

#### **3.5.4 Indirect Benefit**

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

(i) **Increase of Employment Opportunity**

The main impact of the Project will be to greatly increase incomes to the 1,149 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 US\$1,031,000 of fertilizers, US\$385,000 of pesticides, and US\$647,000 of fuel. They will plant seeds, both purchased and farm produced, valued at US\$847,000. They will produce US\$3,945,000 of paddy, US\$886,000 of wheat, and US\$1,836,000 of vegetables and fruits.

(iii) **Increase of Government Revenue**

Project farmers will pay US\$218,000 in social cost contributions to the welfare of workers. Through their purchases and sales, they pay US\$2.5 million of VAT revenues to the State. Farm households will also pay US\$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 Earning**

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.

**3.5.5 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.

### **3.6 Conclusion and Recommendations**

#### **Conclusion**

- (1) Based on the recommendation made in Section 2.6, the feasibility study was made for the Priority Project Area in the Phase-II Study period and clarified that the following works would be needed for successful agricultural development in the area:
  - (i) rehabilitation and improvement of the Kzyl-Orda Headworks, Left Main Canal, inter-farm/on-farm canals,
  - (ii) rehabilitation and improvement of the North and South Main Collectors, inter-farm/on-farm collectors,
  - (iii) rehabilitation and improvement of on-farm facilities,
  - (iv) Improvement of rural infrastructure including farm road and water supply system in the Project Area,
  - (v) introduction of improved farming practices,
  - (vi) improvement of agricultural support services such as agricultural research, and establishment of agricultural extension system,
  - (vii) strengthening of agricultural cooperatives,
  - (viii) establishment of an effective water management and O&M system, and
  - (ix) monitoring and evaluation of irrigation, agricultural and environmental aspects.
- (2) Through the implementation of the above-mentioned project components, the following benefits would be expected:
  - (i) The agricultural production would largely increase and the farmers' income would accordingly increase; from US\$49/ha to US\$633/ha in economic value.
  - (ii) Improvement of a potable water supply to farm households will improve their health and reduce the inconvenience, time and drudgery of obtaining water.
  - (iii) Rehabilitation and improvement of the existing irrigation and drainage facilities will realize irrigation water saving by about 2.2%, which will contribute to environmental conditions in the lower basin of the Syr Darya river including Aral Sea to some extent.
- (3) According to the result of the project evaluation, the agricultural development in the Project Area is technically sound, economically feasible and financially viable.

#### **Recommendations**

- (1) As mentioned in the above, the implementation of the Project is technically sound, economically feasible and financially viable. Moreover, the Project will have many direct and indirect social and economic benefits to the residents of the area. Thus, it is recommended that the project be implemented as early as possible taking the following development phases:

### Phase-I Works

- project office building,
- rehabilitation and improvement of headworks, Left Main Canal (PK0 - PK402), North Main Collector, inter-farm/on-farm canals, on-farm facilities and rural infrastructure for the Ilyasov Area, and
- procurement of O&M equipment, water management equipment, rice mills and farm machinery for the Ilyasov Area.

### Phase-II Works

- rehabilitation and improvement of Left Main Canal (PK402 - PK899), South Main Collector, inter-farm/on-farm canals, on-farm facilities and rural infrastructure for the Shagan Area, and
- procurement of O&M equipment, water management equipment, rice mill and farm machinery also for the Shagan Area.

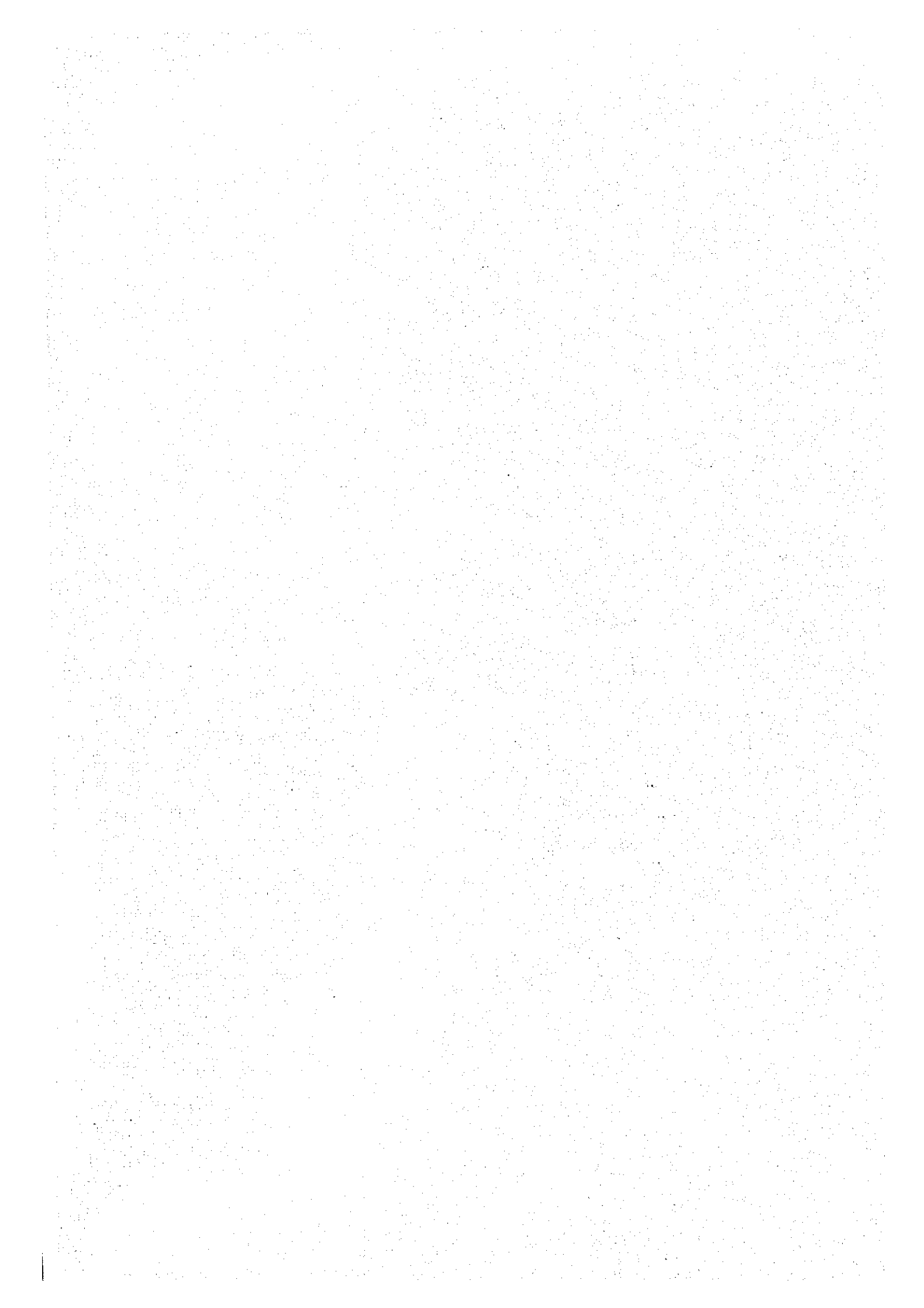
(2) For sustainable agricultural development in the Project Area, it is recommended that the following activities be taken by the GOK:

- (i) The existing organization of the Pre-Aral Scientific Institute for Agro-Ecology and Agriculture should be reinforced to cover the fields of: (i) breeding of high yield and high quality seeds, (ii) improvement of farming practices and soil fertility, (iii) post-harvest techniques, and (iv) improved water management. The research on environmentally sound farming practices should also be necessary to improve the present environmental conditions in the Project Area including the deterioration of water quality, soil salinization and desertification.
- (ii) In the Project Area, MOA should assist in the privatization and commercialization process by including a Farmer's Participatory Training and Information Services Pilot component, which entails the following:
  - Training specific target groups in farm management, agricultural techniques, irrigation practices, business planning, management, marketing, water user associations, and legal issues.
  - Demonstrations of improved and modern technologies for profitable crop production, efficient water management, operation and maintenance, and reduced environmental degradation.
  - Agricultural Extension Office which provides regular information on issues and techniques related to production and marketing through the production of pamphlets and other materials; and acts as a liaison office for the Project with respect to questions regarding agriculture in a market economy.
- (iii) Since the Project is intended to include a line of credit to finance operating loans and purchase of tractors and agricultural machinery, for which management concept is to make a "two-step" loan through some bank, possibly Narodny

Bank and Agroprombank , the Government should assist them in strengthening their organization. and management.

- (iv) For the successful and smooth achievement of the project implementation, it is necessary to establish the Project Implementation Unit (PIU) for dealing with the MOA management, administration and coordination exclusively for the Project, and to establish the Project Office at the site under the custody of PIU. The Project Office will function as a construction office during the construction period of the project works, and as the O&M office after completion of the construction work.
- (3) In order to improve productivity and output in the Kzyl-Orda Left Bank Area, it is recommended to strengthen and improve the present farm organizations by creating an agricultural cooperative which will have the areas of product processing, marketing, inputs procurement and credit that current organizations are unable to provide. Another important difference from the existing organizations in the Area should be that all farmers in the Project Area would be eligible to join the cooperative, including family "peasant" farmers.
- (4) The Project should be implemented based on the realization of a need to let the farmers participate in the irrigation development, operation and maintenance, and management process. The Project would be visualized under the basic principle that WUAs to be formed in the Project will get proper information about the Project from its inception. Users should get full information on the project concept, objectives, procedures of implementation, and roles and responsibilities of parties involved in the Project and generate self service support capabilities. Therefore, the Project should be implemented on the users' demand and their capability. The WUAs along with the staff of the proposed Project Office would develop a capability, by which operation and maintenance of the system would be done properly.

## ***Tables***



## List of JICA Study Team Members and Kazakstan Counterpart Personnel

JICA Study Team		Kazakstan Counterpart Personnel	
Name	Expertise	Name	Position
Toshihiro TOMITA	Team Leader	Mr. Shotanov Ernuk Logembaevich	Director, Project Implementation Unit, Ministry of Agriculture
		Mr. Amedjanov Paizen	Technical Coordinator, Project Implementation Unit, Ministry of Agriculture
Osamu ISHIYAMA	Co-Team Leader / Irrigation and Drainage	Mr. Zhaksilik Baidindaev	Vice Chairman, Kzyl-Orda Oblast Committee on Water Resources
		Mr. Kulumbetov Kamal	Kzyl-Orda Oblast Committee on Water Resources
Genshichi WADA	Agriculture, Extension / Landuse	Ms. Borankulova Zina	
Tetsunari GEJO	Soil / Environment	Mr. Maimagambeev Kumenov	Soil Specialist, Landuse Committee on Kzyl-Orda Oblast
B.K MEHTA	Hydrology	Mr. Almatov Senk	Meteorologist, Hydro-meteorological Center of Kzyl-Orda Oblast
Koki MITSUNOBU	Water Management	Mr. Zhaksilik Baidindaev	Vice Chairman, Kzyl-Orda Oblast Committee on Water Resources
		Mr. Kulumbetov Kamal	Kzyl-Orda Oblast Committee on Water Resources
Komei OZAKI	Geo-Hydrology	Mr. Seydaly Setenovich Basalbaev	Chief Engineer, Kzyl-Orda Hydrogeology (JSC)
Mark W. LUSK	Farmers' Organization / Rural Society	Ms. Makhanbetova Venera	Statistician, Statistic Department of Kzyl-Orda Oblast
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		Ms. Zakharchenko Ludmila Bladimirovna	Kzyl-Orda Oblast Committee on Water Resources
Shigehiko SHINO	Aerial Photo and Topographic Survey	Mr. Ozhikov Sergey	Vice-Head Main Administration of Geodesy and Cartography
Takashi HARADA	Mapping	Mr. Vladimir Kkasienchuk	Chief, Geoinformation System Department, MAGC



Table 2.1.1

## Summary of Monthly and Annual Climatic Data

Name of Raion	Name of Farm	Farm Area (ha)	Number of Beneficiary (persons)
Syr Darya	3. KZ MIS	23,580	1,839
	7. Mahambeete	6,520	2,220
	8. Kangalykol*	6,970	5,367
	Out of Farm	430	-
	Total	37,500	9,426
Terenozek	3. Akzharma	21,180	2,682
	6. Ilyasov	15,930	2,217
	8. Shagan	24,300	3,663
	9. Shirkeili	15,180	2,587
	Out of Farm	1,710	-
Total	78,300	11,149	
Zhalagash	1. Ak-Arik	12,260	2,130
	3. Akkumski	14,270	2,166
	7. Zhanatalan	7,190	2,962
	8. Bukarbaibatir	20,970	2,049
	10. Enbek	10,940	1,707
	11. Madeniet**	9,800	3,638
	12. Tan	26,830	1,402
	14. Kazakhstan	10,080	1,972
	15. Zhursnov	14,330	N.A
	Out of Farm	3,970	-
	Total	130,640	18,026
Karmakshy	1. III International	21,730	2,332
	2. Aktobe	27,190	2,112
	3. Zhanazhol	24,860	2,015
	4. Akzharski	28,390	2,339
	9. Turmanbet	30,600	3,191
	11. Oktoyabyabr	29,070	1,354
	12. Maifiozek	16,540	1,165
	Out of Farm	5,180	-
	Total	183,560	14,508
	Total for Kzyl-Orda Left Bank Area		430,000

Note : \*: Includes Maiaryk, \*\*: Includes Myrzabai, N.A.: Not Available

Table 2.1.2

Station	Climatic Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Chardara	Air Temperature	°C	-0.4	0.5	6.9	15.2	21.4	26.7	29.0	27.1	21.1	13.1	6.6	0.7	14.0	
	Air Relative Humidity	%	83.0	78.0	72.0	61.0	52.0	40.0	40.0	40.0	42.0	56.0	70.0	81.9	59.7	
	Wind Speed	m/s	2.8	2.7	2.5	2.7	2.9	2.9	2.9	2.9	2.7	2.4	2.3	2.5	2.6	2.7
	Sunshine Duration*	hrs	4.6	6.3	6.9	8.7	10.2	11.9	12.2	11.8	10.1	7.5	7.5	5.5	4.8	8.3
	Rainfall	mm	33.1	32.2	38.1	38.0	25.0	6.3	0.5	2.4	11.6	2.4	11.6	24.0	41.4	258.7
Turkestan	Air Temperature	°C	-2.5	-1.4	5.4	14.6	20.5	26.2	29.2	26.6	19.8	10.6	4.0	-1.4	12.6	
	Air Relative Humidity	%	78.0	72.0	65.0	49.0	44.0	33.0	32.0	33.0	38.0	54.0	69.0	79.0	53.8	
	Wind Speed	m/s	2.2	2.6	2.9	4.0	3.7	3.6	3.7	3.7	3.6	3.5	2.7	2.4	2.3	3.1
	Sunshine Duration*	hrs	5.1	6.5	7.4	9.3	10.8	12.7	12.9	12.9	12.4	10.5	8.2	6.0	5.3	8.9
	Rainfall	mm	22.2	23.6	26.0	29.9	23.0	4.4	3.2	3.2	1.5	3.1	11.8	22.4	31.7	202.8
Kzyl-Orda	Air Temperature	°C	-8.2	-7.3	0.8	12.9	19.7	25.5	27.6	24.5	17.9	9.1	1.1	-4.8	9.9	
	Air Relative Humidity	%	79.2	77.3	71.7	50.1	41.0	35.4	35.3	35.7	40.4	53.5	72.1	80.3	56.0	
	Wind Speed	m/s	3.2	3.6	3.9	4.2	3.6	3.0	2.9	2.9	3.2	3.1	4.0	2.8	2.9	3.4
	Sunshine Duration*	hrs	5.3	6.4	7.2	8.2	10.7	12.2	12.4	12.4	11.8	10.0	7.9	5.9	4.6	8.5
	Rainfall	mm	16.3	13.9	18.7	18.7	19.1	8.5	5.0	3.4	3.4	3.6	12.5	16.3	18.3	154.9
Zhusali	Air Temperature	°C	-8.5	-9.8	-1.7	11.7	19.2	25.5	28.7	25.4	17.8	8.1	0.2	-5.5	9.3	
	Air Relative Humidity	%	83.0	81.0	79.0	51.0	42.0	33.0	31.0	34.0	41.0	57.0	76.0	83.0	57.6	
	Wind Speed	m/s	4.0	4.7	5.0	5.0	4.6	4.2	4.2	4.3	4.2	4.1	3.9	4.1	4.1	4.4
	Sunshine Duration*	hrs	5.1	5.9	7.2	8.8	10.7	12.0	12.0	12.2	11.7	9.6	7.3	5.1	4.8	8.4
	Rainfall	mm	13.7	10.4	15.5	19.8	11.0	9.0	6.4	6.4	5.5	4.8	8.6	13.6	15.7	135.4
Kazalinsk	Air Temperature	°C	-8.4	-9.5	-2.1	11.3	19.0	25.0	27.9	24.6	17.2	8.0	0.3	-5.3	9.0	
	Air Relative Humidity	%	80.0	76.0	74.0	53.0	46.0	41.0	42.0	44.0	49.0	62.0	77.0	81.0	60.4	
	Wind Speed	m/s	2.0	2.7	2.5	2.5	2.1	1.8	1.4	1.4	1.4	1.5	1.5	1.8	2.0	1.9
	Sunshine Duration*	hrs	5.1	5.9	7.2	8.8	10.7	12.0	12.2	11.7	9.6	7.3	5.1	4.8	8.4	
	Rainfall	mm	11.2	6.6	15.2	17.1	9.8	5.4	4.7	7.4	5.9	13.1	15.4	15.4	15.2	128.5

\* Estimated from nearest station

Table 2.1.3

## Summary of Monthly, Seasonal and Annual Discharges in the Syr Darya

Station		Monthly Discharge (m <sup>3</sup> /s)												Seasonal Discharge (m <sup>3</sup> /s)			Discharge Volume (MCM)		
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr-Sep	Oct-Mar	Annual	Apr-Sep	Oct-Mar	Annual
Charjara (1970-1995)	Avg	190.1	203.2	292.2	591.0	855.1	744.6	676.1	359.5	182.2	170.7	188.9	201.6	568.1	207.8	387.9	8998.1	3274.1	12272.1
	Max	525.0	615.0	782.0	892.0	1250.0	1130.0	1060.0	803.0	512.0	526.0	488.0	482.0	881.2	480.3	677.9	13969.8	7584.4	21452.7
	Min	48.8	50.1	51.1	369.0	501.0	333.0	303.0	61.7	46.6	50.6	49.9	55.3	278.3	54.3	166.5	4405.2	858.7	5265.8
Koktyube (1976-1993)	Avg	165.3	178.3	256.3	418.3	741.4	671.9	607.0	358.0	200.6	162.1	165.7	179.6	502.3	181.9	342.1	8185.4	2958.2	11157.6
	Max	436.0	441.0	681.0	693.0	1080.0	1030.0	855.0	796.0	536.0	491.0	468.0	471.0	804.7	470.5	637.6	12737.3	7413.4	20150.6
	Min	46.3	55.6	59.0	222.0	471.0	294.0	245.0	127.0	67.9	59.9	52.9	56.2	246.3	61.4	157.3	4984.1	970.7	5954.0
Tomenariyk (1970-1993)	Avg	184.6	194.6	241.9	362.6	611.8	543.1	469.3	335.9	204.2	162.5	164.2	178.1	429.7	187.6	304.1	6664.5	2954.4	9618.8
	Max	673.0	601.0	571.0	793.0	1010.0	924.0	807.0	715.0	498.0	461.0	460.0	476.0	758.0	476.8	592.8	12005.8	7515.1	18726.9
	Min	57.3	55.3	48.4	132.0	324.0	181.0	164.0	91.6	53.5	50.0	54.7	48.0	165.3	53.8	121.7	2620.8	850.7	3850.9
Kergelmes (1970-1991)	Avg	134.3	160.7	202.8	267.6	483.7	456.6	400.0	297.6	177.8	138.4	138.0	145.2	347.2	148.4	252.9	5502.0	2332.8	7834.8
	Max	368.0	611.0	535.0	646.0	776.0	708.0	658.0	586.0	372.0	347.0	381.0	411.0	613.7	402.5	478.9	9718.3	6282.5	15074.8
	Min	41.4	38.2	59.0	71.1	264.0	155.0	135.0	97.1	41.4	38.9	34.7	36.5	135.4	52.4	97.4	2148.9	823.9	3084.8
Kryl-Orda (1970-1995)	Avg	169.3	183.1	215.6	213.9	254.9	235.3	191.5	184.7	166.9	133.5	149.2	165.2	207.9	169.3	188.6	3287.6	2663.6	5951.2
	Max	471.7	564.0	448.0	570.0	610.0	471.0	426.0	516.0	412.3	393.0	404.0	411.0	480.7	404.7	399.0	7609.4	6329.3	12548.4
	Min	44.4	46.5	58.9	43.5	194.0	57.7	35.4	40.2	28.3	24.1	39.6	26.9	56.6	49.0	58.4	895.8	769.1	1541.8
Karaozek (1970-1995)	Avg	136.6	152.4	179.1	189.8	243.1	225.0	183.7	172.9	167.9	138.5	132.1	107.9	197.1	137.0	170.2	3116.6	2155.2	5271.8
	Max	412.0	457.3	494.3	581.0	538.0	462.0	391.0	473.0	396.3	393.7	385.3	282.7	440.2	393.8	374.2	6966.6	6177.2	11781.6
	Min	36.1	26.1	26.5	23.5	79.8	40.7	23.2	21.6	17.1	18.9	14.7	18.2	40.0	27.1	42.2	633.4	427.3	1331.3
Zhusah (1970-1993)	Avg	108.7	126.9	171.5	174.6	180.3	173.1	134.8	142.7	151.2	123.6	114.7	113.3	159.4	124.9	144.2	2519.3	1964.3	4483.6
	Max	346.0	449.0	534.0	499.0	468.0	400.0	362.0	463.0	427.0	363.0	327.0	372.0	435.2	349.7	370.2	6878.7	5475.1	11647.7
	Min	0.3	0.3	8.1	26.0	52.2	25.6	11.3	11.5	17.1	20.1	13.8	20.7	30.1	27.5	35.2	474.1	430.8	1142.9
Kazalinsk (1970-1995)	Avg	133.7	145.3	162.2	149.6	108.5	94.9	73.7	97.4	132.4	116.2	111.3	120.8	109.4	131.6	120.5	1725.9	2069.5	3295.3
	Max	390.0	390.0	485.0	478.0	378.0	278.0	263.0	374.0	382.0	330.0	363.0	350.0	358.8	371.2	319.2	5668.3	5832.3	10048.1
	Min	18.1	20.2	9.7	5.8	3.9	3.9	1.6	1.1	4.0	6.6	7.7	8.0	3.9	24.5	15.2	61.8	385.1	479.7
Karatoren (1993-1995)	Avg	301.8	287.5	315.0	265.0	198.0	153.7	149.0	137.3	232.0	223.7	224.3	235.7	184.2	272.7	228.4	2903.4	4283.0	7186.4
	Max	360.0	360.0	410.0	310.0	220.0	187.0	195.0	236.0	360.0	328.0	349.0	320.0	239.2	332.8	286.0	3775.9	5231.3	9007.1
	Min	260.0	230.0	270.0	200.0	157.0	96.0	11.0	8.0	50.0	63.0	44.0	80.0	111.2	175.7	143.4	1749.3	2751.8	4501.1
Karaozek- Flow (1975-1995)	Avg	40.8	49.2	53.5	34.7	18.0	18.2	12.5	12.8	13.1	15.5	20.5	20.4	17.6	25.1	21.6	276.8	393.0	642.3
	Max	139.0	218.0	292.0	92.7	95.4	63.0	77.0	65.0	56.4	53.0	67.9	128.0	61.1	67.2	59.0	965.1	1047.2	1857.7
	Min	3.2	4.5	8.3	2.7	0.5	0.8	0.2	0.1	0.0	0.0	0.0	0.0	1.1	7.0	4.6	14.7	111.1	142.4
Keles-Mouth (1971-1994)	Avg	12.0	13.1	17.2	25.4	21.8	10.0	7.7	8.6	12.4	12.9	12.7	12.6	14.3	13.4	13.9	226.2	210.8	436.9
	Max	27.3	26.1	28.3	44.1	43.0	34.4	16.2	22.0	30.7	24.3	24.9	26.9	31.7	26.3	29.0	485.8	382.5	857.4
	Min	5.1	4.4	9.0	5.5	3.0	1.0	1.5	2.1	5.3	4.5	5.2	5.0	3.1	5.5	4.3	62.4	106.5	177.8
Ariys-Rail St (1970-1994)	Avg	18.3	27.8	47.3	56.9	26.6	12.1	6.9	6.2	8.1	8.1	10.1	15.0	19.5	21.1	20.3	306.3	331.1	637.4
	Max	61.4	97.2	133.0	162.0	81.9	40.0	16.0	10.4	25.1	14.6	19.1	53.7	50.2	62.7	56.4	788.4	980.8	1269.1
	Min	7.4	8.1	10.9	9.0	8.1	5.1	1.5	1.7	4.5	4.3	6.2	6.9	6.5	10.2	8.7	102.7	159.0	273.5

Irrigation Area and Water Diverted from the Syr Darya

Year	Irrigated Area (ha)					Syr Darya Water Use for Irrigation (MCM)							
	Kzyl-Orda Oblast			South Kazakh.	Total of	Kzyl-Orda Oblast			South Kazakhstan			Total of Two Oblasts	
	LMC	RMC	Total Oblast	KzylK & D/S A	Two Oblasts	LMC	RMC	Total Oblast	KzylK Canal	Others D/S A	Total Oblast	D/S A Chardara	Incl. Kzylk
1985	79,611	8,856	251,710	81,500	333,210	1,780	208	4,987	1,520	310	1,830	5,297	6,817
1986	81,394	8,054	248,410	83,300	331,710	1,569	163	4,159	1,350	225	1,575	4,384	5,734
1987	83,980	8,642	258,490	85,500	343,990	1,870	194	5,150	1,418	275	1,693	5,424	6,842
1988	85,010	9,318	262,680	87,000	349,680	2,121	269	5,594	1,712	137	1,848	5,730	7,442
1989	83,562	8,944	264,190	87,700	351,890	1,796	213	4,992	1,410	216	1,625	5,208	6,618
1990	81,868	8,874	258,390	88,700	347,090	1,878	195	4,869	1,381	124	1,505	4,994	6,375
1991	83,658	8,893	261,430	90,400	351,830	1,846	212	5,314	1,567	182	1,749	5,495	7,063
1992	68,887	8,338	257,170	90,400	347,570	2,010	243	5,071	1,464	299	1,763	5,370	6,834
1993	81,691	8,050	264,250	90,200	354,450	2,258	276	5,669	1,357	268	1,625	5,936	7,294
1994	78,958	5,269	243,100	91,000	334,100	2,163	219	6,457	1,345	104	1,449	6,561	7,906
1995	75,269	7,304	231,460	92,000	323,460	1,830	173	4,779	1,007	107	1,114	4,886	5,893
Mean	80,353	8,231	254,662	87,973	342,635	1,920	215	5,185	1,412	204	1,616	5,390	6,801

Remark : LMC = Left Main Canal, RMC = Right Main Canal, KzylK = Kzylkumsk Canal,  
D/S A = Area Down Stream of Chardara in South Kazakhstan Irrigated by the Syr Darya

Source : Water Resources Committee, Kzyl-Orda

Suspended Load in the Syr Darya River in the Upstream of Kzyl-Orda Headworks

	Year	Suspended Load (mg/l)												Annual
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Tomenariyk (1970-1989)	Avg	52.2	106.9	168.2	292.7	246.5	195.5	151.2	119.9	73.9	58.5	61.7	78.5	133.8
	Max	270.0	520.0	660.0	620.0	580.0	440.0	450.0	330.0	240.0	230.0	210.0	200.0	337.0
	Min	7.4	12.0	14.0	12.0	48.0	33.0	11.0	13.0	4.9	3.4	11.0	5.6	77.9
Kergelmes (1970-1989)	Avg	36.6	60.6	133.1	311.7	390.5	241.0	180.4	127.0	92.8	85.6	89.7	90.4	153.3
	Max	150.0	260.0	380.0	720.0	660.0	520.0	430.0	280.0	290.0	220.0	240.0	270.0	359.0
	Min	17.0	18.0	33.0	43.0	130.0	82.0	39.0	31.0	32.0	13.0	6.4	19.0	85.3

Table 2.1.6

Table 2.1.7

## Irrigation Area in Kzyl-Orda Left Bank Area

		(Unit: ha)							
Farm	Village	Total	Agricultural Land				Non-agricultural Land		
			Original Rice Rotation Area	Present condition in 1995		Pasture	Marsh and Swamps	Bush and Forest	Others
				Irrigated Area	Abandoned Area				
<b>Syrdarya</b>									
3 KZ MIS	Akzharta	23,580	1,400	1,180	220	20,870	0	30	1,280
7 Mahanbektov	Kulba	6,520	750	620	130	420	40	4,900	410
8 Kagdykol*	Oktyabr	6,970	1,180	980	200	2,590	400	750	2,050
Out of Farm Area		430							430
Sub-total		37,500	3,330	2,780	550	23,880	440	5,680	4,170
<b>Terenozek</b>									
3 Akzhurma	Akzhurma	21,180	5,620	5,080	540	11,840	730	1,160	1,830
6 Byasov	Byasov	15,930	6,480	5,200	1,280	5,260	970	530	2,690
8 Shagan	Shagan	24,300	7,210	6,330	880	8,190	1,170	2,400	5,330
9 Shirkeli	Shirkeli	15,180	4,360	4,220	140	7,000	30	2,460	1,330
Out of Farm Area		1,710							1,710
Sub-total		78,300	23,670	20,830	2,840	32,290	2,900	6,550	12,890
<b>Zhalagash</b>									
1 Ak-Ark	Akarik	12,260	3,880	3,370	510	7,710	180	200	290
3 Akkuriski	Akkum	14,270	4,990	3,880	1,110	8,930	90	160	100
7 Zhanatalan	Makpakol	7,190	1,370	1,000	370	4,260	430	190	950
8 Bukarbulotir	Aksai	20,970	6,650	5,710	940	12,380	170	210	1,560
10 Enbek	Akkoshkar	10,940	3,610	3,230	380	6,570	160	410	190
11 Malenier**	Maliniet	9,800	3,740	2,870	870	5,230	0	170	660
12 Tan	Tan	26,830	4,010	3,180	830	21,910	40	0	870
14 Karaketken	Kazakhstan	10,080	2,400	2,050	350	6,070	0	170	1,440
15 Zhurnov	Makpakol	14,330	3,750	2,900	850	7,910	730	340	1,600
Out of Farm Area		3,970							3,970
Sub-total		130,640	34,400	28,190	6,210	80,920	1,790	4,850	11,630
<b>Karmakshy</b>									
1 III International	Internationala	21,730	4,920	4,860	60	8,370	40	50	8,350
2 Akke	Akke	27,190	4,000	4,000	0	11,540	10	80	11,560
3 Zhanaulot	Zhanaulot	24,860	4,630	3,890	740	12,670	10	660	6,890
4 Akzharski	Akzhar	28,390	4,900	4,610	290	13,890	500	150	8,960
9 Turmaubet	Turmaubet	30,600	4,340	4,340	0	17,630	1,070	520	7,040
11 Oktyabr	Oktyabr	29,070	1,480	690	790	23,240	170	480	3,710
12 Malibek	Shalgaskinat	16,540	1,340	900	440	14,240	0	0	960
Out of Farm Area		5,180							5,180
Sub-total		183,560	25,600	23,280	2,320	101,570	1,800	1,940	52,650
<b>Total</b>		<b>430,000</b>	<b>87,000</b>	<b>75,080</b>	<b>11,920</b>	<b>238,710</b>	<b>6,930</b>	<b>16,020</b>	<b>81,340</b>

Source: SCLR and SCWR

\* Includes Malaryk, \*\* Includes Myrzhal

## Planted Area of Major Crops in Four Raions Concerned (1993-1995)

Raion	(Unit: ha)						Total
	Wheat	Paddy	Industrial crops	Vegetables	Lucerne	Other crops	
<b>1995</b>							
Syrdarya	630	910	20	30	870	20	2,480
Terenozek	3,730	7,720	380	760	5,510	1,280	19,380
Zhalagash	4,960	3,510	780	1,070	9,910	1,190	26,420
Karmakshy	5,270	6,450	1,030	440	5,590	1,370	20,150
Study Area	14,590	23,590	2,210	2,300	21,880	3,860	68,430
Kzyl-Orda	51,250	68,540	12,780	12,710	68,030	4,500	217,810
<b>1994</b>							
Syrdarya	710	760	0	30	910	110	2,520
Terenozek	3,840	8,420	390	890	5,300	750	19,590
Zhalagash	3,690	10,190	590	1,020	9,350	3,040	27,880
Karmakshy	3,560	9,270	60	550	5,390	2,370	21,200
Study Area	11,800	28,640	1,040	2,490	20,950	6,270	71,190
Kzyl-Orda	42,870	73,240	3,990	12,900	81,250	14,500	228,750
<b>1993</b>							
Syrdarya	540	900	20	30	940	110	2,540
Terenozek	3,830	8,330	110	1,210	4,830	2,030	20,340
Zhalagash	4,200	9,420	510	1,130	10,150	3,130	28,540
Karmakshy	3,270	9,630	80	640	5,880	2,330	21,830
Study Area	11,840	28,280	720	3,010	21,800	7,600	73,250
Kzyl-Orda	51,670	80,490	3,020	10,850	81,650	22,460	253,140

Source: GOSGOSSTAT

Vegetables includes potato and melons

Yield of Major Crops in Four Raions Concerned (1993-1995)

Raion	Unit: (t/ha)			
	Wheat	Paddy	Vegetables	Lucerne
<u>1995</u>				
Syrdarya	0.54	1.70	2.33	2.23
Terenozek	0.82	2.32	6.41	1.78
Zhalagash	0.75	3.01	5.12	1.65
Karmakshy	0.52	2.94	7.70	2.38
Study Area	0.67	2.71	6.00	1.89
Kzyl-Orda	0.56	2.08	4.16	2.24
<u>1994</u>				
Syrdarya	0.58	3.11	2.33	2.22
Terenozek	0.69	3.04	8.36	3.21
Zhalagash	0.89	3.03	4.65	1.74
Karmakshy	0.85	3.20	6.91	1.98
Study Area	0.79	3.09	6.45	2.20
Kzyl-Orda	0.64	2.73	4.26	2.78
<u>1993</u>				
Syrdarya	1.13	4.16	4.33	2.37
Terenozek	1.40	4.61	6.55	4.59
Zhalagash	0.96	4.52	2.35	2.42
Karmakshy	0.98	4.24	5.17	2.31
Study Area	1.11	4.43	4.66	2.87
Kzyl-Orda	1.08	4.36	3.05	4.47

Source: GOSGOMSTAT      Vegetables includes potato and melons

Production of Major Crops in Four Raions Concerned (1993-1995)

Raion	(Unit: ton)			
	Wheat	Paddy	Vegetables	Lucerne
<u>1995</u>				
Syrdarya	340	1,540	70	1,940
Terenozek	3,050	17,890	4,870	9,830
Zhalagash	3,730	25,580	5,480	16,360
Karmakshy	2,720	18,960	3,390	13,290
Study Area	9,840	63,970	13,810	41,420
Kzyl-Orda	28,860	142,770	13,330	110,520
<u>1994</u>				
Syrdarya	410	2,360	70	2,020
Terenozek	2,650	25,570	7,440	17,010
Zhalagash	3,280	30,850	4,740	16,290
Karmakshy	3,030	29,630	3,800	10,680
Study Area	9,370	88,410	16,050	46,000
Kzyl-Orda	26,380	200,060	16,860	116,370
<u>1993</u>				
Syrdarya	610	3,740	130	2,230
Terenozek	5,350	38,400	7,930	22,150
Zhalagash	4,020	42,550	2,660	24,570
Karmakshy	3,220	40,790	3,310	13,570
Study Area	13,200	125,480	14,030	62,520
Kzyl-Orda	38,070	316,970	4,700	321,930

Source: GOSGOMSTAT      Vegetables includes potato and melons

Table 2.1.10

## Farm Input and Labor Requirement

Input	Unit	Paddy	Wheat	Safflower	Vegetables	Melons	Maize(stilage)	Lucern
Farm input								
1) Seed	kg	300	200 - 250	8	10	4	60	15
2) FYM/Compost	ton	3	3	3	14	3	3	3
3) Chemical Fertilizer								
- Nitro- Ammophos	kg	150	100	100	250	120	150	50
- DSP	kg	50	50	50	80	60	50	50
- Potassium sulphate	kg			30	60			
4) Agricultural Chemicals								
- Fungicide	kg	5	5		5	5		
- Pesticide	kg	5						
- Herbicide	kg							
5) Water	ton	20,000	3,000	5,000	5,000	5,000	6,000	5,000
6) Fuel	kg	210	150	150	260	110	230	250
Labor Requirement								
1) Land preparation	man-hour	6.8	5.4	6.8	21.0	15.4	6.6	5.3
2) Seeding	man-hour	2.5	0.5	0.5	7.0	10.5	1.2	0.6
3) Fertilizer application	man-hour	7.0	3.6	7.0	17.5	9.0	5.8	4.1
4) Crop management	man-hour			7.0	154.7	84.0		
5) Weeding	man-hour	0.9	0.6				0.9	0.6
6) Water management	man-hour	14.5	8.5	10.4	38.5	27.4	10.4	9.3
7) Harvesting	man-hour	3.0	1.5	2.0	161.0	36.4	0.7	3.1
8) Post harvest	man-hour	2.5	1.2	2.0	14.0	2.0	0.5	6.1
Total		37.2	21.3	35.7	413.7	184.7	26.1	29.1

Source: Ministry of Agriculture

Number of Livestock in Kzyl-Orda Oblast by Raion (1993-95)

	Cattles			Milk cow			Pig			Sheep and Goat		
	1993	1994	1995	1993	1994	1995	1993	1994	1995	1993	1994	1995
Syrdaya	6,850	4,640	3,650	2,630	2,020	1,730	110	70	30	59,820	36,910	28,710
Terenozek	16,000	13,350	12,750	5,680	4,890	5,150	690	300	310	61,430	40,360	39,210
Zhalagash	25,780	20,380	19,530	8,560	8,230	8,570	260	140	130	98,140	47,950	47,320
Karmarchin	17,020	12,970	10,880	6,650	5,560	4,910	590	680	570	126,450	48,490	35,660
Total	65,650	51,340	46,810	23,520	20,700	20,360	1,650	1,190	1,040	345,840	173,709	150,900
Kzyl-Orda	235,150	186,520	166,110	98,050	83,520	81,040	6,050	5,360	3,250	1,549,680	979,050	820,100

	Horse			Camel			Poultry		
	1993	1994	1995	1993	1994	1995	1993	1994	1995
Syrdaya	2,740	2,250	1,680	650	640	510	2,120	2,080	
Terenozek	4,440	3,770	3,230	1,000	950	1,020	9,600	13,730	
Zhalagash	8,360	7,610	7,300	1,050	100	900	14,810	21,530	
Karmarchin	3,840	2,940	2,330	1,460	1,180	1,080	14,470	12,390	
Total	19,380	16,570	14,540	4,160	2,870	3,510	41,000	49,730	
Kzyl-Orda	79,960	64,930	58,330	27,650	25,830	23,600	354,300	209,990	

Source: GOSGOMSTAT



Table 2.1.12

Table 2.1.13

### 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

### 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	
HCO <sub>3</sub>	mg/l	370	500	500	
SO <sub>4</sub>	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

## List of Fauna Species in and around the Project Area listed in Red Data Book

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

Table 2.2.1

Table 2.2.2

## Syr Darya Water Use in the Kzyl-Orda and South Kazakhstan Oblasts

S.N. Item	Syr Darya Water Use (MCM)							Total	
	Kzyl-Orda Oblast		South Kazakhstan				D/s of Chardara	Total Incl. Kzylkumsk	
	Plan	Actual	Plan	Actual					
				Kzylkumsk Canal	Others D/S Char	Total			
1 Domestic and Industrial Needs									
April to August	130	130	102	-	110	110	240	240	
September to March	130	130	68	-	75	75	205	205	
Total	260	260	170	-	185	185	445	445	
2 Fishing	90	90	140		68	68	158	158	
3 Agricultural Needs									
Irrigation	4620	3917	1593	1007	107	1114	4024	5031	
Ecology Needs (Hay, Lake system)	400	470	160	71	77	148	547	618	
Losses in Canals	400	392		45	-	45	392	437	
Total	5420	4779	1753	1123	184	1307	4963	6086	
Grand Total	5770	5129	2063	1123	437	1560	5566	6689	

Source : Water Resources Committee

## Water Balance of the Syr Darya Flow Irrigation Area in Kzyl-Orda Left Bank Area

S.N.	Item	Description	Discharge Volume (MCM)		Water Balance (MCM)
			1985-1995	With the Project	
1	Release from Chardara to Kzylkumsk Canal	Irrigation Water Use	1412	1060	-352
2	Release from Chardara to Syr Darya river	Discharge at Chardara Station	14182	14534	352
3	Other Inflows	Inflow from Ariys River	600	600	0
		Return Flow from Irrigation	770	770	0
		Sub Total	1370	1370	0
4	Water Use	Irrigation Water Use			
		a) Kzyl-Orda Oblast	5185	3736	1449
		b) Remaining Area of South-Kazakhstan*	205	205	0
		Sub Total	5390	3941	-1449
		Domestic Use	445	445	0
		Fishing	150	150	0
		Ecology	694	694	0
	Losses in Canals	500	500	0	
		Total	7179	5730	-1449
5	Losses	Other Uses & Losses in Rivers	4805	4805.0	0
6	Flow to Aral Sea	Discharge at Karateren Station**	3568	5369	1801

\* Irrigation area of the South Kazakhstan excluding the Kzylkumsk canal area

\*\* Estimated Value

## Irrigation Area in Kzyl-Orda Left Bank Area

Farm	Village	Total area	Original Rice Rotation Area	Present Condition		Future Without project Condition		Unit: ha
				Irrigated Area	Abandoned Area	Irrigated Area	Abandoned Area	
<b>Syrdarya</b>								
3 KZ MIS	Akzharta	23,580	1,400	1,180	220	1,400	0	
7 Maharbektov	Kitoba	6,520	750	620	130	750	0	
8 Kagalykol*	Oktobyabr	6,970	1,180	980	200	1,180	0	
Out of Farm Area		430						
Sub-total		37,500	3,330	2,780	550	3,330	0	
<b>Terengozek</b>								
3 Akzharna	Akzharna	21,180	5,620	5,080	540	5,620	0	
6 Ilyasov	Ilyasov	15,930	6,480	5,200	1,280	6,480	0	
8 Shagan	Shagan	24,300	7,210	6,330	880	7,210	0	
9 Shirkeli	Shirkeli	15,180	4,360	4,220	140	4,360	0	
Out of Farm Area		1,710						
Sub-total		78,300	23,670	20,830	2,840	23,670	0	
<b>Zhalagash</b>								
1 Ak-Arik	Akrik	12,260	3,880	3,370	510	3,880	0	
3 Akkumski	Akkum	14,270	4,990	3,880	1,110	4,990	3,610	
7 Zhanatalan	Makpalokot	7,190	1,370	1,000	370	1,370	1,010	
8 Bukarbaibotir	Aksai	20,970	6,650	5,710	940	6,650	0	
10 Enbek	Akkoshkar	10,940	3,610	3,230	380	3,610	0	
11 Madenlet**	Madiniet	9,800	3,740	2,870	870	3,740	2,780	
12 Tan	Tan	26,830	4,010	3,180	830	4,010	0	
14 Kazakhstan	Kazakhstan	10,080	2,400	2,050	350	2,400	1,560	
15 Zhursnov	Makpalkol	14,330	3,750	2,900	850	3,750	0	
Out of Farm Area		3,970						
Sub-total		130,640	34,400	28,190	6,210	34,400	8,990	
<b>Kurmakshy</b>								
1 III International	Unternational	21,730	4,920	4,860	60	4,920	2,560	
2 Aktobe	Aktobe	27,190	4,000	4,000	0	4,000	0	
3 Zhanazhol	Zhanazhol	24,860	4,630	3,890	740	4,630	2,990	
4 Akzharskii	Akzhar	28,390	4,900	4,610	290	4,900	0	
9 Turmaubet	Turmaubet	30,600	4,340	4,340	0	4,340	0	
11 Oktobyabr	Oktobyabr	29,070	1,480	690	790	1,480	1,420	
12 Malkozek	Shalgaskiaat	16,540	1,340	900	440	1,340	0	
Out of Farm Area		5,180						
Sub-total		183,560	25,600	23,280	2,320	25,600	6,970	
<b>Total</b>		<b>430,000</b>	<b>87,000</b>	<b>75,080</b>	<b>11,920</b>	<b>87,000</b>	<b>15,960</b>	

\* Includes Malaryk, \*\* Includes Myrzabai

Source: SCLR, SCWR and JICA study team estimation

## Planted Area of Major Crops by Farm under with Project Condition

Farm	unit: ha								Total
	Paddy	Winter wheat	Spring wheat	Safflower	Milze(Sib)	Lucerne	Vegetables	Melons	
<b>Syrdarya</b>									
3 KZ MIS	630	140	140	30	70	350	20	20	1,400
7 Maharbektov	330	80	80	20	40	180	10	10	750
8 Kagalykol*	530	120	120	20	60	290	20	20	1,180
Total		1,490	340	340	70	170	80	50	3,330
<b>Terengozek</b>									
3 Akzharna	2,810	450	390	170	170	1,410	110	110	5,620
6 Ilyasov	3,250	520	450	190	190	1,620	130	130	6,480
8 Shagan	3,590	590	500	220	220	1,810	145	145	7,210
9 Shirkeli	2,180	350	310	130	130	1,090	85	85	4,360
Total		11,830	1,900	1,650	710	710	590	470	23,670
<b>Zhalagash</b>									
1 Ak-Arik	1,930	310	270	120	120	970	80	80	3,880
3 Akkumski	2,490	400	350	150	150	1,250	100	100	4,990
7 Zhanatalan	690	110	100	40	40	340	25	25	1,370
8 Bukarbaibotir	3,320	530	470	200	200	1,650	135	135	6,650
10 Enbek	1,810	290	250	110	110	900	70	70	3,610
11 Madenlet**	1,870	300	260	110	110	940	75	75	3,740
12 Tan	2,010	320	280	120	120	1,000	80	80	4,010
14 Kazakhstan	1,200	190	170	70	70	600	50	50	2,400
15 Zhursnov	1,880	300	260	110	110	940	75	75	3,750
Total		17,200	2,750	2,410	1,030	1,030	860	690	34,400
<b>Kurmakshy</b>									
1 III International	2,460	390	340	150	150	1,230	100	100	4,920
2 Aktobe	2,000	320	280	120	120	1,000	80	80	4,000
3 Zhanazhol	2,310	370	320	140	140	1,160	95	95	4,630
4 Akzhar	2,450	390	340	150	150	1,220	100	100	4,900
9 Turmaubet	2,160	350	300	130	130	1,090	85	85	4,330
11 Oktobyabr	750	120	100	40	40	370	30	30	1,480
12 Malkozek	670	110	90	40	40	340	25	25	1,340
Total		12,800	2,050	1,770	770	770	640	515	25,600
<b>Grand total</b>		<b>43,320</b>	<b>7,010</b>	<b>6,170</b>	<b>2,580</b>	<b>2,650</b>	<b>2,160</b>	<b>1,725</b>	<b>87,000</b>

\* Includes Malaryk, \*\* Includes Myrzabai

Source: JICA Study Team Estimation

Table 2.2.5

Table 2.2.6

## Anticipated Yield of Crops under with Project Condition

Crop	Kazakhstan			Japan*1 (Nothern part)	USA*1	Europe*1	Unit: ton/ha		World Anticipated yield aver in the project area
	Present yield*	Experiment stn.*2	Potential*2						
Paddy	3.8	6.5	8.5	6.5	6.3	5.5	3.5	6.0	
Wheat	1.2	2.5	4.5	3.5	2.5	4.5	2.2	2.5	
Safflower	0.3	1.5	2.0	2.0	1.7	1.0	0.7	1.2	
Maize for silage	16.1	35.0	50.0	40.0	50.0	35.0	30.0	30.0	
Lucern	3.3	6.5	8.0	8.0	8.0	7.5	6.0	6.2	
Vegetables	3.5	12.0	20.0	15-30	10-35	10-30	20.0	10.0	
Melons	7.0	25.0	30.0	28.0	15.0	20.0	15.0	20.0	

\*1: Average value during 1985-1994

\*2: Personal communication with KZRI of Agricultural Science

Source: FAO production year book, World rice statistics, Abstract of statistics of agriculture Japan

## Anticipated Crop Production by Farm under with Project Condition

Farm	unit: ton							
	Paddy	Winter wheat	Spring wheat	Safflower	Maize(Sil)	Lucern	Vegetables	Melons
Syrdarya								
3 KZ.MIS	3,780	420	280	40	2,100	2,200	200	400
7 Mahambeotov	1,980	240	160	20	1,200	1,110	100	200
8 Kogalykol*	3,180	360	240	20	1,800	1,830	200	400
Total	8,940	1,020	680	80	5,100	5,140	500	1,000
Terenozok								
3 Akzharma	16,860	1,350	780	200	5,100	8,810	1,100	2,200
6 Ilyasov	19,500	1,560	900	230	5,700	10,100	1,300	2,600
8 Shagan	21,540	1,740	1,000	260	6,600	11,290	1,450	2,900
9 Shirkeli	13,080	1,050	620	160	3,900	6,800	850	1,700
Total	70,980	5,700	3,300	850	21,300	37,000	4,700	9,400
Zhalagash								
1 Ak-Arik	11,580	930	540	140	3,600	6,060	800	1,600
3 Akkumski	14,940	1,200	700	180	4,500	7,800	1,000	2,000
7 Zhanatdajap	4,140	330	200	50	1,200	2,120	250	500
8 Bukarbaibatir	19,920	1,590	940	240	6,000	10,370	1,350	2,700
10 Enbek	10,860	870	500	130	3,300	5,610	700	1,400
11 Madeniet**	11,220	900	520	130	3,300	5,870	750	1,500
12 Tan	12,060	960	560	140	3,600	6,240	800	1,600
14 Karaketken	7,200	570	340	80	2,100	3,760	500	1,000
15 Zhorgenov	11,280	900	520	130	3,300	5,870	750	1,500
20								
Total	103,200	8,250	4,820	1,220	30,900	53,700	6,900	13,800
Karnakshy								
1 III International	14,760	1,170	680	180	4,500	7,700	1,000	2,000
2 Aktobe	12,000	960	560	140	3,600	6,240	800	1,600
3 Zhanazhol	13,860	1,110	640	170	4,200	7,250	950	1,900
4 Akzhar	14,700	1,170	680	180	4,500	7,620	1,000	2,000
9 Tunnanbet	12,960	1,050	600	160	3,900	6,800	850	1,700
11 Oktoyabr	4,500	360	200	50	1,200	2,300	300	600
12 Maifozek	4,020	330	180	50	1,200	2,120	250	500
13								
Total	76,800	6,150	3,540	930	23,100	40,030	5,150	10,300
Grand total	259,920	21,120	12,340	3,080	80,400	135,870	17,250	34,500

\*: Includes Maiaryk, \*\*: Includes Myrzabai

Table 2.2.7

## Production of Major Crops by Farm under without Condition

Farm	unit: ha											
	Paddy	Winter wheat	Spring wheat	Barley	Maize	Sugar beet	Sunflower	Safflower	Maize(Sil)	Lucern	Vegetable	Melons
<b>Syrdarya</b>												
3 KZ MiS	510	70	60	0	0	0	0	0	0	580	20	30
7 Mahanbeoto	310	40	30	0	0	0	0	0	0	260	0	0
8 Kogalykol*	450	60	50	0	0	0	0	0	150	420	20	30
Total	1,370	170	140	0	0	0	0	0	150	1,260	40	60
<b>Tereozek</b>												
3 Akzharina	3,750	480	50	0	100	10	10	10	1,880	2,360	230	450
6 Ilyasov	2,870	270	230	0	80	0	0	10	1,020	1,600	150	300
8 Shagan	4,280	240	300	0	130	0	10	10	1,490	2,580	190	380
9 Shirkeli	3,120	180	240	0	110	0	10	10	1,240	1,710	190	350
Total	14,020	1,170	820	0	420	10	30	40	5,630	8,250	760	1,510
<b>Zhalagash</b>												
1 Ak-Azik	2,190	180	170	0	20	0	0	0	790	2,070	90	180
3 Akkumski	1,630	160	80	0	20	50	10	0	1,020	1,770	60	120
7 Zhanatalap	530	40	80	0	0	0	0	0	320	190	20	30
8 Bukarbaibati	2,260	350	160	0	20	50	10	0	2,400	3,710	180	370
10 Enbek	2,190	220	90	0	20	0	0	0	1,900	1,420	90	180
11 Madeniet**	1,620	100	60	0	10	0	0	0	720	980	50	90
12 Tan	1,730	180	80	0	10	0	0	10	1,090	1,250	60	120
14 Karaketken	1,170	100	60	0	10	50	10	0	620	830	50	90
15 Zhurgenov	1,160	200	70	0	10	0	0	10	820	1,360	50	90
Total	14,480	1,530	850	0	120	150	30	20	9,680	13,580	650	1,270
<b>Karmakshy</b>												
1 IH Internatio	3,540	380	120	10	20	60	0	0	1,870	2,910	130	260
2 Aktobe	3,040	320	140	20	30	60	10	0	1,600	1,500	130	260
3 Zhanazhol	2,500	370	100	10	30	60	10	10	1,270	1,100	70	150
4 Akzhar	3,120	310	180	40	30	60	10	0	1,850	1,890	90	190
9 Turmanbetov	3,100	400	170	10	10	0	20	10	1,510	1,760	90	190
11 Oktoyabr	110	10	0	0	0	0	0	0	0	30	0	0
12 Mailhozek	290	40	20	10	0	0	0	0	160	230	0	0
Total	15,700	1,830	730	100	120	240	50	20	8,260	9,420	510	1,050
Grand total	45,570	4,700	2,540	100	660	400	110	80	23,720	32,510	1,960	3,890

\* : Includes Mairalyk, \*\* : Includes Myrzaboi

Source : JICA Study Team Estimation

Table 2.2.8

Table 2.2.9

## Major Features of Irrigation/Drainage Facilities

## (a) Kzyl-Orda Head Works

Description	Capacity	Gate
(1) Intake for Left Bank Main Canal	Q=228.0 m <sup>3</sup> /sec	Slide Gate 5.0 m×6 nos.
(2) Intake for Right Bank Main Canal	Q= 30.0 m <sup>3</sup> /sec	Slide Gate 5.0 m×2 nos.
(3) Scoring Sluice		Radial Gate 17.0 m×5 nos.

## (b) Irrigation Canal

Description	Length (km)	Regulator (No.)	Distributor (line)
(1) Left Bank Main Canal	75	6	39
(2) Right Branch Canal	70	6	30
(3) Left Branch Canal	50	5	15
Total	195	17	84

## (c) Distributor Canal

Raion	Farm (No.)	Distributor			
		Inter-Farm		On-Farm	
		(No.)	(km)	(No.)	(km)
(1) Syrdarya	3	-	-	8	51.6
(2) Telenozek	4	2	23.7	29	86.2
(3) Zhalagash	9	3	23.6	32	181.3
(4) Karmakshy	7	3	38.0	7	45.2
Total	23	8	85.3	76	364.3

## (d) Drainage Canal

Description	Capacity (m <sup>3</sup> /sec)	Length (km)
(1) South Collector	55.0	148.8
(2) North Collector	92.4	69.6
(3) Koksu Collector	6.0	18.8
(4) Eastern-Karmachinshy	3.5	42.1
Total		279.3

## Institution / Facilities Relationship

Institutional Body	Management Criteria	Facilities for Management Object
A. Oblast Committee on Water Resources (1)	1. Hydro-Department 2. Inter-Raion Main Canal	1. Kzyl-Orda Headworks 2. Left Bank Main Canal : Section between Headworks and PK420 Regulator
B. Raion Water Management Office (4)	1. On-Raion Main Canal  2. Inter-Farm Distributor (Inter-Farm Canal)	1. Syrdarya W.M.O. - none - 2. Telenozek W.M.O. - none - 3. Zhalagash W.M.O. : Left Branch Canal Section PK 899 - PK 486 Regulators 4. Karmakshy W.M.O. : Right Branch Canal Section PK 420 - PK 702 Regulators 1. 8 alignments with 85.3 km long
C. Farm (23)	1. On-Farm Distributor (On Farm Canal)	1. 76 alignments with 364.3 km long

## Result of IEE

Environmental Items	Ecological Regions			Remarks
	Region I Irrigation Area including irrigation 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				
- Historical and cultural disturbance	x	+	*	
- Recreational 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  
 + : Positive effect is expected  
 - : Negative effect is expected



Table 2.4.1

## Incremental Economic Benefits, Cost and IRR for Individual Farms

Farm and Raion	IRR (%)	Construction Cost per Ha (US\$)	O&M Cost (US\$)	Benefit Per Ha (US\$)
1. Syrdarya				
(1) KZ MIS	11.9	3,704	44	617
(2) Mahambeetov	7.5	5,581	93	617
(3) Kogalykol	8.4	5,287	61	615
(4) Maiaryk*	-	-	-	-
Average on Raion	9.4	4,688	61	616
2. Terenozek				
(1) Akzharna	10.9	3,755	57	584
(2) Ilyasov	13.8	3,081	41	610
(3) Shagan	11.8	3,562	49	592
(4) Shirkeli	10.6	3,783	51	564
Average on Raion	11.8	3,517	49	590
3. Zhalagash				
(1) Ak-Arik	12.6	3,336	47	600
(2) Akkumski	12.0	3,747	47	630
(3) Zhanatalan	8.9	4,960	73	629
(4) Bukarbaibatir	10.8	4,144	51	624
(5) Enbek	11.1	3,793	47	589
(6) Madeniet	12.4	3,607	44	625
(7) Myrzabai**	-	-	-	-
(8) Tan	9.3	4,774	61	619
(9) Kazakhstan	10.8	3,953	60	606
(10) Zhursnov	10.1	4,478	62	637
Average on Raion	11.0	4,029	53	618
4. Karmakshy				
(1) III International Unternauiou	10.2	4,080	45	573
(2) Aktobe	10.1	4,053	45	565
(3) Zhanazhol	12.4	3,471	43	604
(4) Akzharskii	10.6	4,000	46	584
(5) Turmaubet	8.3	4,877	64	565
(6) Oktobyabr	11.1	4,410	58	684
(7) Mailiozek	9.0	5,177	71	656
Average on Raion	10.2	4,162	50	589
Study Area	11.0	3,954	53	610

(Note) \* included in Kogalykol Farm

\*\* included in Madeniet Farm

Present Conditions of Farms in Syrdarya Raion

Farm No.	Name of Farm	Total Area (A)	Number of Beneficiary (B)	Agricultural Land (ha)			Area per Beneficiary (C/B)	Present Crops Irrigability (D)	Irrigation Canal Length (km)		Present Condition of Irrigation and Drainage Facilities	Access Road Length (km)		Progress of Privatization of Farm Land	Development Priority of Other Administrations	EIRR (%)
				Total	Re-allocated	Non-allocated			Inter-farm	On-farm		Inter-farm	On-farm			
3	KZKUS	23,500	1,839	1,699	1,190	20,070	0.8	0.0	16.2	4.4	Poor	0.9	0.9	Keenath Nisakh	11.9	
7	Mahatnays	6,520	2,220	1,170	620	420	0.3	0.0	2.7	0.0	Very poor	5.2	5.2	Complete	7.5	
8	Kapujat	6,970	3,347	3,770	1,900	3,500	0.2	0.0	29.7	3.2	Poor	4.0	4.0	Complete	N.A.	
16	Musayn*	400				400					Poor			Complete		
	Total/Average	37,500	9,429	33,000	22,760	25,160	0.4	34	60.0	31.6	7.5	10.1	10.1	Complete	Scored	9.4

\* Included in Kapshtan

Present Conditions of Farms in Terenozek Raion

Farm No.	Name of Farm	Total Area (A)	Number of Beneficiary (B)	Agricultural Land (ha)			Area per Beneficiary (C/B)	Present Crops Irrigability (D)	Irrigation Canal Length (km)		Present Condition of Irrigation and Drainage Facilities	Access Road Length (km)		Progress of Privatization of Farm Land	Development Priority of Other Administrations	EIRR (%)
				Total	Re-allocated	Non-allocated			Inter-farm	On-farm		Inter-farm	On-farm			
3	Adzhannas	21,100	2,942	17,440	5,620	11,840	2.1	0.0	16.7	29.1	Poor	0.3	0.3	Complete	10.9	
6	Ilyayev	15,900	2,217	11,740	6,400	4,190	2.9	0.0	24.2	7.0	Poor	1.4	1.4	Complete	13.8	
8	Shajet	26,300	3,943	15,400	7,210	6,190	2.9	23.7	15.4	11.9	Poor	0.4	0.4	Complete	11.8	
9	Shirkels	15,100	2,047	11,300	4,200	3,000	1.7	0.0	28.5	10.0	Medium poor	7.2	7.2	Complete	10.6	
	Total/Average	78,300	11,149	65,980	20,830	22,360	2.1	82	23.7	66.2	54.0	9.3	9.3	Complete	Scored	11.4

Source: MCLM, GOSKOMSTAT

Table 2.5.3

Table 2.5.4

Present Conditions of Farms in Zhalagash Raion

Farm No.	Name of Farm	Total Area (A)	Number of Beneficiary (B)	Agricultural Land (ha)			Irrigated Land	Non Irrigated Land	Recessed Area to Total Area (%)	Area per Beneficiary (GB)	Power Capacity (KW)	Irrigated Canal (Length km)			Drainage Canal (Length km)			Fresh Condition of Irrigation and Drainage Facilities	Progress of Preparation of Farm Land	Developed Priority of Mutual Administration	PMK (%)	
				Total	Ess. Natural Area (ha)	Abandoned						Total	Ess. Natural Area (ha)	Abandoned	Inter-ram	Intra-ram	Inter-ram					Intra-ram
1	Al-Ant	12,200	2,130	11,500	5,000	5,100	7,700	6,800	31.6	1.8	8.9	1.4	20.2	21.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
3	Al-Karak	14,200	2,164	13,920	4,900	1,110	4,900	350	33.0	2.3	9.0	4.0	16.6	27.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	12.0
7	Zhalagash	7,100	2,902	5,600	1,800	320	4,200	1,500	19.1	0.5	0.0	3.6	22.6	7.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	6.9
8	Bakarbashi	20,000	2,000	19,000	6,600	5,700	1,600	1,600	11.7	3.2	4.8	26.1	4.1	37.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	10.0
10	Yerkes	10,000	1,200	10,100	3,600	3,200	3,600	6,500	31.0	2.1	0.0	16.0	16.5	20.3	7.5	7.5	7.5	7.5	7.5	7.5	7.5	11.1
11	Makmet	9,000	1,000	8,500	3,700	2,800	4,200	4,300	16.2	1.0	0.0	11.1	16.6	20.8	18.8	18.8	18.8	18.8	18.8	18.8	18.8	12.4
12	Tan	26,000	1,600	25,000	4,000	3,100	21,000	900	14.9	2.9	0.0	36.3	19.1	22.3	3.9	3.9	3.9	3.9	3.9	3.9	3.9	9.3
14	Karakash	10,000	1,975	8,400	2,900	300	6,000	1,600	23.8	1.2	0.0	16.0	17.0	15.3	3.7	3.7	3.7	3.7	3.7	3.7	3.7	10.0
15	Zhalagash	14,300	N.A.	11,600	3,700	2,400	2,900	2,900	29.2	N.A.	0.0	24.0	19.8	20.8	9.5	9.5	9.5	9.5	9.5	9.5	9.5	10.1
	Myrzabek	3,900																				
	100 Farms	130,000	18,024	115,500	34,000	24,100	80,900	15,200	24.3	1.9	37	23.6	193.5	193.2	64.4	64.4	64.4	64.4	64.4	64.4	64.4	11.0

\* in % each in brackets

Present Conditions of Farms in Karmakshy Raion

Farm No.	Name of Farm	Total Area (A)	Number of Beneficiary (B)	Agricultural Land (ha)			Irrigated Land	Non Irrigated Land	Recessed Area to Total Area (%)	Area per Beneficiary (GB)	Power Capacity (KW)	Irrigated Canal (Length km)			Drainage Canal (Length km)			Fresh Condition of Irrigation and Drainage Facilities	Progress of Preparation of Farm Land	Developed Priority of Mutual Administration	PMK (%)	
				Total	Ess. Natural Area (ha)	Abandoned						Total	Ess. Natural Area (ha)	Abandoned	Inter-ram	Intra-ram	Inter-ram					Intra-ram
1	Intermountain	21,200	2,332	15,200	4,500	4,400	8,200	8,400	22.6	2.1	0.0	19.6	0.0	18.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	10.2
2	Al-Kash	27,100	2,112	15,500	4,600	4,000	11,500	11,500	13.7	1.9	16.6	0.0	0.0	22.8	1.4	1.4	1.4	1.4	1.4	1.4	1.4	10.1
3	Zhalagash	24,800	2,015	17,300	6,600	7,600	12,600	7,500	18.6	2.3	7.2	6.2	0.0	20.8	6.7	6.7	6.7	6.7	6.7	6.7	6.7	12.4
4	Al-Jirah	28,300	2,330	16,700	4,500	4,610	9,600	9,600	17.1	2.1	14.3	4.0	0.0	23.8	9.7	9.7	9.7	9.7	9.7	9.7	9.7	10.6
9	Termet	30,000	3,101	21,900	4,200	4,300	17,600	8,500	14.2	1.4	14.2	0.0	21.5	25.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	6.3
11	Al-Kayyash	20,000	1,354	24,200	1,400	600	23,200	4,000	5.1	1.1	6.0	14.1	0.0	24.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	11.1
12	Malibek	18,500	1,165	15,800	1,300	400	14,200	900	4.1	1.2	0.0	11.3	5.2	13.8	12.7	12.7	12.7	12.7	12.7	12.7	12.7	9.0
	100 Farms	4,100																				
	100 Farms	143,500	14,504	127,100	25,600	23,200	101,700	65,800	14.0	1.8	79	42.3	34.2	189.3	40.4	40.4	40.4	40.4	40.4	40.4	40.4	10.2

Source: S. I. R. G. N. S. G. N. S. T. A. T.

Table 3.1.1

Table 3.1.2

Table 3.1.3

Table 3.1.4

## Probable Precipitation at the Kzyl-Orda Station

Year	Probability of Exceedance (%)	Annual Precipitation (mm)	One-Day Maximum Precipitation (mm)	3-Day Maximum Precipitation (mm)
Wet	20	195	21.7	29.4
Normal	50	149	15.5	19.6
Dry	80	114	10.7	13.1

Return period	Month Precipitation (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1/10 Year	4.39	2.38	3.88	0	0	0	0	0	0	0	2.55	3.53
1/5 Year	7.96	6.15	6.88	3.01	1.56	0	0	0	0	1.78	5.78	7.49

## Monthly Discharge in the Syr Darya at the Kzyl-Orda Headworks and Intake into Canals

Year		Discharge (m <sup>3</sup> /s)												Annual (MCM)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Kzyl-Orda Headworks (1970-1995)	Avg	159.3	182.1	215.6	265.9	458.3	452.3	392.4	310.2	169.2	133.5	149.2	165.2	8076
	Max	471.7	564.0	448.0	642.5	874.3	749.4	681.1	672.1	412.3	363.0	404.0	411.0	15087
	Min	44.4	46.5	58.9	54.9	272.4	240.4	202.8	133.3	29.4	24.1	39.6	26.9	3634
Left Main Canal (1976-1996)	Avg	-	-	-	43.3	180	191	177	110	0.6	-	-	-	1858
	Max	-	-	-	114	213	224	225	156	6.87	-	-	-	2307
	Min	-	-	-	0	137	158	132	67.4	0	-	-	-	1395
Right Main Canal (1976-1996)	Avg	-	-	-	5.72	18	30.3	18.9	13.7	2.03	-	-	-	208
	Max	-	-	-	14.5	22.2	25.9	26.5	19.6	7.27	-	-	-	270
	Min	-	-	-	0	10.2	12.9	10.7	8.72	0	-	-	-	132

Remark: - (Dash) indicates no release of irrigation water from the headworks

## Water Discharge in the Kuvan Darya River

Year	Inflow from Zhana Darya into Kuvan Darya River (MCM)	Annual Discharge in the Kuvan Darya river before Junction point with Collectors (MCM)	Inflow from North & South Collectors into Kuvan Darya River During May to Sep (MCM)	Flow in the Kuvan Darya River Below Junction Point with Collectors		
				Annual Discharge (MCM)	Average Discharge (m <sup>3</sup> /s)	Maximum Discharge (m <sup>3</sup> /s)
1991	37.9	14.6	210.8	225.4	19.2	33.4
1992	34.1	12.4	255.5	267.9	19.0	35.3
1993	79.6	33.7	362.0	395.7	22.7	41.6
1994	96.9	35.7	413.7	449.4	30.0	48.6
1995	49.1	16.8	290.7	307.5	21.7	36.3
1996	70.9	25.9	246.1	272.7	20.4	35.5
Average	61.4	23.2	296.6	319.8	22.2	38.5

Source: Zhana Darya Water Management Office, Kzyl-Orda

## Average Monthly Flow in the Kuvan Darya River

Year	Average Monthly Discharge (m <sup>3</sup> /s) in Kuvan Darya River In Downstream of Meeting Point of North and South Collectors					Annual (MCM)
	May	Jun	Jul	Aug	Sep	
1991	17.5	26.9	23.4	27.3		220.8
1992	4.2	29.9	26.5	27.8	8.8	255.5
1993	12.5	35.8	34.0	39.8	10.5	362.0
1994	21.7	38.8	45.5	39.2	12.0	413.7
1995	11.5	29.1	33.4	25.1	5.6	290.7
1996	8.5	22.7	25.2	31.7	4.4	246.1
Average	12.7	30.5	31.3	31.8	7.9	298.3

Source: Zhana Darya Water Management Office, Kzyl-Orda

Table 3.1.5

Table 3.1.6

## Water Supply System in Ilyasov and Shagan Areas (1997)

	Ilyasov	Shagan - 1	Shagan - 2	Shagan - 3
<b>Well</b>				
Depth (m)	300	460	300	460
Diameter (mm)	200	300	300	300
Material of pipe	Steel	Steel	Steel	Steel
<b>Pump</b>				
Type	Submersible pump	Submersible pump	Submersible pump	Submersible pump
Capacity (l/min)	267	267	267	267
Pump head(m)	60	60	60	60
Position of motor (m)	-40	-32	-32	-32
<b>Reservoir Tank</b>				
Capacity (m <sup>3</sup> )	100	500	50	50
Height of tank (m)	17	-	17	17
<b>Pipe Line Network</b>				
Method for distribution	Directly by motor Through head tank	Directly by motor	Through head tank	Through head tank
Pipe length (m)	4,600	6,300	1,200	1,500
Pipe diameter (mm)	150 and 100	150	150	150
Material of pipe	Steel	Cast iron	Cast iron	Cast iron
Buried depth of pipe line (m)	2.0-2.5	1.5	1.5	1.5
Number of outlet standing pipe (In working condition)	32 13	48 13	13 9	10 10
Users (Households)	450	402	94	76
<b>Others</b>				
Condition	Working	Working	Under Repair *	Working
Year of Construction	1966	1965	1972	1980
Staff number in charge	4		9	
Operation hour	15:00-18:00 (3h)		8:00-10:00, 17:00-19:00 (4h)	

\* This system has not been used since middle of June, 1997.

## Bacteriological Content Analysis for Drinking Water

Year	Ilyasov			Shagan		
	Number of Samples	Number of Samples N.A.*	Ratio (%)	Number of Samples	Out of National Standard	Ratio (%)
1986	70	11	15.71	79	4	5.06
1987	76	12	15.79	159	1	0.63
1988	82	2	2.44	160	0	0.00
1989	69	4	5.80	145	5	3.45
1990	106	5	4.72	143	11	7.69
1991	140	2	1.43	164	12	7.32
1992	152	12	7.89	129	11	8.53
1993	137	13	9.49	117	13	11.11
1994	65	8	12.31	88	24	27.27
1995	80	3	3.75	117	5	4.27
1996	79	8	10.13	125	8	6.40
Total	1,056	80	7.58	1,426	94	6.59

Note: Number of samples which are not accept (more than 3 nos./lit.) according to the drinking water standard of Kazakstan.

Table 3.1.7

## Chemical Analysis for Drinking Water

	National Standard	Smell		pH	Ammonia	Nitrite	Nitrate	Chlorine	Sulphate	Fluorine	Dry Residues	Iron
		20°C	60°C									
		less than 2 samples	6 - 9	2 mg/l	3.3 mg/l	45 mg/l	350 mg/l	500 mg/l	0.7 mg/l	1000 mg/l	0.3 mg/l	
1996	January	0	0	7	0.20	0.10	8.40	352	406	0.10	1,100	0.05
	February	0	0	6	0.30	0.20	9.00	320	318	0.50	982	0.10
	March	0	0	7	0.20	0.90	6.40	290	224	0.20	603	0.20
	April	0	0	7	0.70	0.10	6.60	230	316	0.10	700	0.35
	May	0	0	7	0.40	0.09	7.50	190	436	0.50	900	0.20
	June	0	0	6	0.90	0.20	8.40	210	460	0.60	800	0.11
	July	0	0	7	0.40	0.00	9.00	365	277	0.25	1,100	0.29
	August	0	0	6	0.60	0.20	4.40	320	254	0.00	920	0.20
	September	0	0	6	0.00	0.10	3.90	300	224	0.50	980	0.01
	October	0	0	7	0.30	0.09	8.10	240	327	0.10	840	0.25
	November	0	0	7	0.20	0.20	0.00	358	293	0.00	720	0.00
	December	0	0	6	0.20	0.09	5.30	235	180	0.40	780	0.45
1997	January	0	0	6	0.00	0.10	2.00	230	235	0.10	830	0.18
	February	0	0	7	0.10	0.00	2.30	280	140	0.00	920	0.15
	March	0	0	7	0.30	0.20	0.00	340	228	0.20	708	0.00
	April	0	0	6	0.00	0.10	2.20	378	308	0.25	820	0.18
	May	0	0	7	0.10	0.20	4.40	380	156	0.00	1,125	0.08
	June	0	0	7	0.00	0.00	2.20	320	180	0.20	1,105	0.10

	National Standard	Smell		pH	Ammonia	Nitrite	Nitrate	Chlorine	Sulphate	Fluorine	Dry Residues	Iron
		20°C	60°C									
		less than 2 samples	6 - 9	2 mg/l	3.3 mg/l	45 mg/l	350 mg/l	500 mg/l	0.7 mg/l	1000 mg/l	0.3 mg/l	
1996	January	0	0	7	0.25	0.40	4.40	360	220	0.20	1,100	0.20
	February	0	0	6	0.20	0.30	6.80	378	168	0.50	930	0.09
	March	0	0	7	0.10	0.10	7.00	315	280	0.25	730	0.10
	April	0	0	7	0.40	0.50	2.20	320	224	0.10	920	0.15
	May	0	0	7	0.30	0.09	8.40	270	277	0.08	830	0.10
	June	0	0	6	0.04	0.10	8.00	224	201	0.50	780	0.25
	July	0	0	6	2.20	1.00	0.50	325	133	0.50	860	0.09
	August	0	0	7	0.20	0.40	1.10	436	380	0.30	1,112	0.20
	September	0	0	6	1.50	0.20	8.40	333	315	0.25	790	0.18
	October	0	0	7	0.70	0.10	4.10	315	333	0.40	810	0.25
	November	0	0	7	0.10	0.30	3.10	291	247	0.00	915	0.11
	December	0	0	6	0.25	0.05	4.80	267	316	0.20	1,000	0.02
1997	January	0	0	6	0.00	0.03	4.43	300	201	0.30	985	0.10
	February	0	0	7	0.10	0.10	8.90	280	168	0.15	750	0.20
	March	0	0	7	0.20	0.80	4.00	352	156	0.00	608	0.15
	April	0	0	7	0.40	0.30	6.20	417	293	0.05	780	0.10
	May	0	0	6	0.90	0.20	6.80	340	360	0.10	1,005	0.15
	June	0	0	7	1.20	0.50	8.60	290	412	0.25	980	0.20

Table 3.1.8

## Present Land Use in the Project Area

Landuse Category	(unit: ha)				Total
	Total	Ilyasov*		Shagan**	
		P C Ilyasov	P F Berlek		
<b>1. Total area</b>	<b>15,930</b>	<b>14,550</b>	<b>1,380</b>	<b>24,300</b>	<b>40,230</b>
<b>1-1 Agricultural land</b>	<b>11,740</b>	<b>10,590</b>	<b>1,150</b>	<b>15,400</b>	<b>27,140</b>
Originally Rice Rotation Area	6,480	5,750	730	7,210	13,690
Arable land	6,380	5,670	710	7,100	13,480
Perennial crops land	10	10	0	10	20
Kitchengarden	90	70	20	100	190
Pasture	5,260	4,840	420	8,190	13,450
<b>2-2 Non agricultural land</b>	<b>4,190</b>	<b>3,960</b>	<b>230</b>	<b>8,900</b>	<b>13,090</b>
Marsh	970	960	10	1,260	2,230
Shrubs	540	490	50	1,760	2,300
Canals and collectors	960	890	70	1,400	2,360
Roads and streets	190	160	30	240	430
Built-up	120	100	20	420	540
Others	1,410	1,360	50	3,820	5,230
<b>Breakdown of Item 1.</b>					
<b>2. Area of Farm</b>	<b>10,070</b>	<b>8,930</b>	<b>1,140</b>	<b>12,650</b>	<b>22,720</b>
<b>2-1 Agricultural land</b>	<b>8,560</b>	<b>7,600</b>	<b>960</b>	<b>9,790</b>	<b>18,350</b>
Originally Rice Rotation Area	5,200	4,620	580	5,560	10,760
Arable land	5,100	4,540	560	5,470	10,570
Perennial crops land	10	10	0	10	20
Kitchengarden	90	70	20	80	170
Pasture	3,360	2,980	380	4,230	7,590
<b>2-2 Non agricultural land</b>	<b>1,510</b>	<b>1,330</b>	<b>180</b>	<b>2,860</b>	<b>4,370</b>
Marsh	70	60	10	100	170
Shrubs	260	230	30	660	920
Canals and collectors	580	520	60	920	1,500
Roads and streets	140	120	20	130	270
Built-up	120	100	20	420	540
Others	340	300	40	630	970
<b>3. Reserved land</b>	<b>2,410</b>	<b>2,170</b>	<b>240</b>	<b>3,270</b>	<b>5,680</b>
<b>3-1 Agricultural land</b>	<b>2,020</b>	<b>1,830</b>	<b>190</b>	<b>2,920</b>	<b>4,940</b>
Originally Rice Rotation Area	1,280	1,130	150	1,650	2,930
Arable land	1,280	1,130	150	1,630	2,910
Perennial crops land	0	0	0	0	0
Kitchengarden	0	0	0	20	20
Pasture	740	700	40	1,270	2,010
<b>3-2 Nonagricultural land</b>	<b>390</b>	<b>340</b>	<b>50</b>	<b>350</b>	<b>740</b>
Marsh	20	20	0	0	20
Shrubs	80	60	20	0	80
Canals and collectors	180	170	10	230	410
Roads and streets	30	20	10	30	60
Built-up	0	0	0	0	0
Others	80	70	10	90	170
<b>4. Land of Village Administration</b>	<b>3,450</b>	<b>3,450</b>	<b>0</b>	<b>8,380</b>	<b>11,830</b>
<b>4-1 Agricultural land</b>	<b>1,160</b>	<b>1,160</b>	<b>0</b>	<b>2,690</b>	<b>3,850</b>
Originally Rice Rotation Area	0	0	0	0	0
Arable land	0	0	0	0	0
Perennial crops land	0	0	0	0	0
Kitchengarden	0	0	0	0	0
Pasture	1,160	1,160	0	2,690	3,850
<b>4-2 Non agricultural land</b>	<b>2,290</b>	<b>2,290</b>	<b>0</b>	<b>5,690</b>	<b>7,980</b>
Marsh and swamp	880	880	0	1,160	2,040
Shrubs	200	200	0	1,100	1,300
Canals and collectors	200	200	0	250	450
Roads and streets	20	20	0	80	100
Built-up	0	0	0	0	0
Others	990	990	0	3,100	4,090

Note: P C: Production cooperative, P F: Peasant farm,

\*: Include P C Ilyasov and P F Berlek

\*\* : Includes P C Shagan and small peasant farms

Others: Lake, Desert and rock and gravel land and so on

Source: JICA study team estimation based on an aerial photo and the data of Production Cooperative "Ilyasov" and "Shagan" and Peasant Farm Berlek

Table 3.1.9

Table 3.1.10

Table 3.1.11

## Planted Area of Major Crops

	Paddy	Wheat	Vegetables*	Lucern	Other crops	Total	(unit: ha)
<b>Ilyasov</b>							
1993	2,670	1,300	350	1,200	530	6,050	
1994	2,470	1,200	290	1,300	490	5,750	
1995	2,000	1,100	290	1,500	340	5,230	
1996	1,500	440	190	1,400	0	3,530	
1997	1,630	400	180	1,200	20	3,430	
<b>Shagan</b>							
1993	2,800	1,400	460	1,900	530	7,090	
1994	2,700	1,300	390	1,900	520	6,810	
1995	2,400	1,300	300	1,900	320	6,220	
1996	2,000	1,700	170	1,000	90	4,960	
1997	2,150	700	100	900	0	3,850	
<b>Project Area</b>							
1993	5,470	2,700	810	3,100	1,060	13,140	
1994	5,170	2,500	680	3,200	1,010	12,550	
1995	4,400	2,400	590	3,400	660	11,450	
1996	3,500	2,140	360	2,400	90	8,490	
1997	3,780	1,100	280	2,100	20	7,280	

Source: Production Cooperative "Ilyasov and "Shagan", and GOSGOMSTAT

Note: \*: Vegetables include potato and melons

## Yield of Major Crops

	Paddy	Wheat	Vegetables	Potato	Melons	Lucern	(Unit: t/ha)
<b>Ilyasov</b>							
1993	4.20	1.38	5.20	n.a.	n.a.	3.28	
1994	2.94	0.73	7.00	n.a.	n.a.	3.39	
1995	1.97	0.80	5.79	n.a.	n.a.	2.13	
1996	3.83	1.64	8.00	n.a.	n.a.	1.54	
<b>Shagan</b>							
1993	4.20	1.22	7.20	n.a.	n.a.	1.89	
1994	3.66	1.02	9.21	n.a.	n.a.	2.64	
1995	3.00	1.12	7.20	n.a.	n.a.	0.76	
1996	5.02	0.36	9.00	n.a.	n.a.	1.81	
<b>Average of Project Area</b>							
1993	4.20	1.30	6.33	n.a.	n.a.	2.43	
1994	3.32	0.88	8.26	n.a.	n.a.	2.95	
1995	2.53	0.97	6.51	n.a.	n.a.	1.37	
1996	4.51	0.62	8.47	n.a.	n.a.	1.65	

Source: Production Cooperative "Ilyasov and "Shagan", and GOSGOMSTAT

## Production of Major Crops

Year	Paddy	Wheat	Vegetables*	Lucern	(Unit: ton)
<b>Ilyasov Area</b>					
1993	11,210	1,800	1,820	3,930	
1994	7,260	880	2,030	4,410	
1995	3,940	830	1,680	3,200	
1996	5,740	720	1,520	2,160	
<b>Shagan Area</b>					
1993	11,760	1,710	3,310	3,600	
1994	9,830	1,320	3,590	5,020	
1995	7,190	1,450	2,160	1,450	
1996	10,030	610	1,530	1,810	
<b>Project Area</b>					
1993	22,970	3,510	5,130	7,530	
1994	17,140	2,200	5,620	9,430	
1995	11,130	2,330	3,840	4,650	
1996	15,770	1,330	3,050	3,970	

Source: Production Cooperative "Ilyasov and "Shagan", and GOSGOMSTAT

Note: \*: Vegetables include potato and melons



Table 3.1.12

## Water Charge Estimation in 1997

Farm Name	Area (ha) A	Water Amount (MCM) V	Water Charge (Tenge/1000UG) R	Total Charge 1000Tenge C=RxV	Unit Volume (UG/ha) D=V/A	Commencement Date of Irrigation
<b>(1) Syrdarya Raion Management of Watereconomy System</b>						
<b>Kogalykol</b>						
1. Sulukol	420	8.81	56.3	496	20,976	7, May
2. Dostik	50	1.51	56.3	85	30,200	10, May
3. Matarik	579	9.54	56.3	537	16,477	10, May
<b>KZ.Mis</b>						
1. Umit	260	6.01	56.3	338	23,115	5, May
2. Daulet	300	5.67	56.3	319	18,900	5, May
<b>Sub Total</b>	<b>1,609</b>	<b>31.54</b>	<b>56.3</b>	<b>1,776</b>	<b>19,602</b>	<b>5-10, May</b>
<b>(2) Terenezek Raion Management of Watereconomy System</b>						
<b>Production Cooperative</b>						
1. Shirkeli	3,700	72.38	56.3	4,075	19,562	1, May
2. Ilyasov	3,510	79.49	56.3	4,475	22,647	2, May
3. Shagan	4,769	121.87	56.3	6,861	25,555	1, May
4. Akzharma	3,809	92.77	56.3	5,223	24,355	1, May
5. Inkardarya	407	3.74	56.3	211	9,189	2, May
<b>Peasant Farm</b>						
1. Birlık	362	8.5	56.3	479	23,481	2, May
<b>Sub Total</b>	<b>16,557</b>	<b>378.75</b>	<b>56.3</b>	<b>21,324</b>	<b>22,876</b>	<b>1-2, May</b>
<b>(3) Zhalagash Raion Management of Watereconomy System</b>						
<b>Production Cooperative</b>						
1. Ak-arık	3,005	59.52	56.3	3,351	19,807	11, April
2. Akkun	2,118	43.41	56.3	2,444	20,496	11, April
3. Enbek	2,067	45.92	56.3	2,585	22,216	11, April
4. Bubarbai-batır	4,281	67.13	56.3	3,779	15,681	11, April
5. Madenit	1,881	40.42	56.3	2,276	21,489	11, April
6. Zhanatalap	740	15.24	56.3	858	20,595	11, April
7. Mizzabai	879	22.44	56.3	1,263	25,529	12, April
8. Zhurgenov	843	17.69	56.3	996	20,985	16, April
9. Tan	1,544	38.99	56.3	2,195	25,253	11, April
<b>Peasant Farm</b>						
15 Farms	2,804	73.85	56.3	4,158	26,337	13-16, April
<b>Sub Total</b>	<b>20,162</b>	<b>424.61</b>	<b>56.3</b>	<b>23,905</b>	<b>21,060</b>	<b>11-16, April</b>
<b>(4) Karmakshy Raion Management of Watereconomy System</b>						
<b>Production Cooperative</b>						
1. Zhanazhol	3,091	55.34	56.3	3,116	17,904	21, April
2. HI International	4,680	79.74	56.3	4,489	17,038	21, April
3. Aktobe	2,555	57.93	56.3	3,261	22,673	21, April
4. Akzharskii	2,874	76.47	56.3	4,305	26,608	21, April
5. Mailiozek	520	15.22	56.3	857	29,269	21, April
6. Oktobyabr	311	14.21	56.3	800	45,691	21, April
7. Turmaubet	2,171	50.75	56.3	2,857	23,376	21, April
Company *	759	12.87	56.3	725	16,957	21, April
<b>Sub Total</b>	<b>16,961</b>	<b>362.53</b>	<b>56.3</b>	<b>20,410</b>	<b>21,374</b>	<b>21, April</b>
<b>Total</b>	<b>55,289</b>	<b>1,197.43</b>	<b>56.3</b>	<b>67,414</b>	<b>21,658</b>	<b>21, April - 16, May</b>

Note : \* Company with limited responsibility zhettagar

## Selective Statistics on Water Charge Collection

## (1) Intake Amount from Syr Darya Diversion Barrage

		(MCM)		
Description		1994	1995	1996
Intake Amount	Plan	665.57	770.39	558.00
	Actual	646.84	538.99	553.68
Supply Amount	Plan	577.48	494.47	339.30
	Actual	605.42	433.54	339.22

## (2) Collection of Irrigation Fee (Telenozek)

District	Irrigated Area (ha)	Sown Area (ha)	Unit Rate (Tenge/m <sup>3</sup> )	Intake Amount (m <sup>3</sup> )	Water Cost (1000Tenge)	Collected Cost (1000Tenge)
1. Akzharma	5,769	3,724	5.63	116.09	5,972.9	5,747.7
2. Shirkeli	4,506	3,197	5.63	75.92	4,268.7	3,493.9
3. Shagan	7,209	4,695	5.63	120.86	6,804.4	5,050.0
4. Ilyasov	6,478	3,215	5.63	100.83	5,676.7	4,663.0
Total	35,663	21,454	5.63	403.6	22,722.7	18,954.7

## (3) Use of Irrigation Water in Zhalagash

No.	Designation of Farm	Irrigation Area (ha)	Water Amount (1000 m <sup>3</sup> )	Total Cost (Tenge)	Unit Cost (Tiyns)
1	Ak-Arik	3,298	58,474	3,292,086	5.63
3	Akkumski	3,692	65,949	3,712,929	5.63
7	Zhanatalan	985	21,321	1,200,372	5.63
8	Bukarbaibatir	5,085	91,206	5,134,898	5.63
10	Enbek	3,039	53,607	3,018,074	5.63
11	Madeniet	2,785	50,192	2,825,810	5.63
12	Tan	3,090	57,233	3,222,218	5.63
14	Kazakhstan	1,989	38,057	2,142,609	5.63
15	Zhursnov	2,811	58,111	3,271,649	5.63

Table 3.1.14

Table 3.1.15

## Financial Crop Enterprise Budget, Rice, Present Conditions in 1997

					(Unit:us\$)	
Item	Unit	Quan.	Price	VAT	Value	
<b>Crop Value</b>						
Grain	tons	3.45	200.00	44.28	645.72	
Straw	tons	3.45				
Fodder Units	tons	0.35	136.30	9.40	37.62	
<b>Production Input Costs</b>						
<b>Fertilizer</b>						
FYM Compost	tons	3.00	2.00		6.00	
Nitro-Ammo-Phos	tons	0.150	200.00	6.00	30.00	
DSP	tons	0.050	200.00	2.00	10.00	
Potassium	tons		117.00			
<b>Crop Chemicals</b>						
Herbicides	kg	3.00	10.66	6.40	31.98	
Insecticides	kg					
Fungicides	ha					
Fuel	tons	0.21	191.30	8.03	40.17	
Seeds	kg	300.00	0.33	19.80	99.00	
<b>Depreciation and Repair</b>						
Tractors				5.44	27.20	
Machinery				32.18	160.92	
<b>Labor Costs</b>						
Land preparation	hour	7.00	0.70		4.90	
Seeding	hour	3.00	0.70		2.10	
Apply fertilizer	hour	7.00	0.70		4.90	
Weeding	hour	1.00	0.70		0.70	
Water Management	hour	15.00	0.37		5.55	
Harvesting	hour	3.00	0.70		2.10	
Post Harvest	hour	3.00	0.70		2.10	
Hauling	ton/km	60.00	0.31		18.60	
Subtotal					446.22	
Miscellaneous @ 5%				4.46	22.31	
Social Cost 32% of total wage bill					10.52	
Total Cost				93.72	479.05	
Net Return					204.29	
Labor/ha (days)					5.57	

Exchange rate \$US 1=75 tenge.

## Farm Budget Summary, 6,800 ha Farm, Present Condition

Gross Value of Production a/	\$000
Rice (1931 ha)	1424.51
Lucerne (1306 ha)	177.12
Wheat (932 ha)	140.68
Vegetables (204 ha)	186.56
Other crops (135 ha) b/	19.34
Idle or abandoned land	0.00
Total value	1948.21
<b>Crop Production Costs</b>	
Rice (1931 ha)	1028.70
Lucerne (1306 ha)	236.11
Wheat (932 ha)	277.80
Vegetables (204 ha)	157.75
Other crops (135 ha) b/	32.32
Total	1732.68
Water Charges \$17/ha for 4508 ha	76.64
Land Tax (1.33/ha)	9.04
Total Outflow	1818.36
Net Return Before Income Tax	129.85
Income Tax @ 10%	12.98
Net Return After Taxes	116.87

a/ Includes byproducts.

b/ Average of wheat and lucerne.

### Monthly Water Quality Data of Syr Darya River

3.0 km Downstream of Kyzyl-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 (mg/L)	6.0	4.8	5.9	5.8	5.2	5.2	4.9	5.5	5.6	-	5.4
BOD5 (mg/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	91
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
SO4 (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	0.046	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 : Kyzyl-Orda Office of MOEB

### 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	0.0696	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	0.410	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	HCCl	Malathion
1. North Collector (Shagan Farm)	0.03	74	Trace	-	-
2. Groundwater of Paddy Field (Ilyasov)	-	132	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 3.2.1
- Table 3.2.2
- Table 3.2.3
- Table 3.2.4
- Table 3.2.5

### Available Discharge in Volume

Station	Average (1970 - 1995)			1 in 5 years return period		
	Apr - Sept	Oct - Mar	Annual	Apr - Sep	Oct - Mar	Annual
- Inflow Into Chardara			11,688			9,100
- Release from Chardara to Syr Darya river	8,998	3,274	12,272	6,697	1,275.00	7,972
- Kzyl-Orda Headworks (upstream)	5,412	2,664	8,076	3,428	1,121.00	4,549
- Intake into Left Main Canal*	1,858	-	1,858	1,632	-	1,632
- Kazalinsk	4,726	2,069	3,795	262	684.00	948

Remark: \* Available discharge during 1976-1996

### Syr Darya Water Use in Kzyl-Orda Oblast during the Year 1996

Item	Syr Darya Water Use in Kzyl-Orda Oblast (MCM)	
	Plan	Actual
1. Domestic and Industrial Needs		
April to August	130	130
September to March	130	121
Total	260	251
2. Fishing	83	83
3. Agricultural Needs		
Irrigation	4321	4177
Ecology Needs (Hay, Lake system)	240	396
Losses in Zhandarya and LMC	396	358
Total	4957	4926
Grand Total	5300	5252

### 10-day Probable Available Discharge at the Kzyl-Orda Headworks

Return Period	Drought Discharge (m <sup>3</sup> /s)																	
	Apr			May			Jun			Jul			Aug			Sep		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1/5 Year	59.7	61.5	115.7	277.6	330.2	355.3	368.9	345.0	318.2	300.4	264.0	263.4	236.2	189.1	96.7	51.7	49.7	49.0
1/2 Year	186.9	199.1	226.5	351.6	395.6	422.6	444.1	411.9	381.7	360.4	352.2	339.6	315.1	273.3	189.1	126.6	128.3	124.1

### 10-day Probable Available Discharge at the Head of Left Main Canal

Return Period	Discharge (m <sup>3</sup> /s)														
	Apr			May			Jun			Jul			Aug		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1/5 Year	0.0	0.0	32.9	128.5	173.5	179.3	183.7	173.4	163.4	158.6	153.4	142.2	130.3	99.9	22.3
1/2 Year	11.9	30.7	72.2	153.4	194.5	201.0	200.7	189.0	184.0	179.4	177.7	172.7	158.9	121.4	42.1

### Irrigation Area and Irrigation Water Use of Priority Area during 1985-1996

Year	Irrigation Area (ha)			Irrigation Water Use (MCM)			
	Shagan Farm	Ilyasov Farm	Total Area of Two Farms	Shagan Farm	Ilyasov Farm	Total Use in Two Farms	Total Use at Headworks
1985	6733	6286	13019	137	123	260	306
1986	7013	5763	12776	107	98	205	241
1987	7104	5811	12915	133	118	251	295
1988	7295	6015	13310	130	117	247	291
1989	6748	5901	12649	120	106	226	266
1990	7137	5931	13070	138	117	255	300
1991	7047	5969	13016	135	113	248	292
1992	7378	6088	13466	132	112	244	287
1993	6849	5824	12673	128	112	250	294
1994	6560	5490	12050	131	115	246	289
1995	6081	4977	11058	121	101	222	261
1996	5265	3585	8790	129	108	238	268
Average	6779	5643	12422	128	113	240	283

Source: Water Resource Committee, Kzyl-Orda

## Farm Input and Labor Requirement under with Project Condition

Input	Unit	Paddy	Wheat	Safflower	Vegetables	Lucern
<b>Farm input</b>						
1) Seed	kg	300	200 - 250	80	3	5 (15/3)*
2) FYM/Compost	ton	3	3	3	5	3
<b>3) Chemical Fertilizer</b>						
-Nitrogen	kg	120	90	70	180	30
-Phosphorous	kg	80	60	90	80	60
- Potassium	kg	30	30	60	30	20
<b>4) Agricultural Chemicals</b>						
- Fungicide	kg	0	0	0	0	0
- Pesticide	kg	5	2	2	2	0
- Herbicide	kg	5	5	5	0	0
5) Water	ton	20,000	3,000	5,000	5,000	5,000
6) Fuel	kg	250	170	150	260	280
<b>Labor Requirement</b>						
1) Land preparation	man-hour	7.0	6.0	7.0	25.0	5.0
2) Seeding	man-hour	3.0	1.0	1.0	11.0	1.0
3) Fertilizer application	man-hour	7.0	4.0	7.0	18.0	5.0
4) Crop management				11.0	176.0	
5) Weeding	man-hour	1.0	1.0			1.0
6) Water management	man-hour	15.0	9.0	10.0	46.0	9.0
7) Harvesting	man-hour	5.0	2.0	2.0	235.0	5.0
8) Post harvest	man-hour	3.0	2.0	2.0	18.0	9.0
9) Miscellaneous		4.1	2.5	4.0	52.9	3.5
<b>Total</b>		<b>45.1</b>	<b>25.0</b>	<b>40.0</b>	<b>529.0</b>	<b>35.0</b>

Source: JICA study team estimation

Note \*: Seeding is done every three year

## Anticipated Yield of Crops under with Project Condition

Crop	Kazakhstan			Japan*3	USA*3	Europe*3	World *3	Anticipated yield in the project area
	Present yield*1	Experiment stn.*2	Potential*2	(Northern part)			average	
Paddy	3.6	6.5	8.5	6.5	6.3	5.5	3.7	6.0
Wheat	1.1	3.0	4.5	3.5	2.8	4.5	2.5	2.8
Safflower	0.3	1.5	2.0	2.0	1.7	1.0	0.7	1.2
Vegetables	6.4	20.0	30.0	15-40	10-40	10-30	20.0	15.0
Lucern	2.9	8.0	10.0	8.0	8.0	7.5	6.5	7.2

\*1: Average value during 1985-1996

\*2: Personal communication with KZRI of Agricultural Science

\*3: Average value during 1985-1994

Source: FAO production year book, World rice statistics, Abstract of statistics of agriculture Japan

Table 3.2.8

## Financial Crop Enterprise Budget, Rice, Future With Project Condition ( 1997)

						(US\$/ha)
Item	Unit	Quan.	Price	VAT	Value	
<b>Crop Value</b>						
Grain	tons	6.00	200.00	124.07	1075.93	
Straw	tons	6.00				
Fodder Units	tons	0.60	136.30	16.36	65.42	
<b>Production Input Costs</b>						
<b>Fertilizer</b>						
FYM Compost	tons	3.00	2.00		6.00	
Nitrogen	tons	0.12	381.00	9.14	45.72	
Phosphorous	tons	0.08	435.00	6.96	34.80	
Potassium	tons		117.00			
<b>Crop Chemicals</b>						
Herbicides	kg	3.00	10.66	6.40	31.98	
Insecticides	kg	5.00	4.00	4.00	20.00	
Fungicides	ha					
Fuel	tons	0.25	191.30	9.57	47.83	
Seeds	kg	300.00	0.33	19.80	99.00	
<b>Depreciation and Repair</b>						
Tractors				5.44	27.20	
Machinery				32.18	160.92	
<b>Labor Costs</b>						
Land preparation	hour	7.00	0.70		4.90	
Seeding	hour	3.00	0.70		2.10	
Apply fertilizer	hour	7.00	0.70		4.90	
Weeding	hour	1.00	0.70		0.70	
Water Management	hour	15.00	0.37		5.55	
Harvesting	hour	5.00	0.70		3.50	
Post Harvest	hour	3.00	0.70		2.10	
Hauling	ton/km	120.00	0.31		37.20	
Subtotal					537.91	
Miscellaneous @ 5%				5.38	26.90	
Social Cost 32% of total wage bill					11.16	
<b>Total Cost</b>				<b>115.93</b>	<b>575.96</b>	
<b>Net Return</b>					<b>565.39</b>	
<b>Labor/ha (days)</b>					<b>5.86</b>	

Exchange rate \$US 1=75 tenge.

### Facility Inventory by Management Body

<u>Major Facilities</u>	<u>-(Management body)</u>		
1. Kzyl-Orda Head Works-[Hydro-Department for Kzyl-Orda Head Works]			
(1) Intake for Left Main Canal			
Q=228.0 m <sup>3</sup> /s, Roller Gate 5.0 m×6 nos, Under Scoring Sluice Gate 5.0 m×1.5 m			
(2) Intake for Right Main Canal			
Q=30.0 m <sup>3</sup> /s, Roller Gate 5.0 m×2 nos			
(3) Flood Sluice			
Radial Gate 17.0 m×5 nos			
2. Left Main Canal-[Hydro-Department for Kzyl-Orda Head Works]			
(1) Left Main Canal			
L=79.4 km, Regulator 6nos, Head gates 10 places, Inter-farm/on-farm canal 8 lines			
3. Distributor Canal - [Raion Water Management Office/Farm]			
(1) Ilyasov Area			
LMK-6(On-farm Canal)	L=13.0 km,	A=671 ha,	Q=1.04 m <sup>3</sup> /s
LMK-8G (On-farm Canal)	L=0.2 km,	A=146 ha,	Q=0.24 m <sup>3</sup> /s
LMK-8A (On-farm Canal)	L=19.1 km,	A=4,174 ha,	Q=6.49 m <sup>3</sup> /s
LMK-8B (On-farm Canal)	L=11.7 km,	A=1,489 ha,	Q=2.12 m <sup>3</sup> /s
Total 4 lines	L=44.0 km,	A=6,480 ha,	Q=9.89 m <sup>3</sup> /s
(2) Shagan Area			
LMK-12 (On-farm Canal)	L=27.6 km,	A=2,583 ha,	Q=4.02 m <sup>3</sup> /s
LMK-14 (On-farm Canal)	L=10.8 km,	A=824 ha,	Q=1.35 m <sup>3</sup> /s
LMK-16 (On-farm Canal)	L=6.9 km,	A=747 ha,	Q=1.23 m <sup>3</sup> /s
LMK-9 (Inter-farm Canal)	L=11.9 km,	A=1,961 ha,	Q=3.05 m <sup>3</sup> /s
LMK-11V-3 (On-farm Canal)	L=5.4 km,	A=917 ha,	Q=1.51 m <sup>3</sup> /s
LMK-11G (On-farm Canal)	L=1.4 km,	A=178 ha,	Q=0.29 m <sup>3</sup> /s
Total 6 lines	L=64.0 km,	A=7,210 ha,	Q=11.45m <sup>3</sup> /s
4. Drainage Canal - [Department of Zhanadaria Canal Management]			
(1) South Collector			
Capacity 74.3 m <sup>3</sup> /s, L=149.6 km			
(2) North Collector			
Capacity 29.8 m <sup>3</sup> /s, L=119.7 km			

### Number of Water Management Staff

Management Area	Specialist	Assistant	Total	Staff for Hydro-Station in the Kzyl-Orda Left Bank Area	Number of Hydro-post in the Kzyl-Orda Left Bank Area
	(person)	(person)	(person)	(person)	(place)
1. Kzyl-Orda Headworks	22	54	76	4	72
2. Syrdarya Raion	22	43	65	4	-
3. Terenozek Raion	15	33	48	2	12
4. Zhalagash Raion	27	41	68	5	51
5. Karmakshy Raion	15	41	56	3	46
<b>Total</b>	<b>101</b>	<b>212</b>	<b>313</b>	<b>18</b>	<b>181</b>



Table 3.2.11

Duties of Each Section of Agricultural Cooperative

Section Name	Present Conditions (Production Cooperative)	Duties	Under With Project (Agricultural Cooperative)
Crop Production Section	<ul style="list-style-type: none"> <li>- Management of farm crop production</li> <li>- Arrangement of seeds, chemical fertilizer and agro-chemicals</li> <li>- Submit of crop production reports to Raion Administration</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of extension activities to members</li> <li>- Arrangement of training cooperated with governmental organization</li> <li>- Arrangement of seeds, chemical fertilizer and agro-chemicals</li> <li>- Management of demonstration fields</li> <li>- Advice to WUA and WUG</li> <li>- Submit of crop production reports to Raion Administration</li> <li>- Farm budget analysis in cooperation with Livestock Section</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of extension activities to members</li> <li>- Arrangement of training cooperated with governmental organization</li> <li>- Arrangement of veterinary service</li> <li>- Arrangement of fodder</li> <li>- Submit of animal production reports to Raion Administration</li> <li>- Implementation of farm budget analysis in cooperation with Crop Production Section</li> </ul>
Livestock Section	<ul style="list-style-type: none"> <li>- Management of farm livestock production</li> <li>- Arrangement of fodder</li> <li>- Submit of animal production reports to Raion Administration</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of extension activities to members</li> <li>- Arrangement of training cooperated with governmental organization</li> <li>- Arrangement of veterinary service</li> <li>- Arrangement of fodder</li> <li>- Submit of animal production reports to Raion Administration</li> <li>- Implementation of farm budget analysis in cooperation with Crop Production Section</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of extension activities to members</li> <li>- Arrangement of training cooperated with governmental organization</li> <li>- Arrangement of veterinary service</li> <li>- Arrangement of fodder</li> <li>- Submit of animal production reports to Raion Administration</li> <li>- Implementation of farm budget analysis in cooperation with Crop Production Section</li> </ul>
Farm Machinery Section	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on spare parts and fuel</li> <li>- Preparation of plan on farm machinery use</li> <li>- Operation of Agricultural Machinery</li> <li>- Maintenance and repair of Agricultural Machinery</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on spare parts and fuel</li> <li>- Preparation of plan on farm machinery use</li> <li>- Operation of Agricultural Machinery</li> <li>- Maintenance and repair of Agricultural Machinery</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on farm machinery/spare parts and fuel</li> <li>- Preparation of plan on farm machinery use</li> <li>- Operation of Agricultural Machinery</li> <li>- Maintenance and repair of Agricultural Machinery</li> </ul>
Agro-processing Section	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on spare parts and fuel</li> <li>- Maintenance and repair of Rice Mill and other processing facilities</li> <li>- Management of storage facilities</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on spare parts and fuel</li> <li>- Operation of Rice Mill and other processing facilities</li> <li>- Maintenance and repair of Rice Mill and other processing facilities</li> <li>- Management of storage facilities</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of purchase plan on spare parts and fuel</li> <li>- Arrangement of effective processing and storage of agricultural products</li> <li>- Operation of Rice Mill and other processing facilities</li> <li>- Maintenance and repair of Rice Mill and other processing facilities</li> <li>- Management of storage facilities</li> <li>- Implementation of quality and quantity control of agricultural products</li> </ul>
Marketing and Procurement Section	(Not organized)	(Not organized)	<ul style="list-style-type: none"> <li>- Collection of market information and analysis of information</li> <li>- Support of commercial practices such as contract and business plan</li> <li>- Arrangement of collective shipping</li> <li>- Performance of amount control and packing etc.</li> <li>- Purchase of agro-input, spare parts, fuel and others</li> </ul>
Financing Information Section	(Not organized)	(Not organized)	<ul style="list-style-type: none"> <li>- Collection of credit information</li> <li>- Coordination between members and bank</li> <li>- Advice to members about credit</li> <li>- Submit of finance reports to Raion Administration</li> </ul>
Administrative Section	<ul style="list-style-type: none"> <li>- Preparation of annual budget</li> <li>- Management of cooperative account</li> <li>- Assistance to the manager and board members</li> <li>- Preparation of documents related to general cooperative management</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of annual budget</li> <li>- Management of cooperative account</li> <li>- Collection of change related to cooperative activity</li> <li>- Preparation of documents related to general cooperative management</li> <li>- Assistance to the manager and board members</li> <li>- Coordination among the sections</li> <li>- Arrangement for annual external audit</li> <li>- Management of tax payment and tax records</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of annual budget</li> <li>- Management of cooperative account</li> <li>- Collection of change related to cooperative activity</li> <li>- Preparation of documents related to general cooperative management</li> <li>- Assistance to the manager and board members</li> <li>- Coordination among the sections</li> <li>- Arrangement for annual external audit</li> <li>- Management of tax payment and tax records</li> </ul>

## Environmental Monitoring Plan

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

Table 3.2.13 (1/2)

Environmental Conservation Plan (1/2 - 2/2)

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 comfortability 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 comfortability 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
		Installation of proper sanitation facilities on the camps	Camp site and Darya river	During the construction	Project Office	MOA	Oblast government
Contamination to surface water		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 3.2.13 (2/2)

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

Table 3.3.1

Summary of Project Cost

Description	Phase I		Phase II		Total		unit: US\$ 000	
	L/C	F/C	L/C	F/C	L/C	F/C	Amount	Amount
	Amount	Amount	Amount	Amount	Amount	Amount		
1 Construction Cost	390	40	430		390	40		430
Project Office Building	3,025	5,186	8,211		3,025	5,186		8,211
Headworks	34,073	10,273	44,348		75,808	22,374		98,182
Left Main Canal	3,043	3,160	6,203		3,043	3,160		6,203
North Main Collector	7,848	2,170	10,018		5,933	5,621		11,554
South Main Collector	4,536	2,125	6,661		19,311	5,656		24,967
Inter-farm/On-farm Canals	1,500	685	2,185		10,604	4,909		15,513
On-farm Facilities	1,234	137	1,371		2,687	1,482		4,169
Rural Infrastructure	55,649	23,778	79,427		2,113	239		2,352
Buildings					122,602	48,979		171,581
sub-total								
2 Procurement Works	4	76	80		7	132		139
Office Equipment	57	1,111	1,168		59	942		2,110
O&M Equipment	39	736	775		103	2,007		2,110
Water Management Equipment	160	1,920	2,080		100	1,894		1,994
Rice Mill	307	5,811	6,118		220	2,640		2,860
Fund for Farm Machinery	567	9,654	10,221		667	12,610		13,277
sub-total					1,097	19,283		20,380
3 Administration Cost	4,378	0	4,378		8,558	0		8,558
4 Technical Supports	1,164	8,718	9,882		8,875	2,134		18,757
Consulting Service	1,220	0	1,220		310	1,530		1,530
Survey and Study	161	0	161		494	0		494
Training to Project Office Staff	0	0	0		1,250	0		1,250
Demonstration Farm	0	0	0		1,220	0		1,220
Agricultural Strengthening Programme	2,545	8,718	11,263		6,628	16,623		23,251
sub-total								
5 Land Acquisition	9	0	9		9	0		9
6 Fishery Contingency	0	0	0		160	0		160
sub-total of 1 to 6	63,147	42,150	105,297		75,907	42,735		118,642
6 Physical Contingency	6,315	4,215	10,530		4,274	11,864		16,138
sub-total of 1 to 6	69,462	46,365	115,827		47,009	130,506		177,533
7 Price Contingency	10,238	4,613	14,851		8,102	29,990		38,092
8 Total	79,700	50,978	130,678		105,386	185,086		291,174

Disbursement Schedule of Project Cost (1/2 - 2/2)

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		Amount		Amount		Amount		Amount		Amount		Amount		
1 Construction Cost															
Project Office Building															
Headworks															
Left Main Canal (PK0 - PK402)															
North Main Collector															
Inter-farm/On-farm Canals															
On-farm Facilities in Ilyasov Farm															
Rural Infrastructure															
Building Works															
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															
O&M Equipment															
Water Management Equipment															
Rice Mill															
Fund for Farm Machinery															
sub-total			0	0	4	76	107	1,280	370	6,661	87	1,637	567	9,684	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	60	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 3.3.2 (2/2)

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
	Unit: US\$ '000											
1 Construction Cost	7,258	2,104	14,517	4,208	14,517	4,208	5,444	1,578	41,735	12,099	53,834	
Left Main Canal (PK402 - PK899)	0	0	2,498	2,637	2,498	2,637	625	659	5,621	5,933	11,554	
South Main Collector	1,994	606	3,987	1,213	3,987	1,213	1,495	455	11,463	3,486	14,949	
Intra-farm/On-farm Canals			1,618	742	3,236	1,485	1,214	557	6,068	2,784	8,852	
On-farm Facilities in Shagan Farm			1,187	797					1,187	797	1,984	
Rural Infrastructure			879	102					879	102	981	
Building Works	9,252	2,710	23,499	8,902	23,425	10,340	8,777	3,249	66,953	25,201	92,154	
sub-total												
2 Procurement Works	3	56							3	56	59	
Office Equipment			35	672			12	224	46	896	942	
O&M Equipment			46	869			15	290	61	1,158	1,219	
Water Management Equipment			27	320					60	720	780	
Rice Mill			33	400			90	1,700	360	6,799	7,159	
Fund for Farm Machinery	3	56	33	400	377	6,960	117	2,213	530	9,629	10,159	
sub-total												
3 Administration Cost	732	0	976	0	976	0	787	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	
5 Fishery Compensation	160	0							160	0	160	
sub-total	10,639	4,271	25,724	11,278	27,580	18,763	10,493	7,279	1,461	1,144	75,907	
6 Physical Contingency	1,064	427	2,573	1,128	2,758	1,876	1,049	728	146	114	7,591	
Total	11,703	4,699	28,308	12,405	30,338	20,639	11,542	8,007	1,607	1,259	83,497	
7 Price Contingency	2,446	636	6,867	1,935	8,406	3,659	3,608	1,594	561	278	21,888	
8 Total	14,149	5,334	35,175	14,340	38,743	24,299	15,150	9,600	2,168	1,537	105,386	
sub-total												
Total												

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 3.4.1

## Key Staff Requirement for Kzyl-Orda Irrigation and Drainage Project Office

Division and Staff Category	Project Year									
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
<b>A Project Head Office</b>										
- Project Manager	1	1	1	1	1	1	1	1	1	1
<b>B Engineering Division</b>										
- Chief Engineer	1	1	1	1	1	1	1	1	1	1
- Survey Engineer	1	1	-	1	1	1	1	1	1	-
- Design Engineer	1	1	1	1	1	1	1	1	-	-
- Construction Engineer	1	1	2	3	3	3	3	3	2	1
- Technician	4	4	5	10	10	10	10	10	3	1
Sub-total	8	8	9	16	16	16	16	16	7	3
<b>C Agricultural Division</b>										
- Senior Agronomist	1	1	1	1	1	1	1	1	1	1
- Agronomist	1	1	1	1	1	1	1	1	1	1
- Extension Expert	-	-	1	1	1	1	1	1	1	1
- Cooperative Expert	-	-	1	1	1	1	1	1	1	1
- Credit Expert	-	-	1	1	1	1	1	1	1	1
- Technician	1	1	4	4	4	4	4	4	4	4
Sub-total	3	3	9	9	9	9	9	9	9	9
<b>D Administration Division</b>										
- Chief Administrator	1	1	1	1	1	1	1	1	1	1
- Personnel Officer	1	1	1	1	1	1	1	1	1	1
- Procurement Officer	1	1	1	1	1	1	1	1	1	1
- Store Officer	1	1	1	1	1	1	1	1	1	1
- Assistant Officer	3	3	3	3	3	3	3	3	3	3
Sub-total	7	7	7	7	7	7	7	7	7	7
<b>E Finance Division</b>										
- Chief Accountant	1	1	1	1	1	1	1	1	1	1
- Accountant	1	1	1	1	1	1	1	1	1	1
- Auditor	1	1	1	1	1	1	1	1	1	1
- Assistant Officer	3	3	3	3	3	3	3	3	3	3
Sub-total	6	6	6	6	6	6	6	6	6	6
<b>F Monitoring and Evaluation Unit</b>										
- Senior M&E Officer	1	1	1	1	1	1	1	1	1	1
- Environmental Specialist	1	1	1	1	1	1	1	1	1	1
- Irrigation Engineer	1	1	1	1	1	1	1	1	1	1
- Agronomist	1	1	1	1	1	1	1	1	1	1
- Assistant Officer	3	3	3	3	3	3	3	3	3	3
Sub-total	7	7	7	7	7	7	7	7	7	7
<b>Total</b>	<b>32</b>	<b>32</b>	<b>39</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>46</b>	<b>37</b>	<b>33</b>



Table 3.5.1

## Economic Crop Enterprise Budget, With Project Condition

Rice					
Item	Unit	Quantity	Price	Value	
<b>Crop Value</b>					
Grain	tons	6.00	200.00	1,200.00	
Straw	tons	6.00			
Fodder Units	tons	0.60	136.30	81.78	
<b>Production Input Costs</b>					
<b>Fertilizer</b>					
FYM/Compost	tons	3.00	2.00	6.00	
Nitrogen	tons	0.12	305.00	36.60	
Phosphorous	tons	0.08	348.00	27.84	
Potassium	tons	0.03	93.60	2.81	
<b>Crop Chemicals</b>					
I Basargan	kg	3.00	8.53	25.58	
I Insecticides	kg	5.00	4.00	20.00	
Fungicides	ha				
Fuel	tons	0.25	153.04	38.26	
Seeds	kg	300.00	0.26	79.20	
<b>Depreciation and Repair</b>					
Tractors				21.76	
Machinery				128.74	
<b>Labor Costs</b>					
Land Preparation	hour	7.00	0.70	4.90	
Seeding	hour	3.00	0.70	2.10	
Apply Fertilizer	hour	7.00	0.70	4.90	
Weeding	hour	1.00	0.70	0.70	
Water Management	hour	15.00	0.37	5.55	
Harvesting	hour	5.00	0.70	3.50	
Post Harvest	hour	3.00	0.70	2.10	
Hauling	ton/km	120.00	0.31	37.20	
Subtotal				447.74	
Miscellaneous @ 5%				22.39	
Total Cost				470.12	
SCF Adjusted Cost				423.11	
Net Return				858.67	
Labor/Ha (days)				5.86	



Table 3.5.3  
Table 3.5.4

### Farm Budget Analysis, Ilyasov Farm Area

Item	Year	6,480 Hectares (\$'000, 1997)							
		1	2	3	4	5	6	7	8
Gross Value of Production <sup>a/</sup>		425	425	4,535	5,905	5,905	5,905	5,905	5,905
		Outflow							
Investment On-farm Facilities 70%		1,368	2,736	1,026	0	0			
Investment Rice Mill		1,525	763						
Crop Production Costs		318	318	2,929	2,929	2,929	2,929	2,929	2,929
Irrig. System Operating Costs		13	13	421	421	421	421	421	421
Land Tax		9	9	9	9	9	9	9	9
Investment Farm machinery				5,048	1,683				
Total Outflow <sup>b/</sup>		3,233	3,838	9,432	5,041	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
Without Project		85	85	85	85	85	85	85	85
Incremental		(2,893)	(3,498)	(4,982)	779	2,461	2,461	2,461	2,461
		Financing							
Loan Receipts									
Irrig. & Dmg. Construction		1,368	2,736	1,026	0	0	0	0	0
Rice mill & storage		1,525	763	0	0	0	0	0	0
Farm machinery				5,048	1,683	0	0	0	0
Debt Service, Construction Loan (30 Years @ 2.5%)					245	245	245	245	245
Rice mill, 4 yrs @ 4.5% <sup>c/</sup>				103	638	638	638	638	638
Interest on Farm machinery loan (55% of \$6,731,000 @ 4.5%)					167	167	167	167	167
Interest Operating Loan 4.5%		5	5	35	35	35	35	35	35
Net Financing		2,893	3,498	5,971	633	(1,049)	(1,049)	(1,049)	(1,049)
		Net Benefit After Financing							
Total		85	85	1,073	1,497	1,497	1,497	1,497	2,135
Without Project		85	85	85	85	85	85	85	85
Incremental		(0)	(0)	988	1,412	1,412	1,412	1,412	2,049
Wages Paid as Production Cost		29	29	224	224	224	224	224	224
Net Income/Household \$		251	251	2,857	3,790	3,790	3,790	3,790	5,195
FIRR to All Resources Engaged <sup>d/</sup>		= 16.8 %							

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

### Farm Budget Analysis, Shagan Farm Area

Item	Year	7,210 Hectares (\$'000, 1997)							
		1	2	3	4	5	6	7	8
Gross Value of Production <sup>a/</sup>		797	797	5,135	6,531	6,581	6,581	6,581	6,581
		Outflow							
Investment On-farm 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
Irrig. System Operating Costs		26	26	469	469	469	469	469	469
Land Tax		10	10	10	10	10	10	10	10
Investment Farm machinery				5,906	1,969				
Total Outflow <sup>b/</sup>		2,944	10,513	7,071	3,739	3,739	3,739	3,739	3,739
		Net Benefit Before Financing							
Total		(2,147)	(9,716)	(1,936)	2,842	2,842	2,842	2,842	2,842
Without Project		147	147	147	147	147	147	147	147
Incremental		(2,294)	(9,863)	(2,083)	2,695	2,695	2,695	2,695	2,695
		Financing							
Loan Receipts									
Irrig. & Dmg. Construction		1,818	3,635	1,363	0	0	0	0	0
Rice mill & storage		477	381	0	0	0	0	0	0
Farm machinery				5,906	1,969	0	0	0	0
Debt Service, Construction Loan (30 Years @ 2.5%)					326	326	326	326	326
Rice mill, 4 yrs @ 4.5% <sup>c/</sup>				39	239	239	239	239	239
Interest on Farm machinery loan (55% of \$7,875,000 @ 4.5%)					195	195	195	195	195
Interest Operating Loan 4.5%		5	5	39	39	39	39	39	39
Net Financing		2,294	9,923	3,293	(760)	(760)	(760)	(760)	(760)
		Net Benefit After Financing							
Total		147	147	1,357	2,082	2,082	2,082	2,082	2,321
Without Project		147	147	147	147	147	147	147	147
Incremental		0	0	1,210	1,935	1,935	1,935	1,935	2,174
Wages Paid as Production Cost		57	57	249	249	249	249	249	249
Net Income/Household \$		254	254	2,311	3,354	3,354	3,354	3,354	3,698
FIRR to All Resources Engaged <sup>d/</sup>		= 15.9 %							

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

## Payment Capacity Budget, Ilyasov Farm Area

Item	6480 ha Farm							(5000, 1997)
	1	2	3	4	5	6	7	8
<b>Gross Value of Production</b>								
Rice	267	267	2,840	3,698	3,698	3,698	3,698	3,698
Lucerne	37	37	632	830	830	830	830	830
Wheat	20	20	320	421	421	421	421	421
Safflower	2	2	70	92	92	92	92	92
Vegetables	101	101	673	864	864	864	864	864
Total	425	425	4,535	5,905	5,905	5,905	5,905	5,905
<b>Crop Production Costs</b>								
Rice	196	196	1,866	1,866	1,866	1,866	1,866	1,866
Lucerne	36	36	415	415	415	415	415	415
Wheat	30	30	310	310	310	310	310	310
Safflower	4	4	65	85	85	85	85	85
Vegetables	51	51	253	253	253	253	253	253
Subtotal	318	318	2,929	2,929	2,929	2,929	2,929	2,929
<b>Interest on Farm Machinery Loan</b>								
(\$52 * \$6,731,000 @ 4.5% 4 yr)			167	167	167	167	167	167
Rice Mills (\$2,288,000 @ 4.5% 4 yr)			103	638	638	638	638	0
Interest operating loan 4.5% of	5	5	35	35	35	35	35	35
Land Tax (\$1.33/ha)	9	9	9	9	9	9	9	9
Total Outflow	332	332	3,242	3,272	3,272	3,272	3,272	3,139
Net Return w/o repayment & tax	94	94	1,293	2,128	2,128	2,128	2,128	2,766
Without Project	94	94	94	94	94	94	94	94
Incremental	0	0	1,199	2,034	2,034	2,034	2,034	2,672
<b>Payment Capacity</b>								
Wages paid as prod. cost	29	29	224	224	224	224	224	224
Return to management 20% net income			259	426	426	426	426	553
Return to labor & management			483	650	650	650	650	777
Living Allowance @ US\$1000/household			454	454	454	454	454	454
Total Income to Farm Households	123	123	937	1,104	1,104	1,104	1,104	1,231
Payment Capacity			580	1,249	1,249	1,249	1,249	1,751
Irrigation O&M&R \$65/ha of	13	13	421	421	421	421	421	424
Amortization Capacity			159	827	827	827	827	1,328
Income Tax @ 10%	11	11	110	110	110	110	110	123
Net Income after Taxes	99	99	986	993	993	993	993	1,108
Net Income/Household \$	217	217	2,172	2,188	2,188	2,188	2,188	2,441

a/ Without project cropping pattern and production.

b/ Twenty percent new equipment purchased annually beginning in 2nd year.

c/ Annual depreciation of \$672,200 included in crop production cost is

sufficient to replace the machinery investment every 7 years.

d/ Annual loan of \$1,334,000 covers purchase of seeds, fuel, fertilizers,

and chemicals. Loan term 7 months.

## Payment Capacity Budget, Shagan Farm Area

Item	7210 ha Farm							(5000, 1997)
	1	2	3	4	5	6	7	8
<b>Gross Value of Production</b>								
Rice	526	526	3,222	4,120	4,120	4,120	4,120	4,120
Lucerne	72	72	711	924	924	924	924	924
Wheat	43	43	360	465	465	465	465	465
Safflower	5	5	76	99	99	99	99	99
Vegetables	151	151	767	972	972	972	972	972
Total	797	797	5,135	6,581	6,581	6,581	6,581	6,581
<b>Crop Production Costs</b>								
Rice	388	388	2,079	2,079	2,079	2,079	2,079	2,079
Lucerne	71	71	462	462	462	462	462	462
Wheat	67	67	342	342	342	342	342	342
Safflower	12	12	91	91	91	91	91	91
Vegetables	77	77	283	285	285	285	285	285
Subtotal	614	614	3,260	3,260	3,260	3,260	3,260	3,260
<b>Interest on Farm Machinery Loan</b>								
(\$52 * \$7,815,000 @ 4.5% 4 yr)			195	195	195	195	195	195
Rice Mill (\$858,000 @ 4.5% 4 yr)			39	239	239	239	239	0
Interest operating loan 4.5% of	5	5	39	39	39	39	39	39
Land Tax (\$1.33/ha)	10	10	10	10	10	10	10	10
Total Outflow	629	629	3,542	3,743	3,743	3,743	3,743	3,504
Net Return w/o repayment & tax	168	168	1,593	2,839	2,839	2,839	2,839	3,078
Without Project	168	168	168	168	168	168	168	168
Incremental	0	0	1,425	2,670	2,670	2,670	2,670	2,909
<b>Payment Capacity</b>								
Wages paid as prod. cost	57	57	249	249	249	249	249	249
Return to management 20% net income			319	568	568	568	568	616
Return to labor & management			568	817	817	817	817	865
Living Allowance @ US\$1000/household			695	695	695	695	695	695
Total Income to Farm Households	226	226	1,233	1,512	1,512	1,512	1,512	1,500
Payment Capacity			579	1,576	1,576	1,576	1,576	1,767
Irrigation O&M&R \$65/ha of	26	26	469	469	469	469	469	469
Amortization Capacity			111	1,107	1,107	1,107	1,107	1,269
Income Tax @ 10%	20	20	137	151	151	151	151	150
Net Income after Taxes	180	180	1,236	1,361	1,361	1,361	1,361	1,434
Net Income/Household \$	258	258	1,779	1,958	1,958	1,958	1,958	2,020

a/ Without project cropping pattern and production.

b/ Twenty percent new equipment purchased annually beginning in 2nd year.

c/ Annual depreciation of \$762,700 included in crop production cost is

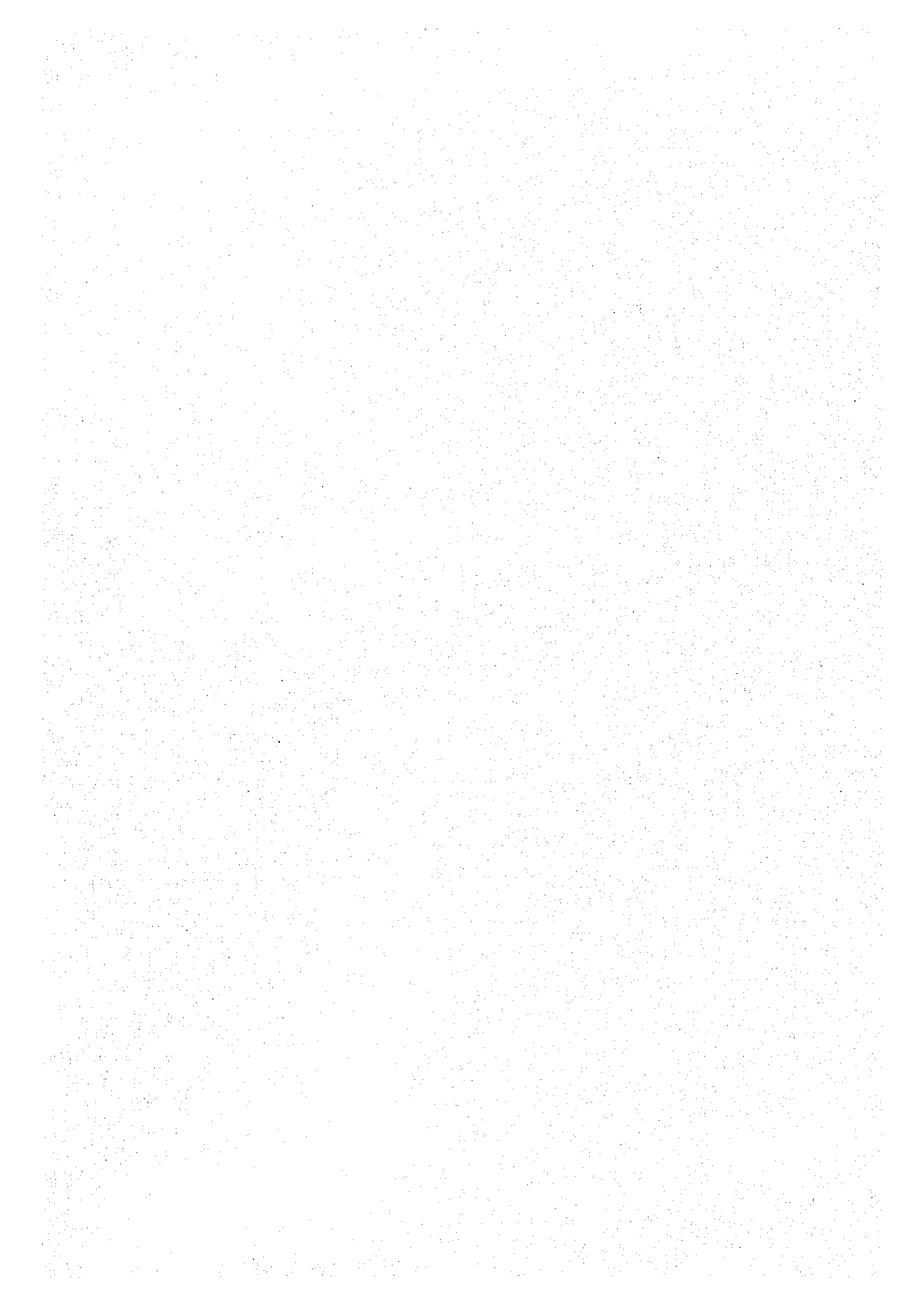
sufficient to replace the machinery investment every 7 years.

d/ Annual loan of \$1,481,000 covers purchase of seeds, fuel, fertilizers,

and chemicals. Loan term 7 months.



## *Figures*



### Work Flow Chart

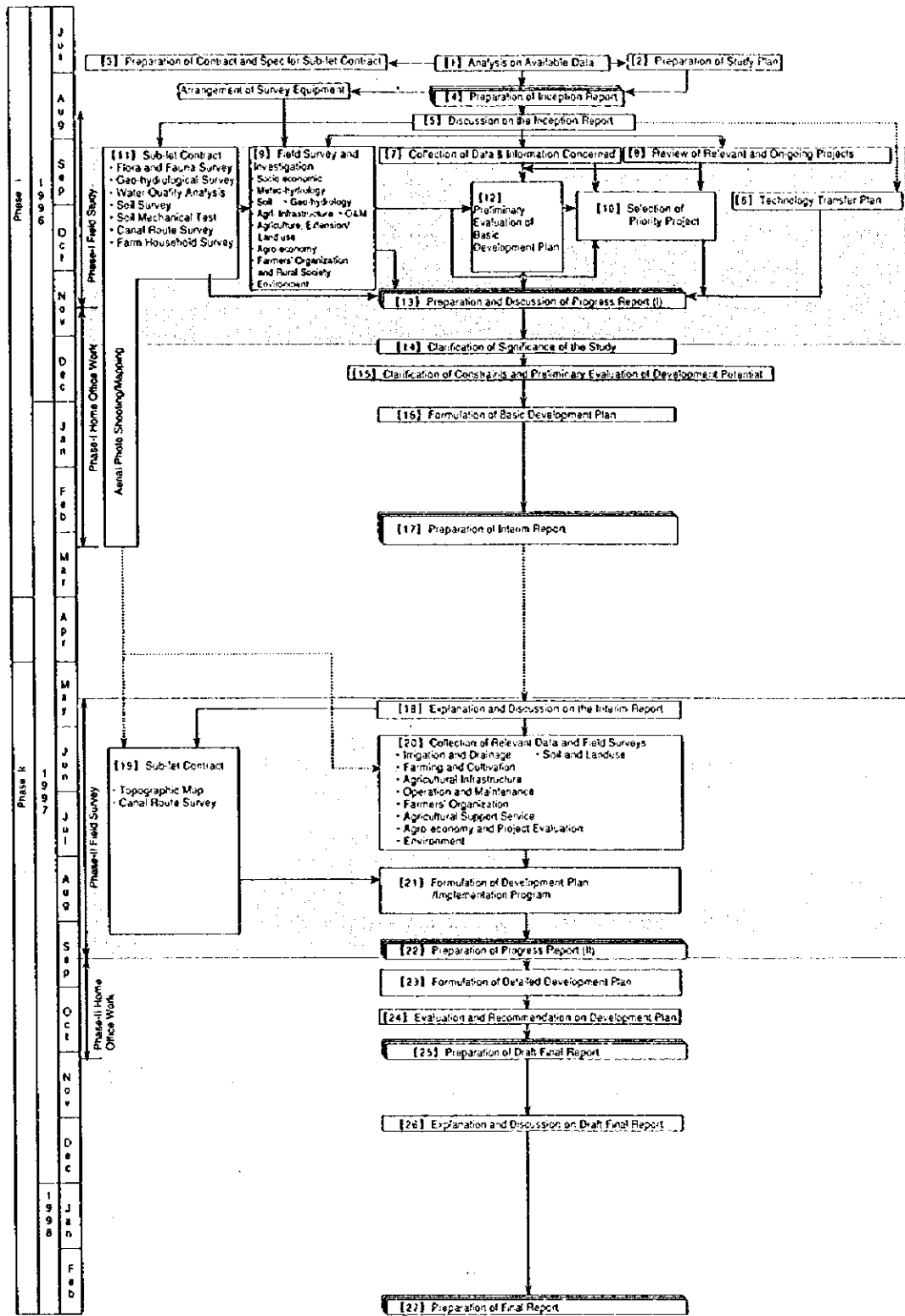
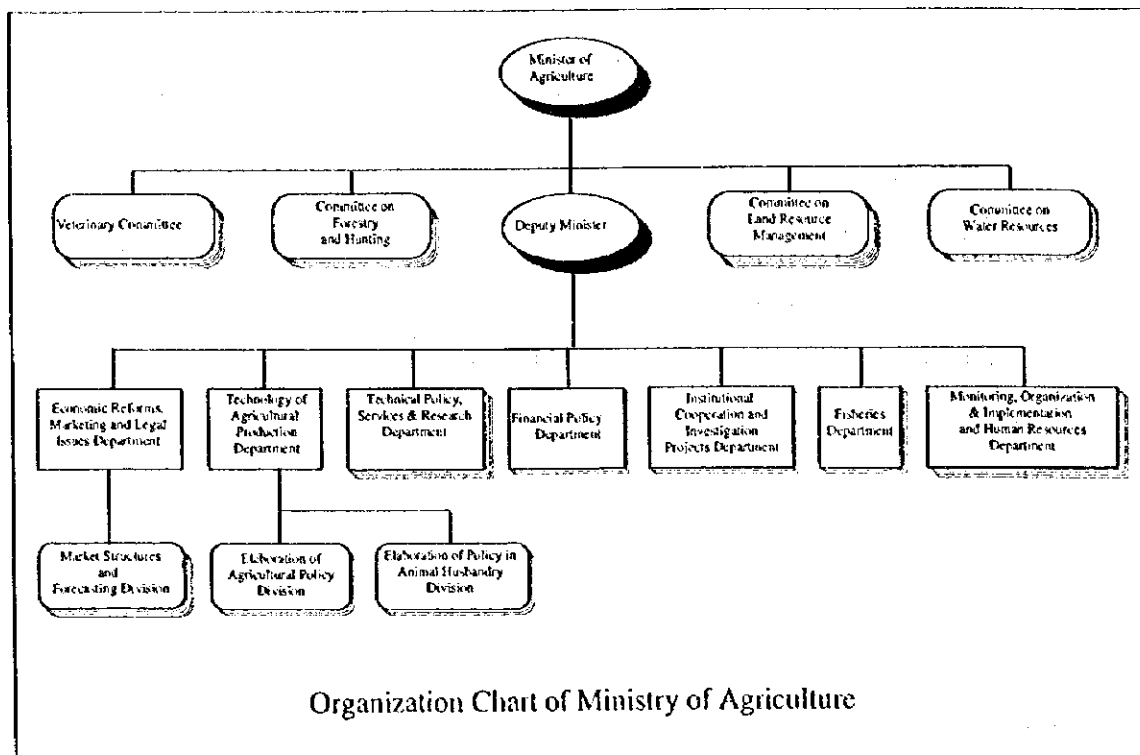


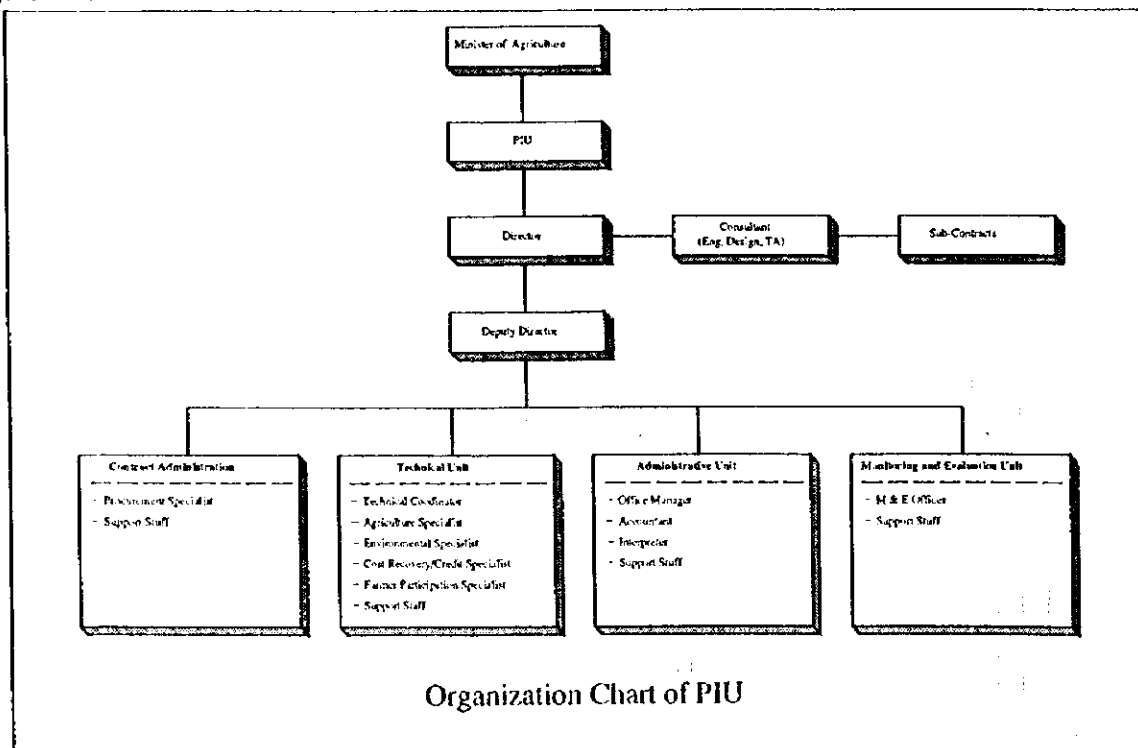


Figure 1.2.1



Organization Chart of Ministry of Agriculture

Figure 1.2.2



Organization Chart of PIU

Figure 1.2.3

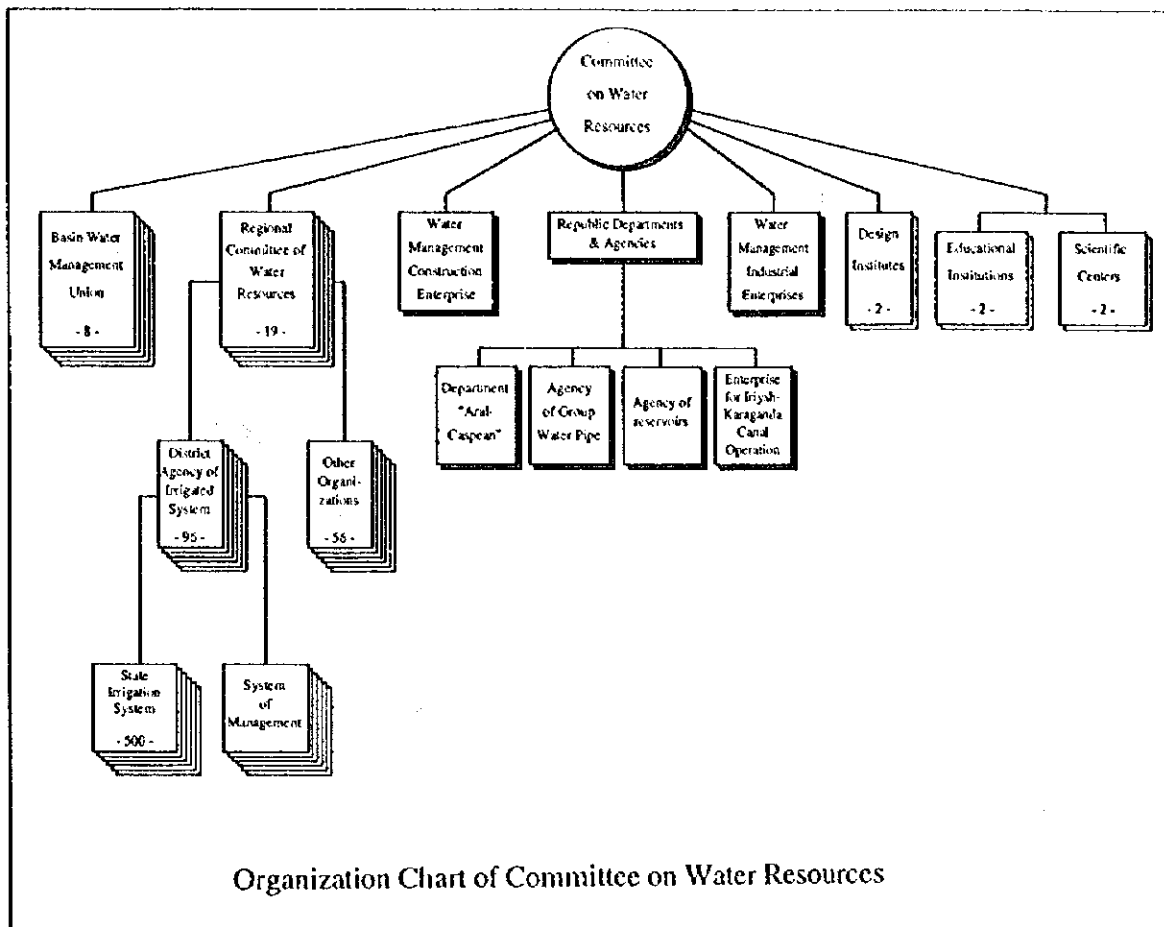


Figure 1.2.4

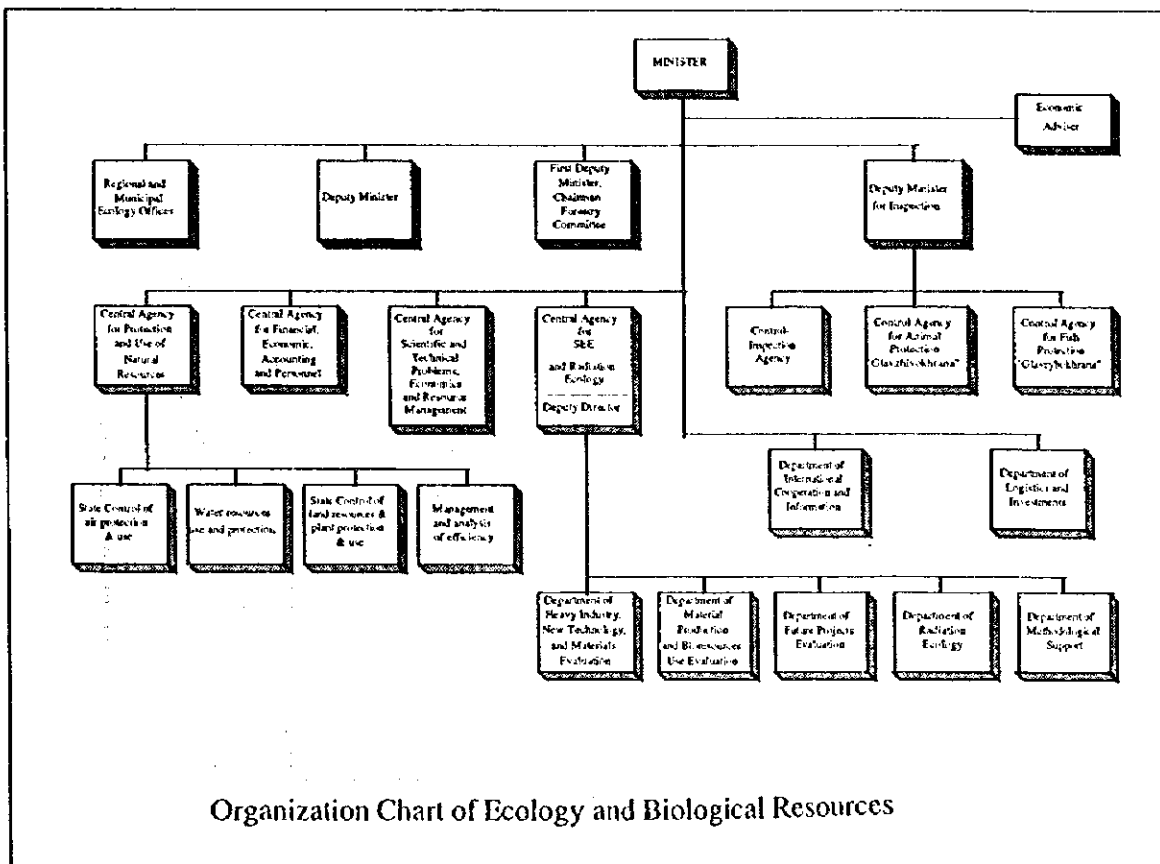


Figure 2.1.1

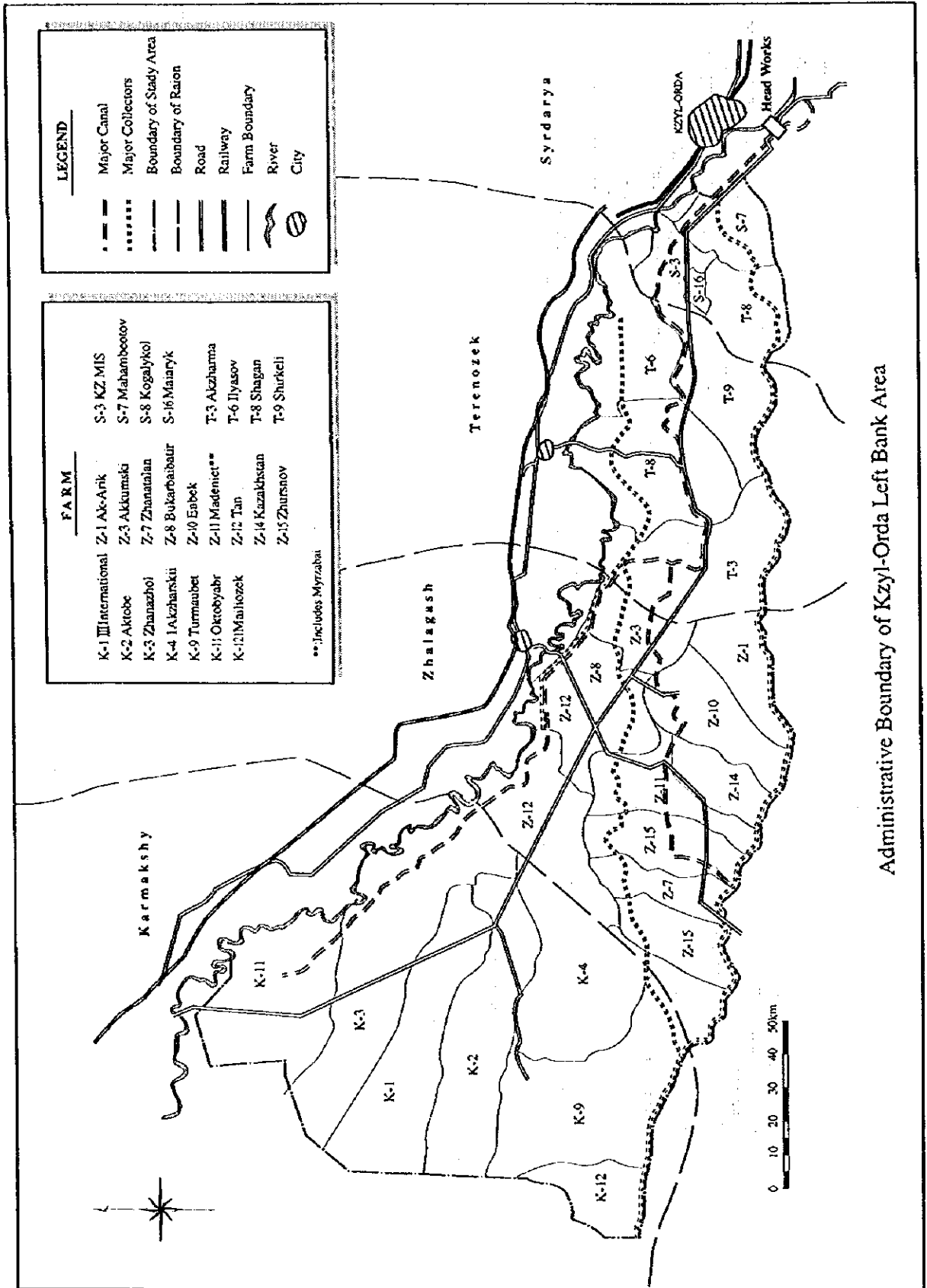
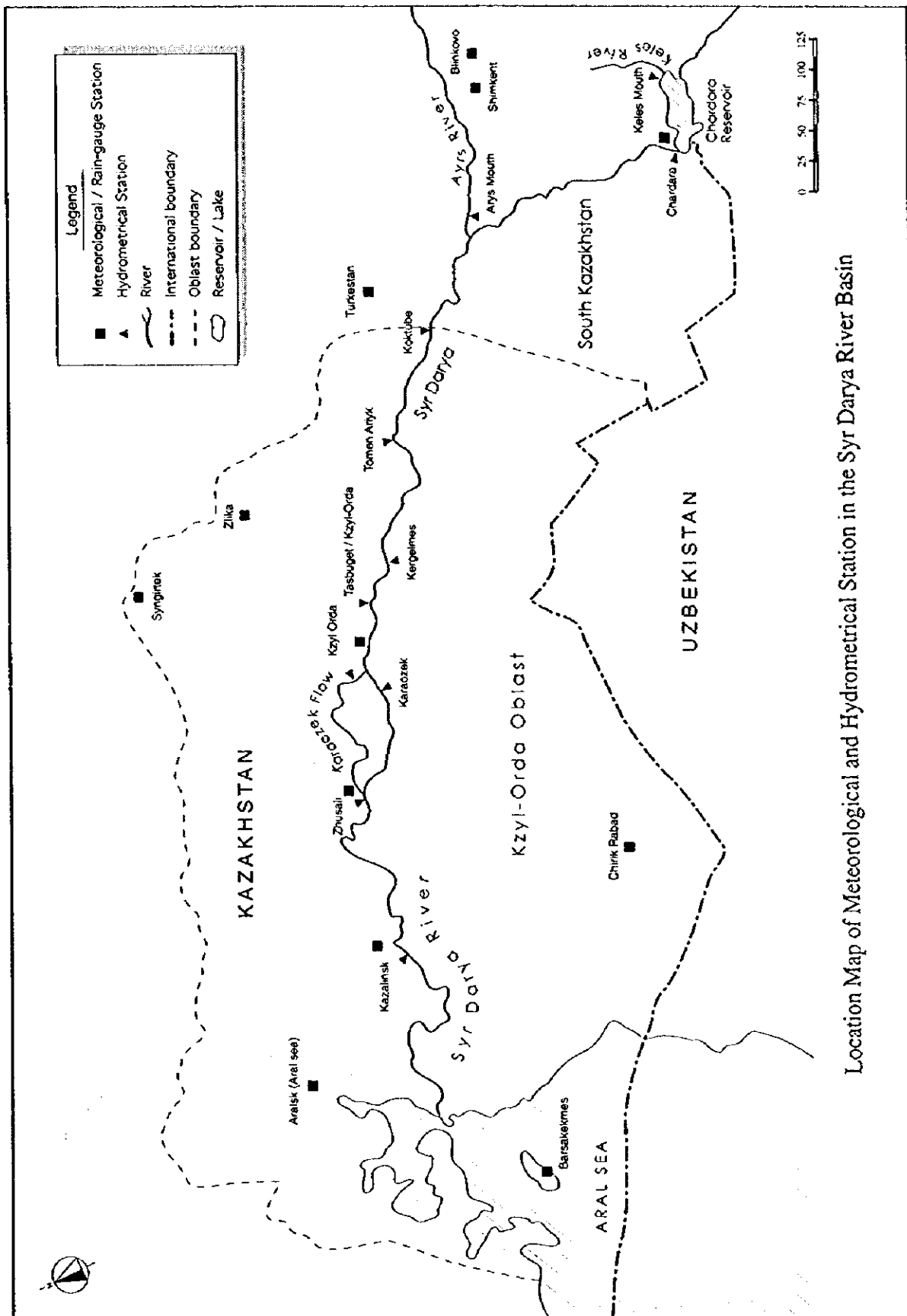
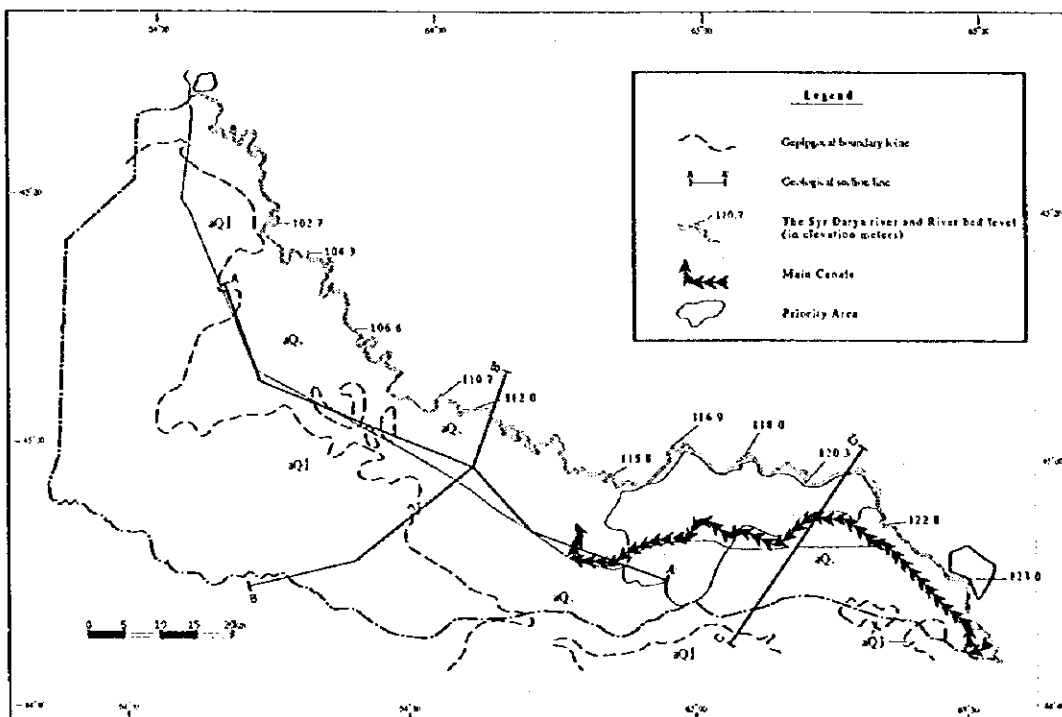
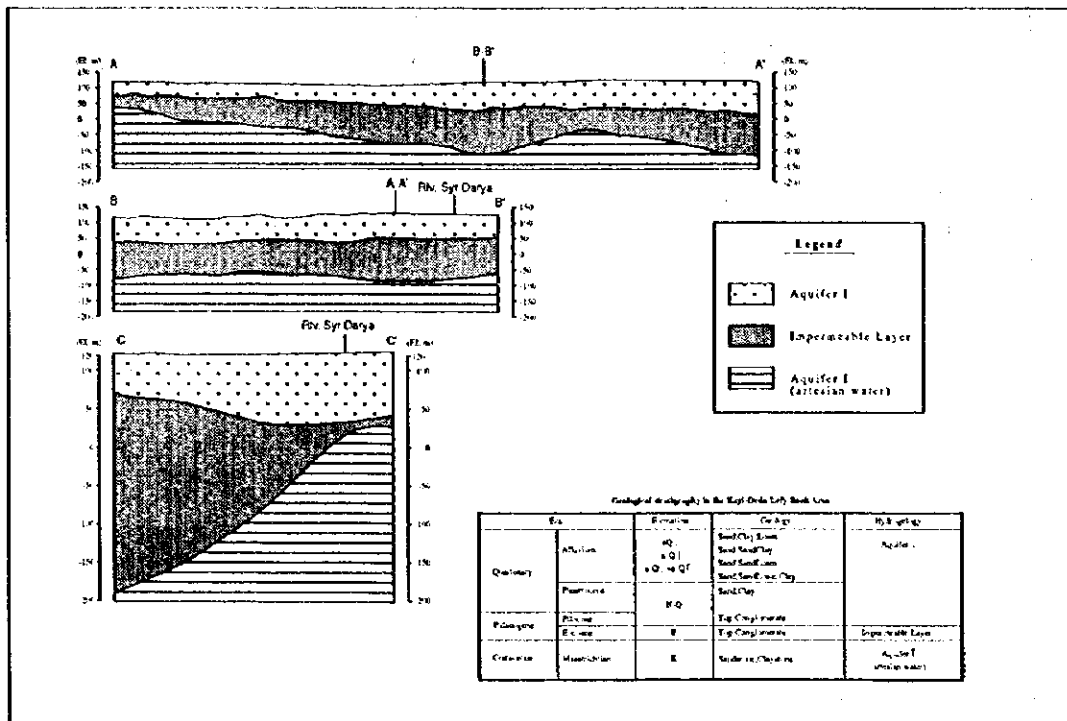


Figure 2.1.2



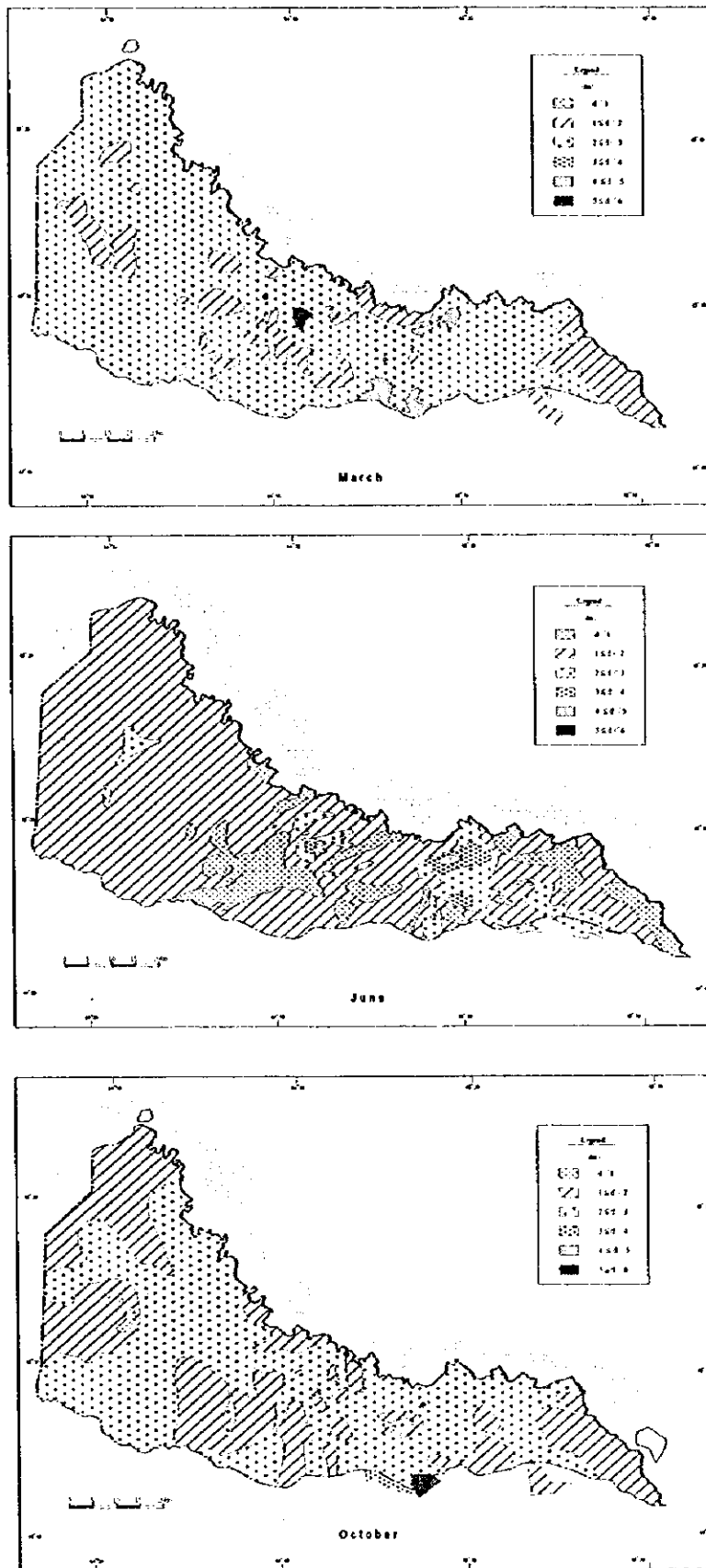
Location Map of Meteorological and Hydrometrical Station in the Syr Darya River Basin

Figure 2.1.3



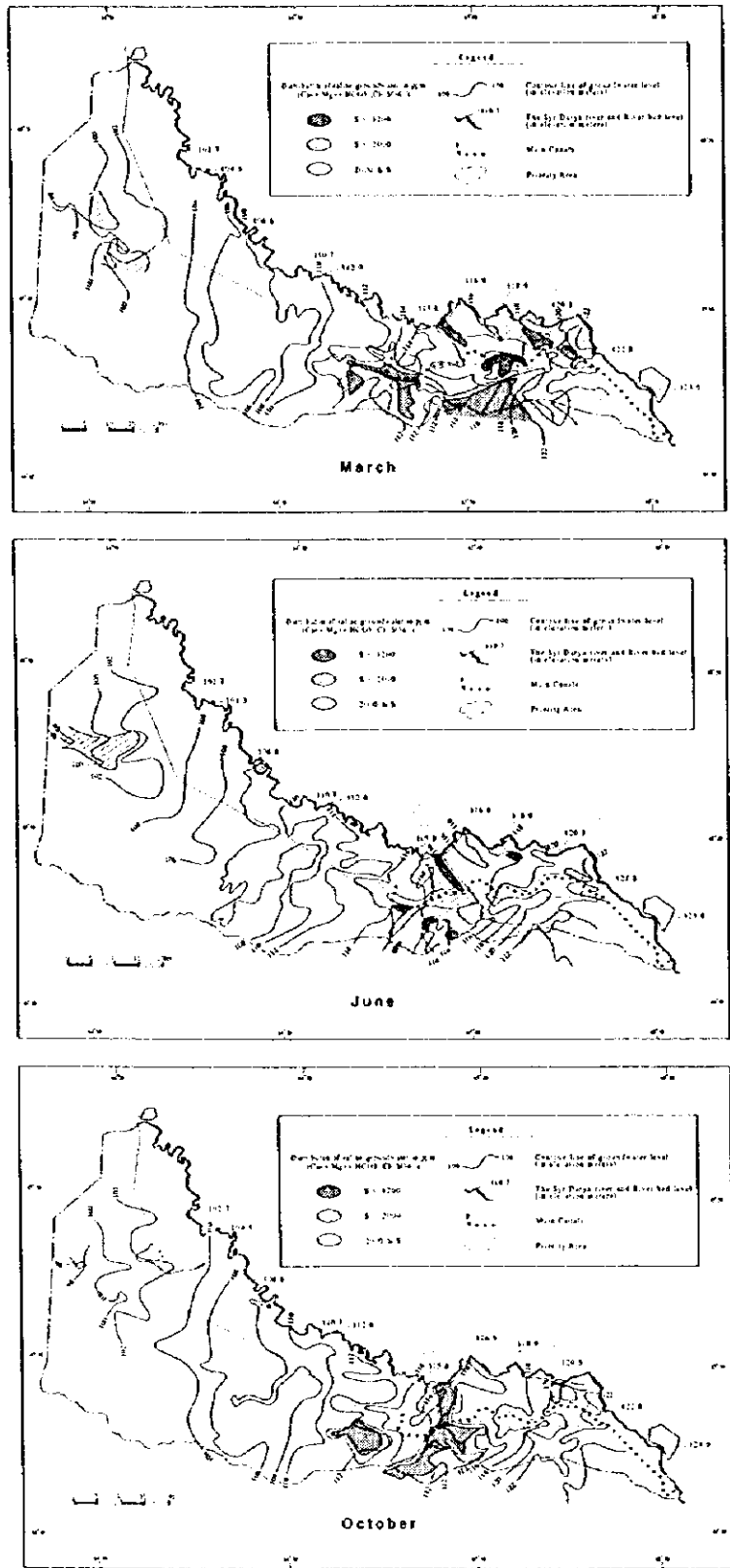
Geological Map of the Kzyl-Orda Left Bank Area

Figure 2.1.4



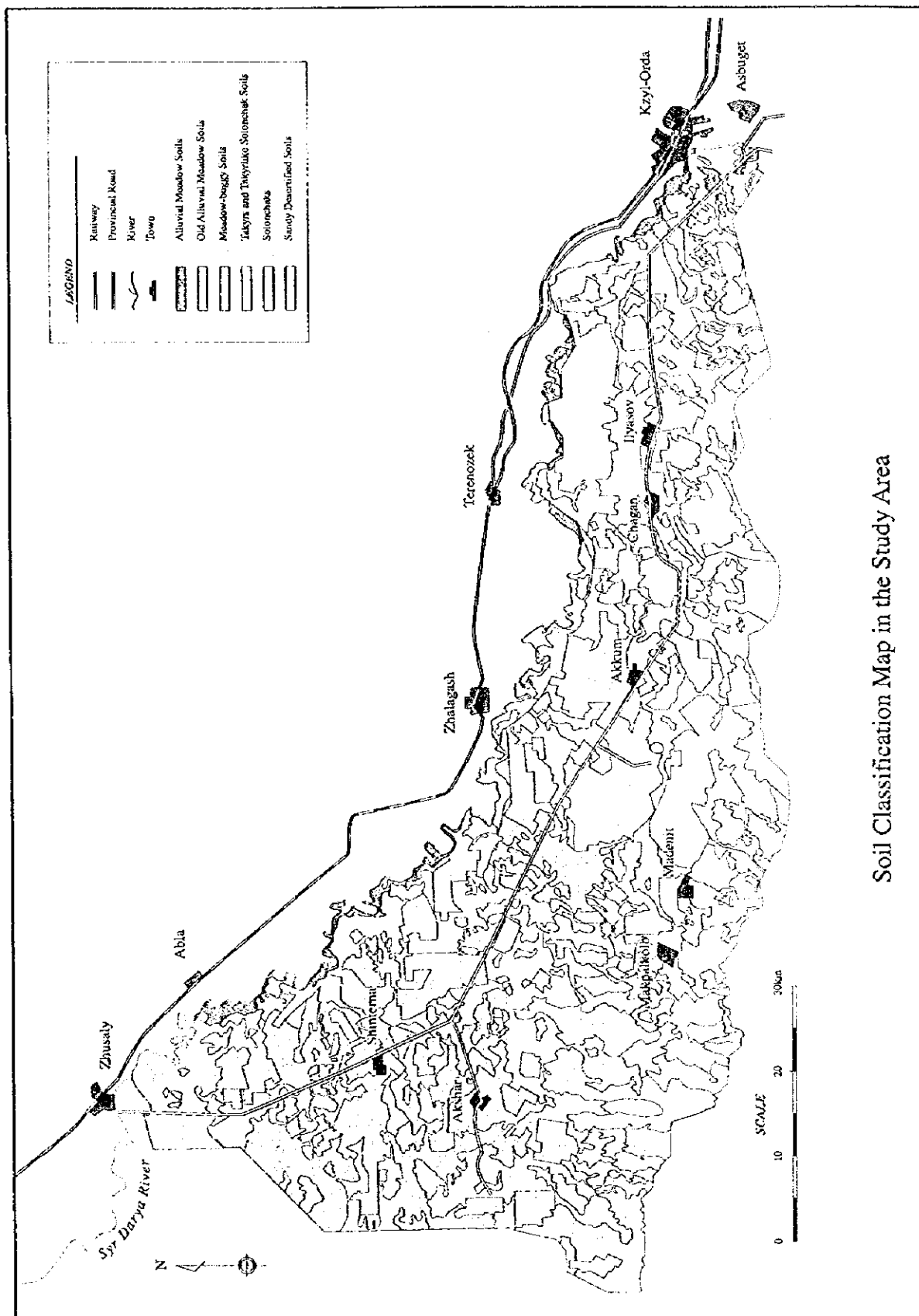
Ground Water Level in the Kzyl-Orda Left Bank Area - 1995 -

Figure 2.1.5



Salinity Hazard Map of Ground Water - 1995 -

Figure 2.1.6



Soil Classification Map in the Study Area



Figure 2.1.7

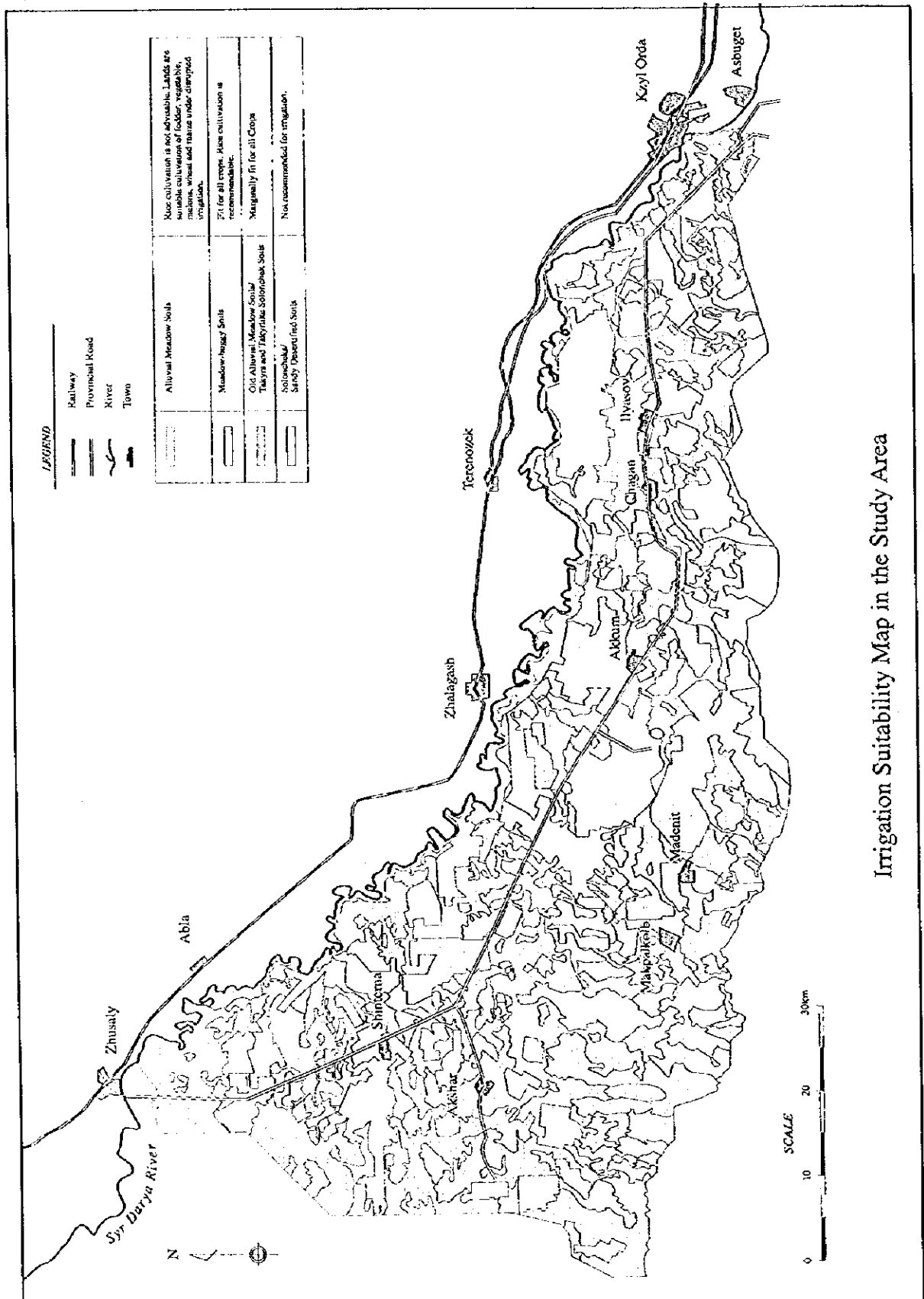


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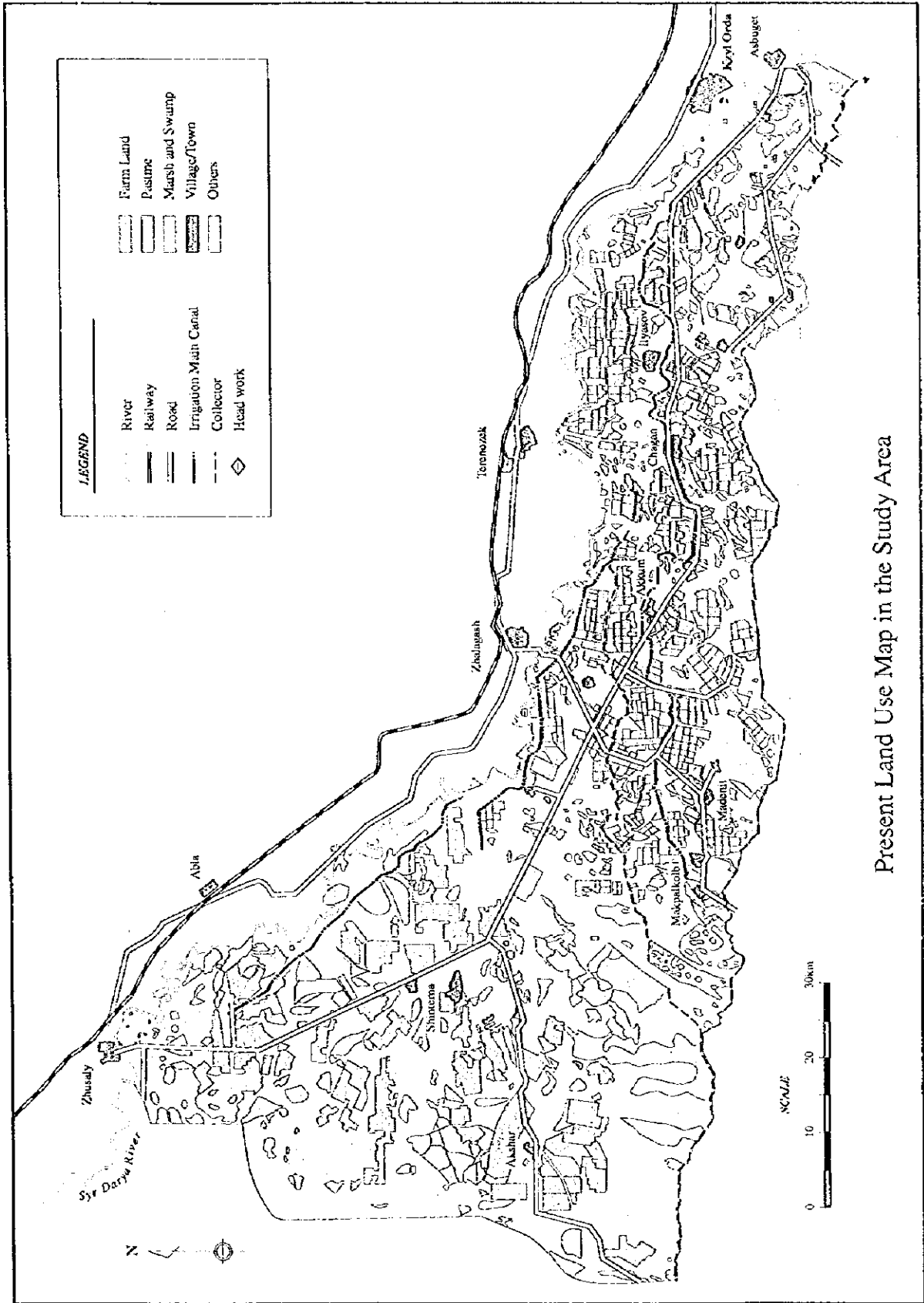
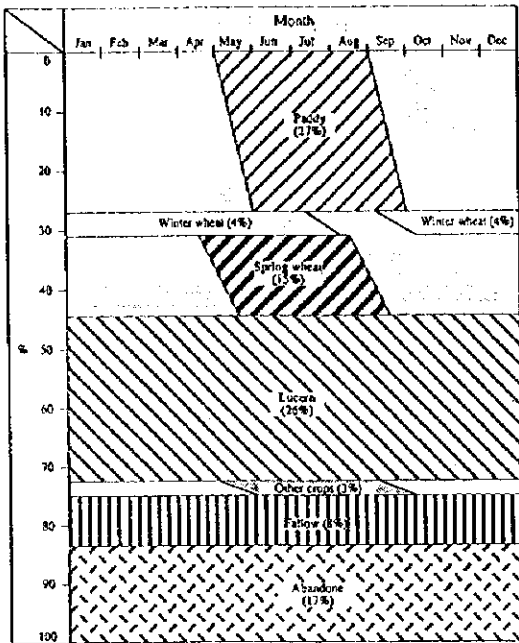
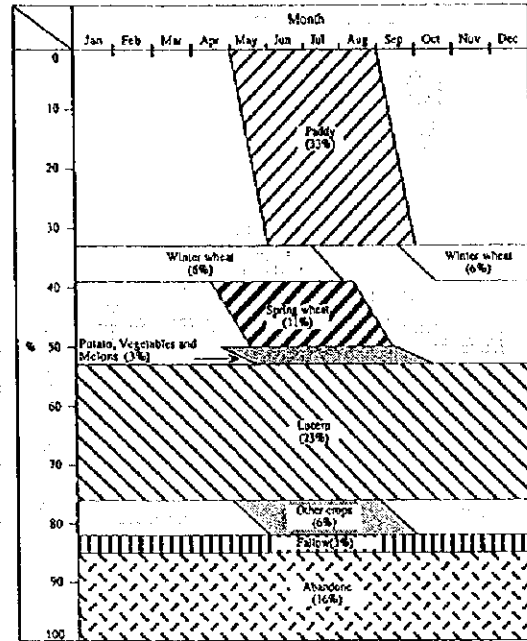


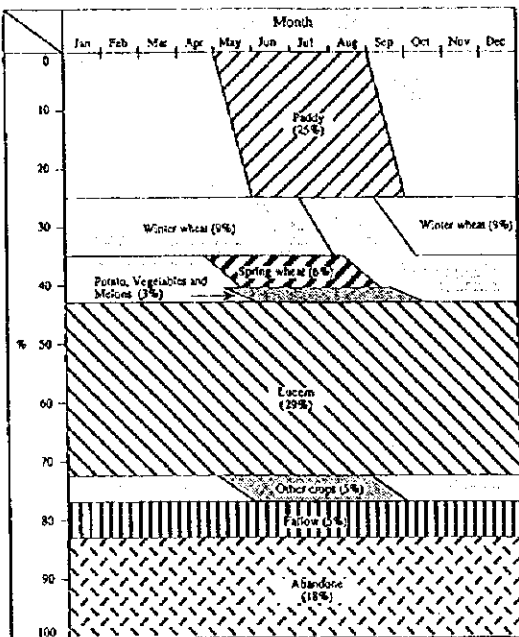
Figure 2.1.9



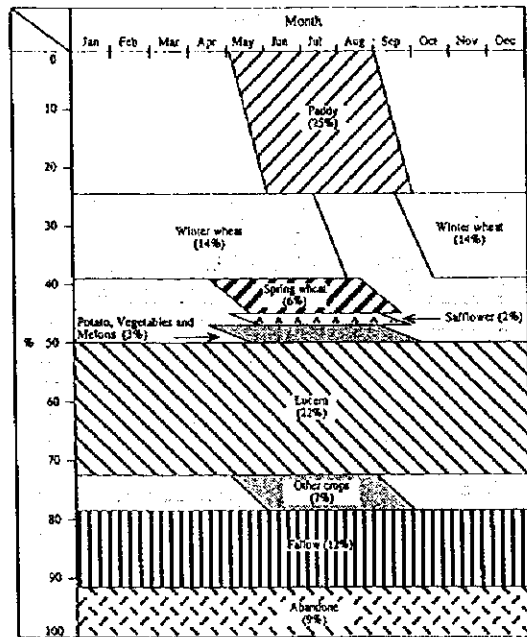
Syrdarya Raion



Terenzek Raion



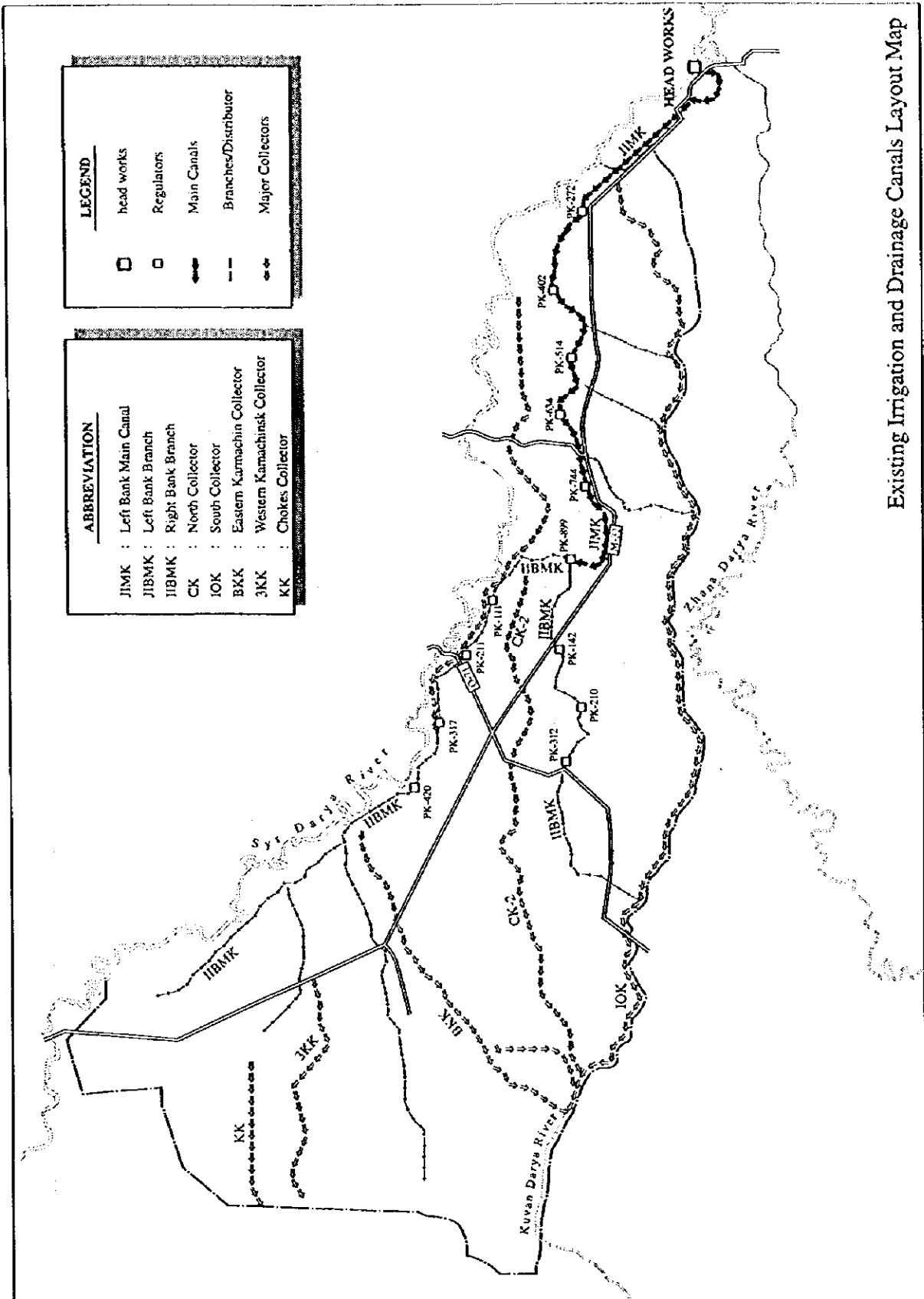
Zhalagashi Raion



Karmakshy Raion

Present Cropping Pattern in the Study Area

Figure 2.1.10



Existing Irrigation and Drainage Canals Layout Map

Figure 2.1.11

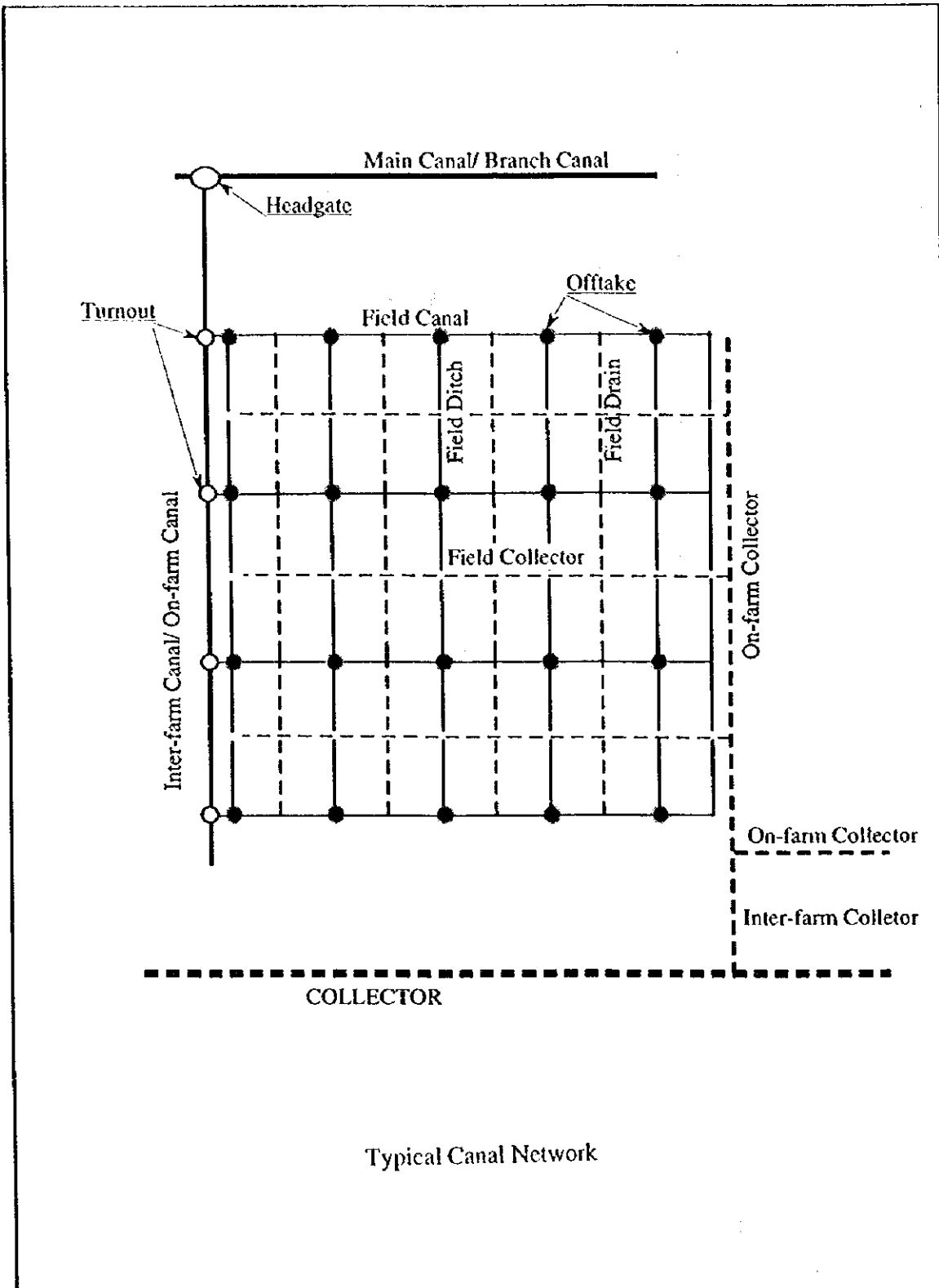


Figure 2.1.12

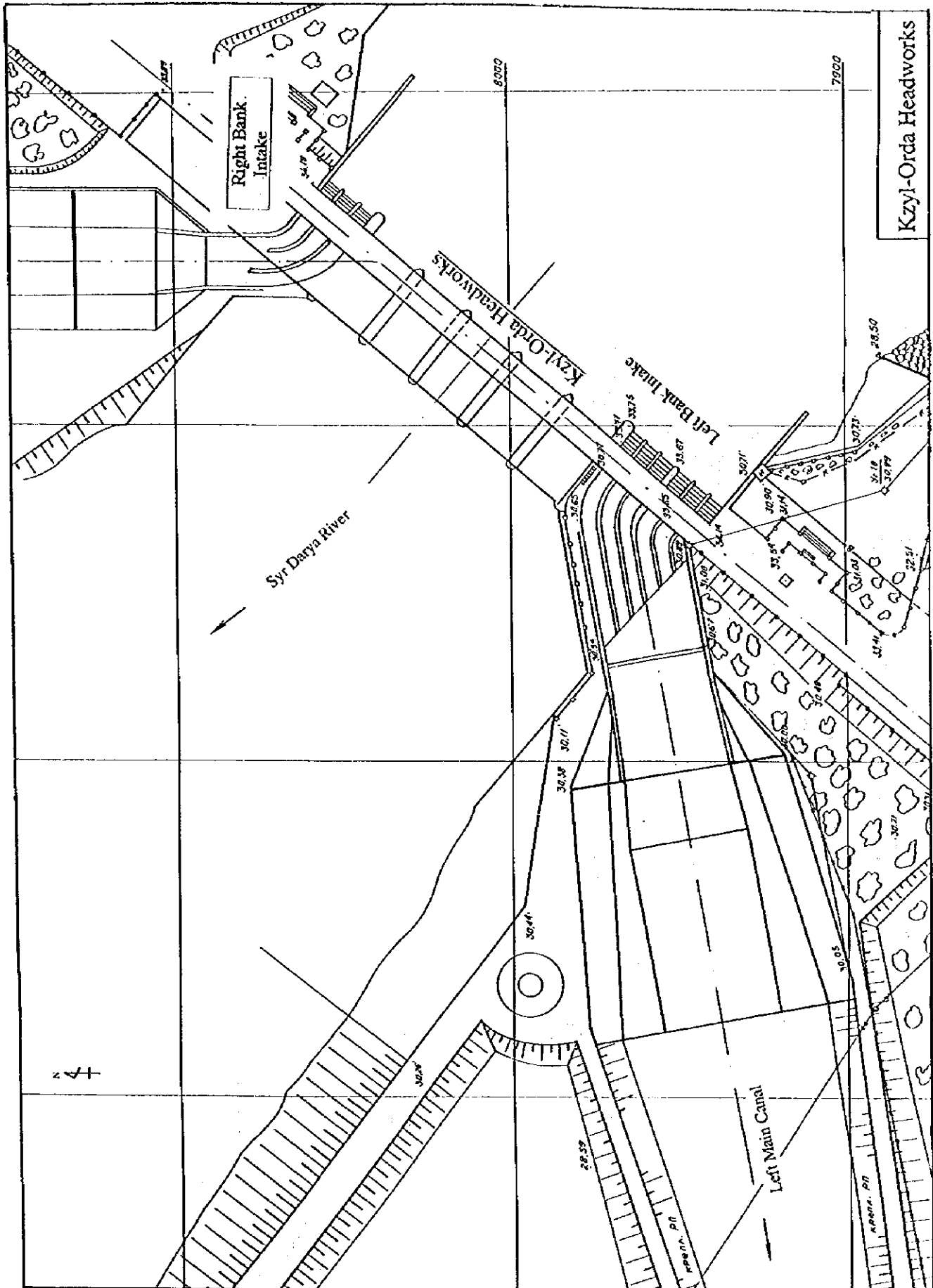
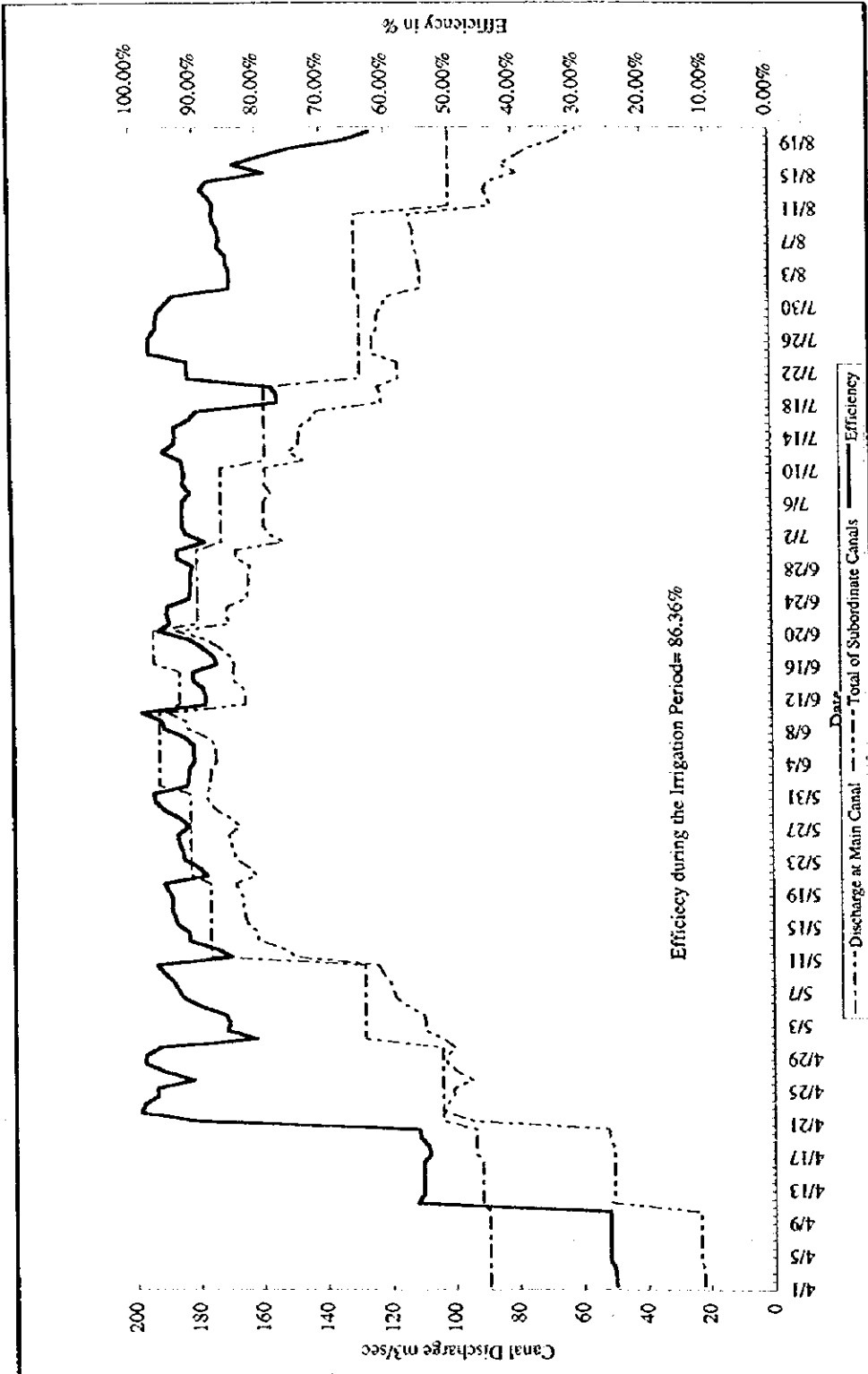


Figure 2.1.13



Efficiency of Left Bank Main Canal

Figure 2.1.14

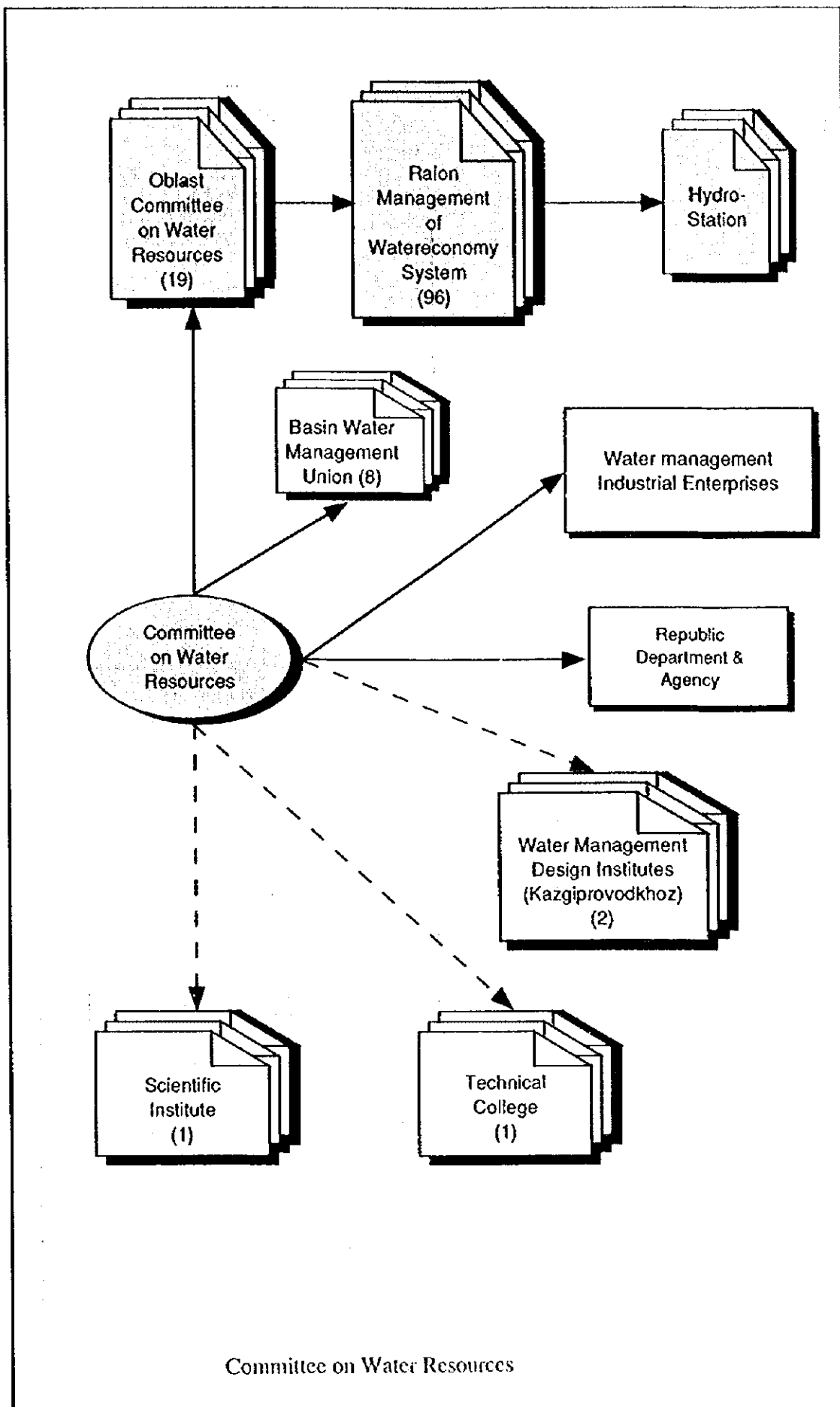




Figure 2.1.15

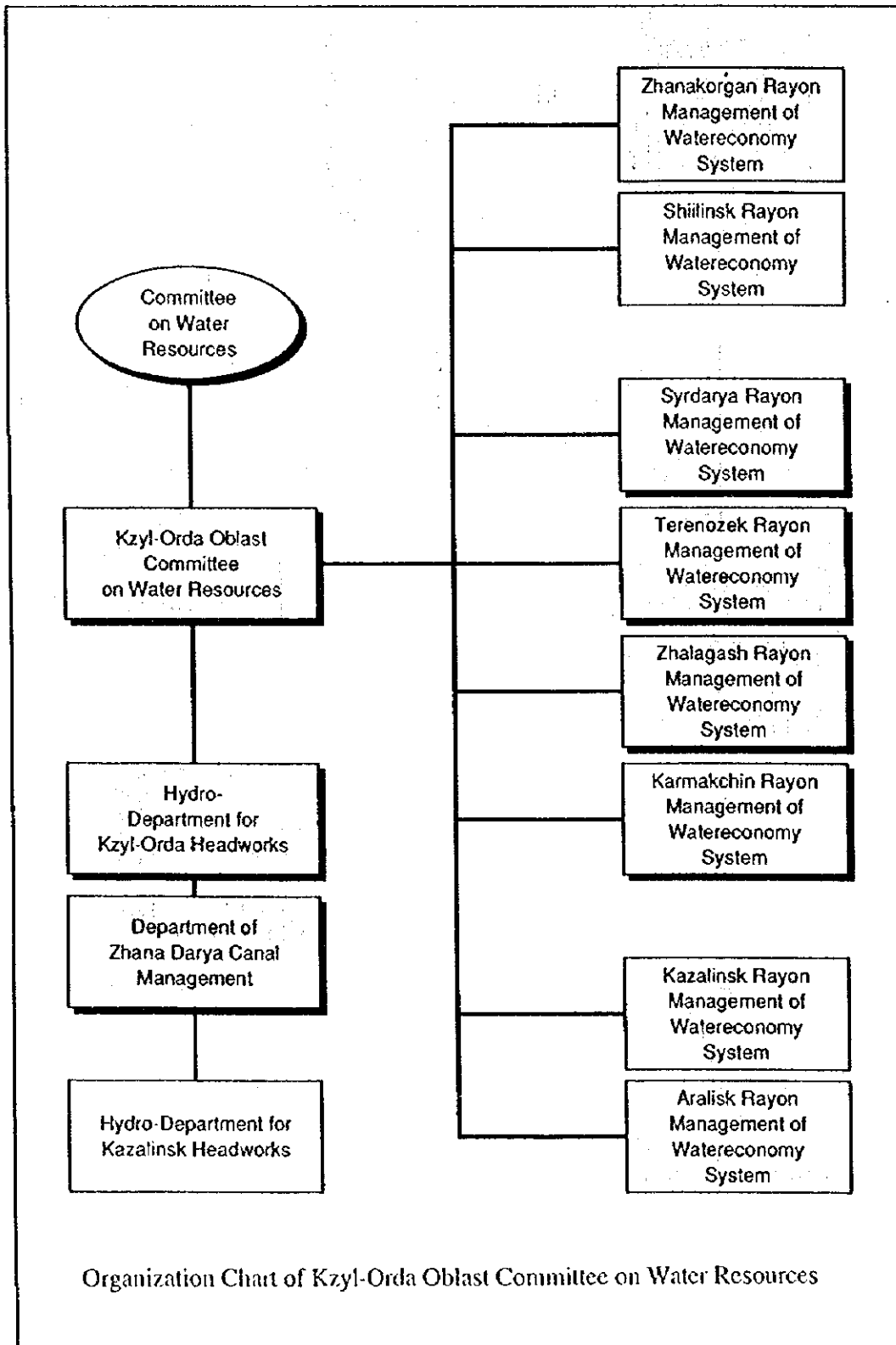


Figure 2.1.16

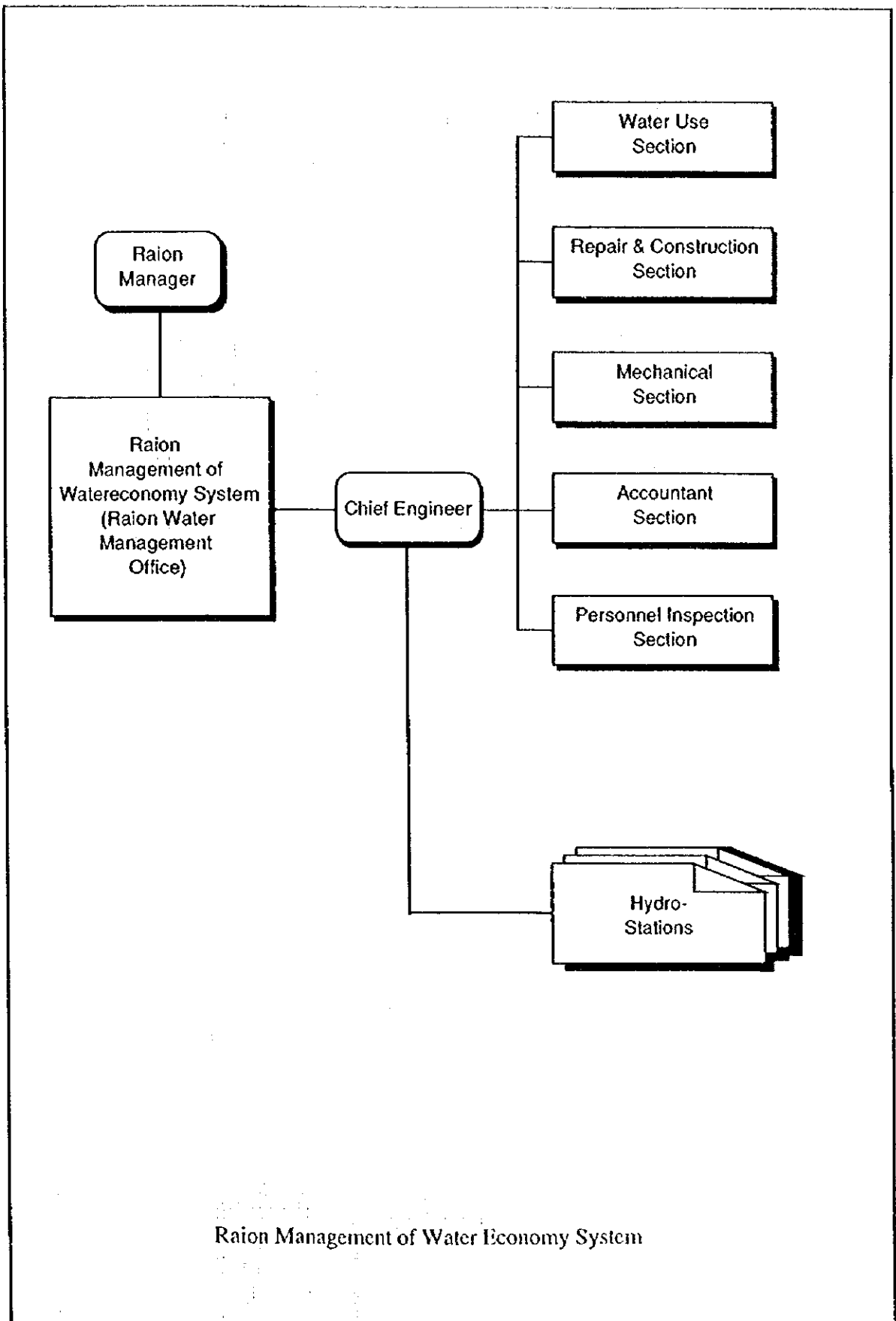


Figure 2.1.17

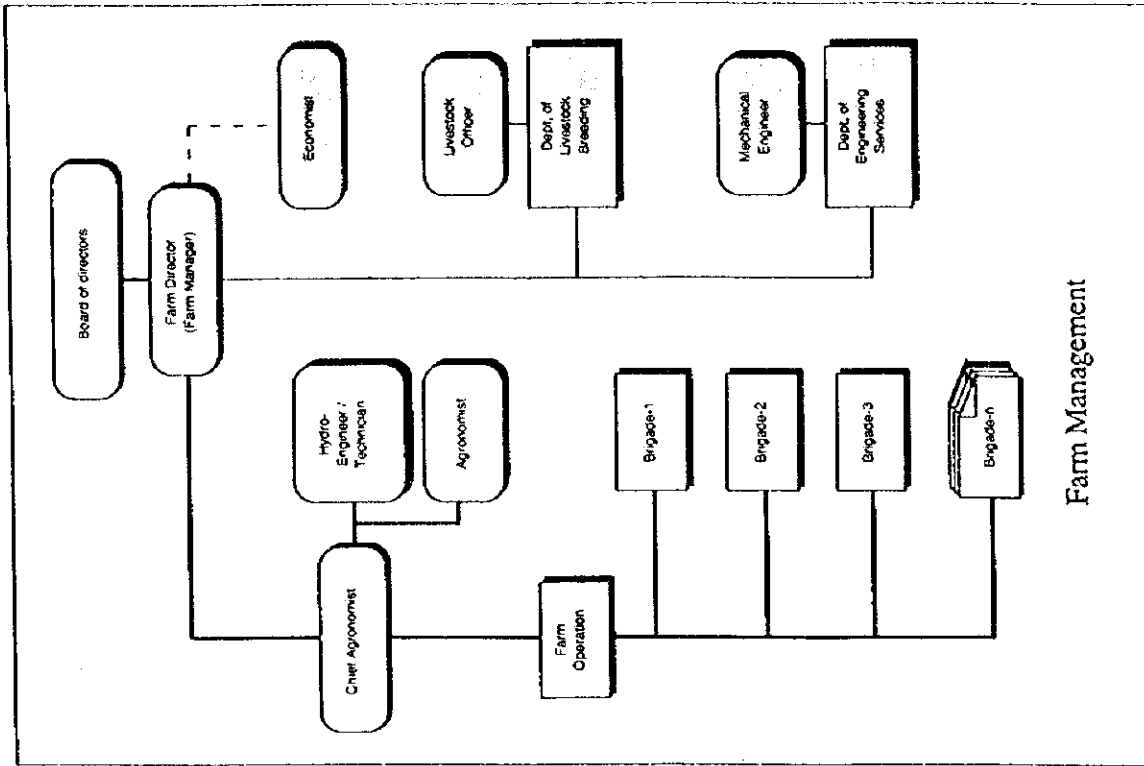


Figure 2.1.18

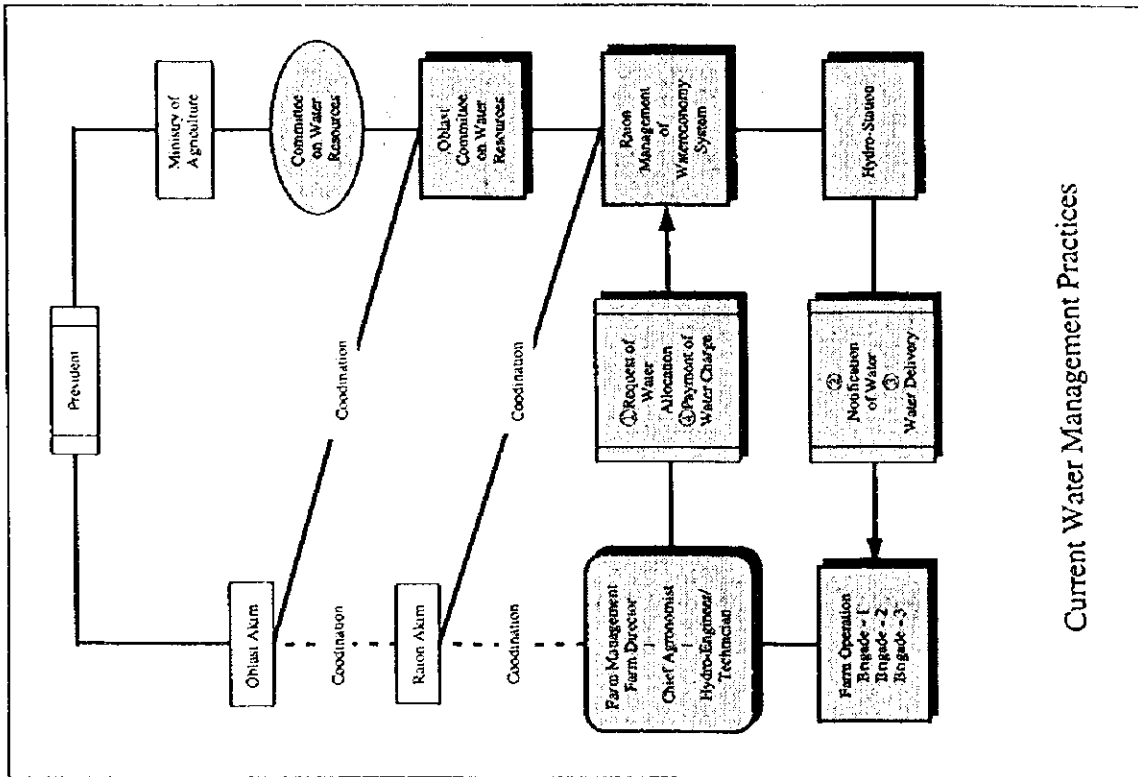
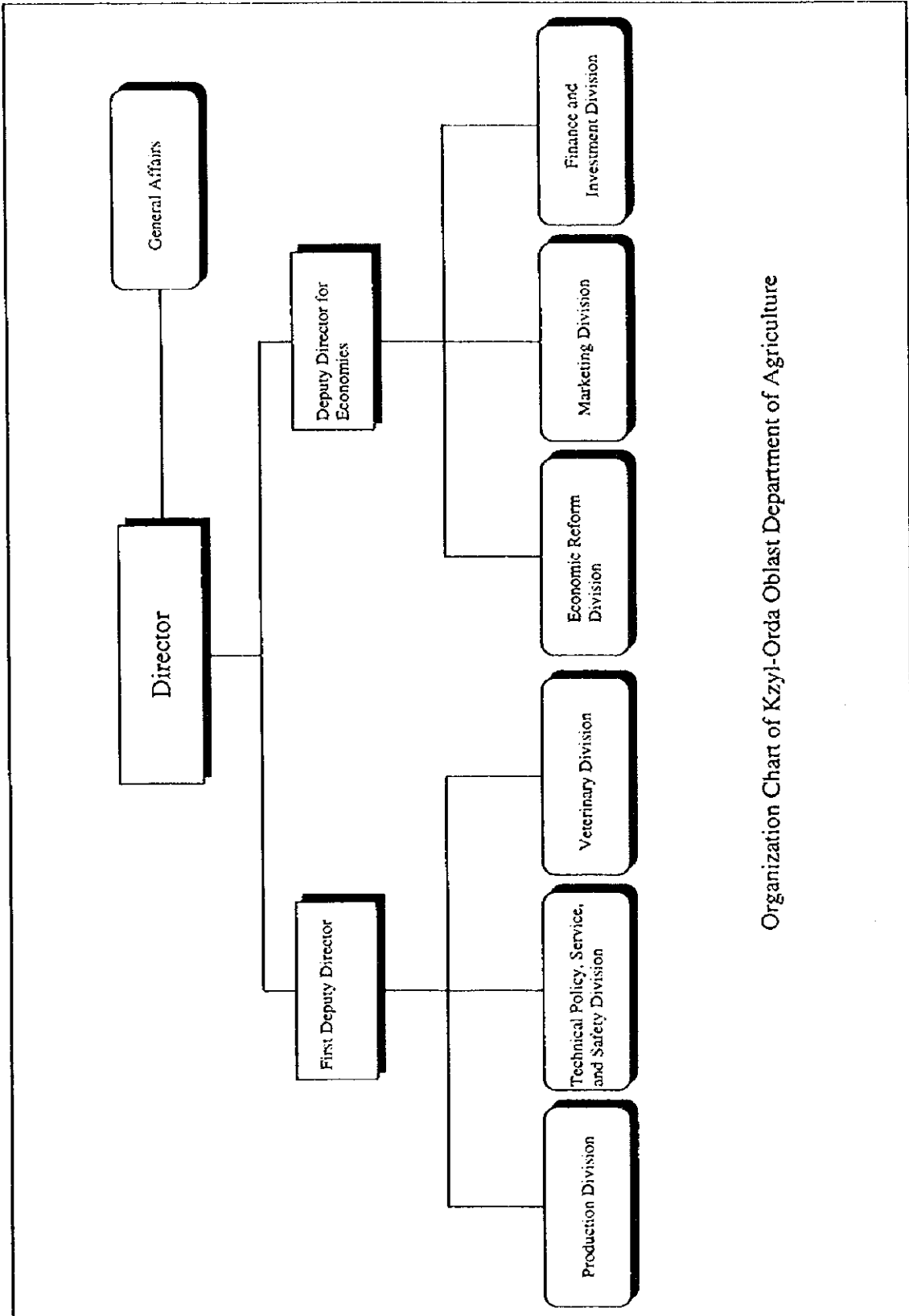
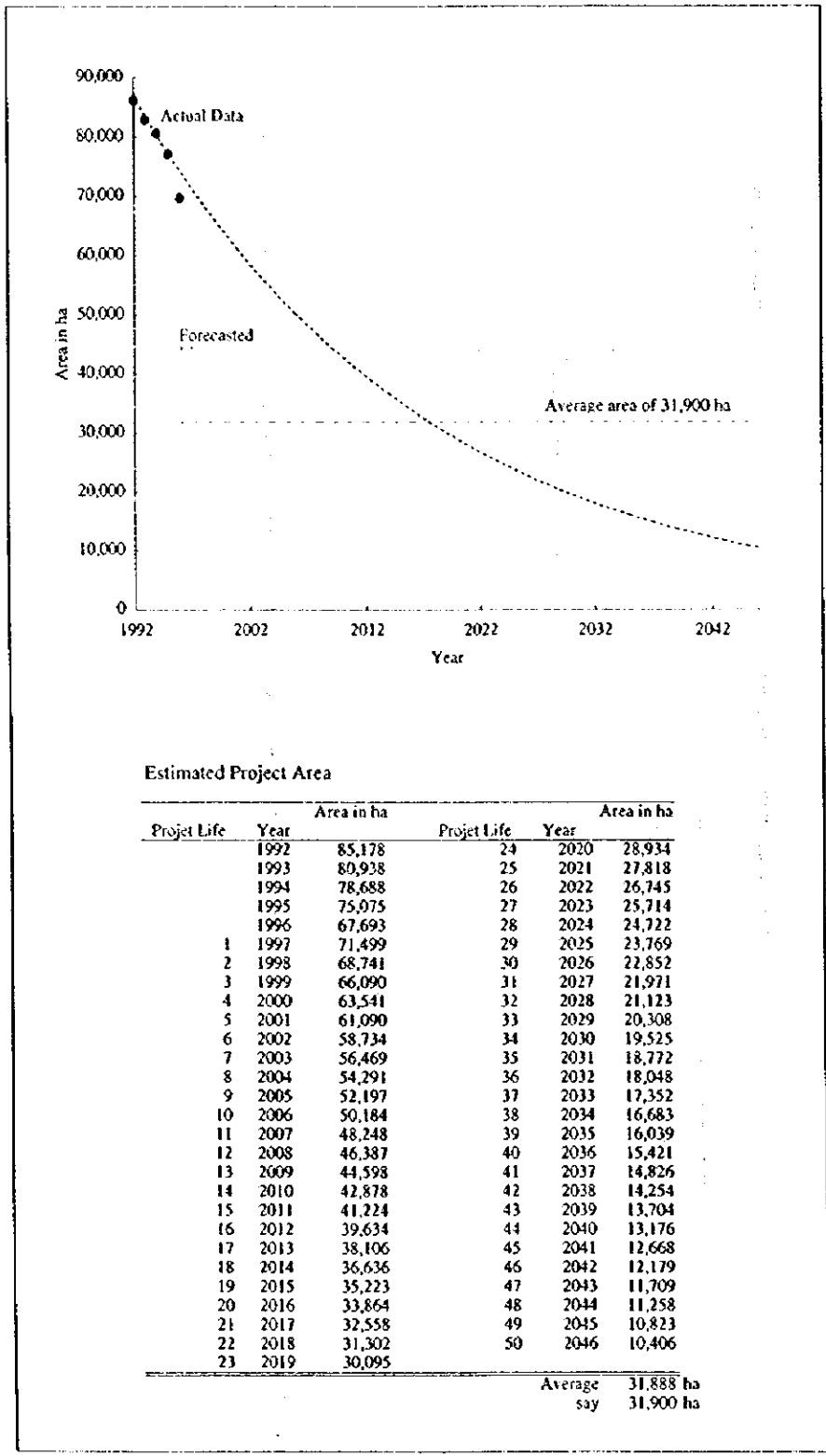


Figure 2.1.19



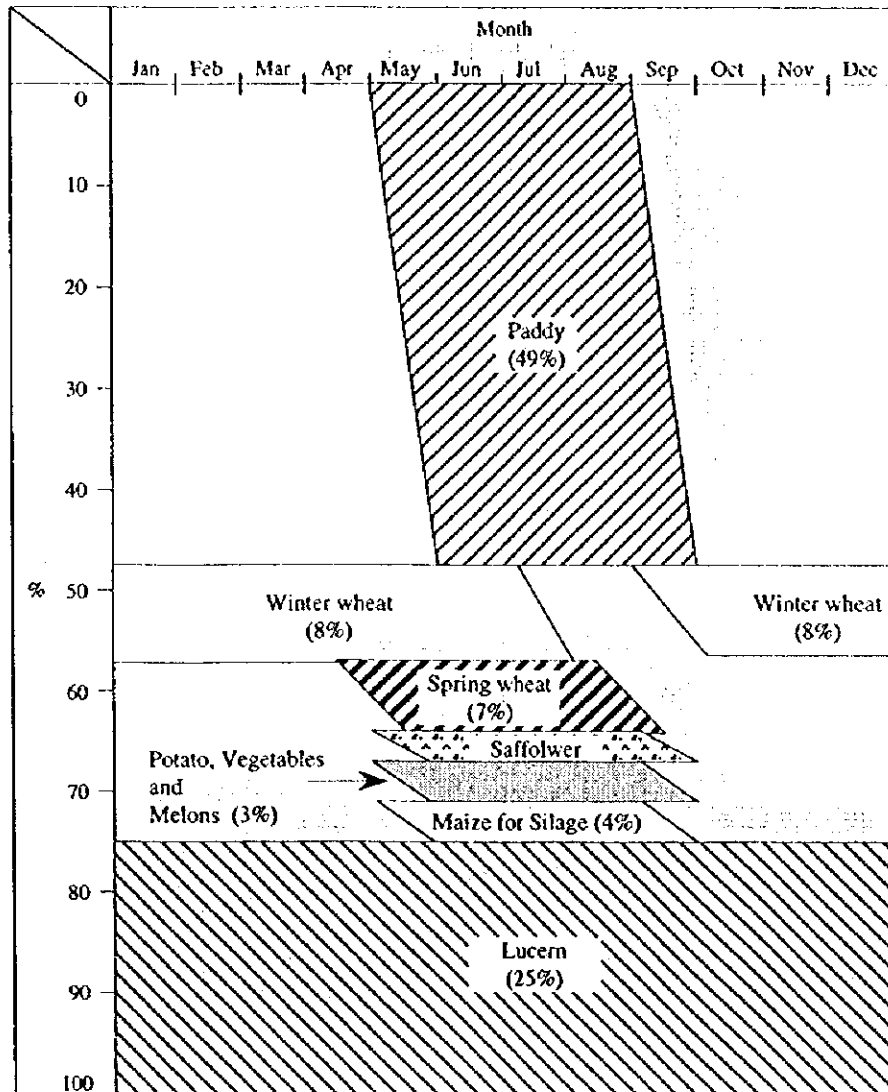
Organization Chart of Kzyl-Orda Oblast Department of Agriculture

Figure 2.2.1



Forecast of Irrigation Area

Figure 2.2.2



Cropping Pattern in the Study Area under with Project Condition

Figure 2.2.3

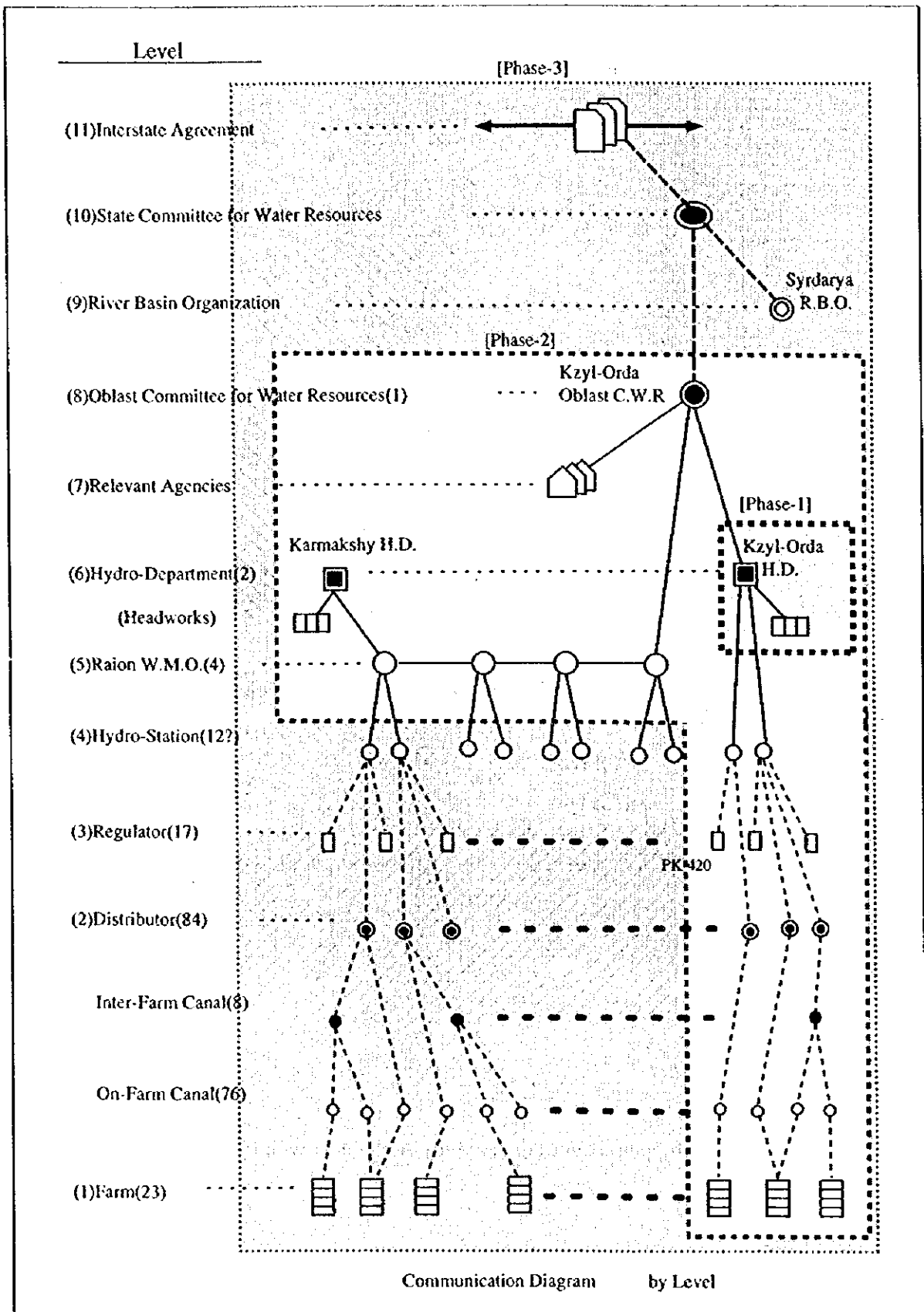


Figure 2.5.1

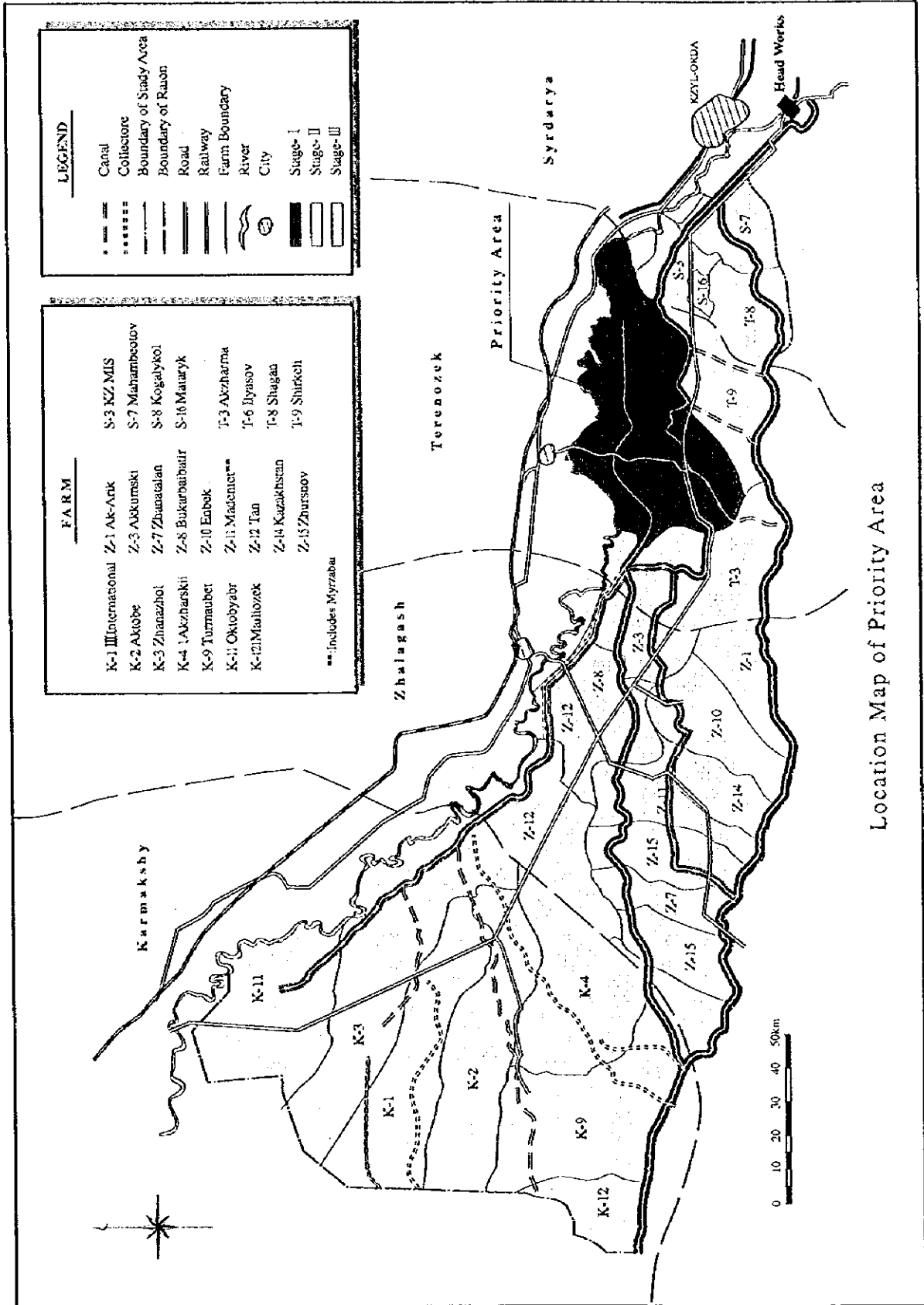






Figure 3.1.1

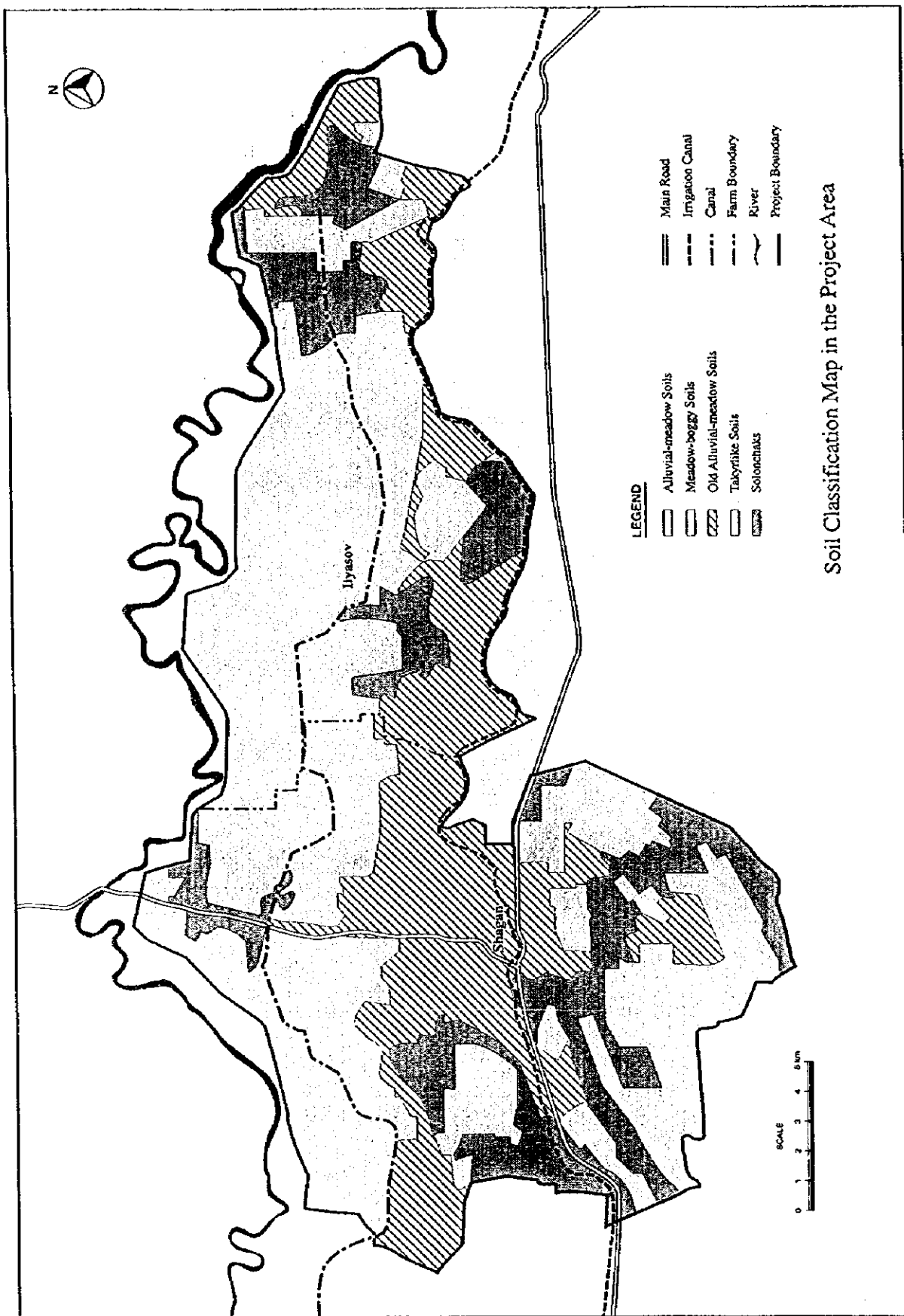


Figure 3.1.2

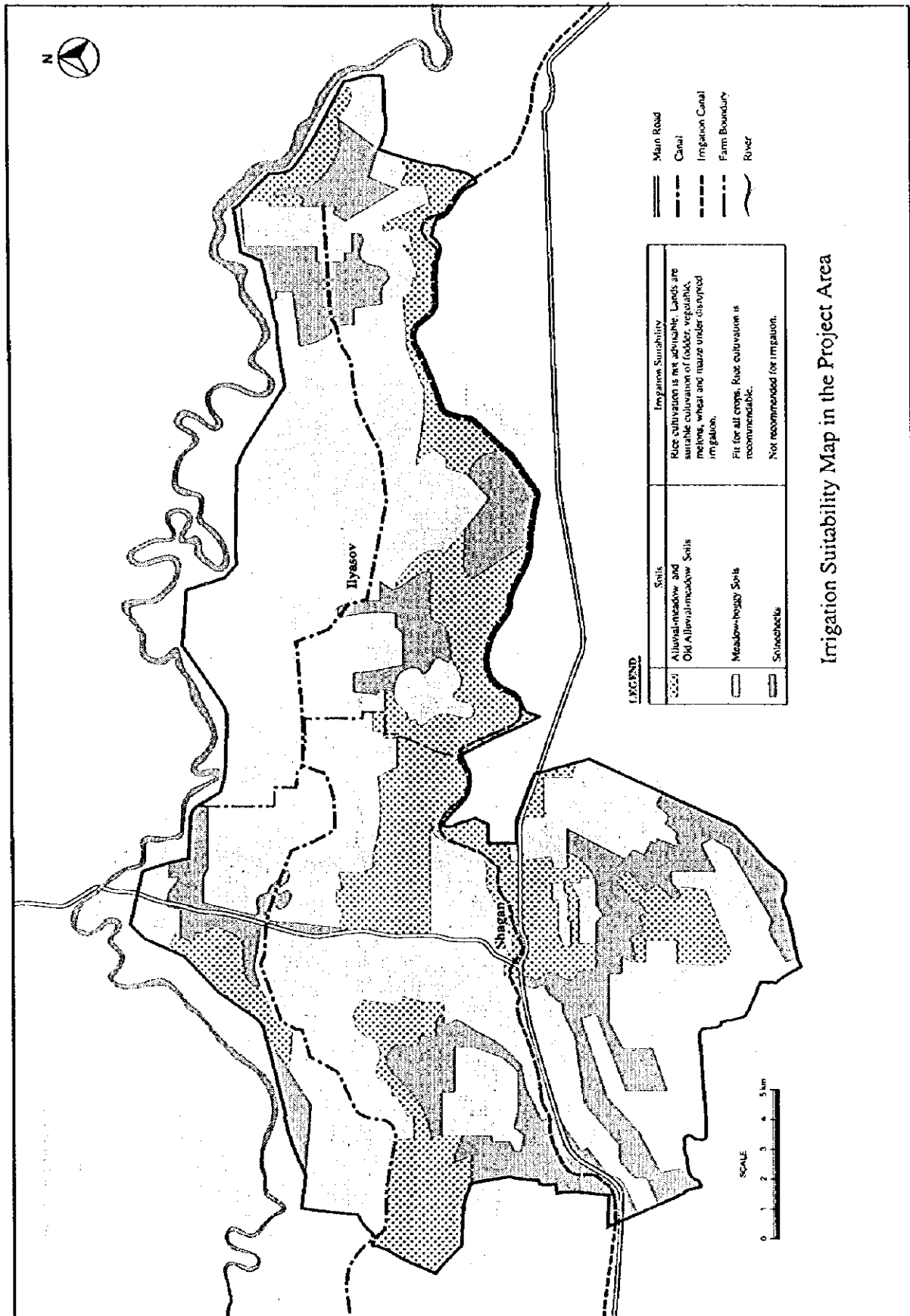


Figure 3.1.3

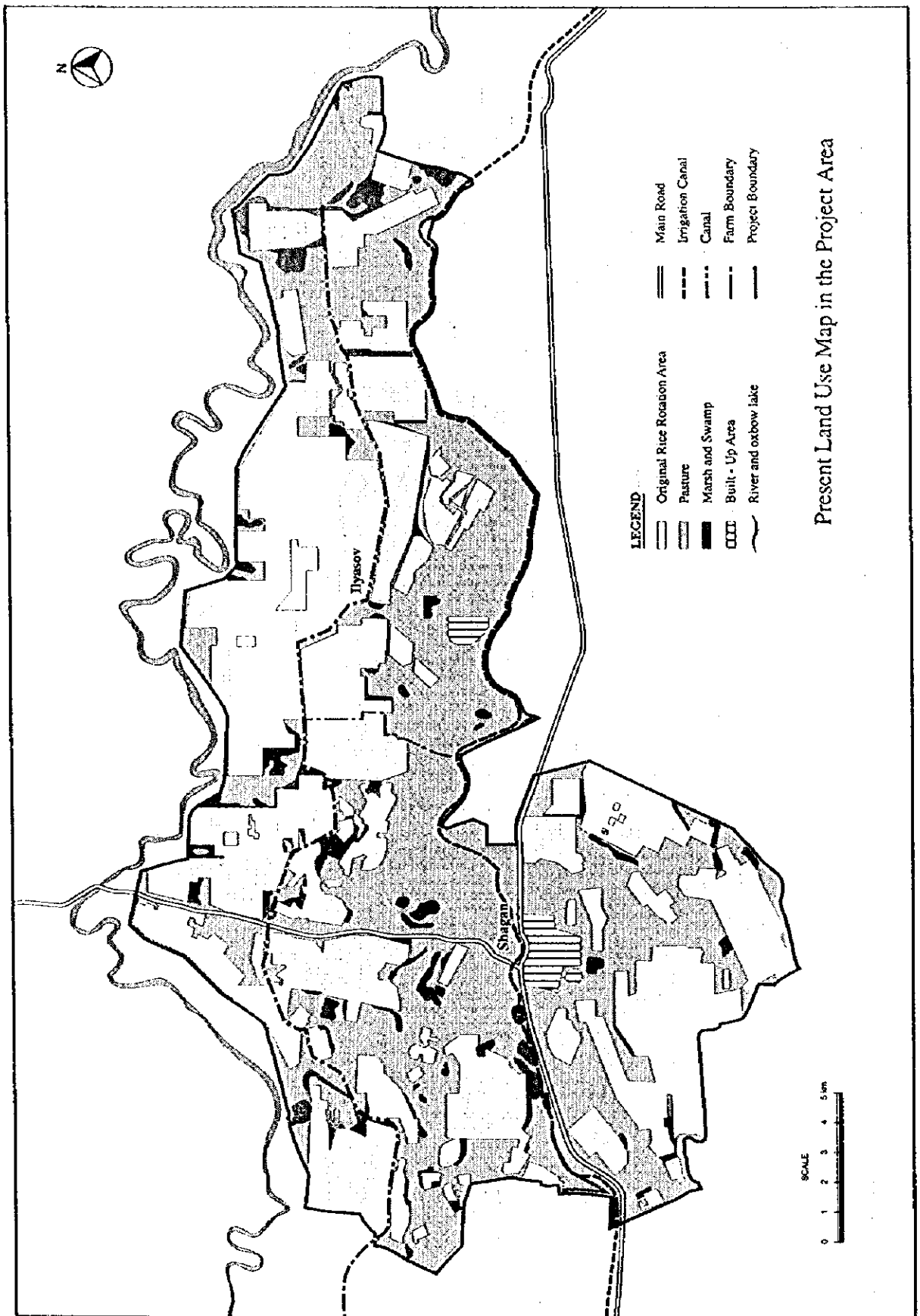
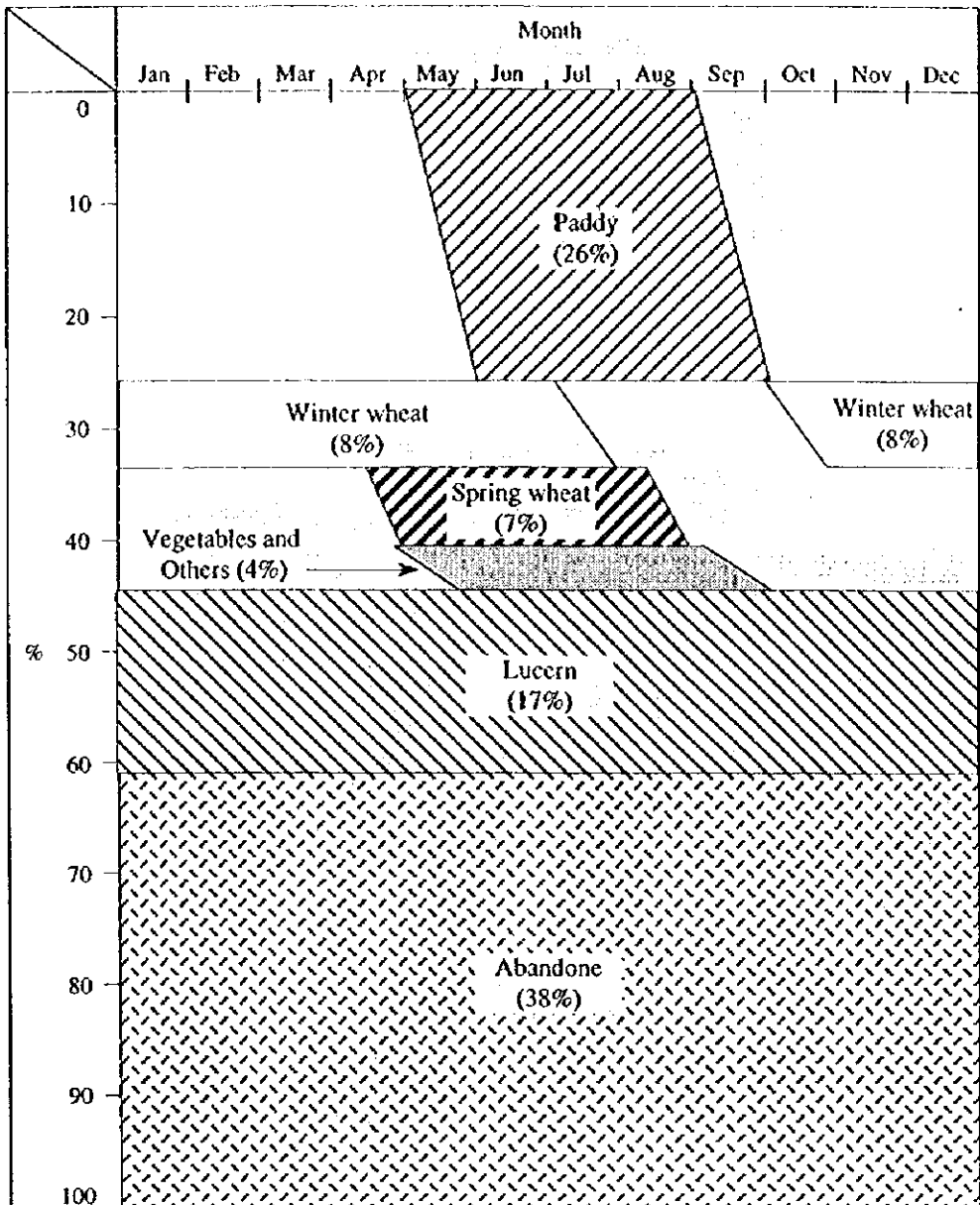


Figure 3.1.4



Present Cropping Pattern in the Project Area