2.1.4 Social Infrastructure

(1) Transportation and Communication

The transportation network in the Kzyl-Orda Oblast is developed for both railways and roadways. The oblast is intersected by a major rail line that links Moscow with Almaty. The rail link connects Kzyl-Orda to the northwest to the Aktobe Oblast and on to the Russian Federation. To the southeast, the rails connect Kzyl-Orda to the Shimkent Oblast with continuing routes to Almaty; northern and central Kazakstan, Kyrgyzstan, Tashkent, Uzbekistan, Ashkabar, Turkmenistan and Peking.

The nearest port served by the railway is Atyrau (formerly Guryev) on the Caspian Sea with regular ship service to Turkey and Iran. Rail conditions are reportedly good and fuel supply for locomotives is adequate. Trains carry both passengers and cargo. Agricultural cargo is estimated by the railway department to have declined precipitously, although statistics for cargo tonnage were not available.

There are 1,266 km of roads in the Kzyl-Orda Oblast. Of them, 29 km are concrete, 141 km are gravel, and 1,096 km are improved gravel. The following table shows the road lengths by type in the four raions concerned:

(Unit : km)

Raion	Concrete	Improved Gravel	Gravel
Syrdarya	18	383.0	111.0
Terenozek	0	129.5	22.3
Zhalagash	0	164.4	29.6
Karmakshy	0	214.3	103.7

Source: Kzyl-Orda Oblast Roads Department.

There are presently seven incoming and seven outgoing airline flights per week at the Kzyl-Orda Airport. All flights originate in or are bound to Almaty. Flights are operated by Kazakstan Airlines and each flight has a capacity of 40 passengers. Maximum passenger volume per week in one direction is 280.

Communication infrastructure in the oblast is comprised of telephones, televisions, radio stations, and newspapers. Data for households with telephones, radios, and television were supplied by the Kzyl-Orda Oblast Department of Telecommunications. The oblast is served by the same broadcasters as the nation as a whole. Communication infrastructure is adequate for agriculture extension. The following table shows the present conditions of communication infrastructure in four raions concerned:

Raion	Number of Households		
	Telephone	Radio	Television
Syrdarya	1,810	1,581	6,755
Terenozek	2,100	3,481	4,976
Karmakshy	2,529	1,420	6,247
Zhalagash	1,814	2,756	6,768
Oblast	40,847	52,838	119,292

Source: Kzyl-Orda Oblast Department of Telecommunications

(2) Domestic Water Supply

According to the Oblast Water Department, 82.4% of households in the Kzyl-Orda Oblast have piped potable water. Households supplied by private domestic water wells comprise 17.6%. No households use streams or irrigation canals for domestic water supply.

The following table summarizes the distribution of domestic water supply by raions in the Kzyl-Orda Left Bank Area.

Raion	Water Piped	Delivery Water	Well Water	Open Reservoir
Syrdarya	60	15	20	5
Terenozek	46	29	24	1
Zhalagash	70	15	14	1
Karmakshy	25	60	10	5

Source: Ministry of Public Health, Kzyl-Orda.

Tests conducted by the Oblast Water Department on piped water quality samples show that excepting Arsenic in Zhalagash Raion, the samples indicate compliance with official norms. Pass rates for tests on micro-organisms are high. Data on water quality in the Kzyl-Orda Oblast should be interpreted with caution and independent tests are recommended.

(3) Education

Figures provided by the Ministry of Education - Kzyl-Orda reveal that the percent of the population over age 6 with no formal education is higher in the Kzyl-Orda Oblast where 15.7% have no formal schooling. Newly privatized state farms in the rural sector provide their own social infrastructure including housing, health clinics and schools. Schools are located within the farm area and are staffed by certified teachers. Access to schooling from the first to the eleventh grade is universal throughout the Kzyl-Orda Left Bank Area.

Higher education in Kazakstan is provided at universities, technical schools, and polytechnic institutes. In the Kzyl-Orda Oblast, higher education is located in the capital city.

After eleven years of schooling, students also may enroll in either a University or Polytechnic Institute. There are two such institutions in the Kzyl-Orda Oblast. The Humanities University offers programs in the arts and sciences including biology, physics, chemistry, etc. The Polytechnic Institute offers programs in the professions including engineering, agronomy, agricultural economics, and other applied areas.

The following table shows the number of schools and pupils in the four raions concerned in 1996:

Raion	Number of Pupil	Primary Schools*	Secondary Schools	Graduates
Syrdarya	10,403	1	18	544
Terenozek	7,117	0	12	445
Zhalagash	9,628	0	2	513
Karmakshy	11,596	0	22	699
Total	38,744	1	54	2,201
Kzyl-Orda City	32,507	2	34	1,432
Oblast	133,271	25	210	7,229

Note : *; Schools in farms are not included.
Source: Kzyl-Orda Oblast Department of Education.

(4) Medical Facilities

Access to health care is not a problem in the Kzyl-Orda Oblast. Within the oblast, there are 44 hospitals, 39 rural medical out-patient departments, and 177 medical attendant obstetric points. Within the four raions concerned, there are 21 hospitals, 19 rural medical out-patient departments, and 55 medical attendant obstetric points. Supplies of drugs and medical equipment are reportedly inadequate. There are 1,702 physicians in the oblast, 320 physicians in the four raions concerned. The oblast averages 28.1 physicians per 10,000 inhabitants-an unfavorable ratio. The following table shows the medical facilities in both Kzyl-Orda Oblast and the four raions concerned:

Raion	Hospital	Rural Medical Out-patient Depts.	Medical Attendant Obstetric Points
Syrdarya	5	3	15
Terenozek	2	7	19
Zhalagash	7	4	17
Karmakshy	7	5	4
Total	21	19	55
Oblast	44	39	177

Source: Kzyl-Orda Health Department

Sanitary conditions in the Kzyl-Orda Left Bank Area are poor. Farm visits revealed that indoor sanitary plumbing was not commonly available and outhouses were often used in homes and farm facilities. Drainage is poor and there is considerable standing water with widespread infestations with mosquitoes and other insects. Garbage collection is erratic and refuse is left out in the open. Streets and pathways are not regularly cleaned. Winds carry airborne salt, dust, and trash. Sanitary and environmental conditions in the area are not conducive to good public health.

2.1.5 Agriculture

(1) Land Holding and Land Tenure

Prior to 1991, agriculture in Kazakstan was exclusively a function and responsibility of the state. Excepting private subsistence gardens, all farming activity was overseen by the Ministry of Agriculture and administered by over 2,000 state farms and collectives. Legislative decrees on the process of privatization began in 1991 and culminated in 1996, when prices on farm commodities were fully liberalized. By October 1996, all state farms and collectives had been privatized except for state research farms which remain the responsibility of the government.

Land is still the property of the state, however the government has granted inheritable rights of use to farmers on leases of 99 years or less. Thus, while land remains the property of the state, individuals and cooperatives may use land leased to them, as if it were private property. At this time, land may not be bought or sold in the free market as such. There are two legal ways of transferring use rights to another individual or entity. The first is through renting the land, which is widespread. The second is by selling or transferring the inheritable right of use which has been permitted since a Presidential Decree on Land Reform in April 1994.

If land is not utilized for productive purposes, the inheritable right of use may be revoked and the land reverts to the state. There has been some discussion of fully privatizing agricultural land, thereby permitting agricultural real estate to be owned and exchanged in the open market, however at this time such transfers of ownership title are not possible.

Privatization is a process, rather than an event, and the process is still incomplete in agriculture. On paper, all of the farms are now private, however the management and structure of former state farms is mostly unchanged. The same managers and specialists are usually still in place and labor is performed under a collective model. Moreover, in the absence of the ability to buy and sell permanent land titles, the privatization process is unfinished. In addition, the legal land registration process is slow and bureaucratic and encumbers a genuine land market.

The best example of genuine privatization is to be found in the thousands of independent family farms that have emerged in Kazakstan during the past five years. These units are privately held and administered and provide for subsistence and surplus agricultural commodities.

Within the Kzyl-Orda Left Bank Area, there are 21 former state farms and 165 private family farms. With the exception of one state research farm, the former state farms are now organized in 25 collective enterprises, locally referred to as production cooperatives. All assets, including land, machinery, infrastructure, and buildings are jointly held and operated. Farmers own their private dwellings and "kitchen gardens"; other property is held in common. On the private family farms, all assets are held and administered by the family unit.

(2) Land Use

The present land use pattern of the Kzyl-Orda Left Bank Area was clarified based on the 1:100,000-scaled land use map prepared by the Oblast Committee on Land Relations and Organization of Land Use (1996) and information collected from the Oblast Committee on Water Resources (1995). The distribution of land use pattern has been further confirmed through the field survey and analysis of agricultural statistics.

The present land use in the Kzyl-Orda Left Bank Area in 1995 is shown in Table 2.1.6 and Figure 2.1.8, and summarized below.

Land Use Category	Area (ha)	Proportion (%)
(1) Agricultural land		
- ORRA*1	87,000	20
- Pasture	237,300	56
Sub-total	324,300	76
(2) Non agricultural land		
- Marsh and swamp	5,440	1
- Bush and forest	14,740	3
- Others*2	85,520	20
Sub-total	105,700	24
Total	430,000	100

Source: Oblast Committee on Water Resources, Oblast Committee on Land Relations and Organization of Land Use.
Note : *1; Original rice rotation area.
*2; Including roads, rivers, resident areas and desert.

The Kzyl-Orda Left Bank Area occupies an area of 430,000 hectares, of which 324,300 hectares or 76% of the total area is used for agricultural purpose including livestock grazing and hay making. While, the non agricultural land area is 105,700 hectares which includes marsh and swamp, bush and forest, village, road, rivers and desert.

The original rice rotation area (original irrigation area) in the Kzyl-Orda Left Bank Area is 87,000 hectares as shown below.

(Unit: ha)

Land Category	Syrdarya	Terenozek	Zhalagash	Karmakshy	Total
- Original rice rotation area	3,330	23,670	34,400	25,600	87,000
- Presently irrigated area*	2,780	20,830	28,190	23,280	75,080
- Presently abandoned area	550	2,840	6,210	2,320	11,920

Note: *; Irrigated area in 1995.
Source: State Committee on Water Resources.

According to the above table, 11,920 hectares of land or 14% of the original crop rotation area is abandoned because of problems such as water shortage due to deterioration of the irrigation canal system, and soil salinization and water logging caused by poor drainage system. The following table shows the areas abandoned by respective causes:

(Unit: ha)

Causes	Syrdarya	Terenozek	Zhalagash	Karmakshy	Total
Shortage of irrigation water	330	790	960	790	3,870
Salinity	60	510	1,230	190	1,990
Water logging	0	540	960	640	2,140
Others*	160	1,000	3,060	700	3,920
Total (Abandoned)	550	2,840	6,210	2,320	11,920

Note: *; Including worn-out agricultural machinery and shortage of agricultural inputs

(3) Agricultural Production

(a) Planted Area and Cropping Pattern

Of the presently irrigated land of 75,080 hectares, about 68,430 hectares was planted with crops in 1995, and 6,650 hectares remained fallow as shown in Table 2.1.7 and Figure 2.1.9, and summarized below:

(Unit: ha)

Crops	Syrdarya	Terenozek	Zhalagash	Karmakshy	Total
- Paddy	910	7,720	8,510	6,450	23,590
- Wheat	630	3,730	4,960	5,270	14,590
- Lucerne	870	5,510	9,910	5,590	21,880
- Industrial crops	20	380	780	1,030	2,210
- Vegetables*	30	760	1,070	440	2,300
- Other crops	20	1,260	1,190	1,370	3,860
Total planted area	2,480	19,380	26,420	20,150	68,430
Cropping intensity (%)	74	82	77	79	79

Note: *; Including potato and melons.
Source: GOSGOMSTAT and the result of farm survey.

In the four raions concerned, paddy and fodder crops are major crops followed by wheat. The planted areas of paddy and lucerne occupy more than one-third of the total planted area respectively. The planted areas of industrial crops, potatoes, vegetables and other cereal crops are very small in all the raions.

Recently, the planted areas of major crops show a decreasing tendency. Total planted area in 1993 was approximately 73,250 hectares and has decreased to approximately 68,430 hectares in 1995. The planted areas of major crops in 1993, 1994 and 1995 are summarized below:

(Unit: ha)

Year	Paddy	Wheat	Ind. Crop	Vegetables*	Lucerne	Others	Total
1993	28,280	11,840	720	3,010	21,800	7,600	73,250
1994	28,640	11,800	1,040	2,490	20,950	6,240	71,190
1995	23,590	14,590	2,210	2,300	21,880	3,860	68,430

Note: *; Including potato and melons
Source: GOSGOMSTAT and the result of farm survey

According to the above table, the paddy area has sharply decreased, while there is a slight change in the areas of wheat, vegetables and lucerne during the period from 1993 to 1995. Only the planted area of industrial crops has increased in the same period.

(b) Yield and Production of Major Crops

The yields of major crops in the Study Area in 1995 are shown in Table 2.1.8, and summarized below:

(Unit: ton/ha)

Raion	Paddy	Wheat	Vegetables*	Lucerne
Syrdarya	1.70	0.55	2.33	2.23
Terenozek	2.32	0.82	6.41	1.78
Zhalagash	3.01	0.75	5.12	1.65
Karmakshy	2.94	0.52	7.70	2.38
Average	2.71	0.67	6.00	1.89
Kzyl- Orda Oblast	2.08	0.56	4.16	2.24

Note: *; Including potato and melons
Source: GOSGOMSTAT and the result of farm survey

The above mentioned yields are very low, and also there are differences in crop yields among the raions. Paddy yield is very low in Syrdarya Raion compared to other raions. The yields of major crops also show a decreasing tendency in the period from 1993 to 1995 as shown below.

(Unit: ton/ha)

Year	Paddy	Wheat	Vegetables*	Lucerne
1993	4.43	1.11	4.66	2.87
1994	3.09	0.79	6.45	2.20
1995	2.71	0.67	6.00	1.89

Note: *; Including potato and melons
Source: GOSGOMSTAT

The yields of major crops except vegetables have sharply decreased during recent three years. The reason for yield decrease of these crops is mainly attributable to less application of agricultural inputs and delay of planting and harvesting.

The amount of production of major crops in the Study Area in 1995 is shown in Table 2.1.9 and summarized below:

(Unit: ton)

Raion	Paddy	Wheat	Vegetables	Lucerne
Syrdarya	1,540	340	70	1,940
Terenozek	17,890	3,050	4,870	9,830
Zhalagash	25,580	3,730	5,480	16,360
Karmakshy	18,960	2,720	3,390	13,290
Total	63,970	9,840	13,810	41,420

Source: GOSGOMSTAT

The following table shows the production of major crops in recent 3 years of 1993 to 1995:

(Unit: ton)

Year	Paddy	Wheat	Vegetables	Lucerne
1993	125,480	13,200	14,030	62,520
1994	88,410	9,370	16,050	46,000
1995	63,970	9,840	13,810	41,420

Source: GOSCOMSTAT

The amount of paddy production has drastically decreased due to decrease of planted areas and low yield as mentioned above. The amount of paddy production in 1995 was less than 50% of that in 1993, and the production of wheat and lucerne in 1995 was 75% and 67% as compared to 1993 respectively. The production of vegetables has not changed much.

(4) Farming Practices and Farm Inputs

The climate is very severe for crops; long winter, short spring and autumn and high temperature in summer. The cropping season of summer crops is limited from late April to September (less than 130 days). In addition, the soil is alkaline and accumulation of salts on the soil surface is observed. Crops cultivated in the area should therefore have a short growth duration and be tolerant to salinity and high temperature in summer, which limits the selection of suitable crops. Under such natural conditions, the major crops presently cultivated are paddy, wheat and lucerne, and other crops are cultivated in very limited area as shown in the cropping patterns (Figure 2.1.9).

In the area, large-scale mechanized farming is predominant, because the field plot is very large, and the labor force is small relative to the cropped area. Due to shortage of budget, however, almost all farms can not repair or renew farm machinery, and as a result the farms can not cultivate all the land even in the irrigated condition due to shortage of machinery.

The quantities of farm inputs and labor requirement for major crops are shown in Table 2.1.10. In recent years, due to absence of guaranteed price supports and inputs from the state, declining trade with Russia, and high interest rates on credit for inputs, farms are facing an economic crisis, and as a result they can not afford to buy the proper quantities of chemical fertilizer and agro-chemical and other inputs.

(5) Animal Husbandry

Animal husbandry is also one of the main agricultural activities in the Study Area. The 1995 animal population by raion in the area is shown in Table 2.1.11, and summarized below:

(Unit: head)

Raion	Cattle	Sheep & Goat	Camel	Poultry
Syrdarya	3,650	28,710	510	2,080
Terenozek	12,750	39,210	1,020	13,370
Zhalagash	19,530	47,320	900	21,530
Karmakshy	10,880	35,660	1,080	12,388
Total	46,810	150,900	3,510	49,728

Source: GOSCOMSTAT

In the Kzyl-Orda Oblast and the four raions concerned, cattle, sheep and goat are important animals, but their population is decreasing in recent years as shown below:

(Unit: head)

Year	Cattle	Sheep & Goat	Camel	Poultry
1993	65,650	345,840	4,160	
1994	51,340	173,709	2,870	41,000
1995	46,810	150,900	3,510	49,730

Source: GOSGOMSTAT

The cattle and poultry are mainly raised by family farms. The share of state farms for animal production is small in case of the Kzyl-Orda Oblast. The livestock population by the type of farm in 1995 is shown below:

(Unit: head)

Type of Farm	Cattle	Sheep & Goat	Camel	Poultry
State Farm*	11,500	51,100	3,900	400
Non State Farm	31,900	466,100	9,400	39,600
Family Farm	122,700	302,900	10,300	170,000

Note: *; Most of farms had been privatized by 1995.
Source: GOSGOMSTAT

2.1.6 Irrigation and Drainage

(1) Irrigation

(a) Irrigation Area and System

(i) Irrigation Area

The Kzyl-Orda Left Bank Massive Irrigation System was completed as a run-of-river system in 1969 to irrigate the farm land extending over the left bank side of the Syr Darya river. The system integrated the intake which had been operated for the area of some 20,000 hectares including paddy field of 9,000 hectares before completion of the system. The Kzyl-Orda Headworks which was constructed on the Syr Darya river for the Right Bank Area in 1957, was also used for the irrigation of the Left Bank Area.

The Left Bank Massive Irrigation System was originally planned and designed to irrigate farm land of 142,400 hectares , expecting the land development in future, but actually some 87,000 hectares has been opened up until now. In this irrigation area, however, the actually planted area has been decreasing year by year, due to inadequate water supply, salinization of land and other causes as shown below.

(Unit: ha)

Raion	1992	1993	1994	1995	1996
Syrdarya	2,849	2,940	3,130	2,777	2,447
Terenozek	22,919	21,476	20,831	20,832	18,070
Zhalagash	34,199	31,072	30,287	28,186	26,954
Karmakshy	25,211	25,450	24,440	23,280	20,222
Total	85,178	80,938	78,688	75,075	67,693

Source: Committee on Water Resources, Kzyl-Orda

(ii) Irrigation System

The Kzyl-Orda Left Bank Massive Irrigation System consists of: (i) Left Main Canal, (ii) Right and Left Branch Canals, (iii) distributors (inter-farm and on-farm canals), (iv) field canals, and (v) field ditches. The inter-farm canal is defined as a canal to convey the water down to the farms, passing along the boundary of two farms and/or traversing the farms for the downstream farm, while the on-farm canal is located within the area of one farm.

Irrigation water released from the Kzyl-Orda Headworks is conveyed to the farms through the Left Main Canal, traversing nearly the center of the Left Bank Area (Figure 2.1.10). At the hydro-knot; the end point of the Left Main Canal, this canal is bifurcated to the Right and Left Branch Canals. The inter-farm/on-farm canals branch off from the main and the branch canals. The major features of these canals are summarized below.

Description	Design Discharge (m^3/sec)	Length (km)
Left Main Canal	228.0	85.4
Right Branch Canal	93.0	70.2
Left Branch Canal	41.0	48.6
Inter-farm Canals/On-farm Canals	0.2 - 36.1	472.9

At the farm, irrigation water is delivered to each crop rotation area of about 600 - 900 hectares through an on-farm canal, and diverted from the on-farm canal to the field canals with a rotation unit area of about 80 - 120 hectares. The field canal has several farm ditches. The water thus conveyed is finally supplied to farm land through field ditches located alongside the farm plots of 0.9 - 2.8 hectares averaging 2.2 hectares. The densities of field canals and field ditches are estimated at 11.2 m/ha and 31.0 m/ha respectively, based on the survey results in the selected area (Figure 2.1.11).

(b) Irrigation Facilities

(i) Headworks

The Kzyl-Orda Headworks is a barrage type of diversion structure built on the Syr Darya river. The headworks is composed of: (i) flood sluice, (ii) intake with under-sluice for the Left Bank Area, and (iii) intake for the Right Bank Area (Figure 2.1.12). The design diversion discharge is 228 m^3/sec to the Left Main Canal and about 30 m^3/sec to the Right Main Canal. The type and size of gates installed on the headworks are as shown below.

Description	Type	Width (m)	Nos.
Flood Sluice	Radial Gate	17.0	5
Left Bank Intake	Slide Gate	5.0	6
Right Bank Intake	Slide Gate	5.0	2

Source: Committee on Water Resources, Kzyl-Orda Oblast

The gate operation was initially designed for a remote control system, but currently the gates can only be operated by local control, because the remote control system has not been repaired due to non availability of spare parts. Some gates have been rusted and dislocated, resulting in much leakage of water through the bottom and sides of gate leaves and holes of

skin plate. Accordingly the water discharge for intake and the release to the downstream of the Syr Darya river can not be properly controlled.

(ii) Canals

All canals have trapezoidal sections and are unlined. The slopes of canals vary from 1:1.5 to 1:2.0, depending on the canal design discharge. The side slope protection works of concrete panels are provided for about 33.8 km in the Left Main Canal and 0.2 km in the Right Branch Canal, but most of them have collapsed.

All the canal sections are irregularly shaped. The Left Main Canal, and the Right and Left Branch Canals have been heavily eroded on the side slopes, especially at curved portions. In the Left Main Canal, the widths of canal sections have been widened by 1.6 - 36.6 m due to erosion as compared to the original sections. Sedimentation and scouring on the canal bottom are also severe; 0.7 m of sedimentation and 0.5 m of scouring on an average. The annual volumes of sediment and erosion are estimated at 0.33 MCM and 0.35 MCM respectively, based on the canal route survey data conducted by the Oblast Committee on Water Resources in 1976 and under sub-let contract in the course of the Study.

Other subordinate canals have also deteriorated. The problems observed in the unlined inter-farm/on-farm canals are sedimentation rather than scouring, except for the sections at the immediately downstream portions of canal structures. At the field level, all the field canals and field ditches are irregularly shaped and thickly vegetated due to absence of regular maintenance.

(iii) Canal Structures

The major canal structures on the main and the branch canals are as shown below.

Description	Regulator	Hydro-knot	Head Gate	Spillway	Bridge
Left Bank Main Canal	5	1	39	1	3
Right Branch Canal	7	-	14	2	-
Left Branch Canal	5	-	23	1	1

(c) Present Irrigation Practices

(i) Irrigation Method

A gravity irrigation system of open channel is applied in the whole Left Bank Massive Irrigation System. Pumps are also used by farms for irrigation at several places to supplement water in case of drought. However, due to shortage of fund for operation and maintenance, most pumps are not operated at present.

In the farm land, a plot is provided with one irrigation inlet to supply irrigation water from the field ditch and one drainage outlet to drain excess water to the field drain. Both inlet and outlet are made of concrete pipe with a diameter of 20 cm.

The surface irrigation method is commonly practised. Water is supplied from plot to plot in a depth of 10 cm to 15 cm at the irrigation interval of 10 to 15 days for paddy

cultivation. The water depth in the plot is controlled by providing an earthen bund in front of drainage outlet or by manually closing the outlet pipe with soil. Irrigation water for upland crops is normally obtained from groundwater, and from field ditches by flooding method or contour ditch (corrugation) method in drought.

(ii) Irrigation Efficiency

Present overall irrigation efficiency in the Left Bank Massive Irrigation System is estimated at about 15% on an average for the last 5 years based on the discharge data at the intake and actually planted area. Furthermore, a canal conveyance efficiency of the Left Main Canal has also been estimated at 86.4% based on the discharge records collected at 10-day interval by the Oblast Committee on Water Resources. The conveyance efficiency varies from 25% to 99% depending on the canal discharge (Figure 2.1.13). This efficiency is low as compared to the efficiency of more than 90% required in the Construction Norms and Rules (1986) of Kazakstan.

(2) Drainage

(a) Drainage Area and System

The drainage area in the Left Bank Area consists of the drainage basins of the Kuvan Darya, Zhana Darya, and the Syr Darya rivers as mentioned below.

(Unit: km^2)

Drainage Basin	Total Drainage Area	Drainage Area in Study Area	Irrigation Area
Kuvan Darya River	3,399.7	2,939.7	688.9
Zhana Darya River	102.5	102.5	7.5
Karmakshy Area	1,078.8	1,078.8	173.6
Syr Darya River	179.0	179.0	-
Total	4,790.0	4,300.0	870.0

Major collectors (drainage canals) in the Kuvan Darya river basin are the North Collector running from the north-east to the south-west in the Left Bank Area (Figure 2.1.10) and the South Collector passing along the southern boundary of the Left Bank Area. The South Collector, after joining the North Collector at St.No.1304, is named as the Kuvan Darya river and runs to the west. The North Collector is disconnected by the Right Branch Canal, because of difficulty in construction of crossing culvert under the canal. Because of this, the North Collector resultantly consists of two collectors, the Upstream North Collector and Downstream North Collector. The excess water in the upstream area of the North Collector is conveyed by the diversion drainage canal running in parallel with the Right Branch Canal, and finally flows in the Right Branch Canal at the downstream point of PK 371 regulator.

The Zhana Darya river basin is located to the south of the Left Bank Area. This river finally joins with the Kuvan Darya river outside the area. A small area in the east of the area is drained to the Zhana Darya river basin.

The Karmakshy drainage area is divided into three sub-drainage areas by the Eastern Karmachinsky Collector, Western Karmachinsky Collector and the Chokes Collectors. All the

collectors run toward the south-west and/or the west, and their drainage water flows down to the depression acting as a retarding basin, except the East Karmachinsky Collector which joins with the South Main Collector.

The drainage basin of the Syr Darya river is located between the Syr Darya river and the flood protection dike/Right Branch Canal. This area is frequently inundated by flood from the Syr Darya river, but there are no particular losses, because no cultivated land exists.

The drainage canal system in the Kzyl-Orda Left Bank Area consists of: (i) main collectors, (ii) inter-farm/on-farm collectors, and (iii) field collectors and field drains. At the field level, the field drains are located in the other side of field ditches in the plots or in between the plots. The field collectors collect excess water from the field drains and discharge to the inter-farm collectors or on-farm collectors. The inter-farm collectors are provided to collect the excess water from the field collectors passing along the boundary of two farms and traversing several farms to drain the upstream farm, while the on-farm collectors are provided within the area of one farm. The general features of the major collectors are summarized below.

Description	Design Discharge (m3/sec)	Length (km)
South Main Collector	74.0	149.6
North Main Collector	18.0	119.9
Koksu Collector	6.0	18.8
Eastern-Karmachinsky	3.5	42.1
Inter-farm and On-farm Collectors	-	911.4

The densities of the field collectors and field drains are estimated at 19.8 m/ha and 28.5 m/ha respectively, based on the survey data in the selected areas. The typical layout of these collectors is shown in Figure 2.1.11.

(b) Drainage Facilities

(i) Drainage Channels

All drainage channels are unlined and have a trapezoidal section. The side slope of the channel varies from 1:0 to 1:2.5, depending on the channel design capacity. As for the major collectors, the side slope of the section is divided into two sections, i.e. 1:2.5 for the wet perimeter portion and 1:1.5 for the dry portion. All the drainage channels have also been deteriorated by sedimentation and erosion. Sediment deposits in the drainage channels create poor drainage conditions, especially in the middle reaches of the Upstream North Collector. Sediment deposits, not only in the major collectors but also in the field drains, bring about local inundation in the farm land.

(ii) Related Structures

The related structures on the major collectors are only road bridges. The number of these bridges is counted as follows:

Description	Bridge (nos.)
South Main Collector	10
North Main Collector	12
Chokes Collector	1
Eastern-Karmachinsky	6

(c) Drainage Method

Natural drainage is prevailing in the Kzyl-Orda Left Bank Area. Pumping drainage system is also applied, in the special case, before harvesting to dry up the farm land for entering of harvesters.

The drainage facilities are provided for the purpose of sub-surface drainage in case of the Left Bank Area, not for surface drainage, since rainfall is very limited during the cropping season. Sub-surface drainage is commonly practised by open drains, while the underground drainage is also applied in limited areas of the III International Farm and other farms.

(3) Farm Road Network

The farm road network is well developed in the Kzyl-Orda Left Bank Area. For inspection and maintenance, earthen roads with a width of 5 to 10 m are provided along either right or left side of the irrigation and drainage canals. At the on-farm level, 5-m wide roads without pavement are provided along the irrigation and drainage canals. Using these on-farm roads, farm machinery can easily reach every farm plot.

The condition of these roads is rather poor due to insufficient maintenance work. The road surface is generally irregular and some ponding occurs after rain, and consequently such bumpy roads hamper traffic.

2.1.7 Water Management and O&M

(1) Water Management in Kazakstan

The context of water management in the Study complies with the institutional structures in the Republic of Kazakstan with emphasis on project level water management as follows:

(i) State Level Water Resources Management

Water together with land are the most fundamental resources for agricultural production, but both are not outcomes of human labor. They are substantially different from the ordinary merchandised commodities. This fact calls for the state intervention to water as well as land sectors in most countries.

The Committee on Water Resources under the Ministry of Agriculture is responsible for organizing the overall water administration in Kazakstan as illustrated in Figure 2.1.14.

(ii) Basin Level Water Resources Management

The eight River Basin Organizations (BVOs) under the Committee on Water Resources cover the entire territory of the Republic. The existing Kzyl-Orda Irrigation/Drainage Project area is under jurisdiction of the Syr Darya River Basin Organization in Shimkent.

(iii) Oblast Level Water Resources Management

Under the Committee on Water Resources, there are nineteen Oblast Committees on Water Resources in each of the oblasts. The Kzyl-Orda Oblast Committee on Water Resources is the responsible body for the project. The four Raion Management of Water Economy Systems under the Kzyl-Orda Oblast Committee on Water Resources are involved in the Project as illustrated in Figure 2.1.15.

The state and oblast level committees receive their funds from the central government but all of the raion level operations are now self-supporting which seriously suppresses the O&M activities of the Project.

(iv) Project Level Water Management

Project level water management refers to the operation and maintenance (O&M) of the following facilities constructed under the Kzyl-Orda Irrigation/Drainage Project:

- The Kzyl-Orda Headworks completed in 1957,
- The Left Bank Massive Irrigation System with total length 303.7 km completed in 1969, and
- The Left Bank Massive Drainage Canal System with total length 518.5 km completed in 1969.

The Left Bank Massive Irrigation System comprises the Left Main Canal, the Right and Left Branch Canals and inter-farm/on-farm canals. Among them, the total length of the Left Main Canal and the Right Branch Canal down to the station number PK 420 are directly managed by the Oblast Committee on Water Resources, while the remaining are managed by the Raion Management of Water Economy System (Figure 2.1.16).

(v) Farm Level Water Management

Farm level water management denotes O&M of the on-farm canals, the field canals and the field ditches down to terminal farm plots (Figure 2.1.11). The objectives of farm level water management are:

- To maintain the function of the on-farm facilities at the original level as far as possible,
- To operate the facilities so as to ensure the planned discharge at each inlet, and

- To maintain the soil moisture conditions so as to meet crop requirement.

The on-farm O&M operations are currently undertaken by the Hydro-Engineer/Technician under the instruction of the Chief Agronomist. (Figure 2.1.17)

(2) Institutional System of Water Management

The institutional system of water management associated with farm management under the project is illustrated in Figure 2.1.18. The Committee on Water Resources represents the "Water Supplier" side, while the farm represents the "Water User" side. Both parties are combined under water supply/demand relationship and form independent "Enterprise" style, free from the government's financial support, but based on different management disciplines.

The water management activities at the project level are frameworked by the Kzyl-Orda Oblast Committee on Water Resources under the supervision of the Committee on Water Resources. Under the Kzyl-Orda Oblast Committee on Water Resources, the Raion Management of Water Economy System together with the Hydro-Stations hold a pivotal role in the practical project level water management. The four Raion Management of Water Economy Systems correspond with administrative jurisdiction such as Syrdarya, Terenozek, Zhalagash and Karmakshy Raions in the Kzyl-Orda Oblast.

The hydro-posts are placed at immediately downstream points from each head gate stand for the delivery points of irrigation water to the farms. Flow discharges, measured at the hydro-posts at the 10 day interval during the irrigation period, are converted into volumetric units for collecting water charge from the farms.

An original water cost is estimated by the Committee on Water Resources on the basis of the Water Cost Estimate Criteria stipulated in the Cabinet Decree. It comes up to 12 tiyns/m^3 for the 1995 fiscal year. However, the farms can hardly accept the water cost which is an intolerable burden to the farm finance. The water charge issue was finally settled by the Governor's arbitration which resulted in 5.63 tiyns/m^3 in 1995. The unit water requirement is estimated at 2.6 lit/sec/ha or 20,200 m^3/ha/90 days. A provisionally estimated O&M cost came up to US$17/ha when the irrigation period of 90 days is applied.

(3) Findings on Project Level Water Management

Site survey revealed the following issues:

(i) Institutional Structure

The most advanced level of engineering standards has been practised in the Study Area by employing volumetric water measurement system that is common in arid zone irrigation farming. However, this system had been effective under the planned economy system, in which the Government fully supported the project in terms of technology and finance.

After disintegration of the Soviet Union in 1991, the transitional economy was proclaimed by the Government. In consequence the water fee system and the farm management system were introduced, though both systems can hardly coexist in principle. It is necessary to find out some practicable solution to overcome the current situation.

(ii) Technical Findings

It is evident that siltation in the canal and the worn-out gates hinder the smooth water flow, reducing the planned water supply during the irrigation period. The water supply to the terminal plots is insufficient for paddy cultivation, particularly during the preparation period and seriously reduces the paddy cropped area. This is one of the reasons why the farms are reluctant to pay the water fee.

2.1.8 Agricultural Support Services and Farmers' Organizations

(1) Agricultural Research

Agriculture research and extension are defined as the production and dissemination of new scientific agricultural information and new technologies through systematic means to reach farmers directly and thereby improve their production techniques and technologies in order to increase yields, reduce inputs, control pests and weeds, improve soils, maintain the ecology, maximize irrigation efficiency, improve labor efficiency, rationalize marketing, and increase household income and welfare. This traditional understanding as used in most nations does not apply directly to the case of Kazakstan. Although the scientific sector of agriculture was well developed under the Soviet Period, the research generated was unevenly distributed and consumed. Scientific agricultural research was directed to increasing yields of state farms by disseminating research findings and recommended practices directly to oblast officials, farm managers, and specialists. Managers operated under a command system in which they were ordered to cultivate certain crops in a specified manner in order to achieve specified production quotas mandated by the Department of Agriculture. Farm laborers were not trained directly, but were told to perform certain tasks with little or no knowledge of the overall agricultural plan or system of implementation.

The responsibility for agricultural research is with the Kazakstan Academy of Sciences which operates the National Center of Agricultural Research. This academy has been reduced in size and budget and a number of research farms have been privatized. Before 1994, there were two research institutes in the Kzyl-Orda Oblast; the Kzyl-Orda Agriculture Research Institute and the Soil Research Institute. Presently, there is only one institute; the Pre-Aral Scientific Research Institute for Agro-Ecology and Agriculture.

This institute has nine research departments and employs 87 personnel of which 33 are scientists as shown below. The number of institute employees has been declining during the period of national independence. In the 1980's there were 166 employees. The institute has an annual budget of T.11 million.

(Unit: person)

Department	Scientists	Staff	Total
Director's Office	0	2	2
Reclamation & Soil Fertility	4	4	8
Land Tenure	4	7	11
Vegetables & Melons	4	1	5
Fodder Crops	3	6	9
Paddy & Seed Production	5	6	11
Agro-Economics	3	0	3
Animal Husbandry	5	0	5
Astrakhan Sheep	4	2	6
Ecology & Information	1	3	4
Administration	0	10	10
Supporting Services	0	13	13
Total	33	54	87

Source: Pre-Aral Institute

The Pre-Aral Institute undertakes research on new crop varieties, seed improvement, vegetable production, animal husbandry, soil conservation and fertility, agro-economics, land tenure, and agricultural machinery. It also is a provider of breeder seeds for paddy production. It produced 2,000 tons of paddy seed in 1996 on its research farms.

The institute currently collaborates with the only two state research farms in the oblast: the Karaultubinsky Research Farm located near Kzyl-Orda City and the Taguskensky Research Farm located 200 km from Kzyl-Orda town in the Zhanakorgan Raion. These two farms produce breeder paddy seed for the oblast, produce crops for the market, and each operates an experimental plot of 100 hectares. Research is conducted on rice, wheat, lucerne, and animal husbandry. Previously, staff scientists also carried out test plots on state farms, but this is no longer the case. The following table identifies area and production for these research farms.

(Unit: ha)

Land Category	Tagushensky	Karualtubinsky
Total Area	14,237	4,911
Total Agricultural Land	12,140	4,568
Cultivated Area	5,910	1,281
Paddy	2,110	450
Lucerne	1,200	200
Wheat	700	200
Other Crops	1,900	431
Hay	190	760
Pasture	6,040	2,016
Other Agricultural Land	0	511

Source: Pre-Aral Institute

(2) Agricultural Extension and Farmer Training

Extension services to farmers do not presently exist in Kazakstan, but several donor agencies are planning their development in the future. During the Soviet Period, agricultural research findings regarding improved practices were distributed to oblast and raion departments of agriculture. These findings were issued in the form of reports and pamphlets. In the Study Area, the Pre-Aral Scientific Research Institute for Agro-Ecology and Agriculture

is not publishing any research documents for farm use. The last pamphlet was issued in 1993. Farm managers and other officials may presently request copies of previous pamphlets and reports at no cost.

The institute, budget permitting, could offer seminars to agricultural officials such as raion and oblast department of agriculture officials, farm managers, farm specialists, and brigade leaders. In the past, these were reportedly conducted on experimental plots administered by the institute. Peasant farmers and private family farmers have not ever been invited to participate in these seminars as the institute director does not think that such farms are within his mandate.

Thus, agriculture extension and farmer training are not occurring in the Kzyl-Orda Oblast or Study Area. There are no written reports issued directly to farmers, and there are no materials being disseminated via radio or television broadcast. No on-site training is being provided to farmers by the Pre-Aral Research Institute or the Ministry of Agriculture. The raion and oblast departments of agriculture are also not providing seminars or written training materials to farmers. Peasant farms and family farms are not being provided with any technical assistance or training.

The Ministry of Agriculture is administratively responsible for agricultural training. It has the mandate to arrange demonstrations or seminars for specialists from collective farms. The link between research and training is absent because the Kazakstan Academy of Sciences, which is responsible for agricultural research, is completely independent of the Ministry of Agriculture. In addition, such training as was provided was for large collective farms and cooperatives. The ministry provides no training for private family farms or peasant farmers.

In the Study Area, the Kzyl-Orda Oblast Department of Agriculture is responsible for the development of agriculture and animal husbandry. The department is organized into six divisions and employs 40 staff. The organization of the department is shown in Figure 2.1.19. The six departments include:

(i) Department of Production: collection of data on crop production and animal husbandry and recommendations on improved practices.

(ii) Department of Veterinary: diagnostic, medical, and preventive veterinary measures; animal epidemiology; and contagion control.

(iii) Department of Technical Service, Technical Supervision and Safety: registration of machinery, machinery inspection, machinery operator certification, and fire and traffic safety.

(iv) Department of Economic Reform: data collection and analysis on agricultural reform, monitoring of debt, food consumption, production forecasting, and provision of assistance to small and medium agricultural businesses.

(v) Department of Marketing: marketing assistance to commodity producers and trade associations.

(vi) Department of Finance and Stocks: accounting, financing, control and liquidation of debts for electrical power, spare parts, fuel, and inputs.

(3) Agricultural Credit

"Agroprombank" is the only source of agriculture cash loans for farmers in the Kzyl-Orda Oblast except for the special state fund loans to small farmers which are described later. Agroprombank is a private bank, with funds generated by deposits and returns on loans. The bank has 6,225 staff and 236 branch offices. As of January 1, 1996, Agroprombank had T.6.9 billion in assets and credit investments totaling T.2.3 billion. The Kzyl-Orda Branch has outstanding loans of T.200 million as of the 1st of August, 1997 broken down as 40% for agriculture, 20% for industry, 30% for small business, 10% for other. All of their loans are short term, one year or less. This year the interest rate on loans is 30%, compared to 45-50% last year.

Of T.80 million loaned to agriculture, T.26 million was for sowing, and the balance was for rice mills and flour mills. All of these loans, except T.26 million for sowing were financed by the ADB mid-term credit line through Agroprombank. The bank will loan an additional T.20-25 million to Kzyl-Orda farmers for harvest expenses in 1997.

Agroprombank requires 150% collateral on the value of their loan. If a farmer fails to pay when the loan is due, the bank will take possession of his paddy and other collateral and sell it to satisfy the loan. Loans must be repaid in cash, not barter.

There are no other bank sources of cash credit available to Kzyl-Orda farmers. Barter credits in exchange for paddy are made by "Hurricane Petroleum Company" for fuel, JSC "Agropromtekhnica" for tractor and machinery spare parts, and JSC "Kunarlylyk" for fertilizers and pesticides.

In December 1994, the Kazakstan Government created the State Fund for Financial Support of Agriculture to improve the economic condition of private farms. The fund is administered by the Ministry of Agriculture. Out of T.85 million of Kzyl-Orda farm debt due to this fund on December 15, 1996, 60% was paid. The amount of T.34 million in arrears was carried over to 1997 and the total amount due for payment on December 15, 1997 is T.105 million. The total remaining debt of Kzyl-Orda farms to the State Fund is about T.150 million, which is a relatively small amount compared to the total debt of T.6 billion owed by all Kazakstan farms.

In 1997, the State Fund loaned T.5.9 million to 34 small peasant farms. The loans are mostly for T.100,000 - T.150,000 (US$ 1,333 - 2,000) per farm, although one farm received T.1.0 million (US$ 13,333). In 1996, the same amount was loaned to 35 farms. The loans are repayable in 3 to 5 years at 10% interest. The loans are for sowing, fertilizer, spare parts, etc. There is no loan program for large farmers.

(4) Agricultural Inputs Distributions

(a) Fertilizer

According to the Oblast Department of Agriculture, the fertilizer actual nutrient requirements for the 70,040 hectares of paddy sown in 1997 were 10,019 tons of nitrogen (N), and 6,813 tons of phosphorous (P). The actual amount applied by farmers to paddy land was 5,754 tons of nitrogen, and 4,383 tons of phosphorous, 60% of the total nutrient requirement. An additional 231 tons of nitrogen were applied to wheat.

Most of the mineral fertilizers used by Kzyl-Orda farms are supplied by the JSC "Kunarlylyk", formerly "Plodorodye".

There are a few small independent sellers of fertilizers who come from outside the oblast, but all fertilizers are supplied through this company, because they have specialized storage in the seven raions. According to the Director of Kunarlylyk, he supplied the Kzyl-Orda Oblast with 35,000 tons of bulk fertilizer in 1997. This figure is corroborated by the data from the Oblast Department of Agriculture, which show that 34,765 tons of bulk fertilizer were applied.

Kunarlylyk will try to supply 100% of the farmer's requirements next year, but, the problem is shortage of cash to pay manufacturers at the time of ordering. Kunarlylyk sells fertilizer to farmers as a barter exchange for paddy and buys from supply companies either in cash or barter of paddy or rice.

Most of the fertilizers used in the Kzyl-Orda Oblast are produced in Kazakstan. The most frequently used and least expensive source of nitrogen, ammonium sulfate, is from Karaganda. Nitro-Ammo-Phos is purchased from Aktau, Uzbekistan and Russia. Double phosphate is from Taras (formerly Zhambyl). Ammonium nitrate is imported from Russia and Uzbekistan. Potassium is also produced in Kazakstan, but, according to the Director of Kunarlylyk, it has not been applied to Kzyl-Orda soils for several years, because it is not needed.

(b) Pesticides

Kunarlylyk also supplies the only two herbicides used in the Kzyl-Orda Oblast, Fatset and Bazagran. Both are for post emergence application to paddy, and produced by the German Company BASF. According to the Oblast Department of Agriculture, herbicide treatment was required on 20,333 hectares out of 70,040 sown (30% coverage) in 1997. In the Terenozek Raion, Bazagran was applied to 2,550 hectares and Fatset was applied to 200 hectares in 1997. The application rates are 3 lit/ha for Basagran, and 2 lit/ha for Fatset. The price of Bazagran is US$10.66/kg, and the price of Fatset is US$37.0/kg. The Kzyl-Orda farmers do not use any insecticides.

(c) Fuel

Gasoline and diesel fuels are supplied by the new Canadian company "Hurricane Petroleum Company" which bought out "Yuzhneftigas". Compared to 1996, the terms of trade

for paddy versus fuel have further deteriorated, as was true of 1996 compared to 1995. The value of paddy is 16% less, as compared to an increase of 10% for diesel, and 18% for gasoline.

(d) Seeds

Paddy seeds are grown on State Seed Farms in the Kzyl-Orda Oblast. Wheat, maize, lucerne and potato seeds are purchased from northern regions. Melon, and vegetable seeds are obtained from Shimkent and Uzbekistan. Seeds are inspected by the Oblast Seed Inspection Station. Paddy growers can use their own paddy as seed for two years, but should replace it with new certified seed every third year in order to maintain high production. According to the Oblast Department of Agriculture, farms supplied 88% of their seed requirements in 1997 from their last year's paddy and the remaining 12% of seeds were purchased.

(e) Tractors and Machinery

Two companies supply tractors, farm machinery and spare parts in the Kzyl-Orda Oblast, "Kazselhoztechnica" and "Agropromtekhnika". The equipment is imported from Russia, Ukraine, and Byleoruss. The Director of Agropromtekhnika said they have not bought any tractors or machinery for four or five years. Instead of buying, farmers lease equipment for five years from the State Leasing Fund. The farmer pays an annual fee ranging from 17 to 25% of the cost of the machine. Farmers must qualify for the equipment lease and contract with Agropromtekhnika.

Practically all their sales of spare parts to farmers are for paddy. He in turn may sell the paddy or barter with it to the plant that supplies parts.

(5) Farm and Farmers' Organizations

Prior to the beginning of the privatization process in 1992, there were 2,100 state farms in Kazakstan, most of which were quite large, averaging 80,000 hectares. In addition, there were 430 collective farms which were smaller, but functioned under the same form of management as state farms. As a result of government decree, all farms, except state research farms, were required to become private enterprises and by October 1996, all of the non-exempt farms in the nation had been privatized, at least on paper.

Privatization of farms in the nation has proceeded in two stages. During Phase I (1991 - 1993), state agro-enterprises involved in marketing and processing were privatized on a one-by-one basis. Such enterprises usually became joint ventures between the state and workers, but the prior management typically retained control and worker shareholders had little or no input into enterprise operation. Phase II (1993 - 1996) entailed the privatization of state farms and collectives. It proceeded with an assessment of farm value by the State Committee on Privatization and the allocation of shares to workers within the farm based on their position, longevity with the farm, and family size. In some cases, a portion of shares was allocated to the state and another portion was made available for public sale. Generally, farm managers were allocated 10% of the shares. Each member's shares were officially registered. Share holders then consulted on-farm structure and management, wrote by-laws, and selected a board

of directors and manager. In practice, most of the former state farms retained their former managers and specialists (agronomists, economists, engineers) and have continued to function as large collective agricultural enterprises. By mid-1996, many farms had begun to issue formal share certificates to workers. By law, farmers are allowed to convert their shares into discrete land holdings and farm independently if they so wish, but often farmers are unaware of this provision. When farmers have seceded from the collective, they have usually been granted inferior land with limited use of irrigation. Moreover, farm and raion management have rarely facilitated the process of secession.

As noted in a number of reports of the World Bank and other agencies, newly privatized farms are moving through a fluid period. Some have reorganized as Joint Stock Companies (JSC), in which the farm is administered by managers, labor is performed by brigades of workers, and planning is carried out by specialists. JSC members have regular assemblies and vote on matters of policy and selection of leadership. In production cooperatives, associations, and other Collective Enterprises, the share holders also select management, but property and land are held and farmed jointly. The surplus or profit is distributed to the membership collectively based on their share holdings. On both JSC's and collective enterprises, land is cultivated by machinery that is held in common, inputs are purchased collectively, and debts, assets and profits are jointly shared. Finally, private family farms are those operated by family units or other groups who work entirely within the private market place and administer their farm independent of any organization. The processes of privatization and organizational change are likely to continue to be fluid for some time as organizations work to achieve economies of scale and market "shake out" proceeds.

Within the Study Area, data were collected on the management of 17 former state farms. Of them, all had been privatized except the Kzyl-Orda Research Farm in the Syrdarya Raion which is exempt as it is a state-supported research entity.

There are also 165 private family farms in the Study Area; 32 in the Karmakshy Raion, 19 in the Terenozek Raion, 59 in the Syrdarya Raion, and 55 in the Zhalagash Raion. These farms are not organized into any farmer association or water users group.

In practice, there is no functional difference between a Production Cooperative (also called a Comrade Association) and an Association. Both maintain a management structure which includes a director, professional staff (specialists), and workers. The leadership (generally a board of directors) is elected by general assembly and the board selects and supervises farm management. Work is carried out collectively under the supervision of section or brigade leaders. Profits and surplus are shared by all after providing for the subsistence needs of the membership. Housing has been privatized. Workers maintain private gardens and may raise private livestock. They may sell their production on the open market and generally do so to commodity buyers and in the local market. A portion of their production, estimated at 41% in the Study Area, goes as barter to state corporations or Joint Stock Companies (such as Yuzneftigas) to pay back loans of fuel and fertilizer.

Water users' associations do not exist in the Study Area. The production cooperative is the farmer group and provides the means of organization for production, marketing, and water

management. As farms continue to evolve and more independent family farms emerge in the area, it will be necessary to organize water user associations to administer irrigation water among different users. Where private family farms may have not emerged, the cooperative may continue to function as an irrigation organization. But, because on-farm and inter-farm irrigation structures are in such a serious state of disrepair, and because water volumes are often insufficient for maximum yields and efficiencies, water user association can be a vital element in carrying out the O&M plan, assuring equitable distribution, and the collection of water fees.

The Study Area includes three different types of farms: the Production Cooperative and two types of Peasant Farms. All of the individual farmers in the Study Area are members of production cooperative or members of Peasant Farm's Associations.

A Production Cooperative is the result of the privatization of a former state farm (sovkhoz). National decrees required that all state farms be "privatized" and in many cases this has meant no more than being registered as a private farms and allocating shares on paper to all of the farm workers. The same administration is usually in place, including the same manager and the same specialists (agronomist, animal husbandry specialist, economists, engineers, etc.). The organization of the farm continues under central management with all major decisions being made at the top managerial level.

Production cooperatives are governed under a publicly-registered charter and by-laws which are approved by the office of the Raion Governor (Akim). Under privatization, all such units were required to allocate the total assets of the cooperative to the member workers. Production Cooperatives carry out their agricultural work including irrigation water management at on-farm level through sections of crop production, animal husbandry and maintenance service, and brigades under supervision of specialists. Technical assistance is provided to the brigade leaders by the farm specialists. Cropping and rotation decisions are made centrally by the manager and specialists.

The second type of farm is called a Peasant Farm. This category includes two sub-types: those with single household and those with multiple households. In this farm type, the unit has been registered as a private farm under the control of the household or households in question, and it is operated separately and independently from a Production Cooperative. The peasant farm is an entirely private enterprise in which the members of the farm make all of the farming decisions. Registered peasant farms which submit a business plan are eligible for small loans from the Oblast Department of Agriculture. Peasant farms may own their own machinery or may rent cultivation services from a production cooperative. They receive irrigation water through the same hydraulic system that serves the production cooperative and make payment for water to the production cooperative for the use of irrigation water. In some cases, they also sell their output to a production cooperative. The peasant farms included in the Project Area are physically located within the area of the production cooperative, but are independent of its management.

Peasant farms emerged from the national process of farm privatization which began in 1991. At this time, national law permitted individual agricultural households to register as

separate units and pursue farming activities independently. In other areas of Kazakstan, this process proceeded with greater speed than in the Project Area. Peasant Farms in the Project Area were formed independently by registering and purchasing state farm shares as permitted under privatization "in order to improve our incomes and to control our own work". Unlike private family farms elsewhere in Kazakstan, incomes and production have not improved since these units became independent, because there has been limited access to credits for inputs and machinery, water supply is irregular and inadequate, and because peasant farmers lack management, business, and marketing expertise.

2.1.9 Market and Prices

(1) General

According to the World Bank mission of June - July, 1997 involved in pre-appraisal of the Farm Restructuring Project:

> *Kazakstan has adopted a liberal price and trade regime. Initially, fixed state procurement prices operated through the state order system were replaced with floor prices set by the price Commission. In January 1997 floor prices were abolished and the Price Commission was disbanded, leaving farmers and traders to negotiate prices freely in the market place. At the same time the Government has moved to phase out subsidies in the sector, removing all input subsidies by September 1996.*
>
> *Trade restrictions have also been removed. All export licenses and quotas on agricultural exports were canceled in 1994, import tariffs have been gradually reduced and restrictions limiting exports of commodities to exchanges have been canceled.*[8/]

The Government has eliminated mandatory procurement quotas. Public sector procurement in 1997 was limited to small quantities of wheat necessary to meet the needs of government supported institutions such as the army, prisons and hospitals, and contracts were fulfilled on a voluntary basis.[9/]

(2) Marketing

Paddy, rice, wheat, wool and livestock skins may be marketed through the "Tabys" Commodity Exchange. Tabys maintains contacts with other exchanges to get market information, publishes prices every day in the newspaper, and sometimes over television. Tabys maintains a register of buyers and sellers, brings buyers and sellers together, and processes contracts for sales. Prices are determined absolutely on a free market basis by negotiations between buyers and sellers. Also, there are lots of private businessmen who make their own contracts with farmers for the purchase of paddy and rice without help from Tabys.

8/ World Bank, Kazakstan Farm Restructuring Project, 1997, p.1

9/ ibid.

The JSC "Kokonis" purchased 7,000 tons of melons and watermelons from Kzyl Orda farmers in 1996 and sold them in Russia and North Kazakstan. They expect to purchase and sell about the same amount in 1997. There are also independent dealers purchasing melons from farmers. Altogether, about 63,000 tons of melons and watermelons were purchased from Kzyl-Orda farmers last year. Kokonis also buys vegetables from Kzyl-Orda farmers, such as carrots, onions, and eggplant and sells them in Kzyl-Orda markets and other urban markets.

Except for paddy, melons, and vegetables, all other crops and livestock products produced on the farms in the Study Area are consumed internally.

(3) Prices of Crops and Farm Inputs

For the first time since independence, the Kazakstan Government did not regulate market prices in 1996. As a consequence, prices of livestock products and paddy were sharply higher based on a comparison at US$ exchange rates. Free market prices generally were higher in 1996 than in 1995, as reflected by the unregulated commodities, vegetables, melons and potatoes as shown in the table below:

Commodity	1995*		October 1996*		%
	Tenge/ton	US$/ton	Tenge/ton	US$/ton	Change
Paddy	9,284	151.29	20,000	294.12	94.4
Vegetables	6,270	102.16	15,000	220.59	115.9
Potatoes	13,027	212.27	17,000	250.00	17.8
Melons	3,020	49.21	5,000	73.53	49.4
Beef, live	18,210	296.73	60,000	882.35	197.4
Mutton, live	16,868	274.87	60,000	882.35	221.0
Milk	9,460	154.14	30,000	441.18	186.2

Note: *; Exchange rates: 1995 $1=61.37 tenge, 1996 $1=68 tenge.
Source: Kzyl-Orda Oblast Agriculture Department.

The State Price Committee set minimum prices for commodities sold for export through the Agricultural Commodity Exchange in 1996. Sales were by individual contracts through private brokers. Farms were free to get higher prices, but, most sales were at or near the listed minimum. The Commodity Exchange export prices on October 28, which were set by the Price Committee as of October 3, 1996 listed the third class soft wheat at US$165/ton, the second class paddy at $250/ton, and second class rice at $490/ton. These are the grades at which most Kzyl-Orda grain are sold.

The costs of fuel and fertilizers in 1996 are summarized as follows:

Item	Tenge/ton	US$/ton	Source
Benzene	15,500	227.94	Department of Agriculture
Diesel	10,200	150.00	"
Ammonium Phosphate	12,000	176.47	JSC "Plodorodye"
Ammonium Sulphate	2,500 ~ 4,000	36.76 ~ 58.82	"
Phosphorous	5,000	73.53	"
Potassium	5,000 ~ 6,000	73.53 ~ 88.23	"

Seed prices in 1996 were as follows:

Crop	Tenge/kg	US$/kg	Crop	Tenge/kg	US$/kg
Paddy	40	0.59	Melon	350	5.15
Wheat	50	0.74	Potato	30	0.44
Maize	100	1.47	Onion	1,350	19.85
Lucerne	200	2.94	Carrot	1,500	22.06

Source: Kzyl-Orda Oblast Department of Agriculture

According to the Oblast Department of Agriculture, wage rates for farm labor in 1996 were US$4.33/day for tractor drivers, and US$2.70/day for irrigators.

(4) Post-harvest, Agro-processing and Storage Facilities

The main agro-processing activity in the Kzyl-Orda Oblast is rice milling. In addition to the large rice mill in Kzyl-Orda city, JSC "Akmarzhan", there are 73 small rice mills in agricultural enterprises, and one in each raion. Of the raion rice mills, only the one in the Zhalagash raion is presently operating. Farmers are not supplying paddy to the other raion mills.

The large rice mill in Kzyl-Orda city, JSC "Akmarzhan" has capacity to process 700 tons/day of paddy, yielding 400 tons/day of milled rice, from two plants. Before dissolution of the Soviet Union, the Kzyl-Orda Oblast had 100,000 hectares of paddy and this mill processed 220,000 tons of paddy over a ten month period. In 1995 the mill processed 45,000 tons of paddy.

The mill yields only 50% of "first quality" rice with 12% broken. The standard for international market rice prices is Thai, 5% broken and the normal international standard for recovery of rice from cleaned paddy is 64-66%.

Akmarzhan has elevator storage capacity for 87,300 tons. At the present time, 4,000 tons of paddy are in storage. Each raion has their own storage. The total storage capacity in the oblast not including on-farm storage is 533,800 tons, of which 214,300 tons are in elevators.

There are six wheat flour mills, and 41 mini-mills in agricultural enterprises. Wheat and flour are not exported from the oblast.

There are no plants for processing vegetables, melons, or fruit in the Kzyl-Orda Oblast. Some home industries preserve dry melons or make jelly.

No meat or meat products are exported from the Kzyl-Orda Oblast. The former state meat factory is closed down. Farms slaughter their own animals. There are 10 small sausage factories.

During the Soviet Union, the big state milk factory in Kzyl-Orda city processed 50 tons of milk daily. Since 1992 the state regulated the price the milk factory paid farmers for milk at such a low level, the farmers stopped supplying the dairy and sold their milk directly in the open market. The factory opened again in 1996 and it was processing one ton of milk per day.

Ten small Israeli equipped dairies of one to two tons daily capacity were purchased by Yuzhneftigas and given to the state. Three of these dairies are still operating; Karaozek farm, Karmakshy Raion, and "Akbulak" dairy in Kzyl-Orda city. The other seven dairies functioned for a while, but, then stopped, because they were not profitable. Farmers would not bring their milk to the dairy, because they could get a higher price for their raw milk in local markets. The dairies pay T.26/liter for milk that the farmers can sell in local markets for T.35/liter.

2.1.10 Farm Economy

(1) Crop Budgets

The most important crops in the Study Area are rice, lucerne, wheat, maize silage, safflower, vegetables and melons. The results of financial crop budgets under present conditions (as of 1996) are as follows:

Crop	Gross Value (US$/ha)	Production Cost (US$/ha)	Labor Hours (hours)	Net Return (US$)
Rice	602	417	37	186
Lucerne	129	159	29	-30
Wheat	134	236	21	-102
Vegetables	684	686	473	-2
Melons	533	356	200	177
Maize, silage	122	302	24	-180
Maize, grain	212	282	27	-70
Safflower	143	300	34	-157

Rice, and melons are the only profitable crops. Net losses from the other crops are caused by very low yields.

(2) Farm Budget

The cropping pattern representative of present conditions is 27% of paddy, 26% of lucerne, 16% of wheat, 4% of maize silage, 2% of safflower, 2% of vegetables, and 1% of melons. Fourteen percent of the cropland has been abandoned, and 8% is fallow. The farm budget for a 5,000 hectares farm under present conditions (as of 1996) had the following results:

(Unit: US$ '000)

Items	Value
1. Gross Value of Production*	1,221.50
2. Outflow	
- Crop Production Costs	1,134.59
- Water Charges (US$17/ha) for 3,900 ha	66.30
- Land Tax (US$1.47/ha)	7.35
Total Outflow	1,208.24
3. Net Return Before Income Tax	13.26
4. Income Tax, @10%	1.33
5. Net Return After Taxes	11.93

Note: *; Farm area includes 8% fallow and 14% abandoned land.

The net return from the 5,000 hectares farm is US$11,930, or about US$2/ha. All of the crops except rice and melons are losing money for the farm because of low yields.

The number of workers reported from the farm survey averages one worker per 4 hectares. Counting US$78,300 from wages charged as labor costs in the crop budgets, and US$11,930 of net farm income, the average return per worker under present conditions is US$72.

The farm budget does not reflect that farmers directly consume some of the production of the farm and they also exchange part of their farm production for other consumption goods or production inputs, thus reducing cash transactions, resulting in less value added tax and income tax than shown in the budget. Also the crop budgets include an annual charge for depreciation of tractors and machinery purchased at current prices, which the farms are not actually paying at the present time. Nonetheless, the results of this analysis indicate that farms in the Study Area are not producing enough income under present conditions to sustain the workers and their families living on them.

Results of the household survey in the Study Area with respect to family food expenditures and food consumption indicate that the average size of household is 6.8 persons and the average expenditure for food/household in 1995 was T.62,538 (US$1,019).

2.1.11 Environment

(1) Water Resources

(a) River and Irrigation Canal Water

According to the Guideline on Assessment of Water Quality Used for Kazakstan Irrigation Lands prepared by Ministry of Ecology and Bioresources (MOEB) in 1994, the standard and the classification of water quality for irrigation are as shown in Tables 2.1.12 and 2.1.13. The annual average water quality data in the Syr Darya river collected by Almaty Institute of Hydrometeorology are available at three locations, i.e., downstream of Chardara reservoir, Kzyl-Orda and Kazalinsk, as shown in Annex J. According to the above-mentioned standard, the quality of river water at Kzyl-Orda is categorized in Class II or Class III in terms of salinity, which is within the limit of the standard in terms of heavy metals. Therefore, it is

judged that the surface water of the Syr Darya river at Kzyl-Orda can be used for the irrigation of most crops except some salt-sensitive ones, but for domestic use, the water quality should be interpreted with caution, and independent tests are recommended.

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

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

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

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

The data collected in the Phase-I Study show that the water quality of irrigation canals is generally categorized in Class III, except that of the Right Branch Canal, which shows the salt content of 2,000 mg/lit (Class IV) which is not acceptable for irrigation use. From the result of this water quality analysis, it may be inferred that the irrigation water is being contaminated by the drainage water carried by the North Collector, of which the upstream portion joins with the Right Branch Canal (Annex-J).

(b) Drainage Water

The water quality of drainage canals in the Study Area was checked by the Kzyl-Orda Hydrology and Land Reclamation Expedition every June. Since 1992, however, the check of quality of drainage water has been stopped due to the financial problems of the Government. The result of water quality checked before 1992 is as shown in Annex J. According to the table, salt content in drainage water was 2,500 mg/lit on an average, ranging from 1,750 in the Eastern-Karmachinsky Collector to 4,900 mg/l in the South Main Collector. This reveals that the average salt content is around 2.5 times compared to that of irrigation water from the Syr Darya river. According to the Irrigation Water Quality Standard of Kazakstan, the quality of the drainage water is categorized in Class IV, which is not suitable for irrigation use.

(c) Groundwater

According to the existing water quality data at observation wells collected from the Kzyl-Orda Hydrology and Land Reclamation Expedition, most samples contain more than 2,000 mg/l of salt and are categorized in Class IV based on the Irrigation Water Quality Standard of Kazakstan. Therefore, the groundwater is not suitable for irrigation use. These results were confirmed through the water quality analyses on the water samples collected at 55 observation wells in the Phase-I Study period (Annex-J).

(2) Biological Resources

(a) Flora

According to the result of the flora and fauna survey, the following five groups of vegetation were confirmed in the water protection zone located between the Syr Darya river and the existing agricultural land.

(i) Tugai Vegetation

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

(ii) Dumetosous Vegetation

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

(iii) Reeds

This vegetation is constituted by reeds such as Phragmites austrails in the wet area caused by flood or shallow depth of groundwater table. The vegetation is natural habitat for wildlife and birds, because reeds produce the animal feeds.

(iv) Mixed Grass Vegetation

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

(v) Saltworts Vegetation

This vegetation is being gradually replaced by salt resistant plant such as Chenopodiaceae family in medium to strong saline soil. The dominant species are

Frosted Orach (Atriplex tatarica), Saltwort (Salsola foliosa), Siberian grass (Petrosimonia sibirica) and Oppositefolious (Climacoptra crassa), etc.

(b) Fauna

Based on the result of the flora and fauna survey, the species of fauna in and around the Study Area were listed in Red Data Book (RDB) of Kazakstan, and these are shown in Table 2.1.18. According to this table, 33 rare species in total, which consist of 11 mammals, 19 birds, 2 fish and one reptile are confirmed from RDB. Of 11 rare species of mammals, 5 species exist in reeds or Tugai vegetation area along the Syr Darya river, and 6 species mainly exist in desert area. On the other hand, of 19 rare species of birds, 9 species exist in reeds or Tugai vegetation, 7 species in desert area and 3 species in and around the river. The reptile mainly exists in desert area. Two rare species of fish were not confirmed for recent 2 years along the Syr Darya river.

According to the existing data collected through the flora and fauna survey, the number of fauna tends to reduce in and around the Syr Darya river due to decrease of river discharge, while the flora including rare species maintains the same situation in desert area.

(c) Downstream Reaches of the Syr Darya River

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

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

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

About 350,000 hectares of new area, caused by the retreat of Aral Sea, is mainly wasteland of saline soil. In addition to the above land use change, the area with slight to strong saline soils had increased from 150,000 hectares in 1955 to 311,000 hectares in 1986 excluding bottom area of Aral Sea. The salinity level in Aral Sea had also increased from fresh water level in 1950's to around 25 g/lit in 1980's.

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

(3) Salinization

Of 430,000 hectares of Kzyl-Orda Left Bank Area, the area with strong to very strong saline soils including Solnechecks is estimated at around 179,580 hectares or 41.8%. The saline soils have a negative impact on soil fertility and crop yield. According to the result of the soil survey, the area of saline soils closely corresponds to the salt content in groundwater. The strongly saline soils are found around the observation wells with groundwater containing salt of more than 8,000 mg/lit.

In general, salt is carried to the top soil by the capillary rise of water in the soil where the groundwater table is less than 2-m below the ground surface, but in paddy fields this salt movement is controlled by water percolation when the field is irrigated. According to the results of the soil survey, about 10% of soil samples collected in paddy fields show moderate to strong salinity. Meanwhile, according to the information from the Oblast Committee on Land Relations and Organization of Land Use, only 1,990 hectares (2.3%) is reported as the presently abandoned area in the original rice rotation area of 87,000 hectares.

(4) Others

(a) Cultural and Historical Assets

According to the reports prepared by UNESCO (1995), some ancient tombs or monuments as historical and cultural assets are located in the four raions concerned. However, these tombs or monuments are outside of the irrigation area.

(b) Water-borne and Water-related Diseases

According to the information from the Kzyl-Orda Oblast Sanitary and Epidemiological Station, water-borne diseases such as malaria, lymphatic filariasis and schistosomiasis are not reported in the four raions concerned. While, some water-related diseases such as salmonellosis, virus hepatitis and typhoid fever are reported in these raions. Deterioration of quality of drinking water is the main cause of such water-related diseases.

2.1.12 Women in Development

Kazakstan, inherited a legacy from the Soviet Union in which women are accorded full equality under law. In practice, this has meant that women are encouraged to complete schooling, pursue higher education, engage in the professions, and participate in political life. Women throughout Kazakstan are involved in careers as physicians, engineers, economists,

professors, and elected officials. Women in rural settings vote in elections, participate in the financial decisions of the family, work as farm specialists, and some serve in leadership positions in their communities.

Unlike the situation of gender inequality in many developing societies, women in Kazakstan are not relegated to second class citizenship or excluded from careers and advanced education. Women have lower rates of literacy than men, but literacy rates in Kazakstan for both women and men are above 95% which is comparable to the advanced economies. While differences in wages have been reported and women are significantly under-represented in farm leadership positions, the differences are not unlike those found in the advanced economies

World Bank statistics indicate that female literacy in Kazakstan is 96.2% and male literacy is 99.1%. The percent of women age group enrolled in secondary education is 91%, higher than the 89% rate of the male age group in secondary education.

In the Kzyl-Orda Oblast, women comprise 43% of the total employed labor force. There are 1,788 women managers and 24,835 women specialists in the oblast. Women have a higher representation of employment than men in the public health and social service sectors, but are well represented in all sectors, including agriculture. Notably, the popularly-elected governor (Akim) of the Terenozek Raion is the only woman raion governor in Kazakstan.

In the project area, women are represented in professional and leadership roles. The Ilyasov Production Cooperative Board of Directors, for example, has two women members and the farm's two staff economists are also women. The Shagan Board of Directors has two women and 22 women in staff positions. In addition, women serve as farm laborers and may hold shares of the cooperative.

A significant burden on women in the Study Area is the situation of domestic water. Many of the stand pipes in the area are broken and others are working below design level. Ten percent of the households do not have proximity to a functioning water pipe and women carry water, often from long distances, to provide domestic water for their households. The Project, by rehabilitating the domestic water distribution system, will substantially improve the lives of women and children in the Study Area by significantly reducing their labor input and freeing their time for more productive endeavors.

2.1.13 Constraints to Agricultural Development

The Kzyl-Orda Left Bank Area had the advantages of high water potentials of the Syr Darya river as well as land resources potentials, which are the fundamental resources for profitable agricultural development. In spite of these advantages, however, agricultural production has stagnated at a low level because of the following constraints:

(a) Physical Constraints

(i) Scarce precipitation

The annual precipitation in the Kzyl-Orda Left Bank Area is only 155 mm and most of the precipitation is in the winter season. During the crop period from April to September, the precipitation is only 40 mm , which is negligibly small compared to the total crop water requirement.

(ii) Poor drainage

The Study Area is characterized by a very flat topography with a slope of only 1/5,000 to 1/10,000 inclining westwards along the Syr Darya river. Coupled with this topographic characteristics, the deteriorated drainage canal network and considerable amount of seepage from the irrigation and drainage canals induce water logging at depressed areas and raising the groundwater table up to the ground surface.

(iii) Unfavorable geological characteristics

The geology in the Kzyl-Orda Left Bank Area is characterized by silty loam in a top layer with a thickness of 1.0 - 1.5 m and a thick layer of sandy loam or fine sand as the second layer. Since most of the irrigation and drainage canals were dug down to the second layer and unlined, a considerable amount of water leaks from the canals, and moreover the canals are erosive.

(iv) Salinity hazard

About 40% of land in the Kzyl-Orda Left Bank Area is suffering from strong to very strong salinity (Solonchek). This soil condition does not allow any crops to grow.

(b) Socio-economic Constraints

(i) Lack of knowledge for marketing under the market-oriented economy

Under the market-oriented economy which has been introduced since 1992, farms or family farmers lack the knowledge for marketing of production and self-financing or credit arrangement for farm inputs due to the shortage of experience. Therefore, it is necessary for farms and family farmers to acquire such knowledge to get more profit from agricultural products.

(ii) Lower commodity prices than reasonable for agricultural products

Since 1996, the commodity prices of agricultural products have not been regulated. However, there is little opportunity for farmers to benefit from free market prices because much of their marketable surplus is already committed at fixed low prices (plus interest) to repay barter credits for inputs from Astyk, Yuzneftigas, and others.

(iii) Lack of O&M for agricultural facilities and equipment caused by cultural tradition

There is little cultural tradition emphasizing regular maintenance and operation of agricultural facilities and equipment. Tradition has emphasized a major role for the state in farm operation, production, and maintenance. Reliance on state provided inputs and equipment has diminished self-reliance and market orientation. With the withdrawal of the state, an organizational vacuum has been created, which has not been filled by local farm organizations. This is particularly evident in irrigation infrastructure which is still viewed as the government's responsibility.

(iv) High cost of credit from the Agroprombank.

The annual rate of interest for short term operating loans from the Agroprombank is 45-50%. Adjusting for inflation, which was 10% in the past year, results in real interest rates of 35-40%. Therefore, it is difficult for farms or private family farms to get operating loans for the next year crops from Agroprombank.

(c) Agricultural Constraints

(i) Shortage of farm machinery and farm inputs

The declining farm economy badly affects the repair and renewal of farm machinery and procurement of farm inputs. Because of this, the number of agricultural machinery has remarkably decreased from its peak in the middle of 1980's due to poor maintenance and excessive use of the machinery without any maintenance, repair and renewal. As for farm inputs, the amount of chemical fertilizer has also decreased year by year, and in 1995 no chemical fertilizer was applied for major crops except vegetables. As a result, crop production has decreased dramatically since 1993.

(ii) Low quantity and quality control in the rice mill

Low recovery rate and high percentage of broken rice are reported for milled rice in the Kzyl-Orda Oblast. Low recovery rate causes lower profits from rice production to farms, because the quantity of milled rice is less. In addition, milled rice containing much broken rice will also cause less profit to farms, because the price of milled rice is lower because of quality in the market-oriented economy.

(iii) Less coordination between research institutes and training activities

The agricultural research activities are at low level due to the shortage of the Government's budget. In addition, the linkage between agricultural research and training activities is very week because of less coordination between National Academy of Sciences and MOA. Therefore, it is difficult for farm

technicians or farm workers to learn new and advanced farming techniques developed by research.

(iv) Lack of proper extension system

Agricultural extension system does not exist in Kazakstan except the direct system between farm technical staff and the MOA official. However, since high progress of privatization in the agricultural sector and increase in number of private family farms are expected in near future, the necessity for the extension system will rapidly increase particularly for the private family farms.

(d) Constraints in Irrigation Practices

(i) Absence of proper maintenance works

Due to shortage of fund and technical staff, maintenance work is not properly done, and as a result causes deterioration of irrigation and drainage facilities. Under such situation, irrigation water can not be distributed properly, and water logging and local inundation are caused in depressed land.

(ii) Over-supply of water

Due to ill management of water distribution and malfunction of water control structures, irrigation water is often supplied excessively, which results in a waste of valuable water resource for the environmental conservation particularly in and around Aral Sea.

(iii) Poor land levelling in paddy fields

Most of the paddy fields are not properly levelled, and accordingly water depths in the plots are uneven, which results in low crop yield and poor drainage.

(iv) Insufficient cost for O&M

The present water fee is fixed lower than the actually required O&M cost, and therefore it is difficult for the Oblast Committee on Water Resources to allocate enough funds for operation and maintenance of facilities.

2.2 Development Plan of the Kzyl-Orda Left Bank Area

2.2.1 Project Concept

The main subjects included in the Study are: (i) enhancement of irrigation efficiency through rehabilitation and improvement of the irrigation system; (ii) assurances of operation and maintenance (O&M) of project facilities by farmers' organizations and beneficiaries themselves in the process of privatization of the agricultural production system; (iii) prevention of salinization through proper management of irrigation and drainage and proper land use and cropping system; (iv) mitigation of environmental negative impact caused by the agricultural development; and (v) enhancement of farmers' incentive towards agriculture through improvement of the agricultural production environment.

For the basic approach to the above-mentioned subjects, the following major concepts are taken into consideration:

(i) In preparing the rehabilitation and improvement plan for irrigation and drainage systems, it should be noted that the rehabilitation and improvement cost be within a reasonable range for the beneficiaries, and the facilities be technically manageable by the beneficiaries themselves, considering their re-payment capacity and technical level.

(ii) It is proposed to establish a technical supporting system and organization in order to make O&M of facilities smooth and sustainable, and to establish a training and education system in order to give technical training to members of agricultural production organizations and to let farmers know the importance of their participation in the project.

(iii) It is proposed to improve the social infrastructure, access to markets and agricultural supporting system including the agricultural input supply system, credit system, and extension system for farming techniques and improved social life in order to enhance the beneficiaries' incentive towards agriculture through the activation of irrigated agriculture and improvement of productivity.

(iv) It is noted that the improvement of present irrigation and drainage practices would bring about good results from the viewpoints of prevention of salinization in farm lands and conservation of environment in the downstream area of the Syr Darya river and Aral Sea.

2.2.2 Delineation of Irrigation Area under the Study

According to the result of present land use mentioned in Paragraph 2.1.5(2), the command area of the Left Bank Massive Irrigation System was initially designed to be 87,000 ha, and had been fully irrigated until 1990. After dissolution of the former Soviet Union, however, Kazakstan has been in a state of economic crisis, and a negligible amount of budget has been allotted to the agricultural sector. As a result, the repair and maintenance of irrigation and drainage facilities have not been done properly. In addition, agricultural machinery has not been repaired and renewed, and farm inputs have not been supplied properly. Under these

critical conditions, 11,920 hectares of farm lands are abandoned at present. However, since these abandoned areas can physically be restored to cultivable land through rehabilitation and improvement of irrigation and drainage facilities, proper water management and O&M practices and establishment of efficient agricultural supporting system, all these abandoned areas are included in the possible irrigation area. Therefore, the irrigation area to be dealt with in this study is 87,000 ha.

2.2.3 Availability of Water Resources

(1) Kzyl-Orda Headworks and Project Area

The annual river discharge at the Kzyl-Orda Headworks (upstream) is estimated at 4,814 MCM in a dry year (1 in 5 years return period), of which 3,481 MCM (72% of annual total) flows during the cultivation period (April-September). While the annual discharge during the normal year (1 in 2 years return period) is estimated at 7,760 MCM, of which 5,124 MCM (68% of annual total) flows during the cultivation period. The monthly and seasonal discharges at the headworks are shown in the following table.

Return Period	Drought Discharge (m^3/s)												Discharge Volume (MCM)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Apr-Sep	Oct-Mar	Total
	Kzyl-Orda Headworks														
5 Year (Dry)	56.0	55.3	95.6	110.4	321.1	338.4	278.7	175.9	55.3	43.7	52.2	63.0	3,481	1,121	4,814
2 Year (Normal)	148.5	155.7	206.3	250.3	429.3	437.8	376.6	289.6	155.5	117.4	131.6	154.7	5,124	2,488	7,760
	Left Main Canal (Project Area)														
5 Year (Dry)	-	-	-	11.0	161.9	174.3	152.0	86.2	-	-	-	-	1,632	-	1,632
2 Year (Normal)	-	-	-	40.5	181.2	190.9	176.4	107.7	-	-	-	-	1,854	-	1,854

Note: Dash indicates no release of irrigation water from the headworks.

The river discharge at the headworks is diverted to the Left Main Canal (LMC) and the Right Main Canal (RMC), and the remaining flow is used in the downstream irrigation areas and Aral sea. The water available for the diversion to the Left Main Canal is estimated at 1,632 MCM in a dry year and 1,854 MCM in a normal year. Since the future water demand for the Study Area is estimated at 1,206 MCM, the available water is sufficient to irrigate the whole Study Area.

(2) Chardara Reservoir

The Chardara reservoir is a main water resource for the irrigation systems in the Kzyl-Orda and South Kazakstan Oblasts. The average annual inflow of the Syr Darya river into the Chardara reservoir was 13,668 MCM during 1970-1996. The annual flow in a dry year (1 in 5 years return period) is estimated at 9,100 MCM. The Chardara reservoir supplies water to the Kzylkumsk Canal and the Syr Darya river. The Kzylkumsk Canal takes in the water directly from the Chardara reservoir by a separate facility. Its average annual intake from the reservoir was 1,412 MCM during the period from 1985 to 1995. Meanwhile, the annual release from the reservoir to the Syr Darya river is fixed to be 8,150 MCM at 90% guarantee according to the operation criteria of the reservoir. However, average release from the Chardara reservoir was actually 12,272 MCM during 1970-1995. The water use of the river in 1995 is shown in

Table 2.2.1 for reference. The available discharge volumes at several points along the river course are shown in the following table.

Station	Available Discharge in Volume (MCM)					
	Average (1970 - 1995)			1 in 5 years return period		
	Apr - Sep	Oct - Mar	Annual	Apr - Sep	Oct - Mar	Annual
- Inflow into Chardara			13,668			9,100
- Release from Chardara to Syr Darya river	8,998	3,274	12,272	6,697	1,275	7,972
- Kzyl-Orda Headworks (upstream)	5,412	2,664	8,076	3,481	1,121	4,814
- Left Main Canal	1,905		1,905	1,632		1,632
- Kazalinsk	1,726	2,069	3,795	262	686	948

(3) Water Balance

The irrigation water requirement in the Study Area under the future "with project" condition is estimated at 1,206 MCM for 87,000 ha, which is 714 MCM lower than the present irrigation requirement of 1,920 MCM during the period 1985-1995 for 80,350 ha. Therefore, about 37.2% of the water under the present irrigation requirement can be saved in the Study Area after implementation of the Project. The irrigation requirements in other irrigation systems of the river basin are estimated at 3,794 MCM in total assuming that similar conditions as in the Study Area will be attained in the future. Therefore, the total irrigation water requirement in the two oblasts would amount to 5,000 MCM, of which 1,060 MCM is for the Kzylkumsk Canal. After knowing these water requirements, the water balance study is made between the river discharge of the Syr Darya and the water requirements, and the result is shown in Table 2.2.2. According to this table, the water release from the Chardara reservoir to the downstream reaches of the Syr Darya river can be increased by 352 MCM which can be saved in the Kzylkumsk Area under the future "with project" condition. The irrigation water demand in the other irrigation areas in the Kzyl-Orda Oblast is estimated at 3,736 MCM, which is 1,449 MCM lower than the present demand. The following table shows the irrigation requirement and water saving under the future "with project" condition:

Oblast	Irrigation System	Irrigation Area (ha)	Water Use		Water Saving (MCM)
			Present (MCM)	With Project (MCM)	
South Kazakstan	Kzylkumsk	66,500	1,412	1,060	352
	Others	21,500	204	204	0
	sub-total	88,000	1,616	1,264	352
Kzyl-Orda	LMC	88,000	1,920	1,206	714
	Others	168,000	3,265	2,530	735
	sub-total	255,000	5,185	3,736	1,449
Total		343,000	6,801	5,000	1,801

Under the future "with project" condition, the annual irrigation water demand is estimated at 5,000 MCM for 343,000 hectares of the irrigation area in two oblasts, which is 1,801 MCM less than the present irrigation demand for the same irrigation area. Thus, there would be 26.5% of water saved under the future "with project" condition for Aral Sea. Then, the annual inflow to Aral Sea will increase from 3,568 MCM to 5,369 MCM under the future "with project" condition.

2.2.4 Agricultural Development Plan

(1) Farm Household and Agricultural Labor Force

Based on the farm household survey, the average farm size and family size as well as the labor force per household in the Study Area are estimated as follows:

Items	Syrdarya	Terenozek	Zhalagash	Karmakshy	Average
Average Farm Size (ha/household)	8.88	18.89	17.94	21.00	15.90
Average Family Size (persons/household)	5.9	6.1	6.2	6.0	6.1
Average Labor Force (men/household)	2.67	2.76	2.92	2.78	2.82

On the other hand, according to the data collected from the Kzyl-Orda Statistics Office, the population of the four raions concerned remains steady from 1994 to 1996 due to both higher death rate and emigration. The labor requirement is expected to decrease under the future "without project" condition because of reduction of the irrigation area as mentioned in Paragraph 2.2.4(2), resulting in increased emigration. Under the future "with project" condition, however, the labor requirement will increase, though slightly. As a result, emigration will be restrained to some extent, and the present labor force will not change much in the future.

The present labor requirement for farming is very low, since completely mechanized cultivation is being applied in the Study Area as mention in Paragraph 2.1.5(4). In future also, the labor requirement under the future "with project" condition will be low as mentioned in Paragraph 2.2.4(4). Therefore, the present labor force is enough to cover labor requirements under both present conditions and "with project" conditions.

(2) Future Land Use

At present, there are 87,000 hectares of the original command area of the Kzyl-Orda Left Bank Massive Irrigation System (original rice rotation area), which include 11,920 hectares of presently abandoned area in 1995. Under the future "with project" condition, however, all the abandoned area will be recovered to the normal cultivation area. On the contrary, under the future "without project" condition, the actually irrigated area will continue to decrease due to increase of the abandoned area. The future decrease of the irrigated area is forecast based on the data mentioned in Paragraph 2.1.6(1) (Figure 2.2.1). According to this forecast, the presently irrigated land will decrease from 75,080 hectares in 1995 to 31,900 hectares which is the average in the project life of 50 years and deemed to be the irrigation area under the future "without project" condition. Based on the above result, the future land use for both "with project" and "without project" conditions is estimated as shown in Table 2.2.3 and summarized below.

(Unit: ha)

Raion	Without Project			With Project		
	Abandoned	Irrigated	Total	Abandoned	Irrigated	Total
Syrdarya	2,200	1,130	3,330	0	3,330	3,330
Terenozek	14,590	9,080	23,670	0	23,670	23,670
Zhalagash	23,370	11,030	34,400	0	34,400	34,400
Karmakshy	14,940	10,660	25,600	0	25,600	25,600
Total	55,100	31,900	87,000	0	87,000	87,000

(3) Proposed Cropping Pattern

In forecasting the future agricultural situation under the future "without project" condition, it is assumed that the irrigated area will decrease with an increase of abandoned area, and cropping intensity will also decrease in proportion to the irrigated area. Under the future "with project" condition, however, all the abandoned area will be recovered to the normal agricultural land by improving the irrigation and drainage facilities, and all the original rice rotation area can be used for crop production.

For the establishment of profitable and sustainable cropping system, paddy, wheat, safflower, vegetables, lucerne and maize are selected as the proposed crops after considering the soil and climatic conditions, profitability, crop rotation and environmental balance. Then, the recommended cropping system is established as shown in Figure 2.2.2 taking into account the crop rotation, requirement of livestock feed, conservation of soil fertility, prevention of soil salinization, farmers' desire and MOA's opinion. As shown in this cropping pattern, the rice-based cropping system is employed for the rotation of crops, and paddy occupies about half of the cultivated area, because paddy is the most suitable and beneficial crop under this soil and climatic condition. Lucerne is also important considering soil conservation and animal food and will be cultivated in one-quarter of the total cultivated land.

For the future cropping pattern, the Pre-Aral Scientific Research Institute for Agro-Ecology and Agriculture recommends to cultivate paddy in the area of more 50% of the Project Area, taking into account the favorable climatic conditions for paddy cultivation and its profitability in the Project Area.

The cultivation area of each crop is shown in Table 2.2.4 and summarized below for both future "without project" and "with project" conditions.

(Unit: ha)

Crops	Syrdarya		Terenozek		Zhalagash		Karmakshy		Total	
	without	with	without	with	without	with	without	with	without	with
Paddy	390	1,490	3,730	11,830	3,770	17,200	4,220	12,800	12,110	43,320
Wheat	290	680	1,720	3,550	2,000	5,160	2,240	3,820	6,250	13,210
Safflower	10	70	140	710	150	1,030	170	770	470	2,580
Vegetables	10	50	200	470	210	690	140	515	560	1,725
Melons	10	50	200	470	210	690	140	515	560	1,725
Lucerne	410	820	2,410	5,930	3,970	8,600	2,940	6,410	9,730	21,760
Maize*	10	170	360	710	580	1,030	520	770	1,470	2,680
Others	0	0	320	0	140	0	290	0	750	0
Total	1,130	3,330	9,080	23,670	11,030	34,400	10,660	25,600	31,900	87,000

Note:*; For silage and fodder

(4) Proposed Farming Practices

In the Study Area, the presently prevailing large-scale mechanized farming will be employed in future also, because present field plots are very large and labor forces are limited. For establishment of profitable and sustainable agriculture under such a farming system as well as the severe natural condition, a package of improved farming practices needs to be introduced to the area. The expected yield and cropping intensity will be attained through employing improved cultural practices under stable irrigation water supply and adequate drainage. The improved agricultural technology includes the use of improved crop varieties, use of recommended dose of fertilizer with timely application, use of recommended seed, use of recommended seeding rate and crop population, keeping an adequate cultivation season, provision of proper water management, efficient use of agricultural machinery, adequate land preparation and good crop husbandry.

The present low yields of crops are attributed to the application of low dose of fertilizer, inadequate cropping season and poor crop husbandry. In addition to these, particularly for paddy, its low yield is also attributed to the uneven crop establishment which is caused by inadequate drainage due to undulation in field plots. In order to increase the yield of paddy, therefore, adequate land preparation should be made to attain the complete drainage of surface water, which is necessary specially during the germination and crop establishment period; 7 to 12 days after seeding (Annex E).

The agricultural input requirements per hectare recommended for future farming practices are shown below.

	Seed	Fertilizer (kg)			Pesticide	Herbicide	Labor
Crop	(kg)	N	P_2O_5	K_2O	(kg)	(kg)	(man-days)
Paddy	300	150	80	30	50	5	6
Wheat	200	100	50	30	20	5	4
Safflower	80	80	60	20	20	5	6
Vegetables	3.0	180	80	30	20	0	75
Melons	3.5	120	60	30	20	0	30
Lucerne	5	30	60	20	0	0	5
Maize(Silage)	60	120	80	30	0	5	4

(5) Anticipated Crop Yield and Production

Present yields of crops in the Study Area remain at relatively low level due to shortage of farm inputs and poor crop husbandry especially in the period from 1992 to 1995. The past trend indicates a decreasing tendency in crop yield. This trend has largely been affected by drastic decrease of farm inputs during the past 4 years. Considering such unusual crop yields in the recent 4 years, it is not correct to estimate the crop yields based on the present yields for the future "without project" condition. Therefore, the average crop yield for the period from 1986 to 1995 is taken as the yield of crops under the future "without project" condition.

After completion of the project work, the yields of crops will be increased through timely supply of irrigation water, adequate drainage and improved farming practices. The yields

of crops under the future "with project" condition are estimated on the basis of the present technology level, research outcomes on yield potential, and crop yields of developed countries which are situated in the same latitude as that of Kazakstan (Table 2.2.5). The anticipated crop yields thus estimated for the future "without project" and "with project" conditions are shown below.

(Unit: ton/ha)

Crops	Syrdarya		Terenozek		Zhalagash		Karmakshy		Total	
	without	with	without	with	without	with	without	with	without	with
Paddy	3.51	6.00	3.76	6.00	3.84	6.00	3.72	6.00	3.76	6.00
Wheat	1.07	2.50	1.16	2.50	1.19	2.50	1.14	2.50	1.16	2.50
Safflower	0.20	1.20	0.24	1.20	0.26	1.20	0.17	1.20	0.22	1.20
Vegetables	3.04	10.00	3.76	10.00	3.08	10.00	3.74	10.00	3.45	10.00
Melons	6.08	20.00	7.52	20.00	6.14	20.00	7.48	20.00	7.03	20.00
Lucerne	3.07	6.24	3.42	6.24	3.42	6.24	3.20	6.24	3.34	6.24
Maize*	15.45	30.00	15.64	30.00	16.67	30.00	15.88	30.00	16.13	30.00

Note:*; For silage and fodder

Future crop production after completion of the project will increase because of increase in planted area and higher yields. The anticipated production in the Study Area is shown in Tables 2.2.6 and 2.2.7, and summarized below.

(Unit: '000ton)

Crops	Syrdarya		Terenozek		Zhalagash		Karmakshy		Total	
	without	with	without	with	without	with	without	with	without	with
Paddy	1,370	8,940	14,020	70,980	14,480	103,200	15,700	76,800	45,570	259,920
Wheat	310	1,700	1,990	9,000	2,380	13,070	2,560	6,150	7,240	33,460
Safflower	0	80	40	850	20	1,220	20	930	80	3,080
Vegetables	40	500	760	4,700	650	6,900	510	5,150	1,960	17,250
Melons	60	1,000	1,510	9,400	1,270	13,800	1,050	13,300	3,890	34,500
Lucerne	1,260	5,140	8,250	37,000	13,580	53,700	9,420	40,030	32,510	135,870
Maize*	150	5,100	5,630	21,300	9,680	30,900	8,260	23,100	23,720	80,400
Others	0	0	830	0	160	0	1,160	0	2,150	0

Note:*; For silage and fodder

(6) Animal Husbandry

The animal population has shown a decreasing tendency during the past 5 years in the Study Area. This decreasing tendency seems temporary, same as in the case of crop production. Since there are large areas of grazing land and hay making land in the Study Area, the potential of animal feeding is high. In the Kzyl-Orda Oblast, a large part of animal feeding is conducted by family farmers. Considering the above mentioned potential of animal feeding and the recent increase of family farmers in the area, the animal population in the Study Area is deemed to be the same as the average number in the past 3 years under both future "without project" and "with project" conditions.

(7) Marketing of Products

The conceptual basis for the marketing plan is simply to produce a quality product and to get a fair price.

It was noted earlier that the recovery of rice from paddy at the main Kzyl-Orda rice mill, "Akmarzhan" is only 50%, compared to the international norm of 64-66%. Also, the first

quality rice from this mill is 12% broken, compared to the international market price standard of Thai; 5% broken. On the international market, because of poor milling, Kzyl-Orda rice would be judged third or fourth quality, meaning it probably would not sell outside the CIS or Russia, and there is a severe quality discount to the price.

Sales of paddy have fallen even faster than paddy production in the last five years, because the amount of paddy consumed directly on the farms remains relatively constant based on project area farm survey data. Therefore, with reduced production, the amount of paddy surplus to on-farm needs declines even more severely. In 1995, sixteen large farms sold only 29,000 tons of paddy compared to 104,000 tons in 1991; a decrease of 72%.

Applying the percent of sales from this survey, 40.6% to total 1995 production from the Kzyl-Orda Oblast indicates that the total sales in that year were only about 60,000 tons. The yield was higher in 1996, averaging 3.7 tons per hectare for the Oblast harvested from 64,095 ha, resulting in 238,541 tons of total production[10/]. At that level, the estimated marketable surplus will be about 60%, or approximately 140,000 tons.

Kzyl-Orda farms have contracted to repay credits to "Astyk" of 105,000 tons in 1996 at below market price, which means that the amount left over for sale at market prices is only on the order of 35,000 tons, say 15% of the harvest.

Possible ways to improve marketing in the Study Area include formation of a marketing cooperative. This cooperative would include new rice milling facilities, and marketing services, such as seeking buyers, and handling and selling members' products. The cooperative could also provide credit to members for purchasing production inputs at a reasonable interest rate. The cooperative belongs to the members, so all profits accrue to the members in proportion to their share of sales.

With respect to marketing crops other than rice under the future "with project" condition, Kzyl-Orda Oblast is deficit in production of wheat, vegetables, milk, and vegetable oils in terms of meeting the consumption requirements of its own population. Increased production of fodder from the project would be used to produce more dairy products and meat for local consumption. Increased wheat production would most likely be milled into flour and consumed locally. However, if production of wheat in the future should exceed oblast requirements, the surplus can be shipped to Russia at a cost of about US$21/ton; much less than the cost of shipping wheat from US or Canadian ports.

Vegetables would most probably be sold through local markets for consumption within the oblast. However, if higher yields could be achieved, there is a good market for surplus production in North Kazakstan and Russia.

Other than rice, the most promising crop for future development of an export market is melons. Kzyl-Orda melons have a reputation for sweetness and flavor. In the past, 60,000 to 65,000 tons were exported to Russia by the Kzyl-Orda firm "Kokonis". The Russian market

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10/. Kzyl-Orda Department of Agriculture Management.

could be restored with the increased supply of about 28,000 tons of melons projected to be available under the future "with project" condition, provided shipping time to Russia is reduced in order to prevent excessive spoilage losses.

Production of safflower is projected to increase from 280 tons of seeds annually under the future "without project" condition to 3,080 tons under the future "with project" condition. Presently, the nearest mill for extracting oil from the seeds is in Shimkent, a distance of about 500 km. At a 40% recovery factor, the annual production of safflower oil from the project will be about 1.23 million liters. The average household consumption of edible oils reported from the farm survey was 9.5 liters per month, or 1.4 liters/person. At this rate of consumption, the project will produce enough oil to supply the annual requirements of about 73,000 people. The increase in vegetable oil production from the project will probably be consumed within the oblast. Any surplus can easily be sold elsewhere in Kazakstan, because edible oils are a major agriculture import.

2.2.5 Improvement Plan of Agricultural Supporting Services

(1) Agricultural Research

The government's tight budgetary condition seriously and adversely affects the activities of all of the agricultural research institutes and their activity has become quite limited. Given this condition, research activities should, within a limited budget, selectively focus on not only the development of technologies to resolve the agricultural restraints faced by farms, but also the improvement of the social, managerial and agro-economic situation of farm and farmers.

The recommended research activities include, in particular, the breeding of high yield and high quality varieties, production of high quality seeds, improvement of farming practices and soil fertility, post harvest techniques, and improved water management. Research on environmentally sound farming practices would also be necessary to improve the present environmental conditions in the Study Area including the deterioration of water quality, soil salinization and desertification.

With regard to the improvement of the social and economic situation, research priority should be given to the farm management, improvement of the marketing systems, land tenure and land holding, credit and farm economy.

In addition, a strong linkage among the agricultural research institutes' agricultural policy and extension divisions needs to be established for the distribution and transfer of newly developed technologies.

Within the Study Area, the Demonstration Farm is proposed to be established as a local site for illustrating new techniques developed by agricultural research, including new varieties, seeds, and practices.

(2) Agricultural Extension Service and Farmers' Training

The agricultural sector is making a difficult transition from a command economy in which all agricultural information was managed centrally at the raion, oblast, and national levels with production targets set centrally based on that information. This monopoly was possible because the country had relatively few farming and agro-processing enterprises, all of which were responsible to regional and national departments of agriculture. This comprehensive and rigid system of information management has collapsed in the emerging market economy. The links between the Ministry of Agriculture (MOA) and the former state farms have weakened since the MOA is no longer providing financial supports, state production quotas have been eliminated, and because former state farms have been subdividing into new and smaller independent farm units.

Under a command economy, agricultural extension was non-existent as such. Since information and decision making was centralized, the need for participatory training for a farming in a market economy was nil. Thus, one key challenge of the transition in the Study Area is to create an agricultural extension program which is matched to the needs of a market economy. In market agriculture, accurate and timely information as well as relevant and current training are crucial to competitiveness and profitability. Such information and training are non-existent in the Study Area. Farm workers and peasant farmers have none of the skills in management, marketing, agriculture economics, water management, business planning, accounting, or the legal environment with which to compete effectively. As farms continue to evolve into different organizational forms of various sizes, it will be crucial to conceptualize agricultural extension as something which is extended to individuals rather than to farms; that is to say, that training and information must be directed not toward large farm units and their managers and specialists, but toward all of those involved in the rapidly changing agricultural enterprise. The improvement plan for agricultural training is developed in Sub-section 3.2.8.

(3) Agricultural Credit

The plan includes funding for an agriculture credit program to make short term farm operating loans and mid-term loans to project farms for the purchase of tractors and farm machinery. The credit program could be managed by an established commercial bank in the Kzyl-Orda Oblast.

However, there may be a problem finding a suitable bank to carry out the project credit program. In a detailed study of rural finance carried out by consultants to the Asian Development Bank, serious deficiencies were found with regard to Agroprombank such as to preclude installing any type of term lending program in the bank without significant technical assistance[11/].

The deficiencies of Agroprombank include the following:

11/ DAI, Study on Rural Credit and Savings in Kazakstan, Part I: Rural Finance, Final Report, November 1996, p.29

(i) Based on the April 1996 audit report of National Bank of the Republic of Kazakstan (NBRK), adversely classified assets (non-standard to loss) represent 48% of the total credit portfolio of T.2.28 billion. Loans classified as loss represent 37% of the portfolio.

(ii) The bank is short T.738 million in unfunded reserves.

(iii) The bank has an excessive amount of bad loans and poor quality lending practices.

(iv) The bank has no set formula for loan pricing and lack of knowledge concerning the cost of funds.

(v) Reported net income for the first quarter of 1996 was T.40.7 million, which was a 70% decrease from 1995.

Concerning bank management, the report acknowledges several improvements in the past year such as 24% reduction in staff, and implementing a system for monitoring costs of oblast branches, but concludes that the bank has poor earnings, weak financial health, weak management, and an excessively high rate of default on its loans. This report is pessimistic as to the likelihood of the bank becoming a viable institution capable of responding to rural credit needs over the next few years.

Narodny Bank, the former State Savings Bank is viewed more favorably by the consultants as being able to reach a large percentage of the rural population through its existing outlet network and thus able to provide a range of financial services. There are 12 branch offices of Narodny Bank in Kzyl-Orda city, and 9 branch offices in the Raions of Kzyl-Orda Oblast.

Narodny Bank is still 100% owned by the Government of Kazakstan. It's primary purpose was to attract personal savings from individuals and make social payments to citizens. As of April 30, 1996 the Narodny Bank controlled 53% of total bank deposits in Kazakstan, including 76% of demand deposits, 36% of time deposits, and 35% of foreign currency deposits.

Based on the April 1996 audit report of NBRK, adversely classified assets (non-standard to loss) comprise only 6% of the bank's total credit portfolio of T.8.1 billion and unfunded reserves were short by T.246 million. Reported net income for the first quarter of 1996 was T.477 million, 97% higher compared to the second quarter of 1995.

However, Narodny Bank currently makes loans only for the short term, less than 3 months. The consultants found several deficiencies in lending procedures, such as undue outside influence on the flow of funds, and concluded as in the case of Agroprombank that they could not recommend installing any kind of term lending program in the bank without significant technical assistance being provided prior to startup of the lending program.

Performance of these banks may improve prior to the implementation of the Kzyl-Orda Irrigation/Drainage and Water Management Project, so that it will be possible to manage the farm credit component through branches of one or both banks.

2.2.6 Improvement Plan of Farms and Farmers' Organizations

(1) Agricultural Cooperative

All of the farmers in the Study Area belong to either a production cooperative or a peasant farmer's association as stated in Paragraph 2.1.8(5). The rural appraisal of these organizations indicates that each of them is functioning adequately in the fields of farm management, crop production, and animal husbandry. However, they are not working adequately in the fields of marketing of products, procurement of agricultural inputs and consumer goods, and financing. In order to improve productivity and output in the Study Area, it is intended to: (i) strengthen these existing organizations through training; (ii) create an agricultural cooperative that provides all of the project farms with marketing, input procurement and financing services; and (iii) organize a water user association.

In the case of the large production cooperatives in the Study Area, the organizational design is a carry over from the state farm system in which agricultural work is carried out by brigades under the leadership of the Agronomist. These large farms are organized into sections, such as Crop Production, Animal Husbandry, Maintenance Service, Agro-processing and Planning and Accounting.

On the smaller peasant family farms, all decisions are made by households. They would benefit from participation in the agricultural cooperative, especially in the area of marketing.

Since there are no sections for marketing, procurement, and financing in the production cooperatives, it is proposed to establish a new agricultural cooperative which is responsible for these functions as outlined in Sub-section 3.2.9.

(2) Water User's Association (WUA)

The WUA is needed to assure equitable delivery of water to all of the farms, especially the new peasant family farms in the Study Area, which do not have adequate water supply or a voice in water management. Currently, the hydraulic system serves multiple users and farms. Water is delivered to the head gates of the production cooperatives and then is centrally administered by these two units at the farm level. However, there are numerous peasant farms which function independently of the larger production cooperatives and they presently rely on the larger farms for irrigation water. The current system does not assure the representation of the minor farms in irrigation water management nor does it guarantee timely and adequate delivery of water in requisite amounts. Peasant farmers report that they receive water in insufficient amounts and not at the needed times. Canals serving the area are in disrepair; some of those serving peasant family farms are nearly non-functional. Moreover, smaller farms must pay the larger production cooperatives for water; a commodity the larger farms do not have legal right to administer on an inter-farm basis.

The Committee on Water Resources, which has domain over inter-farm systems, seeks to develop water user associations to manage water at the local on-farm level. In addition, the farming system is constantly evolving within the newly privatized market context and it can be expected that during the project period, the farming system will develop into smaller units

including more peasant farms and additional production cooperatives. Formation of a WUA will provide the organizational mechanism for on-farm irrigation management. This proposal is fully supported by national, oblast, and raion officials as well as farmers themselves.

The WUA provides the organizational structure for equitably distributing water, collecting fees, controlling water theft, and implementing the O&M plan. It is a corporate form of organization that entails an elected board of directors, a manager, irrigation employees, and water users. It is proposed that water users' groups (WUGs) will be organized at brigade level to make O&M activities of the irrigation and drainage system of brigade. WUGs will form WUA which basically be organized for each on-farm / inter-farm canal. WUAs in Kzyl-Orda Left Bank Area will form a Water Users' Union (WUU) on the Left Main Canal basis to distribute an equitable water to each on-farm/inter-farm canals and carry out the maintenance work. In addition to the above function, WUU will have a function as contact point with the Oblast Committee on Water Resources for preparation of operation program of the intake structure of the headworks and assisting and advising WUAs in preparing a maintenance and repairing program.

Farmer surveys indicate strong support for agricultural reform in the Study Area. All of the farmers interviewed support the privatization of agriculture and 66% support the privatization of irrigation. Over 80% said their situation had improved as a result of privatization. One hundred percent said they would be willing to join a water user association, if it would improve local water management. Over 80% said that they would engage in regular maintenance activities and would be willing to pay more for water, if it would improve supply and reliability.

2.2.7 Irrigation Development Plan

(1) Irrigation Method

(a) Basic Concept and Strategy

A basic concept of irrigation for this project is to supply the farm land with an adequate quantity of water required for crops when they need it. The current over-supply of irrigation water and seepage water though the Kzyl-Orda Left Bank Massive Irrigation System, which causes salt injury to the upland crops due to rising groundwater, should be controlled. In order to attain this objective, measures should be taken to provide the Study Area with an adequate quantity of water effectively for crop cultivation, to distribute the water with less conveyance and operation losses through improvement of the irrigation water supply system, and ultimately to restore the natural environment of Aral Sea by applying such water saving methods to other irrigation projects in the Syr Darya and Amu Darya basins.

(b) Irrigation System

The run-of-river type of system will be employed as the water diversion method for the project also in the future. The irrigation water will be diverted from the Syr Darya river at the existing headworks for the project area and conveyed to the farm lands through canals by gravity. The existing major irrigation canal network will be used for the future plan.

However, a minor modification will be made in the distributors, and some distributors will be demolished and/or integrated with other distributors, taking into account the water head, location of farms, etc.

The future irrigation area is the same as the original rice rotation area of 87,000 hectares in total, but the command area of each distributor will be rearranged based on the proposed land use discussed in Paragraph 2.2.4(2). The areas to be irrigated through major canals are as follows:

Irrigation Area at Head Works	87,000 ha
in which : Area irrigated directly from LMC	33,390 ha
Area thru. Right Branch	34,960 ha
Area thru. Left Branch	15,890 ha
Area for Kos-Uzyak	2,760 ha

(c) Field Irrigation Method

The irrigation water at the farms will be conveyed to the crop rotation areas through on-farm canals and to the irrigation rotation area by the field canals. Along the field ditches, 4 to 8 farm plots will be arranged. The water will be supplied to the farm plot through the inlet provided for each farm plot.

The surface irrigation method will be applied at the farm plot, i.e., flooding irrigation for paddy and flooding/corrugation irrigation for upland crops. The water depth of flooding irrigation will be 5 to 10 cm for one time, depending on the rotation interval and crop growing stage, while the irrigation application interval for upland crops will be determined by crop water requirements and total readily available moisture (TRAM). Flexibility in time and depth of water will be maintained to accommodate the distinct difference in crop water requirement during the crop growing cycle. The water saving irrigation is better rather than application of the fixed water supply schedule. Deep flooding depth of water and/or over-supply of water should not be allowed. If the proposed water depth is difficult to be applied to one plot due to undulation of farm land, provision of farm levees and/or ditches parallel to contour line are recommended.

(2) Irrigation Water Requirements

(a) Crop Water Requirement

The determination of irrigation requirements for paddy and for upland crops is different. The crop water requirement for paddy is the water required for evapo-transpiration of crop and deep percolation, while the crop water requirement for upland crops is the water necessary to be retained in soils for the growing of crops. The water requirement for crops must be estimated based on the field measurement data. However, since adequate data were not available, the Modified Penman method, which is commonly applied for other projects in Kazakstan, was used in the Study Area (Annex F).

For estimating crop water requirements, the reference crop evapo-transpiration (ETo) on a monthly basis is computed for a crop growing period by applying the Modified Penman method. Crop coefficient (Kc) is selected by referring to FAO Irrigation and Drainage Paper No.24. For paddy field, the percolation rate of 3 mm/day is applied considering that the characteristics of soil in the area are mostly silty, and the groundwater table will be lowered in the future by improving the drainage canal system.

Since meteorological data for the estimate of ETo were collected from the meteorological station located in dry surroundings, the Oasis effect is considered in the calculation of ET crop, applying the correction factor of 0.85 for summer season cropping and 0.9 for winter season cropping.

In addition, non-irrigation period before harvesting is set up to be 30 days for paddy, 20 days for maize and wheat and 15 days for vegetables. Based on the proposed cropping calendar, the water requirements for crops are obtained by multiplying ETo by Kc as follows:

Crops	Cropping Period	Sowing	Harvesting	Avg. Kc	ETcrop (mm)
Paddy	120 days	May	Sept.	1.01	964.6
Maize	135 days	May	Late Sept.	0.73	610.9
Spring Wheat	110 days	Late Apr.	Mid-Aug.	0.71	539.6
Winter Wheat	280 days	Late Sept.	Early Jul.	0.74	789.5
Melon etc.	120 days	May	Sept.	0.75	544.5
Safflower	120 days	May	Sept.	0.69	638.6
Lucerne	360 days		May/Jul./Sept.	0.90	1,217.7

Note 1: The sowing and harvesting last for 30 days in the above-mentioned months respectively.
2: ETcrop for paddy includes percolation water.

(b) Net Irrigation Requirement

(i) Pre-irrigation Water

For paddy, a water depth of 120 mm will be supplied immediately after sowing, for saturation of the tillage depth of about 20 cm, to soak seeds and to protect seeds from birds. After one week of soaking, standing water in the paddy field will be drained. The irrigation water for crop management will be supplied one week after drying. While, for upland crops, a water depth of 25 to 35 mm, which is equivalent to TRAM for a tillage depth of 20 cm, will be supplied as a pre-irrigation for ploughing, harrowing and seed germination.

(ii) Leaching Water

According to the proposed cropping pattern, the planting of upland crops is scheduled after paddy cultivation. Salinity level in the soils will be decreased by deep seepage water (percolation) from the paddy field and lowering of the groundwater table by drainage improvement. In other words, paddy irrigation will leach salt accumulation in the soils. Therefore, leaching water is not taken into account in the calculation of water requirement. In actual practices, however, some leaching water will be given to the field, when serious salt concentration is observed on soil surface.

(iii) Effective Rainfall

Effective rainfall is defined as a quantity of precipitation consumed by crops effectively at the field level. Precipitation during the non-irrigation period for the months from October to March is estimated at 74 mm in 4 of 5 years, but precipitation is negligibly small for the months from April to September. The effective rainfall is therefore ignored for the summer season crops but counted for the winter season crops, such as winter wheat and lucerne, in 1/5 year probability.

(iv) Groundwater Contribution

The contribution from groundwater was determined by the depth between groundwater table and the root zone of crops, expecting the capillary properties of soils. Considering the lowering of groundwater in future after the project implementation, groundwater may contribute to crop growing. The salinity content in the groundwater in its upper portion may be more or less 1,000 mg/lit, as observed by the water quality survey in the drainage channels under the sub-let contract. In order to avoid over-supply of water to upland crops, therefore, the groundwater contribution was taken into account as moisture supplied by capillary action.

(v) Stored Soil Water

The water requirements for winter season wheat and lucerne are estimated at about 26.6 mm and 78.3 mm in the non-irrigation period from October through March. While, precipitation during the same period is estimated at about 70 mm in 4 out of 5 years, which percolates to the root zone of crops in spring after thawing of frozen rain water. The groundwater table is relatively high, 2 to 3 meters, and contributes to the crops. From these conditions, it is judged that the stored soil water may be at field capacity in the initial stage of the irrigation period, especially in April. Then, the supply of stored soil water is assumed to be about 60 % of readily available soil water for crops.

(vi) Net Irrigation Requirement

Net water requirement for irrigation is calculated by subtracting effective rainfall, groundwater contribution and stored soil water from the sum of crop water requirement and pre-irrigation water on a monthly basis. The net irrigation requirements thus calculated for the period from April to September are as follows:

(Unit: mm)

Crops	ET crop	Pre-Irr.	Groundwater	Soil Stored	N.I.R.
Paddy	906.5	120.0	-	-	1,026.5
Maize	602.6	35.0	400.1	-	237.1
S. Wheat	446.8	30.0	245.8	-	231.0
W. Wheat	457.3	-	117.3	79.2	260.8
Melon etc.	462.5	30.0	52.6	-	439.9
Safflower	567.1	30.0	206.2	-	390.9
Lucerne	1,002.1	30.0	493.6	85.8	452.7

Note: N.I.R; Net irrigation requirement

(c) Irrigation Efficiency

The water diverted from the headworks to be conveyed to the farm plots is reduced in quantity due to evaporation from the water surface, seepage from wetted perimeter of canals and leakage through cracks/holes of canals, etc. (conveyance losses), due to water distribution waste caused by time lag between the headworks and farm plot, water necessary for damming up the water surface by the regulators/check structures, etc. (operation losses), and due to water application method to the crops in the farm plot (application losses).

The conveyance losses will be largely reduced for the Left Main Canal and Right and Left Branch Canals by providing concrete lining on side slopes, and improved inter-farm/on-farm canals, field canals and field ditches by rehabilitating and improving those canals. The operation losses will also be reduced significantly by improved water management. The application losses are expected to be reduced by better farm management.

Irrigation efficiency is expressed by percentage of net irrigation requirement to the diversion water requirement which involves all the losses. The proposed irrigation efficiency and the estimated present efficiency are compared below:

Items	Present		With Project	
	Paddy	Upland	Paddy	Upland
Application efficiency	85%	60%	95%	70%
Conveyance efficiency	42%		73%	
Operation efficiency	45%		80%	
Weighted mean of overall efficiency	16%		52%	

(d) Diversion Water Requirement

The diversion water requirement for the irrigation period from April to September was calculated taking into account the net water requirement for crops, proposed cropping pattern and irrigation efficiency shown below:

D.W.R.	April	May	June	July	Aug.	Sept.	Total
in MCM	26.4	327.3	275.6	347.5	181.3	46.8	1,205.9
in m^3/sec	10.2	122.3	106.3	129.7	67.7	18.1	80.0*

Note * : Average

The above calculated diversion water requirement will be supplied from the Syr Darya river, because the estimated average monthly discharge of the Left Main Canal is more than the above requirement. Moreover, about 760 MCM per annum or 40 % of the average quantity of water presently discharged to the Left Main Canal would be saved after implementation of the project.

The design diversion water requirement is calculated as the maximum water requirement taking into account the crop rotational pattern, and obtained to be 137.1 m^3/sec at the headworks. The unit design discharges applied to the respective canals are obtained as follows:

(Unit: lit/sec/ha)

Canals	Unit Design Discharges
For Main, Branches and distributors	1.576
For Field Canals	1.772
For Field Ditches	4.170

(3) Irrigation Facilities

(a) Irrigation Canals

As described in Paragraph 2.1.6(1), the canal banks of Left Main Canal as well as Left and Right Branch Canals and other subordinate canals have receded from erosion due to unfavorable geological conditions and improper design of water flow velocity. Furthermore, the groundwater study in Paragraph 2.1.3(5) has revealed that fluctuation of the groundwater table is largely caused by canal seepage water especially along the major canals. Accordingly, rehabilitation and improvement of these canals should be implemented particularly for reducing erosion and seepage. The rehabilitation and improvement plans of these irrigation canals are as mentioned below;

(i) Left Main Canal and Right and Left Branch Canals

The Left Main Canal with a length of 85.4 km was constructed to convey irrigation water from the headworks to the bifurcating point of the Right and Left Branch Canals. The Right Branch Canal with a length of 70.2 km and the Left Branch Canal with a length of 48.6 km were constructed in the Kzyl-Orda Left Bank Area to supply irrigation water to the farms in the downstream area. The proposed diversion water requirement of the Left Main Canal and the Right and Left Branch Canals are 137.1 m^3/sec, 55.1 m^3/sec and 25.0 m^3/sec respectively. However, considering that the potential development area is 142,400 hectares as mentioned in Paragraph 2.1.6(1), the additional discharge is considered for the above mentioned potential area.

Since the present irrigation canal network has been completed and functioning, the rehabilitation and improvement works are designed to convey the design discharge without changing the originally designed water level and canal gradient, and without interrupting the water supply during the construction period. Service roads along these canals will also be upgraded by providing gravel pavement.

For conveying irrigation water by the main and branch canals in an effective way, provision of canal lining would be needed, because the banks of these canals are very erosive and allow lots of seepage as mentioned in the above. There are three types of canal lining methods, which are: (i) hard-surface and exposed-membrane lining; (ii) buried membrane linings; and (iii) earth lining. Taking into account the availability of local materials and local experience for the selection of lining method, it is judged that the buried membrane lining is not recommended, while the hard-surface and exposed-membrane lining such as concrete lining and precast concrete block lining are recommended. As for earth lining, the soil mechanical test carried out under the sub-let contract in the Phase-I Study has revealed that there would be no suitable material for

the earth lining in and around the Study Area, and therefore this lining method is not recommended.

Since there would be no technical difficulty in construction of concrete lining and precast concrete block lining as mentioned above, the comparative study is made only from the economical viewpoint between cast-in-situ concrete lining and precast concrete block lining on inside slopes of canal, taking the total length of the main canal as a sample. The following table shows the result of comparison:

(Unit: US$ '000)

Description	Concrete Lining	Precast Concrete Block Lining
Construction Cost	96,649	93,427
Annual Equivalent Total Cost		
- Annual Equivalent Construction Cost*	9,748	9,423
- Annual Operation and Maintenance Cost	384	434
- Total	10,132	9,857

Note: *; at the discount rate of 10% in the project useful life of 50 years.

According to the above table, the precast concrete block lining has more advantage from the economical view point. Furthermore, if the following points are taken into consideration, the precast concrete block lining would be more advantageous:

i) The production of concrete block will be made at factories and the quality control is easier than that of concrete lining.

ii) The production of concrete block can be made without being affected by the irrigation water and climate.

iii) A construction period of lining works is limited in non-irrigation period from September to April. During this period, particularly from November to March, it is impossible to provide a cast-in-situ concrete for lining because of low temperature. While, the concrete block lining works can be implemented regardless of temperature resulting in shortening the construction period.

iv) In case of the concrete block lining, it is easier and quicker to repair the damaged portion, because replacement of panels is only required at the damaged portion.

(ii) Inter-farm/On-farm Canals

All the inter-farm/on-farm canals are branched off from the main or branch canals to convey the water to brigades in the farms. There are 8 inter-farm canals and 63 on-farm canals in the Left Bank Massive Irrigation System, and the total length of these canals is 473 km. All the inter-farm/on-farm canals will be lined with concrete to avoid slope erosion and to cut seepage through the wet perimeters of canals. Service roads provided along these canals will also be metaled with gravel.

(b) Related Structures

In order to operate the canal system in a proper and secure manner, the following related structures need to be rehabilitated or newly provided in the canal system:

(i) Kzyl-Orda Headworks

The intake structure at the headworks will be rehabilitated for the proper water supply to the Left Main Canal. The work consists of: 1) replacement of 6 intake gates including mechanical and electrical works; 2) replacement of downstream guide walls; 3) re-construction of sand flushing conduits; 4) rehabilitation and improvement of downstream protection work; and 5) replacement of electrical work for the gantry crane. No provision of settling basin will be made, since the particle size of sediment load in the river water is smaller than 0.3 mm, which is the minimum size for the provision of settling basin in general.

(ii) Headgates

All the gates installed on the headgate structures and provision of concrete protection works for inlet channel will need to be replaced with new ones.

(iii) Regulators

The replacement of all the gates installed on the regulators; 5 regulators and one hydro net on the Left Main Canal, 7 regulators on the Right Branch Canal and 5 regulators on the Left Branch Canals, will be needed as well as replacement of mechanical and electrical works.

(iv) Spillways

Spillways of over-flow type without gates will be provided in front of every regulator and at certain places where spill-out facilities are required from the hydraulic viewpoint.

(v) Turnouts

The gates installed on all turnouts will be replaced to divert irrigation water to field canals in a proper way.

(vi) Measuring Device

A measuring device will be provided at each headgate point to measure the discharge precisely for the use of water charge collection.

(c) On-farm System

All the field canals and field ditches will be rehabilitated and improved so as to convey required irrigation water smoothly and effectively.

For proper operation of the on-farm system, the gates installed on all the off-takes will be replaced, since these gates have been used for more than their durable period and mostly damaged. The locations of about 20 % of field outlets will be shifted to more suitable places to improve the drainage condition at the plot level.

(d) Service Road

All the service roads provided along the field canals and field ditches as well as field collectors and field drains will be rehabilitated by filling depressions on the road surface with earth.

2.2.8 Drainage Development Plan

(1) Drainage Method

(a) Basic Concept and Strategy

The direct objective of drainage is to improve crop growing condition and working condition for farming by draining excess water on the ground surface and in the soil. Drainage control is very important in the management of farm land, same as in the case of irrigation. The main purpose should be sub-surface drainage to control soil moisture rather than surface drainage in the Study Area, because rainfall in the area is very small with mean monthly precipitation ranging from 19.3 mm in May to 3.5 mm in August and a total rainfall of 59.0 mm during the irrigation period; April to September.

From the above standpoint, drainage control will be pursued to remove excess soil moisture to a depth of about 0.5 meter below the ground surface and to lower the presently high groundwater table by 0.5 meter. Through this drainage control, it is expected to improve farming operations and to accelerate leaching of salt in the top soil.

(b) Drainage System

The present drainage system will be upgraded, which consists of the Kuvan Darya river basin with North and South Main Collectors, the Karmakshy drainage area and the Zhana Darya river basin in the Kzyl-Orda Left Bank Area as mentioned in Paragraph 2.1.6(2). The drainage area in the Syr Darya river basin is situated outside the proposed irrigation area.

The drainage water in the upstream area of the North Main Collector will be directly conveyed to the existing North Main Collector in the downstream area by providing a drainage siphon across the Right Branch Canal. The existing drainage diversion channel will not be used any more. The collected water in the North and South Collectors will be drained away to the outside of the irrigation area through the Kuvan Darya river. The drainage water of major collectors in the Karmakshy drainage area will be finally discharged to the depressed land.

The drainage water at the farms will be discharged to the inter-farm/on-farm collectors through the field drains and field collectors. The water collected in the inter-farm/on-farm collectors will be basically discharged to the main collectors. Nevertheless, some will be

drained directly to the depressed land, in case the water can not be discharged to the main collectors due to lower elevation of the depressed land than the bottom elevation of the collectors.

The surface drainage system is not so developed at present in the area. The excess rain water penetrates into the soils, flows down to the depressed land and/or drains to field drains in the farm land. Most of this water will finally contribute to the groundwater, or will be collected by the drainage channels as percolation water. A small quantity of excess water in the farm land may flow out to the field drains because of small quantity of rainfall and retentive function of paddy field for rainfall. The drainage system in the settlement area, however, should be improved to drain away the water to the field collectors or on-farm collectors by providing village drainage channels.

(c) Field Drainage Method

At the farm plots, the excess water will be drained away though a farm outlet provided in each farm plot. The farm outlet will be located at the lowest portion in the farm plot. As stated previously, provision of temporary farm ridges in the farm plot, in the case of undulated farm land, will be effective to keep the water depth evenly in the farm plot, for accommodating heavy rain and over-supply of irrigation water caused by mis-operation of facilities. The farm drain will collect not only such excess water from the farm outlet but also the excess soil moisture seeping to the field drain.

Natural drainage by open channel will be employed as the field drainage method. The open channels will be designed with low water level enough to collect the percolation water along the channels. By keeping the water level in the open channel at 1.5 meter below the field ground surface as a minimum, the drainage objective stated previously will be achieved. However, proper drainage control to maintain the lower water level in the channel is needed for the sub-surface drainage. Excessive surface water can satisfactorily be drained away to these open channels, because of less rainfall during the irrigation period.

As the drainage conditions of the farm lands are not so poor and groundwater table will be moderately controlled after the Project, the under-drainage system will not be recommended from the engineering and economic points of view.

(2) Drainage Discharge

(a) Drainage Module

The drainage water in farm land will consist of percolation water collected by the field drains and a part of operation losses from irrigation water distribution. While, the drainage water from the land other than the farm land will be of percolation water collected by other channels, such as main collectors, inter-farm/on-farm collectors, etc. Drainage module is estimated based on the said standpoints, and the estimated results are as follows:

Land Category	Drainage Module ($m^3/sec/km^2$)
Farm land	0.0398
Other land than farm land	0.0174

(b) Drainage Discharge

Drainage discharges for major collectors are calculated by applying the drainage module to each land category, and the calculated results are as follows:

Collectors	Location	Drainage Area (km^2)	Discharge (m^3/sec)
North Collector	Before confluence	1,388.4	30.0
South Collector	Before confluence	1,557.1	34.0
Kuvan Darya river	At End of Project Area	3,399.7	74.4
East Karmachinsky C.	at Confluence	254.8	5.0
West Karmachinsky C.	At End of Project Area	357.9	8.2
Chokes Collector #1	At End of Project Area	223.9	5.2

(3) Drainage Facilities

As mentioned in Paragraph 2.1.6(2), most of the drainage canals are deteriorated by sedimentation and erosion due to lack of maintenance. In order to maintain the proper drainage function of the canals, therefore, sediments in the canal will be removed, and service roads provided along the drainage canals will be restored to the original shape.

Particularly for the North Main Collector, the canal is separated into two reaches by the Right Branch Canal; i.e. upstream reaches and downstream reaches at present due to technical difficulty in construction of a cross syphon across the Right Branch Canal. For the proper drainage operation, the collector should be connected across the Right Branch Canal following the original design.

There are 29 bridges on the North and South Collectors and other collectors. The conditions of the super-structures are generally fair, but scouring around the bridge abutment is severe. Therefore, the canal protection works will be needed upstream and downstream of all the bridge abutments.

2.2.9 Development Plan of Rural Infrastructure

(1) Farm Roads

A main trunk road in the Study Area is the International Road M32 (Moscow - Peking road) which runs through the Study Area in east-west direction. This road is well maintained, and all the farms in the Study Area can access to this main trunk road directly or through other trunk roads. The farm road network in the farms is also well developed as shown in the following table:

Raion	Road Pavement (km)		Condition		
	Asphalt	Gravel	Fair (km)	Poor (km)	Poor (%)
Syrdarya	12.2	14.7	2.2	24.7	91.8
Terenozek	66.1	84.2	10.9	139.4	92.7
Zhalagash	103.2	122.4	17.8	207.8	92.1
Karmakshy	72.9	99.0	12.4	159.5	92.8
Total	254.4	320.3	43.3	531.4	92.5

As seen in the above table, the rate of asphalt-paved roads to the total length of the access roads is 44.3% in the Study Area. Among these farm roads, 7.5% of roads are in good condition and the remaining 92.5% are in poor condition. Among them, about 211.2 km of the asphalt-paved roads should be re-paved, and the total length of 320.3 km of the gravel roads should be re-metalled as shown in the following table, to facilitate marketing and farming activities in the Study Area:

(Unit: km)

Farm	Existing Road Length		Road Length to be Paved	
	Total	Poor Condition	Asphalt	Gravel
Syrdarya Raion	26.9	24.7	10.0	14.7
Terenozek Raion	150.3	139.4	55.2	84.2
Zhalagash Raion	225.6	207.8	85.4	122.4
Karmakshy Raion	171.9	159.5	60.5	99.0
Total	574.7	531.4	211.1	320.3

(2) Rural Water Supply System

Rural water supply in the Study Area is mostly from piped systems from deep wells except some of which are served by shallow wells. These piped water supply systems are equipped with water purification plants in most cases, while water supply systems by shallow wells are not provided with any purification plants.

About 20 existing schemes of deep well water supply, all of which have a depth of more than 400 m, are confirmed in the Study Area. Among these existing schemes, 5 schemes have a difficulty for the use of wells due to high contents of organic matters such as BOD and COD in the water, and about 13,000 of beneficiaries are facing poor quality of drinking water.

The following table shows three rural water supply schemes being promoted by the Oblast Administration in the Study Area. Since designs of these schemes have been completed, financial arrangement is now required.

Title	Water Source	Beneficiary (Nos.)	Pipe Length (km)	Discharge (lit/sec)
Kzylordinsk Left Bank	Toragnylysayskoe	26,100	66.8	40.97
Octyabrsky	III International Farm	17,800	116.3	52.31
Akkoshkarsky	Akkoshkarsky Farm	15,100	87.0	58.33

Source: Kzylorda Left Bank Group Pipe Water in Kzyl-Orda Oblast, 1990

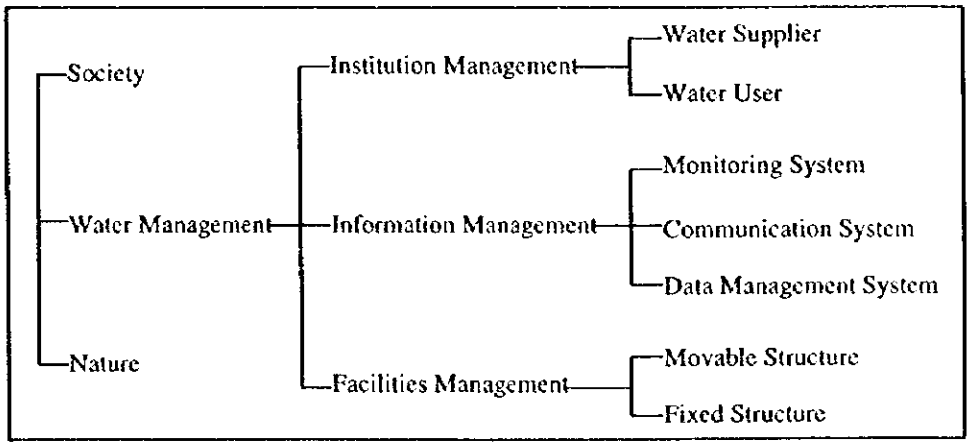
When the above-mentioned schemes are completed, these schemes will cover almost all the Study Area, and residents who need the water supply will be able to get water from these piped water systems. Accordingly, 13,000 people under unfavorable conditions and people who are using water from shallow wells will be benefited by the above water supply schemes. Therefore, these three rural water supply schemes are proposed to be taken up as one of the project components.

2.2.10 Improvement Plan of Water Management and O&M

(1) Overview of Water Management

In association with the current water management situation and the proposed infrastructure development plans, the water management improvement plan is also envisaged to the project goals.

It is significant that water management stands for an interfacial position between nature and society, and comprises three major components such as facilities management, information management and institution management as shown below:



(2) Water Management System

(a) Facilities Management

It can be deemed that the irrigation/drainage facilities are transformed nature which benefits the society by providing controlled water for agricultural production.

The irrigation/drainage facilities to be managed under the project are described in Sub-sections 2.2.7 and 2.2.8. The major features are summarized in Table 2.2.8.

Facilities management is identical to the operation and maintenance (O&M) of project facilities. Maintenance refers to the activities to keep the facilities as near to their original state as possible. While, operation means the activities to perform the originally intended function of facilities. Facilities management can be performed through the information management mentioned below.

(b) Information Management

Information management occupies a pivotal role in water management and consists of the following systems:

(i) Monitoring System
(ii) Communication System
(iii) Data Management System

The overall water management scheme is illustrated in Figure 2.2.3 that represents not only the scope of information management but also the relation with the institutions involved and the facilities to be managed.

(i) Monitoring System

The Project facilities are currently managed through the line of Hydro Station-Raion Management of Water Economy System (Raion Water Management Office)-Hydro Department-Kzyl-Orda Oblast Committee on Water Resources as illustrated in Figure 2.2.3. While the On-farm canals are managed by the Farm Management as shown in Figure 2.1.16.

The most important water management activity in the above line would be the water level and discharge measurements, because they originate data for the water management. The water level measurement will be carried out every ten days at each hydro-post by the hydro-station staff. While the discharge measurement is undertaken twice a year to establish H-Q relationship at the same hydro-post sites.

(ii) Communication System

The measurement data are transmitted by radio to the Oblast Committee on Water Resources through the Hydro-Department for Kzyl-Orda Headworks and relevant Raion Water Management Offices. The data transmission routes are as illustrated in Figure 2.2.3. In this figure the dotted lines denote manual operation by motor cycle or tractor as the case may be. While the real lines indicate public telephone or radio system as the case may for ensured data transmission.

(iii) Data Management System

The data management system refers to the computer system comprising hardware, software and humanware. The software consists of database and model. The database is suggested to be built upon the CALS (Continuous Acquisition and Life Cycle Support) concept, because it enables to provide a consistent project management system throughout the planning stage to management stage in autonomous way. The dissemination to similar projects would also be facilitated by applying the above concept.

(c) Institution Management

The significance of institution management is explained in the following section.

(3) Institutional Structure

(a) Background of Institution

The institutional structure of water management consists of the water supplier side and the water user side. The Water Committee on Water Resources represents the former and the Farm /Water User Association (WUA) stands for the latter. There are 25 farms and 165 independent family farms within the Study Area being already privatized by October 1996. Even after privatization the land is still the property of the state but the rights of use transferred to individuals. It is quite similar to the relationship between joint-stock company and stockholder.

The institutional framework of the water users organization should subsequently coincide with the land holding/tenure system in principle. It means that water is incidental to land but not vice versa.

(b) Water Supplier

The institutional structure of the water supplier side is fully described in Sub-section 2.1.7 and Figures 2.1.13, 2.1.14, 2.1.15 and 2.1.17. The institutional context of water supplier side is precisely described in Figure 2.2.3 and Table 2.2.9.

(c) Water User

The farm is current water user and its water management system is presented in Figure 2.1.16. The interrelation with the water supplier side is also shown in Figure 2.1.17. The current on-farm level water management issues seem to be non-technical but financial matters originated from water pricing mechanism or farm products marketing system. Nevertheless, there is considerable room to improve the current institutional structure in water user side as dealt with in the following section.

(4) Water Users' Association

The on-farm level water management has been practised within the framework of the farm management based on the top-down system as shown in Figure 2.1.16. However, this system involves several drawbacks to achieve the goal of privatization mentioned in Sub-section 2.2.6. Thus, the Water Users Association (WUA) has been advocated instead of the current farm based water management. Formation of WUAs would be in consequence of an increase in the number of eligible independent family farms.

2.2.11 Environmental Consideration

(1) Initial Environmental Examination (IEE)

Initial Environmental Examination (IEE), which is a preliminary environmental review to assess the project formulation in the Master Plan, was conducted on the present condition in the Kzyl-Orda Left Bank Area. Referring to the existing guidelines for Environmental Impact Assessment (EIA) prepared by JICA, IBRD, International Commission on Irrigation and Drainage (ICID) and Overseas Economic Cooperation Fund (OECF), Japan, 16 environmental items are selected for the IEE. The area to be affected by the project is broadly divided into following three ecological regions:

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

The result of IEE is shown in Table 2.2.10. As a result, the following environmental items are expected to be significant impacts caused by the project.

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

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

(2) Preliminary Environmental Conservation Plan

(a) Negative Impact Caused during the Construction Stage

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

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

(b) Deterioration of Water Quality in the Drainage Canals and the Kuban Darya River

According to the result of the salt balance study shown in Paragraph 2.2.11(2)(e), the water quality in the drainage canals and the downstream reaches of the Kuban Darya river will be deteriorated due to increase of the total salt volume from the irrigation area in future. As for the Kuban Darya river, however, no major damage to environment in the downstream reaches of the river will be expected even after the completion of the project, since this river disappears in the desert. On the other hand, the water of drainage canals is contaminating irrigation water in the Study Area at present. Therefore, the following countermeasures should be taken for the project:

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

(c) Application of Chemical Fertilizer and Agro-chemicals

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

(Unit : ton)

	Nitrogen	Phosphorous	Potassium	Pesticide	Herbicide
Present Condition	3,300	2,100	0	300	100
With Project Condition	8,000	6,200	2,400	2,600	300
Balance	4,700	4,100	2,400	2,300	200

According to the above result, the possibility of negative impact will be expected after the implementation of the project, if there is no environmental protection. Therefore, the following countermeasures should be taken for the project:

- To make proper use of chemical fertilizer and agro-chemicals through the farmers' training and extension activity.
- To select the chemical fertilizers which are low salinity content as far as possible.

- To select the agro-chemicals which have low toxicity hazard and high dissolution.
- To avoid the spray of the agro-chemicals by airplane, and
- To monitor the water quality and damage to human and animals.(d) Conservation on Tugai Vegetation

According to the result of the flora and fauna survey, the Tugai vegetation distributed along the Syr Darya river is the most important ecosystem in the Kzyl-Orda Left Bank Area because of not only water conservation factor but also natural habitant for wildlife and birds including significant species. Therefore, the following conservation manner should be noted for the project:

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

(e) Evaluation of Positive Impact To Be Caused by the Project

According to the result of the IEE, the following positive impacts will be expected in the environmental condition after the project:

(i) Increase of Inflow to Aral Sea

According to the result of the water balance study as mentioned in Paragraph 2.2.3(3), the discharge of the Syr Darya river to Aral Sea will increase from present 3,568 MCM to 4,282 MCM or 20 % under the future "with project" condition. If the same irrigation development system as proposed in this study is applied to other irrigation areas in the Syr Darya river basin area in the part of Kazakstan, the discharge of the Syr Darya river to Aral Sea would increase from present 3,568 MCM to 5,369 MCM or 50 % under the future "with project" condition. As a result, reduction of surface area of Aral Sea is expected to be restrained to some extent. In addition, the vegetation along the Syr Darya river would recover because of increase of river flow.

(ii) Decrease of Salinity Hazard

Based on the existing data and the result of soil survey and water quality analysis conducted under sub-let contract in the Phase-I Study, the salt balance study was made on a preliminary basis in four raions concerned. The result is summarized below:

(Unit : dS/m)

Soil Depth	ECe in Soil				
	Syrdarya	Terenozek	Zhalagash	Kamakshy	Study Area
Present Condition					
0-100 cm	5.15	4.11	3.77	6.70	4.93
100-200 cm	5.04	3.26	2.14	5.04	3.87
With Project Condition					
0-100 cm	3.83	3.70	3.63	3.91	3.77
100-200 cm	3.25	2.63	2.34	3.69	2.98

According to the above table, decrease of salt in the soil is expected because of the drainage improvement under the project and the increase in cropping intensity of paddy under the future "with project" condition in the Study Area.