I.4 Social Impact Assessment

(1) Increase in employment opportunity

The project implementation will increase employment opportunity at several phases in the Project area. The increase in cropping area and agricultural productivity will require more farm labor inputs of which annual incremental requirement in the future (W) project condition is estimated at 7.37 million man-day (additional 24,600 persons' employment as for 300 working days). The project works will accrue construction labor employment of 8.6 million man-day in seven years (1.23 million man-day per year). In addition, increased production will accelerate agro-based industries and marketing activities which will increase employment opportunity.

(2) Improvement of regional transportation

Beside the direct benefit from farm road development, traffic condition outside the Project area will be improved by easy accessibility to D. I. Khan city and other regional markets and prospective road network linked with the project road along the main canal.

(3) Impact of Project growth center

The Project will cover the construction of 25 growth centers at the respective head of distributary covering administration, education, health, processing, marketing, recreation functions. Social and economic impacts through promotion of agriculture and agro-based industries, improvement of medical and educational services, settlement of young generation in the area, etc. will be expected by the center development.

(4) Increase in land value and enlargement of income disparity

Financial value of farm and residential land will be suddenly increased by the Project implementation. It will increase the value of land assets as a mortgage and the large land owners will have more monetary power in the future. On the contrary, small farmers will be hard to acquire farm lands due to increase in land prices. It is assumed that income disparity between small and large farmers be enlarged. Promotion of agrarian reform, especially the land transfer of absentees to small and tenant farmers, improvement of leasehold tenancy (change from present share tenancy to fixed rent), increase in non-agricultural year-round employment, etc. will be indispensable for the Project implementation. In order to assure status and rights of tenant and small scale farmers as members of farmer association and to be fully involved in the association's activities, special support services are also important.

TABLES

Table I.2.2.1 Economic Price Structure for Wheat, 2005 (Import Substitution Value, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Wheat
1 Projected price Canadian No.1, Western red spring /_a		US$/ton	154
2 Ocean freight and insurance	+	US$/ton	30
3 CIF Karachi price	=	US$/ton	184
US$=Rs.	30.0	Rs./ton	5,520
4 Port charge, storage and other cost /_b	+	Rs./ton	467
5 Rail/road transport, Karachi-D.I.Khan /_c	+	Rs./ton	552
6 NWFP incidental costs with imported wheat /_b	+	Rs./ton	38
7 Value of imported wheat in D.I.Khan	=	Rs./ton	6,577
8 Transport and handling cost (threshing floor-procurement center /_d	-	Rs./ton Rs./ton	77
9 Farm gate price/threshing floor value of wheat	=	Rs./ton	6,500

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Food Department, Peshawar, NWFP
/_c Food Department, D.I.Khan, NWFP
/_d JICA Market Survey

Table I.2.2.2 Economic Price Structure for Maize, 2005 (Import Substitution Value, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Corn
1 US No.2 Yellow Corn, FOB Gulf ports /_a		US$/ton	95
2 Ocean freight and insurance	+	US$/ton	30
3 CIF Karachi price	=	US$/ton	125
US$=Rs.	30.0	Rs./ton	3,750
4 Port charge, storage and other cost /_b	+	Rs./ton	467
5 Rail/road transport, Karachi-D.I.Khan /_c	+	Rs./ton	552
6 Value of imported corn in D.I.Khan	=	Rs./ton	4,769
7 Transport and handling cost(farm gate - market) /_d	-	Rs./ton	77
8 Farm gate price	=	Rs./ton	4,692

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Food Department, Peshawar, NWFP
/_c Food Department, D.I.Khan, NWFP
/_d JICA Market Survey

Table I.2.2.3 Economic Price Structure for Cotton, 2005 (Export Partity Price, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Wheat
1 Projected price Outlook "A" Index, Middling, CIF Europe /_a		US$/ton	1,530
2 Quality difference (14% of CIF price)	-	US$/ton	214
3 Ocean freight and insurance	-	US$/ton	79
4 FOB Karachi price	=	US$/ton	1,237
US$=Rs.	30.0	Rs./ton	37,110
5 Port handling, warehousing, procurement and other costs /_b	-	Rs./ton	1,967
6 Value of lint, ginnery gate	=	Rs./ton	35,143
7 Value of lint component	34.0%	Rs./ton	11,949
8 Value of cotton seed (62% yield) /_c	+	Rs.	3,073
9 Ginning cost /_d	-	Rs./ton	1,125
10 Value of seed cotton at ginnery gate	=	Rs./ton	13,897
11 Transport and handling cost (farm gate-factory) /_d	-	Rs./ton	95
12 Farm gate price of seed cotton	=	Rs./ton	13,802

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Cotton Export Corporation of Pakistan
/_c Based on economic price of cotton seed /_d JICA Market Survey

Table I.2.2.4 Economic Price Structure for Cotton Seed, 2005 (Import Substitution Value, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Wheat
1 Projected price, Soyabean oil Dutch Crude, FOB /_a		US$/ton	422
2 Quality difference (50% of FOB price)	+	US$/ton	211
3 Ocean freight and insurance	+	US$/ton	38
4 CIF Karachi price	=	US$/ton	671
US$=Rs.	30.0	Rs./ton	20,130
5 Port handling, warehousing, procurement and other costs /_b	+	Rs./ton	1,057
6 Transport, handling, and other costs, Karachi - Oil mill in D.I.Khan /_c	+	Rs./ton	563
7 Ex-mill value of cotton seed oil	=	Rs./ton	21,750
8 Conversion from oil to cotton seed	10%	Rs./ton	2,175
9 By-product (cotton seed cake, 85%)	+	Rs.	3,101
10 Crushing and transport cost	-	Rs./ton	320
11 Ex-ginnery value of cotton seed	=	Rs./ton	4,956

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Trade Corporation of Pakistan (Estimated at 5.25% of CIF excluding transfer payment
/_c JICA Market Survey
/_d Market cake price of Rs. 4,054/ton is adjusted by SCF of 0.9.

Table I.2.2.5 Economic Price Structure for Sunflower Seed, 2005 (Import Substitution Value, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Wheat
1 Projected price, Soyabean oil Dutch Crude, FOB /_a		US$/ton	422
2 Quality difference (5% of FOB price)	+	US$/ton	21
3 Ocean freight and insurance	+	US$/ton	36
4 CIF Karachi price	=	US$/ton	479
US$=Rs.	30.0	Rs./ton	14,370
5 Port handling, warehousing, procurement and other costs /_b	+	Rs./ton	754
6 Transport, handling, and other costs, Karachi - Oil mill in D.I.Khan /_c	+	Rs./ton	563
7 Ex-mill value of sunoil	=	Rs./ton	15,687
8 Conversion from sunoil to sunflower seed	34%	Rs./ton	5,334
9 By-product (meal per ton of sunflower seed) /_c	+	Rs./ton	2,700
10 Oil extraction cost /_c	-	Rs./ton	1,107
11 Farm gate price of sunflower seed	=	Rs./ton	6,927

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Trade Corporation of Pakistan (Estimated at 5.25% of CIF excluding transfer payment.
/_c JICA Market Survey
/_d National Oilseeds Development Board, Ministry of Agriculture
Market meal price of Rs. 3,000/ton is adjusted by SCF of 0.9.

Table I.2.2.6 Economic Price Structure for Sugar, 2005 (1994 Constant Price)

Item	Operation	Unit	Year 2005 Price Wheat
I. Import Substitution Value			
1 Projected price ISA daily price, FOB and stowed at greater Caribbean ports /_a		US$/ton	313
2 Ocean freight and insurance	+	US$/ton	31
3 CIF Karachi price	=	US$/ton	344
US$=Rs.	30.0	Rs./ton	10,320
4 Port charge, handling, sampling, and	+	Rs./ton	617
5 Road transportand handling cost, Ka	+	Rs./ton	563
6 Ex-mill value of sugar	=	Rs./ton	11,500
7 Processing cost per ton of sugar	-	Rs./ton	2,932
8 Conversion to sugar cane	8.4%	Rs./ton	720
9 Transport and handling cost (farm g:	-	Rs./ton	77
10 Farm gate price	=	Rs./ton	643
II. Export Parity Price			
1 Projected price ISA daily price, FOB and stowed at greater Caribbean ports /_a		US$/ton	313
2 Ocean freight and insurance	-	US$/ton	31
3 FOB Karachi price	=	US$/ton	282
US$=Rs.	30.0	US$/ton	8,460
4 Port charge, handling, sampling, and	-	Rs./ton	534
5 Road transportand handling cost, Ka	-	Rs./ton	315
6 Ex-mill value of sugar	=	Rs./ton	7,611
7 Processing cost per ton of sugar	-	Rs./ton	2,932
8 Conversion to sugar cane	8.4%	Rs./ton	393
9 Transport and handling cost (farm g:	-	Rs./ton	77
10 Farm gate price	=	Rs./ton	316
III. Average Value		Rs./ton	480

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Trading Corporation of Pakistan (Included storage losses with 0.5% of CIF price)
/_c JICA Market Survey

Table I.2.2.7 Economic Price Structure for Fertilizer, 2005 (Import Substitution Value, 1994 Constant Price)

Item	Operation	Unit	Year 2005 Price
I. UREA			
1. Bagged price, FOB N.W. Europe/_a		US$/ton	148
2. Ocean freight and insurance	+	US$/ton	25
3. CIF Karachi price	=	US$/ton	173
US$=Rs.	30.0	Rs./ton	5,190
4. Port charge, handling and warehousing, etc./_b	+	Rs./ton	170
5. Transport and handling cost, Karachi - D.I.Khan/_c	+	Rs./ton	586
6. Marketing and dealers' cost/_a	+	Rs./ton	117
7. Transport and handling cost, dealer - farmer/_d	+	Rs./ton	77
8. Farm gate price	=	Rs./ton	6,140
(Nutrient ; Nitrogen)	46%	Rs./kg	13.3
(Ammonium Sulfate)	21%	Rs./kg	2.8
II. TSP			
1. Bulk export price, FOB US Gulf ports/_a		US$/ton	137
2. Ocean freight and insurance	+	US$/ton	40
3. CIF Manila price/_2	=	US$/ton	177
US$=Rs.	30.0	Rs./ton	5,310
4. Port charge, handling and warehousing, etc./_b	+	Rs./ton	170
5. Transport and handling cost, Karachi - D.I.Khan/_c	+	Rs./ton	586
6. Marketing and dealers' cost/_a	+	Rs./ton	117
7. Transport and handling cost, dealer - farmer/_d	+	Rs./ton	77
8. Farm gate price	=	Rs./ton	6,260
(Nutrient ; Phosphorus)	46%	Rs./kg	13.6
III. MURIATE OF POTASH			
1. Bulk export price, FOB Vancouver/_1		US$/ton	109
2. Ocean freight and insurance	+	US$/ton	53
3. CIF Manila price/_2	=	US$/ton	162
US$=Rs.	30.0	Rs./ton	4,860
4. Port charge, handling and warehousing, etc./_b	+	Rs./ton	170
5. Transport and handling cost, Karachi - D.I.Khan/_c	+	Rs./ton	586
6. Marketing and dealers' cost/_a	+	Rs./ton	117
7. Transport and handling cost, dealer - farmer/_d	+	Rs./ton	77
8. Farm gate price	=	Rs./ton	5,810
Ajusted to Sulfate of Potash		Rs./ton	4,842
(Nutrient ; Potassium)	60%	Rs./kg	9.7

Note : /_a Based on World Bank Price Prospects for Major Primary Commodities, 1994-2005(June, 1994)
/_b Fertilizer Imports Department, Ministry of Food and Agriculture, Karachi
/_c National Logistic Cell (NLC), Karachi
/_d JICA Marketing Survey

Table I.2.2.8 Financial and Economic Farm Gate Prices of Agricultural Inputs and Outputs

OUTPUTS			
Item	Unit	1994 Financial Price	2005 Economic Price
Cereals			
Wheat	Rs./kg	3.50	6.50
Maize(seed)	Rs./kg	4.33	4.69
Maize(seed/fodder)	Rs./kg	4.02	4.35
Bajra (Millet)	Rs./kg	4.86 =	4.86
Jowar (Sorghum)	Rs./kg	4.18	4.18
Barley	Rs./kg	3.40 =	3.40
Pulses			
Mung (whole)	Rs./kg	9.45 =	9.45
Gram Black (whole)	Rs./kg	9.92 =	9.92
Oil Seeds			
Rape and Mustard	Rs./kg	7.60 =	7.60
Sunflower	Rs./kg	7.00	6.93
Sugarcane	Rs./kg	0.35	0.48
Seed Cotton	Rs./kg	9.80	13.80
Vegetables			
Brinjals (Eggplant)	Rs./kg	3.17 =	3.17
Cauliflower	Rs./kg	3.36 =	3.36
Fruits			
Mangoes	Rs./kg	10.25 =	10.25
Fodder			
Fodder (Maize)	Rs./kg	0.13 =	0.13
Fodder (Berseem)	Rs./kg	0.25 =	0.25
Fodder (Millet/Sorghum)	Rs./kg	0.20 =	0.20
Guara	Rs./kg	4.00 =	4.00
By-Products			
Wheat Straw	Rs./kg	0.50 =	0.50
Maize	Rs./kg	0.20 =	0.20
Mung	Rs./kg	0.25 =	0.25
Gram	Rs./kg	0.20 =	0.20
Cooton	Rs./kg	0.25 =	0.25

OUTPUTS			
Item	Unit	1994 Financial Price	2005 Economic Price
Seed/Seedling			
Wheat	Rs./kg	5.90 =	5.90
Maize	Rs./kg	4.64 =	4.64
Bajra (Millet)	Rs./kg	7.95 =	7.95
Jowar (Sorghum)	Rs./kg	8.08 =	8.08
Barley	Rs./kg	4.50 =	4.50
Mung	Rs./kg	12.00 =	12.00
Gram Black	Rs./kg	12.00 =	12.00
Rape and Mustard	Rs./kg	12.00 =	12.00
Sunflower	Rs./kg	20.00 =	20.00
Sugarcane	Rs./kg	0.45 =	0.45
Cotton	Rs./kg	8.25 =	8.25
Brinjals (Eggplant)	Rs./kg	400.00 =	400.00
Cauliflower	Rs./kg	450.00 =	450.00
Mangoes	Tree	30.00 =	30.00
Fodder (Berseem)	Rs./kg	25.00 =	25.00
Guara	Rs./kg	5.25 =	5.25
Fertilizer			
Urea	Rs./kg	4.68	6.14
TSP	Rs./kg	3.92	6.26
SOP	Rs./kg	3.90	4.84
Agro-chemical			
Insecticide	Rs./kg	35.00 =	35.00
Pesticide	Rs./lit.	250.00 =	250.00
Labor	Rs./day	50.00	44.00
Machinery and Animal Power			
Land preparation	Rs./hour	75.00 =	75.00
Drill for sowing	Rs./hour	75.00 =	75.00
Threshing by tractor	Rs./hour	70.00 =	70.00

Table I.2.2.9 Economic Crop Budget under without Project Condition (1/2)

Items	Unit	- WHEAT - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)	- SORGHUM - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)
GROSS RETURN															
Production	(kg)	6.50	950	6,175	970	6,305	2,020	13,130	4.18	700	2,926	740	3,093	790	3,302
By Products (straw)	(kg)	0.50	1,045	523	1,067	534	2,222	1,111							
				6,698		6,839		14,241			2,926		3,093		3,302
PRODUCTION COST															
Farm Inputs															
1. Seeds	(kg)	5.99	74.2	438	88.8	524	91.5	540	8.06	19.8	160	20.3	164	29.5	238
2. FYM/Compost	(tons)	50							50						
3. Fertilizer															
- Urea (N : 46%)	(kg)	6.14					150	921	6.14						
- TSP (P : 46%)	(kg)	6.26					125	783	6.26						
- SOP (K : 50%)	(kg)	4.84							4.84						
4. Agro-chemicals															
- Insecticides	(kg)	35							35						
- Pesticide	(lit.)	250							250						
Sub-total				438		524		2,242			160		164		238
Machinery and Animal Power															
1. Land preparation	(hrs)	75.0	3.2	240	3.2	240	7.5	563	75.0	2.4	180	2.9	218	5.1	383
2. Drill for sowing	(hrs)	75.0	3.0	225	3.0	225	3.0	225	75.0						
3. Threshing by tractor	(hrs)	70.0	2.0	140	2.4	168	5.2	364	70.0						
Sub-total				605		633		1,152			180		218		383
Labor	(man-day)	44	11.0	484	14.0	616	22.0	968	44	7.0	308	9.0	396	11.0	484
Miscellaneous															
5 % of above cost				76		89		218			32		39		55
Total Production Cost				1,603		1,862		4,581			680		816		1,159
Net Return per Ha	(Rs.)			5,094		4,977		9,660			2,246		2,277		2,142

Items	Unit	- OILSEED (Mustard) - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)	- MILLET - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)
GROSS RETURN															
Production	(kg)	7.60	500	3,800	530	4,028	540	4,104	4.86	750	3,645	770	3,742	780	3,791
By Products (straw)	(kg)								0.20	1,125	225	1,155	231	1,170	234
				3,800		4,028		4,104			3,870		3,973		4,025
PRODUCTION COST															
Farm Inputs															
1. Seeds	(kg)	12.00	10.8	130	8.5	102	8.7	104	7.95	17.4	138	15.9	126	23.7	188
2. FYM/ Compost	(tons)	50							50						
3. Fertilizer															
- Urea (N : 46%)	(kg)	6.14							6.14						
- TSP (P : 46%)	(kg)	6.26							6.26						
- SOP (K : 50%)	(kg)	4.84							4.84						
4. Agro-chemicals															
- Insecticides	(kg)	35							35						
- Pesticide	(lit.)	250							250						
Sub-total				130		102		104			138		126		188
Machinery and Animal Power															
1. Land preparation	(hrs)	75.0	2.5	188	5.0	375	5.3	398	75.0	2.1	158	4.4	330	5.4	405
2. Drill for sowing	(hrs)	75.0							75.0						
3. Threshing by tractor	(hrs)	70.0							70.0						
Sub-total				188		375		398			158		330		405
Labor	(man-day)	44	11.0	484	12.0	528	13.0	572	44	8.0	352	12.0	528	18.0	792
Miscellaneous															
5 % of above cost				40		50		54			32		49		69
Total Production Cost				841		1,055		1,128			680		1,034		1,455
Net Return per Ha	(Rs.)			2,959		2,973		2,976			3,190		2,940		2,570

Items	Unit	- GRAM - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)	- GUARA - Unit Price	Rainfed Area Quantity	Rainfed Area Amount (Rs.)	Red Kohi Area Quantity	Red Kohi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)
GROSS RETURN															
Production	(kg)	9.92	600	5,952	600	5,952	640	6,349	4.00	1,500	6,000	1,630	6,520	1,900	7,600
By Products (straw)	(kg)														
				5,952		5,952		6,349			6,000		6,520		7,600
PRODUCTION COST															
Farm Inputs															
1. Seeds	(kg)	12.00	46.3	556	43.2	518	50.0	600	5.25	18.9	99	20.0	105	20.0	105
2. FYM/ Compost	(tons)	50							50						
3. Fertilizer															
- Urea (N : 46%)	(kg)	6.14							6.14						
- TSP (P : 46%)	(kg)	6.26							6.26						
- SOP (K : 50%)	(kg)	4.84							4.84						
4. Agro-chemicals															
- Insecticides	(kg)	35							35						
- Pesticide	(lit.)	250							250						
Sub-total				556		518		600			99		105		105
Machinery and Animal Power															
1. Land preparation	(hrs)	75.0	5.7	428	5.7	428	6.3	474	75.0	5.7	428	5.7	424	6.1	471
2. Drill for sowing	(hrs)	75.0	2.2	165	2.2	165	2.5	188	75.0	2.0	150	2.0	150	2.5	188
3. Threshing by tractor	(hrs)	70.0							70.0						
Sub-total				593		593		662			578		574		659
Labor	(man-day)	44	10.0	440	10.0	440	15.0	660	44	25.0	1,100	30.0	1,320	30.0	1,320
Miscellaneous															
5 % of above cost				79		79		95			89		100		126
Total Production Cost				1,668		1,629		2,016			1,866		2,103		2,651
Net Return per Ha	(Rs.)			4,284		4,324		4,333			4,134		4,417		4,949

Source : February, 1993 by the JICA Team

Note : Harvesting and threshing cost calculated based on contract basis as 1/10th of the yield

Table I.2.2.9 Economic Crop Budget under without Project Condition (2/2)

Items	Unit	- RABI VEGETABLES - Unit Price	Red Kobi Area Quantity	Red Kobi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)	- COTTON - Unit Price	Red Kobi Area Quantity	Red Kobi Area Amount (Rs.)	Irrigation Area Quantity	Irrigation Area Amount (Rs.)
GROSS RETURN											
Production	(kg)	3.36	4,000	13,440	4,200	14,112	13.80	1,300	17,940	1,540	21,252
By Products (straw)	(kg)						0.25	650	163	770	193
				13,440		14,112			18,103		21,445
PRODUCTION COST											
Farm Inputs											
1. Seeds	(kg)	450	7.0	3,150	7.0	3,150	8.25	40.0	330	40.0	330
2. FYM/ Compost	(tons)	50					50				
3. Fertilizer											
- Urea (N : 46%)	(kg)	6.14					6.14	125	768	125	768
- TSP (P : 46%)	(kg)	6.26					6.26				
- SOP (K : 50%)	(kg)	4.84					4.84				
4. Agro-chemicals											
- Insecticides	(kg)	35					35				
- Pesticide	(lit.)	250					250	1	250	2	500
Sub-total				3,150		3,150			1,348		1,598
Machinery and Animal Power											
1. Land preparation	(hrs)	75.0	5.0	375	5.0	375	75.0	7.0	525	7.0	525
2. Drill for sowing	(hrs)	75.0					75.0				
3. Threshing by tractor	(hrs)	70.0					70.0				
Sub-total				375		375			525		525
Labor	(man-day)	44	65.0	2,860	68.0	2,992	44	65.0	2,860	70.0	3,080
Miscellaneous											
5 % of above cost				319		326			237		260
Total Production Cost				6,704		6,843			4,969		5,463
Net Return per Ha	(Rs.)			6,736		7,269			13,133		15,982

Items	Unit	- RABI FODDER - Unit Price	Irrigated Area Quantity	Irrigated Area Amount (Rs.)	- KARIF FODDR - Unit Price	Irrigated Area Quantity	Irrigated Area Amount (Rs.)	- KHARIF VEGETABLES - Unit Price	Red Kobi Area Quantity	Red Kobi Area Amount (Rs.)	Irrigated Area Quantity	Irrigated Area Amount (Rs.)
GROSS RETURN												
Production	(kg)	0.25	13,300	3,325	0.20	11,860	2,372	3.17	2,200	6,974	2,400	7,608
By Products (straw)	(kg)											
				3,325			2,372			6,974		7,608
PRODUCTION COST												
Farm Inputs												
1. Seeds	(kg)	25.00	15	385	4.64	19.6	91	400.00	3.0	1,200	3.0	1,200
2. FYM/ Compost	(tons)	50			50			50				
3. Fertilizer												
- Urea (N : 46%)	(kg)	6.14			6.14			6.14				
- TSP (P : 46%)	(kg)	6.26			6.26			6.26				
- SOP (K : 50%)	(kg)	4.84			4.84			4.84				
4. Agro-chemicals												
- Insecticides	(kg)	35			35			35				
- Pesticide	(lit.)	250			250			250				
Sub-total				385			91			1,200		1,200
Machinery and Animal Power												
1. Land Preparation	(hrs)	75.0	6.1	458	75.0	6.1	458	75.0	5.0	375	5.0	375
2. Drill for sowing	(hrs)	75.0			75.0			75.0				
3. Threshing by tractor	(hrs)	70.0			70.0			70.0				
Sub-total				458			458			375		375
Labor	(man-day)	44	31.0	1,408	44	75.0	1,100	44	48.0	2,112	53.0	2,332
Miscellaneous												
5 % of above cost				113			82			184		192
Total Production Cost				2,363			1,731			3,871		4,102
Net Return per Ha	(Rs.)			962			641			3,103		3,506

Items	Unit	-MUNG BEANS - Unit Price	Irrigated Area Quantity	Irrigated Area Amount (Rs.)	- MAIZE - Unit Price	Irrigation Area Quantity	Irrigation Area Amount (Rs.)	- SUGARCANE - Unit Price	Irrigated Area Quantity	Irrigated Area Amount (Rs.)	- Fruit (mango) - Unit Price	Irrigated Area Quantity	Irrigated Area Amount (Rs.)	NPV 10% (Rs.)
GROSS RETURN														
Production	(kg)	9.45	520	4,914	4.35	630	2,741	0.48	35.55	17,064	10.25	13,000	133,250	
By Products (straw)	(kg)				0.20	945	189							
				4,914			2,930			17,064			133,250	(6,760)
													(6,760)	
PRODUCTION COST														
Farm Inputs														
1. Seeds	(kg)	12.00	50.0	600	4.64	36.8	171	0.45	7,950	3,578	30.00	51.0	1,530	
2. FYM/ Compost	(tons)	50			50			50			50.0	15.0	750	
3. Fertilizer														
- Urea (N : 46%)	(kg)	6.14			6.14	125	768	6.14	225	1,382	6.14	1,600	9,824	
- TSP (P : 46%)	(kg)	6.26			6.26			6.26	150	939	6.26	1,200	7,512	
- SOP (K : 50%)	(kg)	4.84			4.84			4.84			4.84	800	3,872	
4. Agro-chemicals														
- Insecticides	(kg)	35			35			35			35	400	14,000	
- Pesticide	(lit.)	250			250			250	1		250	16	4,000	
Sub-total				600			938			5,899			41,488	(1,800)
Machinery and Animal Power														
1. Land Preparation	(hrs)	75.0	6.1	473	75.0	5.8	435	75.0	4.9	368	75.0	10.0	750	
2. Drill for sowing	(hrs)	75.0	2.5	188	75.0			75.0	5.3	371	75.0			
3. Threshing by tractor	(hrs)	70.0	6.0	420	70.0			70.0			70.0			
Sub-total				1,080			435			739			750	(420)
Labor	(man-day)	44	15.0	669	44	16.8	742	44	58.0	2,552	44	47.0	2,068	(1,120)
Miscellaneous														
5 % of above cost				113			109			439			2,215	(150)
Total Production Cost				2,457			2,224			9,648			46,321	(3,070)
Net Return per Ha	(Rs.)			2,457			706			7,416	10 years =		86,929	(3,070)

Source : Farm survey, 1993 by the JICA Team

Note : Harvesting and threshing cost calculated based on contract basis as 1/10th of the yield

Table I.2.2.10 Economic Net Crop Production Value under without Project Condition

Items CCA 101,800 ha	Irrigated Area			Rod Kohi Area			Rainfed Area			Total Area		
	Cropping Area (ha)	Unit Production Value (Rs./ha)	Total Production Value (Rs. ,000)	Cropping Area (ha)	Unit Production Value (Rs./ha)	Total Production Value (Rs. ,000)	Cropping Area (ha)	Unit Production Value (Rs./ha)	Total Production Value (Rs. ,000)	Cropping Area (ha)	Unit Production Value* (Rs./ha)	Net Production Value (Rs. ,000)
Kharif Season Crops												
Sorghum	10	2,142	21.4	1,310	2,277	2,982.9	1,120	2,246	2,515.5	2,440	2,260	5,519.8
Millet	10	2,570	25.7	1,010	2,940	2,969.4	1,370	3,190	4,370.3	2,390	3,080	7,365.4
Maize	20	656	13.1	0	0	0.0	82 0	0	0.0	20	660	13.1
Pluses	10	2,457	24.6	0	0	0.0	0 0	0	0.0	10	2,460	24.6
Sugarcane	30	0	0.0	0	0	0.0	0	0	0.0	30	0	
Cotton	40	15,982	639.3	20	13,133	262.7	0	0	0.0	60	15,030	901.9
Fodder	10	641	6.4	0	0	0.0	0	0	0.0	10	640	6.4
Guara	10	4,949	49.5	70	4,417	309.2	130	4,134	537.4	210	4,270	896.1
Vegetables (Eggplant)	10	3,506	35.1	20	3,103	62.1	0	0	0.0	30	3,240	97.1
Sub-total	150		815.1	2,430		6,586.2	2,702		7,423.2	5,200		14,824.5
Rabi Season Crops												
Wheat	650	9,660	6,279.0	4,900	4,977	24,387.3	2,950	5,094	15,027.3	8,500	5,380	45,693.6
Pulses (Gram)	160	4,333	693.3	1,970	4,324	8,518.3	2,150	4,284	9,210.6	4,280	4,300	18,422.2
Oilseeds (Rape/Mustard)	20	2,976	59.5	1,380	2,973	4,102.7	1,000	2,959	2,959.0	2,400	2,970	7,121.3
Sugarcane	30	8,716	261.5	0	0	0.0	0	0	0.0	30	8,720	261.5
Fodder (Berseem)	60	962	57.7	0	0	0.0	0	0	0.0	60	960	57.7
Fruits	5	3,670	18.4	10	3,670	36.7	0	0	0.0	15	3,670	55.1
Vegetables, others	5	7,269	36.3	10	6,736	67.4	0	0	0.0	15	6,910	103.7
Sub-total	930		7,405.7	8,270		37,112.4	6,100		27,196.9	15,300		71,715.0
Kharif Season Crops	150		815.1	2,430		6,586.2	2,702		7,423.2	5,200		14,824.5
Rabi Season Crops	930		7,405.7	8,270		37,112.4	6,100		27,196.9	15,300		71,715.0
Total	1,080		8,220.7	10,700		43,698.6	8,802		34,620.1	20,500		86,539.4

Remarks Ref. Table I.2, *) ; Weighted average of unit production value

Table I.2.2.11 Economic Crop Budget under with Project Condition

Items	Unit	Wheat Unit Price	Wheat Quantity	Wheat Amount (Rs.)	Maize Unit Price	Maize Quantity	Maize Amount (Rs.)	Maize (seed) Unit Price	Maize (seed) Quantity	Maize (seed) Amount (Rs.)	Pulses (Mung) Unit Price	Pulses (Mung) Quantity	Pulses (Mung) Amount (Rs.)	Pulses (Gram) Unit Price	Pulses (Gram) Quantity	Pulses (Gram) Amount (Rs.)
GROSS RETURN																
Production	(kg)	6.50	4,000	26,000	4.35	3,500	15,225	4.69	3,500	16,415	9.45	2,000	18,900	9.92	2,000	19,840
By Products (straw)	(kg)	0.50	4,400	2,200	0.20	5,250	1,050	0.20	5,250	1,050	0.25	1,000	250	0.20	1,000	200
			(x 1.1)	28,200		(x 1.5)	16,275		(x 1.5)	17,465		(x 0.5)	19,150		(x 0.5)	20,040
PRODUCTION COST																
Farm Inputs																
1. Seeds	(kg)	5.90	100.0	590	4.64	30.0	139	4.64	30.0	139	12.0	100.0	1,200	12.0	60.0	720
2. FYM/ Compost	(tons)	50	5.0	250	50	5.0	250	50	5.0	250	50			50		
3. Fertilizer																
- Urea (N : 46%)	(kg)	6.14	225	1,382	6.14	200	1,228	6.14	200	1,228	6.14	100	614	6.14	125	768
- TSP (P : 46%)	(kg)	6.26	150	939	6.26	125	783	6.26	125	783	6.26	125	783	6.26	125	783
- SOP (K : 50%)	(kg)	4.84	125	605	4.84			4.84			4.84			4.84	125	605
4. Agro-chemicals																
- Insecticide	(kg)	35	10	350	35	10	350	35	10	350	35	10	350	35	10	350
- Pesticide	(lit.)	250	2	500	250	2	500	250	2	500	250	1	250	250	1	250
Sub-total				4,616			3,250			3,250			3,197			3,475
Machinery and Animal Power																
1. Land preparation	(hrs)	75.0	7.5	563	75.0	7.5	563	75.0	7.5	563	75.0	6.0	450	75.0	6.0	450
2. Drill for sowing	(hrs)	75.0	5.5	413	75.0	5.5	413	75.0	5.5	413	75.0	5.5	413	75.0	5.5	413
3. Threshing by tractor	(hrs)	70.0	7.0	490	70.0			70.0			70.0			70.0		
Sub-total				1,465			975			975			863			863
Labor	(man-day)	44	40.0	1,760	44	40.0	1,760	44	40.0	1,760	44	40.0	1,760	44	40.0	1,760
Miscellaneous																
5 % of above cost				392			299			299			291			305
Total Production Cost				8,233			6,284			6,284			6,110			6,402
Net Return per Ha	(Rs.)			19,967			9,991			11,181			13,040			13,638

Items	Unit	Sugarcane Unit Price	Sugarcane Quantity	Sugarcane Amount (Rs.)	Oilseeds (Rape/mustard) Unit Price	Oilseeds (Rape/mustard) Quantity	Oilseeds (Rape/mustard) Amount (Rs.)	Oilseeds (Sunflower) Unit Price	Oilseeds (Sunflower) Quantity	Oilseeds (Sunflower) Amount (Rs.)	Kharif Fodder (Millet) Unit Price	Kharif Fodder (Millet) Quantity	Kharif Fodder (Millet) Amount (Rs.)	Rabi Fodder (Berseem) Unit Price	Rabi Fodder (Berseem) Quantity	Rabi Fodder (Berseem) Amount (Rs.)
GROSS RETURN																
Production	(kg)	0.48	70,000	33,600	7.60	2,500	19,000	6.93	2,500	17,325	0.20	45,000	9,000	0.25	55,000	13,750
By Products (straw)	(kg)		(40,000)													
			ratoon	33,600 (19,200)			19,000			17,325			9,000			13,750
PRODUCTION COST																
Farm Inputs																
1. Seeds	(kg)	0.45	6,000	2,700 *	12.0	7.5	90	20.00	7.5	150	7.95	15.0	119	25.0	20.0	500
2. FYM/ Compost	(tons)	50	5.0	250 *	50			50	5.0	250	50	5.0	250	50	5.0	250
3. Fertilizer																
- Urea (N : 46%)	(kg)	6.14	250	1,535	6.14	150	921	6.14	150	921	6.14	100	614	6.14	100	614
- TSP (P : 46%)	(kg)	6.26	200	1,252	6.26	125	783	6.26	125	783	6.26	50	313	6.26	125	783
- SOP (K : 50%)	(kg)	4.84	150	726	4.84			4.84			4.84			4.84		
4. Agro-chemicals																
- Insecticide	(kg)	35	20	700	35	10	350	35	10	350	35			35	10	350
- Pesticide	(lit.)	250	2	500	250	2	500	250	1	250	250			250	1	250
Sub-total				7,663 (4,713)			2,644			2,704			1,296			2,747
Machinery and Animal Power																
1. Land preparation	(hrs)	75.0	7.5	563 *	75.0	6.0	450	75.0	6.0	450	75.0	7.5	563	75.0	7.5	563
2. Drill for sowing	(hrs)	75.0			75.0	5.5	413	75.0			75.0			75.0		
3. Threshing by tractor	(hrs)	70.0			70.0			70.0			70.0			70.0		
Sub-total				563			863			450			563			563
Labor	(man-day)	44	80.0	3,520 (2,900) *	44	50.0	2,200	44	40.0	1,760	44	30.0	1,320	44	40.0	1,760
Miscellaneous																
5 % of above cost				587			285			246			159			253
				(ratoon)												
Total Production Cost				12,333 7,994			5,991			5,159			3,338			5,322
				2 years average*												
Net Return per Ha	(Rs.)			21,267 11,206	16,237 *		13,009			12,166			5,662			8,428

Items	Unit	Cotton Unit Price	Cotton Quantity	Cotton Amount (Rs.)	Kharif Vegetable Unit Price	Kharif Vegetable Quantity (Egg plant)	Kharif Vegetable Amount (Rs.)	Rabi Vegetables Unit Price	Rabi Vegetables Quantity (Cauliflower)	Rabi Vegetables Amount (Rs.)	Fruits (Mango) Unit Price	Fruits (Mango) Quantity	Fruits (Mango) Amount (Rs.)	Annual Crop Budget NPV 10% (Rs.)	
GROSS RETURN															
Production	(kg)	13.8	2,000	27,600	3.17	10,000	31,700	3.36	15,000	50,400	10.25	40,000	410,000		
By Products (straw)	(kg)	0.25	1,000	250											
			(x 0.5)	27,850			31,700			50,400			410,000	21,575	
PRODUCTION COST															
Farm Inputs															
1. Seeds	(kg)	8.25	25.0	206	400	0.6	240	450	1.5	675	30.00	55.0	1,650		
2. FYM/ Compost	(tons)	50	5.0	250	50	5.0	250	50	5.0	250	50	45.0	2,250		
3. Fertilizer															
- Urea (N : 46%)	(kg)	6.14	200	1,228	6.14	200	1,228	6.14	200	1,228	6.14	4,000	24,560		
- TSP (P : 46%)	(kg)	6.26	125	783	6.26	125	783	6.26	125	783	6.26	3,200	20,032		
- SOP (K : 50%)	(kg)	4.84	50	242	4.84			4.84			4.84	1,600	7,744		
4. Agro-chemicals															
- Insecticide	(kg)	35	20	700	35	100	3,500	35	100	3,500	35	800	28,000		
- Pesticide	(lit.)	250	2	500	250	2	500	250	4	1,000	250	40	10,000		
Sub-total				3,969			6,501			7,436			94,236	4,158	
Machinery and Animal Power															
1. Land preparation	(hrs)	75.0	7.5	563	75.0	7.5	563	75.0	7.5	563	75.0	10.0	750		
2. Drill for sowing	(hrs)	75.0	5.5	413	75.0			75.0			75.0				
3. Threshing by tractor	(hrs)	70.0			70.0			70.0			70.0				
Sub-total				975			563			563			750	33	
Labor	(man-day)	44	55.0	2,420	44	70.0	3,080	44	85.0	3,740	44	602.0	26,488	116,930	
Miscellaneous															
5 % of above cost				365			507			587			6,074	268	
Total Production Cost				7,669			10,651			12,325			127,548	5,628	
Net Return per Ha	(Rs.)			20,181			21,050			38,075		30 years	282,452	15,947	

Source : Farm survey, 1993 by the JICA Team

Note : Harvesting and threshing cost calculated based on contract basis as 1/10th of the yield

Table I.2.2.12 Incremental Economic Net Crop Production Value

Items	CCA 115,600 ha	Without Project: Cropping Area (ha)	Without Project: Net Production Value Per ha (Rs./ha)	Without Project: Net Production Value Total (Rs.'000)	With Project: Cropping Area (ha)	With Project: Net Production Value Per ha (Rs./ha)	With Project: Net Production Value Total (Rs.'000)	Incremental: Cropping Area (ha)	Incremental: N.P. Value (Rs.'000)
Kharif Season Crops									
Sorghum		2,440	2,260	5,520				-2,440	-5,520
Millet		2,390	3,080	7,365				-2,390	-7,365
Maize		20	660	13	23,100	9,991	230,792	23,080	230,779
Pluses		10	2,460	25	5,800	13,040	75,632	5,790	75,607
Cotton		60	15,030	902	11,500	20,181	232,082	11,440	231,180
Fodder		10	640	6	11,500	5,662	65,113	11,490	65,107
Guara		210	4,270	896				-210	-896
Vegetables (Eggplant)		30	3,240	97	3,000	21,050	63,150	2,970	63,053
Sub-total		5,170		14,824	54,900		666,769	49,730	651,944
Rabi Season Crops									
Wheat		8,500	5,380	45,694	52,000	19,967	1,038,284	43,500	992,590
Pulses (Gram)		4,280	4,300	18,422	11,500	13,638	156,837	7,220	138,415
Oilseeds (Rape/Mustard)		2,400	2,970	7,121	11,500	13,009	149,604	9,100	142,482
Sugarcane		30	8,720	262	11,500	16,237	186,726	11,470	186,464
Fodder (Berseem)		60	960	58	11,500	8,428	96,922	11,440	96,864
Fruit (Mango)		15	3,670	55	3,000	15,947	47,841	2,985	47,786
Vegetables		15	6,910	104	3,000	38,075	114,225	2,985	114,121
Sub-total		15,300		71,715	104,000		1,790,438	88,700	1,718,723
Spring Season Crops									
Maize					5,800	11,181	64,850	5,800	64,850
Oilseeds					5,800	12,166	70,563	5,800	70,563
Sub-total					11,600		135,413	11,600	135,413
Kharif Season Crops		5,170		14,824	54,900		666,769	49,730	651,944
Rabi Season Crops		15,300		71,715	104,000		1,790,438	88,700	1,718,723
Spring Season Crops					11,600		135,413	11,600	135,413
Total		20,470		86,540	170,500		2,592,619	150,030	2,506,080
								(Rs./ha)	21,679

Table I.2.3.1 Estimation of Road Development Benefit

1. Assumption (Based on the Survey in Paharpur Area)

(1) Average distance from farmgate/field to local markets
6 km

(2) Transportation Cost

By truck	Rs.	2 /ton/km
By animal	Rs.	25 /ton/km

(3) Distance and Mode of Transportation from farmgate/field to local market

With road development	2 km by animal and 4 km by truck
Without road development	6 km by animal

(4) Distance and Mode of Transportation from farmgate/field to local market

With road development
Rs. 58 /ton/6km
(=Rs.25 x 2 km + Rs.2 x 4 km)

Without road development
Rs. 150 /ton/6km
(=Rs.25 x 6 km)

Difference (saving cost) 92 /ton/6km

2. Estimation of Commodity Traffic Quantity

Crops	Production (ton)	Farm Inputs Per ha(kg)	Area (ha)	Total (ton)
Kharif Season Crops				
Maize	80,850	372	23,100	8,593
Pulses	11,600	336	5,800	1,949
Cotton	23,000	427	11,500	4,911
Fodder	517,500	170	11,500	1,955
Vegetables	30,000	432	3,000	1,296
Rabi Season Crops				
Wheat/Barley	208,000	617	52,000	32,084
Pulses	28,750	321	11,500	3,692
Oilseeds	28,750	294	11,500	3,381
Fodder	632,500	261	11,500	3,002
Sugarcane	632,500	6,627	11,500	76,211
Fruits	30,000	401	3,000	1,203
Vegetable	45,000	435	3,000	1,305
Spring Season Crops				
Maize	20,300	372	5,800	2,158
Oilseeds	14,500	298	5,800	1,728
Total (Input & Output)	2,303,250			143,468 (A)
Consumer goods (10% of A)				14,347
Total Quantity (ton)				2,461,065

3. Road Development Benefit under With Project Condition

	(Rs.'000)
Commodity traffic (B)	226,418
Passenger traffic(10% of B)	22,642
Total Benefit	
Financial	249,060
Economic	224,154

Table I.2.3.2 Estimation of Benefit from Transfer of Rod Kohi Water Right

Items	Rod Kohi Sown Area (ha)	Economic Net Production Value	
		Per ha (Rs./ha)	Total (Rs.'000)
A. Kharif Season Crops			
Sorghum	1,310	2,277	2,983
Millet	1,010	2,940	2,969
Cotton	20	13,133	263
Guara	70	4,417	309
Vegetables	20	3,103	62
B. Rabi Season Crops			
Wheat/Barley	4,900	4,977	24,387
Pulses	1,970	4,324	8,518
Oilseeds	1,380	2,973	4,103
Vegetables	20	6,736	135
Total	10,700		43,729
	Estimated Transferable Benefit (60%)		26,237

Table I.2.3.3 Estimation of Domestic Water Supply Benefit (1/2)

Tehsil / Union Council / Mouza	Total Area (km2)	Year 1993 Popu-lation	No. of House-hold	Average Family Size (/H.hold)	Popu-lation Density (Km2)	Water Supply Facility	Population covered Data from P.H.E.D	Ajusted Popu-lation (A)	Condition	Actually Beneficiary estimated (A)x0.7
1. D.I. Khan										
Paniala										
Paniala Janobi	127.3	7,022	937	7.5	55	I.G	10,839	7,022	Very Bad	0
Band Korai										
Band Korai	35.3	7,211	1,185	6.1	204	D.T	7,010	7,211	-	5,048
Kahliq-Shah	18.9	4,350	665	6.5	230					
Yarik										
Budh	136.7	5,476	953	5.7	40					
Rodikhel	31.9	1,914	316	6.0	60					
Saddra	23.0	1,020	147	6.9	44					
Talgi Rodi Khel	7.3	0	0	0	0					
Yarik	47.2	5,035	876	5.7	107	D.T	19,473	5,035	Normal	3,525
Keach										
Hissam	30.5	2,840	453	6.3	93					
Keach	47.5	4,345	737	5.9	92	S.T	4,294	4,345	Normal	3,042
Muqim Shah	19.5	2,155	328	6.6	111					
Rahman	36.9	1,218	190	6.4	33	D.T	7,794	1,218	-	853
Chakhan										
Chakhan	45.6	2,175	380	5.7	48	C.T	4,468	2,175	Normal	1,523
Durabari	15.7	522	95	5.5	33					
Garah Jamal	16.6	249	41	6.0	15					
Gumal	36.6	2,292	331	6.9	63					
Hayat Korai	13.0	1,430	242	5.9	110					
Jowia Shai	9.9	386	54	7.2	39					
Kalera Chania	4.6	0	0	0	0					
Kot Isa Khan	13.3	1,088	189	5.8	82					
Moor	6.4	187	31	6.0	29					
Pota	22.9	2,563	480	5.3	112	D.T	1,689	1,689	-	1,182
Rakh Chena	2.2	0	0	0	0					
Sikandar Shumali	34.6	315	55	5.7	9	D.T	5,583	315	-	221
Surab Hasar	5.1	37	8	4.5	7					
Yara Manjhi Khel	16.8	543	85	6.4	32					
Zindani										
Akhmed	4.4	522	76	6.9	119					
Bhabh	5.3	0	0	0	0					
Bhoon	1.7	92	14	6.7	54					
Bigwani Janubi	17.8	1,481	224	6.6	83					
Chaddar	5.6	0	0	0	0					
Dad Mehar Baig	0.8	72	14	5.2	90					
Dad Wala Shomali	0.9	350	56	6.2	389					
Dar Wesha	10.3	422	72	5.9	41					
Dikhana	4.9	164	25	6.6	34					
Faqira	4.5	140	25	5.6	31					
Fateh	36.2	2,442	391	6.2	68	D.T	5,884	2,442	-	1,709
Gahroka	1.0	82	12	6.6	83					
Ghafoora	1.0	77	10	7.7	77					
Haindan	18.8	518	88	5.9	28	D.T	5,583	518	-	363
Hasni	8.8	196	32	6.2	22					
Hatoo	2.0	313	56	5.6	157					
Hawasi	1.0	116	21	5.5	116					
Jandi	2.7	611	112	5.4	226					
Khodka	3.2	529	77	6.8	165					
Khuthi	37.2	1,406	213	6.6	38					
Loke	13.9	456	74	6.1	33					
Mapal Janubi	1.9	63	14	4.6	33					
Mapal Shumali	2.7	0	0	0	0					
Naurang Dau	1.7	113	18	6.2	67					
Naurang Otra	7.2	352	59	6.0	49					
Nawab Patafi	1.7	0	0	0	0					
Ruk Nau	8.7	952	131	7.3	109					
Sewang	9.2	302	50	6.1	33					
Sheru Kolma	7.2	1,479	333	4.4	205					
Sheru Nau	8.1	724	116	6.2	89					
Solma Shah	0.7	50	8	5.9	71					
Taj	4.4	458	67	6.8	104					
Tali	1.0	262	53	4.9	262					
Zindani	27.4	1,218	238	5.1	45	D.T	7,249	1,218	Very Bad	0

Table I.2.3.3 Estimation of Domestic Water Supply Benefit (2/2)

(Cont.)

Tehsil / Union Council / Mouza	Total Area (km2)	Year 1993 Popu-lation	No. of House-hold	Average Family Size (/H.hold)	Popu-lation Density (Km2)	Water Supply Facility	Population covered Data from P.H.E.D	Ajusted Popu-lation	Condition	Actually Beneficiary estimated
Lunda Sharif										
Adha Khiara	9.6	278	45	6.1	29					
Adil Sipra	25.2	1,642	272	6.0	65	D.T	5,509	1,642	-	1,149
Bali Janobi	1.7	0	0	0	0					
Balu Gama Nihal	6.3	809	121	6.7	129	D.T	3,183	809	-	566
Bobi	1.4	721	124	5.8	515					
Chhigiri	5.5	343	52	6.5	62					
Ghulam Daider	2.8	117	21	5.6	42					
Hayat Bochra	9.4	870	114	7.6	93					
Hayat Jorh	2.2	117	22	5.3	53					
Jumma Sharif	3.6	280	40	7.0	78	D.T	3,183	280	Normal	196
Mahmood Bhatti	1.4	119	25	4.8	85					
Mithy	8	265	47	5.7	33					
Rora	11.1	1,301	187	6.9	117					
Shahmear	7.6	369	69	5.3	49					
Umar Boba	0.8	115	19	6.1	143					
Zaman Talokara	6.2	98	19	5.1	16					
Naivala										
Malakhi	23.9	1,416	211	6.7	59					
Rashid	50.6	2,610	380	6.9	52	D.T	4,554	2,610	-	1,827
Mahra										
Mahra	64.2	4,353	671	6.5	68	S.T	14,974	4,353	-	3,047
Sikandar Janubi	42.5	1,789	333	5.4	42					
Miran										
Bhutaisar	33.3	1,696	276	6.1	51					
Chirri-Bhor	65.2	1,218	238	5.1	19	D.T	2,576	1,218	-	853
Ghamsan	31.1	2,843	495	5.7	91					
Miran	46.1	1,872	289	6.5	41					
Ramak	119.8	6,803	1,105	6.2	57	S.T	16,700	6,803	-	4,762
Ghara Isa Khan										
Dhulka Kehna	4.3	79	11	7.2	18					
Gandi Umar Khan	82.5	3,915	475	8.2	48					
Khayara Fateh Mohd	3.9	302	47	6.4	77					
Sigo Mian Kheil	28.8	485	70	6.9	17	D.T	5,180	485	Very Bad	0
Gira Mir Alam Khan	27.8	1,561	246	6.3	56					
Dhul Ka Jadid	5.3	875	145	6.0	165					
Gira Murid Shah	12.3	209	40	5.2	17					
Khayara Basharat	4.1	35	7	5.0	8					
Khawar	24.1	1,396	195	7.2	58					
Musa Zia Sharif										
Gandi Ashiq	33.7	1,860	260	7.2	55					
Gandi Isab	4.6	513	94	5.4	112					
Chowdwan										
Kori Hoot	26.4	787	160	4.9	30					
Mugha	13.6	240	45	5.3	18					
Tilli Budha Shah	25.9	855	132	6.5	33					
Maroo	12.8	451	67	6.7	35					
Jandi Babar	53.7	979	123	8.0	18	D.T	4,554	979	-	685
Kori Jamal	21.2	656	100	6.6	31					
D.I.Khan Tehsil Total	2,033.7	117,577	18,849	6.2	58		140,279	52,367		30,551
2. Kulachi										
Muddi										
Muddi	43.9	3,932	541	7.3	90	D.T	4,208	3,932	Bad	0
Sigu Ganda Pur	4.3	1,167	167	7.0	271					
Kulachi Tehsil Total	48.2	5,099	708	7.2	106		4,208	3,932		0
Administrative Area covering Study Area	2,081.9	122,676	19,557	6.3	59		144,487	56,299		30,551
	Population covered by one D.T (usable 13 deep tube well)									1,398
	Non-beneficiary population									92,125
	Number of D.T required for non-beneficiaries									66
	Required development cost for 66 D.T (Rs. 600,000/unit)								(Rs.'000)	39,600
	Annual operation cost for 66 D.T (Rs.40,000/years)								(Rs.'000)	2,640
	Warer charges/benefit from 66 D.T (Rs.360/years/house)								(Rs.'000)	5,264
Domestic Water Supply Benefit										
	Financial benefit								(Rs.'000)	47,504
	Economic benefit								(Rs.'000)	42,754

Note : I.F ; Infiltration gallery D.T ; Deep tube well (less than 91.4 m) S.T ; Shallow tube well (Above 91.4 m)
C.T ; Community tank P.H.E.D ; Public Health Engineering Department - ; No information

Table I.2.3.4 Estimation of Benefit from Reduction of Seasonal Migration

Sample No.	Zindani(36) Month	Livi Exp	Farm Exp	Gadi Umer Khan(30) Month	Livi Exp	Farm Exp	Chakhan(25) Month	Livi Exp	Farm Exp	Rahman(27) Month	Livi Exp	Farm Exp
1	May	417	417	Mar-Apr	1,500	333	May	83	208	Mar	2,000	100
2				Mar-Apr	1,000	1,000	May	2,000	5,000	Mar-Apr	3,000	2,000
3				Ari-May	833	167	May	250	500	Mar-Apr	3,000	2,000
4				Mar-Ma	500	4,167	May	250	833	Mar-Apr	3,000	2,000
5				Mar	1,000	500				Mar	3,000	1,500
6				Mar	500	167				May	2,000	3,000
7				Mar-Apr	833	667				Mar	2,000	3,000
8				Mar	42	167						
9				Mar-Apr	1,000	1,000						
10				Mar-Apr	500	1,000						
11				Mar-Apr	1,667	667						
12				Mar-Apr	4,167	1,667						
13				Mar-Apr	3,333	2,000						
Total		417	417		16,875	13,502		2,583	6,541		18,000	13,600

Sample No.	Paniala Janobi(30) Month	Livi Exp	Farm Exp	Budh(30) Month	Livi Exp	Farm Exp	Yarik(30) Month	Livi Exp	Farm Exp	Muddi(25) Month	Livi Exp	Farm Exp
1	Mar-Apr	2,000	5,000	Nov-Dec	1,000	1,600	June	1,000	1,000			
2	May	100	800	Mar-Apr	1,000	1,600	June	1,000	1,000			
3				Mar-Apr	1,200	2,000	May	3,000	1,000	None		
4				Mar-Apr	2,000	2,000						
5				Apr	4,000	3,000						
6				Mar-Apr	1,500	2,500						
7				May	1,000	3,000						
8				Apr	1,000	3,000						
9				Apr	2,000	4,000						
10				May-Jur	2,000	7,000						
11				Mar-Apr	1,000	3,000						
Total		2,100	5,800		17,700	32,700		5,000	3,000			

Sample No.	Jumma Sharif (20) Month	Livi Exp	Farm Exp	Chhigiri(20) Month	Livi Exp	Farm Exp	Total (273) Month	Livi Exp	Farm Exp
1	Mar-Apr	1,500	2,500	March	800	700		10,300	11,858
2	Mar-Apr	1,000	1,000	March	400	250		9,500	12,650
3	Mar-Apr	400	800					8,683	6,467
4	Apr	1,000	0					6,750	9,000
5	Mar-Apr	2,000	0					10,000	5,000
6	Mar-Apr	1,500	0					5,500	5,667
7	Apr-June	1,500	0					5,333	6,667
8								1,042	3,167
9								3,000	5,000
10								2,500	8,000
11								2,667	3,667
12								4,167	1,667
13								3,333	2,000
Total		8,900	4,300		1,200	950		72,775	80,810
				Total migrant			(50)		
				Total sample			(273)		

Benefit from Reduction of seasonal migration	
Total household number	19,557
Percentage of migrating households	18.3%
Financial migration cost	(Rs./year)
- Living expense	5,213,409
- Farm expense	5,789,015
Total	11,002,424
Economic migration cost	(Rs./year)
- Living expense	4,692,068
- Farm expense	5,210,114
Total	9,902,182

Source : JICA Village Survey, July 1994

Table I.2.4.1 Weighted Conversion Factor of Cost Component

Project Cost Component	Financial Cost				Economic Cost				Weighted Average
	Local Cost		Foreign Cost	Total	Local Cost		Foreign Cost		
	Transfer n-skilled	Others			Transfer n-skilled	Others			
A. Capital Cost									
1. Direct Construction Cost									
a) Land Acquisition and Others	42.0	1.1	43.3	13.6	100.0	0.0	1.0	39.0	13.6	53.6
Land Acquisition	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Compensation(House)	10.0	0.0	90.0	0.0	100.0	0.0	0.0	81.0	0.0	81.0
Construction Camp	6.0	3.3	50.8	39.9	100.0	0.0	2.9	45.7	39.9	88.5
b) Feeder Canal	4.0	4.5	26.8	64.7	100.0	0.0	4.0	24.1	64.7	92.8
Earthwork	2.0	2.6	16.1	79.3	100.0	0.0	2.3	14.5	79.3	96.1
Structure	6.0	7.3	43.6	43.1	100.0	0.0	6.4	39.2	43.1	88.7
c) Pump Station	2.0	4.5	18.4	75.1	100.0	0.0	4.0	16.6	75.1	95.7
Pump Equipment	2.0	4.7	8.5	84.8	100.0	0.0	4.1	7.7	84.8	96.6
Other Works	5.0	4.2	35.8	55.0	100.0	0.0	3.7	32.2	55.0	90.9
d) Main Canal	5.0	5.2	38.9	50.9	100.0	0.0	4.6	35.0	50.9	90.5
Earthwork	3.0	3.9	25.7	67.4	100.0	0.0	3.4	23.1	67.4	93.9
Structure	6.0	5.8	44.9	43.3	100.0	0.0	5.1	40.4	43.3	88.8
e) Distributory Canals	5.0	10.1	34.3	50.6	100.0	0.0	8.9	30.9	50.6	90.4
Earthwork	4.0	13.6	22.2	60.2	100.0	0.0	12.0	20.0	60.2	92.2
Structure	6.0	5.8	49.5	38.7	100.0	0.0	5.1	44.6	38.7	88.4
f) Regulation Pond	4.0	5.7	34.8	55.5	100.0	0.0	5.0	31.3	55.5	91.8
h) River Treatment & Drainage Canals	2.0	1.2	14.8	82.0	100.0	0.0	1.1	13.3	82.0	96.4
i) Farm Roads	4.0	2.8	32.2	61.0	100.0	0.0	2.5	29.0	61.0	92.5
j) On-farm Development Cost	5.0	0.5	40.2	54.3	100.0	0.0	0.4	36.2	54.3	90.9
k) Sump Well & Domestic Water Supply	5.0	10.2	30.7	54.1	100.0	0.0	9.0	27.6	54.1	90.7
l) Other and Miscellaneous Works	6.0	3.3	50.7	40.0	100.0	0.0	2.9	45.6	40.0	88.5
Sub-total	4.7	4.3	29.2	61.8	100.0	0.0	3.8	26.3	61.8	91.9
2. Indirect Construction Cost										
a) Consultancy Service Cost	4.0	0.0	34.2	61.8	100.0	0.0	0.0	30.8	61.8	92.6
b) Implementation Cost	4.0	4.3	29.9	61.8	100.0	0.0	3.8	26.9	61.8	92.5
Sub-total	4.0	1.6	32.6	61.8	100.0	0.0	1.4	29.3	61.8	92.5
3. Physical Contingency	4.0	4.3	29.9	61.8	100.0	0.0	3.8	26.9	61.8	92.5
Total Base Construction Cost	4.5	4.0	29.7	61.8	100.0	0.0	3.5	26.7	61.8	92.0
B. O & M Cost	8.0	16.9	59.1	16.0	100.0	0.0	14.9	53.2	16.0	84.1
1. Public	8.0	5.4	68.5	18.1	100.0	0.0	4.8	61.7	18.1	84.6
2.Association	9.0	45.7	34.6	10.7	100.0	0.0	40.2	31.1	10.7	82.0
C. Replacement Cost	2.0	4.8	13.7	79.5	100.0	0.0	4.2	12.3	79.5	96.0
1. Public	2.0	4.8	13.3	79.9	100.0	0.0	4.2	12.0	79.9	96.1
2.Association	4.0	4.5	28.9	62.6	100.0	0.0	4.0	26.0	62.6	92.6

Table I.2.4.2 Economic Cost Estimate and Annual Disbursement

Project Cost Component	Financial Cost (Rs.'000)	Construction Conversion Factor	Economic Cost (Rs.'000)	Annual Economic Cost Disbursement (Rs.'000) 1st	2nd	3rd	4th	5th	6th	7th	Total
I. Direct Cost											
a) Land Acquisition	262,012.0	53.6	140,438.4	30,116.4	22,064.4	22,064.4	22,064.4	22,064.4	22,064.4	0.0	140,438.4
b) Feeder Canal	2,287,758.4	92.8	2,123,039.8	0.0	353,840.0	707,679.9	707,679.9	353,840.0	0.0	0.0	2,123,039.8
c) Pump Station	1,588,618.0	95.7	1,520,307.4	0.0	92,007.5	184,015.0	368,030.0	396,069.0	480,185.9	0.0	1,520,307.4
d) Main Canal	2,129,298.8	90.5	1,927,015.4	0.0	0.0	0.0	335,300.7	698,221.9	530,571.6	362,921.2	1,927,015.4
e) Distributory Canals	816,016.8	90.4	737,679.2	0.0	0.0	0.0	69,341.8	257,450.0	222,779.1	188,108.3	737,679.2
f) Regulation Pond	595,483.5	91.8	546,653.9	0.0	0.0	0.0	51,385.5	190,782.2	165,089.5	139,396.7	546,653.9
h)Drainage Canals	1,521,116.2	96.4	1,466,356.0	0.0	0.0	0.0	0.0	454,081.6	563,569.5	448,704.9	1,466,356.0
i) Farm Roads	18,060.1	92.5	16,705.6	0.0	0.0	0.0	981.5	4,518.9	6,093.4	5,111.8	16,705.6
j) On-farm Development	639,117.6	90.9	580,957.9	0.0	0.0	0.0	34,131.3	157,149.1	211,904.4	177,773.1	580,957.9
k) Sump Well	20,160.2	90.7	18,285.3	0.0	0.0	0.0	1,718.8	6,381.6	5,522.2	4,662.7	18,285.3
l) Miscellaneous	242,760.0	88.5	214,842.6	30,691.8	30,691.8	30,691.8	30,691.8	30,691.8	30,691.8	30,691.8	214,842.6
Sub-total	10,120,401.6	91.8	9,292,281.5	60,808.2	498,603.7	944,451.1	1,621,325.7	2,571,250.5	2,238,471.8	1,357,370.5	9,292,281.5
II. Indirect Cost											
a) Consultancy Service	1,012,040.2	92.6	937,149.2	197,294.6	123,309.1	147,970.9	246,618.2	98,647.3	73,985.5	49,323.6	937,149.2
b) Implementation	607,224.1	92.5	561,682.3	245,551.0	52,688.5	52,688.5	52,688.5	52,688.5	52,688.5	52,688.8	561,682.3
Sub-total	1,619,264.3	92.6	1,498,831.5	442,845.6	175,997.6	200,659.4	299,306.7	151,335.8	126,674.0	102,012.4	1,498,831.5
III. Physical Contingency	1,012,040.2	92.5	936,137.2	8,405.2	51,178.4	95,341.1	163,418.0	258,165.1	223,901.5	135,727.9	936,137.2
Base Cost	12,751,706.0		11,727,250.2	512,059.0	725,779.7	1,240,451.6	2,084,050.4	2,980,751.4	2,589,047.3	1,595,110.8	11,727,250.2

				1st	2nd	3rd	4th	5th	6th	7th	8th
IV. O & M Cost (Full Year)	317,080.0	84.1	266,664.3	0.0	0.0	0.0	0.0	27,929.6	41,806.1	123,460.5	266,664.3
				28st	29nd	30th	31st	32nd	33th	34th	Total
V. Replacement Cost											
a) PumpEquipment	1,080,000.0	96.5	1,042,200.0	0.0	312,660.0	312,660.0	416,880.0	0.0	0.0	0.0	1,042,200.0
b) Gate	105,500.0	86.6	91,363.0	12,297.2	12,297.2	36,978.2	14,895.2	14,895.2	0.0	0.0	91,363.0
c) Others	4,655.0	96.1	4,473.5	602.1	602.1	1,810.6	729.3	729.4	0.0	0.0	4,473.5

Table I.2.5.1 Economic Cost and Benefit Stream for Economic Evaluation

(Unit : Rs.'000)

No. of Year	Cost				Production Area Developed (ha)	Built-up Ratio	Benefit				
							Crop Production Benefit		(IRR/CPV=		11.07%)
	Construction	O&M	Replacement	Total			Area(A)	Area(B)	Area(C)	Area(D)	Total
1	512,059	0	0	512,059	0		0	0	0	0	0
2	725,780	0	0	725,780	0		0	0	0	0	0
3	1,240,452	0	0	1,240,452	0		0	0	0	0	0
4	2,084,050	0	0	2,084,050	0		0	0	0	0	0
5	2,980,751	27,930	0	3,008,681	18,140 (A)	0.50	196,629	0	0	0	196,629
6	2,589,047	41,808	0	2,630,853	9,070 (B)	0.65	235,617	98,314	0	0	353,931
7	1,595,111	123,461	0	1,718,572	53,000 (C)	0.75	294,943	127,809	574,496	0	997,246
8	0	266,664	0	266,664	35,390 (D)	0.85	334,269	147,471	746,842	383,610	1,612,192
9	0	266,664	0	266,664	0	0.90	353,931	167,134	861,740	498,693	1,881,498
10	0	266,664	0	266,664	0	0.95	373,594	176,966	976,639	575,415	2,102,614
11	0	266,664	0	266,664	0	1.00	393,257	186,797	1,034,088	652,133	2,266,279
12	0	266,664	0	266,664	0		393,257	196,629	1,091,538	690,498	2,371,922
13	0	266,664	0	266,664	0		393,257	196,629	1,148,987	728,859	2,467,732
14	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
15	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
16	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
17	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
18	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
19	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
20	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
21	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
22	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
23	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
24	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
25	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
26	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
27	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
28	0	266,664	12,899	279,563	0		393,257	196,629	1,148,987	767,220	2,506,093
29	0	266,664	325,559	592,223	0		393,257	196,629	1,148,987	767,220	2,506,093
30	0	266,664	351,449	618,113	0		393,257	196,629	1,148,987	767,220	2,506,093
31	0	266,664	432,305	699,169	0		393,257	196,629	1,148,987	767,220	2,506,093
32	0	266,664	15,625	282,289	0		393,257	196,629	1,148,987	767,220	2,506,093
33	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
34	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
35	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
36	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
37	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
38	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
39	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
40	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
41	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
42	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
43	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
44	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
45	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
46	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
47	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
48	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
49	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093
50	0	266,664	0	266,664	0		393,257	196,629	1,148,987	767,220	2,506,093

No.	Year	Benefit						Balance With					
		Road Development	Water Right Transfer	Domestic Water Supply	Reduction/ Seasonal Migration	Environment	Total	Crop Production	+ Road Development	+ Water Right Transfer	+ Domestic Water Supply	+ Reduction/ Seasonal Migration	All Item
1		0	0	0	0	0	0	-512,059	-512,059	-512,059	-512,059	-512,059	-512,059
2		0	0	0	0	0	0	-725,780	-725,780	-725,780	-725,780	-725,780	-725,780
3		0	0	0	0	0	0	-1,240,452	-1,240,452	-1,240,452	-1,240,452	-1,240,452	-1,240,452
4		0	0	0	0	0	0	-2,084,050	-2,084,050	-2,084,050	-2,084,050	-2,084,050	-2,084,050
5		18,582	2,059	3,544	821	3,648	225,283	-2,812,052	-2,793,470	-2,791,411	-2,787,867	-2,787,046	-2,783,398
6		32,149	3,705	6,132	1,420	6,311	403,648	-2,276,922	-2,244,773	-2,241,068	-2,234,936	-2,233,516	-2,227,205
7		89,197	10,440	17,013	3,940	17,509	1,135,345	-721,326	-632,129	-621,689	-604,676	-600,736	-583,227
8		144,200	16,878	27,504	6,370	28,306	1,835,450	1,345,528	1,489,728	1,506,606	1,534,110	1,540,480	1,568,786
9		168,288	19,698	32,098	7,434	33,034	2,142,050	1,614,834	1,783,122	1,802,820	1,834,918	1,842,352	1,875,386
10		188,065	22,013	35,871	8,308	36,916	2,393,787	1,835,950	2,024,015	2,046,028	2,081,899	2,090,207	2,127,123
11		202,704	23,726	38,663	8,954	39,790	2,580,116	1,999,615	2,202,319	2,226,045	2,264,708	2,273,662	2,313,452
12		212,153	24,832	40,465	9,372	41,644	2,700,388	2,105,258	2,317,411	2,342,243	2,382,708	2,392,080	2,433,724
13		220,723	25,835	42,100	9,750	43,326	2,809,466	2,201,068	2,421,791	2,447,626	2,489,726	2,499,476	2,542,802
14		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
15		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
16		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
17		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
18		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
19		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
20		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
21		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
22		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
23		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
24		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
25		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
26		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
27		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
28		224,154	26,237	42,754	9,902	44,000	2,853,140	2,226,530	2,450,684	2,476,921	2,519,675	2,529,577	2,573,577
29		224,154	26,237	42,754	9,902	44,000	2,853,140	1,913,870	2,138,024	2,164,261	2,207,015	2,216,917	2,260,917
30		224,154	26,237	42,754	9,902	44,000	2,853,140	1,887,980	2,112,134	2,138,371	2,181,125	2,191,027	2,235,027
31		224,154	26,237	42,754	9,902	44,000	2,853,140	1,806,924	2,031,078	2,057,315	2,100,069	2,109,971	2,153,971
32		224,154	26,237	42,754	9,902	44,000	2,853,140	2,223,804	2,447,958	2,474,195	2,516,949	2,526,851	2,570,851
33		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
34		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
35		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
36		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
37		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
38		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
39		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
40		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
41		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
42		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
43		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
44		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
45		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
46		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
47		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
48		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
49		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
50		224,154	26,237	42,754	9,902	44,000	2,853,140	2,239,429	2,463,583	2,489,820	2,532,574	2,542,476	2,586,476
EIRR		13.62%	14.69%	14.81%	15.01%		15.06%		15.26%				
NPV(10%)	(Rs.'000)												
Benefit		12,504,982	13,634,368	13,755,285	13,968,792		14,018,240		14,237,969				
Cost		9,066,355	9,066,355	9,066,355	9,066,355		9,066,355		9,066,355				
B/C(10%)		1.38	1.50	1.52	1.54		1.55		1.57				

Table I.3.1.1 Assessment of Water Charge and Replacement Cost

Item	Crop Water Requirement (m3/ha/net)	Cropping Area (ha)	Total Net Water Requirement ('000 m3)	Required Water Charges Pubic	Associ-ation	Total	Required Replacement Charges Pubic	Associ-ation	Total	Required Total Charges Pubic	Associ-ation	Total
Kharif Season Crops												
Maize	3,900	23,100	90,090	1,536	266	1,802	444	74	518	1,980	340	2,320
Pulses	2,050	5,800	11,890	807	140	947	233	39	272	1,040	179	1,219
Cotton	6,320	11,500	72,680	2,489	431	2,920	720	119	839	3,209	550	3,759
Fooder	3,210	11,500	36,915	1,264	219	1,483	366	60	426	1,630	279	1,909
Vegetables	6,680	3,000	20,040	2,631	456	3,087	761	126	887	3,392	582	3,974
Rabi Season Crops												
Wheat	2,970	52,000	154,440	1,170	202	1,372	338	56	394	1,508	258	1,766
Pulses(Gram)	3,370	11,500	38,755	1,327	230	1,557	384	64	448	1,711	294	2,005
Oilseeds(Rape/Mustard	3,120	11,500	35,880	1,229	213	1,442	355	59	414	1,584	272	1,856
Sugarcane	12,290	11,500	141,335	4,841	838	5,679	1,400	232	1,632	6,241	1,070	7,311
Fodder	2,240	11,500	25,760	882	153	1,035	255	42	297	1,137	195	1,332
Fruit	2,860	3,000	8,580	1,127	195	1,322	326	54	380	1,453	249	1,702
Vegetables	2,860	3,000	8,580	1,127	195	1,322	326	54	380	1,453	249	1,702
Spring Season Crops												
Spring Maize	3,470	5,800	20,126	1,367	236	1,603	395	66	461	1,762	302	2,064
Oil seeds	3,650	5,800	21,170	1,438	249	1,687	416	69	485	1,854	318	2,172
Total		170,500	686,241									

O&M Cost (Rs.'000)	317,080	O&M Cost per 1000 m3	462.1
Public Expenses	270,330	Public Expenses	393.9
Associations' Expenses	46,750	Associations' Expenses	68.2

			Total	Annual/25 years(10% of interest)
Replacement Cost (Rs.'000)	210,250	Replacement Cost per 1000	306.4	132.8
Public Expenses	180,300	Public Expenses	262.7	113.9
Associations' Expenses (Excliding Pump)	29,950	Associations' Expenses	43.7	18.9

Table I.3.1.2 Farm Budget Analyses (1/3)

Type I (Maize-Fodder-Wheat-Maize-Wheat-Cotton)

Item							
(Operating size/ Result of sampling survey, ha)				**Small 2.31**	**Medium 4.70**	**Large 18.89**	**Total 12.94**
I. Without Project Condition (Based on Farm JICA Farm Survey)							
1. Income				22,098	29,406	38,065	33,135
a) Farm Income				10,904	17,210	24,145	20,089
b) Non - Farm Income				11,194	12,196	13,920	13,046
2. Expenditure				21,571	28,158	35,254	31,066
a) Farm Expenditure				2,462	4,462	10,175	7,529
b) Non - Farm Expenditure				19,109	23,696	25,079	23,537
3. Net Surplus				527	1,248	2,811	2,069
II. With Project Condition							
Type I : Year		1st	1st	2nd	2nd	3rd	3rd
Cropping Pattern		Maize(S)	Fodder(K)	Wheat	Maize(K)	Wheat	Cotton
Intensity		0.1	0.6	0.9	0.6	0.9	0.6
Gross Return	(Rs./ha)	16,205	9,000	16,200	15,120	16,200	19,850
Production Cost	(Rs./ha)	5,187	2,516	6,913	5,187	6,913	6,617
Water Charge	(Rs./ha)	1,558	1,441	1,333	1,751	1,333	2,837
Replacement Charges	(Rs./ha)	448	414	383	503	383	815
1. Income				55,209	101,751	373,853	259,607
a) Farm Income (3 years Average)				44,015	89,555	359,933	246,561
b) Non - Farm Income (Same as Without)				11,194	12,196	13,920	13,046
2. Expenditure				39,528	62,203	165,814	121,214
a) Farm Expenditure				16,597	33,768	135,719	92,970
b) Non - Farm Expenditure (Without x 1.2)				22,931	28,435	30,095	28,244
3. Net Surplus				15,681	39,548	208,039	138,393
4.Required Full O&M and Replacement Charges							
a) Total				6,119	12,448	50,034	34,273
b) Water Charge				4,753	9,670	38,867	26,624
c) Replacement Charge				1,366	2,778	11,167	7,649
d) Share to Net Surplus(%)							
Total				39.0%	31.5%	24.1%	24.8%
Water Charge				30.3%	24.5%	18.7%	19.2%
Replacement Charge				8.7%	7.0%	5.4%	5.5%

Note : Operating sizes of farm are the sampling result of JICA Farm Survey.

Table I.3.1.2 Farm Budget Analyses (2/3)

Type II (Wheat-Maize-Oilseed-Maize-Wheat-Maize)

Item			Small	Medium	Large	Total
(Operating size/ Result of sampling survey, ha)			2.31	4.70	18.89	12.94
I. Without Project Condition (Based on Farm JICA Farm Survey)						
1. Income			22,098	29,406	38,065	33,135
a) Farm Income			10,904	17,210	24,145	20,089
b) Non - Farm Income			11,194	12,196	13,920	13,046
2. Expenditure			21,571	28,158	35,254	31,066
a) Farm Expenditure			2,462	4,462	10,175	7,529
b) Non - Farm Expenditure			19,109	23,696	25,079	23,537
3. Net Surplus			527	1,248	2,811	2,069
II. With Project Condition						
Type II : Year		1st	1st	2nd	2nd	3rd	3rd
Cropping Pattern		Wheat	Maize(K)	Oilseed(R)	Maize(K)	Wheat	Maize(K)
Intensity		0.9	0.6	0.9	0.6	0.9	0.6
Gross Return	(Rs./ha)	16,200	15,120	19,000	15,120	16,200	15,120
Production Cost	(Rs./ha)	6,913	5,187	5,034	5,187	6,913	5,187
Water Charge	(Rs./ha)	1,333	1,751	1,401	1,751	1,333	1,751
Replacement Charges	(Rs./ha)	383	503	402	503	383	503
1. Income				67,771	127,308	476,574	329,972
a) Farm Income (3 years Average)				56,577	115,112	462,654	316,926
b) Non - Farm Income (Same as Without)				11,194	12,196	13,920	13,046
2. Expenditure				43,190	69,655	195,764	141,730
a) Farm Expenditure				20,259	41,220	165,669	113,486
b) Non - Farm Expenditure (Without x 1.2)				22,931	28,435	30,095	28,244
3. Net Surplus				24,581	57,653	280,810	188,242
4.Required Full O&M Charges							
a) Total				6,752	13,737	55,214	37,822
b) Water Charge				5,245	10,672	42,894	29,383
c) Replacement Charge				1,507	3,065	12,320	8,439
d) Share to Net Surplus(%)							
Total				27.5%	23.8%	19.7%	20.1%
Water Charge				21.3%	18.5%	15.3%	15.6%
Replacement Charge				6.1%	5.3%	4.4%	4.5%

Note : Operating sizes of farm are the sampling result of JICA Farm Survey.

Table I.3.1.2 Farm Budget Analyses (3/3)

Type III (Fodder-Sugarcane-Sugarcane--Maize)

Item			Small	Medium	Large	Total
(Operating size/ Result of sampling survey, ha)			2.31	4.70	18.89	12.94
I. Without Project Condition (Based on Farm JICA Farm Survey)						
1. Income			22,098	29,406	38,065	33,135
a) Farm Income			10,904	17,210	24,145	20,089
b) Non - Farm Income			11,194	12,196	13,920	13,046
2. Expenditure			21,571	28,158	35,254	31,066
a) Farm Expenditure			2,462	4,462	10,175	7,529
b) Non - Farm Expenditure			19,109	23,696	25,079	23,537
3. Net Surplus			527	1,248	2,811	2,069
II. With Project Condition						
Type III : Year		1st	1st	2nd	2nd	3rd	3rd
Cropping Pattern		Fodder(R)	Sugarcane	Sugarcane	-	Maize(S)	-
Intensity		0.9	1.0	1.0	0.0	0.1	0.0
Gross Return	(Rs./ha)	13,750	24,500	14,000	0.0	16,205	0.0
Production Cost	(Rs./ha)	4,379	11,079	6,656	0.0	5,187	0.0
Water Charge	(Rs./ha)	1,006	5,517	3,862	0.0	1,558	0.0
Replacement Charges	(Rs./ha)	289	1,585	1,110	0.0	448	0.0
				(70% of Charges)			
1. Income				51,616	94,439	344,467	239,477
a) Farm Income (3 years Average)				40,422	82,243	330,547	226,431
b) Non - Farm Income (Same as Without)				11,194	12,196	13,920	13,046
2. Expenditure				40,021	63,207	169,848	123,978
a) Farm Expenditure				17,090	34,772	139,753	95,734
b) Non - Farm Expenditure (Without x 1.2)				22,931	28,435	30,095	28,244
3. Net Surplus				11,595	31,232	174,619	115,499
4.Required Full O&M Charges							
a) Total				10,349	21,056	84,627	57,972
b) Water Charge				8,039	16,356	65,738	45,032
c) Replacement Charge				2,310	4,700	18,889	12,940
d) Share to Net Surplus(%)							
Total				89.3%	67.4%	48.5%	50.2%
Water Charge				69.3%	52.4%	37.7%	39.0%
Replacement Charge				19.9%	15.1%	10.8%	11.2%

Note : Operating sizes of farm are the sampling result of JICA Farm Survey.

FIGURES

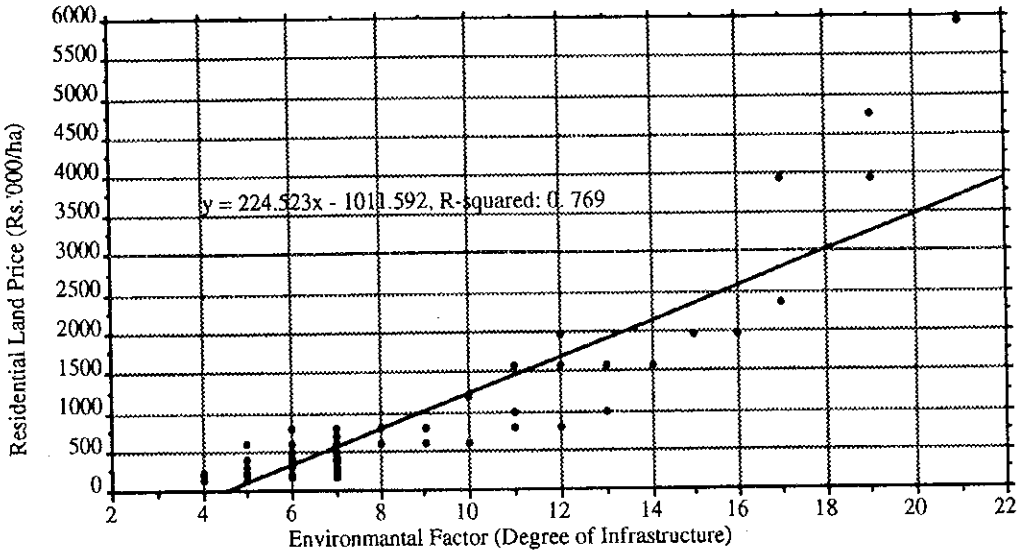

Fig. I.2.3.1 **Comparison of Residential Land Price and Environmental Condition (1/2) (Linear Regression)**

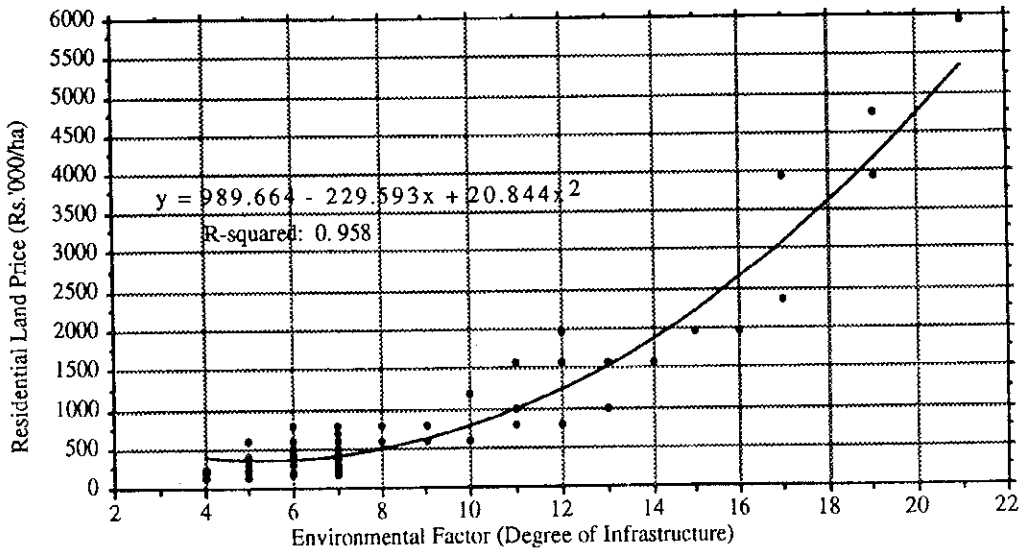

Fig. I.2.3.1 **Comparison of Residential Land Price and Environmental Condition (2/2) (Polynomial Regression)**

ANNEX J

ENVIRONMENT

ANNEX-J

ENVIRONMENT

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ANNEX J. ENVIRONMENT

J.1 Environmental Impact Assessment

Environmental Impact Assessment (EIA) carried out in the Study can be shown as Environmental Impact Assessment Table (EIA Table J.1.1 to J.1.3). EIA Table is attached in this Annex.

J.2 Environmental Planning And Management

In the long term, the environmental management activities of such a major developmental Project would need to be undertaken by a relevant local environmental department. The subject of environment is new in this country and at present all environmental institutions are facing problems of recent establishment, under-staffing, under-funding and lack of transport and laboratory facilities. However, various projects are either started or are going to be started very soon for the strengthening of these institutions.

Based on the expected potential of these environmental institutions after completion of the proposed project, the responsibility for the long-term environmental management of this project could be given to the following institutions.

- the Environmental Section of the NWFP Planning, Environment and Development (PE & D) Department;
- the NWFP Environmental Protection Agency (EPA);
- the WAPDA Environmental Cell (WEC), based in Lahore.

The WAPDA Environmental Cell (WEC) has been recently established in Lahore, under the ADB-funded project "WAPDA Strengthening of Environmental Management for Water Resources Development". After completion of this project the WEC would have developed the capabilities for the environmental management of this project. However, the WEC is probably not a feasible choice due the following two main reasons;

- WAPDA's policy to a have limited involvement in the long-term project operation.
- WEC's location in Lahore which makes it inconvenient for the institution to perform the ask of environmental monitoring and control of this project.

The Environment Section of the NWFP, PE&D department is involved in preparation and implementation of the Provincial Conservation Strategy (PCS) and its integration

with development planning which would give it some interest in the Project, but primarily through the provincial Environmental Protection Agency. This section currently with only one technical personal, has no plans in the near future to create any facilities for conducting such activities like monitoring and control. Therefore the Environment Section is also not a feasible choice to be given the responsibility of the long-term environmental management.

The EPA in NWFP has been brought within the PE & D department, at least for the next few years, and acts under the auspices of the Secretary, PE & D. Although at present the EPA, NWFP lacks any real capability and resources to take such a responsibility, but keeping in view the institutional strengthening programs, it is expected that until the completion of this lift irrigation project the agency will be well equipped and fully staffed to take the responsibility. The EPA receiving institutional strengthening under the World Bank project "Institutional strengthening of NWFP, EPA" from 1993-1998. This project will not only increase the EPA staffing from 28 to 103 during five years until 1998 but also supply the mobile laboratory and other equipment required for monitoring. Moreover the project also involves establishing regional offices in north and south of the province. For the southern regional office D. I. Khan is the most probable place to be chosen.

Thus the EPA, NWFP, seems to be the logical choice for environmental management of the Project, as through the PE&D it will have much closer governmental links with the DoI than does the WEC. But for this purpose the working relationship between the two departments (DOI & EPA) should be clearly chalked out before handling over the responsibility to EPA.

J.3 System of Preliminary Monitoring and Evaluation

(1) Aim

The principle guidelines for the system of initial monitoring and evaluation is described hereinafter in accordance with the result of the study. Their actual method will be decided at the future stage of detail design. Their objectives of this system in the Project are:

i) to evaluate the change and the affection of the surrounding environment with the lapse of time.
ii) to assess the working condition of environmental management plan.
iii) to inspect the propriety of the EIA.

iv) to certify the negative or unexpected impacts at the earliest

(2) Contents

The following components should be included in the system of monitoring and evaluation at the future stage of detail design of this Project.

i) Actual method for works and procedure.
ii) Location and frequency as well as schedule and cost of samples during measuring and testing.
iii) Evaluation of monitoring data regarding environment and the procedure and schedule for reporting.
iv) Counter-action plan against unexpected and sudden environmental hazards if were created due the implementation of the Project.

(3) The guideline of working and procedure for monitoring

Monitoring and the required procedures for them should be conducted for the items selected in EIA. However, it seems that the issues may as well choose indispensable issues to the monitoring of the Project if it is difficult to manage the working schedule, the cost and so on.

The selection of monitoring items does not entirely have to adhere to the evaluation value of EIA, because one of the main objective of the system of environmental monitoring and evaluation is to counter-check the propriety of the result of EIA itself.

The general plan of monitoring for each environmental issue is as follows:

1) Physical Environment Impacts

a) Irrigation water availability

Measuring the situation of water distribution in the irrigation system from main canal up to on-farm. It should be intensively carried out during peak irrigation period (from the end of September till the middle of October) in dry season.

b) Quality of irrigation water

Monitoring of this factor is not necessary because the water quality for irrigation has been tested during this study and was found suitable for irrigation.

c) Groundwater level

Watertable should be measured periodically at the selected sampling sites. The monitoring of watertable will need special attention in of September when it reaches at peak level due to the irrigation water supply. Monitoring should be carried out every month during the first year and every three months from the second year of the project implementation. Similar data on the CRBC gravity command area can be collected with the association of SCARP monitored by WAPDA.

d) Quality of groundwater

Monitoring for the quality of groundwater should be carried out simultaneously with the monitoring of groundwater level at the same sites. They should be compared with the standard for drinking water of the Ministry of Health. It seems that monitoring once a year would be sufficient.

e) Surface run-off

The run-off discharge in the major Nullahs should be measured every month.

f) Flooding

The field investigation of flood damage should be carried out after any flood event Attention should be focused on the project facilities and the infrastructures in the command area and surroundings.

g) Hydrology on river system

Monitoring would be not required for the hydrology of Indus River.

h) Quality of river water

Monitoring is not necessary for the Indus River water. However, water in the nullahs of the Study Area should be tested in detail, at least once a year.

i) Salinity and alkalinity contained in the soil

Analysis should be carried out twice a year at those points where high salinity or alkalinity was recorded during the soil survey conducted for the project.

j) Soil erosion

Any major soil erosion in the project command area and surroundings should be checked every year.

k) Land availability/Land capability

Field reconnaissance on this matter should be done periodically.

2) Biotic Environment Impacts

The biotic environment is not expected to be significantly effected due to the project so there no need for monitoring in this regard.

3) Human Environment Impacts

a) Social / Economic/Institutional

Population should be checked from the data of national census, usually conducted after every ten years. The additional information on economy and health could be extracted from Annual Statistics published by the government. The monitoring and evaluation component regarding project benefit should be included at the detail design stage.

b) Human activity

Data for human activity/human life could be extracted from the data on social and economic benefits of the project. Agricultural Statistics could be very fruitful in this regard.

(4) Evaluation and reporting

The evaluation of monitoring should be reported at least once a year as a summary of the monitored environmental components. The evaluation process of monitoring is as follows:

i) Analyzing and arranging annually, the information measured and collected for each component. The components which may require further detailed analysis should be pointed out.
ii) Comparing all the collected data with the result of the Study conducted for this project. Warning system would be required in the early stages, in case, any

significant negative environment impacts was developed by the project implementation.

iii) Estimating the propriety of IEE conducted for this Study.

Moreover, the following contents should be described in the report.

i) The situation (progress, data information and analysis) of monitoring works and investigation for each environmental components.
ii) The detail description about the change of situation, the factors responsible for this change, the affected area in case there is a remarkable negative environmental impacts.
iii) The verification of the propriety of IEE with amending (if necessary) the table of environmental impacts evaluation reported in this Study.
iv) The plan for further monitoring and general cost estimation.

(5) Ability of implementation

Long-term environmental management responsibilities of the Project are proposed to be given to a department concerning the environmental conservation in the province of NWFP. as described in the section of environmental management plan. This organization will coordinate the monitoring and evaluate the data.

The cooperation of some other organizations would be required in the special fields such as monitoring and analysis of groundwater and salinity, for which cooperation with SCARP of WAPDA would be beneficial.

(6) Warning system against urgent environment impacts

The main objective of developing a warning system is to predict quickly the unexpected remarkable negative environmental impacts, caused suddenly by the implementation of the Project. Such an hazard can be recognized from the data obtained periodically during the monitoring. An early recognition would help in minimizing the damages and the amount of affected area.

The following procedure is proposed to be taken promptly when ever a serious negative environmental impacts has been anticipated.

i) Examine the reliability of data and information.
ii) Request for cooperation to another association or organization, in case, some judgment in special field is required.

iii) Report to the concerned organizations.
iv) Reconsider the contents, the frequency and the sites for monitoring.

The important points for executing the above proposed system would be that the specialists incharge of monitoring;

- can recognize the significance of negative impacts,
- have the ability to implement promptly the system
- obtain supports from other organization.

To fulfill these requirements, some specific training for monitoring would be necessary for the specialists incharge to understand the necessity and importance of the monitoring system.

TABLES

Table J.1.1 Physical Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
WATER	Surface water availability	Actual	Inundation flows originated from the mountain and hilly range are utilized as irrigation and some parts of domestic water. The occurrence and scale of the flows are unstable.	Large-scale flows often couse flood damages due to lack of drainage facilities in the site.	↓			↓			
		Potential	Indus river water is led in order to utilize as irrigation water. While inundation flows are discharged to the Indus by the improved drainage facilities.	There are negligible impacts owing to the change of the hydrological condition in the Indus. While the improvement of drainage system reduces the flood damages in the site and lower slopes to the Indus.		→			→		
	Surface water quality	Actual	Inundation flows originated from the mountain and hilly range contain the soil particles transported from large catchment area. The water quality indicate high density of salinity.	Utilization for the irrigation water which is high density of salinity causes saline accumulation on the surface soil. These accumulation result in soil salinity.	↓				0		
		Potential	Water quality of the Indus is quite suitable for irrigation.	Adoption of the Indus water mitigates saline accumulation on the surface soil.		→			0		

Table J.1.1 Physical Environmental Impacts

(2/4)

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
WATER	Groundwater levels	Actual	Groundwater level under the site is stable in depth among 15 m and 30 m.	There are no impacts.		0			0		
		Potential	Inappropriate use during long-term for irrigation water causes increase of groundwater table.	The shallow depth of ground water table result in waterlogging and soil salinity	↓			↓			Monitoring of the ground water level should be carried out continuously and periodically.
	Groundwater quality	Actual	Groundwater quality of the site is high density of salinity and mineral.	Utilization for the irrigation water by means of the tube-well causes saline accumulation on the surface soil.	↓				0		
		Potential	There are no changes of aspect.	The change to new irrigation system which don't utilize the ground water mitigates saline accumulation on the surface soil.		→			0		
	Flooding / Run-off	Actual	Inundation flows originated from the mountain and hilly range cause the flood in the site.	Flood damages caused in the low lying area are heavy losses to property, communication system, canal, crops and human lives.	↓			↓			
		Potential	The inundation flow beds are incorporated as one of the drainage system.	Flood damages are mitigated by improved inundation flow beds.		→			→		

Table J.1.1 Physical Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
WATER	River morphology	Actual	Inundation flow beds are eroded by the flood.	The embankment which has been broken by the flood affects the spread of flood damages. While the sediment eroded at the flow bed is transported to the low lying area, and result in some damages there.	↓			↓			
		Potential	Improved inundation flow beds are incorporated as one of the drainage system.	The spread of flood damages are diminished by the improved drainage system.		→			→		
LAND	Soil salinity	Actual	Soil salinity in amounts deleterious for plant growth is practically non-existent in the area.	There are no impacts.		0			0		
		Potential	Inappropriate irrigation during long-term gives rise to the logging by the linkage between ground surface and groundwater table. If groundwater involves higher ratio of dissolved soils, it occurs the soil salinity problem.	Land availability deteriorate in the damaged area, and the land will go to desertification.	↓			↓			Practical use of the monitoring data regarding groundwater level and analysis of periodically soil sampling test should be done continuously.
	Soil erosion	Actual	Notable soil erosion can not recognize on the site due to the topographical condition of almost flat.	There are no impacts.		0			0		
		Potential	There are no changes of aspect.	There are no impacts.		0			0		

Table J.1.1 Physical Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
LAND	Land use	Actual	The land in the site is mostly utilized for the cultivation and the livestock farming. However, the land availability is very low.	Merely wastelands and desertificational areas can recognize in the site due to deterioration of land availability caused by severe climate.	↓				0		
		Potential	Land use and availability in the site improve owing to the implementation of the irrigation development.	Improvement of the land availability reduce the spread of wastelands and desertificational areas.		→			→		
CLIMATE	Macro-climate / Micro-climate	Actual	The climate of the site is semi-arid. Dust and sand storm occur frequently in the site.	Inhabitants and their activity are often obstructed by the dust and sand storm. Their residence has rarely broken by them.	↓				0		
		Potential	The expansion and intensification of irrigated land slightly improve the microclimate, it add to humidity and decrease wind speeds owing to effectiveness of created oasis.	The occurrence of the dust and sand storm seems to decrease. Therefore, the damages of inhabitants also mitigate.		→			0		
ATMOSPHERE	Dust / Odor / Noise	Actual	There are not any aspects regarding atmosphere component besides the occurrence of dust problem in climate component.	There are no impacts.		0			0		
		Potential	During construction stage, some changes of atmosphere environment are more prominent but most of them are localized and temporary.	The inhabitants who lives near the construction site and their activities may be affected by the charge of atmosphere environment.	↓				0		These impacts can eliminate through the appropriate consideration for the activities by the contractors.

Table J.1.2 Biotic Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
FAUNA	Bird communities/ habitats	Actual	The water birds issue is a very minor issue because there is not present any permanent wetland fauna. The so-called wetlands are only seasonal and are very limited in the extent. Similarly, the water birds the are attracted by these seasonal wetlands are very few in number.	There are no impacts.		0			0		
		Potential	There are few changes of aspects.	There are no impacts.		0			0		
	Reptile communities/ habitats	Actual	There is having a substantial number of lizards and other reptile species in the out-of-command areas and in the gullied lands.	There are no impacts.		0			0		
		Potential	There are few changes of aspects.	There are no impacts.		0			0		
FLORA	Forests / Trees / Other terrestrial vegetation	Actual	There is no endemic flora in the site.	There are no impacts.		0			0		
		Potential	There are few changes of aspects.	There are no impacts.		0			0		

Table J.1.3 Human Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
SOCIAL	Human carrying capacity	Actual	The human carrying capacity, which is attributed to low farm productivity due to traditional agriculture, is still in low level.	The low capacity accelerate outflow of labor force to town areas.	↓				0		
		Potential	Increase of human carrying capacity is expected by means of improvement of agricultural productivity.	Increase of human carrying capacity contributes to control the labor force outflow.		→			0		
	Population growth	Actual	Vital statistics shows that this area is extremely thin population.	There are no impacts.		0			0		
		Potential	Improved food supplies mean better nutrition and leading to lower mortality rates. Added to this is accelerated immigration and a slowing of outflow.	The population growth is unlikely to negative aspect because a substantial number of labor force is expected for intensity of agricultural productivity at the vast area.			↑		0		
	Demographic structure	Actual	Young generation is likely to outmigration to town areas due to the scarce circumstances of employment opportunity.	There are few significant impacts.		0			0		
		Potential	Labor force requirement for agricultural activities due to increase of employment opportunity slightly reduces the out migration of young generation.	Settlement of young generation seems to contribute toward a rural activation.			↑		0		

Table J.1.3 Human Environmental Impacts

(2/7)

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
SOCIAL	Land tenure	Actual	Almost land has already been instituted tenure right. Although the number of large land owner is limited, the share to the whole land is very high. While numerous marginal and small land owners have remaining small land.	There are no impacts.		0			0		
		Potential	There are few changes of aspect.	There are no impacts.		0			0		
	Social equity	Actual	Social inequity affected the scale of land tenure exists in the site.	There are no impacts.		0			0		
		Potential	There are few changes of aspect.	There are no impacts.		0			0		
	Social cohesion	Actual	Tribal social cohesion and power dispute can not recognize in the site. While some areas have the social cohesion regarding the usage of the flood irrigation (Rod Kohi) system.	There are no impacts.		0			0		
		Potential	The social cohesion formed in the flood irrigation site is dissolved by new irrigation system.	There are no impacts.		0			0		

Table J.1.3 Human Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
SOCIAL	Social attitude	Actual	In accordance with the rule of Rod Kohi system, the upstream channels or distributors are entitled to receive irrigation supply before the lower ones. The lower areas are suffered from the short of irrigation water supply. Therefore, this situation makes a difference regarding social attitude between upstream and lower.	The lower areas are compelled the low level of productivity and income.	↓				0		
		Potential	New irrigation system which attains appropriate water supply for irrigation solves the problem of difference regarding social	The difference of productivity is mitigated.		→			0		
	Health	Actual	Health condition of the habitants in the site deteriorates owing to the short of domestic water supplies and the insanitation. Add to the habitants don't have any knowledge regarding health and sanitation. There are few facilities for health such as Basic Health Unit (BHU).	Waterborne intestinal disease occurs frequently, especially among infant. Similarly, nitrate accumulation according to groundwater used for domestic water supplies are considered injurious for human health.	↓				0		
		Potential	The health and sanitary situation becomes worse because of population growth for the Project.	Waterborne intestinal disease occurs more frequently and expansively.	↓				←		Improvement of facilities for health should be considered in cooperation with PHED.

Table J.1.3 Human Environmental Impacts

(4/7)

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
HUMAN USE	Cultivation	Actual	The cultivation, of which the methods are flood irrigation, groundwater irrigation by tube-well, and rainfed, has low and unstable productivity.	Low and unstable productivity affects low farm income.	↓				0		
		Potential	High farm productivity and increase of cultivated area are attained by adequate irrigation water supply.	High farm income, investment and employment opportunity are realized by improvement of the irrigation system.			↑		0		
	Livestock	Actual	Mainly goat and sheep are raised as livestock. livestock farming is grazed on the glassland along the inundation flows.	Grazing on the riverside cause the soil erosion.	↓				0		
		Potential	The productivity of feed crops are intensified, and feeder can also get the chance to strengthen livestock carrying capacity.	Soil erosion at the riverside is mitigated.		→			0		
	Agro-industrial activities	Actual	Agro-industrial activities of rice mill, flour mill, oil mill, oil extraction plant, and sugar mill can recognize in the site, though some mills can not seasonally operate due to unstable farm productivity.	Processing facilities of which the rate of operation is unfavorable have the unemployment problem.	↓				0		
		Potential	Agro-industrial activities become prosperous by means of increase of farm productivity.	The improvement of the operation gives the chance of employment.		→			0		

Table J.1.3 Human Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
HUMAN USE	Transport communication	Actual	The improvement of transport communication network in the site gets behind. Some transport communications often are cut by the floods.	The interruption of transport communications affect human and other activities.	↓				0		
		Potential	The maintenance roads along the Main canal, Districutaries and Minors of the Project are used as farm roads.	The proposed farm roads facilitate human and other activity and marketing.		→			0		
	Domestic water supply	Actual	The domestic water is supplied by the groundwater and/or surface water stored in the small tank. The quantity is often short, and the quality is not so good.	The quantity and quality cause the problem regarding health and sanitation.	↓				0		
		Potential	There are few changes of aspect because the component for domestic water supplies is not included besides regulating ponds used as domestic water only around the ponds.	Although the shortage of the domestic water is compensated to the only areas around the ponds, there are few changes of impact as a whole.	↓				0		Some facilities for the domestic water supply should be improved in cooperation with PHED in order to supply stable water.
	Recreation	Actual	There aren't any recreation facilities in the site.	There are no impacts.		0			0		
		Potential	The proposed regulation ponds are expected to act as recreation area.	Activation of the social community is expected at the areas around the ponds.			↑		0		

Table J.1.3 Human Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
HUMAN USE	Energy supply / Utilization	Actual	The rate of electrical energy supply is recently raised due to progress of power plant construction	There are no impacts.		0			0		
		Potential	The electrical energy demand for the pump operation on the Project is supplied by the implementation of the new power planed near the site.	There are no impacts.		0			0		
ECONOMIC	Income	Actual	Farm income is very low due to unstable farm productivity. Livelihood of marginal and small owners depend on casual labor employment.	The short of the money left over means the deficiency of investment for the next chance to crop, and it cause a decline in farmers' volition for the farm productivity and a depreciation of living standard.	↓				0		
		Potential	Slightly increase of farm income with improvement of farm and related industrial productivity is expected by means of stable irrigation water supply.	Increase of investment incentive and improvement of living standard are expected with increase of farm income.			↑		0		
	Employment	Actual	Employment opportunity remains in a low level due to a stagnation of agro-economy.	Outflow of labor force is incurred due to low employment opportunity in the rural area.	↓				0		
		Potential	Employment opportunity is created by activation of farming practice with strengthening of farm productivity.	Created employment opportunity affects decrease of unemployment, and controls outflow of labor force.			↑		0		

Table J.1.3 Human Environmental Impacts

↓ : Negative Impact ↑ : Positive Impact 0 : No Impact
← : Toward Negative Impact → : Toward Positive Impact

Environmental component	Environmental Issue	Actual or Potential	ACTUAL and POTENTIAL ENVIRONMENTAL ASPECT	ACTUAL and POTENTIAL ENVIRONMENTAL IMPACT	Places and degree Environmental Impact Occur						MITIGATORY MEASURES
					ON-SITE			OFF-SITE			
					-	0	+	-	0	+	
CULTURAL	Historic/ archaeological sites	Actual	One of archaeological sites inferred to have been in pre-Indus Valley Civilization exists in the site. However, it has not been preserved after excavated Around this site human and their activity for the flour cropping in winter season can recognize. In addition, this site is not recognized as archaeological site by the inhabitants.	This site may be damaged by the human and other activities.	↓				0		
		Potential	Although this site is excluded from the irrigation developed area, the traffic for human and other activities increases through and around this site.	Damages to this site increase further due to improvement of social economy and population growth of the surrounding area.	↓				0		Preservation for the archaeological site should be considered.
	Lifestyle	Actual	Living standard is very low owing to the low income.	Living condition which has been damaged by natural disaster is not improved due to the short of the left money in household economy. While almost inhabitants in the site don't have any interestings to and chances on the education.	↓				0		
		Potential	Improvement of the living condition is expected by increase of farm income and employment opportunity.	Inhabitants can get chances to improve the living condition and education.			↑		0