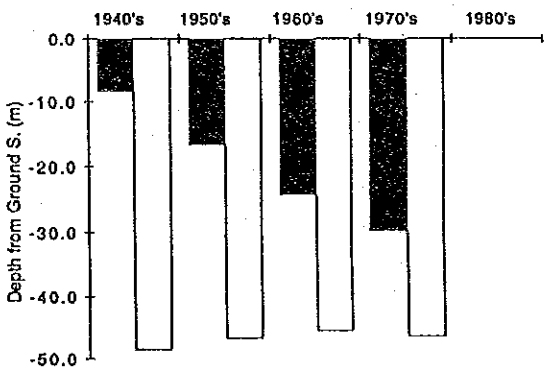


Fig. G.2-3 Depth of Production Dugwells in Each Decade

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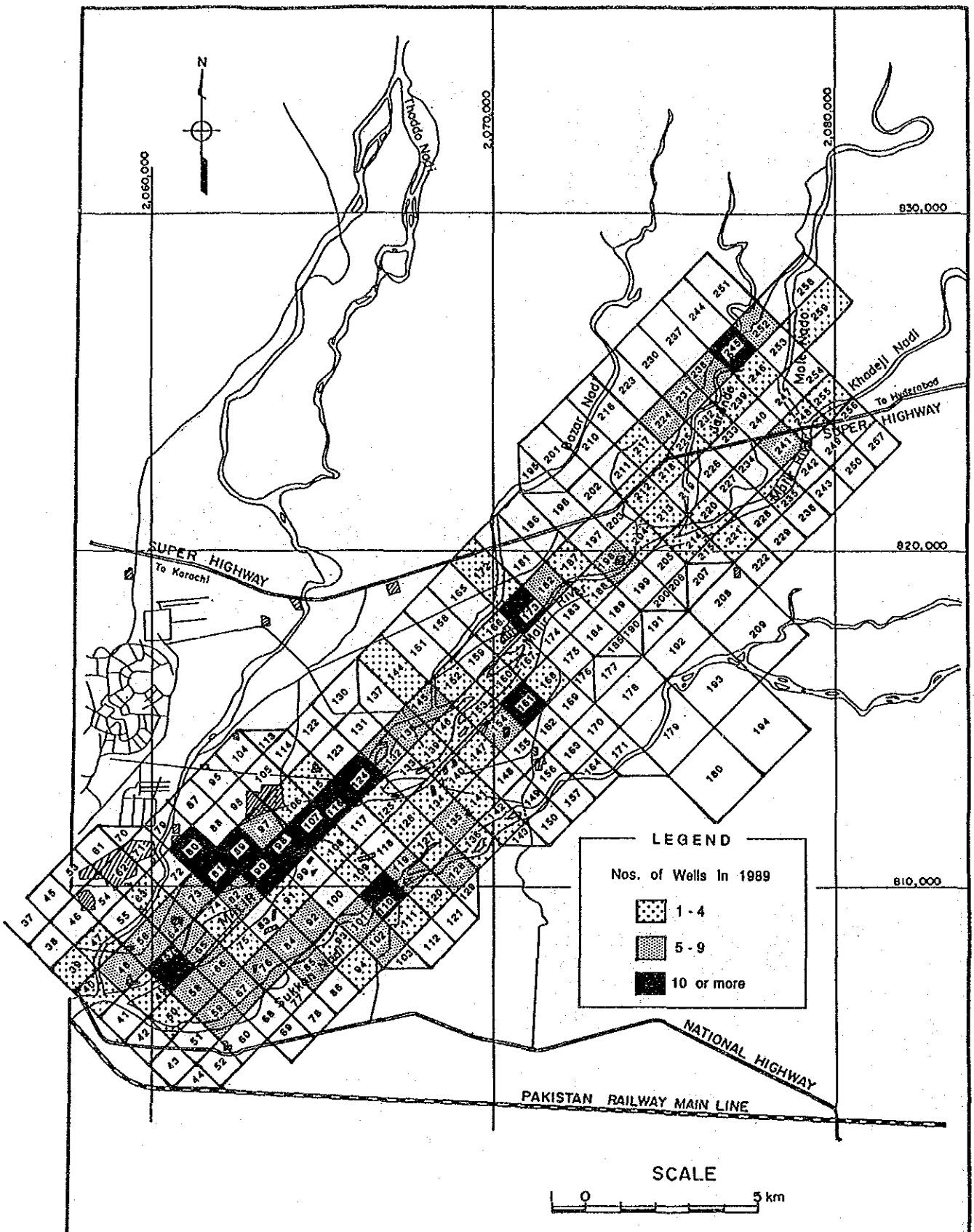

Fig. G.2-4 Density of Production Wells

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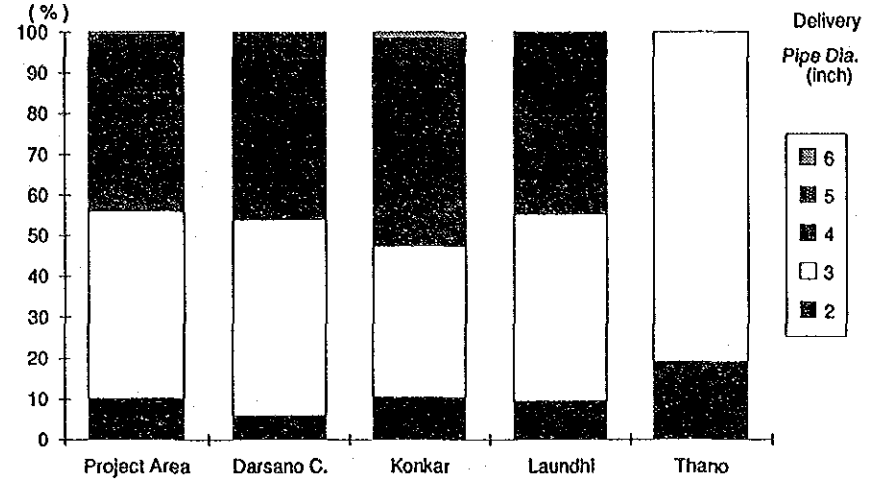

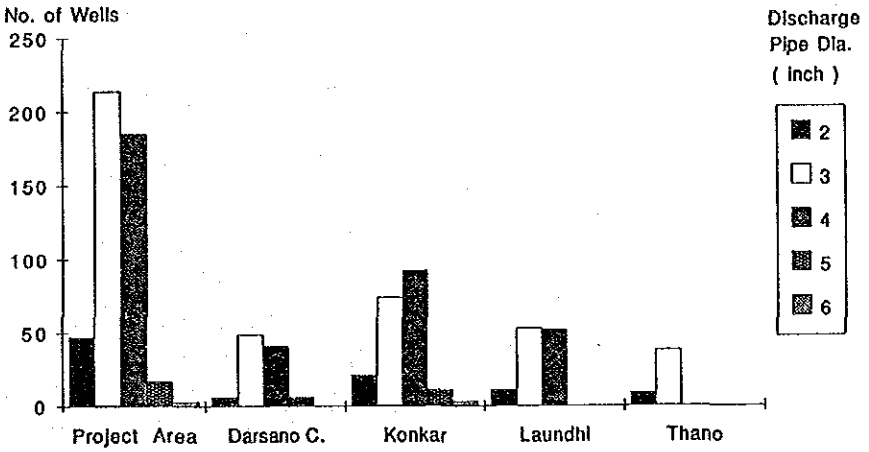

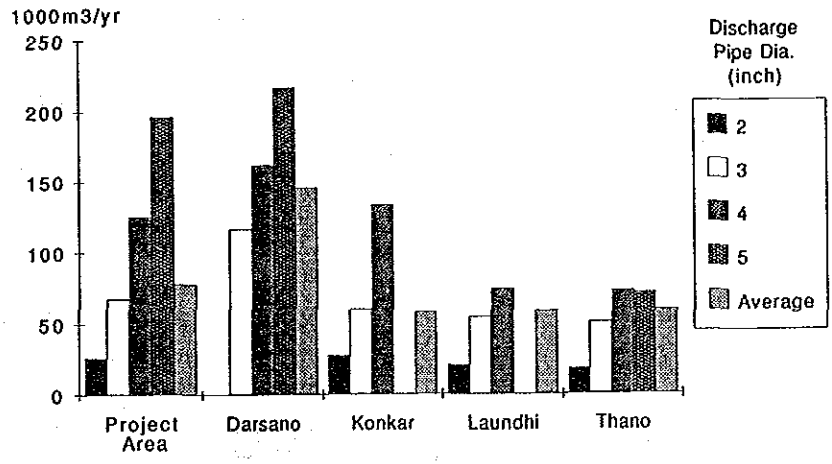

Fig. G.2-5 Average Well Yield in Each Union Council

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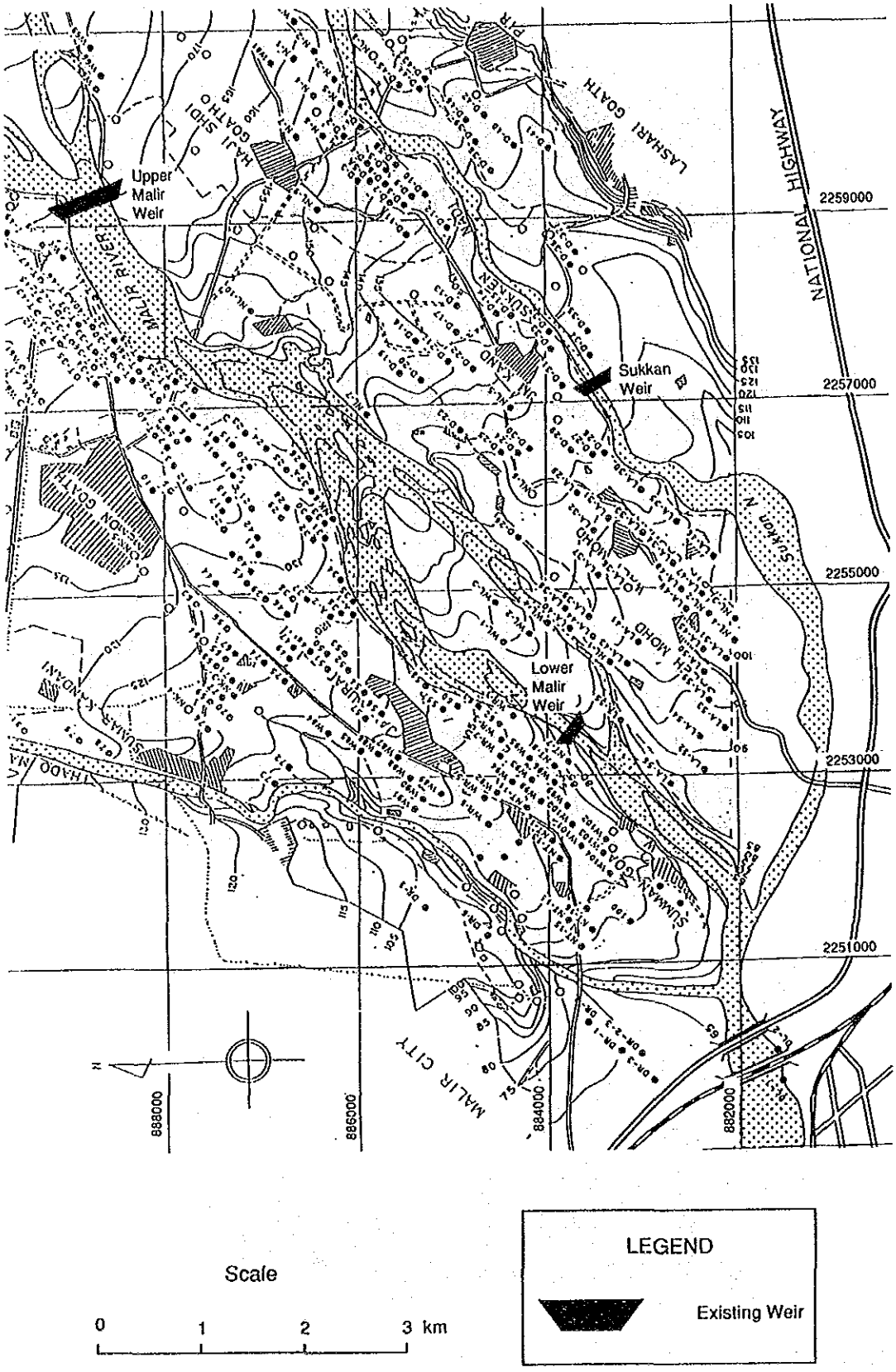

Fig. G.2-6 Location Map of Existing Weir

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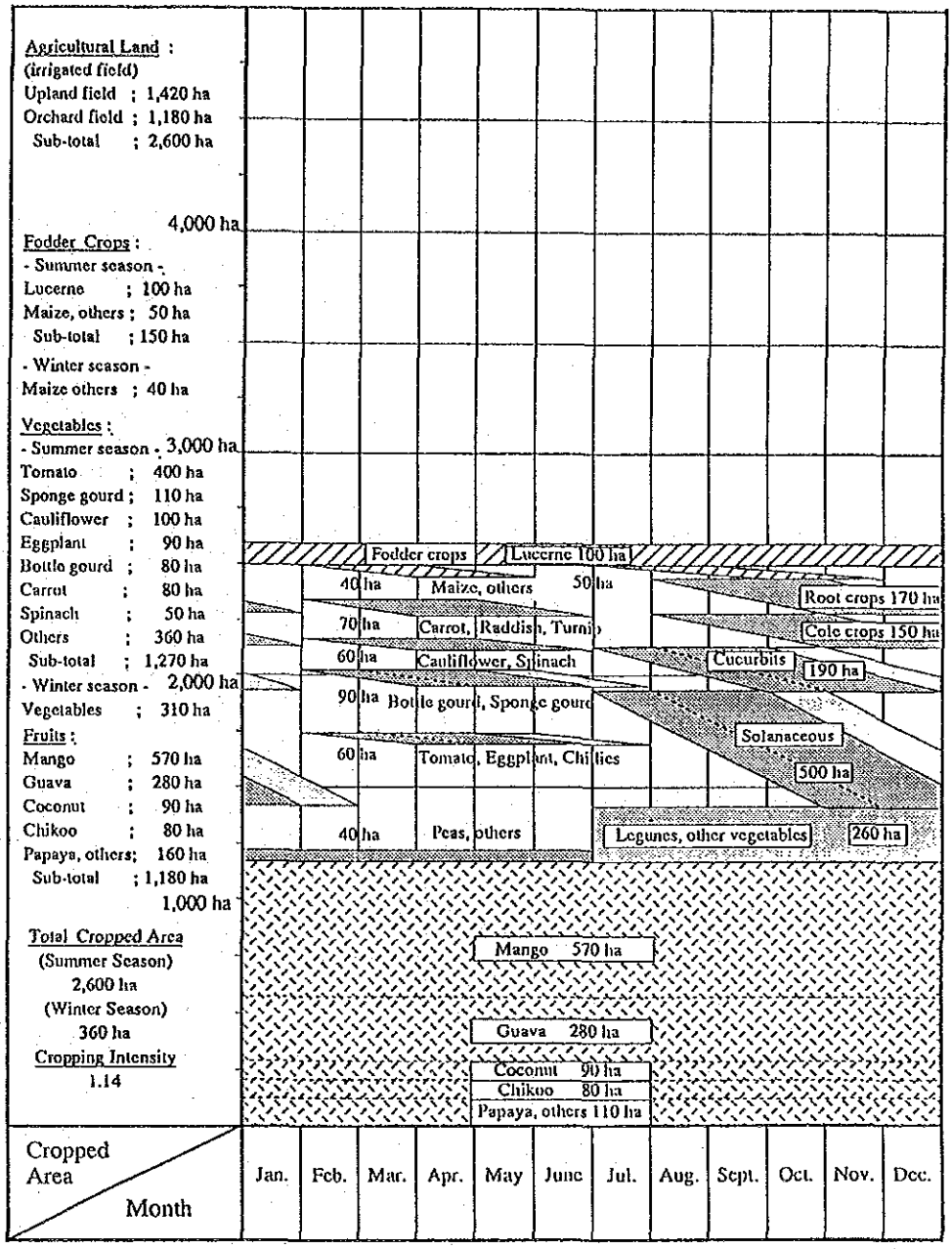

Fig. G.3-1 Present Cropping Pattern and Cropping Intensity

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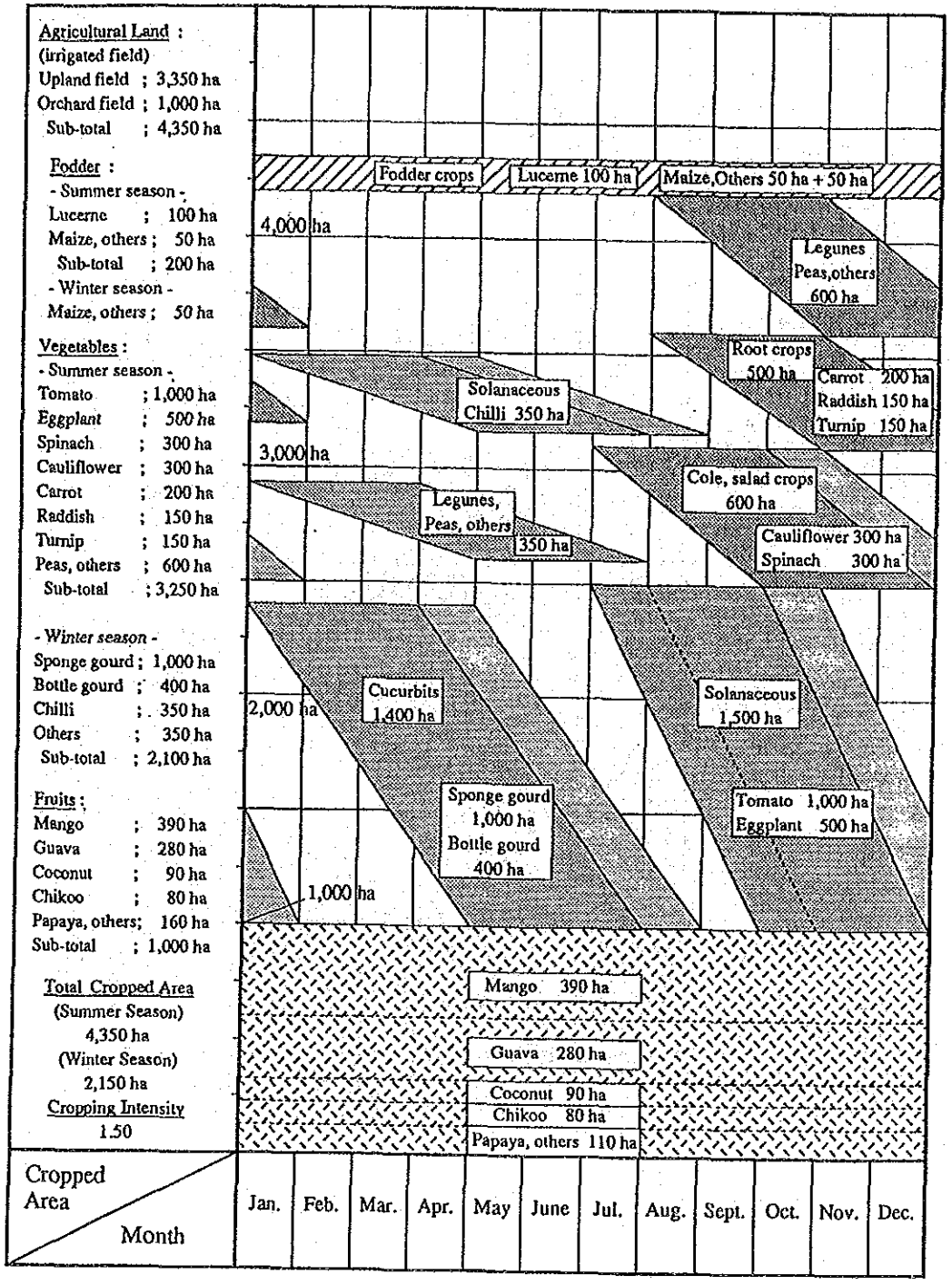

Fig. G.3-2 Proposed Cropping Pattern and Cropping Intensity

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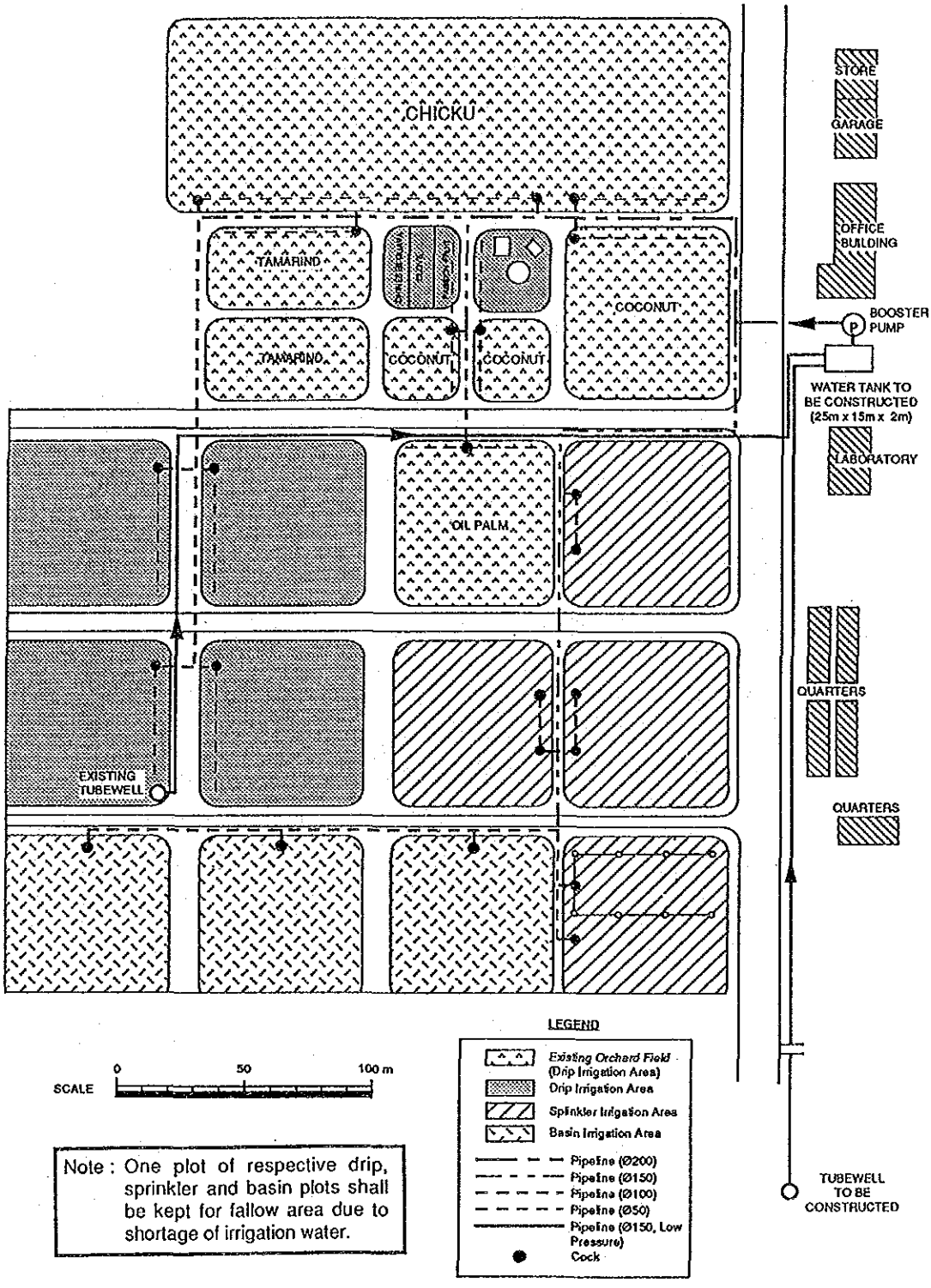

Note : One plot of respective drip, sprinkler and basin plots shall be kept for fallow area due to shortage of irrigation water.

Fig. G.4-1 General Layout of Pilot Demonstration Farm

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