2.5 Fishery Compensation

The cost for fishery compensation is estimated based on the Ordinance on "Protection of Fish Resources and Management of Inland Fishery". The amount of compensation cost for the whole Kzyl-Orda Left Bank Area (87,000 ha) is estimated at US$ 1.0 million. The compensation cost for the Stage-I Project (13,690 ha) is proportionally obtained to be US$ 160,000.

2.6 Project Administration

The administration cost will include: (i) salary for the staff and running cost of the Project Implementation Unit (PIU Kzyl-Orda) and the Project Office, (ii) groundwater monitoring by the Monitoring and Evaluation Division of the Project Office, (iii) cost for training to farmers, and (iv) other cost such as expertise cost which is obligated by the Government. The project administration cost is estimated at 5 % of the direct construction cost during the construction period .

2.7 Technical Supports

(1) Consulting Service

Consulting services will be required to advise and assist the Project Office in: (i) designing irrigation canal system and associated works of drainage system and on-farm works; (ii) preparing bid documents and bid evaluation; (iii) providing construction techniques; (iv) providing construction quality control; (v) monitoring of progress of work; (vi) establishing operation and maintenance, and water management criteria, and training the farmers in the field applying these criteria; (vii) providing agricultural and farmers organization support; (viii) operating the demonstration farm; (ix) monitoring and evaluating the water resources and water supply; (x) planning work programs and budgets; and (xi) designing the project training program. For the above mentioned consulting services, a tentative assignment schedule of consultants is prepared and shown in Figure H.2, following the proposed project implementation schedule shown in Figure H.1. Based on this assignment schedule, the cost for the consulting services is estimated at US$ 9,882 thousand for the Phase-I implementation and US$ 8,875 thousand for the Phase-II implementation.

(2) Canal Route Survey

A canal route survey will be required for a length of about 840 km, consisting of 300 km for the irrigation canal system, and 540 km for the drainage system. This canal route survey will be conducted by local survey companies under the supervision of the project consultants. The required cost for canal route survey is estimated at US$ 1,220.0 thousand during the Phase-I and US$ 310.0 thousand during the Phase-II.

(3) Training of Project Office Staff

The Project Office will organize training/seminars for its staff to develop their project implementation capacity. The staff training seminars will basically focus on: (i) orienting the staff towards the objectives and process of the Project to enable them to efficiently implement the Project; (ii) building a team approach among the staff to skillfully handle their team relations; (iii) reviewing project outcomes and suggesting improvement measures to collectively promote their project implementation capability. In the early stage of the Project, the Project Office will focus on (i) and (ii) type of training/seminars. In the subsequent year of the Project, the Project Office will focus on (iii) type of training/seminars. Local consultants, with assistance from foreign consultants, will conduct the training/seminars in close collaboration with the Project Office trainers. The required cost for the training is estimated at US$ 161.0 thousand during the Phase-I and US$ 333.0 thousand during the Phase-II.

(4) Demonstration Farm

In order to exhibit the results of agricultural research made by Agricultural Research Institute and to demonstrate the modern cultural practices, new varieties and new crops and efficient irrigation farming to the farmers, it is proposed to establish a demonstration farm in the Project Area. The site of the demonstration farm will have the area of 100 hectares to be selected in the Ilyasov Production Cooperative. For establishment and operation of the demonstration farm, the required cost is estimated at US$ 1,250 thousand, which is allocated to the Phase-II of the Project.

(5) Agricultural Fund

Under the agricultural strengthening program, the Project Office is proposed to provide the agricultural support fund under a technical assistance arrangement. The fund will be utilized by the Oblast Department of Agriculture, Kzyl-Orda, and the Pre-aral Scientific Research Institute for Agroecology and Agriculture. The Project Office will be in charge of coordinating and monitoring the agricultural activities of the said two organizations with an assistance of the project consultants. The Oblast Department of Agriculture and the Pre-aral Scientific Research Institute for Agroecology and Agriculture will prepare an action plan in collaboration with the project consultants to utilize the agricultural support fund. The fund will be required at US$ 1,220.0 thousand and will be commenced from the seventh project year.

2.8 Project Cost

The total project cost is estimated at US$ 291.174 million comprising US$ 185.086 million for the local currency portion and US$ 106.088 million for the foreign currency portion. The cost is further divided into two phases; Phase-I and Phased-II, as summarized below and details are shown in Table H.10.

(Unit: US$ '000)

Description	Local Currency	Foreign Currency	Amount
Phase-I	79,700	50,978	130,678
Phase-II	105,386	55,110	160,496
Total	185,086	106,088	291,174

2.9 Annual Disbursement Schedule

The annual disbursement schedule is worked out based on the project implementation schedule shown in Figure H.1. The following table shows the summary of the annual disbursement schedule and the details are shown in Table H.11.

(Unit: US$ '000)

Phase	Year	Local Currency	Foreign Currency	Amount
Phase-I	1999	2,094	1,138	3,232
	2000	1,555	2,075	3,630
	2001	12,205	8,179	20,384
	2002	26,496	14,243	40,739
	2003	27,807	19,404	47,211
	2004	9,543	5,939	15,482
	Total	79,700	50,978	130,678
Phase-II	2004	14,149	5,334	19,483
	2005	35,175	14,340	49,515
	2006	38,744	24,299	63,043
	2007	15,150	9,600	24,750
	2008	2,168	1,537	3,705
	Total	105,386	55,110	160,496
Total		185,086	106,088	291,174

2.10 Replacement Cost

Some project facilities, especially hydromechanical and electrical works, have a shorter economic life time than project life and will require replacement during the proposed 50 years of the project life. The following table shows the economic life times and replacement costs of the works to be replaced.

(Unit: US$'000)

Description	Economic Life Time	Replacement Cost
- Hydromechanical Works	25 years	4,592.0
- O&M Equipment	10 years	2,247.9
- Water Management Equipment	10 years	1,993.4
- Pump for Water Supply	10 years	66.6
- Pipe and Valves for Water Supply	25 years	574.9
- Wooden Stoplog	5 years	23.3

2.11 Annual Operation and Maintenance Cost

The annual operation and maintenance cost of the project facilities includes the salaries of the staff for the Project Office, staff of the WUAs, the materials and labor costs for repair and maintenance of the project facilities, the cost for operation, and repair and maintenance of O&M equipment. As shown in Table H.12, the estimated cost is US$ 65/ha per annum and US$ 890,000 per annum for the total project area of 13,690 ha.

Tables

Table H.1 Labour Wage

Description	Unit	Wage US$	Remarks
Foreman	man/day	18.11	8 hrs/day
Skilled Labour	man/day	7.86	-ditto-
Common Labour	man/day	6.04	-ditto-
Carpenter	man/day	10.64	-ditto-
Plasterer	man/day	10.64	-ditto-
Steel Bender	man/day	10.64	-ditto-
Welder	man/day	10.64	-ditto-
Mechanics	man/day	18.11	-ditto-
Electrician	man/day	10.64	-ditto-
Pipe Fitter	man/day	10.64	-ditto-
Mason	man/day	10.64	-ditto-
Painter	man/day	10.64	-ditto-
Metal Worker	man/day	10.64	-ditto-
Concrete Worker	man/day	10.64	-ditto-
Form Worker	man/day	10.64	-ditto-
Brick Worker	man/day	10.64	-ditto-
Machine Operator	man/day	10.64	-ditto-
Driver	man/day	10.64	-ditto-

Table H.2 Material Cost

Description	Unit	Price US$	Remarks
Fine Aggregate 1	m3	28.19	for large structure
Fine Aggregate 2	m3	7.28	for common structure
Coarse Aggregate 1	m3	30.18	
Coarse Aggregate 2	m3	23.03	for common structure
Crushed Stone 1	m3	29.91	
Crushed Stone 2	m3	18.40	for common structure
Gravel 1	m3	28.06	
Gravel 2	m3	11.65	for common structure
Ordinary Portland Cement	ton	40.24	
Portland Cement Sulphate Stable	ton	45.93	
Ready Mixed Concrete (1:2:4)	m3	95.83	
Ready Mixed Concrete (1:3:6)	m3	106.42	
Ready Mixed Concrete (1:4:8)	m3	114.36	
Reinforcement Bar	ton	559.10	
Wooden Formwork	m2	18.80	
Steel Formwork	m2	25.02	
Structural Steel	ton	508.27	
Steel Sheet Pile	ton	960.16	
Simple Steel Gate	ton	1103.24	
Plywood, 4 mm	m2	3.18	
Plywood, 6 mm	m2	4.24	
Timber, Plank	m3	139.77	
Timber, Square	m3	179.48	
Timber, Log	m3	93.58	
Precast Concrete Panel	m3	214.16	
Precast L-shape Block	m3	120.71	
Precast Rectangular Block	m3	115.16	
Concrete Pile	m3	180.41	
Concrete Pipe, D 500	m	32.03	
Concrete Pipe, D 800	m	69.23	
Concrete Pipe, D 1000	m	113.30	
Concrete Pipe, D 1500	m	228.72	
Steel Pipe	ton	827.53	
Gabion	m3	22.77	
Petrol	100 lit	21.05	Bulk
Diesel	100 lit	16.94	Bulk
Engine Oil	lit	1.32	
Hydraulic Oil	lit	1.27	
Grease	kg	2.38	

Table II.3 Bill of Quantity for Rehabilitation Works of Kzyl-Orda Headworks

Unit: US$

Description	Unit	Q'ty	Unit Price L/C	Unit Price F/C	Total L/C	Total F/C	Total Amount
I Left Bank Intake Rehabilitation							
1 Coffer Dam							
Provision of Coffer Dam	m³	10,000	24.8	6.43	248,000	64,300	312,300
Removal of Coffer Dam	m³	10,000	5.59	5.59	55,900	55,900	111,800
Miscellaneous Works	LS				30,390	12,020	42,410
Sub-total of Coffer Dam					334,290	132,220	466,510
2 Intake Structure							
Civil Works							
Demolishing Exiting Structures	m³	1,440	20.03	11.74	28,843	16,906	45,749
Chipping of Existing Concrete	m³	131	20.03	11.74	2,624	1,538	4,162
Concrete	m³	3,031	90.77	41.21	275,124	124,908	400,031
Reinforcement Bar	ton	139	346.36	811.28	48,144	112,768	160,912
Form Work	m²	2,850	7.12	3.77	20,292	10,745	31,037
Plaster Concrete	m³	132	88.08	79.11	11,627	10,443	22,069
Sheet Pile	ton	3	382.56	1353.26	1,148	4,060	5,207
Hand Rail	ton	2	522.49	1223.81	1,045	2,448	3,493
Asphalt Concrete	m³	3	142.5	67.06	428	201	629
Sand and Gravel Filter	m³	70	55.86	5.26	3,910	368	4,278
Gravel Foundation	m³	135	24.2	2.27	3,267	306	3,573
Miscellaneous Works	LS				39,645	28,469	68,114
sub-total					436,096	313,158	749,254
Hydromechanical Works							
Disassembling Exiting Gates	ton	45	47.31	11.82	2,129	532	2,661
Disassembling Exiting Gate Hoists	ton	18	38.84	9.71	699	175	874
Roller Gates	set	6	10,792.34	256,210.44	64,754	1,537,263	1,602,017
Under Sluice Gates	set	6	8,150.39	203,375.56	48,902	1,220,253	1,269,156
Miscellaneous Works	LS				283	71	353
sub-total					116,767	2,758,293	2,875,061
Electrical Works							
Electric Device of Stoplog Trolley Crane	set	1	9,754.10	113,622.39	9,754	113,622	123,376
Central Control Panel with cable	set	1	55,369.71	569,849.56	55,370	569,850	625,219
sub-total					65,124	683,472	748,596
Dewatering Works	LS	5%			21,805	15,658	37,463
Sub-total of Intake Structure					639,792	3,770,581	4,410,373
3 Total of Left Bank Intake Rehabilitation					974,082	3,902,801	4,876,883
II Flood Way Rehabilitation							
1 Civil Works							
Provision of River Channel Protection					686,400	64,550	750,950
2 Electrical Works							
Electrical Device of Radial Gates	set	1	10,227.90	118,440.73	10,228	118,441	128,669
Electric Device of Self Moving Crane	set	1	21,460.05	230,737.51	21,460	230,738	252,198
Sub-total of Electrical Works					31,688	349,178	380,866
3 Total of Flood Way Rehabilitation					718,088	413,728	1,131,816

(to be continued)

Table II 3 Bill of Quantity for Rehabilitation Works of Kzyl-Orda Headworks

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
III Temporally River Diversion Works							
1 Temporally Works							
Provision of Coffer Dam	m³	24,000	2.48	1.33	59,520	31,920	91,440
Removal of Coffer Dam	m³	24,000	0.56	0.56	13,440	13,440	26,880
Temporally bypass Asphalt Road	m	1,000	187.12	100.15	187,120	100,150	287,270
* Bypass of 10KVA Transmission Line	km	0.6	21479.49	0	12,888	0	12,888
* Bypass of Communication Lines	km	7.5	4837.25	0	36,279	0	36,279
Miscellaneous Works	LS				30,925	14,551	45,476
Sub-total of Temporally Works					340,172	160,061	500,233
2 Diversion Structure							
Civil Works							
Excavation	m³	154,000	0.56	0.56	86,240	86,240	172,480
Concrete	m³	1,737	90.77	41.21	157,667	71,582	229,249
Reinforcement Bar	ton	177	346.36	811.28	61,306	143,597	204,902
Formwork	m²	1,500	7.12	3.77	10,680	5,655	16,335
Sheet Pile	ton	154	382.56	1353.26	58,761	207,861	266,622
Sand and Gravel Filter	m³	200	55.86	5.26	11,172	1,052	12,224
Gabion Mattress with Sand Foundation	m³	2,630	137.28	12.91	361,046	33,953	395,000
Structural Metal	ton	25	651.95	1150.24	16,299	28,756	45,055
Plug Concrete	m³	180	60.93	28.85	10,967	5,193	16,160
Miscellaneous Works	LS				77,421	58,251	135,672
sub-total					851,560	642,139	1,493,699
Hydromechanical Works							
Assembling Gates	ton	18	181.67	46.15	3,324	831	4,155
Assembling Gate Hoists	ton	6	155.23	38.96	931	234	1,165
Miscellaneous Works	LS				426	106	532
sub-total					4,681	1,171	5,852
Sub-total of Diversion Structure					856,241	643,310	1,499,551
3 Restoration Works							
Asphalt Road	m	1,000	112.27	60.09	112,270	60,090	172,360
* 10KVA Transmission Line	km	0.6	6443.85	0	3,866	0	3,866
* Communication Lines	km	5.43	1451.18	0	7,880	0	7,880
Miscellaneous Works	LS				12,402	6,009	18,411
Sub-total of Restoration Works					136,418	66,099	202,517
4 Total of River Diversion Works					1,332,831	869,470	2,202,301
IV Total of Item I, II and III					3,025,000	5,186,000	8,211,000

Table H.4 Bill of Quantity for Canal Rehabilitation Works, Phase-I

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
I Left Main Canal BP to PK 402 Regulator							
1 Canal Earth Works							
Clearing, Grass	m²	252,000	0.01	0.02	2,520	5,040	7,560
Clearing, Bush	m²	50,300	0.01	0.04	503	2,012	2,515
Stripping	m³	24,660	0.32	0.34	7,891	8,384	16,276
Excavation	m³	1,747,000	0.38	0.38	663,860	663,860	1,327,720
Embankment	m³	4,113,000	1.7	0.91	6,992,100	3,742,830	10,734,930
Miscellaneous Works	LS				383,344	221,106	604,450
sub-total					8,050,218	4,643,233	12,693,451
2 Canal Lining Works							
Concrete Lining	m³	2,680	4.9	2.59	13,132	6,941	20,073
Concrete Panel	m²	1,160,000	17.72	2.14	20,555,200	2,482,400	23,037,600
Concrete Anchor	m	66,800	11.62	1.67	776,216	111,556	887,772
Weep Hole Placing	nos	45,430	3.13	20.65	142,196	938,130	1,080,325
Sand Foundation	m³	35,200	12.3	1.09	432,960	38,368	471,328
H-shape Steel	m	89,120	2.57	9.08	229,038	809,210	1,038,248
Miscellaneous Works	LS				1,107,437	219,330	1,326,767
sub-total					23,256,179	4,605,935	27,862,114
3 Bridges							
Preparatory Works	lot	2	23.36	70.09	47	140	187
Approach Road	lot	2	54182.34	16184.34	108,365	32,369	140,733
Substructure	lot	2	93212.1	17754.68	186,424	35,509	221,934
Superstructure	lot	2	189349.45	38352.28	378,699	76,705	455,403
Miscellaneous Works	LS				33,677	7,236	40,913
sub-total					707,211	151,959	859,170
4 Other Related Structures							
Side Spillway	nos	10	19256.02	14887.87	192,560	148,879	341,439
Rehabilitation of Head Gates	lot	1	139418.14	125705.14	139,418	125,705	265,123
Rehabilitation of Regulator	nos	2	59131.94	50212.21	118,264	100,424	218,688
Demolishing, Disassembling Exiting Structures	LS				12,884	11,306	24,191
Miscellaneous Works	LS				23,156	19,316	42,472
sub-total					486,283	405,630	891,913
5 Dewatering Works	LS				1,565,433	462,471	2,027,904
6 Ancillary Works							
Approach Road	m	0	45.24	13.57	0	0	0
Discharge Measuring Device	nos	21	348.12	261.77	7,311	5,497	12,808
Miscellaneous Works	LS				366	275	640
sub-total					7,676	5,772	13,448
7 Total of Left Main Canal					34,073,000	10,275,000	44,348,000
II North Main Collector							
1 Canal Earth Works							
Clearing, Grass	m²	720,000	0.01	0.02	7,200	14,400	21,600
Clearing, Bush	m²	288,000	0.01	0.04	2,880	11,520	14,400
Stripping	m³	3,400	0.32	0.34	1,088	1,156	2,244
Excavation	m³	5,800,000	0.44	0.47	2,552,000	2,726,000	5,278,000
Embankment	m³	33,500	1.61	0.54	53,935	18,090	72,025
Inspection Road Shaping	m²	324,000	0.42	0.49	136,080	158,760	294,840
Miscellaneous Works	LS				137,926	146,004	283,930
sub-total					2,891,109	3,075,930	5,967,039
2 Related Structures							
Box Culvert, 5 lanes	nos	1	99271.2	64231.14	99,271	64,231	163,502
Box Culvert, single lane	nos	2	13798.34	6400.57	27,597	12,801	40,398
Extension of Bridge Span, 10m	nos	2	7814.36	1140.32	15,629	2,281	17,910
Demolishing, Disassembling Exiting Structures	LS				2,161	754	2,915
Miscellaneous Works	LS				7,233	4,003	11,236
sub-total					151,891	84,070	235,961
3 Total of North Main Collector					3,043,000	3,160,000	6,203,000
III Inter-farm/On-farm Canals							
1 Canal Earth Works							
Clearing, Grass	m²	133,000	0.01	0.02	1,330	2,660	3,990
Clearing, Bush	m²	27,000	0.01	0.04	270	1,080	1,350
Stripping	m³	14,000	0.32	0.34	4,480	4,760	9,240
Excavation	m³	60,000	0.38	0.38	22,800	22,800	45,600
Embankment	m³	1,022,000	1.7	0.91	1,737,400	930,020	2,667,420
Gravel Metaling	m³	44,200	14.72	2.64	650,624	116,688	767,312
Miscellaneous Works	LS				120,845	53,900	174,746
sub-total					2,537,749	1,131,908	3,669,658

(to be continued)

Table H.4 Bill of Quantity for Canal Rehabilitation Works, Phase-I

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
2 Canal Lining Works							
Type F1	m	1,000	238.62	53.54	238,620	53,540	292,160
Type F2	m	1,700	180.44	37.8	306,748	64,260	371,008
Type F3	m	1,200	157.93	32.12	189,516	38,544	228,060
Type F4	m	4,900	147.67	24.55	723,583	120,295	843,878
Type F5	m	1,900	112.91	20.77	214,529	39,463	253,992
Type F6	m	22,200	107.77	16.99	2,392,494	377,178	2,769,672
Type F7	m	3,200	62.76	10.48	200,832	33,536	234,368
Type F8	m	3,300	60.98	9.62	201,234	31,746	232,980
Type F9	m	4,600	59.33	7.94	272,918	36,524	309,442
Type F10	m	200	31.52	3.79	6,304	758	7,062
Miscellaneous Works	LS				237,048	40,179	277,227
sub-total					4,983,826	836,023	5,819,849
3 Related Structures							
Turnout							
Type TO1	nos	2	7660.06	2262.92	15,320	4,526	19,846
Type TO2	nos	2	4261.54	1334.42	8,523	2,669	11,192
Type TO3	nos	32	2999.51	1148.17	95,984	36,741	132,726
Check Structure							
Type CK1	nos	1	3038.66	3917.69	3,039	3,918	6,956
Type CK2	nos	3	2061.88	2631.41	6,186	7,894	14,080
Type CK3	nos	1	1083.6	1340.98	1,084	1,341	2,425
Type CK4	nos	9	861.94	1063.5	7,757	9,572	17,329
Type CK5	nos	4	500.7	578.42	2,003	2,314	4,316
Culvert							
Box Culvert		9	3197.92	2708.3	28,781	24,375	53,156
Pipe Culvert		11	1851.91	424.8	20,371	4,673	25,044
Demolishing, Disassembling Exiting Structures	LS				9,452	4,901	14,353
Miscellaneous Works	LS				9,925	5,146	15,071
sub-total					208,425	108,069	316,494
4 Total of Inter-farm/On-farm Canal					7,730,000	2,076,000	9,806,000
IV Inter-farm/On-farm Collector							
1 Canal Earth Works							
Clearing, Grass	m²	79,500	0.01	0.02	795	1,590	2,385
Clearing, Bush	m²	31,800	0.01	0.04	318	1,272	1,590
Stripping	m³	390	0.32	0.34	125	133	257
Excavation	m³	126,000	0.38	0.38	47,880	47,880	95,760
Embankment	m³	3,900	1.61	0.54	6,279	2,106	8,385
Inspection Road Shaping	m²	47,700	0.42	0.49	20,034	23,373	43,407
Miscellaneous Works	LS				3,085	4,047	7,132
sub-total					78,516	80,401	158,916
2 Related Structures							
Drain Inlet							
Reconstruction	nos	7	2461.06	847.09	17,227	5,930	23,157
Rehabilitation	nos	16	738.31	254.12	11,813	4,066	15,879
Drainage Culvert							
Reconstruction	nos	4	1693.13	584.88	6,773	2,340	9,112
Rehabilitation	nos	0	507.94	175.46	0	0	0
Cross Drain	nos	0	3009.88	1071.84	0	0	0
Demolishing, Disassembling Exiting Structures	LS				1,791	617	2,407
Miscellaneous Works	LS				1,880	648	2,528
sub-total					39,484	13,600	53,084
3 Total of Inter-farm/On-farm Collector					118,000	94,000	212,000
V On-farm System							
1 Field Canal Earth Works							
Clearing, Grass	m²	167,000	0.01	0.02	1,670	3,340	5,010
Clearing, Bush	m²	33,300	0.01	0.04	333	1,332	1,665
Stripping	m³	7,800	0.32	0.34	2,496	2,652	5,148
Excavation	m³	179,000	0.38	0.4	68,020	71,600	139,620
Embankment	m³	605,000	1.61	0.54	974,050	326,700	1,300,750
Miscellaneous Works	LS				52,328	20,281	72,610
sub-total					1,098,897	425,905	1,524,803
2 Field Collectors Earth Works							
Clearing, Grass	m²	143,000	0.01	0.02	1,430	2,860	4,290
Clearing, Bush	m²	28,500	0.01	0.04	285	1,140	1,425
Stripping	m³	130	0.32	0.34	42	44	86
Excavation	m³	176,000	0.38	0.4	66,880	70,400	137,280
Embankment	m³	1,300	1.61	0.54	2,093	702	2,795
Inspection Road Shaping	m²	10,800	0.42	0.49	4,536	5,292	9,828
Miscellaneous Works	LS				3,763	4,022	7,785
sub-total					79,029	84,460	163,489

(to be continued)

Table II.4 Bill of Quantity for Canal Rehabilitation Works, Phase-I

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
3 Field Ditches Earth Works							
Clearing, Grass	m²	134,000	0.01	0.02	1,340	2,680	4,020
Clearing, Bush	m²	0	0.01	0.04	0	0	0
Stripping	m³	59,300	0.32	0.34	18,976	20,162	39,138
Excavation	m³	53,700	0.38	0.4	20,406	21,480	41,886
Embankment	m³	566,000	1.61	0.54	911,260	305,640	1,216,900
Miscellaneous Works	LS				47,599	17,498	65,097
sub-total					999,581	367,460	1,367,041
4 Field Drains Earth Works							
Clearing, Grass	m²	361,000	0.01	0.02	3,610	7,220	10,830
Clearing, Bush	m²	145,000	0.01	0.04	1,450	5,800	7,250
Stripping	m³	12,300	0.32	0.34	3,936	4,182	8,118
Excavation	m³	1,059,000	0.38	0.4	402,420	423,600	826,020
Embankment	m³	76,500	1.61	0.54	123,165	41,310	164,475
Miscellaneous Works	LS				26,729	24,106	50,835
sub-total					561,310	506,218	1,067,528
5 Field Canal Related Structures							
Turnout							
Type TO5	nos	1	4470	1365.11	4,470	1,365	5,835
Type TO6	nos	1	3195.62	1180.82	3,196	1,181	4,376
Type TO7	nos	95	2315.44	816.86	219,967	77,602	297,569
Offtake	nos	314	1415.09	693.29	444,338	217,693	662,031
Check Structure							
Type CK6	nos	4	1017.02	976.09	4,068	3,904	7,972
Type CK7	nos	18	638.03	648.61	11,485	11,675	23,160
Culvert	nos	15	3009.01	536.96	45,135	8,054	53,190
Acquiduct	nos	0	1889.32	355.01	0	0	0
Demolishing, Disassembling Exiting Structures	LS				36,633	16,074	52,707
Miscellaneous Works	LS				38,465	16,877	55,342
sub-total					807,756	354,426	1,162,182
6 Field Collector Related Structures							
Drain Inlet							
Reconstruction	nos	14	2164.99	766.25	30,310	10,728	41,037
Rehabilitation	nos	0	649.5	229.87	0	0	0
Drainage Culvert	nos	3	1724.86	614.51	5,175	1,844	7,018
Cross Drain	nos		3009.88	1071.84	0	0	0
Bridge	nos	0	6291.56	887.12	0	0	0
Demolishing, Disassembling Exiting Structures	LS				1,774	629	2,403
Miscellaneous Works	LS				1,863	660	2,523
sub-total					39,121	13,860	52,981
7 Field Ditches and Field Drains Related Structures							
Field Inlet	nos	2,290	89.84	51.86	205,734	118,759	324,493
Field Outlet	nos	2,850	94.45	18.95	270,127	54,197	324,324
Drain Inlet	nos	304	1269.22	544.03	385,843	165,385	551,228
Demolishing, Disassembling Exiting Structures	LS				43,085	16,917	60,002
Miscellaneous Works	LS				45,517	17,413	62,930
sub-total					950,305	372,672	1,322,977
8 Total of On-farm System					4,536,000	2,125,000	6,661,000
VI Summary of Phase-I Canal Rehabilitation Works							
Left Main Canal BP to PK 402 Regulator					34,073,000	10,275,000	44,348,000
North Main Collector					3,043,000	3,160,000	6,203,000
Inter-farm/On-farm Canals					7,730,000	2,076,000	9,806,000
Inter-farm/On-farm Collector					118,000	94,000	212,000
On-farm System					4,536,000	2,125,000	6,661,000
Total					49,500,000	17,730,000	67,230,000

Table II.5 Bill of Quantity for Canal Rehabilitation Works, Phase-II

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
I Left Main Canal FK 402 Regulator to I P							
1 Canal Earth Works							
Clearing, Grass	m²	342,600	0.01	0.02	3,426	6,852	10,278
Clearing, Bush	m²	68,600	0.01	0.04	686	2,744	3,430
Stripping	m³	34,300	0.32	0.34	10,976	11,662	22,638
Excavation	m³	1,227,600	0.38	0.38	466,488	466,488	932,976
Embankment	m³	4,462,000	1.7	0.91	7,585,400	4,060,420	11,645,820
Miscellaneous Works	LS				403,349	227,408	630,757
sub-total					8,470,325	4,775,574	13,245,899
2 Canal Lining Works							
Concrete Lining	m³	0	4.9	2.59	0	0	0
Concrete Panel	m²	1,521,900	17.72	2.14	26,968,068	3,256,866	30,224,934
Concrete Anchor	m	91,400	11.62	1.67	1,062,068	152,638	1,214,706
Weep Hole Placing	nos	60,920	3.13	20.65	190,680	1,257,998	1,448,678
Sand Foundation	m³	46,200	12.3	1.09	568,260	50,358	618,618
H-shape Steel	m	121,880	2.57	9.08	313,232	1,106,670	1,419,902
Miscellaneous Works	LS				1,455,115	291,227	1,746,342
sub-total					30,557,423	6,115,757	36,673,179
3 Other Related Structures							
Side Spillway	nos	7	19256.02	14887.87	134,792	104,215	239,007
Rehabilitation of Head Gates	lot	1	309749.68	292716.62	309,750	292,717	602,466
Rehabilitation of Regulator	nos	4	59131.94	50212.21	236,528	200,849	437,377
Demolishing, Disassembling Exiting Structures	LS				27,314	24,678	51,992
Miscellaneous Works	LS				35,419	31,123	66,542
sub-total					743,803	653,581	1,397,384
5 Dewatering Works	LS				1,951,022	544,742	2,495,764
6 Ancillary Works							
Approach Road	m	0	45.24	13.57	0	0	0
Discharge Measuring Device	nos	34	348.12	261.77	11,836	8,900	20,736
Miscellaneous Works	LS				592	445	1,037
sub-total					12,428	9,345	21,773
7 Total of Left Main Canal					41,735,000	12,099,000	53,834,000
II South Main Collector							
1 Canal Earth Works							
Clearing, Grass	m²	897,500	0.01	0.02	8,975	17,950	26,925
Clearing, Bush	m²	359,100	0.01	0.04	3,591	14,364	17,955
Stripping	m³	6,400	0.32	0.34	2,048	2,176	4,224
Excavation	m³	10,900,000	0.44	0.47	4,796,000	5,123,000	9,919,000
Embankment	m³	63,600	1.61	0.54	102,396	34,344	136,740
Inspection Road Shaping	m³	404,000	0.42	0.49	169,680	197,960	367,640
Miscellaneous Works	LS				508,166	538,939	1,047,105
sub-total					5,590,856	5,928,733	11,519,589
2 Related Structures							
Extension of Bridge Span, 10m	nos	2	7814.36	1140.32	15,629	2,281	17,909
Extension of Bridge Span, 20m	nos	1	12456.96	1698.31	12,457	1,698	14,155
Demolishing, Disassembling Exiting Structures	LS				623	85	708
Miscellaneous Works	LS				1,435	203	1,639
sub-total					30,144	4,267	34,411
3 Total of South Main Collector					5,621,000	5,933,000	11,554,000
III Inter-farm/On-farm Canals							
1 Canal Earth Works							
Clearing, Grass	m²	192,100	0.01	0.02	1,921	3,842	5,763
Clearing, Bush	m²	38,400	0.01	0.04	384	1,536	1,920
Stripping	m³	19,300	0.32	0.34	6,176	6,562	12,738
Excavation	m³	120,100	0.38	0.38	45,638	45,638	91,276
Embankment	m³	1,526,500	1.7	0.91	2,595,050	1,389,115	3,984,165
Gravel Metaling	m³	64,300	14.72	2.64	946,496	169,752	1,116,248
Miscellaneous Works	LS				179,783	80,822	260,606
sub-total					3,775,448	1,697,267	5,472,716

(to be continued)

Table H.5 Bill of Quantity for Canal Rehabilitation Works, Phase-II

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
2 Canal Lining Works							
Type F1	m	0	238.62	53.54	0	0	0
Type F2	m	0	180.44	37.8	0	0	0
Type F3	m	4,180	157.93	32.12	660,147	134,262	794,409
Type F4	m	5,720	147.67	24.55	844,672	140,426	985,098
Type F5	m	8,750	112.91	20.77	987,963	181,738	1,169,700
Type F6	m	30,370	107.77	16.99	3,272,975	515,986	3,788,961
Type F7	m	1,900	62.76	10.48	119,244	19,912	139,156
Type F8	m	3,530	60.98	9.62	215,259	33,959	249,218
Type F9	m	3,490	59.33	7.94	207,062	27,711	234,772
Type F10	m	6,090	31.52	3.79	191,957	23,081	215,038
Miscellaneous Works	LS				324,964	53,854	378,818
sub-total					6,824,243	1,130,927	7,955,170
3 Related Structures							
Turnout							
Type TO1	nos	0	7660.06	2262.92	0	0	0
Type TO2	nos	8	4261.54	1334.42	34,092	10,675	44,768
Type TO3	nos	41	2999.51	1148.17	122,980	47,075	170,055
Check Structure							
Type CK1	nos	0	3038.66	3917.69	0	0	0
Type CK2	nos	6	2061.88	2631.41	12,371	15,788	28,160
Type CK3	nos	3	1083.6	1340.98	3,251	4,023	7,274
Type CK4	nos	11	861.94	1063.5	9,481	11,699	21,180
Type CK5	nos	7	500.7	578.42	3,505	4,049	7,554
Culvert							
Box Culvert		16	3197.92	2708.3	51,167	43,333	94,500
Pipe Culvert		5	1851.91	424.8	9,260	2,124	11,384
Demolishing, Disassembling Exiting Structures	LS				12,281	6,754	19,035
Miscellaneous Works	LS				12,921	7,285	20,206
sub-total					271,308	152,805	424,114
4 Total of Inter-farm/On-farm Canal					10,871,000	2,981,000	13,852,000
IV Inter-farm/On-farm Collector							
1 Canal Earth Works							
Clearing, Grass	m²	284,000	0.01	0.02	2,840	5,680	8,520
Clearing, Bush	m²	114,000	0.01	0.04	1,140	4,560	5,700
Stripping	m³	4,300	0.32	0.34	1,376	1,462	2,838
Excavation	m³	899,000	0.38	0.38	341,620	341,620	683,240
Embankment	m³	43,000	1.61	0.54	69,230	23,220	92,450
Inspection Road Shaping	m²	171,000	0.42	0.49	71,820	83,790	155,610
Miscellaneous Works	LS				24,185	23,448	47,633
sub-total					512,211	483,780	995,991
2 Related Structures							
Bridge	nos	5	6291.56	887.12	31,458	4,436	35,893
Drain Inlet							
Reconstruction	nos	4	2461.06	847.09	9,844	3,388	13,233
Rehabilitation	nos	4	738.31	254.12	2,953	1,016	3,970
Drainage Culvert							
Reconstruction	nos	13	1693.13	584.88	22,011	7,603	29,614
Rehabilitation	nos	0	507.94	175.46	0	0	0
Cross Drain	nos	3	3009.88	1071.84	9,030	3,216	12,245
Demolishing, Disassembling Exiting Structures	LS				2,192	761	2,953
Miscellaneous Works	LS				2,301	799	3,101
sub-total					79,789	21,220	101,009
3 Total of Inter-farm/On-farm Collector					592,000	505,000	1,097,000
V On-Farm System							
1 Field Canal Earth Works							
Clearing, Grass	m²	450,000	0.01	0.02	4,500	9,000	13,500
Clearing, Bush	m²	100,000	0.01	0.04	1,000	4,000	5,000
Stripping	m³	12,100	0.32	0.34	3,872	4,114	7,986
Excavation	m³	250,000	0.38	0.4	95,000	100,000	195,000
Embankment	m³	874,000	1.61	0.54	1,407,140	471,960	1,879,100
Miscellaneous Works	LS				75,576	29,454	105,029
sub-total					1,587,088	618,528	2,205,615
2 Field Collectors Earth Works							
Clearing, Grass	m²	157,000	0.01	0.02	1,570	3,140	4,710
Clearing, Bush	m²	31,400	0.01	0.04	314	1,256	1,570
Stripping	m³	130	0.32	0.34	42	44	86
Excavation	m³	217,000	0.38	0.4	82,460	86,800	169,260
Embankment	m³	1,300	1.61	0.54	2,093	702	2,795
Inspection Road Shaping	m²	11,800	0.42	0.49	4,956	5,782	10,738
Miscellaneous Works	LS				4,572	4,886	9,458
sub-total					96,006	102,610	198,617

(to be continued)

Table H.5 Bill of Quantity for Canal Rehabilitation Works, Phase-II

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
3 Field Ditches Earth Works							
Clearing, Grass	m²	164,700	0.01	0.02	1,647	3,294	4,941
Clearing, Bush	m²	0	0.01	0.04	0	0	0
Stripping	m³	59,300	0.32	0.34	18,976	20,162	39,138
Excavation	m³	65,700	0.38	0.4	24,966	26,280	51,246
Embankment	m³	692,000	1.61	0.54	1,114,120	373,680	1,487,800
Miscellaneous Works	LS				57,985	21,171	79,156
sub-total					1,217,694	444,587	1,662,281
4 Field Drains Earth Works							
Clearing, Grass	m²	433,000	0.01	0.02	4,330	8,660	12,990
Clearing, Bush	m²	173,000	0.01	0.04	1,730	6,920	8,650
Stripping	m³	12,300	0.32	0.34	3,936	4,182	8,118
Excavation	m³	1,268,000	0.38	0.4	481,840	507,200	989,040
Embankment	m³	91,800	1.61	0.54	147,798	49,572	197,370
Miscellaneous Works	LS				31,982	28,827	60,808
sub-total					671,616	605,361	1,276,976
5 Field Canal Related Structures							
Turnout							
Type TO5	nos	0	4470	1365.11	0	0	0
Type TO6	nos	0	3195.62	1180.82	0	0	0
Type TO7	nos	149	2315.44	816.86	345,001	121,712	466,713
Offtake	nos	454	1415.09	693.29	642,451	314,754	957,205
Check Structure							
Type CK6	nos	0	1017.02	976.09	0	0	0
Type CK7	nos	28	638.03	648.61	17,865	18,161	36,026
Culvert	nos	31	3009.01	536.96	93,279	16,646	109,925
Acquiduct	nos	2	1889.32	355.01	3,779	710	4,489
Demolishing, Disassembling Exiting Structures	LS				55,119	23,599	78,718
Miscellaneous Works	LS				57,875	24,779	82,654
sub-total					1,215,368	520,361	1,735,729
6 Field Collector Related Structures							
Drain Inlet							
Reconstruction	nos	24	2164.99	766.25	51,960	18,390	70,350
Rehabilitation	nos	0	649.5	229.87	0	0	0
Drainage Culvert	nos	6	1724.86	614.51	10,349	3,687	14,036
Cross Drain	nos	0	3009.88	1071.84	0	0	0
Bridge	nos	0	6291.56	887.12	0	0	0
Demolishing, Disassembling Exiting Structures	LS				3,115	1,104	4,219
Miscellaneous Works	LS				3,271	1,159	4,430
sub-total					68,695	24,340	93,035
7 Field Ditches and Field Drains Related Structures							
Field Inlet	nos	3,420	89.84	51.86	307,253	177,361	484,614
Field Outlet	nos	4,270	94.45	18.95	403,302	80,917	484,219
Drain Inlet	nos	306	1269.22	544.03	388,381	166,473	554,854
Demolishing, Disassembling Exiting Structures	LS				54,947	21,238	76,185
Miscellaneous Works	LS				57,650	22,224	79,874
sub-total					1,211,533	468,213	1,679,746
8 Total of On-farm System					6,068,000	2,784,000	8,852,000
VI Summary of Phase-II Canal Rehabilitation Works							
Left Main Canal BP to PK 402 Regulator					41,735,000	12,099,000	53,834,000
South Main Collector					5,621,000	5,933,000	11,554,000
Inter-farm/On-farm Canals					10,871,000	2,981,000	13,852,000
Inter-farm/On-farm Collector					592,000	505,000	1,097,000
On-Farm System					6,068,000	2,784,000	8,852,000
Total					64,887,000	24,302,000	89,189,000

Table II.6 Bill of Quantity for Rural Infrastructure Rehabilitation Works

Unit: US$

Description	Unit	Q'ty	Unit Price		Total		
			L/C	F/C	L/C	F/C	Amount
I Phase-I Ilyasov Farm							
1 Water Supply Scheme							
Deep Well	m	300	157.08	104.72	47,124	31,416	78,540
Distribution Pipe	m	6,650	8.93	26.78	59,385	178,087	237,472
Pump	nos	2	357	7973	714	15,946	16,660
Water Tower	nos	1	11854.64	15026.25	11,855	15,026	26,881
Purification facilities	LS				1,381	1,569	2,949
Miscellaneous Works					6,023	12,102	18,125
sub-total					126,481	254,146	380,627
2 Rehabilitation of Road Network							
Asphalt Paved Road	m	19,000	44.86	13.46	852,340	255,740	1,108,080
Gravel Paved Road	m	22,500	20.24	6.87	455,400	154,575	609,975
Miscellaneous Works					65,779	20,539	86,318
sub total					1,373,519	430,854	1,804,373
3 Total of Phase-I Works					1,500,000	685,000	2,185,000
II Phase-II Shagan Farm							
1 Water Supply Scheme							
Deep Well	m	1,220	157.08	104.72	191,638	127,758	319,396
Distribution Pipe	m	9,450	8.93	26.78	84,389	253,071	337,460
Pump	nos	6	357	7973	2,142	47,838	49,980
Water Tower	nos	3	11854.64	15026.25	35,564	45,079	80,643
Purification facilities	LS				11,044	12,552	23,596
Miscellaneous Works					16,239	24,315	40,554
sub-total					341,015	510,613	851,628
2 Rehabilitation of Road Network							
Asphalt Paved Road	m	600	44.86	13.46	26,916	8,076	34,992
Gravel Paved Road	m	38,500	20.24	6.87	779,240	264,495	1,043,735
Miscellaneous Works					39,829	13,816	53,645
sub-total					845,985	286,387	1,132,372
3 Total of Phase-II Works					1,187,000	797,000	1,984,000

Table H.7 Bill of Quantity for Buildings Works

Unit: US$

Description	unit	Q'ty	Unit Price L/C	Unit Price F/C	Total L/C	Total F/C	Total Amount
I Project Office							
1 Office Building							
Main Office	m²	600	300	30	180,000	18,000	198,000
Machinery Storage	m²	1200	175	18	210,000	21,600	231,600
Miscellaneous	l.s				0	400	400
2 Total of Project Office					390,000	40,000	430,000
II Phase-I							
1 Brigade Office							
New Construction	m²	1,200	135	20	162,000	24,000	186,000
Rehabilitation	nos	1,200	45	7	54,000	8,400	62,400
sub-total					216,000	32,400	248,400
2 Gate Keeper's Office at Hydro Point							
New Construction	m²	0	220	25	0	0	0
Rehabilitation	nos	200	75	8	15,000	1,600	16,600
sub-total					15,000	1,600	16,600
3 Total of Phase-I					231,000	34,000	265,000
III Phase-II							
1 Brigade Office							
New Construction	m²	400	135	20	54,000	8,000	62,000
Rehabilitation	nos	2,800	45	7	126,000	19,500	145,500
sub-total					180,000	27,500	207,500
2 Gate Keeper's Office at Hydro Point							
New Construction	m²	300	220	25	66,000	7,500	73,500
Rehabilitation	nos	0	73	8	0	0	0
sub-total					66,000	7,500	73,500
3 Total of Phase-II					246,000	35,000	281,000
IV Total of Building Works					477,000	69,000	546,000

Table II.8 Cost for Water Management Equipment

Unit: US$

Description	unit	Q'ty	Unit Price L/C	Unit Price F/C	Total L/C	Total F/C	Total Amount
I Phase-I							
Vehicle	nos	2	1,500	28,500	3,000	57,000	60,000
Motor Cycle	nos	8	100	2,400	800	19,200	20,000
Communication System							
Key Station	lot	1	26,000	495,000	26,000	495,000	521,000
Hydro Station	lot	2	4,600	82,400	9,200	164,800	174,000
Data Processing System	lot	0	17,300	329,700	0	0	0
Graphic Panel	lot	0	21,700	412,300	0	0	0
Total of Phase-I					39,000	736,000	775,000
II Phase-II							
Vehicle	nos	2	1,500	28,500	3,000	57,000	60,000
Motor Cycle	nos	12	100	2,400	1,200	28,800	30,000
Communication System							
Key Station	lot	0	26,000	495,000	0	0	0
Hydro Station	lot	4	4,600	82,400	18,400	329,600	348,000
Data Processing System	lot	1	17,400	329,600	17,400	329,600	347,000
Graphic Panel	lot	1	21,000	413,000	21,000	413,000	434,000
Total of Phase-II					61,000	1,158,000	1,219,000
III Total of Water Management Equipment					100,000	1,894,000	1,994,000

Table II.9 Cost for O&M Equipment and Office Equipment

Unit: US$

Description	unit	Q'ty	Unit Price L/C	Unit Price F/C	Total L/C	Total F/C	Total Amount
Phase-I Procurement							
I Operation and Maintenance Equipment							
1 Construction Equipment							
1) Excavator 0.63 m³	units	1	1,300	25,700	1,300	25,700	27,000
2) Excavator 1.0 m³	units	1	1,800	36,200	1,800	36,200	38,000
3) Excavator 1.5 m³	units	1	4,700	94,200	4,700	94,200	98,900
4) Bulldozer 130 Ps	units	1	1,700	33,400	1,700	33,400	35,100
5) Bulldozer 80Ps	units	1	900	17,300	900	17,300	18,200
6) Wheel Loader 1.5 m³	units	2	1,800	35,100	3,600	70,200	73,800
7) Motor Grader 270 Ps	units	2	2,500	50,000	5,000	100,000	105,000
8) Tire Roller, 6-8 ton	units	1	2,700	53,300	2,700	53,300	56,000
9) Plate Compactor, 50 - 60 Kg	units	1	100	1,400	100	1,400	1,500
10) Concrete Mixer 0.1 m3	units	2	500	9,700	1,000	19,400	20,400
11) Portable Generator 3 KVA	units	2	200	3,200	400	6,400	6,800
12) Submersible Pump D=75 mm	units	3	100	1,100	300	3,300	3,600
13) Track Crane 20 ton	units	1	2,700	54,300	2,700	54,300	57,000
14) Water Tanker 6000 lit	units	1	1,600	32,000	1,600	32,000	33,600
15) Dump Truck 13 ton	units	2	1,000	20,800	2,000	41,600	43,600
16) Dump Truck 10 ton	units	2	1,000	19,600	2,000	39,200	41,200
17) Lorry 10 ton	units	2	1,000	20,000	2,000	40,000	42,000
18) Lorry 8 ton	units	3	900	18,700	2,700	56,100	58,800
19) Dredger	units	1	8,300	165,200	8,300	165,200	173,500
sub-total					44,800	889,200	934,000
2 Transportation Equipment							
1) 4WD Car 2500 cc	units	4	1,500	28,500	6,000	114,000	120,000
2) Motorcycle 100 cc	units	20	130	2,370	2,600	47,400	50,000
sub-total					8,600	161,400	170,000
3 Meteorological Equipment							
1) Recording Rainfall Gauge	units	1	200	4,000	200	4,000	4,200
2) Thermo-hydrograph Meter	units	1	220	4,500	220	4,500	4,720
3) Windvane and Anemometer	units	1	100	2,000	100	2,000	2,100
4) Large-scale Evaporimeter	units	1	120	2,330	120	2,330	2,450
5) Sunshine Sensor and Recorder	units	1	20	490	20	490	510
6) Solar Radiation Recorder	units	1	40	870	40	870	910
7) Fuess-type Psychrometer	units	1	120	2,330	120	2,330	2,450
8) Fuess-type Maximum-minimum Thermometer	units	1	220	4,500	220	4,500	4,720
9) Instrument Shelter	units	1	10	170	10	170	180
10) Measuring Supporting Pole	units	1	80	1,670	80	1,670	1,750
11) Consumable Material	Ls				610	260	870
sub-total					1,740	23,120	24,860
4 Survey Instrument							
1) Theodolite	units	2	180	3,660	360	7,320	7,680
2) Automatic Level	units	2	90	1,830	180	3,660	3,840
3) Distance Meter	units	2	490	9,820	980	19,640	20,620
4) Current Meter	units	2	170	3,330	340	6,660	7,000
sub-total					1,860	37,280	39,140
5 Total of Operation and Maintenance Equipment					57,000	1,111,000	1,168,000
II Office Equipment							
Desktop Computer	sets	10	150	2,850	1,500	28,500	30,000
Printer	sets	4	50	950	200	3,800	4,000
Photo Copy Machine	nos.	2	150	2,850	300	5,700	6,000
Facsimile	sets	1	25	475	25	475	500
Telephone Set	sets	10	10	190	100	1,900	2,000
Desk and Chair	sets	50	10	190	500	9,500	10,000
Furniture	sets	2	40	760	80	1,520	1,600
Air Conditioner	nos.	10	40	760	400	7,600	8,000
Blue Printing Machine	nos.	1	175	3,325	175	3,325	3,500
Drafting Equipment with table and lights	sets	6	40	760	240	4,560	4,800
Drawing Cabinet	nos.	6	50	950	300	5,700	6,000
Miscellaneous					180	3,420	3,600
Total of Office Equipment					4,000	76,000	80,000
III Total of Phase-I O&M Equipment and Office Equipment					61,000	1,187,000	1,248,000

Table II.9 Cost for O&M Equipment and Office Equipment

Unit: US$

Description	unit	Q'ty	Unit Price L/C	Unit Price F/C	Total L/C	Total F/C	Total Amount
Phase-II Procurement							
I Operation and Maintenance Equipment							
1 Construction Equipment							
1) Excavator 0.63 m³	units	1	1,300	25,700	1,300	25,700	27,000
2) Excavator 1.0 m³	units	1	1,800	36,200	1,800	36,200	38,000
3) Excavator 1.5 m³	units	1	4,700	94,200	4,700	94,200	98,900
4) Bulldozer 130 Ps	units	1	1,700	33,400	1,700	33,400	35,100
5) Bulldozer 80Ps	units	1	900	17,300	900	17,300	18,200
6) Wheel Loader 1.5 m³	units	1	1,800	35,100	1,800	35,100	36,900
7) Motor Grader 270 Ps	units	1	2,500	50,000	2,500	50,000	52,500
8) Tire Roller, 6-8 ton	units	1	2,700	53,300	2,700	53,300	56,000
9) Plate Compactor, 50 - 60 Kg	units	1	100	1,400	100	1,400	1,500
10) Concrete Mixer 0.1 m3	units	1	500	9,700	500	9,700	10,200
11) Portable Generator 3 KVA	units	1	200	3,200	200	3,200	3,400
12) Submersible Pump D=75 mm	units	1	100	1,100	100	1,100	1,200
13) Track Crane 20 ton	units	1	2,700	54,300	2,700	54,300	57,000
14) Water Tanker 6000 lit	units	1	1,600	32,000	1,600	32,000	33,600
15) Dump Truck 13 ton	units	1	1,000	20,800	1,000	20,800	21,800
16) Dump Truck 10 ton	units	2	1,000	19,600	2,000	39,200	41,200
17) Lorry 10 ton	units	2	1,000	20,000	2,000	40,000	42,000
18) Lorry 8 ton	units	2	900	18,700	1,800	37,400	39,200
19) Dredger	units	1	8,300	165,200	8,300	165,200	173,500
sub-total					37,700	749,500	787,200
2 Transportation Equipment							
1) 4WD Car 2500 cc	units	2	1,500	28,500	3,000	57,000	60,000
2) Motorcycle 100 cc	units	20	130	2,370	2,600	47,400	50,000
sub-total					5,600	104,400	110,000
3 Meteorological Equipment							
1) Recording Rainfall Gauge	units	1	200	4,000	200	4,000	4,200
2) Thermo-hydrograph Meter	units	1	220	4,500	220	4,500	4,720
3) Windvane and Anemometer	units	1	100	2,000	100	2,000	2,100
4) Large-scale Evaporimeter	units	1	120	2,330	120	2,330	2,450
5) Sunshine Sensor and Recorder	units	1	20	490	20	490	510
6) Solar Radiation Recorder	units	1	40	870	40	870	910
7) Fuess-type Psychrometer	units	1	120	2,330	120	2,330	2,450
8) Fuess-type Maximum-minimum Thermometer	units	1	220	4,500	220	4,500	4,720
9) Instrument Shelter	units	1	10	170	10	170	180
10) Measuring Supporting Pole	units	1	80	1,670	80	1,670	1,750
11) Consumable Material	L.s				640	600	1,240
sub-total					1,770	23,460	25,230
4 Survey Instrument							
1) Theodolite	units	1	180	3,660	180	3,660	3,840
2) Automatic Level	units	1	90	1,830	90	1,830	1,920
3) Distance Meter	units	1	490	9,820	490	9,820	10,310
4) Current Meter	units	1	170	3,330	170	3,330	3,500
sub-total					930	18,640	19,570
5 Total of Operation and Maintenance Equipment					46,000	896,000	942,000
II Office Equipment							
Desktop Computer	sets	10	150	2,850	1,500	28,500	30,000
Printer	sets	4	50	950	200	3,800	4,000
Photo Copy Machine	nos.	1	150	2,850	150	2,850	3,000
Facsimile	sets	1	25	475	25	475	500
Telephone Set	sets	5	10	190	50	950	1,000
Desk and Chair	sets	10	10	190	100	1,900	2,000
Furniture	sets	1	40	760	40	760	800
Air Conditioner	nos.	5	40	760	200	3,800	4,000
Blue Printing Machine	nos.	1	175	3,325	175	3,325	3,500
Drafting Equipment with table and lights	sets	6	40	760	240	4,560	4,800
Drawing Cabinet	nos.	3	50	950	150	2,850	3,000
Miscellaneous					170	2,230	2,400
Total of Office Equipment					3,000	56,000	59,000
III Total of Phase-II O&M Equipment and Office Equipment					49,000	952,000	1,001,000
Grand Total							
I Operation and Maintenance Equipment					103,000	2,007,000	2,110,000
II Office Equipment					7,000	132,000	139,000
III Total					110,000	2,139,000	2,249,000

Table H.10 Summary of Project Cost

unit: US$ '000

Desceiption	Phase-I			Phase-II			Total		
	L/C	F/C	Amount	L/C	F/C	Amount	L/C	F/C	Amount
1 Construction Cost									
Project Office Building	390	40	430				390	40	430
Headworks	3,025	5,186	8,211				3,025	5,186	8,211
Left Main Canal	34,073	10,275	44,348	41,735	12,099	53,834	75,808	22,374	98,182
North Main Collector	3,043	3,160	6,203				3,043	3,160	6,203
South Main Collector				5,621	5,933	11,554	5,621	5,933	11,554
Inter-farm/On-farm Canals	7,848	2,170	10,018	11,463	3,486	14,949	19,311	5,656	24,967
On-farm Facilities	4,536	2,125	6,661	6,068	2,784	8,852	10,604	4,909	15,513
Rural Infrastructure	1,500	685	2,185	1,187	797	1,984	2,687	1,482	4,169
Buildings	1,234	137	1,371	879	102	981	2,113	239	2,352
sub-total	55,649	23,778	79,427	66,953	25,201	92,154	122,602	48,979	171,581
2 Procurement Works									
Office Equipment	4	76	80	3	56	59	7	132	139
O&M Equipment	57	1,111	1,168	46	896	942	103	2,007	2,110
Water Management Equipment	39	736	775	61	1,158	1,219	100	1,894	1,994
Rice Mill	160	1,920	2,080	60	720	780	220	2,640	2,860
Fund for Farm Machinery	307	5,811	6,118	360	6,799	7,159	667	12,610	13,277
sub-total	567	9,654	10,221	530	9,629	10,159	1,097	19,283	20,380
3 Administration Cost	4,378	0	4,378	4,181	0	4,181	8,558	0	8,558
4 Technical Supports									
Consulting Service	1,164	8,718	9,882	970	7,905	8,875	2,134	16,623	18,757
Canal Route Survey	1,220	0	1,220	310	0	310	1,530	0	1,530
Training to Project Office Staff	161	0	161	333	0	333	494	0	494
Demonstration Farm	0	0	0	1,250	0	1,250	1,250	0	1,250
Agricultural Strengthen Fund	0	0	0	1,220	0	1,220	1,220	0	1,220
sub-total	2,545	8,718	11,263	4,083	7,905	11,988	6,628	16,623	23,251
5 Land Acquisition	9	0	9	0	0	0	9	0	9
6 Fishery Compensation	0	0	0	160	0	160	160	0	160
sub-total of 1 to 6	63,147	42,150	105,297	75,907	42,735	118,642	139,054	84,885	223,939
6 Physical Contingency	6,315	4,215	10,530	7,591	4,274	11,864	13,905	8,489	22,394
sub-total of 1 to 6	69,462	46,365	115,827	83,497	47,009	130,506	152,959	93,374	246,333
7 Price Contingency	10,238	4,613	14,851	21,888	8,102	29,990	32,126	12,715	44,841
8 Total	79,700	50,978	130,678	105,386	55,110	160,496	185,086	106,088	291,174

Table H.11 (1/2) Disbursement Schedule, Phase-I Implementation

Unit: US$. '000

Description	1999		2000		2001		2002		2003		2004		Total		
	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	Amount
1 Construction Cost															
Project Office Building			325	33	65	7							390	40	430
Headworks					1,513	2,593	1,513	2,593					3,025	5,186	8,211
Left Main Canal (PK0 - PK402)					5,926	1,787	11,851	3,574	11,851	3,574	4,444	1,340	34,073	10,275	44,348
North Main Collector							1,287	1,337	1,404	1,458	351	365	3,043	3,160	6,203
Inter-farm/On-farm Canals					1,365	377	2,730	755	2,730	755	1,024	283	7,848	2,170	10,018
On-farm Facilities in Ilyasov Farm							1,210	567	2,419	1,133	907	425	4,536	2,125	6,661
Rural Infrastructure									1,500	685			1,500	685	2,185
Building Works							1,234	137					1,234	137	1,371
sub-total	0	0	325	33	8,868	4,764	19,825	8,962	19,905	7,605	6,726	2,413	55,649	23,778	79,427
2 Procurement Works															
Office Equipment					4	76							4	76	80
O&M Equipment									57	1,111			57	1,111	1,168
Water Management Equipment									29	552	10	184	39	736	775
Rice Mill							107	1,280	53	640			160	1,920	2,080
Fund for Farm Machinery									230	4,358	77	1,453	307	5,811	6,118
sub-total			0	0	4	76	107	1,280	370	6,661	87	1,637	567	9,654	10,221
3 Administration Cost	676	0	676	0	830	0	976	0	976	0	244	0	4,378	0	4,378
4 Technical Supports	1,127	998	303	1,754	248	2,077	509	1,625	239	1,559	119	706	2,545	8,718	11,263
5 Land Acquisition					9	0							9	0	9
sub-total	1,803	998	1,304	1,787	9,959	6,917	21,416	11,867	21,489	15,826	7,176	4,756	63,147	42,150	105,297
6 Physical Contingency	180	100	130	179	996	692	2,142	1,187	2,149	1,583	718	476	6,315	4,215	10,530
Total	1,984	1,098	1,434	1,966	10,955	7,608	23,558	13,054	23,638	17,408	7,893	5,231	69,462	46,365	115,827
7 Price Contingency	110	40	121	109	1,250	570	2,938	1,190	4,169	1,996	1,650	707	10,238	4,613	14,851
8 Total	2,094	1,138	1,555	2,075	12,205	8,179	26,496	14,243	27,807	19,404	9,543	5,939	79,700	50,978	130,678

Note; L/C: Local Currency Portion, F/C: Foreign Currency Portion
Price Contingency: Annual price escalation rate is 3% for local currency portion and 2% for foreign currency portion

Table H.11 (2/2) Disbursement Schedule, Phase-II Implementation

Unit: US$, '000

Description	2004		2005		2006		2007		2008		Total		
	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	Amount
1 Construction Cost													
Left Main Canal (PK402 - PK899)	7,258	2,104	14,517	4,208	14,517	4,208	5,444	1,578			41,735	12,099	53,834
South Main Collector	0	0	2,498	2,637	2,498	2,637	625	659			5,621	5,933	11,554
Inter-farm/On-farm Canals	1,994	606	3,987	1,213	3,987	1,213	1,495	455			11,463	3,486	14,949
On-farm Facilities in Shagan Farm			1,618	742	3,236	1,485	1,214	557			6,068	2,784	8,852
Rural Infrastructure					1,187	797					1,187	797	1,984
Building Works			879	102							879	102	981
sub-total	9,252	2,710	23,499	8,902	25,425	10,340	8,777	3,249			66,953	25,201	92,154
2 Procurement Works													
Office Equipment	3	56									3	56	59
O&M Equipment					35	672	12	224			46	896	942
Water Management Equipment					46	869	15	290			61	1,158	1,219
Rice Mill			33	400	27	320					60	720	780
Fund for Farm Machinery					270	5,099	90	1,700			360	6,799	7,159
sub-total	3	56	33	400	377	6,960	117	2,213			530	9,629	10,159
3 Administration Cost	732	0	976	0	976	0	787	0	710	0	4,181	0	4,181
4 Technical Supports	493	1,505	1,227	1,975	802	1,464	812	1,817	751	1,144	4,083	7,905	11,988
5 Fishery Compensation	160	0									160	0	160
sub-total	10,639	4,271	25,734	11,278	27,580	18,763	10,493	7,279	1,461	1,144	75,907	42,735	118,642
6 Physical Contingency	1,064	427	2,573	1,128	2,758	1,876	1,049	728	146	114	7,591	4,274	11,864
Total	11,703	4,699	28,308	12,405	30,338	20,639	11,542	8,007	1,607	1,259	83,497	47,009	130,506
7 Price Contingency	2,446	636	6,867	1,935	8,406	3,659	3,608	1,594	561	278	21,888	8,102	29,990
8 Total	14,149	5,334	35,175	14,340	38,743	24,299	15,150	9,600	2,168	1,537	105,386	55,110	160,496

Note; L/C: Local Currency Portion, F/C: Foreign Currency Portion
Price Contingency: Annual price escalation rate is 3% for local currency portion and 2% for foreign currency portion

Table II.12 Annual Operation and Maintenence Cost

Unit: US$

Description		Overall
I Overall O&M Cost for 87,000 ha		
1 Staff Slary and Office Operation Cost		396,000
2 Staff Salary for WUA and WUG		480,000
3 O&M Cost for Civil Works		
Headworks and Left Main Canal		520,953
North and South Collectors		355,148
Left &Right Branch Canals		189,777
Other Major Collectors		122,449
Inter-farm/On-farm Canals		751,740
Inter-farm/On-farm Collectors		166,406
On-farm Systems		1,478,797
Rural Infrastructures		132,464
Buildings		61,321
	sub-total	3,779,053
4 O&M Cost for Equipment		
O&M Equipment and Office Equipment		526,658
Water Management Equipment		461,010
	sub-total	987,668
5 Total		5,642,721
6 Cost per ha		65
II O&M Cost for the Project Area 13,690ha		
	65 $/ha x 13,690 ha =	890,000

Figures

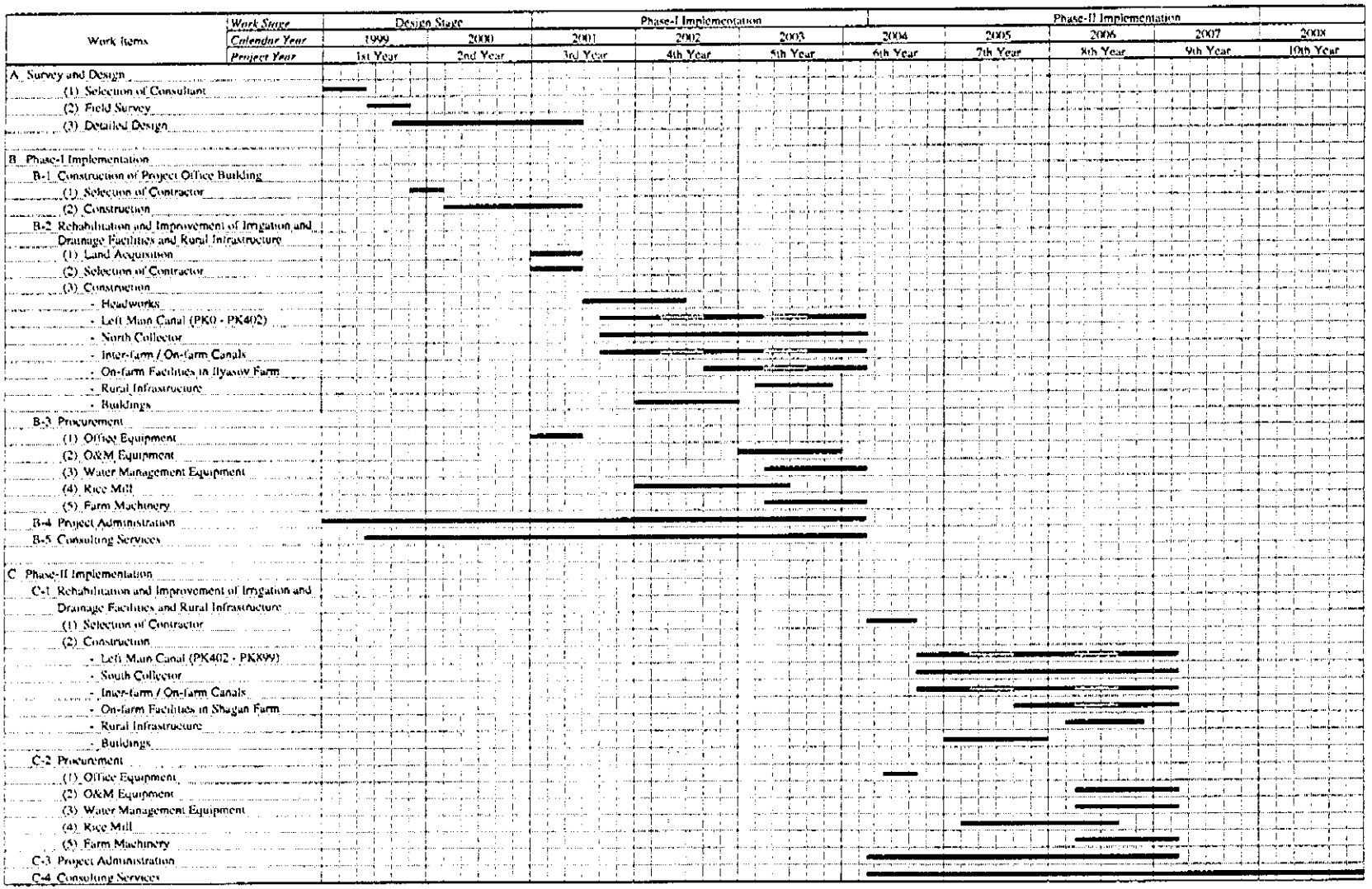

Figure H.1 Project Implementation Schedule

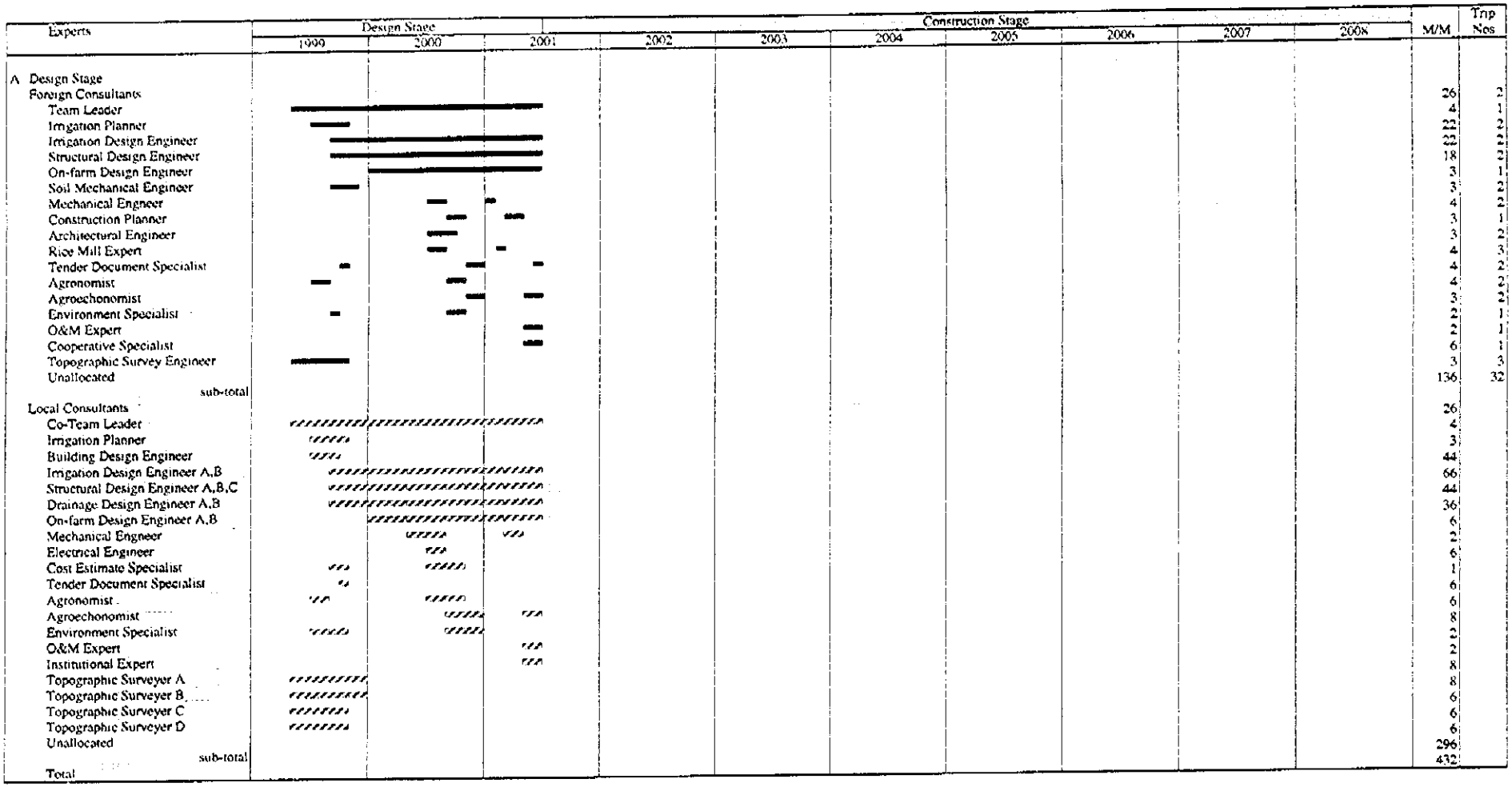

Figure H.2 Tentative Assignment Schedule of Consultants

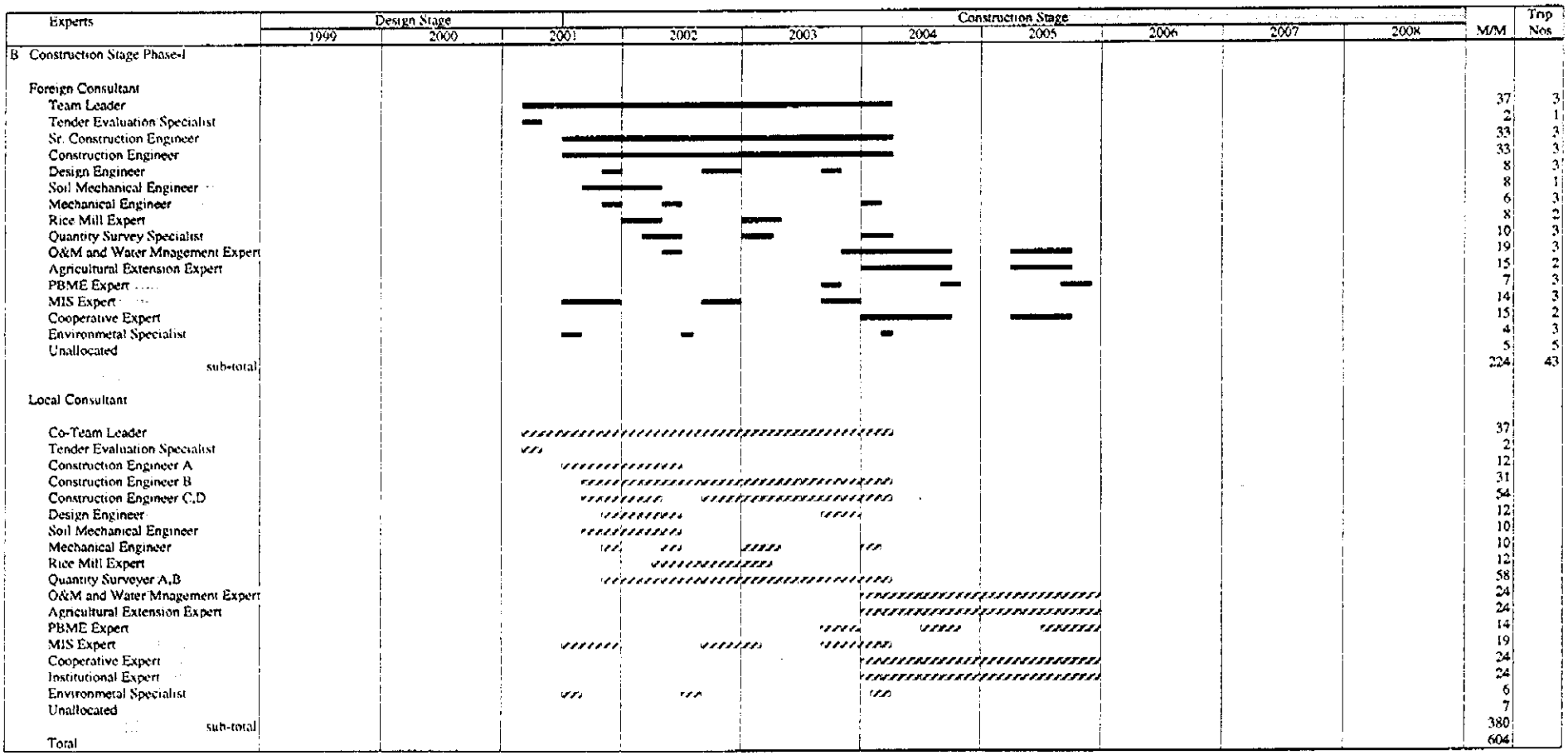

Figure H.2 Tentative Assignment Schedule of Consultants

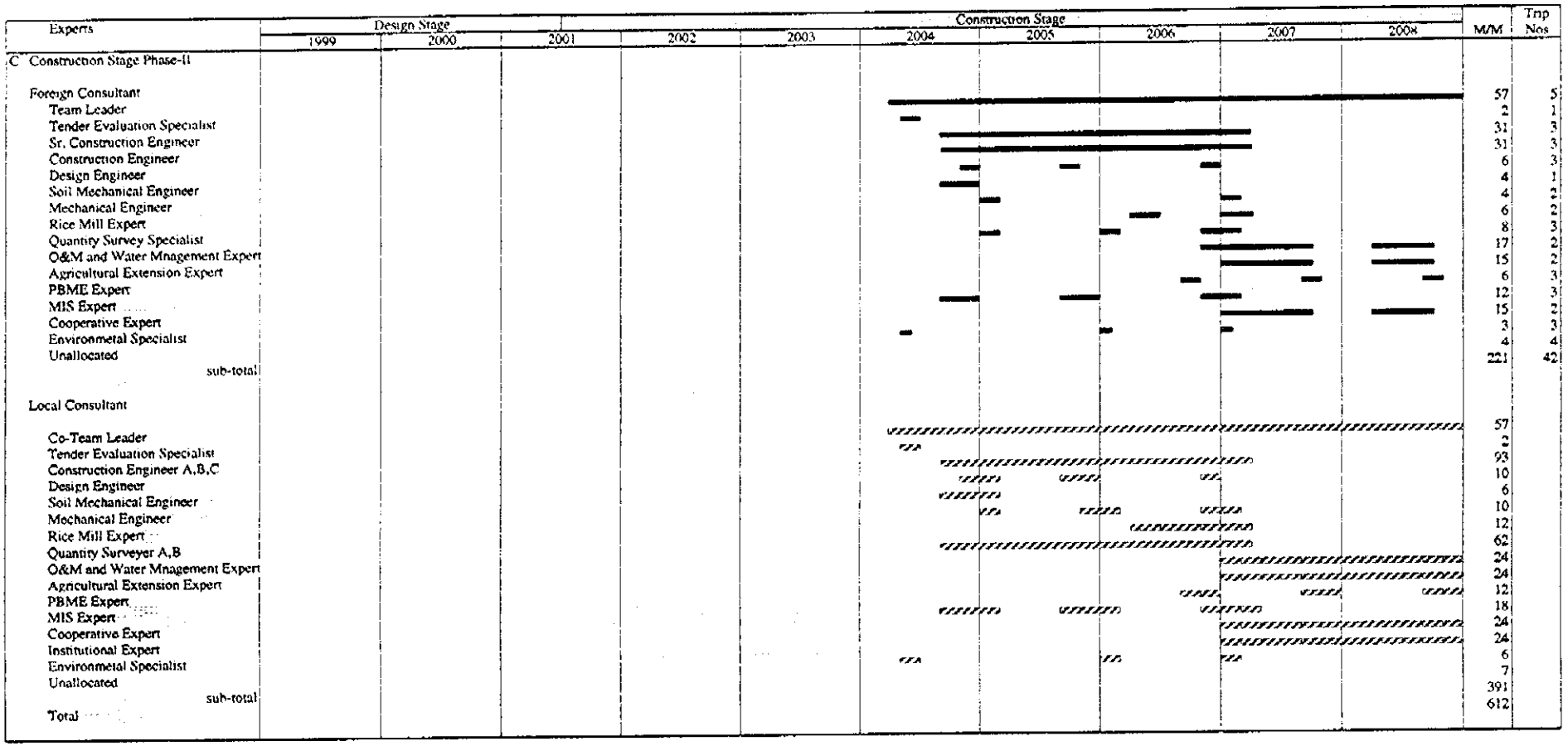

Figure H.2 Tentative Assignment Schedule of Consultants

ANNEX - I

PROJECT EVALUATION

ANNEX - I

PROJECT EVALUATION

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ANNEX - I

PROJECT EVALUATION

1 General

The project evaluation is made from economic and financial viewpoints. The economic analysis is from the perspective of the social welfare of the country as a whole, while financial analysis is from the standpoint of the farm and the project. The difference between the two analyses is in terms of the prices at which resources used by the project and outputs of the project are valued. The economic feasibility of the project is determined by the economic internal rate of return (EIRR). Net present value (NPV), and the benefit/cost ratio (BCR) are also calculated using a 10% discount rate. As part of the economic evaluation, a sensitivity analysis is made of increased construction cost, decreased benefit, or delay of implementation. Financial feasibility of the project is judged in terms of the financial internal rate of return (FIRR), increase of income to farmers and workers, and ability of the farmers to pay for annual project operation, maintenance and replacement costs and a share of the project construction investment.

2 Economic Evaluation

2.1 Basic Considerations

The economic evaluation is made on the basis of the following assumptions:

(i) The economic useful life of the Project is 50 years.

(ii) All prices are expressed in constant US$ at the mid-1997 level with an exchange rate of 75 tenge = $1.

(iii) A standard conversion factor (SCF) of 0.9 is used to convert local currency financial prices to economic prices.

(iv) Transfer payments such as taxes, duties, and interest are not included in economic prices.

(v) A shadow wage rate factor of 0.5 is applied to the unskilled labor component of project cost.

(vi) Farm gate prices of traded commodities are estimated on the basis of international market prices for 1997.

(vii) The implementation schedule spans a period of 10 years, 1999 - 2008. Actual construction of irrigation and drainage works for each phase of the project is four years, covering a span of seven years beginning in 2001 and ending in 2007.

(viii) The estimated rate of buildup of benefits is that 75% of Phase I benefits accrue in the year 2003 with full benefits thereafter. Phase II benefits begin at the 75% rate in the year 2007, and full benefits accrue thereafter.

2.2 Economic Cost

Project financial costs were adjusted to economic costs by making the following changes:

(i) Price contingencies for inflation were deleted.

(ii) Duties and taxes were deleted.

(iii) A standard conversion factor (SCF) was applied to the local cost component to adjust for distortions in local costs because of government trade restrictions.

(iv) Unskilled labor was shadow priced based on opportunity cost.

The economic analysis is in constant US$ at the 1997 price level.

Standard Conversion Factor (SCF). Tariffs and trade restrictions introduce a distortion in the price relationships between traded goods (valued at market prices), and non-traded goods (valued at local prices). The benefits of the project are evaluated at world market prices. In order to make the project cost comparable to benefits, a SCF is applied to the price of non-traded goods. The estimated SCF is 0.9 based on 1995-96 trade statistics as shown in the following table.

Estimated Standard Conversion Factor ($ million)

Year	Exports	Imports	Duties	SCF
1995	4,975	3,781	974	0.90
1996	6,230	4,261	783	0.93

Source: National Statistical Agency of Republic of Kazakstan, Statistical Bulletin No.4 1996, Almaty, 1997, p.42. Duties were provided by the National Bank of Republic of Kazakstan.

Opportunity Cost of Labor. The unemployment rate in the four project area Raions ranges from 19% to 45%. Overall the unemployment rate of Kzyl-Orda Oblast is estimated at 28%.[1/] Considering such high unemployment, the estimated opportunity cost of unskilled construction labor is 50% of the wage rate.

Project Costs. Project engineering cost estimates were broken down into three sets, 1) total project costs for Phase I and Phase II, 2) total project costs allocated to the Ilyasov and Shagan farm area of 13,690 hectares for Phase I and II, and 3) project costs allocated to individual Ilyasov and Shagan farm areas for the purpose of making a separate estimate of their individual economic feasibility. The total financial and economic costs under these three conditions are summarized in the following table.

Total Economic Costs of the Proposed Project

Cost Breakdown	Financial ($000)	Economic ($000)	Ratio %
Total Project, Phase I	130,848.7	89,015.3	68
Total Project, Phase II	160,321.6	103,718.1	65
Total Project, Phase I & II	291,170.3	192,733.5	66
Allocated Cost, Phase I	52,748.6	30,126.8	57
Allocated Cost, Phase II	66,946.4	37,576.3	56
Total Allocated Cost	119,695.0	67,703.1	57
Ilyasov Alternative Cost	51,309.3	28,687.1	56
Shagan Alternative Cost	63,637.7	38,842.1	61
Total Alternative Cost	114,947.0	67,709.2	59

Economic costs are 66% of financial costs for the total project, and 57% of financial costs for the total cost allocated to Ilyasov and Shagan farm areas (13,690 hectares). The reasons for the lower economic costs are: 1) the project costs for rice mills, rural infrastructure, farm machinery loans, land acquisition, and fishery compensation and price contingencies are not included in the benefit/cost analysis, 2) the unskilled labor component of financial costs is shadow priced at 50%, 3) the VAT component of financial cost is deleted from economic cost, 4) the remaining local cost component of financial costs is shadow priced by the SCF 0.9, 5) physical contingency costs are less under the economic cost estimate because they are based on 10% of the project physical costs.

1/ MOA and JICA, The Study of Kzyl-Orda Irrigation/Drainage and Water Management Project in the Republic of Kazakstan. Progress Report (I), November, 1996, p. 17.

The reasons for deleting costs of certain facilities of the project from economic costs for the benefit/cost analysis are as follows:

(i) The cost of rice mills is accounted for as an annual cost per ton of yield ($31/ton of rice) in the derivation of the farm gate price for paddy used in the crop budgets.

(ii) Rural infrastructure is for domestic water supply and improvement of roads, the benefits of which have not been included in the calculation of project benefits.

(iii) Farm machinery costs are included in the crop budgets as an annual depreciation charge.

(iv) The land acquisition cost is for grazing land of little economic value. Also, the economic value of land acquired by the project is offset by the economic value of a greater quantity of land that is released back to grazing as a result of canal realignment.

(v) Fishery compensation is not included as an economic cost because in fact there is no increase in the amount of fishery loss as a result of the project investment.

The construction conversion factor (CCF) was calculated by comparing financial and economic costs after deleting the above costs and the price contingencies. The CCF is the combined result of shadow pricing unskilled labor, deleting VAT, and applying the SCF to the remaining local cost component. No adjustment is made to foreign costs. The CCF is 0.83 for the total project, and 0.86 for the allocated costs to Ilyasov and Shagan area.

The following table summarizes the effect of the deletions, and shadow pricing adjustments on the main categories of project costs allocated to the 13,690 hectares project of the Ilyasov and Shagan farm areas.

Comparison of Financial and Economic Costs for
the Ilyasov and Shagan Area Proposed Project

Description	Phase I		Phase II	
	Financial	Economic	Financial	Economic
Construction Cost	($000)	($000)	($000)	($000)
Rural Infrastructure	2,184.6	0	1,984.3	0
Remaining Construction	26,976.4	22,741.1	34,740.6	29,629.0
Subtotal	29,161.0	22,741.1	36,724.9	29,629.0
Procurement Works				
Rice Mill	2,080.0	0	780.0	0
Farm Machinery	6,118.4	0	7,158.9	0
Remaining Procurement	453.1	450.9	458.0	455.8
Subtotal	8,651.5	450.9	8396.9	455.8
Administration Cost	1,194.7	1,075.2	1,140.9	1,026.8
Technical Support	3,073.7	3,004.3	3,271.5	3,160.1
Land Acquisition	1.4	0		
Fishery Compensation			160.0	0
Subtotal	42,082.3	27,271.5	49,694.1	34,271.6
Physical Contingency	4,208.1	2,727.1	4,969.5	3,427.2
Subtotal	46,290.4	29,998.6	54,663.6	37,698.8
Price Contingency	6,287.9	0.0	12,457.0	0
Total Cost	52,578.3	29,998.6	67,120.6	37,698.8

The total economic cost allocated to Phase I of the project is $30.0 million, $4629/ha and the economic cost of Phase II is $37.7 million, $5229/ha. The combined economic cost allocated to Ilyasov and Shagan areas for Phase I and II of the project is $67.7 million, $4945/ha for the 13,690 hectares project area.

The life of the project is 50 years commencing from the fifth year when construction of Phase I irrigation works is completed. Capital components with a 10 year life are replaced at an economic cost of $922 thousand, and components with a 25 year life are replaced at an economic cost of $964 thousand.

The estimated O&M cost under with project conditions is $65/ha and the estimated O&M cost under without project conditions is based on the 1996 water charge, $17/ha [2/] for the area irrigated under without project conditions. After shadow pricing the local cost component (80%), the O&M cost is $60/ha under project conditions and $15/ha under without project conditions.

2.3 Economic Benefit

Financial and economic crop budgets, and the budget supporting data for prices, yields, and inputs are provided in the Agriculture and Agro-economy Annex. The results of the economic crop budgets are summarized in the following table for future without project and future with project conditions.

Net Returns per Hectare from Economic Crop Budgets

Crop	Future With Project	Future W/O Project	Increase With Project
Rice	$859	$399	$460
Lucerne	325	66	259
Wheat	226	-25	251
Vegetables	2420	931	1489
Safflower	271	-138	409

Note: Based on economic prices, no taxes are included.

The benefits of the project result from 1) restoration of abandoned land, 2) increased yields and 3) conversion to a more intensive cropping pattern. Without the project, 83% of the crop area will be abandoned. This cropland will be restored to production under with project conditions. The yield of the major crop - paddy is projected to increase from 3.59 tons/ha under without project conditions to 6 tons/ha with the project. Under with project conditions, the cropped area is expected to include 50% paddy, as compared to 8.5% under without project conditions.

The average net return per hectare without the project is $49, compared to $682 with the project. The incremental benefit per ha is $633, and the total benefit from the combination of higher yields and more intensive cropping is $8.7 million annually at full development of 13,960 hectares.

2.4 Economic Evaluation

The EIRR of the project is 11.3%. Using a 10% discount rate, the NPV of the project is $5.2 million and the BCR is 1.1. The benefit/cost cash flow is shown as Table I.1 at the end of the text for this Annex.

The full economic cost of Phase I, $88.9 million ($13,717/ha) was evaluated against the economic benefit from only the Ilyasov farm area of 6,480 hectares. The result of course was a very low EIRR, 3.2%. Also, Ilyasov farm area and Shagan farm area were evaluated separately based on an allocation of total project costs. The result was an EIRR of 13.4% for the Ilyasov area of 6480 hectares, and 10.6% for the Shagan farm area of 7210 hectares.

2/ Ibid, p. 41.

Sensitivity Analysis. The EIRR of the proposed project is 11.3%. If the construction cost is increased by 10%, the EIRR becomes 10.2%. If the benefit is 10% less, the EIRR becomes 10.0%. If both events occur, the EIRR falls to 9.0%. If there is a one year delay in construction implementation of Phase I, which delays Phase II by one year, and delays benefits by one year, the EIRR becomes 10.9%. To calculate the latter figure, it was assumed that only 70% of scheduled construction was completed in the 4th and 5th years of Phase I and the carryover work was completed in the 6th year. The work scheduled for the 6th year was postponed to a year later and the beginning of Phase II was delayed one year.

3 Financial Analysis

3.1 General

The purpose of this section is to examine the financial condition of the project farms and determine whether they will have sufficient income to pay for O,M&R costs, and their share of project construction costs.

Under terms of the Government Resolution specifying conditions for implementing the Kazakstan Irrigation and Drainage Improvement Project (KIDIP) financed partly through a World Bank loan to the Government, the farms/beneficiaries are required to repay 70% of the "amount invested for improvement of irrigation and drainage system on the land of the farm/beneficiary."[3/] Local government budgets (Raion and Oblast) must repay 10% of the construction cost, and the Republic Budget covers the remaining 20% of the cost. Although the Government must repay the World Bank loan within 20 years, the farmers are allowed a 30 year repayment period.

In the following analysis, it is assumed that the same terms will apply to the Kzyl Orda Irrigation/Drainage and Water Management Project. In other words, project farms will be required to repay 70% of on-farm development costs over a 30 year repayment period with interest. The interest rate at which these costs are repaid is assumed to be 2.5%.

This project differs from the KIDIP in that nearly all the construction investment of KIDIP is for on-farm development. Most of the construction investment for this project is for the Left Main Canal and Inter-farm canals.

The financial analysis is conducted in two parts. The first part examines the financial condition of project farms assuming they repay 70% of the on-farm construction cost. The second part is a payment capacity analysis to see how much of the construction investment farmers could repay and still have a reasonable household income.

3.2 Farm Budget Analysis

Farmers will also receive loans under the project for rice mills, farm machinery, and annual operating loans for purchase of production inputs. In the farm budget analysis it was assumed that rice mill loans are repaid over five years at 4.5% interest, with only interest repayment required in the first year. The repayment period is similar to the four year term allowed for Shagan Production Cooperative to repay the rice mill loan it received under the Asian Development Bank Mid-term Credit loan.

Annual farm operating loans for purchase of production inputs are assumed to be repaid in seven months at an annual 4.5% interest rate.

With respect to the farm machinery loans, interest is charged in the farm budgets at 4.5% on 55% of the loan. The crop budgets include depreciation costs by the straight line method on 90% of farm machinery costs. The combination of the interest charge and the

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[3/] Resolution of the Government of Kazakstan No. 1237 Dated 7 October 1996, Attachment 2, Note No. 10.

depreciation cost is sufficient to replace the entire inventory of machinery every seven years in perpetuity.

The results of the farm budget analysis for Ilyasov farm area are summarized in the following table. The complete budgets are at the end of this Annex as Tables I.2 and I.3.

Results of the Ilyasov Farm Budget Analysis ($000, 1997)

Item	Year				
	1-2	3	4	5-7	8-30
Gross Value of Production	425	4,535	5,905	5,905	5,905
Total Outflow a/	3,233	9,432	5,041	3,359	3,359
Net Benefit Before Financing	-2,808	-4,897	864	2,546	2,546
Net Benefit After Financing	85	1,073	1,497	1,497	2,135
Net Income/Household b/ $	251	2,857	3,790	3,790	5,195
Financial Internal Rate of Return %	16.8				

a/ Year 1 figures shown. Total outflow in Year 2 was $3,838; and net benefit before financing was-$3,413. The rest of the figures are the same for Year 2.
b/ Includes wages paid as crop production costs.

The financial internal rate of return to all resources engaged (FIRR) which is calculated from the incremental cash flow before financing is 16.8% for the Ilyasov farm area. Net income per household, including wages from crop production labor, increases from only $251 before the project to $2,857 in the 3rd year when farms begin to increase production as a result of project investment. During the 4th through 7th years, net income/household increases to $3,790 at full production as the rice mill loan is repaid. After the rice mill loan is repaid, net income/household is $5,195.

The results of the Shagan farm area analysis indicate a FIRR of 15.9%. Net income/household in the first two years without project benefit is $294, rising to $2,311 in the 3rd year, $3,354 in the 4th through 7th years, and $3,698 thereafter.

3.3 Capacity to Pay

Payment capacity is defined as the ability of the farm family to pay for project water charges, both O&M and construction repayment. Making a determination of payment capacity requires making a judgment as to what constitutes an adequate level of income to the farm family. Any residual profit above that amount is called payment capacity which may be allocated to pay annual O&M costs and part or all of project construction costs. After subtracting the annual O&M costs, the remaining payment capacity is called amortization capacity, which is the ability of the farm to repay project construction charges.

The farm survey reported that there are 1149 households in the Project area.[4/] Thus the average area of the Project is 11.9 irrigated ha/household. In determining whether project farms have payment capacity, it is necessary to specify what is considered to be an adequate return for labor, management, and living expenses to these households. This is a subjective judgment, but, the following background provides perspective on the current levels of income in Kazakstan.

The national average monthly salary in Kazakstan was 6851 tenge ($101.83) in 1996. The average monthly salary of workers in agriculture was 3558 tenge ($52.88) and the average monthly salary of workers in education was 5003 tenge ($74.35).[5/]

4/ Section 3.7.5 of the Progress Report (II), Study of Kzyl-Orda Irrigation/Drainage and Water Management Project in the Republic of Kazakstan, September 1997, Nippon Koei Co. Ltd, p. 45.

5/ National Statistical Agency of Republic of Kazakstan, Statistical Bulletin 1996, No. 4, Almaty, 1997, p.20.

The project area Household Survey found with respect to family food expenditures that the average expenditure for food in 1995 was 62,538 tenge ($1019) or $85/month.[6/] Adjusting for about 4% inflation in the US$ since then, the equivalent amount in October 1997 is about $88.40/month or 6,630 tenge/month. The wage charge for skilled tractor drivers in the crop budgets is $0.70/hour, which converts to a monthly income of $122.50 (9,188 tenge/month).

Based on the above review of wages and incomes, it was decided that for the purpose of estimating payment capacity, farm households in the project area should have an after tax income of at least 135,000 tenge ($1800). In order to arrive at this level of income per household in Shagan farm area, it was necessary to add a family living allowance of $1000/household to the household income from labor and management on the farm. A lower allowance around $800 per household would have been sufficient on Ilyasov farm area, but, the same figure was used for both farms, resulting in somewhat higher average income to households in the Ilyasov farm area compared to Shagan farm area households.

The detailed payment capacity budgets are in Tables 11 and 12 at the end of this Annex. In summary, the budgets deduct the following costs from gross value of production: 1) crop production costs, 2) all debt service costs for farm machinery, rice mills, and operating loan, 3) all taxes, and 4) the returns to farm households for labor, management, and living allowance. The residual payment capacity is then allocated first to pay annual O,M&R cost, and the balance remaining is amortization capacity for repaying project construction costs. Results of the payment capacity budget for the Ilyasov farm area are summarized in the following table.

Summary of Payment Capacity and Farm Household Incomes
for Ilyasov Farm Area, 6480 ha ($000)

Component	Year			
	1-2	3	4-7	8-30
Net Income/Household $	217	2,172	2,188	2,441
Payment Capacity	0	580	1,249	1,759
less O,M&R $65/ha		421	421	421
Amortization Capacity		159	828	1,338
less repayment of on-farm development			245	245
Remaining amortization capacity			583	1,093
per ha $			90	169

Household incomes were somewhat less for the Shagan farm area of 7,210 hectares. Income per household is $1,779 in Year 3, $1,958 in Years 4 through 7, and $2,020 thereafter. Amortization capacity is $154/ha. After deducting $45 for repayment of 70% of the on-farm development cost, the remaining amortization capacity is $109/ha. If we take the average of the remaining amortization capacity from the two farm areas, $100/ha, this is sufficient to repay another $2,093/ha or $28.7 million total of project construction costs over 30 years at 2.5% interest. Also, it should be noted that after the rice mill loans are paid off, there is considerable more income available to households, or this income can be used to pay for more of the construction costs.

3.4 Loan Repayment

The allocation of costs for repayment and the terms of repayment are yet to be negotiated. An example of the apportionment of construction costs for repayment and the schedule and cash flow of funds is shown in Table I.4 and I.5 at the end of this report. This example is based on the following assumptions:

6/ Nippon Koei Co., Ltd., The Study of Kzyl-Orda Irrigation/Drainage and Water Management Project in the Republic of Kazakstan, Interim Report, March 1997, p.50.

(i) Farmers repay all of the rice mill and farm machinery costs and 70% of the cost of on-farm irrigation and drainage facilities.

(ii) Local governments (Raion and Oblast) pay 10% of project costs excluding rice mills and farm machinery.

(iii) The Republic Government repays the remainder of the construction cost (loan) after deducting the shares paid by farmers and local governments.

(iv) The interest rate charged on the loan is 2.5%.

(v) Interest during construction (IDC) is charged at 2.5% of the loan balance at the beginning of the year (the sum of construction expenditures and interest from previous years), plus 2.5% of one half of the construction expenditure during the current year.

(vi) The term of the loan is 40 years consisting of the 10 year construction period and 30 year repayment period thereafter.

(vii) The repayment period for local governments and the Republic government is 30 years, commencing in 2009, the year after project construction is completed.

(viii) The repayment period for farmers is 30 years, commencing the year after the construction of on-farm facilities is completed for each phase of construction. Thus the farmers served by Phase I construction begin repayment of on-farm facilities in the year 2005 and farmers served by Phase II begin repayment in the year 2008.

Repayment of the loans for the rice mills and farm machinery are shown separately in the analysis under the special terms of these loans as follows:

(i) Repayment of the rice mill cost begins the year after the expenditures are completed for each phase.

(ii) Only interest is paid in the first year of repayment for the rice mills.

(iii) The principal of the rice mill loans is paid over a period of four years at an interest charge of 4.5% of which 2.5% is credited to Project repayment and 2% is for loan administrative fees.

(iv) The farm machinery costs are repaid as five consecutive seven year term loans, each loan consisting of 20% of the total project cost for farm machinery.

(v) Repayment of the first farm machinery loan under each phase of construction begins in the first year of expenditure of funds for farm machinery, 2003 for Phase I farmers, and 2006 for Phase II farmers.

(vi) As with the rice mills, interest is charged to farmers at 4.5% of the farm machinery loans, of which 2.5% is credited to project loan repayment.

(vii) IDC is not charged on the rice mill and farm machinery loans.

As shown in the following table, the total project construction cost including physical and price contingency allowances is $291.2 million of which $3.5 million is for rice mills, $16.9 million for farm machinery, and $20.6 million for on-farm facilities. IDC is $31.3 million, making a loan balance of $322.5 million at the end of the construction period.

Item	Farmers	Local Governments	Republic Government
Total Loan and IDC			322,450
Repayment of Principal and Interest @2.5%			
Rice Mills	3,847		
Farm Machinery	18,648		
Remaining Project Costs	20,644	43,295	368,868
% Repayment exc. rice mills & farm machinery	4.8	10.0	85.2
Total Repayment	43,139	43,295	368,868
% of Total Repayment	9.5	9.5	81.0

Total project repayment from all sources is $455.3 million, of which $164.1 million is interest. Excluding rice mill and farm machinery loans, the average annual payments over the 30 year repayment period are farmers - $688,000; local governments - $1,443,000; and Republic Government - $12,244,000.

4 Socio-economic Impacts

In addition to the direct benefit counted in the economic and financial evaluations, the following indirect and intangible benefits are expected from project implementation:

(i) Increase of Employment Opportunity

The main impact of the project will be to greatly increase incomes to the 1149 farm households as discussed previously. The project will provide an increase of about 98,000 days of employment in crop production.

(ii) Activation of Marketing Activities

Indirectly, the project will increase employment and incomes to the suppliers of farm inputs, and the firms such as Tabys and Kokonis, and the transportation companies involved in the marketing of farm commodities. Annually, project farmers will purchase $1,031,000 of fertilizers, $385,000 of pesticides, and $647,000 of fuel. They will plant seeds, both purchased and farm produced valued at $847,000. They will produce $3,945,000 of paddy, $886,000 of wheat, and $1,836,000 of vegetables and fruits.

(iii) Increase in Government Revenue

Project farmers will pay $218,000 in social cost contributions for the welfare of workers. Through their purchases and sales, they will pay $2,461,000 million of VAT revenues to the State. Farm households will also pay $279,000 of income taxes annually.

(iv) Enhancement of Living Conditions

The project infrastructure component provides a potable water supply to farm households, thus improving health and reducing the inconvenience, time and drudgery of obtaining water.

(v) Demonstration Effect of Improved Farming Practices

The improvement in on-farm water management and crop cultural practices on project farms will provide a demonstration to other farms in the Left Bank area, thus having a spin-off effect to raise productivity in the area and reduce water losses.

(vi) Foreign Currency Earnings

Foreign exchange earnings will increase as a result of exporting the increased production of rice from the project, as well as vegetables and melons.

(vii) Improvement of Natural Environmental Conditions

After implementation of the Project, irrigation water saving will be realized to a certain extent, which will contribute to the environmental conditions in the lower basin of the Syr Darya river including Aral Sea.

5 Project Justification

The project is technically sound, economically feasible, and financially viable. There are no serious environmental impacts. Irrigated farming is the main economic driver of the Kzyl Orda Oblast economy. The project will have many direct and indirect social and economic benefits to the residents of the area both rural and urban as just listed. Also, it will increase foreign exchange earnings and revenues to the State.

Tables

Table I.1 Benefit/Cost Cash Flow, Ilyasov and Shagan Farm Areas

Without Project Net Income

Crop	Area Ha	Income $/ha	Total $000
Wheat	320	-24.95	-8.0
Paddy	1160	398.87	462.7
Safflower	40	-138.33	-5.5
Vegetables	200	930.73	186.1
Melons			0.0
Maize Silage			0.0
Lucerne	590	66.20	39.1
Abandoned	11380		0.0
Total	13690		674.4
Average Net Income $/ha			49

With Project Net Income

Crop	Area ha	Income $/ha	Total $000
Wheat	1790	225.50	403.6
Paddy	6850	858.67	5881.9
Safflower	220	271.31	73.3
Vegetables	680	2419.87	1645.5
Melons			0.0
Maize Silage			0.0
Lucerne	4100	324.79	1331.6
Abandoned			0.0
Total	13690		9335.9
Average Net Income $/ha			682
Incremental Benefit			8662
Incremental Benefit $/ha			633

Project Cost Estimate Item	Total $000	Per ha. $
Phase I Construction	29999	4629
Phase II Construction	37698	5229
Total Construction	67697	4945
Operation and Maintenance		
Phase I O,M&R	376.9	58
Phase II O,M&R	409.2	57
Total Incremental O,M&R	786.1	57

Computation of NPV, IRR, and BCR

($000, 1997 Economic Prices)

Year	Ph. I Const.	Ph. II Const.	Ph. I O,M&R	Ph. II O,M&R	Total Cost	Ph. I Benefits	Ph. II Benefits	Net Cash Flow	Present Value @ 10% Project Benefits	Total Cost	Cash Flow
0	699		0	0	699	0	0	-699	0	699	-699
1	735		0	0	735	0	0	-735	0	668	-668
2	4104		0	0	4104	0	0	-4104	0	3392	-3392
3	9816		0	0	9816	0	0	-9816	0	7375	-7375
4	10841		377	0	11218	3075	0	-8144	2100	7662	-5562
5	3804	4505	377	0	8686	4100	0	-4586	2545	5393	-2848
6		12407	377	0	12784	4100	0	-8684	2314	7216	-4902
7		14359	377	0	14736	4100	0	-10637	2104	7562	-5458
8		5764	377	409	6550	4100	3422	971	3509	3056	453
9		663	377	409	1450	4100	4562	7212	3673	615	3059
10			377	409	786	4100	4562	7876	3339	303	3036
11			377	409	786	4100	4562	7876	3036	276	2760
12			377	409	786	4100	4562	7876	2760	250	2509
13			377	409	786	4100	4562	7876	2509	228	2281
14	460		377	409	1246	4100	4562	7416	2281	328	1953
15			377	409	786	4100	4562	7876	2074	188	1885
16			377	409	786	4100	4562	7876	1885	171	1714
17			377	409	786	4100	4562	7876	1714	156	1558
18		462	377	409	1248	4100	4562	7413	1558	225	1333
19			377	409	786	4100	4562	7876	1416	129	1288
20			377	409	786	4100	4562	7876	1287	117	1171
21			377	409	786	4100	4562	7876	1170	106	1064
22			377	409	786	4100	4562	7876	1064	97	967
23			377	409	786	4100	4562	7876	967	88	880
24	460		377	409	1246	4100	4562	7416	879	127	753
25			377	409	786	4100	4562	7876	799	73	727
26			377	409	786	4100	4562	7876	727	66	661
27			377	409	786	4100	4562	7876	661	60	601
28		462	377	409	1248	4100	4562	7413	601	87	514
29	741		377	409	1527	4100	4562	7135	546	96	450
30			377	409	786	4100	4562	7876	496	45	451
31			377	409	786	4100	4562	7876	451	41	410
32			377	409	786	4100	4562	7876	410	37	373
33		224	377	409	1010	4100	4562	7652	373	43	329
34	460		377	409	1246	4100	4562	7416	339	49	290
35			377	409	786	4100	4562	7876	308	28	280
36			377	409	786	4100	4562	7876	280	25	255
37			377	409	786	4100	4562	7876	255	23	232
38		462	377	409	1248	4100	4562	7413	232	33	198
39			377	409	786	4100	4562	7876	211	19	191
40			377	409	786	4100	4562	7876	191	17	174
41			377	409	786	4100	4562	7876	174	16	158
42			377	409	786	4100	4562	7876	158	14	144
43			377	409	786	4100	4562	7876	144	13	131
44	460		377	409	1246	4100	4562	7416	131	19	112
45			377	409	786	4100	4562	7876	119	11	108
46			377	409	786	4100	4562	7876	108	10	98
47			377	409	786	4100	4562	7876	98	9	89
48		462	377	409	1248	4100	4562	7413	89	13	76
49			377	409	786	4100	4562	7876	81	7	74
50			377	409	786	4100	4562	7876	74	7	67
51			377	409	786	4100	4562	7876	67	6	61
52			377	409	786	4100	4562	7876	61	6	55
53			377	409	786	4100	4562	7876	55	5	50
54			377	409	786	4100	4562	7876	50	5	46
									52475	47307	5168
				EIRR %	11.3						
				BCR @10	1.1			NPV @10%	5168		

Table 1.2 Farm Budget Analysis, Ilyasov Farm Area

6,480 Hectares ($000, 1992)

Item / Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gross Value of Production a/	425	425	4,553	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905
		Outflow																												
Investment Onfarm Facilities 20%	1,368	2,736	1,026	0	0																									
Investment Rice Mill	1,525	263																												
Crop Production Costs	318	318	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929
Irrig. System Operating Costs	13	13	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
Land Tax	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Investment Farm machinery			5,048	1,683																										
Total Outflow b/	3,233	3,338	9,432	5,041	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359	3,359
		Net Benefit Before Financing																												
Total	-2,808	-3,413	-4,897	864	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546	2,546
Without Project	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Incremental	-2,893	-3,498	-4,982	779	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461	2,461
		Financing																												
Loan Receipts																														
Irrig. & Drng. Construction	1,368	2,736	1,026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice mill & storage	1,525	263	0	0																										
Farm machinery			5,048	1,683	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt Service, Construction Loan (30 Years @ 2.5%)				245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245
Rice mill, 4 yrs @ 4.5% c/			103	638	638	638	638																							
Interest on Farm machinery loan (55% of $6,731,000 @ 4.5%)				167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167
Interest Operating Loan 4.5%	5	5	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Net Financing	2,893	3,498	5,971	633	-1,049	-1,049	-1,049	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412	-412
		Net Benefit After Financing																												
Total	85	85	1,073	1,497	1,497	1,497	1,497	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135	2,135
Without Project	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Incremental	0	0	988	1,412	1,412	1,412	1,412	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049	2,049
Wages Paid as Production Cost	29	29	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Net Income/Household $	251	251	2,857	3,790	3,790	3,790	3,790	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195	5,195
FIRR on All Resources Employed %	-	10.8 d/																												

a/ Seventy five percent of the with project gross return in the third year (2004).
b/ Project costs include 10% physical contingency allowance.
c/ Interest only in 3rd year because of low income. Repayment begins in 4th year.
d/ FIRR of incremental benefit before financing.

Table 1.3 Farm Budget Analysis, Shagan Farm Area

2,210 Hectares ($'000, 1997)

Item \ Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gross Value of Production a/	797	797	3,188	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581
Outflow																														
Investment Outlays Facilities 70%	1,818	3,635	1,363	0	0																									
Investment Rice Mill	477	381																												
Crop Production Costs	614	614	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260
Irrig. System Operating Costs	26	26	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469
Land Tax	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Investment Farm machinery		5,906	1,969																											
Total Outflow b/	2,944	10,573	7,071	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739	3,739
Net Benefit Before Financing																														
Total	-2,147	-9,776	-3,936	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842	2,842
Without Project	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
Incremental	-2,294	-9,923	-4,083	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695	2,695
Financing																														
Loan Receipts																														
Irrig. & Drng. Construction	1,818	3,635	1,363	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice mill & storage	477	381	0	0	0																									
Farm machinery		5,906	1,969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt Service, Construction Loan																														
(30 Years @ 2.5%)				326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326
Rice mill, 4 yrs @ 4.5% c/			39	239	239	239	239																							
Interest on Farm machinery loan																														
(55% of $7,875,000 @ 4.5%)				195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195
Interest Operating Loan 4.5%	5	5	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Net Financing	2,294	9,923	3,293	4760	4760	4760	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521	4521
Net Benefit After Financing																														
Total	147	147	1,357	2,082	2,082	2,082	2,082	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321	2,321
Without Project	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
Incremental	0	0	1,210	1,935	1,935	1,935	1,935	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174	2,174
Wages Paid as Production Cost	57	57	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249
Net Income/Household $	204	204	2,311	3,354	3,354	3,354	3,354	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698
FIRR to All Resources Employed %	•	(5.9) d/																												

a/ Seventy five percent of the with project gross return in the third year (2004)
b/ Project costs include 10% physical contingency allowance
c/ Interest only in 3rd year because of low income. Repayment begins in 4th year.
d/ FIRR of incremental benefit before financing.

Table I.4 Payment Capacity Budget, Ilyasov Farm Area

(4x90 ha Farm, ($'000, 1997))

Item	1 a/	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gross Value of Production																														
Rice	267	267	2,640	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698	3,698
Lucerne	35	35	832	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830	830
Wheat	20	20	320	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
Safflower	2	2	70	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Vegetables	101	101	673	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864	864
Total	425	425	4,535	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905	5,905
Crop Production Costs																														
Rice	196	196	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866	1,866
Lucerne	36	36	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415	415
Wheat	30	30	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310
Safflower	4	4	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Vegetables	51	51	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253
Subtotal	318	318	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929
Interest on Farm Machinery Loan																														
(55%*56,731,000 @ 4.5%) b/			167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167	167
Rice Mills ($2,288,000 @ 4.5% 4 yr.)			103	638	638	638	638	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest operating loan 4.5% c/	5	5	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Land Tax ($1.33/ha)	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Total Outflow	332	332	3,242	3,777	3,777	3,777	3,777	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139	3,139
Net Return w/o repayment & tax	93	93	1,293	2,128	2,128	2,128	2,128	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766	2,766
Without Project	93	93	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Incremental	0	0	1,199	2,034	2,034	2,034	2,034	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672	2,672
Payment Capacity																														
Wages paid as prod. cost	29	29	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
Return to management 20% net income			259	426	426	426	426	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553	553
Return to labor & management			483	650	650	650	650	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777	777
Living Allowance @ US$1000/household			454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454	454
Total Income to Farm Households	123	123	937	1,104	1,104	1,104	1,104	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231	1,231
Payment Capacity			580	1,249	1,249	1,249	1,249	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759	1,759
Irrigation O,M&R $65/ha d/	13	13	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421	421
Amortization Capacity			159	827	827	827	827	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338	1,338
Income Tax @ 10%	11	11	110	110	110	110	110	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123
Net Income after Taxes	99	99	986	993	993	993	993	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108	1,108
Net Income/Household $	217	217	2,172	2,188	2,188	2,188	2,188	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441

a/ Without project cropping pattern and production.
b/ Twenty percent new equipment purchased annually beginning in 2nd year.
Annual depreciation of $672,200 included in crop production cost is sufficient to replace the machinery investment every 7 years.
c/ Annual loan of $1,331,000 covers purchase of seeds, fuel, fertilizers, and chemicals. Loan term 7 months.
d/ $17/ha for cropped land w/o project, then $65/ha thereafter with project.

Table I.5 Payment Capacity Budget, Shagan Farm Area

7210 Ha Farm ($000, 1967)

Item	1 a/	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Gross Value of Production																														
Rice	526	526	3,222	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120	4,120
Lucerne	72	72	911	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924	924
Wheat	43	43	360	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465	465
Safflower	5	5	76	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
Vegetables	151	151	767	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972
Total	797	797	5,135	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581	6,581
Crop Production Costs																														
Rice	388	388	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079	2,079
Lucerne	71	71	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462
Wheat	67	67	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342
Safflower	12	12	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Vegetables	77	77	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285	285
Subtotal	614	614	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260	3,260
Interest on Farm Machinery Loan ($556*$2,075,000 @ 4.5% b/			195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195
Rice Mill ($858,000 @ 4.5% 4 yr.)			39	239	239	239	239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest operating loan 4.5% c/	5	5	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Land Tax ($1.3/ha)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total Outflow	629	629	3,542	3,743	3,743	3,743	3,743	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	3,504
Net Return w/o repayment & tax	168	168	1,593	2,839	2,839	2,839	2,839	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078	3,078
Without Project	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168
Incremental	0	0	1,425	2,670	2,670	2,670	2,670	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909	2,909
Payment Capacity																														
Wages paid as prod. cost	57	57	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249
Return to management 20% net income			319	568	568	568	568	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616	616
Return to labor & management			568	817	817	817	817	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865	865
Living Allowance @ US$1000/household			695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695	695
Total Income to Farm Households	226	226	1,263	1,512	1,512	1,512	1,512	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560	1,560
Payment Capacity			570	1,576	1,576	1,576	1,576	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767	1,767
Irrigation O,M&R $A/ha d/	26	26	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469
Amortization Capacity			131	1,107	1,107	1,107	1,107	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299	1,299
Income Tax @ 10%	20	20	137	151	151	151	151	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156
Net Income after Taxes	180	180	1,236	1,361	1,361	1,361	1,361	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404
Net Income/Household $	258	258	1,759	1,958	1,958	1,958	1,958	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020	2,020

a/ Without project cropping pattern and production.
b/ Twenty percent new equipment purchased annually beginning in 2nd year.
Annual depreciation of $762,700 included in crop production cost is sufficient to replace the machinery investment every 7 years.
c/ Annual loan of $1,481,000 covers purchase of seeds, fuel, fertilizers, and chemicals. Loan term 7 months.
d/ $17/ha for cropped land w/o project, then $45/ha thereafter with project.

Table 1.6 Project Loan Repayment Schedule ($000, costs include physical and price contingencies)

Item	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017-2034	2035-2037	2038	Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19-36	37-39	40	
Loan																						
Phase I																						
Rice Mill				1,675	854																	2,529
Farm Machinery					5,642	1,917																7,558
Onfarm Facilities				2,205	4,520	1,737																8,463
Remaining Costs	3,232	3,630	20,384	36,859	36,197	11,828																112,129
Total Phase I	3,232	3,630	20,384	40,740	47,212	15,482																130,678
Phase II																						
Rice Mill							554	452														1,006
Farm Machinery								6,983	2,372													9,355
Onfarm Facilities							3,156	6,470	2,487													12,113
Remaining Costs						19,483	45,805	49,137	19,892	3,705												138,022
Total Phase II						19,483	49,515	63,042	24,751	3,705												160,496
Total Phase I & II																						
Rice Mill				1,675	854		554	452														3,535
Farm Machinery					5,642	1,917		6,983	2,372													16,913
Onfarm Facilities				2,205	4,520	1,737	3,156	6,470	2,487													20,576
Remaining Costs	3,232	3,630	20,384	36,859	36,197	31,311	45,805	49,137	19,892	3,705												250,151
Total Phase I&II	3,232	3,630	20,384	40,740	47,212	34,965	49,515	63,042	24,751	3,705												291,174
Project Loan excluding rice mills and farm machinery																						31,331
Interest Charges a/	40	127	431	1,184	2,211	3,189	4,293	5,708	6,825	7,322												302,057
Loan Balance	3,272	7,029	27,843	68,092	111,020	147,256	200,510	261,826	291,030	302,057												
Repayment																						
Repayment Revenues from Farms																						
Phase I																						
Rice Mill b/						63	672	672	672	672												2,752
Farm Machinery c/					238	476	714	952	1,191	1,191	1,191	952	714	476	238							8,334
Onfarm Facilities 70%							283	283	283	283	283	283	283	283	283	283	283	283	283			8,491
Phase II									25	262	267	267	267									1,095
Rice Mill b/								295	589	884	1,179	1,473	1,473	1,473	1,179	884	589	295				10,314
Farm Machinery c/										405	405	405	405	405	405	405	405	405	405	405		12,153
Onfarm Facilities 70%																						
Total Repayment from Farms					238	539	1,670	2,202	2,760	3,702	3,325	3,381	3,143	2,638	2,105	1,572	1,277	983	688	405		43,139
Adjusted Loan Balance After Credit for Farm Repayment of Onfarm Facilities																						31,293
Interest Adjustment	40	127	431	1,184	2,211	3,189	4,286	5,701	6,818	7,305												300,887
Adjusted Loan Balance	3,272	7,029	27,843	68,092	111,020	147,256	200,220	261,245	290,159	300,887												
Local Government Repayment 10%											1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	1,443	43,295
Republic Government Repayment											12,244	12,244	12,244	12,244	12,244	12,244	12,244	12,244	12,244	12,527	12,932	368,868

a/ Interest charged at 2.5% on loan balance plus 1/2 current year investment.
b/ Farmers pay 4.5% interest on rice mills and farm machinery, but only 2.5% interest is credited to project payout assuming the other 2% is for loan administration fees.
c/ Replacement of 20% of machinery/year with 7 year loans.

ANNEX - J

ENVIRONMENT

ANNEX J

ENVIRONMENT

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ENVIRONMENT

1. Legal Framework on Environment in Kazakstan

1.1 Laws and Responsible Ministries on Environment

The law on "Environmental Protection" was published in June 1991 in order to clarify the state ownership of natural resources including water, land, forests and wildlife. The law also shows the conduct of the State Ecological Expertize (SEE), which is the public review to the environmental impact caused by the proposed project or programme. According to the law on "Environmental Protection", the SEE is required to all investment projects including foreign and international investment. In line with this law, several regulations have been published since 1992; water code, land code, forestry code and law on animal world. In addition, the large number of other laws affect the environment.

Since 1992, the Ministry of Ecology and Biological Resources (MOEB) has been responsible for the coordination of all national and environmental activities in Kazakstan. The MOEB is a successor of the State Committee on Ecology and Nature Use and Ministry of Forestry. The MOEB is responsible for not only the above coordination but also environmental standard setting, permits and licenses issuing, environmental monitoring and implementation of the SEE. In addition, 19 Oblast departments were established as the provincial environmental foundations and important channel to local governments or agencies.

Kazakstan built a large environmental monitoring system including plan, analytical method and standard during former Soviet Union time. Many agencies were involved into this system. At present, however, Kazakstan is not able to provide the adequate budgetary resource to manage the proper environmental monitoring system. As a result, number of staff, stations and samples dramatically decrease in those agencies.

1.2 Environmental Impact Assessment System

Based on the result of Environmental Impact Assessment (EIA) carried out by project proponent, the MOEB must conduct the SEE review. However, there are no official guidelines for the EIA. The MOEB has published only "Temporary Instruction for Performance of Environmental Impact Assessment" on 1993. The content of this instruction is mainly as follows:

- brief description of ecological and social resources, and
- identification of the environmental impact, especially to natural resources, caused by the projects.

The implementation of SEE was rather limited, while there was no experience of conducting the EIA for agricultural development projects including irrigation and drainage in Kazakstan. Based on the discussion between he Word Bank and MOEB, therefore, the Irrigation and Drainage Improvement Project (IDIP) financed by the Bank prepared the Environmental Assessment Guideline in order to improve the above condition and to enhance the quality of the assessment. The content of this guideline is as follows:

- Introduction,
- Policy, Legal and Administrative Framework,
- Project Description,
- Baseline Data,
- Environmental Impact Analysis,
- Mitigation Plan,
- Environmental Management and Training, and
- Environmental Monitoring Plan.

According to the above guideline, the foreign and local consultants of IDIP are going to prepare the EIA reports for the all sub-projects under the IDIP.

2. Baseline Condition

2.1 Water Resources

(1) River and Irrigation Canal Water

According to the Guideline on Assessment of Water Quality Used for Kazakstan Irrigation Lands prepared by Ministry of Ecology and Bioresources (MOEB) in 1994, the standard and the classification of water quality for irrigation are as shown in Tables J.1 and J.2. The monthly water quality data on the Syr Darya river are available from the Kzyl-Orda Oblast Office of MOEB as shown in Table J.3. In addition, the annual average water quality data in the Syr Darya river collected by Almaty Institute of Hydrometeorology are also available at three locations, i.e., downstream of Chardara reservoir, Kzyl-Orda and Kazalinsk, as shown in Table J.4. According to the above guideline, the quality of river water at Kzyl-Orda is categorized in Class II in terms of salinity during the irrigation period of the Project Area from May to August, except in June when the water quality is in Class III.

The above information shows that regular monitoring of water quality should be necessary along the Syr Darya river in order to check the deterioration of water quality.

In addition to the above-mentioned existing data, the detailed water quality analyses of surface water at the Kzyl-Orda Headworks on the Syr Darya river and the diversion point to the Ilyasov Area on the Left Main Canal were carried out by the survey team of Environmental Impact Assessment (EIA) under the sub-let contract in the Phase-II Study period, and the

results of analyses are shown in Table J.5. The concentration of heavy metals such as copper, zinc, lead, cadmium, arsenic, mercury and chrome is much lower than the standard referred to in the above-mentioned guidelines. The organic chemicals such as phenols, HCCH, DDE and DDT were not confirmed in the samples. Therefore, it is judged that the surface water of the Syr Darya river at the Kzyl-Orda Headworks and the Left Main Canal can be used as irrigation water for most crops except some salt-sensitive ones.

According to the result of bacterial analysis under the said EIA survey, total number of microorganism and coli index show 100,000-1,000,000 Nos. per milliliters, and 23 per liter respectively in the water samples collected at the headworks. These contents are more than the maximum levels of the standard for domestic water in Kazakstan, while the concentration of inorganic or organic materials is within the limit of the standard. For the domestic use of this water, therefore, the water quality should be interpreted with caution, and independent tests and purification are recommended.

The water quality indicators (salinity, BOD, nitrates, ammonium, total-phosphorous (T-P) and organic substances) show higher contamination in the downstream reach of the Syr Darya river. According to information from the oblast office of MOEB, the following pollution sources are reported along the Syr Darya river.

(i) The Syr Darya river receives waste water from urban and industrial areas in Shimkent, Kzyl-Orda and other small towns located along the river. Especially in the industrial complex of Chimkent, heavy pollution is reported to be produced from chemical factories, mining, oil refinery, manufacturing factories and food processing factories polluting the water of the Badam river, which is a tributary of the Syr Darya river.

(ii) The return flow from irrigated agricultural land to the Syr Darya river is reported in its whole basin, except the Study Area where the return flow from irrigated area is limited due to the existing layout of the drainage canal system and rather high water level of the Syr Darya river compared to the surface of paddy field in the area.

(2) Drainage Water

The detailed water quality analysis was made on two water samples collected from the existing drainage canals in the Project Area (Table J.5). In addition, the salt content analysis was carried out on seven water samples collected from the drainage canals in July 1997 under the sub-let contract of Phase-II Study period (Table J.6). According to these tables, salt content in drainage water is 2,100 mg/lit on an average, ranging from 2,000 mg/lit in the upper reaches of the North Collector to 2,500 mg/lit in its middle reaches, which reveals that the average salt content is around 2.0 times compared to that of irrigation water from the Syr Darya river. According to the irrigation water quality standard of Kazakstan, the quality of this drainage water is categorized in Class IV, which is not suitable for irrigation use. Meanwhile, the result of water quality analysis of drainage water carried out in September 1996 under the sub-let contract of Phase-I Study period showed the salt content of 7,000 - 10,000 mg/lit, which is more than 3 times compared to the result of analyses carried out in the Phase-II Study

period. The difference of salt content in July and September is explained by the fact that the period from June to July is the main irrigation season for paddy cultivation, and there is much return flow from paddy fields to the drains diluting the drainage water, while September is an off-season for irrigation, and there is less return flow to drains.

The result of detailed water quality analysis of drainage water also shows that the content of heavy metals is much lower than the above-mentioned standard, same as irrigation water. In addition, the organic chemicals such as phenols, HCCH, DDE and DDT were not found in the samples. Therefore, the pollution caused by the application of agro-chemicals is judged to be very low level in terms of drainage water from the Project Area at present.

(3) Groundwater

The water quality analyses on the water samples collected at upper, middle and bottom parts in 38 existing observation wells and 4 auger boring points were carried out under the sub-let contract in the Phase-II Study period in order to facilitate the salt balance study in the Project Area (Table J.5). According to these results, most of the samples contain more than 2,000 mg/lit of salt, which is categorized in Class IV based on the Irrigation Water Quality Standard of Kazakstan. Therefore, the groundwater in the Project Area is judged not suitable for irrigation use.

In addition to the above water quality analyses, the water quality analysis was carried out on the water samples collected from the deep wells being used for domestic water supply purpose in both Ilyasov and Shagan Areas under the EIA survey, and the analyzed results are shown in Table J.5. According to these results, the samples show more than 1,500 mg/lit of salt, which is more than the maximum level of the standard for domestic water in Kazakstan. The total number of microorganism and coli index also exceed the maximum levels of the standard. According to information from the officer who is in charge of the domestic supply system in the Project Area, the inflow of sub-surface water through the damaged casing pipes of wells causes the high contamination of water in deep wells.

2.2 Biological Resource

(1) Vegetation and flora

According to the results of the EIA survey and land use survey, the vegetation cover in the Project Area is divided into two categories; planted vegetation and natural vegetation. Planted vegetation includes mainly rice, wheat, lucerne and vegetables in the original rice rotation area (original irrigation area). The trees are planted in and around the settlement areas and along the roads in the Project Area.

The natural vegetation includes dumetosous vegetation, reeds, mixed grass vegetation and saltworts vegetation. The characters of vegetation are as follows:

(i) Dumetosous Vegetation

This vegetation is characterized by a homogeneous community or combined community with reeds, grass and saltworts. Tamarisk (Tamarix ramosissima and Tamariz hispida) and Silver Chingil (Halimodendron halodeddron) are most dominant species in this vegetation. The dumetosous vegetation is used as pasture land for cattle.

(ii) Reeds

This vegetation is constituted by the reeds such as Phragmites australis in the wet area caused by flood or shallow depth of groundwater table. The vegetation is natural habitat for wildlife and birds, because reeds produce the animal feeds. The reeds cover the wet area caused by poor drainage or the presently abandoned area of original rice rotation area in the Project Area.

(iii) Mixed Grass Vegetation

In this vegetation, Camel Thorn (Alhagi kirghisorum), Kaspian Karelinia (Karelina caspia), Poundear Statice (Limonium otolepis) and Creeping Bettering (Acroptilon repens) are dominant species. This vegetation area is used as pasture land for cattle.

(iv) Saltworts Vegetation

This vegetation is being gradually replaced by salt resistant plant such as Chenopodiaceae family in the medium to strong saline soil. The dominant species are Frosted Orach (Atriplex tatarica), Saltwort (Salsola foliosa), Siberian grass (Petrosimonia sibirica) and Oppositefolious (Climacoptra crassa), etc.

The northeastern boundary of the Project Area is close to the Tugai vegetation area which is characterized by a complex of phytocenological communities consisting of trees and bushes growing along the river channel. The vegetation is the most important ecosystem in the Kzyl-Orda Left Bank Area because of not only water conservation but also natural habitant for wildlife and birds including significant species. In addition, the Tugai vegetation contains rare species of plants; Populous diversifolia and Populous pruinosa.

(2) Fauna

Based on the result of the EIA survey, the species of fauna in and around the Project Area were listed in Red Data Book (RDB) of Kazakstan, and these are shown in Table J.7. According to this result, 33 rare species in total, which consist of 11 mammals, 19 birds, 2 fish and one reptile are listed in Red Data Book (RDB).

According to information collected through the EIA survey, the number of fauna tends to have been reduced in and around the Syr Darya river due to decrease of river discharge, while the fauna including rare species maintains the same situation in desert area around the Project Area.

The preliminary estimate made by the Scientific Research Institute of Fish shows that about 200 - 300 tons of fish annually flow in the Left Main Canal through the intake facilities of the Kzyl-Orda Headworks from the Syr Darya river in Attachment VI of Main Report. These fish are caught by people living along the irrigation canals during the irrigation period as an important protein source for them, or the fish die in the canals during the non-irrigation period, because the irrigation canals dry up. The Ordinance on "Protection of Fish Resource and Management of Inland Fishery" obliges to take the countermeasure to fish loss at the intake facilities. However, no countermeasure has been taken due to shortage of the government budget.

(3) Reforestation

The strong wind with sand dusts is reported in spring and the beginning of summer in the Project Area. The Oblast office of Committee of Forest and Hunting is planting the seedling of saxual tree in the area in order to protect the desertification caused by strong wind. The activity of the committee is limited in and around settlement area due to the shortage of budget. In addition, it is difficult to grow the seedling without irrigation, because the tree needs irrigation water for 4 years after the planting. From these reasons, there are some difficulties for the committee at present to provide reforestation area even around the farm lands.

(4) Downstream Reaches of the Syr Darya River

According to the report on "Syr Darya Control and Delta Development Project" prepared by IBRD (1996), the discharge of the Syr Darya river had decreased from 13,000 MCM in 1955-1970 to 1,200 MCM in 1981-1987, and 37,000 MCM to 5,600 MCM for the Amu Darya river in the same period. As a result, the reduction of the discharge had caused the retreat of Aral Sea; reduction of the surface area by 45%, the storage volume by 70% and the average water depth by 43%.

The following change of landuse in the delta area of the Syr Darya river, which has around 21.1 million hectares extending from Kazalinsk to the Aral Sea, is estimated in the period from 1960 to 1990:

Landuse	Year 1960		Year 1990	
	ha	%	ha	%
1. Delta Small Lakes	76,600	10	33,600	3
2. Syr Darya Riverbed	5,600	1	8,000	1
3. Marsh Land	51,900	7	56,700	5
4. Forest	21,000	3	6,500	1
5. Agricultural Land	273,000	36	253,000	23
6. Settlements	8,000	1	11,000	1
7. Pasture etc.	313,900	42	381,200	35
8. Bottom of the Aral Sea (New Area)	0	0	350,000	32
Total	750,000	100	1,100,000	100

About 350,000 hectares of new area, caused by the retreat of Aral Sea, is mainly wasteland of saline soil. In addition to the above landuse change, the area with slight to strong

saline soils had increased from 150,000 hectares in 1955 to 311,000 hectares in 1986 excluding bottom area of Aral Sea. The salinity level in Aral Sea had also increased from fresh water level in 1950's to around 25 g/lit in 1980's.

The above-mentioned environmental condition has caused the change of fauna and flora in the Delta area. The number and biodiversity of plant species has reduced, while salt and arid resistant plant species have increased. Regarding the terrestrial fauna, 71 mammals and 51 birds are reported to be extinct because of cleaning up of forest area and increasing of desert area. The quantity and species of fish, phytoplankton and zooplankton dramatically have reduced and changed to salt tolerant species of the aquatic fauna of Aral Sea, because fresh water organisms can not survive under such a saline condition.

2.3 Land Resources

(1) Soil Salinization

Of 40,230 hectares of the Project Area, the area with strong to very strong saline soils including Solonchaks is estimated at around 17,190 hectares or 43 %. The saline soils have a negative impact on soil fertility and crop yield. According to the result of soil survey and water quality analysis carried out under sub-let contract, the area of saline soils closely corresponds to the salt content in groundwater. The strongly saline soils are found around the observation wells with groundwater containing salt of more than 10,000 mg/lit. Most of the original rice rotation area is outside the area of strong to very strong saline soils.

According to information from the Terenozek Raion Administration and farms, only 700 hectares (5.1%) are reported as the presently abandoned area due to salinity problem in the original rice rotation area of 13,690 hectares. According to the result of the field survey, most of the salinized area in the original rice rotation area is located in the abandoned area where the farmers used to cultivate lucerne or other upland crops under poor drainage conditions, and as a result salt has been carried upward by capillary rise of groundwater which contains salt, and accumulated on the surface soil. While in paddy field, this salt movement is always downward being controlled by water percolation when the field is irrigated.

(2) Soil Pollution

According to the result of detailed soil analysis under the EIA survey as shown in Table J.8, the content of heavy metals is much lower than the Kazakstan standard for the soils. In addition, the organic chemicals such as phenols, HCCH, DDE and DDT were not confirmed in the samples. Therefore, soil pollution caused by the application of agro-chemicals is judged very low in the Project Area.

2.4 Others

(1) Construction of Short-cut Canal

As mentioned in Sub-section 4.5.4 of the Main Report, the upstream-most reaches of 9.0 km of the Left Main Canal is proposed to be short-cut for efficient canal operation and maintenance. The length of short-cut canal is 3.5 km, of which about 2.9 km will run across the grass lands owned by the government and managed by the Oblast committee on Water Resources. Remaining reaches of 0.6 km pass through private lands which are mainly used as country gardens with cottages (dacha), but the canal is so designed to pass the garden areas. Therefore, the cottages will not need to be dislocated.

(2) Cultural and Historical Assets

According to the result of the EIA survey, historical and cultural assets protected by law are not located in the Project Area, though some ancient tombs or monuments exist in the Project Area but outside of the original rice rotation area.

(3) Water-borne and Water-related Diseases

According to the information from Kzyl-Orda Oblast Sanitary and Epidemiological Station, existence of water-borne diseases such as malaria, lymphatic filariasis and schistosomiasis is not reported in the Project Area. While, existence of some water-related diseases such as salmonellosis, virus hepatitis and typhoid fever is reported in the Project Area. These water-related diseases are mainly caused by deterioration of quality of drinking water.

3. Initial Environmental Examination (IEE)

3.1 Objective of IEE

Initial Environmental Examination (IEE), which is a preliminary environmental review to assess the project formulation, was conducted for the present condition in and around the Kzyl-Orda Left Bank Area. Major study components of IEE include: (i) present environmental condition; (ii) preliminary assessment of environmental impacts; (iii) scooping of significant impacts and evaluation for whether EIA is necessary or not for the Project.

3.2 Environmental Items and Ecological Regions

Referring to the existing guidelines for Environmental Impact Assessment (EIA) prepared by JICA, IBRD, International Commission on Irrigation and Drainage (ICID) and Overseas Economic Cooperation Fund (OECF), Japan, 16 environmental items are selected for the IEE as shown in Table J.9.

The area to be affected by the Project is broadly divided into following three ecological regions:

- Region I : Irrigation Area including irrigation and drainage canals.
- Region II : Downstream reaches of the Syr Darya river from the Kzyl-Orda headworks to Aral Sea.
- Region III : Downstream reaches of the Kuban Darya river from the confluence with the South Collector down to its tail.

3.3 Result of the IEE

(1) Dislocation of People

The major work items of the construction in the Project are rehabilitation and improvement of existing irrigation and drainage facilities. Furthermore, since the Project does not include the new expansion of irrigation area, and the most of people live in the dwelling area of farm which is located at different area from agricultural land or irrigation and drainage facilities, the people do not need to be shifted. In addition, newly proposed short-cut canal passes through private lands which are mainly used as country gardens with cottages (dacha), but the canal is so designed to pass the garden areas. Therefore, the cottages will not need to be dislocated.

(2) Change of Land Use

According to the land use plan, the future land use does not include the new expansion of irrigation area. As a result, the future land use basically does not change from present condition. At present, there is 13,690 ha of original rice rotation area in the Project Area, which includes 5,200 ha of abandoned area in 1996. Under the future "with project" condition, however, all the abandoned area will be recovered to the normal cultivation area, and all the original rice rotation area will be used for crop production. On the contrary, the irrigated land will decrease from 8,490 ha in 1996 to 2,310 ha, which is the average area to be decreased during the project life of 50 years and deemed to be the irrigation area under the future "without project" condition. Therefore, positive impact to land use will be expected under the future "With project" condition.

(3) Impairment of Transportation

The impairment of transportation will be expected during the construction stage, because the construction vehicles will increase in and around the Project Area while construction of the project facilities. However, the negative impact of the Project to the transportation in the area would be small, because the intensity of traffic is low at present. On the other hand, the road condition in the Project Area will be improved by the construction of the farm road and canal service roads after the implementation of the Project.

(4) Historical and Recreational Disturbance

According to the EIA Survey, some ancient tombs or monuments are located in the Project Area. However, these tombs or monuments exist in the outside of the irrigation area in

the Study Area. No negative impact to historical and recreational disturbance will therefore be caused by the Project.

(5) Ecological Disturbance

According to the result of the EIA survey, the Tugai vegetation distributed along the Syr Darya river is the most important ecosystem in the Kzyl-Orda Left Bank Area because of not only water conservation factor but also natural habitant for wildlife and birds including significant species.

The relatively high magnitude of negative impact to the Tugai vegetation will be expected during the construction stage, if there is no environmental protection. The negative impact will mainly be caused by construction waste. While the vegetation along the Syr Darya river including the Tugai vegetation would be recovered because of increase of river flow after the implementation of the Project.

(6) Erosion and Sedimentation

The average annual suspended load in the Syr Darya river was 230 mg/lit varying from 51 mg/lit in January to 405 mg/lit in May during the period from 1970 to 1989 at the Kergelmes gauging station located 85 km upstream of the Kzyl-Orda Headworks. The particle size of sediment load in the river water is smaller than 0.3 mm, which is the minimum size for the provision of settling basin in general. Therefore, it is judged that the sedimentation load is not serious to headworks and irrigation canals in the Study Area.

The canal banks of Left Main Canal as well as Left and Right Branch Canals and other subordinate canals have been receded by erosion due to unfavorable geological condition and improper design of water flow velocity. The erosion and sedimentation in the irrigation canals will be improved through the precast concrete block lining in the canals.

(7) Fishery Loss

Due to improvement of the intake facilities of the Kzyl-Orda Headworks, and water saving as mentioned Paragraph 3.3 (9), the fish loss would be decreased to some extent. According to the estimate of Scientific Research Institute of Fish, the annual fish loss will decrease from the present 200 - 300 tons to 140 - 200 tons. In addition to this positive impact, the construction cost for the fish breeding pond needs to be included in the project cost following the Ordinance on "Protection of Fish Resource and Management of Inland Fishery" (Attachment VI of the Main Report).

(8) Groundwater Deterioration

According to the records of groundwater levels at 372 existing observation wells of the Kzyl-Orda Left Bank Area, groundwater table stays at relatively shallow sub-surface (2 - 5 m) over the area. Generally, the depth of groundwater table tends to be deep in the central part of the area. The uppermost unconfined aquifer is subject to rapid fluctuations according to the seasons of the year and irrigation practices. From these phenomena, it is judged that

fluctuation of groundwater table is largely affected by the canal seepage water especially around the major canals. In general, salt is carried to the top soil by the capillary rise of water in the soil where the groundwater table is less than 2-m below the ground surface. After implementation of the Project, however, the groundwater table will be lowered to some extent, because the canal seepage will be checked through the precast concrete block lining in the canals and improvement of drainage system under the future "with project" condition.

According to the records of groundwater quality at the existing observation wells, salinity concentration of groundwater ranges from approximately 700 to 36,000 mg/lit, and the concentration exceeds 2,000 mg/lit, which is categorized in Class IV based on the Irrigation Water Quality Standard of Kazakstan, at 70 % of the existing observation wells. Therefore, the groundwater is not suitable for irrigation use. The application of chemical fertilizer in the irrigation area would cause the more deterioration of the water quality of groundwater. Therefore, the possibility of negative impact will be expected after the implementation of the Project, if there is no environmental protection.

(9) Change of River Flow Regime

According to the result of the water balance study as mentioned in Paragraph 3.2.3(2) of the Main Report, 80 MCM or about 28% water can be saved at the headworks after implementation of the Project. As a result, the discharge of the Syr Darya river to Aral Sea will increase from present 3,568 MCM to 3,648 MCM or 2.2 % under the future "with project" condition. If the same irrigation development system as proposed in the Project is applied to other irrigation areas in the Study Area of 87,000 hectares, the discharge of the Syr Darya river to Aral Sea would increase from present 3,568 MCM to 4,076 MCM or 14.2% under the future "with project" condition. As a result, reduction of surface area of Aral Sea is expected to be restrained to some extent. In addition, the vegetation along the Syr Darya river would be recovered because of increase of river flow.

(10) Surface Water Deterioration

It is expected that the water quality in the drainage canals and the downstream reaches of the Kuban Darya river will be deteriorated due to increase of the total salt volume from irrigation area in future. The quality of surface water in the Study Area and its downstream area might be affected by the increase of the pollution loads of chemical fertilizer and agro-chemicals from the cultivation area. Therefore, the detailed assessment is required in order to clarify the magnitude of the impact caused by the Project.

(11) Public Health Issues

According to the information from Kzyl-Orda Oblast Sanitary and Epidemiological Station, existence of water-borne diseases such as malaria, lymphatic filariasis and schistosmiasis is not reported in four raions concerned. While, existence of some water-related diseases such as salmonellosis, virus hepatitis and typhoid fever is reported in these raions. Deterioration of quality of drinking water would mainly cause such water-related diseases. The implementation of rural water supply is one of the components in the Project. The water-

related disease will decrease, because the quality of drinking water will be improved after the implementation of the Project.

(12) Climatic Change

According to the report on "Syr Darya Control and Delta Development Project" prepared by IBRD (1996), the discharge of the Syr Darya river had decreased from 13,000 MCM in 1955-1970 to 1,200 MCM in 1981-1987, and 37,000 MCM to 5,600 MCM for the Amu Darya river in the same period. As a result, the reduction of the discharge had caused the retreat of Aral Sea; reduction of the surface area by 45%, the storage volume by 70% and the average water depth by 43%. In addition, change of micro-climate was reported around Aral Sea.

According to the result of the water balance study, the discharge of the Syr Darya river to Aral Sea will increase from present 3,795 MCM to 3,886 MCM or 2.4 % under the future "with project" condition as shown in Paragraph 3.3 (9). As a result, the change of micro-climate around Aral Sea is expected to be restrained to some extent.

(13) Water Rights Conflicts

According to the result of the water balance study as mentioned in Paragraph 3.2.3(2) of the Main Report, 91 MCM or about 32% water can be saved at the headworks after implementation of the Project. As a result, no water right conflicts will be expected after implementation of the Project, because the downstream flow will increase under the future "with project" condition.

(14) Soil Degradation (Salinity)

Of 40,230 hectares of the Project Area, the area with strong to very strong saline soils including Solonchaks is estimated at around 17,190 hectares or 43 %. The saline soils have a negative impact on soil fertility and crop yield.

The soil salinity will be reduced because of the drainage improvement under the Project and the increase in cropping intensity of paddy under the future "with project" condition in the Project Area. According to the salt tolerance criteria prepared by FAO (1984), the yield of even salt-sensitive crop and moderately sensitive crops will be expected to increase from 40 - 80 % of the expected yield under the present condition to 70- 90 % under the future "with project" condition. Based on the salt balance study, the detailed assessment will be carried out in order to clarify the magnitude of the positive impact caused by the Project.

(15) Change of Farming Practice

Under future "with project" condition, the farm income will be increased to a great extent. In addition, the agricultural extension work and training to farmers will be carried out in order to attain the improved farming practices including the promotion of scheduled and collective crop production, proper application of farm inputs promotion and introduction of new irrigation method. As a result, the positive impact will be expected.

3.4 Summary of the IEE

A preliminary evaluation of magnitude of impacts has been conducted on the selected 16 environmental items and its result is summarized in Table J.9. As a result, the following environmental items are expected to be significant impacts caused by the Project.

Environmental Items	Ecological Regions		
	Region I	Region II	Region III
1. Impairment of transportation	-	*	*
2. Ecological disturbance	+/-	+	-
3. Erosion and sedimentation	+	-	+
4. Fisheries losses	x	+	x
5. Groundwater deterioration	+	*	-
6. Change of river flow regime	*	+	+
7. Surface water deterioration			
- Toxic Substance	-	x	-
- Salinity	+	x	-
8. Climatic change	*	+	*
9. Water rights conflicts	+	+	x
10. Soil degradation (Salinization)	+	+	-
11. Changing farming practices	+	x	x

x : No effect is expected, * : There is no relation
+ : Positive effect is expected, - : Negative effect is expected

4. Environmental Impact Assessment (EIA)

4.1 General

According to the result of IEE, the Project will not cause large negative impacts, while some positive impacts such as increase of inflow to Aral Sea and reduction of the salinity hazard will be expected under the "with project" condition. On the other hand, according to the legal framework and EIA system in Kazakstan, the MOEB must conduct the SEE to all investment project on the basis of the review of the EIA under the law on "Environmental Protection". The full EIA, which deals with the impact analysis for all the environmental items, is not necessary, because the negative impact is limited. As a conclusion, the study on EIA including the impact analysis should be conducted under the present study for the following four items on the basis of the result of IEE.

(i) Negative impact to be caused during the construction stage,

(ii) Application of chemical fertilizer and agro-chemicals,

(iii) Salinization of land and water resources, and

(iv) Impact on Tugai vegetation and marsh area.

4.2 Result of the EIA

4.2.1 Negative Impact Caused during the Construction Stage

The relatively high magnitude of negative impact will be expected during the construction stage. The negative impact will mainly be caused by construction waste, increase of turbidity in the surface water and waste water from workers' camps. The main construction wastes are disposal of dredged and excavated materials from canal rehabilitation and construction under the Project. The quantity of materials for disposal is estimated as follows:

Item	Length (m)	Excavation (m^3)	Embankment(m^3)
Canal			
Left Main	79,300	2,974,000	4,112,000
Inter-farm/On-farm	108,000	180,000	2,548,000
Field	277,500	427,600	1,478,000
Collector			
North and South Main	269,500	16,700,000	97,100
Inter-farm/On-farm	121,100	1,023,500	46,100
Field	149,800	391,700	2,600
Total		21,696,800	8,283,800

According to the above estimate, the quantity of excavation would be 21.7 million m^3, of which 16.7 million m^3 or 77 % are in the North and South Main Collectors. Although most of these excavated materials can be used as the embankment materials for canal rehabilitation, the balance of 13.4 million m^3 between the excavation and embankment is necessary to be disposed of at some areas. It is judged that the high magnitude of negative impacts will be expected, if the selection of appropriate disposal area and proper construction management are not conducted during the construction stage.

According to the proposed construction plan, most of the earthworks on the irrigation canals will be implemented during the non-irrigation period so as not to disturb the irrigation water supply to agricultural land. As a result, the impact of water turbidity caused by earthworks will be almost nil.

During construction stage, around 2,000 workers per day will be employed in the Project. It means that 60 kg per day of BOD load (30 g/person/day x 2,000 persons) will be discharged from workers' camps without any proper treatment. These discharges will cause the deterioration of surface water and groundwater in and around the Project Area, and the high magnitude of the negative impacts will be caused, if the proper sanitation facilities are not installed in the workers' camps during the construction stage.

4.2.2 Application of Chemical Fertilizer and Agro-chemicals

The application of chemical fertilizer and agro-chemicals in the Project Area would affect the water quality of both surface water and groundwater. The possibility of the impacts is examined on the basis of the difference of farm inputs between the present condition and the "with project" condition as shown below:

(Unit : ton)

	N	P	K	Ca	S	Pesticide	Herbicides
Present Condition	450	160	80	130	520	10	10
With Project Condition	1,430	470	520	380	1,780	360	30
Balance	980	310	440	250	1,260	350	20

The above calculated result shows the large increase of load by inputs of chemical fertilizer and agro-chemicals as compared with the present condition in the Project Area. Based on these calculated results, the future change of surface water quality of Kuvan Darya river, which connects with the North and South Main Collectors, is estimated as follows:

(Unit : ppm)

Description	NH_4	NO_3	P_2O_4	K	Ca	SO_4	Pesticide	Herbicides
Present Condition	0.10	-	n.a.	7.6	120.2	960.7	-	-
"With Project" Condition	0.33	1.57	0.26	8.6	120.4	963.4	0.13	0.01
Standard								
- Domestic	2	45	3.5	50	180	100	-	-
- Fish	0.39	9	0.25	10	180	500	-	-
- Irrigation	-	-	-	-	160	600	-	-

Note : n.a. means that no data are available.

The above table shows that only a small impact is expected to the surface water of the Kuvan Darya river under the future "with project" condition. As for the groundwater, most of the drainage water flows into the field drain under the future "with project" condition. Therefore, it is judged that the elements of chemical fertilizer and agro-chemicals will not be accumulated in the groundwater, and accordingly the impact of chemical fertilizer and agro-chemicals would be small.

4.2.3 Salinization of Land Resources and Water Resources

(1) Salinization in Agricultural Land

Based on the existing data and the result of soil survey and water quality analysis conducted under sub-let contract in the Study, a salt balance calculation is made employing the proposed cropping pattern described in Annex C. The results are shown in the following table.

Year	Crop	Soil Salinity in Root Zone (ECe in mS/cm)	
		Ilyasov Area	Shagan Area
Present		3.88	4.61
1	Paddy	3.28	3.52
2	Wheat	4.49	4.82
3	Paddy	3.48	3.59
4	Lucerne	4.96	5.09
5	Lucerne	6.03	6.18
6	Lucerne	6.89	7.05
7	Paddy	4.26	4.32
8	Paddy	3.40	3.42
9	Wheat	4.73	4.76
10	Paddy	3.56	3.57

The above result shows the decrease of salinity content in the root zone after paddy cultivation and the increase after upland crops cultivation in both Ilyasov and Shagan Areas.

After the completion of one cycle of 10 years, the salinity content in the root zone in both areas is about 3.60 mS/cm, which is lower than the present EC value. The decrease in salinity is attributed to proper drainage system and increase in the cropping intensity of paddy.

(2) Salinity in the Collectors and the Kuvan Darya River

Based on the result of impact assessment for the chemical fertilizer and agro-chemicals, and salt balance, it is estimated that the salt outflow from the Project Area will increase by 39,800 tons in a year under the future "with project" condition. The increment of the salt outflow consists of 38,700 tons from soil and 1,100 tons from chemical fertilizer. At present, the discharge of the Kuvan Darya river is around 309 MCM at its head; the meeting point of the North and South Main Collectors, during irrigation period. Therefore, the increment of salt concentration in the river water from the present level to that of the future "with project" condition is estimated at 129 ppm. Since the present salt concentration in the Kuvan Darya river is 2,500 ppm, it is judged that this impact is very small.

4.2.4 Tugai Vegetation and Marsh Area

According to the result of the EIA survey, the northeastern boundary of the Project Area is close to the Tugai vegetation area which is the most important ecosystem distributed along the Syr Darya river in the Kzyl-Orda Left Bank Area because of not only water conservation but also natural habitat for wildlife and birds including significant species. According to the result of field survey, however, the Tugai vegetation area is not involved directly in the area to be influenced by the irrigation and drainage systems, and also in the original rice rotation area. Therefore, it can be judged that the project impact is almost nil, if special attention is paid to conserve the area.

According to the result of land use survey, around 2,230 hectares of marsh area exists in the Project Area. This marsh area, which is occupied mainly by reeds along canals or around agricultural land, is also natural habitat for wildlife and birds. The area may disappear due to the improvement of drainage condition after the completion of the Project, if no action is taken to protect the area. In order to avoid this crucial situation in future, ecological maintenance water is included in the estimated irrigation water requirements.

5. Environmental Monitoring and Conservation Plan

5.1 Environmental Monitoring Plan

The Monitoring and Evaluation (M&E) Unit is proposed to be established in the Project Office as mentioned in Paragraph 3.4.1(3) of the Main Report. The main duties concerning environmental monitoring and management of M&E Unit are as follows:

- To prepare a concrete monitoring plan and management programs.
- To conduct and supervise the actual monitoring.
- To analyze the data obtained through the monitoring.

- To propose and evaluate the management program.
- To conduct a special study for the environment, if necessary.

The monitoring items include the condition of disposal area, water quality and discharge of surface water, water quality and groundwater table, condition of farm inputs, condition of ecosystem and salinization of agricultural land. In addition, it is necessary to monitor the socio-economical condition of local people through result of baseline survey and setting of benchmark to be carried out in the design stage in order to clarify the project effect and complaints of local people. The summary of the environmental monitoring plan is as shown in Table J.10.

Based on the result of monitoring, the M&E Unit will conduct the environmental management program. The environmental management program includes the evaluation of monitoring result, the preparation of annual or general work plan for the environmental protection such as the above conservation plan including budget allocation, the implementation and follow-up of the work plan and implementation of training related to environmental protection.

5.2 Environmental Conservation Plan

5.2.1 General

Based on the result of the EIA, the plans for the environmental conservation and the monitoring are prepared for the future reference. This plan is recommended to be managed by the proposed M&E Unit in the Project Office, in cooperation with MOA, MOEB and the local government. The environmental conservation plans thus prepared are as shown in Table J.11 and summarized in the following sections.

5.2.2 Negative Impact Caused during the Construction Stage

The relatively high magnitude of negative impact will be expected during the construction stage, if there is no environmental protection. The negative impact will mainly be caused by construction waste and waste water from workers' camps. Therefore, the following countermeasures to ensure environmental protection should be carried out during the construction stage.

- To select proper area to waste the disposal of dredged materials from the canal rehabilitation taking into account the drainage system, the transportation and the ecosystem,
- To install the proper sanitation facilities in the workers' camps to prevent the outflow of the domestic waste water,
- To monitor the water quality of the surface water and complain of local people, and
- To include the above items in the bidding documents to contractors.

5.2.3 Deterioration of Water Quality in the Drainage Canals and the Kuban Darya River

According to the result of the EIA, the water quality in the drainage canals and the downstream reaches of the Kuban Darya river will be deteriorated due to increase of the total salt volume from the irrigation area in future. As for the Kuban Darya river, however, no major damage to environment in the downstream reaches of the river will be expected even after the completion of the Project, since this river disappears in the desert. On the other hand, the water of drainage canals is contaminating irrigation water in the Study Area at present. Therefore, the following countermeasures should be taken for the Project.

- To monitor the water quality and discharge of the drainage canals, and
- To prevent contamination of irrigation water caused by drainage water through the improvement of the design and construction quality of canals.

5.2.4 Application of Chemical Fertilizer and Agro-chemicals

Control of chemical fertilizer and agro-chemicals is the most effective measures to mitigate the degradation of water quality for both surface and groundwater. The method of control is summarized below:

- To make proper use of chemical fertilizer and agro-chemicals through the farmers' training and extension activity,
- To select the chemical fertilizers which are low salinity content as far as possible,
- To select the agro-chemicals which have low toxicity hazard and high dissolution,
- To avoid the spray of the agro-chemicals by airplane, and
- To monitor the water quality and damage to human and animals.

5.2.5 Conservation on Tugai Vegetation and Marsh Area

According to the result of the EIA survey, the Tugai vegetation distributed along the Syr Darya river is the most important ecosystem in the Kzyl-Orda Left Bank Area because of not only water conservation factor but also natural habitant for wildlife and birds including significant species. In addition, the marsh area is also natural habitat for wild life and birds. Therefore, the following conservation manner should be noted for the Project.

- To protect the Tugai vegetation area and marsh area during the construction stage,
- To protect the Tugai vegetation area from human activities such as farming or cutting trees after the implementation of the construction,
- To keep the ecological maintenance flow in canal, and
- To monitor the condition of the flora and fauna in the area.

Tables

Table J.1 Description of Irrigation Water Quality Classes

Water Quality Class	Characteristics of Classes
I	Irrigation water does not have an adverse impact on soils fertility, yield and quality of agricultural products, surface and underground water. Water is suitable for irrigation of all agricultural crops.
II	Irrigation water does not have an adverse impact on agricultural products, surface and underground water. Soil salinity, reduction of crops (of weak salt resistance) up to 10% can occur with insufficient drainage. To leach excess salt from soil the leaching irrigation mode is required with drainage and reclamation measures (application of calcium into soil and water, introduction of organic fertilizers and so on).
III.	Irrigation water has an adverse impact on soils fertility and yield of agricultural crops; yield reduction of crops of weak and medium salt resistance up to 25%. Without preliminary water and soils reclamation the development of salinity, sodium and magnesium alkalinity and soils soda formation is inevitable. It is necessary to regulate pH of irrigation water, to introduce calcium. The leaching mode is needed with drainage, the intensity of which should be related with soils properties and its composition. Special complex of reclamation measures limited composition of agricultural crops is required.
IV.	Irrigation water has an adverse impact on soils fertility, yield and quality of agricultural crops; reduction crops capacity up to 50 %. Soils and water improvement is being required. Water does not fit for irrigation without preliminary change of its quality or without special study of its influence on agricultural products quality, soils fertility and other natural factors.

Source : SNIP 2.06.03 -85, 1988

Table J.2 Water Quality Standard for Irrigation in the Syr Darya River Basin

1. Salinity

Indicators	Unit	Irrigation Water Quality Class		
		II	III	IV
pH	-	6.5-8.5	6.5-8.5	6.5-8.5
Temperature	C	10-35	10-35	10-35
Salinity	mg/l	700-1,200	1,200-2,000	More than 2,000
HCO3	mg/l	370	500	500
SO4	mg/l	350	480	600
Ca	mg/l	140	160	160
Mg	mg/l	85	100	120
Na	mg/l	100	230	280

2. Heavy Metals

Cu	Zn	Pb	Mn	Mo	As	Hg	Al	Cd	Cr	Co	Ni	Ag
1.2	1.2	0.04	0.12	0.3	0.01	0.0006	0.6	0	0.6	0.12	0.12	0.06

Source : MOEB

Table J.3 Monthly Water Quality Data of Syr Darya River

3.0 km Dawnstream of Kzyl-Orda (Average data from year 1994-1996)

Indicators		Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Average
pH		7.20	7.25	6.93	7.18	7.35	7.40	7.05	7.08	7.20	7.10	7.17
O2	(mgO/L)	6.0	4.8	5.9	5.8	5.2	5.2	4.9	5.5	5.6	-	5.4
BOD5	(mgO/L)	2.36	2.28	1.88	2.40	2.32	2.40	2.24	1.92	1.28	-	2.16
SS	(mg/L)	89	86	140	128	104	90	84	75	83	75	94
Oxidation	(mg/L)	11.56	9.52	8.56	8.27	7.65	7.12	6.51	6.92	6.88	-	8.21
Hardness	(mg/L)	10.7	9.2	9.3	9.7	9.2	10.9	9.4	8.1	14.2	12.0	10.1
Ca	(mg/L)	110.0	74.0	93.0	51.4	64.0	24.5	46.3	105.6	116.0	72.0	72.7
Mg	(mg/L)	66.2	64.9	56.5	89.8	73.2	62.5	62.1	49.2	102.8	102.0	69.3
Cl	(mg/L)	106.7	139.6	127.6	148.9	125.3	116.5	126.9	124.1	131.2	120.5	126.8
HCO3	(mg/L)	247.1	201.3	268.4	213.5	242.1	123.4	168.3	201.3	207.4	268.4	210.2
S04	(mg/L)	447.6	542.2	377.7	498.1	448.4	410.9	357.8	429.1	435.7	-	444.8
NH4	(mg/L)	0.028	0.016	0.035	0.021	0.047	0.027	0.028	0.032	0.030	-	0.034
NO2	(mg/L)	0.013	0.023	0.009	0.023	0.016	0.024	0.020	0.015	0.012	0.030	0.019
NO3	(mg/L)	4.675	2.760	1.790	2.428	2.113	3.537	1.190	2.660	2.300	2.450	2.688
Dryresidues	(mg/L)	1,296	1,080	1,036	1,067	1,172	1,026	1,064	908	1,352	-	1,114
Oilproducts	(mg/L)	0.023	0.037	0.020	0.036	0.016	0.015	0.025	0.010	0.030	-	0.027
Salinity	(mg/L)	977.5	1022.0	923.2	1001.8	953.0	737.8	761.4	909.2	993.1	-	919.9
Irrigation Class		II	III	II	III	II	II	II	II	II	-	II

Source : Kzyl Orda Office of MOEB

Table J.4 (1/3) Water Quality Data of Syr Darya River

2.0 km Dawnstream of Chardara Dam (Depth below 0.5m)

Indicators	Symbol	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Smell		grade	-	-	-	-	-	-	-	-	-	-
Transparency		cm	16	20	20	22	22	25	-	-	-	-
Temperature	t	C	14.2.	17.0	14.50	13.3	16.7	16.6	-	-	-	-
Suspended solid	SS	mg/l		468	66.8	20.9	71.2	16.1	20.00	16.51	8.808	12.91
Oxygen	O2	mg/l	12.70	11.60	11.40	10.30	8.63	10.2	10.99	10.38	10.56	10.49
Oxidation	CAC	mg/l	6.3	12.0	15.40	15.10	15.20	17.60	22.49	24.36	18.42	19.69
BOD	BOD5	mg/l	2.64	2.25	2.77	5.42	2.06	2.09	1.421	1.259	1.201	1.217
Ammonia	NH4	mg/l	0.07	0.27	0.11	0.05	0.08	0.1	0.072	0.064	0.084	0.045
Nitrigen nitrite	NO2	mg/l	0.085	0.292	0.042	0.06	0.036	0.068	0.042	0.042	0.037	0.027
Nitrogen nitrate	NO3	mg/l	3.1	1.51	3.56	1.96	1.28	4.42	3.433	3.068	2.888	3.574
Phosphate	P2O4	mg/l	0.006	0.033	0.025	0.018	0.036	0.032	0.021	0.020	0.030	0.029
Silicate	Si	mg/l	5.2	5.7	5.4	5.4	5.8	12.8	10.3	-	-	-
Resin,asphalt		mg/l	0.11	0.14	0.23	0.022	0	0	0.004	-	-	-
Petroleum detergents		mg/l	0.04	0.08	0.07	0.07	0.1	0.05	0.037	0.041	0.056	0.038
Phenols		mg/l	0	0.002	0.003	5E-04	0.0001	0.001	0.001	0.001	0.001	0.001
Fats		mg/l	-	-	-	-	-	-	-	-	-	-
Detergents		mg/l	-	-	-	-	-	-	-	-	-	-
pH	pH	-	8.6	6.43	7.9	7.9	8.00	8	7.5	-	-	-
Hydrocarbonates	HCO3	mg/l	190	184	176.0	171.0	170.0	205.0	159	-	-	-
Chloride	Cl	mg/l	132.0	139	125	112	81.2	108.0	98.3	59.82	54.37	65.62
Sulfate	SO4	mg/l	500	383	546	495	546	492	473.3	516.4	516.6	476.4
Calcium	Ca	mg/l	124	120	111	119	128	170	100.5	122.5	117.7	109.6
Magnesium	Mg	mg/l	73	74.6	62.8	67.1	75.4	39.6	48.88	67.42	69.14	63.69
Sodium	Na	mg/l	47	-	-	-	-	167.0	192	-	-	-
Potassium	K	mg/l	-	-	-	-	-	4.7	-	-	-	-
Hardness	Ca+Mg	mg/l	12.19	11.97	10.69	11.45	12.60	11.7	12.6	-	-	-
Mineralization		mg/l	1,165	983	1,216	1,097	1,173	1,224	1,067	912	1,028	985
Iron(total)	Fe	mg/l	0.17	0.07	0.1	0.04	0.05	0.35	0.175	0.144	0.151	0.324
Copper	Cu	ug/l	0	0	0	0.5	0	0.67	0.001	0.001	0.002	0.002
Zink	Zn	ug/l	0	0	3.4	1.8	0	0	0.001	0.001	0.001	0.002
Nickel	Ni	ug/l	6	2.6	2.9	2.1	9.4	4.9	-	-	-	-
Chrome	Cr	ug/l	-	-	-	-	-	-	-	-	-	-
Lead	Pb	ug/l	0	0	0	0	0	0	0.000	0.001	0.000	0.000
Mercury	Hg	ug/l	-	-	-	-	-	-	0	-	-	0
Cadmium	Cd	ug/l	-	-	-	-	-	-	0.001	0	0	0
Molybdenum	Mo	ug/l	11	8.5	9.8	8.2	6.4	6.4	10	-	-	-
Cobalt	Co	ug/l	0	0	0	0	0	0	2.5	-	-	-
Silver	Ag	ug/l	0		0	0	0	0	<10	-	-	-
Vanadium	V	ug/l	5.5	3.2	2.8	2.4	4.8	4.2	-	-	-	-
Tin	Sn	ug/l	0	0	0	0	0.004	0	-	-	-	-
Alluminium	Al	ug/l	5.8	0	2.2	7.8	1.4	5.5	-	-	-	-
Manganese	Mn	ug/l	0	0	3.1	12.1	7.2	5.1	-	-	-	-
Titanium	Ti	ug/l	0	2	3	2	1	7.4	-	-	-	-
Vismuth	Bi	ug/l	0	0	0	0	0	0	-	-	-	-
Fluorine	F	mg/l	-	-	-	-	-	-	0.000	-	-	-
Dichlordephinil-dichloethane	DDD	ug/l	0.000	0.012	0.064	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlordephinil-dichloethane	DDE	ug/l	0.000	0.006	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
Dichlordephinil-threechloethan	DDT	ug/l	0.042	0.018	0.113	0.014	0.004	0.000	0.000	0.000	0.000	0.000
Hexachlorocye lo-hexane	HCCH	ug/l	0.015	0.15	0.072	0.03	0.1	0.006	0.105	0.002	0.003	0.000
Lindane		ug/l	0.017	0.066	0.055	0.022	0.058	0.004	0.036	0.004	0.000	0.000

Source : Institute of Hydrometeorology,Almaty

Table J.4 (2/3) Water Quality Data of Syr Darya River

3.0 km Dawnstream of Kzyl-Orda (Depth 0.3-0.5m)

Indicators	Symbol	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Smell		grade	0	0	0	0	0	0	-	-	-	-
Transparency		cm	14.7	15.9	15.3	13.3	19	16.5	-	-	-	-
Temperature	t	C	11.7	8.2	10.90	15.2	15.8	17.1	-	-	-	-
Suspended solid	SS	mg/l	-	-	295.0	101.0	127.9	41.82	30.60	38.64	24.43	28.09
Oxygen	O2	mg/l	11.44	11.11	12.22	11.35	11.40	10.2	10.99	10.6	10.36	10.40
Oxidation	CAC	mg/l	15.8	12.8	24.12	14.87	21.68	20.22	22	24.88	22.64	24.77
BOD	BOD5	mg/l	2.65	2.14	2.3	2.37	2.56	2.59	2.126	2.261	2.330	2.489
Ammonia	NH4	mg/l	0.072	0.062	0.056	0.037	0.178	0.058	0.052	0.087	0.066	0.064
Nitrigen nitrite	NO2	mg/l	0.021	0.04	0.026	0.024	0.014	0.022	0.02	0.029	0.023	0.035
Nitrogen nitrate	NO3	mg/l	2.478	1.594	2.041	1.66	1.238	2.51	3.384	2.586	2.439	2.581
Phosphate	P2O4	mg/l	0.023	0.005	0.007	0.019	0.031	0.027	0.039	0.030	0.040	0.056
Silicate	Si	mg/l	5.3	4.3	6.8	4.8	3.5	12.4	-	-	-	-
Resin,asphalt		mg/l	0.55	0.20	0.20	0.030	0	0	-	-	-	-
Petroleum detergents		mg/l	0.092	0.157	0.083	0.05	0.06	0.13	0.063	0.119	0.183	0.106
Phenols		mg/l	0.001	0.002	0.001	3E-04	0.0020	0.003	0.001	0.000	0	0.001
Fats		mg/l	-	0.05	0.33	0.03	-	-	-	-	-	-
Detergents		mg/l	0.01	0	0	0.007	0.003	0.06	-	-	-	-
pH	pH	-	7.62	7.57	7.65	7.57	7.60	7.7	-	-	-	-
Hydrocarbonates	HCO3	mg/l	192	178	172.0	471.7	159.5	173.5	-	-	-	-
Chloride	Cl	mg/l	155.8	164.3	145.6	110.7	123	128.5	107.4	69.21	58.49	63.49
Sulfate	SO4	mg/l	524	404.7	595	595.3	683.5	512.2	515.4	566	587.7	540.7
Calcium	Ca	mg/l	122.8	103.8	111	119	154.5	173	111.6	111	106.9	99.29
Magnesium	Mg	mg/l	80.5	82.6	71.8	82.1	78.6	62.2	41.27	71.73	67.55	72.49
Sodium	Na	mg/l	140.2	-	-	-	-	162.0	-	-	-	-
Potassium	K	mg/l	-	-	-	-	-	5	-	-	-	-
Hardness	Ca+Mg	mg/l	12.68	12.34	11.44	13.01	14.18	13.8	-	-	-	-
Mineralization		mg/l	1,225	1,038	1,297	1,233	1,410	1,245	1,005	1,051	1,127	1,013
Iron(total)	Fe	mg/l	0.047	0.025	0.127	0.12	0.035	0.44	0.272	0.521	0.281	0.511
Copper	Cu	ug/l	0	0	0.43	4	0	2.33	0.001	0.001	0.002	0.002
Zink	Zn	ug/l	1.5	0	4.71	5.0	0	0	0	0.001	0.001	0
Nickel	Ni	ug/l	-	0	1.75	2.67	2.3	3.4	-	-	-	-
Chrome	Cr	ug/l	-	-	0	-	-	-	-	-	-	-
Lead	Pb	ug/l	-	0	8	0	0	0	0.000	0.001	0.000	0.001
Mercury	Hg	ug/l	-	-	-	-	-	-	0	0	0.002	0
Cadmium	Cd	ug/l	-	-	-	-	-	-	-	-	-	-
Molybdenum	Mo	ug/l	-	3.9	8.62	6.37	7.9	1.25	-	-	-	-
Cobalt	Co	ug/l	-	0	0	0	0	0	-	-	-	-
Silver	Ag	ug/l	-	0	0	0	0	0	-	-	-	-
Vanadium	V	ug/l	-	-	-	-	-	-	-	-	-	-
Tin	Sn	ug/l	-	-	-	-	-	-	-	-	-	-
Alluminium	Al	ug/l	-	5	10.45	6.5	5.65	31	-	-	-	-
Manganese	Mn	ug/l	-	1.35	3.03	0	3.0	2	-	-	-	-
Titanium	Ti	ug/l	-	0	4	0	0	5.5	-	-	-	-
Vismuth	Bi	ug/l	-	0	0.83	0	0	0	-	-	-	-
Fluorine	F	mg/l	-	1.20	0.71	0.57	0.66	0.62	0.531	0.604	0.601	0.579
Dichlordephinil-dichloethane	DDD	ug/l	0.004	0.011	0.006	0.008	0.000	0	0.002	0.002	0.000	0.000
Dichlordephinil-dichloethane	DDE	ug/l	0.008	0.021	0	0.004	0	0.000	0.001	0.005	0.000	0.000
Dichlordephinil-threechloethan	DDT	ug/l	0.327	0.086	0.027	0.025	0.000	0	0.009	0.020	0.000	0.000
Hexachlorocyc lo-hexane	HCCH	ug/l	0.015	0.026	0.033	0.025	0.009	0.012	0.034	0.020	0.015	0.000
Lindane		ug/l	0.02	0.017	0.019	0.017	0.007	0.009	0.023	0.005	0.000	0.000

Source : Institute of Hydrometeorology,Almaty

Table J.4 (3/3) Water Quality Data of Syr Darya River

3.0 km Dawnstream of Kazalinsk (Depth 0.3-0.5m)

Indicators	Symbol	Unit	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Smell		grade	0	0	0	0	0	0	-	-	-	-
Transparency		cm	18.4	18.6	18.8	13.7	9.5	24.5	-	-	-	-
Temperature	t	C	10.3	9.5	8.43	14.5	15.1	16.2	-	-	-	-
Suspended solid	SS	mg/l	-	-	105.8	102.7	76.58	15.72	22.16	18.12	11.23	24.18
Oxygen	O2	mg/l	11.0	8.68	14.34	9.64	9.13	11.1	10.48	11.09	11.48	10.40
Oxidation	CAC	mg/l	16.6	16.5	24.34	15.47	23.83	20.57	22.16	22.85	20.93	28.88
BOD	BOD5	mg/l	1.83	2.78	3.71	2.92	4.22	3.65	2.882	2.210	2.257	2.574
Ammonia	NH4	mg/l	0.045	0.08	0.081	0.045	0.13	0.082	0.143	0.070	0.060	0.089
Nitrigen nitrite	NO2	mg/l	0.017	0.012	0.015	0.022	0.021	0.024	0.029	0.018	0.024	0.056
Nitrogen nitrate	NO3	mg/l	1.5	0.98	2.098	1.43	1.203	2.602	3.201	2.657	2.794	3.397
Phosphate	P2O4	mg/l	0.016	0.013	0.036	0.011	0.028	0.017	0.013	0.027	0.044	0.488
Silicate	Si	mg/l	10.2	5.1	12.9	4.6	4.0	11.9	-	-	-	-
Resin,asphalt		mg/l	0.28	0.44	0.27	0.032	0	0	-	-	-	-
Petroleum detergents		mg/l	0.071	0.43	0.25	0.075	0.115	0.072	0.045	0.052	0.04	0.062
Phenols		mg/l	5E-04	4E-04	0.001	2E-04	0.0013	0.004	0.001	0.001	0.001	0.006
Fats		mg/l	-	0.35	0.20	0.10	0.16	0.28	-	-	-	-
Detergents		mg/l	0.048	0.007	0.014	0.04	0.035	0.06	-	-	-	-
pH	pH	-	7.62	7.63	7.67	7.75	7.70	7.67	-	-	-	-
Hydrocarbonates	HCO3	mg/l	158.8	144.7	197.0	169.7	148.0	174.0	-	-	-	-
Chloride	Cl	mg/l	176.6	189	162.7	107.7	134.5	142.0	121.4	75.13	67.39	67.79
Sulfate	SO4	mg/l	553.8	358.5	697.2	645	740.5	500.5	578.9	604.3	588.8	646
Calcium	Ca	mg/l	130.3	116.6	112.4	124.7	134.5	107.5	102.4	120	108.6	122.5
Magnesium	Mg	mg/l	82.2	81.7	67.5	62.2	75.1	80.5	42.83	85.33	75.74	0
Sodium	Na	mg/l	145.6	-	-	-	-	158.0	-	-	-	-
Potassium	K	mg/l	-	-	-	-	-	5.7	-	-	-	-
Hardness	Ca+Mg	mg/l	13.51	12.55	11.17	11.33	13.13	12.0	-	-	-	-
Mineralization		mg/l	904	962	1,520	1,320	1,410	1,145	1,104	1,094	1,162	1,161
Iron(total)	Fe	mg/l	0.098	0	0.21	0.097	0.09	0.195	0.237	0.147	0.187	0.184
Copper	Cu	ug/l	0.4	0	0	0	0.17	0.33	0.000	0.002	0.001	0.001
Zink	Zn	ug/l	2.2	0	2.5	0.6	0.33	0	0.001	0.001	0.001	0.003
Nickel	Ni	ug/l	-	0	0	2.37	5.47	0	-	-	-	-
Chrome	Cr	ug/l	-	-	-	-	0	0.5	0.001	0.002	0.002	0.002
Lead	Pb	ug/l	-	0	0	0	1.67		0.000	0.001	0.000	0.000
Mercury	Hg	ug/l	-	-	-	-	-	-	-	-	-	-
Cadmium	Cd	ug/l	-	-	-	-	-	-	-	0.000	0.000	0.002
Molybdenum	Mo	ug/l	-	8.8	6.4	3.87	6.0	-	-	-	-	-
Cobalt	Co	ug/l	-	0	0	0	0	-	-	-	-	-
Silver	Ag	ug/l	-	0	0	0	0	-	-	-	-	-
Vanadium	V	ug/l	-	1.75	1.66	2.0	2.95	-	-	-	-	-
Tin	Sn	ug/l	-	0	0	0	0	-	-	-	-	-
Alluminium	Al	ug/l	-	1.25	3.5	1.47	1.17	-	-	-	-	-
Manganese	Mn	ug/l	-	4.25	6.22	2.5	6.0	-	42.83	85.33	75.74	64.09
Titanium	Ti	ug/l	-	0	0	0	0	-	-	-	-	-
Vismuth	Bi	ug/l	-	-	-	-	-	-	-	-	-	-
Fluorine	F	mg/l	-	1.45	0.81	0.54	0.62	0.57	0.512	0.611	0.579	0.457
Dichlordephinil-dichloethane	DDD	ug/l	0.006	0.035	0.012	0.008	0.083	0	0.000	0.000	0.000	0.000
Dichlordephinil-dichloethane	DDE	ug/l	0.002	0.008	0	0.009	0	0.000	0.000	0.000	0.000	0.000
Dichlordephinil-threechloethan	DDT	ug/l	0.214	0.023	0.028	0.022	0.079	0	0.000	0.000	0.000	0.000
Hexachlorocyc lo-hexane	HCCH	ug/l	0.028	0.011	0.079	0.048	0.151	0.133	0.038	0.047	0.006	0.006
Lindane		ug/l	0.039	0.024	0.047	0.033	0.085	0.085	0.014	0.020	0.000	0.000

Source : Institute of Hydrometeorology,Almaty

Table J.5 The Result of Detailed Water Quality Analysis

(Unit : ppm)

Sampling Point	pH	Total Salt	Zn	Cu	Pb
1. North Collector (Shagan Farm)	7.7	2,494.0	0.3055	0.0174	0.0153
2. Groundwater of Paddy Field (Ilyasov	8.4	928.9	0.1385	0.0250	Trace
3. Ending Point of North Collector	7.7	2,222.3	0.1652	0.0111	Trace
4. Deep Well of Shagan Farm	7.9	1,589.2	0.4333	0.0486	0.0325
5. Headworks of Syr Darya River	7.7	1,085.3	0.1446	0.0096	0.01
6. Intake of Shagan Farm on LMC	7.8	1,076.6	0.0864	0.0107	0.0125
7. Deep Well of Ilyasov Farm	7.8	1,561.4	0.5445	0.0071	0.0139

Sampling Point	Cd	Mn	V	Mo	Se
1. North Collector (Shagan Farm)	Trace	0.350	Trace	0.0050	Trace
2. Groundwater of Paddy Field (Ilyasov	Trace	0.440	Trace	0.0025	Trace
3. Ending Point of North Collector	0.0006	0.220	Trace	0.0070	Trace
4. Deep Well of Shagan Farm	0.0025	0.056	Trace	0.0070	Trace
5. Headworks of Syr Darya River	Trace	0.072	Trace	0.0060	Trace
6. Intake of Shagan Farm on LMC	Trace	0.062	Trace	0.0100	Trace
7. Deep Well of Ilyasov Farm	0.0015	0.062	Trace	0.0070	Trace

Sampling Point	As	Hg	Ni	Co	Cr
1. North Collector (Shagan Farm)	0.0035	Trace	Trace	0.0040	Trace
2. Groundwater of Paddy Field (Ilyasov	Trace	Trace	0.0067	0.0025	Trace
3. Ending Point of North Collector	Trace	Trace	Trace	0.0040	Trace
4. Deep Well of Shagan Farm	Trace	Trace	0.017	0.0025	Trace
5. Headworks of Syr Darya River	Trace	Trace	Trace	0.0025	Trace
6. Intake of Shagan Farm on LMC	Trace	Trace	Trace	0.0025	Trace
7. Deep Well of Ilyasov Farm	Trace	Trace	0.005	0.0025	Trace

Sampling Point	P	SS	Phenol	HCCH	Malathion
1. North Collector (Shagan Farm)	0.03	74	Trace	-	-
2. Groundwater of Paddy Field (Ilyasov	-	142	Trace	-	-
3. Ending Point of North Collector	-	62	0.0005	-	-
4. Deep Well of Shagan Farm	-	49	Trace	-	-
5. Headworks of Syr Darya River	-	22	Trace	-	-
6. Intake of Shagan Farm on LMC	-	50	0.0005	-	-
7. Deep Well of Ilyasov Farm	-	2	Trace	-	-

Sampling Point	Bromophos	DDE	DDT
1. North Collector (Shagan Farm)	-	-	-
2. Groundwater of Paddy Field (Ilyasov	-	-	-
3. Ending Point of North Collector	-	-	-
4. Deep Well of Shagan Farm	-	-	-
5. Headworks of Syr Darya River	-	-	-
6. Intake of Shagan Farm on LMC	-	-	-
7. Deep Well of Ilyasov Farm	-	-	-

Sampling Date : June 26-july 2, 1997

Source : The EIA Study conducted by JICA Study Team

Table J 6.4.1(3/3) Result of Salinity Analysis in the Project Area

(Unit : mg/lit)

S.N	Sampling Point	Depth of Sample point (m)	HCO_3	CO_3	SO_4	Cl	Mg	Ca	K	Na	Salts Content Sum.	pH	Hardness as $CaCO_3$	
													Total	Carbonate
1	Head of LMK	-	207.5		450.3	127.7	45.6	152.3	4.4	129.0	1168	7.8	61.6	34
2	Head of LMK 16 (Bhaura Farm)	-	146.5		408.3	134.7	48.6	136.2	5.0	105.0	974	7.4	59.8	24
3	Head of North Collector	-	268.5		936.6	212.7	126.6	192.4	6.6	220.0	1958	7.0	99.6	44
4	DS of North Collector	-	341.3		1264.8	361.7	150.5	192.4	6.6	360.0	2528	7.2	114.0	56
5	End position North Collector	-	256.6		1056.7	241.0	134.1	128.3	6.6	285.0	2125	7.7	79.4	42
6	Begin position South Collector	-	414.9		993.7	226.9	156.1	160.3	8.6	265.0	2230	7.8	81.6	48
7	Mid position South Collector	-	292.9	12.0	936.6	245.2	158.5	136.2	7.6	265.0	2652	8.0	88.8	48
8	End position South Collector	-	305.1		960.2	248.2	158.5	128.3	7.6	345.0	2108	7.1	89.2	50
9	Back water point after joining North & South Collector	-	305.1	12.0	960.2	255.3	158.1	120.2	7.6	305.0	2124	8.1	89.0	50
Bhaura Farm														
	Well No.													
3	1	1.65	220.2 37.9		9.6 0.2	326.2 9.2	267.7 13.6	24.1 1.2	50.0 2.3	620.0 29.1	3529	7.9	15.0	15.0
	1	4.00	223.2 36.6	24.0 0.8	9.6 0.2	255.3 7.2	262.8 13.6	20.0 1.0	5.0 0.3	685.0 29.8	3384	8.4	14.6	14.6
	1	6.50	225.7.8	48.0 32.0	9.6 0.2	269.4 7.6	262.8 13.4	20.1 1.0	50.0 2.3	705.0 31	3529	8.4	14.8	14.8
2	3	0.50	156.7 2.6		105.7 2.2	127.7 3.6	17.6 1.4	24.1 1.2	5.0 0.1	150.0 5.5	568	7.3	2.6	2.6
	3	3.50	156.7 2.6		312.2 6.5	134.7 3.6	38.6 3.0	16.0 0.8	5.0 0.1	175.0 7.6	850	7.8	4.8	2.6
	3	7.00	317.3 5.2		326.6 6.8	156.0 4.4	72.8 6.1	40.0 2.0	4.4 0.1	170.0 7.4	1092	7.8	8.4	5.2
3	5	3.20	170.9 2.8		288.2 6.0	127.7 3.6	29.2 2.4	40.1 2.0	8.0 0.2	190.0 8.3	854	7.5	4.4	2.8
	5	3.70	122.0 2.0		268.2 6.0	106.4 3.0	21.9 1.8	28.1 1.4	6.0 0.2	170.0 7.4	743	7.6	3.2	2.0
	5	6.20	170.8 2.8	24.0 0.8	105.7 2.2	148.9 4.2	17.0 1.4	32.1 1.6	6.0 0.2	160.0 7.0	665	8.1	3.0	2.8
4	11	2.25	97.6 1.6		691.6 14.4	340.3 11.0	94.8 7.7	164.3 8.2	4.0 0.1	345.0 15.1	1858	6.6	16.0	1.0
	11	4.75	61.0 1.0		268.5 16.9	627.4 17.6	158.0 13.0	212.4 10.6	3.0 0.1	235.0 10.2	2058	5.7	23.6	1.0
	11	7.25	61.0 1.0		936.6 19.5	636.9 17.4	170.1 13.0	260.5 13.0	3.0 0.1	235.0 10.2	2240	5.5	27.0	4.0
5	12	1.90	61.0 1.0	12.0 0.4	86.5 1.8	170.1 4.8	12.2 1.0	30.1 1.5	9.0 0.2	105.0 4.6	453	8.3	2.5	1.0
	12	4.80	109.8 1.8		268.9 5.6	184.4 5.2	40.1 3.3	94.2 4.7	4.4 0.1	105.0 4.6	808	7.0	8.0	1.8
	12	7.40	122.0 2.0		296.5 6.3	254.2 7.1	38.9 3.2	104.2 5.2	4.4 0.1	110.0 4.9	848	7.5	8.1	2.0
6	13	2.80	579.7 9.5	60.0 2.0	1921.3 40.0	620.5 17.5	380.9 29.0	280.6 14.0	4.0 0.1	620.0 27.0	4427	8.2	42.0	9.5
7	14	0.30	128.1 2.1	6.0 0.2	168.9 3.4	99.3 2.8	9.7 0.8	10.0 0.5	3.6 0.1	150.0 6.5	580	8.3	1.3	1.3
	14	3.30	134.2 2.2		192.1 4.0	156.0 4.4	26.8 2.2	44.1 2.2	2.6 0.1	125.0 5.4	681	7.8	4.4	2.2
	14	6.30	109.8 1.8		259.4 5.4	191.5 5.4	45.6 3.8	48.1 2.4	2.6 0.1	135.0 5.7	691	7.7	6.4	1.8
8	15	0.80	683.3 11.2		1801.2 37.5	411.3 11.6	240.2 21.4	302.8 15.6	7.0 0.2	430.0 18.4	3676	7.5	41.0	11.2
9	16	0.00	817.3 13.4		268.2 5.0	127.7 3.6	87.6 7.2	104.2 5.2	70.0 0.2	220.0 9.6	1715	7.7	12.4	12.4
	16	2.20	634.6 10.4	24.0 0.8	67.3 1.4	113.5 3.2	46.2 3.8	36.1 0.8	57.0 1.5	385.0 8.1	1154	8.2	5.6	5.6
	16	4.20	622.4 10.2	36.0 1.2	120.1 2.5	113.5 3.2	60.8 5.0	44.1 2.2	53.0 1.4	185.0 8.1	1235	8.2	7.2	7.2
10	18	1.60	256.5 4.2	12.0 0.4	1056.7 22.0	262.4 7.4	121.6 10.0	296.1 10.0	10.0 0.3	325.0 14.1	2244	8.0	26.0	4.2
11	20	1.80	917.7 15.1		600.1 12.5	333.3 9.4	175.1 14.4	68.9 2.4	45.0 1.2	395.0 17.0	2410	7.7	66.8	43.4
	20	3.10	781.0 12.8	24.0 0.8	672.5 14.0	297.8 8.4	180.2 15.6	80.1 2.8	42.0 1.1	390.0 17.0	2432	8.2	67.6	42.8
	20	4.90	854.3 14.0		744.5 15.5	326.2 9.2	204.3 16.6	124.3 4.3	37.0 1.0	340.0 14.8	2651	7.2	73.0	44.0
12	25	0.80	646.8 10.6		624.1 13.0	212.7 6.0	94.8 7.8	36.1 1.8	62.0 1.6	420.0 18.3	2066	8.0	36.6	36.6
	25	3.50	585.6 9.6	120.0 4.0	456.3 9.5	205.6 5.8	145.8 12.0	84.0 4.2	47.0 1.2	340.0 14.8	1887	8.4	72.4	36.6
	25	6.20	585.6 9.6	60.0 2.0	552.4 11.5	205.6 5.8	145.8 12.0	86.0 4.3	53.0 1.4	360.0 15.7	1964	8.4	72.8	36.8
13	26	3.30	122.0 2.0		824.6 18.0	181.8 5.0	48.1 5.6	476.4 3.8	47.0 1.4	240.0 8.7	1540	7.4	14.4	2.0
	26	3.70	183.1 3.0		840.5 17.5	170.2 4.8	68.1 5.6	268.4 10.4	6.6 0.2	185.0 8.1	1662	7.6	16.0	3.0
	26	6.20	61.0 1.1	24.0 0.8	912.6 19.0	177.8 5.0	68.1 5.6	220.8 14.0	6.0 0.2	200.0 8.3	1659	8.2	10.6	3.0
14	29	0.50	631.7 5.6		720.5 15.0	148.9 4.2	82.5 9.2	188.8 9.2	4.4 0.1	230.0 8.3	3673	7.4	10.2	5.6
15	Soil Pit in Paddy Field	0.20	378.8 6.2		528.8 11.0	163.1 4.6	97.3 8.0	132.2 5.6	8.0 0.2	170.0 7.4	1457	7.2	13.6	6.2
16	Soil Pit in Barren Field	2.00	573.6 9.4		2065.4 43.0	284.0 8.0	233.5 19.2	525.0 26.2	14.6 0.4	345.0 15.0	3951	7.2	65.4	9.4

Table 3.6 (2/3) Result of Salinity Analysis in the Project Area

(Unit : mg/lit)

S/N	Sampling Point	Depth of Sample point (m)	HCO_3	CO_3	SO_4	Cl	Mg	Ca	K	Na	Salts Content Sum. mg/l	pH	Hardness mg/l	
													total	carbonate
Shegan Farm														
	Well Sc.													
17	33	1.90	317.2	24.0	1272.9	333.3	229.7	92.4	5.6	470.0	2679	8.3	20.0	5.2
			5.2	0.8	26.5	9.4	18.9	8.5	0.2	20.5				
	34	3.30	170.8		1439.9	875.8	252.9	76.1	4.0	420.0	2769	7.4	24.6	2.9
			2.8		31.0	10.6	20.8	3.8	0.1	19.1				
	35	4.70	156.4		2069.4	411.3	345.3	132.9	4.4	420.0	3589	7.7	37.0	2.9
			2.6		43.5	11.6	28.4	6.6	0.1	19.1				
18	35	0.30	183.1		864.6	367.1	97.8	36.1	12.0	490.0	3078	7.7	9.6	5.0
			3.0		18.0	11.2	7.9	1.8	0.3	24.3				
	35	2.60	122.0		883.8	413.3	109.4	56.1	9.6	430.0	3032	7.4	11.8	2.0
			2.0		18.4	11.6	9.0	2.8	0.3	19.1				
	35	5.30	73.2	12.0	912.6	397.1	121.6	60.1	9.0	420.0	2906	8.2	13.0	1.2
			1.2	0.4	19.0	11.2	10.0	3.0	0.2	18.3				
19	36	4.50	642.6	438.1	7445.0	7431.0	4550.1	801	12.0	6800.0	23515	10.4	127.5	10.4
			10.4	14.5	155.0	209.0	127.5	2.0	0.3	261.0				
	36	3.50	152.6		9366.0	7978.0	1739.0	160.3	8.4	6200.0	25604	7.0	151.0	2.4
			2.5		195.0	225.0	143.0	8.0	0.2	269.3				
	36	5.50	292.9		9030.0	794.3	1768.0	150.3	9.0	6300.0	25172	7.9	154.5	4.8
			4.8		188.0	22.4	147.0	7.5	0.2	261.0				
20	37	1.90	295.2	480.1	8456.0	9138.0	2237.0	601.1	18.4	6700.0	27483	10.3	187.0	13.0
			4.8	16.0	176.0	256.0	184.0	3.0	0.5	291.4				
	37	3.10			6064.0	10247.0	4565.0	960.9	14.0	5400.0	23976	8.7	378.0	
					126.0	288.0	375.0	24.0	0.4	234.9				
	37	5.30			7925.0	9768.7	2110.0	300.6	13.0	5100.0	25237	7.8	265.0	
					165.0	275.5	173.0	15.0	0.3	234.9				
21	38	1.80			13349.0	14750.0	5180.0	681.4	27.0	8500.0	41062	5.1	382.0	
					280.0	416.0	426.0	34.0	0.7	369.6				
	38	9.80			11396.0	15849.0	5478.0	741.5	25.0	8500.0	40292	5.0	324.0	
					345.0	447.0	265.0	37.0	0.6	365.4				
	38	5.20			12649.0	16558.0	3526.0	741.5	25.0	9400.0	43221	8.1	327.0	
					270.0	467.0	290.0	37.0	0.7	408.9				
22	39	2.30	244.1	60.0	2482.0	1223.3	401.3	89.2	6.8	1425.0	6322	8.5	37.0	4.0
			4.0	2.0	60.0	34.5	33.0	4.0	0.2	62.0				
	39	4.0	213.6	30.0	2648.8	1499.2	389.1	80.1	6.0	1250.0	5670	8.2	34	5.4
			3.5	1.0	55.0	39.0	32.0	2.0	0.1	54.4				
	39	5.6	152.5	30.0	2402.3	1152.4	352.6	80.1	6.0	1250.0	5165	8.2	31.0	2.5
			2.5	1.0	50.0	32.5	29.0	2.0	0.1	54.4				
23	40	0.9	512.5		840.6	354.6	162.9	60.1	12.0	430.0	2583	8.1	16.8	8.4
			8.4		17.5	10.0	13.5	3.0	0.3	19.5				
	40	3.1	439.3		630.1	226.9	150.8	28.1	9.6	270.0	4725	7.4	13.8	7.2
			7.2		13.5	6.4	12.4	1.4	0.3	11.7				
	40	5.2	488.2		701.3	177.3	153.2	46.1	8.6	275.0	6650	8.0	14.9	6.0
			8.0		14.5	5.0	12.6	2.3	0.2	12.0				
24	41	0.8	427.1	84.0	456.3	134.2	102.8	30.0	5.6	360.0	4760	8.9	2.0	2.0
			7.0	2.8	9.5	3.8	8.5	0.5	0.2	20.0				
	41	1.8	195.3		744.5	304.9	82.7	68.1	5.6	350.0	4781	7.8	10.2	3.2
			3.2		15.5	8.6	6.8	3.4	0.1	16.5				
	41	2.9	244.1		912.6	191.5	85.1	100.2	5.6	360.0	1899	7.9	12.0	4.0
			4.0		19.0	5.4	7.0	5.0	0.1	15.7				
25	42	5.6		residue							3840	5.6		
26	44	5.1		residue							3284	5.5		
27	45	0.3	439.3		384.3	106.4	68.8	10.0	12.6	225.0	1288	7.6	5.5	5.5
			7.2		8.0	3.0	5.0	0.5	0.3	12.0				
	45	2.3	384.4		432.1	159.9	63.5	14.0	14.0	235.0	1276	7.6	7.4	6.3
			6.3		9.1	5.1	6.2	0.7	0.4	10.2				
	46	4.4	427.1		403.5	127.2	72.9	20.1	13.0	250.0	1322	7.3	7.8	7.0
			7.0		8.4	3.6	6.0	1.4	0.3	10.9				
28	9	2.7	1359.2	360.0	422.7	17619	221.7	80	65.0	11850.0	5080	8.6	18.4	18.4
			22.6	12.0	8.8	49.6	18.4	0.8	0.7	80.3				
	9	3.1	2135.3	342.1	240.2	17218	236.4	40	65.0	11850.0	5040	8.6	19.0	18.0
			35.0	11.4.0	5.0	50.0	17.8	0.2	1.7	80.5				
	9	4.4	2392.1	342.0	240.2	17720	216.9	16.0	64.0	11850.0	4676	8.3	18.0	18.5
			36.1	10.4	5.0	50.0	18.0	0.8	1.6	80.5				
29	10	2.5	488.2		11523.9	12126	2614	190.2	82.0	5900.0	19522	7.3	26.5	16.0
			8.0		240.0	34.2	21.5	5.0	2.1	256.6				
	10	3.2			10379.1	2666.8	237.1	180.4	80.0	5900.0	19343	5.8	57.0	
					215.9	75.2	19.5	9.0	2.0	256.6				
	10	3.9			8886.8	2607.6	3526	220.4	78.0	4900.0	17125	6.6	80.0	
					185.0	75.8	29.0	11.0	2.0	213.1				
30	B4	1.9	256.3		618.4	141.8	73.0	160.3	29.0	690.0	3369	7.3	34.0	9.2
			4.2		13.5	4.0	6.0	8.0	0.7	30.0				
	B4	2.9	280.7		696.5	85.1	77.8	152.3	87.0	690.0	3479	7.3	35.0	4.6
			4.6		14.5	2.4	6.4	7.6	0.7	30.0				
	B4	3.8	244.1		696.1	85.1	73.0	148.3	27.0	150.0	3427	7.5	33.4	4.0
			4.0		14.5	2.4	6.0	7.4	0.7	6.6				
31	12	2.0	466.1	24.0		292.6	29.1	92.0	78.0	265.0	1242	8.2	2.9	4.0
			10.9	0.8		8.2	2.3	0.6	2.0	12.4				
	12	3.0	673.3	12.0		269.2	20.7	14.0	76.0	275.0	1284	8.0	2.4	2.3
			11.1	0.4		5.9	1.7	0.7	1.9	12.0				
	12	4.0	671.2		19.2	1115	24.3	12.0	69.0	235.0	1134	7.7	2.6	2.8
			11.0		0.8	3.2	2.0	0.6	1.8	10.2				
32	13	3.5		residue		1950.1			8.6	29.0	5026	4.2		2.6
						55.0			0.2	1.3				
	13	4.1		residue		4241.0			4.0	22.0	7102	5.6		
						35.9			0.1	1.0				
	13	5.1		residue							8150	6.5		
33	14	3.2			903.0	263.7	114.3	252.5	6.0	390.0	3559	4.0	22.0	
					18.0	8.0	9.4	12.6	0.2	17.0				
	14	3.6			268.9	293.3	139.6		5.0	640.0	755	5.6	11.0	
					5.6	8.0	11.0		0.2	2.8				
	14	3.9			1824.0	268.8	304.6	60.1	5.9	690.0	1846	5.3	28.0	
					37.8	8.2	25.0	3.0	0.1	3.0				

Table J 6 (3/3) Result of Salinity Analysis in the Project Area

(Unit : mg/lit)

S/N	Sampling Point	Depth of Sample (cm)	HCO3	CO3	SO4	Cl	Mg	Ca	K	Na	Salt Content Sum, mg/l	pH	Hardness, mg/l	
													total	carbonate
34	15	0-8	341.7	12.0	960.6	297.8	55.9	16.0	12.0	720.0	2424	8.5	5.4	5.4
			5.0	4.0	20.0	8.4	4.6	0.8	0.3	31.3				
	15	2-8	158.7	36.0	168.1	191.5	145.8	160.3	9.0	570.0	2632	8.3	19.0	2.6
			2.6	1.2	35.0	5.4	12.0	7.0	0.2	24.8				
	15	4-0	158.7		1329.1	375.8	170.9	160.2	9.6	620.0	3244	7.3	25.0	2.6
			2.6		36.0	10.6	14.0	8.0	0.2	27.0				
35	16	2-5			1441.0	446.8	153.2	296.6	24.0	360.0	2722	8.7	27.4	
					30.0	12.6	12.6	14.8	0.6	15.7				
	16	3-5	146.5		1441.0	425.5	158.1	326.6	24.0	385.0	2641	7.3	29.0	2.4
			2.4		30.0	12.0	13.0	16.0	0.6	13.7				
	16	4-8	244.1		1154.5	460.9	142.8	348.7	24.0	345.0	2722	7.3	32.0	4.0
			4.0		24.2	13.0	15.0	17.0	0.6	13.2				
36	17	1-6	219.7		216.2	70.9	30.4	60.0	6.0	455.0	718	8.2	2.8	
			3.6		4.5	2.0	2.5	3.0	0.2	6.2				
	17	4-2	170.9		365.1	72.3	72.9	42.0	4.3	190.0	828	8.0	6.6	2.8
			2.9		7.6	2.4	6.0	0.6	0.1	5.7				
	17	6-9	170.9	12.0	240.2	106.4	48.6	24.1	4.0	125.0	735	8.4	5.4	2.8
			2.8	0.4	5.0	3.0	4.0	1.4	0.1	5.4				
37	18	1-4	244.5	60.0	192.8	70.9	36.2	5.0	7.0	175.0	808	8.8	8.2	4.0
			4.0	2.0	4.0	2.0	3.0	0.3	0.2	7.6				
	18	3-6	317.3	48.0	288.0	70.9	68.5	6.0	7.0	190.0	972	8.7	5.6	5.2
			5.2	1.6	5.6	2.0	5.3	0.3	0.2	8.3				
	18	5-5	341.7	24.0	355.4	70.9	85.3	10.0	6.6	185.0	1070	8.4	7.6	5.6
			5.6	0.8	7.4	2.0	7.1	0.5	0.2	8.1				
38	19	1-1	219.7	60.0	1296.8	414.3	182.3	44.1	8.6	650.0	2869	8.4	17.0	3.6
			3.6	2.0	27.0	11.6	15.0	2.0	0.2	28.7				
	19	2-3	195.3		1344.9	468.0	158.5	70.1	7.0	560.0	2854	7.3	19.0	3.2
			3.2		28.0	13.2	13.5	3.5	0.2	25.2				
	19	3-4	122.0		1941.1	507.2	192.3	190.3	7.0	260.0	3419	7.2	21.0	2.0
			2.0		35.0	16.0	15.0	8.0	0.2	30.5				
39	20	0-0	317.3	24.0	240.2	29.8	42.6	6.0	7.0	195.0	872	8.4	9.8	
			5.2	0.8	5.0	1.4	3.5	0.3	0.2	8.1				
	20	3-2	305.1	60.0	224.0	70.9	56.0	6.0	7.0	185.0	951	8.6	8.9	
			5.0	2.0	4.6	2.0	4.6	0.3	0.2	8.1				
	20	6-2	268.5	48.0	336.2	85.1	80.9	6.0	6.6	190.0	1021	8.4	6.9	4.4
			4.4	1.6	7.0	2.4	6.6	0.3	0.2	8.3				
40	B10	1-9	523.6	84.0	4812.7	2006.6	737.8	420.8	24.0	2106.0	10706	8.4	85.0	9.4
			9.4	2.8	100.0	56.6	60.0	21.0	0.5	91.3				
	B10	5-7	890.8		7050.5	2595.2	958.4	480.9	45.0	2750.0	14727	7.3	105.0	13.6
			13.6		147.0	73.2	80.0	24.0	0.9	119.6				
	B10	9-5	840.9	24.0	4961.6	2325.7	972.2	481.0	8.6	3650.0	12754	8.0	104.0	13.6
			13.5	0.8	133.0	65.6	80.0	24.0	0.2	133.7				
41	Soil Pit in Paddy Field	0-3	317.3		432.3	191.5	87.6	104.2	7.0	170.0	1310	7.3	34.4	5.2
			5.2		9.0	5.4	7.2	5.2	0.2	7.4				
42	Soil Pit in Fallow Field	2-0	390.5		1056.3	191.5	158.1	152.5	6.6	360.0	2256	7.3	26.6	6.4
			6.4		22.0	5.4	13.0	7.6	0.2	15.7				

Sampling Date : June 26-July 2, 1997
Source : The EIA Study conducted by JICA Study Team

Table J.7 List of the Fauna Species in and around the Project Area listed in Red Data Book

Mammals	Birds
1. Grey Putorak (Diplamesodon pulchellum)	1. Dalmatin Pelican (Pelecanus Crispus)
2. Pale Pigmy Jerboa (Salpingotus pallidus)	2. European (White) Pelican (Pelecanus onocratalus)
3. Hepter's Pigmy Jerboa (Salpingotus heptner)	3. Glossy Ibis (Plegadis falcinellus) L
4. Bobrinski Jerboa (Alactodipus bobrinski)	4. Common (gray) Heron (Ardea cinerea) L..
5. Sand Cat (Felismargarita thinobius)	5. Little Heron (Egreta alba) L
6. Pallas Cat (Felis manul)	6. Pond Heron (Ardeola ralloides Scop)
7. Marbled Polecat (Vormela peregusna)	7. Marbled Duck (Anas angustirostris) Men
8. Goitered Gazelle (Gazella subgutturosa)	8. Stiff-Tailed Duck (Oxyuraleucocephala Scop)
9. Oriental Moufflon (Ovisorientalis severtzovi)	9. Houbara Bustard (Otis undulata Jacg)
10. White-bellied Long-eared Bat (Otonyeteris hemprichi)	10. White-Tailed Plover (Vanellochettusia leucura Licht)
11. Wide-eared Free-tailed Bat (Tadarida teniotis)	11. Black-Bellied Grouse (Pterocles orientalis) L.
Reptilies	12. Pin-Tailed Grouse (Pterocles alchata) L
1. Grey Monitor Lizard (Varanus griseus)	13. Pallas Sand Grouse (Syrrhaptes paradoxus) Pall
	14. Golden Eagle (Aguila chrysaetus) L.
Amphibia	15. Imperial Eagle (Aguila heliaca) Sav.
None	16. Booted Eagle (Aguila pennata) Gm.
Fish	17. Serpent Hawk (Circaetus ferox) GM.
1. Nosed Sturgeon (Pseudoscaphip Kunchu fedenhenkor)	18. Fish Hawk (Pandion haliaetus)
2. Pickerel Zherekhsalmon (Aspiotucius esocinus)	19. Eagle Owl (Bubo bubo)
3. Aral Simon (Simotrutta)	

Table J.8 The Result of Detailed Soil Analysis

(Unit : ppm)

Sampling Point	pH	Zn	Cu	Pb	Ni
1. Soil in Lucerne Field (0-30cm)	7.4	0.0099	0.018	Trace	Trace
2. Soil in Paddy Field (0-30cm)	7.4	0.0138	0.0160	Trace	0.005

Sampling Point	Mo	Se	As	Hg	HCCH
1. Soil in Lucerne Field (0-30cm)	0.0050	Trace	Trace	Trace	-
2. Soil in Paddy Field (0-30cm)	0.0025	Trace	Trace	0.0002	-

Sampling Point	Maltion	Bromophos	DDE	DDT	
1. Soil in Lucerne Field (0-30cm)	-	-	-	-	
2. Soil in Paddy Field (0-30cm)	-	-	-	-	

Sampling Point	Ca	Mg	Na	K	
1. Soil in Lucerne Field (0-30cm)	188	45	68	6	
2. Soil in Paddy Field (0-30cm)	56	18	23	7	

Sampling Point	CO	HCO3	Cl	SO4	NO3
1. Soil in Lucerne Field (0-30cm)	0	37	62	683	0
2. Soil in Paddy Field (0-30cm)	0	49	12	203	2

Sampling Date : June 26-july 2, 1997

Source : The EIA Study conducted by JICA Study Team

Table 3.9 Result of IEE

Environmental Items	Ecological Regions			Remarks
	Region I Irrigation Area including irritation and drainage canal	Region II Downstream reaches of the Syr Darya river from Kzyl-Orda headworks	Region III Downstream reaches of the Kuban Darya river from the end points of South Collector	
1. Displaced of people	x	x	*	
2. Land use changes	x	*	*	
3. Impairment of transportation	-/C	*	*	Construction Stage (Region I)
4. Historical and recreational disturbance				
- Histrical and cultural disturbance	x	*	*	
- Recretional disturbance	x	*	*	
5. Ecological disturbance				
- Terrestrial fauna and flora	-/C	+/B-C	x	Construction Stage (Region II)
- Aquatic fauna and flora	+/C	+/B-C	-/C	
- Wetland	x	+/C	x	
6. Erosion and sedimentation	+/B-C	-/C	+/B-C	Construction Stage (Region II)
7. Fisheries losses	x	+/C	x	
8. Groundwater deteriorations				
- Groundwater table	+/B-C	*	-/C	
- Groundwater quality	-/C	*	-/C	
9. Change of river flow regime	*	+/B-C	+/C	
10. Surface water deterioration				
- Toxic Substance	*	-/C	-/C	
- Salinity	*	+/B-C	-/C	
11. Public health issues	x	x	*	
12. Climatic change	*	+/C	*	
13. Water rights conflicts	+/C	+/C	x	
14. Soil degradation (Salinity)	+/B-C	+/C	-/C	
15. Changing farming practices	+/B-C	x	x	
16. Water-borne and Water-related Disease	x	*	*	

A : Relative high magnitude of impact is expected
B : Relative medium magnitude of impact is expected
C : Relative low magnitude of impact is expected
x : No effect is expected
* : There is no relation
+ : Possitive effect is expected
- : Negative effect is expected

Table J.10 Environmental Monitoring Plan

Description of Impact	Environmental Monitoring Plan	Monitoring Methodology	Analysis Methodology	Location	Timing	Frequency	Monitoring Execution Agency	Related Institution
1. Excavated Materials								
	Escavated area and disposal area	Direct Observation and checking construction plan	Data analysis and reporting	Disposal area and Irrigation and drinage canal	During the construction	Upon on a require	Project Office	MOA, Oblast Governmment
	Water quality of surface water	Direct Observation and sampling	Laboratory analysis	Syr darya river and irrigation and drinage canal	During the construction	Bimonthly or monthly	Project Office	MOEB, MOA, Oblast Governmment
2. Waste water from Workers' Camps								
	Water quality of surface water	Direct Observation and sampling	Laboratory analysis	Syr darya river and irrigation and drinage canal	During the construction	Bimonthly or monthly	Project Office	MOEB, MOA, Oblast Governmment
	Water quality of drinking water	Direct Observation and sampling	Laboratory analysis	Drinking Water supply system	During the construction	Two time per year	Project Office	MOH, Oblast Governmment
3. Salinization of agricurtural land								
	Water quality of obserbation wells	Direct Observation and sampling	Laboratory analysis	Project Area	During and after the construction	Bimonthly or monthly	Project Office	MOA, Oblast Governmment
	Area of salinity or submerged area	Direct Observation and soil survey	Laboratory analysis	Project Area	During and after the construction	Two time per year	Project Office	MOA, Oblast Governmment
	Groundwater table of obserbation wells	Direct Observation	Analysis of mesuring result	Project Area	During and after the construction	Bimonthly or monthly	Project Office	MOA, Oblast Governmment
4. Deterioration of water quality								
	Water quality and discharge of surface water	Direct Observation and sampling	Laboratory analysis	Kuvan Darya and drinage canal	During and after the construction	Bimonthly or monthly	Project Office	MOEB, MOA, Oblast Governmment
	Water quality of obserbation wells	Direct Observation and sampling	Laboratory analysis	Project Area	During and after the construction	Bimonthly or monthly	Project Office	MOA, Oblast Governmment
	Farming practice	Interview and soil sampling	Analysis of interview result	Project Area	During and after the construction	Once a year	Project Office	MOA, Oblast Governmment
	Groundwater table of obserbation wells	Direct Observation	Analysis of mesuring result	Project Area	During and after the construction	Bimonthly or monthly	Project Office	MOA, Oblast Governmment
4. Tugai and marsh area								
	Condition of ecological condition	Direct Observation and interview	Data analysis and reporting	Project Area	During and after the construction	Once a year	Project Office	MOEB, Oblast Governmment
5. Others								
- Local disease	Condition of local disease	Data collection	Data analysis and reporting	Project Area	During and after the construction	Once a year	Project Office	MOH, Oblast Governmment
- Complain of local people	Constraint of local people	Interview	Analysis of interview result	Project Area	During and after the construction	Once a year	Project Office	MOA, Oblast Governmment
- Soico-economical impact	Socio-economical condition of local people	Interview	Analysis of interview result	Project Area	During and after the construction	Once a year	Project Office	MOA, Oblast Governmment
- Others	Upon on a require	Direct Observation and interview	Data analysis and reporting	Project Area	Upon on a require	Upon on a require	Project Office	MOA, Oblast Governmment, etc.

Table J.11 (1/2) Environmental Conservation Plan

Description of Impact	Source of Impact	Environmental Conservation Plan	Location	Timing	Executor of the Conservation	Supervision Institution	Related Institution
1. Negative Impact to be Caused during Construction Stage							
1.1 Excavated Materials							
	Increase of soil erosion	Preparation of proper construction plan	Irrigation and Drainage Canal	During the construction	Project Office	MOA	Oblast government
	Contamination to surface water	Preparation of proper construction plan	Irrigation and Drainage Canal	During the construction	Project Office	MOA	Oblast government
		Selection of proper area to waste the disposal of excavation materials	Disposal Area		Project Office	MOA	Oblast government
		Monitoring of water quality			Project Office	MOA	Oblast government
		Treatment of outflow water from disposal area, if necessary			Project Office	MOA	Oblast government
	Disturbance to people comfortablity and health	Selection of proper disposal area for excavation materials	Disposal Area	During the construction	Project Office	MOA	Oblast government
1.2 Waste water from Workers' Camps							
	Disturbance to people comfortablity and health	Installation of proper sanitation facilities on the camps	Camp site and settlement area	During the construction	Project Office	MOA	Oblast government
		Selection of proper site of the camps			Project Office	MOA	Oblast government
		Monitoring of water quality of water supply system			Project Office	MOA	Oblast government
		Monitoring of complain of local people			Project Office	MOA	Oblast government
	Contamination to surface water	Installation of proper sanitation facilities on the camps	Camp site and Syr Darya river	During the construction	Project Office	MOA	Oblast government
		Selection of proper site of the camps			Project Office	MOA	Oblast government
		Monitoring of water quality			Project Office	MOA	Oblast government
2. Salinization of Land and Water							
2.1 Salinization of Agricultural Land							
	Increase of salinity area	Monitoring of water quality in observation wells	Agricultural land in the Project area	During and after the construction	Project Office	MOA	Oblast government
		Introduction of proper farming system			Farms/Project Office	MOA	Oblast government
		Introduction of proper water management system			Farms/Project Office	MOA	Oblast government

Table J.11 (2/2) Environmental Conservation Plan

Description of Impact	Source of Impact	Environmental Conservation Plan	Location	Timing	Executor of the Conservation	Supervision Institution	Related Institution
2.2 Salinization of Drainage water							
	Increase of salinity in drainage water	Monitoring of water quality in drainage water and Kuvan Darya river	Collectors and Kuvan Darya river	During and after the construction	Project Office	MOA and MOEB	Oblast government
		Introduction of proper water management system			Farms/Project Office	MOA and MOEB	Oblast government
		Selection of chemical fertilizer which have low salinity content			Farms/Project Office	MOA and MOEB	Oblast government
		Usage of manure or organic fertilizer instead of chemical fertilizer			Farms/Project Office	MOA and MOEB	Oblast government
	Contamination to irrigation water by drainage water	Monitoring of water quality in irrigation water	Irrigation canal	During and after the construction	Project Office	MOA and MOEB	Oblast government
		Proper design of irrigation and drainage canal		During the designs stage	Project Office	MOA and MOEB	Oblast government
		Enhancement of construction quality of drainage canal		During the construction	Project Office	MOA and MOEB	Oblast government
3. Deterioration of water quality							
	Increment of crop intensity	Introduction of the proposed crop rotation system	Project Area	During and after the construction	Farms/Project Office	MOA	Oblast government
	Increment of utilization of farm inputs : chemical fertilizer and agro-chemicals	Usage of manure or organic fertilizer instead of chemical fertilizer			Farms/Project Office	MOA	Oblast government
		Introduction of IPM system			Farms/Project Office	MOA	Oblast government
		Establishment of proper pest forecasting system			Farms/Project Office	MOA	Oblast government
	Improper use of farm inputs : chemical fertilizer and agro-chemicals	Application of farm inputs at proper timing and volume			Farms/Project Office	MOA	Oblast government
		Limitation of high toxicant agro-chemicals			Farms/Project Office	MOA	Oblast government
	Overall of above impact source	Monitoring of water quality in drainage water and Kuvan Darya river	Collectors and Kuvan Darya river	During and after the construction	Project Office	MOA and MOEB	Oblast government
4. Tugai vegetation and marsh area							
	Disappear or decrease of the area	Protection of area against the construction activity	Project Area	During the construction	Project Office	MOA and MOEB	Oblast government
		Protection of area against the human activity	Project Area	During and after the construction	Project Office	MOA and MOEB	Oblast government
		Monitoring of flora and fauna			Project Office	MOA and MOEB	Oblast government