4.6.4 Proposed Farming Practices and Farm Inputs

Proper farming practice is a one of the essential factors for realizing full exploitation of the agricultural potential in the Project Area. In the area, the presently prevailing large scale mechanized farming will also be employed in future, because the field plots are very large and labor forces are limited. For establishment of profitable and sustainable agriculture, a package which includes selection of variety, certified seeds, planting period, cultural practice and farm inputs, needs to be introduced to the area. The expected yield and cropping intensity will be attained through employing the package under stable irrigation water supply and adequate drainage. The recommended packages for crop cultivation are shown in Table E-32-E-37.

The present low yields of crops are attributed to application of low dose of fertilizer, delayed planting and poor crop husbandry, especially weed damage. In addition to these, particularly for paddy, its low yield is attributed to uneven crop establishment which is caused by inadequate drainage control due to undulation in the field. And delayed seeding and delayed harvesting are also cause of low yield of paddy. In order to increase of paddy yield, therefore, the elaborate land preparation and water management should be made to attain the complete drainage of surface water, during the period from germination stage to crop establishment stage (7 to 14 days after seeding). Such land preparation will be made by farmers themselves by using tractors, though it will take certain place. Since the undulation in paddy field is mainly brought by furrow of combine harvester at harvesting time, it is necessary to plough and to harrow and leveling the paddy field just after harvesting for decreasing undulation in the field.

Also, weed damage is also one reason of low yield. The elaborate weed control is necessary for increasing yield. Weed control would be carried out by herbicide application and water management. In addition to these, timely application of adequate amount of fertilizer and determination of most adequate cropping season are also necessary.

Since the Project Area is salinity prone, crop rotation pattern should be decided in consideration of prevention of salt accumulation on the soil surface. In this regard, it is intended to cultivate all upland crops after paddy cultivation and just after upland crop cultivation, paddy should be planted, because paddy cultivation is very effective for leaching salt from soil surface.

The agricultural input requirement per hectare recommended for future farming practices are shown in Table E-38 and summerized below.

	Seed	Fertilizer(kg)			Pesticide	Herbicide	Labor
	(kg)	N	P2O5	K2O	(kg)	(kg)	(man-day)
Paddy	300	150	80	30	5	5	6
Wheat	200	100	50	30	2	5	4
Safflower	80	80	60	20	2	5	6
Vegetables	3	180	80	30	2	0	75
Lucerne	5	30	60	30	0	0	5

At present, one of the reason why the planted area is decreasing and planting season and harvesting are delay is shortage and deterioration of agricultural machinery. Almost all of agricultural machinery in the two PCs are used for many years, average at 8 to 9 years. And almost all of the machinery should be replaced.

The required number of key farm machinery is estimated as follows:

(i) Staggering period for each operation is within 30 days.

(ii) Land preparation: one ploughing and two times harrowing.

(iii) Operation efficiency 75% for tractor and 70% for combined harvestor.

Under this condition, total number of required key machinery for farm operation is estimated as follows.

	Tractor	Plough*	Seeder	Mower	Combine
Ilyasov	108	57	9	12	54
Shagan	120	63	10	14	60

Note: Plough and Disc harrow

4.6.5 Anticipated Yield and Production

Present yields of crops in the Project Area remain at relatively low level and fluctuate year by year due to shortage of farm inputs, irregular irrigation water supply, poor crop husbandry and inadequate cropping season, especially during the period from 1992 to 1995. The low yields of crops during period from 1993 to 1995 had largely been affected by drastic decrease of farm inputs. The past trend of the yields of crops does not show a definite tendency. Therefore, it is difficult to forecast the future crop yield under "without project" condition from the past trend of crop yields. Considering such unusual crop yields in past five years, it is not correct way to estimate the crop yields based on the present yields for the "without project" condition. Therefore, the average crop yield for the period from 1986 to 1996 is taken as the yield of crop under the "without project" condition for each crop.

After completion of the project work, the yields of crops will increase through timely supply of irrigation water, adequate drainage and employing improved farming practices. The yields of crops under the "with project" condition are estimated on the basis of the present technology level, research outcomes on the yield potential, crop yields of developed countries which are situated in the same latitude as that of Kazakstan (Table E-39). The anticipated crop yields thus estimated for the "without project" and "with project" conditions are shown below.

(Unit: t/ha)

Crop	Ilyasov*1		Shagan*2		Total	
	without	with	without	with	without	with
Paddy	3.39	6.00	3.69	6.00	3.59	6.00
Wheat	1.08	2.80	1.04	2.80	1.06	2.80
Safflower	0.25	1.20	0.25	1.20	0.25	1.20
Vegetables*3	6.36	15.00	7.14	15.00	6.85	15.00
Lucern	3.09	7.20	2.74	7.20	2.86	7.20

Note: *1; P. C. Ilyasov and P. F. Berlek, *2; P. C. Shagan and Peasant Farms
*3; Includes melons

Future crop production after completion of the Project is estimated on the basis of the proposed land use, cropping pattern and anticipated yields of crops. The anticipated production in the Project Area is given in following Table:

(Unit: ton)

Crop	Ilyasov*1		Shagan*2		Total	
	without	with	without	with	without	with
Paddy	1,320	19,440	2,840	21,660	4,160	41,100
Wheat	110	2,380	230	2,630	340	5,010
Safflower	3	160	7	170	10	330
Vegetables*3	510	4,800	860	5,400	1,370	10,200
Lucern	620	13,970	1,070	15,550	1,690	29,520

Note: *1; Ilyasov PC and Berlek PF, *2; Shagan PC and peasant farms
*3; Include melon

The amount of production of crops under "with project" condition is about ten times of those under "without project" condition. An increase of the amount of crop production is largely attributed to an increase of cropped area.

4.6.6 Agro-processing and Post Harvest Facilities

(1) Rice Mill

Under the "with project" condition, paddy is the main crop and it occupies 50 % of total cropped land. Accordingly rice milling will be one of the main agro-processing activities in the Project Area. At present, there are some small rice mills and a large rice mill JSC "Akmarzhan" in and around the Project Area. Recovery of rice from paddy in rice mill JSC "Akmarzhan" is very low, only 50% (12% broken) and rice quality is also very low. These values are too low compared with international standard. Therefore, new rice mill which is international level, is required.

Recently, in Shagan PC a new German made rice mill has been built and Russian made one is under construction. Their capacities are 20 and 50 tons per day under two shifts, respectively. The percentage of recovery rate is around 65% including 6% of broken rice which is acceptable, though still inferior to world standard of first class rice, but their capacities will not be enough for the future quantity of paddy production.

Under the above-mentioned conditions, new rice mill construction is proposed for the Project. The required capacity of the proposed rice mill is estimated as follows:

(i) The quantities of paddy to be milled are 18,500 tons for Ilyasov Area and 20,600 tons for Shagan Area as shown below

	Area (ha)	Yield (t/ha)	Production (t)	Seed (t)	For milling (t)
Ilyasov	3,240	6	19,440	970	18,470
Shagan	3,610	6	21,660	1,080	20,580

(ii) The harvesting period of paddy is estimated from beginning of September to the end of September, around 30 days.

(iii) The operating conditions of rice mills are determined, based on the capacity of collection of paddy, processing and storing considering the present working condition.

Operation Period		7 month
Operation Days		180 days
Number of Operation Shift		3 shifts
Operation Hours	Total	24 hrs/day
	Net	21 hrs/day
	Annual	3,800 hrs

Under this condition, total required capacity for milling is estimated at 7 tons per hour for the Ilyasov Area asbd 8 tons/hr for the Shagan Area as shown below:

Item	Unit	Ilyasov	Shagan
Total Quantity	tons	18,470	20,580
Net operation days	days	180	180
Processing Capacity	ton/day	100	110
Operation Hours	hrs	21	21

Operation Efficiency	%	70	70
Milling Capacity	tons/hr	7	8

Present milling capacity of Ilyasov rice mill is 0.3 ton per hour. This value is negligible and does not meet required milling capacity for future paddy production. According this estimation, it is proposed that two sets of rice mills with 4 tons per hour will be established in Ilyasov Area. On the other hand, the rice mills in Shagan Area can treat 12,600 tons of paddy under the above-mentioned condition as shown in following table. Therefore, it is also proposed additional one set of rice mill with a capacity of 3 tons per hour will be established.

Item	Unit	Present Capacity	Additional Capacity	Required Capacity
Total Quantity	tons	12,600	7,980	20,580
Net operation days	days	180	180	180
Processing Capacity	ton/day	70	44	114
Operation Hours	hrs	21	21	21
Operation Efficiency	%	70	70	70
Milling Capacity	tons/hr	5	3	8

(2) Storage Facility

According to the result of field survey, the available storage capacity in the Project Area is 19,010 tons; 7,260 in Ilyasov Area and 11,510 tons in the Shagan Area as shown below

Present Condition

(Unit: ton)

	Ilyasov	Shagan
Raw Paddy	5,600	8,500
Cleaned paddy	700	1,100
Polished rice and seeds	350	550
Byproducts	500	1,300
Wheat	110	300
Total	7,260	11,750

Under the "with project" condition, since the amount of paddy production will increase, relatively large storage facilities will be required. The required storing facilities are estimated based on the following assumptions:

(i) Harvesting period of paddy is estimated from the beginning of September to the end of September, around 30 days and drying and threshing period is estimated from early September to middle of October.

(ii) Considering the capacity of rice mill, storage facilities for raw paddy and cleaned paddy estimated as one third of total harvest and one sixth of total harvest, respectively.

(iii) Polished rice except farm consumption is sold as soon as possible, and only small amount (500-600 tons) of rice is kept in storage. A larger part of byproduct is consumed in the farm as animal foods and kept for a long time. About half of byproduct is kept in the storage facility at a peak period.

(iv) Planted area of winter wheat is almost the same as that of spring wheat. The harvesting period of wheat is estimated early July to late August, around 50 days. A larger part of wheat is processed and consumed in the farm, and surplus is sold to market as soon as possible. The amount of wheat kept in the storage for a long time is estimated at one-eighth of total production.

(v) A larger part of fertilizer is directly transported to the field and only small part of fertilizer is kept in storage for a relatively long time (1- 3 weeks). The storage facility for fertilizer and agro-chemicals is estimated at a half amount of required nitrogen fertilizer for paddy.

(vi) The area of storage required for keeping 1 ton of paddy is estimated at 0.32 m^2.

Based on the above assumptions, required storage facilities are estimated as follows:

Required (Unit: ton)

	Ilyasov	Shagan
Raw paddy	6,500	7,500
Cleaned paddy	3,300	3,800
Polished rice and seeds	1,600	1,800
Byproducts	1,300	1,500
Wheat	300	300
Miscellaneous	500	500
Fertilizer*	900	1,080
Total	14,400	16,480

Note: * Fertilizer includes agro-chemical.

From the above estimates, additional storing facilities with 2,300 m^2 for Ilyasov Area and 1,800 m^2 for Shagan Area will be required in total as shown below. In addition to these, new rice mill building with an area of 2,000 m^2, is also required in Ilyasov Area.

Items	Additionally Required Storage Capacity			
	Ilyasov		Shagan	
	Weight (t)	Area (m^2)	Weight (t)	Area (m^2)
Raw Paddy	900	290	0	0
Cleaned paddy	2,600	830	2,700	860
Polished rice and seeds	1,250	400	1,250	400
Byproducts	800	260	200	60
Wheat	190	60	0	0
Miscellaneous	500	160	500	160
Fertilizer*	900	290	1,080	350
Total	7,140	2,290	5,730	1,830

Note: * Fertilizer includes agro-chemical

Additional storing facilities in the two farms are estimated at 2,300 m^2 for Ilyasov farms and 1,800 m^2 for Shagan Area. In addition to these, new rice mill building with an area of 2,000 m^2, is also required in Ilyasov Area.

(3) Processing and Post Harvest Facilities for Other Crops

As for the other crops than paddy, the quantities of production are nominal in the Project Area and mostly consumed locally at present after local processing as mentioned in Sub-section 3.3.6. There are some agro-processing facilities for other crops in the two farms, and around the Project Area, as stated in Sub-section 3.3.6. The capacity of these agro-processing facilities exceeds the requirement of processing for agricultural products. Therefore, no agro-processing facilities other than rice mill would not need to be constructed under the Project.

4.6.7 Livestock Production

Animal husbandry will also be one of the main agricultural activities in the Project Area. At the Oblast level, animal population, except poultry, has shown a decreasing tendency since

last five years as presented in Sub-section 4.3.7. This decreasing tendency seems to be temporary due to drastic change in the type of farms due to privatization of agriculture.

Since there are large area of grazing land and hay making land in the Project Area, the potential of animal feeding is high. Considering the trend of animal population and above mentioned potential of animal feeding, the animal population in the Project Area is deemed to be almost same as an average number of the recent four years under both "without project" and "with project" conditions.

4.6.8 Agricultural Supporting Service

(1) Agricultural Research

As noted in Sub-section 4.5.1, agricultural research is primarily the responsibility of Kazakstan Academy of Science. There is one research institute, Pre-Aral Scientific Research Institute for Agro-Ecology and Agriculture, in the Kzyl-Orda Oblast. It is primarily now involved in the production of paddy breeder seed and is disseminating minimal research materials for farmer consumption. Thus, the Project Area is not receiving current and reverent information on crop and animal production nor on marketing and water management.

An agricultural research component is proposed to fill the gap by selectively focusing not only on the development of technologies to resolve agricultural constraints faced by farmers, but also the improvement of the social and agro-economic situation of the farmers. Research on environmentally sound farming practices would also be necessary to improve the present environmental conditions in the Project Area including the deterioration of water quality, soil salinization, and desertification. With regard to the improvement of social and economic situation, research priority should be given to the improvement of marketing system, land tenure and land holding, credit and farm economy.

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

The Ilyasov Area will have a site of a research and demonstration farm of approximately 100 ha which will be used for: (i) production of high quality seeds; (ii) improvement of farming practices and soil fertility; (iii) post-harvest techniques; and (iv) improved water management. The research activities of the demonstration farm would be carried out by the Agricultural Extension Office detailed in the following section.

(2) Agricultural Extension

The Agricultural Extension component of the Project summarized in Sub-section 3.6.7. It is proposed to confront the challenge of providing training which is matched to the needs of a market economy. In market agriculture, accurate and timely information as well as relevent and current training are crucial to competitiveness and profitability. Such information and training are non-existence in the Project Area. Farm workers and peasant farmers have none of the skills in farm management, marketing, agricultural economics, water management, business planning, accounting, or the legal environment with which to complete 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.

In the Project Area, it is important to assist in the privatization and commercialization process by including a Farmer's Participatory Training and Information Service Pilot component. This entails:

(i) Training specific target groups in farm management, agricultural techniques, irrigation practices, business planning, management marketing, water user associations and legal issues.

(ii) Demonstrations of improved and modern technologies for profitable crop production, efficient water management, operation and maintenance, and reduced environmental degradation.

(iii) Agricultural Extension Office which provides regular information on issues and techniques related to production and marketing through the production of pamphlets and other materials; and acts as a liaison office for the Project with respect to questions regarding agriculture in a market economy.

The Training Component entails the production of on-site expertise in market-based agronomy, water management, marketing, irrigation operation and maintenance, business planning, agricultural marketing, water user association and management, animal husbandry, business management, farm mechanization and the legal environment of agriculture. Currently, agricultural expertise is disproportionately held by leaders and technical experts. Not only is the expertise inequitably distributed at the top, such knowledge expertise as is present is based on large scale crop and livestock production under state command agriculture. The purposes of training are to distribute agricultural expertise more broadly among the many constituents of the Project Area's agricultural system and to provide training that is fitted to a business management and marketing, are those least evident among farm personnel. Moreover, as the farming system becomes more diversified and evolves to new economies of scale, it is crucial that such skills be imparted widely so as to facilitate a smoother and more rapid transition to market agriculture.

Training would be offered in on-site short course offered evenings and weekends to facilitate participation and would include workshops in:

(i) Agricultural business management,
(ii) Preparation of business plans,
(iii) Acquiring and managing farm credit,
(iv) Fundamentals of market agriculture,
(v) Basic agricultural marketing,
(vi) Water user association management,
(vii) Irrigation operation and management,
(viii) Environmental aspects of irrigated agriculture, and
(ix) The legal environment of private agriculture in Kazakstan.

Classroom training would be supplemented with written materials and pamphlets published in the Kazak language and site visits to the Demonstration Farm.

The demonstration component will be carried out on an easily-accessible 100 ha area of rehabilitated land that is to be provided by the Ilyasov Production Cooperative. This land will be cultivated with paddy and other crops including wheat, lucerne, melons and vegetables. Its purpose would be to demonstrate effective land preparation, seeding and crop management, on-farm water management, effective use of farm inputs, soil management, irrigation and drainage techniques, farm safety, water conservation, erosion control, and related topics.

The Agricultural Extension Office would function as an on-going office which would provide the basis and physical center for agricultural extension. Its functions would be to:

(i) Disseminate printed and other media materials to farmers (posters, pamphlets, newspaper articles, etc.),
(ii) Establish a library of relevant extension materials and media from various national and international sources,
(iii) Carry out demonstrations on the farm demonstration plot,

(iv) Serve as a liaison center for farmer questions and technical assistance and
(v) Function as the office for training staff.

Training staff would be developed by expatriates who would "train the trainers" from the farm and the Project Office which would carry out demonstration and training with consultant assistance.

4.6.9 Crop Budgets

Crop budgets have been prepared based on estimated "without project" and "with project" conditions. The without project crop budget for paddy is presented in Table E-40. Prices, taxes, and social cost are the same as explained earlier in the paddy financial budget under present conditions (Sub-section 4.4.4). The yield of paddy is higher, 3.59 tons/ha as explained in Sub-section 4.3.5 and it is assumed that insecticides will be used under future conditions (Sub-section 4.6.4). All other production inputs remain the same as in the present condition. The net return of paddy is US$ 209/ha.

The results of financial crop budgets for other crops under future "without project" conditions are summarized in following table (Table E-41-E-44). The low yields of wheat and safflower are not sufficient to cover all costs of production.

(Unit: US$ '000)

Crop	Gross Value *	Production Cost	Labor Days	Net Return
Paddy	$767	$558	5.6	$209
Lucerne	195	190	4.1	5
Wheat	195	304	3.3	-109
Vegetables	1,507	890	59.3	617
Safflower	162	404	5.1	-242

* Includes byproducts.

The paddy financial crop budget for future "with project" conditions is presented in Table E-40. The yield of paddy has been increased to 6 tons/ha (Subsection 4.6.6). Production costs for fertilizers, fuel, harvest labor, and hauling have also been increased compared to "without project" conditions (Sub-section 4.6.4). The result is a net return/ha of US$ 565 under "with project" conditions.

The results of financial crop budgets for other crops under future "with project" conditions are summarized in following table (Table E-41-E-44). The last column of the table shows the incremental increase in income under future conditions "with the project" compared to the "without project" conditions. The incremental income of paddy is US$ 356/ha. Although safflower produces a net return of only US$ 56, it has an incremental income of US$ 298 because under the without project condition it has a negative return (-US$ 242).

Crop	Gross Value *	Production Cost	Labor Days	Net Return	Increase from w/o
Paddy	$1,282	$717	5.9	$565	356
Lucerne	491	277	5	214	209
Wheat	515	384	3.6	131	240
Vegetables	3,300	1,390	75.6	1,910	1,293
Safflower	780	724	5.7	56	298

* Includes byproducts.

4.6.10 Marketing and Price Prospects

Prices of commodities and production inputs under "with project" conditions are expected to remain the same as at present (1997) except for vegetables. Paddy and wheat will be milled on the large farms. Paddy and surplus wheat flour (if any) will be sold through a

marketing cooperative or individually by farmers using the service of Tabys Commodity Exchange. Safflower seeds will be hauled to the oil processing plant in Shimkent and the refined oil will be sold on the local market because Kzyl-Orda is deficit in production of cooking oils. Vegetables and melons will be sold through the marketing cooperative, or individually by farmers to independent truckers or Kokonis. Livestock products will be consumed by the farm population. If there is any surplus milk or meat production, it can also be sold in the Kzyl-Orda market.

The vegetable price used in the Master Plan report was US$ 220/ton as reported by the Oblast Agriculture Department in October 1996 as the average price Kzyl-Orda farmers received for vegetables. Subsequently, in August 1997, the Department reported an average price for vegetables received by farmers in 1996 as US$118/ton. The most recent price was used in Sub-section 4.4.3 for present conditions. However, it is believed that this price is too low, and consequently the price used for vegetables under future conditions with and without the project is US$220/ton. The higher price seems reasonable considering the World Bank staff appraisal report for the Kazakstan Irrigation and Drainage Improvement Project estimated an average vegetable price of US$292/ton, and the future price for onions and potatoes at US$420/ton.[1/]

Market and price conditions have improved remarkably in Kzyl-Orda less than one year later than the Master Plan Report was written in October 1996. The supply of inputs has improved, interest rates on farm loans have gone down, and farmers can get a fair price for their products, if they have some to sell. Some of the specific changes which have occurred are:

(i) The supply of fertilizers increased from 45% of requirements in 1996 to 60% in 1997. Next year Kunarlylyk expects to supply 100% of requirements. But, still the problem of lack of cash with which to purchase fertilizers from manufacturer exists.

(ii) The State Leasing Fund and the ADB mid-term credit line are making it easier for farmers to procure tractors and equipment.

(iii) The State Resource System of procurement and State Paddy Committees no longer exist.

(iv) The problem of poor quality product caused by bad milling of paddy is lessened because of new paddy mills already purchased and new mills proposed to be purchased under the Project.

(v) The values at which paddy is exchanged in barter for production inputs are very close to the value of paddy based on the international market.

(vi) The interest rate for loans from Agroprombank has dropped from 45-50% in 1996 to 30% in 1997.

(vii) Kzyl-Orda farmers appear to be close to paying off their debt to the State Fund for Financial Support of Agriculture.

(viii) With the "Tabys" Commodity Exchange, and the presence of many independent buyers, farmers in Kzyl-Orda have access to market information and they can get a fair market paddy for their produce.

Even though these very significant changes have occurred, there still remain some problems:

[1/] World Bank, Kazakstan Irrigation and Drainage Project, SAR Report No. 15379 KZ, March 29, 1996.

(i) Farmers still lack cash to purchase production inputs and lack product to sell for cash, because most of their production is committed to repay barter debts for inputs and consumption goods.

(ii) Farmers still lack experience (knowledge) of marketing under a private enterprise system, and self-financing or arranging credit sufficient to cover operating costs for the next year's crop.

(iii) Deteriorated or worn-out physical infrastructure and equipment.

Both managers of the two large project farms stressed their concern about finding buyers, and the need for adequate complements of farm machinery, and adequate supply of fertilizer and chemical inputs in order to achieve the projected yield of 6 tons of paddy/ha under "with project" conditions.

Notwithstanding the progress toward improved market conditions, it still appears that as suggested in the Master Plan report, formation of a marketing cooperative to sell produce and procure production inputs would have several advantages to project farms such as:

(i) Volume purchase of production inputs thereby reducing paddies and assuring timely availability.

(ii) Greater volume of milled paddy for sale, thus increasing market presence and attracting buyers.

(iii) Improved marketing of vegetables and melons through accumulation of larger quantities, quality controls, and storage.

(iv) Improved efficiency (less cost) of marketing.

(v) Development of marketing knowledge and skills.

The above advantages should be especially beneficial to small peasant farms.

4.6.11 Agricultural Credit

The Project includes a line of credit to finance farm operating loans and purchase of tractors and farm machinery. The program includes a revolving fund for one year term farm operating loans of US$ 3 million to cover purchase of commercial fertilizers, chemicals, fuel and seeds. The Project will also establish a mid-term credit line of US$ 2.1 million annually for five years to finance the purchase of tractors and farm machinery. This will cover replacement of approximately 20% each year of the total tractor and farm machinery investment needed for the Project of US$ 10.6 million at 1997 prices. The management concept is to make a "two-step" loan, meaning that the Project would make a loan to a commercial bank such as Agroprombank, and then the commercial bank would make loans to project farmers and manage and supervise the loans.

It appears there will be a problem finding for 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, it was concluded with regard to Agroprombank that "because of these deficiencies, it is not recommended at this time to install any type of term lending program in the bank without significant technical assistance being provided to the bank before start up of the program." 12/

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

The deficiencies referred to in the preceding statement are briefly summarized as follows:

(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 directs 100% of its credit towards agriculture and is dependent upon the success of the yearly harvest. In previous years, over estimates of crop yields have resulted in the bank incurring significant amounts of bad debt.

(iv) Excessive amount of bad loans and poor quality lending practices.

(v) The bank has no set formula for loan pricing, and it probably is not pricing its loans at a profitable level because of artificial caps (set by funding sources such as NBRK auction funds) and lack of knowledge concerning the cost of funds.

(vi) 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:

While some significant changes have taken place, the bank continues to have poor earnings and weak financial health. Non-interest expenses continue to drive down the earnings of the bank and additional reductions in staff and closure of unprofitable branches need to be made. The bank has developed a complex branch analysis tool, but the results have been negligible. Management oversight of adherence to procedures and policies has been weak, as reflected in the excessively high rate of default in the bank's credit portfolio.

Based on the bank's progress in restructuring over the last two years and the current financial position, it appears unlikely that the bank's financial situation will improve over the next few years making it difficult for the bank to achieve the transformation from a state-owned institution to a financially viable bank, capable of responding to the credit and savings demand of people and private enterprises in the rural sector.[13/]

Narodny Bank, the former State Savings Bank is viewed more favorably by the consultants as having "the ability to reach a large percentage of the rural population through its existing outlet network and thus able to provide a range of financial services to the rural areas.[14/] There are 12 branch offices of Narodny Bank in Kzyl-Orda city, and 9 branch offices in the Raions of Kzyl-Orda Oblast. One of these is in Terenozek Raion.

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

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13/ Ibid, p.31.

14/ Ibid, p.33.

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. However, if this does not happen, then it will be necessary to manage the farm credit program through direct loans from the Project Implementation Unit to project farms.

4.6.12 Economic Crop Budget

The results of the economic crop budgets are summarized in following table for future without project and future with project conditions (Table E-45-E-49). Prices for crop outputs and production inputs are the same under both conditions. No taxes are included in the cost of inputs. Value added tax is not deducted from the value of output. Production costs were reduced by the Standard Conversion Factor 0.9. The major cause of different net returns under future conditions for the same crop is the difference in yields, although production costs vary, mainly because of the level of fertilizer and chemical inputs.

Crop	Future With Project	Future W/O Project	Increase with Project
Paddy	$859	$399	$460
Lucerne	325	66	259
Wheat	226	-25	201
Vegetables	2420	931	1489
Safflower	271	-138	409

Note: Based on economic prices, no tax

4.6.13 Project Benefit

The benefits of the project result from (i) restoration of abandoned land, (ii) increased yields and (iii) conversion to a more intensive cropping pattern. Without the Project, 83% of the crop area will be abandoned. This cropland will be restored to production under "with project" conditions. The yield of the major crop, paddy, is projected to increase from 3.59 tons/ha under "without project" conditions to 6 tons/ha "with project" conditions. The estimated yields of the two other major crops, lucerne and wheat, are expected to be 152% and 164% higher under "with project" conditions compared to without project conditions. Under "with project" conditions, the cropped area is expected to include 50% paddy, as compared to 8.5% under without project conditions.

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

4.6.14 Farm Economy

Farmers will also receive loans under the Project for rice mills, farm machinery, and annual operating loans for purchase of production inputs. In the farm budget analysis it was assumed that rice mill loans are repaid over five years at 4.5% interest, with only interest payment required in the first year. The repayment period is similar to the four year term

allowed for Shagan Production Cooperative to repay the rice mill loan it received under the Asian Development Bank Mid-term Credit loan.

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

With respect to the farm machinery loans, interest is charged in the farm budgets at 4.5% on 55% of the loan. The crop budgets include depreciation costs by the straight line method on 90% of farm machinery costs. The combination of the interest charge and the depreciation cost is sufficient to replace the entire inventory of machinery every seven years in perpetuity.

The results of the farm budget analysis for Ilyasov PC are summarized in following table (Table E-50). The financial internal rate of return to all resources engaged (FIRR) which is calculated from the incremental cash flow before financing is 18.3% for the Ilyasov farm area. Net income per household, including wages from crop production labor, increases from only US$251 before the project to US$2,878 in the 3rd year when farms begin to increase production as a result of project investment. During the 4th through 7th years, net income/household increases to US$3,989 at full production as the rice mill loan is repaid. After the rice mill loan is repaid, net income/household is US$5,266.

(Unit: US$ '000)

Item	Yr 1-2	3	4	5--7	8--30
Gross Value of Production	425	4,535	5,905	5,905	5,905
Total Outflow *	2,998	8,901	4,888	3,359	3,359
Net Benefit Before Financing	-2,573	-4,366	1,017	2,546	2,546
Net Benefit After Financing	85	1,083	1,587	1,587	2,167
Net Income/Household ** $	251	2,878	3,989	3,989	5,266
Financial Internal Rate of Return %	18.3%				

* Year 1 figures shown. Total outflow in Year 2 was US$3,576; and net benefit before financing was US$3,151. The rest of the figures are the same for Year 2.

** Includes wages paid as crop production costs.

The results of the Shagan PC analysis indicate a FIRR of 17.5% (see following table). Net income/household in the first two years "without project" benefit is US$294, rising to US$2,317 in the 3rd year, US$3,460 in the 4th through 7th years, and US$3,273 thereafter (Table E-51).

(Unit: US$ '000)

Item	Yr 1-2	3	4	5--7	8--30
Gross Value of Production	797	5,135	6,581	6,581	6,581
Total Outflow *	2,715	6,753	3,739	3,739	3,739
Net Benefit Before Financing	-1,918	-1,618	2,842	2,842	2,842
Net Benefit After Financing	147	1,361	2,156	2,156	2,373
Net Income/Household ** $	294	2,317	3,460	3,460	3,273
Financial Internal Rate of Return %	17.5%				

* Year 1 figures shown. Total outflow in Year 2 was US$9,630, and net benefit before financing was US$-8,833. The rest of the figures are the same for Year 2.

** Includes wages paid as crop production costs.

Tables

Table E-1 The Area and Population of Farms Concerned in the Study Area

Name of Raion	Name of Farm	Farm Area (ha)	Number of Beneficiary (persons)
Syr Darya	3. KZ MIS	23,580	1,839
	7. Mahambeete	6,520	2,220
	8. Kangalykol*	6,970	5,367
	Out of Farm	430	-
	Total	37,500	9,426
Terenozek	3. Akzharma	21,180	2,682
	6. Ilyasov	15,930	2,217
	8. Shagan	24,300	3,663
	9. Shirkeili	15,180	2,587
	Out of Farm	1,710	-
	Total	78,300	11,149
Zhalagash	1. Ak-Arik	12,260	2,130
	3. Akkumski	14,270	2,166
	7. Zhanatalan	7,190	2,962
	8. Bukarbaibatir	20,970	2,049
	10. Enbek	10,940	1,707
	11. Madeniet**	9,800	3,638
	12. Tan	26,830	1,402
	14. Kazakhstan	10,080	1,972
	15. Zhursnov	14,330	N.A
	Out of Farm	3,970	-
	Total	130,640	18,026
Karmakshy	1. III International	21,730	2,332
	2. Aktobe	27,190	2,112
	3. Zhanazhol	24,860	2,015
	4. Akzharski	28,390	2,339
	9. Turmanbet	30,600	3,191
	11. Oktoyabyabr	29,070	1,354
	12. Mailiozek	16,540	1,165
	Out of Farm	5,180	-
	Total	183,560	14,508
Total for Kzyl-Orda Left Bank Area		430,000	53,109

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

Table E-2 Irrigation Area in Kzyl-Orda Left Bank Area

(Unit: ha)

Farm	Village	Total	Agricultural Land				Non-agricultural Land		
			Original Rice Rotation Area	Present condition in 1995 Irrigated Area	Present condition in 1995 Abandoned Area	Pasture	Marsh and Swamps	Bush and Forest	Others
Syrdarya									
3 KZ MIS	Akzharma	23,580	1,400	1,180	220	20,870	0	30	1,280
7 Mahambeetov	Kiloba	6,520	750	620	130	420	40	4,900	410
8 Kagalykol*	Oktoyabr	6,970	1,180	980	200	2,590	400	750	2,050
Out of Farm Area		430							430
Sub-total		37,500	3,330	2,780	550	23,880	440	5,680	4,170
Terenozek									
3 Akzharma	Akzhalma	21,180	5,620	5,080	540	11,840	730	1,160	1,830
6 Byasov	Byasov	15,930	6,480	5,200	1,280	5,260	970	530	2,690
8 Shagan	Shagan	24,300	7,210	6,330	880	8,190	1,170	2,400	5,330
9 Shirkeli	Shirkeli	15,180	4,360	4,220	140	7,000	30	2,460	1,330
Out of Farm Area		1,710							1,710
Sub-total		78,300	23,670	20,830	2,840	32,290	2,900	6,550	12,890
Zhalagash									
1 Ak-Arik	Akarik	12,260	3,880	3,370	510	7,710	180	200	290
3 Akkumski	Akkum	14,270	4,990	3,880	1,110	8,930	90	160	100
7 Zhanatalap	Makpalokol	7,190	1,370	1,000	370	4,260	420	190	950
8 Bukarbaibatir	Aksai	20,970	6,650	5,710	940	12,380	170	210	1,560
# Enbek	Akkoshkar	10,940	3,610	3,230	380	6,570	160	410	190
# Madeniet**	Madiniet	9,800	3,740	2,870	870	5,230	0	170	660
# Tan	Tan	26,830	4,010	3,180	830	21,910	40	0	870
# Karaketken	Kazakhstan	10,080	2,400	2,050	350	6,070	0	170	1,440
# Zhursnov	Makpolkol	14,330	3,750	2,900	850	7,910	730	340	1,600
Out of Farm Area		3,970							3,970
Sub-total		130,640	34,400	28,190	6,210	80,970	1,790	1,850	11,630
Karmakshy									
1 III International	Internacion	21,730	4,920	4,860	60	8,370	40	50	8,350
2 Aktobe	Aktobe	27,190	4,000	4,000	0	11,540	10	80	11,560
3 Zhanazhol	Zhanazhol	24,860	4,630	3,890	740	12,670	10	660	6,890
4 Akzharskii	Akzhar	28,390	4,900	4,610	290	13,880	500	150	8,960
9 Turmaubet	Turmaubet	30,600	4,340	4,340	0	17,630	1,070	520	7,040
# Oktobyabr	Oktobyabr	29,070	1,480	690	790	23,240	170	480	3,710
# Maiiozek	Shalgaskiaat	16,540	1,340	900	440	14,240	0	0	960
Out of Farm Area		5,180							5,180
Sub-total		183,560	25,600	23,280	2,320	101,570	1,800	1,940	52,650
Total		430,000	87,000	75,080	11,920	238,710	6,930	16,020	81,340

Source: SCLR and SCWR

*: Includes Maiaryk, **: Includes Myrzabai

Table E-3 The Planted Area of Major Crops in the Four Raion Concerned (1993-1995)

(Unit: ha)

Raion	Wiheat	Paddy	Industrial crops	Vegetables	Lucerne	Other crops	Total
1995							
Syrdarya	630	910	20	30	870	20	2,480
Terenozek	3,730	7,720	380	760	5,510	1,280	19,380
Zhalagash	4,960	8,510	780	1,070	9,910	1,190	26,420
Karmakshy	5,270	6,450	1,030	440	5,590	1,370	20,150
Study Area	14,590	23,590	2,210	2,300	21,880	3,860	68,430
Kzyl-Orda	51,250	68,540	12,780	12,710	68,030	4,500	217,810
1994							
Syrdarya	710	760	0	30	910	110	2,520
Terenozek	3,840	8,420	390	890	5,300	750	19,590
Zhalagash	3,690	10,190	590	1,020	9,350	3,040	27,880
Karmakshy	3,560	9,270	60	550	5,390	2,370	21,200
Study Area	11,800	28,640	1,040	2,490	20,950	6,270	71,190
Kzyl-Orda	42,870	73,240	3,990	12,900	81,250	14,500	228,750
1993							
Syrdarya	540	900	20	30	940	110	2,540
Terenozek	3,830	8,330	110	1,210	4,830	2,030	20,340
Zhalagash	4,200	9,420	510	1,130	10,150	3,130	28,540
Karmakshy	3,270	9,630	80	640	5,880	2,330	21,830
Study Area	11,840	28,280	720	3,010	21,800	7,600	73,250
Kzyl-Orda	51,670	80,490	3,020	10,850	84,650	22,460	253,140

Source : State Statistical Agency Vegetables includes potato and melons

Table E-4 Farm Input and Labor Requirement (per ha)

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

Source: Ministry of Agriculture

Table E-5 The Yield of Major Crops in the Four Raion Concerned (1993-1995)

Unit: (t/ha)

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

Source: State Statistical Agency Vegetables includes potato and mwlons

Table E-6 The Production of Major Crops in the Four Raion Concerned (1993-1995)

(Unit: ton)

Raion	Wheat	Paddy	Vegetables	Lucerne
1995				
Syrdarya	340	1,540	70	1,940
Terenozek	3,050	17,890	4,870	9,830
Zhalagash	3,730	25,580	5,480	16,360
Karmakshy	2,720	18,960	3,390	13,290
Study Area	9,840	63,970	13,810	41,420
Kzyl-Orda	28,860	142,770	13,330	110,520
1994				
Syrdarya	410	2,360	70	2,020
Terenozek	2,650	25,570	7,440	17,010
Zhalagash	3,280	30,850	4,740	16,290
Karmakshy	3,030	29,630	3,800	10,680
Study Area	9,370	88,410	16,050	46,000
Kzyl-Orda	26,380	200,060	16,860	116,370
1993				
Syrdarya	610	3,740	130	2,230
Terenozek	5,350	38,400	7,930	22,150
Zhalagash	4,020	42,550	2,660	24,570
Karmakshy	3,220	40,790	3,310	13,570
Study Area	13,200	125,480	14,030	62,520
Kzyl-Orda	38,070	346,970	4,700	321,930

Source: State Statistical Agency Vegetables includes potato and melons

Table E-7 Number of livestock in Kzyl-Orda by Raion (1993-95)

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

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

Source: State Statistical Agency

Table E-8 Financial Crop Enterprise Budget, Rice, Present Conditions (1996)

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Grain	tons	2.71	230.37	51.53	572.79
Straw	tons	2.71			
Fodder Units	tons	0.27	136.3	7.39	29.55
Production Input Costs					
Fertilizer					
FYM Compost	tons	3	2		6
Nitrogen	tons	0	176.47		
Phosphorous	tons	0	73.53		
Potassium	tons	0	80.88		
Crop Chemicals					
Herbicides	kg	0	1.32		
Insecticides	kg	0			
Fungicides	ha	0			
Fuel	tons	0.21	169.49	7.12	35.59
Seeds	kg	300	0.59	35.29	176.47
Depreciation and Repair					
Tractors				9.82	49.12
Machinery				17.21	86.03
Labor Costs					
Land preparation	hour	6.8	0.54		3.68
Seeding	hour	2.5	0.54		1.35
Apply fertilizer	hour	7	0.54		3.79
Weeding	hour	0.9	0.54		0.49
Water Management	hour	14.5	0.34		4.89
Harvesting	hour	3	0.54		1.62
Post Harvest	hour	2.5	0.54		1.35
Hauling	ton/km	60	0.31		18.6
Subtotal					388.99
Miscellaneous @ 5%				3.89	19.45
Social Cost 32% of total wage bill					8.08
Total Cost				73.33	416.53
Net Return					185.81
Labor/ha (hours)					37.2

a/ $250/ton less 5% waste and 3% storage cost.
Exchange rate $US 1=68 tenge.

Table E-9 Farm Budget Summary, 5000 Ha Farm, Present Condition

1996		(US$,000)
Gross Value of Production a/		US$,000
	Rice (1350 ha)	813.16
	Lucerne (1300 ha)	167.44
	Wheat (800 ha)	107.2
	Maize Silage (200 ha)	24.39
	Safflower (100 ha)	14.3
	Vegetables (100 ha)	68.37
	Melons (50 ha)	26,65
	Total	1221.5
Crop Production Costs		
	Rice (1350 ha)	562.32
	Lucerne (1300 ha)	206.43
	Wheat (800 ha)	188.99
	Maize Silage (200 ha)	60.46
	Safflower (100 ha)	29.99
	Vegetables (100 ha)	68.6
	Melons (50 ha)	17.81
	Total	1134.59
Water Charges $17/ha for 3,900 ha		66.3
Land Tax (1.47/ha)		7.35
Total Outflow		1208.24
Net Return Before Income Tax		13.26
Income Tax @ 10%		1.33
Net Return After Taxes		11.93

a/ Farm area includes 8% fallow and 14% abandoned land.

Table E-10 Farm Family Food Consumption in the Project Area

Survey Question or Item	Average a/ Response	Response Count a/
No. of Households	80	80
No. of Persons/Household	6.8	80
Food Expenditure 1995 (tenge) a/	62,538	78
Monthly Food Consumption b/	kg/month	
Rice	25.8	80
Wheat Flour	62.4	78
Sugar	11.3	71
Edible Oils (liter)	9.5	47
Mutton	7.7	29
Beef	7.9	34
Fruits	13.3	17
Vegetables	13.1	13

a/ Response to Q 2.8 "How much did you spend for food in 1995?"
b/ Response to Q 2.12: "How many kilograms of food did you consume a month and how much did you pay for them in 1995
Source: Farm Household Survey

Table E-11 Irrigation Area in Kzyl-Orda Left Bank Area

(Unit: ha)

	Farm	Village	Total area	Original Rice Rotation Area	Present condition Irrigated Area	Present condition Abandoned Area	Future Without project Condition Irrigated Area	Future Without project Condition Abandoned Area
	Syrdarya							
3	KZ MIS	Akzharta	23,580	1,400	1,180	220	1,400	0
7	Mahambeetov	Kiloba	6,520	750	620	130	750	0
8	Kagalykol*	Oktoyabr	6,970	1,180	980	200	1,180	0
	Out of Farm Area		430					
	Sub-total		37,500	3,330	2,780	550	3,330	0
	Terenozek							
3	Akzharma	Akzhalma	21,180	5,620	5,080	540	5,620	0
6	Ilyasov	Ilyasov	15,930	6,480	5,200	1,280	6,480	0
8	Shagan	Shagan	24,300	7,210	6,330	880	7,210	0
9	Shirkeli	Shirkeli	15,180	4,360	4,220	140	4,360	0
	Out of Farm Area		1,710					
	Sub-total		78,300	23,670	20,830	2,840	23,670	0
	Zhalagash							
1	Ak-Arik	Akarik	12,260	3,880	3,370	510	3,880	0
3	Akkumski	Akkum	14,270	4,990	3,880	1,110	1,350	3,640
7	Zhanatalan	Makpalokol	7,190	1,370	1,000	370	360	1,010
8	Bukarbaibatir	Aksai	20,970	6,650	5,710	940	6,650	0
10	Enbek	Akkoshkar	10,940	3,610	3,230	380	3,610	0
11	Madeniet**	Madiniet	9,800	3,740	2,870	870	960	2,780
12	Tan	Tan	26,830	4,010	3,180	830	4,010	0
14	Kazakhstan	Kazakhstan	10,080	2,400	2,050	350	840	1,560
15	Zhursnov	Makpalkol	14,330	3,750	2,900	850	3,750	0
	Out of Farm Area		3,970					
	Sub-total		130,640	34,400	28,190	6,210	25,410	8,990
	Karmakshy							
1	III International	Untornauional	21,730	4,920	4,860	60	2,360	2,560
2	Aktobe	Aktobe	27,190	4,000	4,000	0	4,000	0
3	Zhanazhol	Zhanazhol	24,860	4,630	3,890	740	1,640	2,990
4	Akzharskii	Akzhar	28,390	4,900	4,610	290	4,900	0
9	Turnaubet	Turnaubet	30,600	4,340	4,340	0	4,340	0
11	Oktobyabr	Oktobyabr	29,070	1,480	690	790	50	1,420
12	Mailiozek	Shalgaskiaat	16,540	1,340	900	440	1,340	0
	Out of Farm Area		5,180					
	Sub-total		183,560	25,600	23,280	2,320	18,630	6,970
	Total		430,000	87,000	75,080	11,920	71,040	15,960

*: Includes Maiaryk, **: Includes Myrzabai

Source: SCLR,SCWR and JICA study team estimation

Table E-12 Planted Area of Major Crops by Farm under with Condition

unit: ha (Unit: ha)

Farm	Paddy	Winter wheat	Spring wheat	Safflower	Maize(Sil)	Lucerne	Vegetables	Melons	Total
Syrdarya									
3 KZ MIS	630	140	140	30	70	350	20	20	1,400
7 Mahambeotov	330	80	80	20	40	180	10	10	750
8 Kogalykol*	530	120	120	20	60	290	20	20	1,180
Total	1,490	340	340	70	170	820	50	50	3,330
Terenozek									
3 Akzharma	2,810	450	390	170	170	1,410	110	110	5,620
6 Ilyasov	3,250	520	450	190	190	1,620	130	130	6,480
8 Shagan	3,590	580	500	220	220	1,810	145	145	7,210
9 Shirkeli	2,180	350	310	130	130	1,090	85	85	4,360
Total	11,830	1,900	1,650	710	710	5,930	470	470	23,670
Zhalagash									
1 Ak-Ank	1,930	310	270	120	120	970	80	80	3,880
3 Akkumski	2,490	400	350	150	150	1,250	100	100	4,990
7 Zhanatalap	690	110	100	40	40	340	25	25	1,370
8 Bukarbaibatir	3,320	530	470	200	200	1,660	135	135	6,650
10 Enbek	1,810	290	250	110	110	900	70	70	3,610
11 Madeniet**	1,870	300	260	110	110	940	75	75	3,740
12 Tan	2,010	320	280	120	120	1,000	80	80	4,010
14 Karaketken	1,200	190	170	70	70	600	50	50	2,400
15 Zhurgenov	1,880	300	260	110	110	940	75	75	3,750
20									
Total	17,200	2,750	2,410	1,030	1,030	8,600	690	690	34,400
Karmakshy									
1 Ill International	2,460	390	340	150	150	1,230	100	100	4,920
2 Aktobe	2,000	320	280	120	120	1,000	80	80	4,000
3 Zhanazhol	2,310	370	320	140	140	1,160	95	95	4,630
4 Akzhar	2,450	390	340	150	150	1,220	100	100	4,900
9 Turmanbet	2,160	350	300	130	130	1,090	85	85	4,330
11 Oktoyabr	750	120	100	40	40	370	30	30	1,480
12 Mailiozek	670	110	90	40	40	340	25	25	1,340
13									
Total	12,800	2,050	1,770	770	770	6,410	515	515	25,600
Grand total	43,320	7,040	6,170	2,580	2,680	21,760	1,725	1,725	87,000

*: Includes Maiaryk, **: Includes Myrzabai

Source : JICA Study Team Estimation

Table E-13 Anticipated Yield of Crops under with Project Condition

(Unit: ton/ha)

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

*1 : Average value during 1985-1994

*2 : Personel communication with KZRI of Agricultural Science

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

Table E-14 Anticipated Crop Production by Farm under with Project Condition

unit: ton

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

* : Includes Maiaryk, ** : Includes Myrzabai

Table E-15 Production of Major Crops by Farm under without Condition

(Unit: ton)

Farm	Paddy	Winter wheat	Spring wheat	Barley	Maize	Sugar beet	Sunflower	Safflower	Maize(Sil)	Lucern	Vegetable	Melons
Syrdarya												
3 KZ MIS	610	70	60	0	0	0	0	0	0	580	20	30
7 Mahambeoto	310	40	30	0	0	0	0	0	0	260	0	0
8 Kogalykol*	450	60	50	0	0	0	0	0	150	420	20	30
										0		
Total	1,370	170	140	0	0	0	0	0	150	1,260	40	60
										0		
Terenozek	0									0		
3 Akzharma	3,750	480	50	0	100	10	10	10	1,880	2,360	230	450
6 Ilyasov	2,870	270	230	0	80	0	0	10	1,020	1,600	150	300
8 Shagan	4,280	240	300	0	130	0	10	10	1,490	2,580	190	380
9 Shirkeh	3,120	180	240	0	110	0	10	10	1,240	1,710	190	380
										0		
Total	14,020	1,170	820	0	420	10	30	40	5,630	8,250	760	1,510
										0		
Zhalagash										0		
1 Ak-Arik	2,190	180	170	0	20	0	0	0	790	2,070	90	180
3 Akkumski	1,630	160	80	0	20	50	10	0	1,020	1,770	60	120
7 Zhanatalap	530	40	80	0	0	0	0	0	320	190	20	30
8 Bukarbaibatu	2,260	350	160	0	20	50	10	0	2,400	3,710	180	370
10 Enbek	2,190	220	90	0	20	0	0	0	1,900	1,420	90	180
11 Madeniet**	1,620	100	60	0	10	0	0	0	720	980	50	90
12 Tan	1,730	180	80	0	10	0	0	10	1,090	1,250	60	120
14 Karaketken	1,170	100	60	0	10	50	10	0	620	830	50	90
15 Zhurgenov	1,160	200	70	0	10	0	0	10	820	1,360	50	90
20										0		
Total	14,480	1,530	850	0	120	150	30	20	9,680	13,580	650	1,270
										0		
Karmakshy										0		
1 IH Internatio	3,540	380	120	10	20	60	0	0	1,870	2,910	130	260
2 Aktobe	3,040	320	140	20	30	60	10	0	1,600	1,500	130	260
3 Zhanazhol	2,500	370	100	10	30	60	10	10	1,270	1,100	70	150
4 Akzhar	3,120	310	180	40	30	60	10	0	1,850	1,890	90	190
9 Turmanbetor	3,100	400	170	10	10	0	20	10	1,510	1,760	90	190
11 Oktoyabr	110	10	0	0	0	0	0	0	0	30	0	0
12 Mailiozek	290	40	20	10	0	0	0	0	160	230	0	0
13										0		
Total	15,700	1,830	730	100	120	240	50	20	8,260	9,420	510	1,050
Grand total	45,570	4,700	2,540	100	660	400	110	80	23,720	32,510	1,960	3,890

* : Includes Maiaryk, ** : Includes Myrzabai

Source : JICA Study Team Estimation

Table E-16 Present Land Use in the Project Area

(Unit: ha)

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

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

*: Include P C Ilyasov and P F Berlek

**: Includes P C Shagan and small peasant farms

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

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

Table E-17 Planted Area of Major Crops

(Unit: ha)

	Paddy	Wheat	Vegetables*	Lucern	Other crops	Total
Ilyasov						
1993	2,670	1,300	350	1,200	530	6,050
1994	2,470	1,200	290	1,300	490	5,750
1995	2,000	1,100	290	1,500	340	5,230
1996	1,500	440	190	1,400	0	3,530
1997	1,630	400	180	1,200	20	3,430
Shagan						
1993	2,800	1,400	460	1,900	530	7,090
1994	2,700	1,300	390	1,900	520	6,810
1995	2,400	1,300	300	1,900	320	6,220
1996	2,000	1,700	170	1,000	90	4,960
1997	2,150	700	100	900	0	3,850
Project Area						
1993	5,470	2,700	810	3,100	1,060	13,140
1994	5,170	2,500	680	3,200	1,010	12,560
1995	4,400	2,400	590	3,400	660	11,450
1996	3,500	2,140	360	2,400	90	8,490
1997	3,780	1,100	280	2,100	20	7,280
Terenozek Raion						
1993	14,220	6,280	2,040	8,800	3,270	34,610
1994	13,620	5,910	1,440	9,100	2,790	32,860
1995	12,060	6,030	1,240	8,330	2,190	29,850
1996	10,220	3,820	1,190	6,930	850	23,010
1997	11,600	2,810	1,170	7,540	80	23,200
Kyzyl-Orda Oblast						
1993	80,490	51,660	10,860	84,650	34,820	262,480
1994	73,240	44,870	12,900	81,250	22,660	234,920
1995	68,540	51,250	12,710	68,030	20,510	221,040
1996	66,030	45,910	13,530	62,730	12,300	200,500
1997	70,040	19,760	7,150	50,690	6,890	154,530

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

Note : * : Vegetables include potato and melons

Table E-18 Yield of Major Crops in the Project Area

(Unit : t/ ha)

	Paddy	Wheat	Vegetables	Potato	Melons	Lucern
Ilyasov						
1993	4.20	1.38	5.20	n.a.	n.a.	3.28
1994	2.94	0.73	7.00	n.a.	n.a.	3.39
1995	1.97	0.80	5.79	n.a.	n.a.	2.13
1996	3.83	1.64	8.00	n.a.	n.a.	1.54
Shagan						
1993	4.20	1.22	7.20	n.a.	n.a.	1.89
1994	3.66	1.02	9.21	n.a.	n.a.	2.64
1995	3.00	1.12	7.20	n.a.	n.a.	0.76
1996	5.02	0.36	9.00	n.a.	n.a.	1.81
Average of Project Area						
1993	4.20	1.30	6.33	n.a.	n.a.	2.43
1994	3.32	0.88	8.26	n.a.	n.a.	2.95
1995	2.53	0.97	6.51	n.a.	n.a.	1.37
1996	4.51	0.62	8.47	n.a.	n.a.	1.65
Terenozek Raion						
1993	4.59	1.41	4.56	1.97	12.79	3.84
1994	2.99	0.63	7.75	6.33	10.30	1.91
1995	2.24	0.77	5.56	3.66	12.09	1.92
1996	3.39	0.47	10.87	10.60	12.16	1.99
Kyzyl-Orda Oblast						
1993	4.31	0.99	6.35	2.46	6.48	3.80
1994	2.73	0.59	4.82	3.99	6.43	1.43
1995	2.77	0.56	5.07	3.87	7.05	1.62
1996	3.08	0.25	9.15	7.65	10.25	1.40

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

Table E-19 Production of Major Crops in the Project Area

(Unit : ton)

Year	Paddy	Wheat	Vegetables*	Lucern
Ilyasov Area				
1993	11,210	1,800	1,820	3,930
1994	7,260	880	2,030	4,410
1995	3,940	880	1,680	3,200
1996	5,740	720	1,520	2,160
Shagan Area				
1993	11,760	1,710	3,310	3,600
1994	9,880	1,320	3,590	5,020
1995	7,190	1,450	2,160	1,450
1996	10,030	610	1,530	1,810
Project Area				
1993	22,970	3,510	5,130	7,530
1994	17,140	2,200	5,620	9,430
1995	11,130	2,330	3,840	4,650
1996	15,770	1,330	3,050	3,970
Terenozek Raion				
1993	65,330	8,870	9,300	33,820
1994	40,710	3,700	11,160	17,370
1995	27,030	4,640	6,900	16,020
1996	34,610	1,780	12,930	13,770
Kyzyl-Orda Oblast				
1993	346,970	51,110	68,960	321,930
1994	200,060	26,380	62,160	116,370
1995	190,080	28,880	64,450	110,520
1996	203,440	11,450	123,850	88,060

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

Note : * : Vegetables include potato and melons

Table E-20 Farm Gate Paddy Price Based on Internatuional market Projected price

(US$/ton 1997)

Commodity	1997	1998	2000	2005	2010
Thai, 5% broken *1	330	315	306	293	287
I&F Baltic ports	35	35	35	35	35
Russian markets	365	350	341	328	322
less I&F Kazakstan to Russia	-21	-21	-21	-21	-21
less milling	-31	-31	-31	-31	-31
Kazakstan markets	313	298	289	276	270
Convert to paddy 65%	203	194	188	179	176
less 3% storage	-6	-6	-6	-6	-6
less 5% waste	-10	-10	-9	-9	-9
plus fodder byproduct *2	13	13	13	13	13
Farm gate price	200	192	186	178	175
Farm gate price Tenge/ton	15,018	14,364	13,940	13,345	13,109

*1:World Bank, Commodity Markets and the Developing Countries, May, 1997.
*2 :13-15% fodder valued at 7 tenge/kg for barter.
Source: Shagan Production Cooperative.

Table E-21 Farm Gate Wheat Price Based on Internatuional market Projected price

(US$/ton 1997)

Commodity	1997	1998	2000	2005	2010
US, Hard Red Winter *	165	148	143	132	126
US, Soft Red Winter (90%)	149	133	129	119	113
I&F Baltic ports	35	35	35	35	35
Russian markets	184	168	164	154	148
less I&F Kazakstan to Russia	-21	-21	-21	-21	-21
Kazakstan markets	163	147	143	133	127
less 3% storage	-5	-4	-4	-4	-4
less 5% waste	-8	-7	-7	-7	-6
Farm gate price	150	136	131	122	117
Farm gate price Tenge/ton	11,213	10,175	9,852	9,184	8,775

*1: World Bank, Commodity Markets and the Developing Countries, May 1997.
*2 :13-15% fodder valued at 7 tenge/kg for barter.
Source: Shagan Production Cooperative.

Table E-22 Tractor and Machinery Prices, Kzyl-Orda, 1997

Machine	Model	US$
Tractor	DT-75M	20,066
Tractor	MTZ-80	11,866
Tractor	K-701	51,200
Disk	BDT-7.0	5,313
Plow	PB-35	1,013
Plow	PTK8-35	1,909
Ditcher	KZY-03	933
Fertilizer Spread er	1RMR-4	1,866
Herbicide Sprayer	OP-2000	5,600
Harrow	BZSS-1.0	3,146
Leveler	PA-3	1,666
Fertilizer Spread er	PRT-16	1,333
Fertilizer Loader	PB-35	1,733
Cultivator	KPS-4	1,728
Row Cultivator	KRN-8.4	4,050
Seeder	SRN-36	2,066
Seeder	SKNK-8	3,933
Packer	ZKKSH-6	3,733
Combine, rice	Eni sei-12	67,933
Combine, wheat	SK5 Neva	64,933
Silage Harvester	KSS-2.6	16,746
Swather	KPS-5.6	18,933
Straw Pickup	PS-1.6	5,066
Straw Loader	SNU-05	1,866
Straw Loader	TO-25	5,066
Straw Hauler	2PTS-4	2,306
Truck, 3 Ton	GA3-53	6,600

Price includes 20% value added tax, and transportation cost.
Source: "Agropromtekhnika", Kzyl Orda.

Table E-23 Financial Crop Enterprise Budget of Paddy under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Grain	tons	3.45	200.00	44.28	645.72
Straw	tons	3.45			
Fodder Units	tons	0.35	136.30	9.40	37.62
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.15	200.00	6.00	30.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	kg	3.00	10.66	6.40	31.98
Insecticides	ha				
Fungicides	ha				
Fuel	tons	0.21	191.30	8.03	40.17
Seeds	kg	300.00	0.33	19.80	99.00
Depreciation and Repair					
Tractors				5.44	27.20
Machinery				32.18	160.92
Labor Costs					
Land preparation	hour	7.00	0.70		4.90
Seeding	hour	3.00	0.70		2.10
Apply Fertilizer	hour	7.00	0.70		4.90
Weeding	hour	1.00	0.70		0.70
Water Management	hour	15.00	0.37		5.55
Harvesting	hour	3.00	0.70		2.10
Post Harvest	hour	3.00	0.70		2.10
Hauling	ton/km	60.00	0.31		18.60
Subtotal					446.22
Miscellaneous @ 5%				4.46	22.31
Social Cost @ 32% of wage bill					10.52
Total Cost				93.72	479.05
Net Return					204.29
Labor/Ha (days)					5.57

Exchange rate US$ 1= 75 Tenge

Table E-24 Financial Crop Enterprise Budget of Lucerne under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Hay	tons	1.99	0.00		0.00
Fodder Units	tons	1.00	136.30	0.00	135.62
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.05	200.00	2.00	10.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Inoculant	kg	0.01	0.22	0.00	0.00
Fuel	tons	0.25	191.30	9.57	47.83
Seeds 1/3	kg	5.00	2.00	2.00	10.00
Depreciation and Repair					
Tractors				3.03	15.13
Machinery				9.63	48.13
Labor Costs					
Land preparation	hours	5.00	0.70		3.50
Seeding	hours	1.00	0.70		0.70
Apply Fertilizer	hours	4.00	0.70		2.80
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	3.00	0.70		2.10
Post harvest	hours	6.00	0.70		4.20
Subtotal					164.42
Miscellaneous @ 5%				1.64	8.22
Social Cost					8.16
Total Cost				29.86	180.79
Net Return					-45.18
Labor/Ha (days)					4.14

Exchange rate US$ 1= 75 Tenge

Table E-25 Financial Crop Enterprise Budget of Wheat under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Grain	tons	0.82	150.00	0.00	123.00
Straw	tons	1.03			
Fodder Units	tons	0.21	136.30	0.00	27.94
Production Input Costs					
Fertilizer					
Nitrogen	tons	0.10	200.00	4.00	20.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Fungicides	ha				
Fuel	tons	0.15	191.30	5.74	28.70
Seeds	kg	200.00	0.19	7.60	38.00
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				29.97	149.86
Labor Costs					
Land preparation	hours	5.00	0.70		3.50
Seeding	hours	1.00	0.70		0.70
Apply fertilizer	hours	4.00	0.70		2.80
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	2.00	0.70		1.40
Post harvest	hours	1.00	0.70		0.70
Hauling	ton/km	30.00	0.31		9.30
Subtotal					278.00
Miscellaneous @ 5%				2.78	13.90
Social Cost					6.18
Total Cost				53.89	298.07
Net Return					-147.13
Labor/Ha (days)					3.29

Exchange rate US$ 1= 75 Tenge

Table E-26 Financial Crop Enterprise Budget of Vegetables under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Vegetables	tons	7.75	118.00	129.88	784.62
Production Input Costs					
Fertilizer					
Manure	tons	13.35	2.00		26.70
Nitrogen	tons	0.25	200.00	10.00	50.00
Phosphorous	tons	0.08	200.00	3.20	16.00
Potassium	tons	0.06	117.00	1.40	7.02
Crop Chemicals					
Herbicides	ha				
Insecticides	kg	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	tons	0.26	191.30	10.06	50.31
Seeds	kg/ha	3.00	15.33	9.20	45.99
Depreciation and Repair					
Tractors				5.46	27.31
Machinery				6.93	34.66
Labor Costs					
Plowing	hr	21.00	0.70		14.70
Planting	hr	7.00	0.70		4.90
Cultivation	hr	155.00	0.70		108.50
Apply Fertilizer	hr	18.00	0.70		12.60
Irrigation	hr	39.00	0.37		14.43
Harvest by hand	hr	161.00	0.37		59.57
Post Harvest	hr	14.00	0.70		9.80
Hauling	ton/km	84.00	0.31		26.04
Subtotal					516.53
Miscellaneous @ 5%				5.17	25.83
Social Cost					101.04
Total Cost				53.02	643.39
Net Return					141.23
Labor/Ha (days)					59.29

Exchange rate US$ 1= 75 Tenge

Table E-27 Financial Crop Enterprise Budget of Safflower under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Safflower seeds	tons	0.22	650.00	0.00	143.00
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.05	200.00	2.00	10.00
Phosphoreus	tons	0.03	200.00	1.20	6.00
Potassium	tons	0.01	117.00	0.23	1.17
Crop Chemicals					
Herbicides	ha				
Insecticides	ha	1.00	8.72	1.74	8.72
Fungicides	ha				
Fuel	tons	0.15	191.30	5.74	28.70
Seeds	kg/ha	80.00	1.33	21.28	106.40
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				28.76	143.78
Labor Costs					
Plowing	hours	7.00	0.70		4.90
Planting	hours	1.00	0.70		0.70
Cultivation	hours	7.00	0.70		4.90
Apply Fertilizer	hours	7.00	0.70		4.90
Irrigation	hours	10.00	0.37		3.70
Harvest	hours	2.00	0.70		1.40
Post harvest	hours	2.00	0.70		1.40
Hauling	ton/km	85.00	0.31		26.35
Subtotal					368.02
Miscellaneous @ 5%				3.68	18.40
Social Cost					16.92
Total Cost				66.44	403.35
Net Return					-260.35
Labor/Ha (days)					5.14

Exchange rate US$ 1= 75 Tenge

Table E-28 Financial Crop Enterprise Budget of Melon under Present Condition

(Unit: US$/ha)

Item	Unit	Quantity	Price	VAT	Value
Crop Value					
Melons	tons	8.50	53.33	56.57	396.73
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.12	200.00	4.80	24.00
Phosphoreus	tons	0.06	200.00	2.40	12.00
Potassium	tons		117.00	0.00	0.00
Crop Chemicals					
Herbicides	ha				
Insecticides	ha	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	tons	0.11	191.30	4.36	21.81
Seeds	kg	4.00	8.33	6.66	33.32
Depreciation and Repair					
Tractors				5.46	27.31
Machinery				5.63	28.15
Labor Costs					
Plowing	hr	15.00	0.70		10.50
Planting	hr	11.00	0.70		7.70
Cultivation	hr	84.00	0.70		58.80
Apply Fertilizer	hr	9.00	0.70		6.30
Irrigation	hr	27.00	0.37		9.99
Harvest by hand	hr	37.00	0.37		13.69
Post Harvest	hr	2.00	0.70		1.40
Hauling	ton/km	156.00	0.31		48.36
Subtotal					317.33
Miscellaneous @ 5%				3.17	15.87
Social Cost					50.34
Total Cost				34.09	383.54
Net Return					13.20
Labor/Ha (days)					26.43

Exchange rate US$ 1= 75 Tenge

Table E-29 Farm Budget Summary, 6800 Ha Farm, Present Condition

(Unit: US$,000)

Gross Value of Production a/	
Rice (1931 ha)	1424.51
Lucerne (1306 ha)	177.12
Wheat (932 ha)	140.68
Vegetables (204 ha)	186.56
Other crops (135 ha) b/	19.34
Idle or abandoned land	0
Total value	1948.21
Crop Production Costs	
Rice (1931 ha)	1028.7
Lucerne (1306 ha)	236.11
Wheat (932 ha)	277.8
Vegetables (204 ha)	157.75
Other crops (135 ha) b/	32.32
Total	1732.68
Water Charges $17/ha for 4508 ha	76.64
Land Tax (1.33/ha)	9.04
Total Outflow	1818.36
Net Return Before Income Tax	129.85
Income Tax @ 10%	12.98
Net Return After Taxes	116.87

a/ Includes byproducts.
b/ Average of wheat and lucerne.

Table E-30 Balance Sheet of Assets and Liabilities, Ilyasov Production Cooperative

(Unit: Tenge 000)

Assets	Beginning 1996	Ending 1996	July 1 1997
I. Fixed Assets (main buildings, facilities)			
initial value	36,221	42,542	36,788
less depreciation	9,874	13,287	11,638
remaining value	26,347	29,255	25,150
Uncompleted capital investment	368	265	822
Long term financial investment	12	12	12
Subtotal Fixed Assets	26,227	29,532	25,984
II. Reserves and Expenses			
Production reserves	12,736	18,873	2,677
Livestock	5,978	4,784	280
Minor items	91	84	149
Uncompleted production	872	837	29,254
Finished Products	3,405	622	5
Goods for sale	35	99	95
Goods purchased	35	99	95
Subtotal Reserves and Expenses	23,017	25,299	32,460
III. Currency and Debtors			
For goods and work	1,414	3,685	2,445
With branch enterprise	3,318	2,488	2,843
With other debtors		159	159
Cash accounts	2		
Currency	17		
Other assets	1,860	4,123	4,666
Subtotal Currency and Debtors	6,611	10,465	10,163
Balance	56,355	65,286	68,607

Liabilities	Beginning 1996	Ending 1996	July 1 1997
I. Fund			
Regulated fund	64	64	64
Social welfare fund	18,535	14,260	14,260
Undistributed losses of past y	-9,427		
Income of current year		9,841	
Income of current year used		-9,841	122
Subtotal	9,172	14,324	14,202
II. Long Term Liabilities			
Long term loans	11,372	5,226	7,777
Short term bank credits	500	500	
Accounts with creditors			
for goods, work, & service	27,597	28,441	28,033
for labor payment	4,037	9,149	11,574
Social insurance	3,202	6,731	2,131
Income tax	259	421	742
Other creditors	120	480	4098
Advances and reserves	46	14	
Subtotal Long Term Liabilities	47,183	50,962	54,405
Balance	56,355	65,286	68,607

Source: Ilyasov Production Cooperative

Table E-31 Balance Sheet of Assets and Liabilities, Shagan Production Cooperative

(Unit: Tenge 000)

Assets of Shagan Farm	Beginning 1996	Ending 1996	July 1, 1997
I. Fixed Assets (main buildings, facilities)			
initial value		143,812	208,943
less depreciation		81,747	107,275
remaining value		62,065	101,667
Uncompleted capital investment		998	1019
Long term financial investment		27	27
Subtotal Fixed Assets	65,188	63,060	102,713
II. Reserves and Expenses			
Production reserves		28,537	16,693
Livestock for breeding & feeding		12,283	11,449
Minor items of little value		220	10
Uncompleted production		1,080	47,837
Finished Products		61,558	8,093
Goods for sale		667	682
Goods purchased		667	682
Subtotal Reserves and Expenses	46,055	104,345	84,764
III. Currency and Debtors			
For goods and work	1,838	17,074	16,399
With branch enterprise			
With other debtors			1,275
Cash accounts		37	10
Currency		20,561	
Short term financial investments	5,452	30	1,071
Subtotal Currency and Debtors	7,290	37,702	18,755
Balance	118,533	205,137	206,232

Liabilities	Beginning 1996	Ending 1996	July 1, 1997
I. Fund			
Regulated fund		67	67
Social welfare fund		115,241	128,338
Undistributed losses of past years			
Income of current year			6,700
Income of current year used			
Subtotal	86,206	115,308	135,105
II.Long Term Liabilities			
Long term loans	3,885	3,241	3,741
Long term bank credits		20,561	21,316
Short term bank credits	500	1,138	
Accounts with creditors	11,986		
for goods, work, & service		21,870	24,921
for labor payment		25,286	
Social insurance & security		9,321	8,458
Income tax		6,275	8,371
Consumption funds		883	3,791
Other creditors	15,956		529
Advances from purchasers - reserve for pending expenses		552	
Subtotal Long Term Liabilities	32,327		
Balance	118,533	205,137	206,232

Source: Shagan Production Cooperative

Table E-32 Modern Technology Transfer Package for Paddy

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping pattern i) Paddy mono-culture
ii) Paddy based rotation

3. Cropping period of paddy plant: Early May to Late September
Staggering period for seeding is 30days and for harvesting 30 days

4. Variety: Marzhan (120-125 days GD) and short duration variety (Kuban 3, less than 110 days)
When the seeding time is later than 20th May, Short duration varieties should be used

5. Cultural Practice

(1) Soil preparation

Autumn ploughing at a depth of 18--20 cm----October to early November
Early spring ploughing at a depth of 18--20 cm----Mid-April to early May
Hurrowing by disc hurrow 90 % of soil particle should be less than 1 cm at diametre.
Levelling at the accuracy of +- 5 cm----End of April to early May
Pressing soil before seeding----May (just before seeding)
Application of basal fertilizer (40% of N and total of P and K): May (just before seeding

(2) Seeding

Broadcasting at a seeding rate of 300 kg/ha
Depth of covering soil : 1.0--2.0 cm
Suitable paint density:150--200 plant/m2

(3) Water management

Just after seeding, start to water and to keep flood condition(10--12 cm) for few days
Just after starting germination (5--7 days after seeding), drain surface water
Keep the field wet and no surface water condition for few days
Then keep water depth at 12--20 cm, up to milky ripening stage
Drain surface water at milky stage and dry up field for harvesting

(4) Topdressing of nitrogen

40 % of total N at 3rd leaf age stage
20 % of total N at early panicle initiation stage(25 days before flowering)

(5) Weed control

1) Herbicide application at tillering stage
2) Weed control by deep water irrigation

(6) Harvesting

By combine harvester.
Not later than 35 days after flowering

6. Amount of input

Fertilizer	Nitrogen	150 kg-N/ha
	Phosphorus	80 kg- P2O5/ha
	Potassium	30 kg- K2O/ha
Pesticide	MEP 59 % (Sumithion)	1.2-3.0 kg/ha
Herbicide	Basagran	3-5 kg/ha

Table E-33 Modern Technology Transfer Package for Winter Wheat/ Barley

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping period : Late September to July/ August

3. Variety: Recommended variety in each oblast

4. Cultural practice

(1) Soil preparation

a-1. Just after harvesting of paddy, ploughing soil ay the depth of 30 cm
(a-2). Just after 3rd cutting of lucerne, ploughing at the depth of about 10cm.---lucerne
Ploughing at the depth of about 30 cm
(a-3). Just after harvesting of sugar beet discing at the depth of 22--25 cm---sugar beet
Ploughing at the depth of about 30 cm
b. Harrowing and leveling: more than 80 % of soil particle should be size of
1--10 mm in diametre.
c. Organic fertilizer application and incorporation

(2) Seeding

Drill seeding(10 cm interval) or broadcasting at a rate of 200--250 kg
depth of covering soil: 2--3 cm
Seeding time: Early september to beginning of October
Suitable plant density: around 200--250 plant/ m2

(3) Amount of fertilizer

N: 100 kg/ha, 50--60 kg/ha as a basal, 40--50 kg/ha as a topdressing at late April
P2O5: 50 kg/ha, K2O: 30 kg/ha as a basal

(4) Weed control

Application of 2 4-D (2.0--2.5 kg/ha) at tillering stage.

(5) Irrigation water supply

i. Soil preparation period or after seeding, depend on soil moisture content. 50--100 mm
ii. Tillering stage to ear primordia initiation stage.--- 80 mm
iii. Flowering stage to early ripening stage 80--100 mm
iv. Ripening stage.--- only dry year

(6) Harvesting

By combine harvester
Not later than 40 days after flowering

Note: Winter wheat/barley should be planted only just after paddy in the Project Area

Table E-34 Modern Technology Transfer Package for Spring Wheat/ Barley

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping period : Late April to August

3. Variety : Recommended variety in each region

4. Cultural practice

(1) Soil preparation

a. After harvesting of paddy ploughing soil at the depth of 25--30 cm
b. Spring ploughing at the depth of 25--30 cm, in the end of March to April
c. Harrowing and leveling: more than 80 % of soil particle should be size of 1--10 mm in diametre.
d. Organic fertilizer application and incorporation

(2) Seeding

Drill seeding(10 cm interval) or broadcasting at a rate of 200--250 kg
depth of covering soil: 2--3 cm
Seeding time: Late April to early May
Suitable plant density: around 200--250 plant/ m2

(3) Amount of fertilizer

N: 100 kg/ha, 50--60 kg/ha as a basal, 40--50 kg/ha as a topdressing at June
P2O5: 50 kg/ha, K2O: 30 kg/ha as a basal

(4) Weed control

Application of 2 4-D (2.0--2.5 kg/ha) at tillering stage.

(5) Irrigation water supply

i. Soil preparation period or after seeding, depend on soil moisture content. 50--100 mm
ii. Tillering stage to ear primordia initiation stage.--- 80 mm
iii. Flowering stage to early ripening stage 80--100 mm
iv. Ripening stage.--- only dry year

(6) Harvesting

By combine harvester
Not later than 40 days after flowering

Note: Spring wheat/barley should be planted only just after paddy in the Project Area

Table E-35 Modern Technology Transfer Package for Safflower

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping period : May to August

3. Variety : Recommended variety in each region

4. Cultural practice

(1) Soil preparation

a. Just after harvesting of paddy, ploughing soil at the depth of 30 cm
b. Harrowing and leveling: more than 80 % of soil particle should be size of 1--10 mm in diametre.
c. Organic fertilizer application and incorporation

(2) Seeding

Broadcasting at a rate of 70--80 kg/ha
Depth of covering soil: 2--3 cm
Seeding time: End of Aprilr to early May
Suitable plant density: around 30--100 plant/ m2

(3) Amount of fertilizer

N: 80 kg/ha as a basal
P2O5: 60 kg/ha and K2O: 20 kg/ha as a basal

(4) Weed control

By hand before harvesting

(5) Irrigation water supply

2 to 3 times during growth period
Flowering stage

vi) Harvesting

By combine harvester

Note: Safflower should be planted only just after paddy in the Project Area

Table E-36 Modern Technology Transfer Package for Maize for Silage

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping period: May to September

3. Variety: Recommended variety in each region. F1 hybrid is recommended

4. Cultural practice

(1) Soil preparation

a. Autumn ploughing at the depth of 25--30 cm, in September to begginning of October
b. Spring ploughing at the depth of 25--30 cm, in end of March to April
c. Harrowing and leveling: more than 80 % of soil particle should be size of 1--10cm in diametre.
d. Organic fertilizer application and incorporation
e. Ditching at the depth of 10--20 cm in June, befor supply of irrigation

(2) Seeding

a. Amount of seed: 60--70 kg/ha
b. Spacing: 70 x 15--20 cm, 7--12 plants/m2 (suitble plant densuty) for grain maize, 10--15plants/ m2 for silage maize
c. Seeding time: beginning of May---warm region, Middle to late May---cool region
d. Depth of covering soil: 5--7 cm
e. Thinning of plant: at the leaf age of 3--4

(3) Amoun t of fertilizer

N: 120 kg/ha. 60--70 kg/ ha -- basal application, 50--70 top dressing at june(inter tillage tim and silky stage.
P2O5: 80 kg/ha, K2O: 30 kg/ha--Basal application

(4) Weed control

a. Inter tillage at 5-7 leaf stage
b. Application of 2 4-D (2.0--2.5 kg/ha), at 3--5 leaf stage

(5) Pest cntrol

Application of pesticides (when symptom is observed)

(6) Irrigation water supply

3--5 times for heavy soil
6--10 times for light soil
The first irrigation water supply at 30 days after germination and the last one at 10--15days before harvesting .
Total amount of irrigation water: 500--700 mm

(7) Harvesting

Time: Milky stage
By harvestor

Note: Maize should be planted only just after paddy in the Project Area

Table E-37 Modern Technology Transfer Package for Lucerne

1. Field size: Acreage of one plot: 2--20ha (paddy field)

2. Cropping period : Ist year April to 3rd year September

3. Cultivars : Recommended variety

4. Cultural practice

(1) Soil preparation

a. Just after harvesting of paddy, plough at the depth of 30 cm (autumn plough)
b. Spring ploughing at the depth of about 30 cm
c. Harrowing and leveling: more than 80 % of soil particle should be size of 1--10 mm in diametre.

(2) Seeding

Drill seeding (10-15 cm interval)at a rate of 200--250 kg----spring wheat
Drill seeding (10 - 15 cm interval) at a rate of 15 kg/ha----lucerne, 2 weeks after spring wheat
Depth of covering soil: 4--5 cm
Seeding time: Late April to niddle of May
Suitable plant density: around 20--50 plant/ m2

(3) Amount of fertilizer

N:30 kg/ha, P2O5: 60 kg/ha, K2O: 20 kg/ha as a basal in 1st year
Fertilizer application in 2nd and 3rd year: just after cutting at the same rate as first year

(4) Weed control

Application of simazine or chlorprham (2.0--2.5 kg/ha)just after seedong
No weed control---2nd and 3rd year

(5) Irrigation water supply

1. Total amount of irrigation water 300--900 mm
2.Time: 2 weeks after harvesting, considering the plant growth and soil moisture content of soil

(6) Cutting

Southern region (agro-ecological zone III and IV)

Ist year		September
		End of September
2nd year	1st harvest:	Early June
	2nd harvest:	Late July
	3rdt harvest:	middle to late September
3rd year	1st harvest:	Early June
	2nd harvest:	Late July
	3rdt harvest:	middle to late September

Cutting is done by mower

Note: Lucern should be sown just after paddy cultivation in the Prpject Area

Table E-38 Proposed Farm Input and Labor Requirement (per ha)

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

Source: JICA study team estimation

Note *: Seeding is done every three year

Table E-39 Anticipated Yield of Crops under with Project Condition

(Unit: ton/ha)

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

*: Average value during 1985-1996

*2:Personel communication with KZRI of Agricultural Science

*3: Average value during 1985-1994

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

Table E-40 Financial Crop Enterprise Budget of Paddy under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Grain	tons	6.00	200.00	124.07	1075.93
Straw	tons	6.00			
Fodder Units	tons	0.60	136.30	16.36	65.42
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.12	381.00	9.14	45.72
Phosphorous	tons	0.08	435.00	6.96	34.80
Potassium	tons	0.03	117.00	0.70	3.51
Crop Chemicals					
Bazagran	kg	3.00	10.66	6.40	31.98
Insecticides	kg	5.00	4.00	4.00	20.00
Fungicides	ha				
Fuel	tons	0.25	191.30	9.57	47.83
Seeds	kg	300.00	0.33	19.80	99.00
Depreciation and Repair					
Tractors				5.44	27.20
Machinery				32.18	160.92
Labor Costs					
Land preparation	hours	7.00	0.70		4.90
Seeding	hours	3.00	0.70		2.10
Apply fertilizer	hours	7.00	0.70		4.90
Weeding	hours	1.00	0.70		0.70
Water management	hours	15.00	0.37		5.55
Harvesting	hours	5.00	0.70		3.50
Post harvest	hours	3.00	0.70		2.10
Hauling	ton/km	120.00	0.31		37.20
Subtotal					537.91
Miscellaneous @ 5%				5.38	26.90
Social Cost					11.16
Total Cost				115.93	575.96
Net Return					565.39
Labor/Ha (days)					5.86

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Grain	tons	3.59	200.00	45.27	672.73
Straw	tons	3.59			
Fodder Units	tons	0.36	136.30	9.79	39.15
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.15	200.00	6.00	30.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	kg	3.00	10.66	6.40	31.98
Insecticides	ha	5.00	4.00	4.00	20.00
Fungicides	ha				
Fuel	tons	0.21	191.30	8.03	40.17
Seeds	kg	300.00	0.33	19.80	99.00
Depreciation and Repair					
Tractors				5.44	27.20
Machinery				32.18	160.92
Labor Costs					
Land preparation	hours	7.00	0.70		4.90
Seeding	hours	3.00	0.70		2.10
Apply fertilizer	hours	7.00	0.70		4.90
Weeding	hours	1.00	0.70		0.70
Water management	hours	15.00	0.37		5.55
Harvesting	hours	3.00	0.70		2.10
Post harvest	hours	3.00	0.70		2.10
Hauling	ton/km	70.00	0.31		21.70
Subtotal					469.32
Miscellaneous @ 5%				4.69	23.47
Social Cost					10.52
Total Cost				98.33	503.31
Net Return					208.57
Labor/Ha (days)					5.57

Table E-41 Financial Crop Enterprise Budget of Lucerne under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Hay	tons	7.20	0.00		0.00
Fodder Units	tons	3.60	136.30	62.85	427.83
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.03	381.00	2.29	11.43
Phosphorous	tons	0.06	435.00	5.22	26.10
Potassium	tons	0.02	117.00	0.47	2.34
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Inoculant	kg	0.01	0.22	0.00	0.00
Fuel	tons	0.28	191.30	10.71	53.56
Seeds 1/3	kg	5.00	2.00	2.00	10.00
Depreciation and Repair					
Tractors				3.03	15.13
Machinery				9.63	48.13
Labor Costs					
Land preparation	hours	5.00	0.70		3.50
Seeding	hours	1.00	0.70		0.70
Fertilizer application	hours	5.00	0.70		3.50
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	5.00	0.70		3.50
Post harvest	hours	9.00	0.70		6.30
Subtotal					194.23
Miscellaneous @ 5%				1.94	9.71
Social Cost					10.12
Total Cost				35.28	214.06
Net Return					213.77
Labor/Ha (days)					5.00

Exchange rate US$ 1 = 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Hay	tons	2.86	0.00		0.00
Fodder Units	tons	1.43	136.30	9.12	185.79
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.05	200.00	2.00	10.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Inoculant	kg	0.01	0.22	0.00	0.00
Fuel	tons	0.25	191.30	9.57	47.83
Seeds	kg	5.00	2.00	2.00	10.00
Depreciation and Repair					
Tractors				3.03	15.13
Machinery				9.63	48.13
Labor Costs					
Land preparation	hours	5.00	0.70		3.50
Seeding	hours	1.00	0.70		0.70
Apply fertilizer	hours	4.00	0.70		2.80
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	3.00	0.70		2.10
Post harvest	hours	6.00	0.70		4.20
Subtotal					164.42
Miscellaneous @ 5%				1.64	8.22
Social Cost					8.16
Total Cost				29.86	180.79
Net Return					4.99
Labor/Ha (days)					4.14

Exchange rate US$ 1 = 75 Tenge

Table E-42 Financial Crop Enterprise Budget of Wheat under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Grain	tons	2.80	150.00	6.96	413.04
Straw	tons	3.50			
Fodder Units	tons	0.70	136.30	13.38	82.03
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.09	381.00	6.86	34.29
Phosphorous	tons	0.06	435.00	5.22	26.10
Potassium	tons	0.03	117.00	0.70	3.51
Crop Chemicals					
Herbicides	ha				
Insecticides	kg	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	ton	0.17	191.30	6.50	32.52
Seeds	kg	200.00	0.19	7.60	38.00
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				29.97	149.86
Labor Costs					
Land preparation	hours	6.00	0.70		4.20
Seeding	hours	1.00	0.70		0.70
Apply fertilizer	hours	4.00	0.70		2.80
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	2.00	0.70		1.40
Post harvest	hours	2.00	0.70		1.40
Hauling	ton/km	60.00	0.31		18.60
Subtotal					340.42
Miscellaneous @ 5%				3.40	17.02
Social Cost					6.83
Total Cost				77.04	364.27
Net Return					130.80
Labor/Ha (days)					3.57

Exchange rate US$ 1 = 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Grain	tons	1.06	150.00	0.00	159.00
Straw	tons	1.33			
Fodder Units	tons	0.27	136.30	0.00	36.12
Production Input Costs					
Fertilizer					
FYM/Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.10	200.00	4.00	20.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.00	117.00	0.00	0.00
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Fungicides	ha				
Fuel	ton	0.15	191.30	5.74	28.70
Seeds	kg	200.00	0.19	7.60	38.00
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				29.97	149.86
Labor Costs					
Land preparation	hours	5.00	0.70		3.50
Seeding	hours	1.00	0.70		0.70
Apply fertilizer	hours	4.00	0.70		2.80
Weeding	hours	1.00	0.70		0.70
Water management	hours	9.00	0.37		3.33
Harvesting	hours	2.00	0.70		1.40
Post harvest	hours	1.00	0.70		0.70
Hauling	ton/km	30.00	0.31		9.30
Subtotal					284.00
Miscellaneous @ 5%				2.84	14.20
Social Cost					6.17
Total Cost				53.95	304.37
Net Return					-109.25
Labor/Ha (days)					3.29

Exchange rate US$ 1 = 75 Tenge

Table E-43 Financial Crop Enterprise Budget of Lucerne under Future With and Without Project Condition

Future with project condition					(Unit: US$/ha)
Item	Unit	Amount	Price	VAT	Value
Crop Value					
Safflower seeds	tons	1.20	650.00	71.15	708.85
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.07	381.00	5.33	26.67
Phosphorous	tons	0.09	435.00	7.83	39.15
Potassium	tons	0.06	117.00	1.40	7.02
Crop Chemicals					
Herbicides	kg	5.00	5.00	5.00	25.00
Insecticides	ha	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	tons	0.15	191.30	5.74	28.70
Seeds	kg/ha	80.00	1.33	21.28	106.40
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				28.76	143.78
Labor Costs					
Plowing	hours	7.00	0.70		4.90
Planting	hours	1.00	0.70		0.70
Cultivation	hours	11.00	0.70		7.70
Apply Fertilizer	hours	7.00	0.70		4.90
Irrigation	hours	10.00	0.37		3.70
Harvest	hours	2.00	0.70		1.40
Post harvest	hours	2.00	0.70		1.40
Hauling	ton/km	600.00	0.31		186.00
Subtotal					610.43
Miscellaneous @ 5%				6.10	30.52
Social Cost					11.61
Total Cost				84.85	652.56
Net Return					56.29
Labor/Ha (days)					5.71

Exchange rate US$ 1 = 75 Tenge

Future without project condition					(Unit: US$/ha)
Item	Unit	Amount	Price	VAT	Value
Crop Value					
Safflower seeds	tons	0.25	650.00	0.00	162.50
Production Input Costs					
Fertilizer					
FYM Compost	tons	3.00	2.00		6.00
Nitrogen	tons	0.10	200.00	4.00	20.00
Phosphorous	tons	0.05	200.00	2.00	10.00
Potassium	tons	0.03	117.00	0.70	3.51
Crop Chemicals					
Herbicides	ha				
Insecticides	ha				
Fungicides	ha				
Fuel	tons	0.15	191.30	5.74	28.70
Seeds	kg/ha	80.00	1.33	21.28	106.40
Depreciation and Repair					
Tractors				1.80	9.01
Machinery				28.76	143.78
Labor Costs					
Plowing	hours	7.00	0.70		4.90
Planting	hours	1.00	0.70		0.70
Cultivation	hours	7.00	0.70		4.90
Apply Fertilizer	hours	7.00	0.70		4.90
Irrigation	hours	10.00	0.37		3.70
Harvest	hours	2.00	0.70		1.40
Post harvest	hours	2.00	0.70		1.40
Hauling	ton/km	85.00	0.31		26.35
Subtotal					375.64
Miscellaneous @ 5%				3.76	18.78
Social Cost					10.29
Total Cost				68.04	404.72
Net Return					-242.22
Labor/Ha (days)					5.14

Exchange rate US$ 1 = 75 Tenge

Table E-44 Financial Crop Enterprise Budget of Vegetables under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Vegetables	tons	15.00	220.00	599.01	2700.99
Production Input Costs					
Fertilizer					
Manure	tons	5.00	2.00		10.00
Nitrogen	tons	0.18	381.00	13.72	68.58
Phosphorous	tons	0.08	435.00	6.96	34.80
Potassium	tons	0.03	117.00	0.70	3.51
Crop Chemicals					
Herbicides	ha				
Insecticides	kg	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	tons	0.26	191.30	10.06	50.31
Seeds	kg/ha	3.00	15.33	9.20	45.99
Depreciation and Repair a/					
Tractors				5.46	27.31
Machinery				6.93	34.67
Labor Costs					
Plowing	hr	25.00	0.70		17.50
Planting	hr	11.00	0.70		7.70
Cultivation	hr	176.00	0.70		123.20
Apply Fertilizer	hr	18.00	0.70		12.60
Irrigation	hr	46.00	0.37		17.02
Harvest by hand	hr	235.00	0.37		86.95
Post Harvest	hr	18.00	0.70		12.60
Hauling	ton/km	240.00	0.31		74.40
Subtotal					635.14
Miscellaneous @ 5%				6.35	31.76
Social Cost					124.54
Total Cost				60.99	791.43
Net Return					1909.55
Labor/Ha (days)					75.57

Exchange rate US$ 1 = 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	VAT	Value
Crop Value					
Vegetables	tons	6.85	220.00	248.39	1258.61
Production Input Costs					
Fertilizer					
Manure	tons	13.35	2.00		26.70
Nitrogen	tons	0.25	200.00	10.00	50.00
Phosphorous	tons	0.08	200.00	3.20	16.00
Potassium	tons	0.06	117.00	1.40	7.02
Crop Chemicals					
Herbicides	ha				
Insecticides	kg	2.00	4.00	1.60	8.00
Fungicides	ha				
Fuel	tons	0.26	191.30	10.06	50.31
Seeds	kg/ha	3.00	15.33	9.20	45.99
Depreciation and Repair					
Tractors				5.46	27.31
Machinery				6.93	34.67
Labor Costs					
Plowing	hr	21.00	0.70		14.70
Planting	hr	7.00	0.70		4.90
Cultivation	hr	155.00	0.70		108.50
Apply Fertilizer	hr	18.00	0.70		12.60
Irrigation	hr	39.00	0.37		14.43
Harvest by hand	hr	161.00	0.37		59.57
Post Harvest	hr	14.00	0.70		9.80
Hauling	ton/km	80.00	0.31		24.80
Subtotal					515.30
Miscellaneous @ 5%				5.15	25.77
Social Cost					100.91
Total Cost				53.01	641.98
Net Return					616.64
Labor/Ha (days)					59.29

Exchange rate US$ 1 = 75 Tenge

Table E-45 Economic Crop Enterprise Budget of Paddy under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Grain	tons	6.00	200.00	1200.00
Straw	tons	6.00		
Fodder Units	tons	0.60	136.30	81.78
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitrogen	tons	0.12	305.00	36.60
Phosphorous	tons	0.08	348.00	27.84
Potassium	tons	0.03	93.60	2.81
Crop Chemicals				
Basargan	kg	3.00	8.53	25.58
Insecticides	kg	5.00	4.00	20.00
Fungicides	ha			
Fuel	tons	0.25	153.04	38.26
Seeds	kg	300.00	0.26	79.20
Depreciation and Repair				
Tractors				21.76
Machinery				128.74
Labor Costs				
Land Preparation	hour	7.00	0.70	4.90
Seeding	hour	3.00	0.70	2.10
Apply Fertilizer	hour	7.00	0.70	4.90
Weeding	hour	1.00	0.70	0.70
Water Management	hour	15.00	0.37	5.55
Harvesting	hour	5.00	0.70	3.50
Post Harvest	hour	3.00	0.70	2.10
Hauling	ton/km	120.00	0.31	37.20
Subtotal				447.74
Miscellaneous @ 5%				22.39
Total Cost				470.12
SCF Adjusted Cost				423.11
Net Return				858.67
Labor/Ha (days)				5.86

Exchange Rate US$ 1= 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Grain	tons	3.59	200.00	718.00
Straw	tons	3.59		
Fodder Units	tons	0.36	136.30	48.93
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitrogen	tons	0.15	160.00	24.00
Phosphorous	tons	0.05	160.00	8.00
Potassium	tons	0.00	93.60	0.00
Crop Chemicals				
Herbicides	kg	3.00	8.53	25.59
Insecticides	ha	5.00	4.00	20.00
Fungicides	ha			
Fuel	tons	0.21	153.04	32.14
Seeds	kg	300.00	0.26	79.20
Depreciation and Repair				
Tractors				21.76
Machinery				128.74
Labor Costs				
Land preparation	hours	7.00	0.70	4.90
Seeding	hours	3.00	0.70	2.10
Apply Fertilizer	hours	7.00	0.70	4.90
Weeding	hours	1.00	0.70	0.70
Water management	hours	15.00	0.37	5.55
Harvesting	hours	3.00	0.70	2.10
Post harvest	hours	3.00	0.70	2.10
Hauling	ton/km	70.00	0.31	21.70
Subtotal				389.43
Miscellaneous @ 5%				19.47
Total Cost				408.95
SCF Adjusted Cost				368.06
Net Return				398.87
Labor/Ha (days)				5.57

Exchange Rate US$ 1= 75 Tenge

Table E-46 Economic Crop Enterprise Budget of Lucerne under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Hay	tons	7.20	0.00	0.00
Fodder Units	tons	3.60	136.30	490.68
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitrogen	tons	0.03	305.00	9.15
Phosphorous	tons	0.06	348.00	20.88
Potassium	tons	0.02	93.60	1.87
Crop Chemicals				
Herbicides	ha			
Insecticides	ha			
Inoculant	kg	0.01	0.18	0.00
Fuel	tons	0.28	153.04	42.85
Seeds 1/3	kg	5.00	2.00	10.00
Depreciation and Repair				
Tractors				15.13
Machinery				48.13
Labor Costs				
Land preparation	hours	5.00	0.70	3.50
Seeding	hours	1.00	0.70	0.70
Apply fertilizer	hours	5.00	0.70	3.50
Weeding	hours	1.00	0.70	0.70
Water management	hours	9.00	0.37	3.33
Harvesting	hours	5.00	0.70	3.50
Post harvest	hours	9.00	0.70	6.30
Subtotal				175.55
Miscellaneous @ 5%				8.78
Total Cost				184.32
SCF Adjusted Cost				165.89
Net Return				324.79
Labor/Ha (days)				5.00

Exchange Rate US$ 1= 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Hay	tons	2.86	0.00	0.00
Fodder Units	tons	1.43	136.30	194.91
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitro-Ammo-Phos	tons	0.05	160.00	8.00
DSP	tons	0.05	160.00	8.00
Potassium	tons	0.00	93.60	0.00
Crop Chemicals				
Herbicides	ha			
Insecticides	ha			
Inoculant	kg	0.01	0.18	0.00
Fuel	tons	0.25	153.04	38.26
Seeds 1/3	kg	5.00	1.60	8.00
Depreciation and Repair				
Tractors				12.10
Machinery				38.50
Labor Costs				
Land preparation	hours	5.00	0.70	3.50
Seeding	hours	1.00	0.70	0.70
Apply fertilizer	hours	4.00	0.70	2.80
Weeding	hours	1.00	0.70	0.70
Water management	hours	9.00	0.37	3.33
Harvesting	hours	3.00	0.70	2.10
Post harvest	hours	6.00	0.70	4.20
Subtotal				136.20
Miscellaneous @ 5%				6.81
Total Cost				143.01
SCF adjustment				128.71
Net Return				66.20
Labor/Ha (days)				4.14

Exchange Rate US$ 1= 75 Tenge

Table E-47 Economic Crop Enterprise Budget of Wheat under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Grain	tons	2.80	150.00	420.00
Straw	tons	3.50		
Fodder Units	tons	0.70	136.30	95.41
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitrogen	tons	0.09	305.00	27.45
Phosphorous	tons	0.06	348.00	20.88
Potassium	tons	0.03	93.60	2.81
Crop Chemicals				
Herbicides	kg	5.00	5.00	25.00
Insecticides	kg	2.00	4.00	8.00
Fungicides	kg			
Fuel	ton	0.17	153.04	26.02
Seeds	kg	200.00	0.15	30.40
Depreciation and Repair				
Tractors				7.21
Machinery				119.89
Labor Costs				
Land Preparation	hours	6.00	0.70	4.20
Seeding	hours	1.00	0.70	0.70
Apply fertilizer	hours	4.00	0.70	2.80
Weeding	hours	1.00	0.70	0.70
Water management	hours	9.00	0.37	3.33
Harvesting	hours	2.00	0.70	1.40
Post harvest	hours	2.00	0.70	1.40
Hauling	ton/km	60.00	0.31	18.60
Subtotal				306.78
Miscellaneous @ 5%				15.34
Total Cost				322.12
SCF Adjusted Cost				289.91
Net Return				225.50
Labor/Ha (days)				3.57

Exchange Rate US$ 1= 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Grain	tons	1.06	150.00	159.00
Straw	tons	1.33		
Fodder Units	tons	0.27	136.30	36.12
Production Input Costs				
Fertilizer				
FYM/Compost	tons	3.00	2.00	6.00
Nitro-Ammo-Phos	tons	0.10	160.00	16.00
DSP	tons	0.05	160.00	8.00
Potassium	tons	0.00	93.60	0.00
Crop Chemicals				
Herbicides	ha			
Insecticides	ha			
Fungicides	ha			
Fuel	kg	0.15	153.04	22.96
Seeds	kg	200.00	0.15	30.40
Depreciation and Repair				
Tractors				7.21
Machinery				119.89
Labor Costs				
Land preparation	hours	5.00	0.70	3.50
Seeding	hours	1.00	0.70	0.70
Apply fertilizer	hours	4.00	0.70	2.80
Weeding	hours	1.00	0.70	0.70
Water management	hours	9.00	0.37	3.33
Harvesting	hours	2.00	0.70	1.40
Post harvest	hours	1.00	0.70	0.70
Hauling	ton/km	30.00	0.31	9.30
Subtotal				232.88
Miscellaneous @ 5%				11.64
Total Cost				244.53
SCF Adjusted Cost				220.07
Net Return				-24.95
Labor/Ha (days)				3.29

Exchange Rate US$ 1= 75 Tenge

Table E-48 Economic Crop Enterprise Budget of Safflower under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Safflower seeds	tons	1.20	650.00	780.00
Production Input Costs				
Fertilizer				
FYM Compost	tons	3.00	2.00	6.00
Nitrogen	tons	0.07	305.00	21.35
Phosphorous	tons	0.09	348.00	31.32
Potassium	tons	0.06	93.60	5.62
Crop Chemicals				
Herbicides	ha	5.00	5.00	25.00
Insecticides	kg	2.00	4.00	8.00
Fungicides	ha			
Fuel	tons	0.15	153.04	22.96
Seeds	kg/ha	80.00	1.06	85.12
Depreciation and Repair				
Tractors				7.21
Machinery				115.02
Labor Costs				
Plowing	hours	7.00	0.70	4.90
Planting	hours	1.00	0.70	0.70
Cultivation	hours	11.00	0.70	7.70
Apply Fertilizer	hours	7.00	0.70	4.90
Chemical Treatment	hours	0.00	0.70	0.00
Irrigation	hours	10.00	0.37	3.70
Harvest	hours	2.00	0.70	1.40
Post harvest	hours	2.00	0.70	1.40
Hauling	ton/km	600.00	0.31	186.00
Subtotal				538.29
Miscellaneous @ 5%				26.91
Total Cost				565.21
SCF Adjusted Cost				508.69
Net Return				271.31
Labor/Ha (days)				5.71

Exchange Rate US$ 1= 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Safflower seeds	tons	0.25	650.00	162.50
Production Input Costs				
Fertilizer				
FYM Compost	tons	3.00	2.00	6.00
Nitro-Ammo-Phos	tons	0.10	160.00	16.00
DSP	tons	0.05	160.00	8.00
Potassium	tons	0.03	93.60	2.81
Crop Chemicals				
Herbicides	ha			
Insecticides	ha	1.00	6.98	6.98
Fungicides	ha			
Fuel	tons	0.15	153.04	22.96
Seeds	kg/ha	80.00	1.06	85.12
Depreciation and Repair				
Tractors				7.21
Machinery				115.02
Labor Costs				
Plowing	hours	7.00	0.70	4.90
Planting	hours	1.00	0.70	0.70
Cultivation	hours	7.00	0.70	4.90
Apply Fertilizer	hours	7.00	0.70	4.90
Chemical Treatment	hours	0.00	0.70	0.00
Irrigation	hours	10.00	0.37	3.70
Harvest	hours	2.00	0.70	1.40
Post harvest	hours	2.00	0.70	1.40
Hauling	ton/km	85.00	0.31	26.35
Subtotal				318.34
Miscellaneous @ 5%				15.92
Total Cost				334.26
SCF Adjusted Cost				300.83
Net Return				-138.33
Labor/Ha (days)				5.14

Exchange Rate US$ 1= 75 Tenge

Table E-49 Economic Crop Enterprise Budget of Vegetables under Future With and Without Project Condition

Future with project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Vegetables	tons	15.00	198.00	2970.00
Production Input Costs				
Fertilizer				
Manure	tons	5.00	2.00	10.00
Nitrogen	tons	0.18	305.00	54.90
Phosphorous	tons	0.08	348.00	27.84
Potassium	tons	0.03	93.60	2.81
Crop Chemicals				
Herbicides	kg			
Insecticides	kg	2.00	4.00	8.00
Fungicides	kg			
Fuel	tons	0.26	153.04	40.25
Seeds	kg/ha	3.00	12.26	36.79
Depreciation and Repair				
Tractors				21.85
Machinery				27.74
Labor Costs				
Plowing	hr	25.00	0.70	17.50
Planting	hr	11.00	0.70	7.70
Cultivation	hr	176.00	0.70	123.20
Apply Fertilizer	hr	18.00	0.70	12.60
Irrigation	hr	46.00	0.37	17.02
Harvest by hand	hr	235.00	0.37	86.95
Post Harvest	hr	18.00	0.70	12.60
Hauling	ton/km	240.00	0.31	74.40
Subtotal				582.14
Miscellaneous @ 5%				29.11
Total Cost				611.25
SCF Adjusted Cost				550.13
Net Return				2419.87
Labor/Ha (days)				75.57

Exchange Rate US$ 1= 75 Tenge

Future without project condition (Unit: US$/ha)

Item	Unit	Amount	Price	Value
Crop Value				
Vegetables	tons	6.85	198.00	1356.30
Production Input Costs				
Fertilizer				
Manure	tons	4.00	2.00	8.00
Nitro-Ammo-Phos	tons	0.25	160.00	40.00
DSP	tons	0.08	160.00	12.80
Potassium	tons	0.06	93.60	5.62
Crop Chemicals				
Herbicides	ha			
Insecticides	kg	2.00	4.00	8.00
Fungicides	ha			
Fuel	tons	0.26	153.04	40.25
Seeds	kg/ha	3.00	12.26	36.79
Depreciation and Repair				
Tractors				21.85
Machinery				27.74
Labor Costs				
Plowing	hr	21.00	0.70	14.70
Planting	hr	7.00	0.70	4.90
Cultivation	hr	155.00	0.70	108.50
Apply Fertilizer	hr	18.00	0.70	12.60
Irrigation	hr	39.00	0.37	14.43
Harvest by hand	hr	161.00	0.37	59.57
Post Harvest	hr	14.00	0.70	9.80
Hauling	ton/km	80.00	0.31	24.80
Subtotal				450.34
Miscellaneous @ 5%				22.52
Total Cost				472.86
SCF Adjusted Cost				425.57
Net Return				930.73
Labor/Ha (days)				59.29

Exchange Rate US$ 1= 75 Tenge

Table E-50 Farm Budget Analysis, Ilyasov Farm Area

6,480 Hectares (Unit: $000, 1997)

Item	Year	1	2	3	4	5	6	7	8
Gross Value of Production a/		425	425	4,535	5,905	5,905	5,905	5,905	5,905
			Outflow						
Investment Onfarm Facilities 70%		1,368	2,736	1,026	0	0			
Investment Rice Mill		1,525	763						
Crop Production Costs		318	318	2,929	2,929	2,929	2,929	2,929	2,929
Irrig. System Operating Costs		13	13	421	421	421	421	421	421
Land Tax		9	9	9	9	9	9	9	9
Investment Farm machinery				5,048	1,683				
Total Outflow b/		3,233	3,838	9,432	5,041	3,359	3,359	3,359	3,359
				Net Benefit Before Financing					
Total		-\(2,808\)	-\(3,413\)	-\(4,897\)	864	2,546	2,546	2,546	2,546
Without Project		85	85	85	85	85	85	85	85
Incremental		-\(2,893\)	-\(3,498\)	-\(4,982\)	779	2,461	2,461	2,461	2,461
				Financing					
Loan Receipts									
Irrig. & Drng. Construction		1,368	2,736	1,026	0	0	0	0	0
Rice mill & storage		1,525	763	0	0	0			
Farm machinery				5,048	1,683	0	0	0	0
Debt Service, Construction Loan									
(30 Years @ 2.5%)					245	245	245	245	245
Rice mill, 4 yrs @ 4.5% c/				103	638	638	638	638	
Interest on Farm machinery loan									
(55% of $6,731,000 @ 4.5%)					167	167	167	167	167
Interest Operating Loan 4.5%		5	5	35	35	35	35	35	35
Net Financing		2,893	3,498	5,971	633	-\(1,049\)	-\(1,049\)	-\(1,049\)	-\(412\)
				Net Benefit After Financing					
Total		85	85	1,073	1,497	1,497	1,497	1,497	2,135
Without Project		85	85	85	85	85	85	85	85
Incremental		\(0\)	\(0\)	988	1,412	1,412	1,412	1,412	2,049
Wages Paid as Production Cost		29	29	224	224	224	224	224	224
Net Income/Household $		251	251	2,857	3,790	3,790	3,790	3,790	5,195
FIRR to All Resources Engaged %	=		16.8 d/						

a/ Seventy five percent of the with project gross return in the third year (2004)

b/ Project costs include 10% physical contingency allowance.

c/ Interest only in 3rd year because of low income. Repayment begins in 4th year.

d/ FIRR of incremental benefit before financing.

Table E-51 Farm Budget Analysis, Shagan Farm Area

7,210 Hectares (Unit: $000, 1997)

Item	Year	1	2	3	4	5	6	7	8
Gross Value of Production a/		797	797	5,135	6,581	6,581	6,581	6,581	6,581
			Outflow						
Investment Onfarm Facilities 70%		1,818	3,635	1,363	0	0			
Investment Rice Mill		477	381						
Crop Production Costs		614	614	3,260	3,260	3,260	3,260	3,260	3,260
Irrig. System Operating Costs		26	26	469	469	469	469	469	469
Land Tax		10	10	10	10	10	10	10	10
Investment Farm machinery			5,906	1,969					
Total Outflow b/		2,944	10,573	7,071	3,739	3,739	3,739	3,739	3,739
			Net Benefit Before Financing						
Total		-\(2,147\)	-\(9,776\)	-\(1,936\)	2,842	2,842	2,842	2,842	2,842
Without Project		147	147	147	147	147	147	147	147
Incremental		-\(2,294\)	-\(9,923\)	-\(2,083\)	2,695	2,695	2,695	2,695	2,695
			Financing						
Loan Receipts									
Irrig. & Drng. Construction		1,818	3,635	1,363	0	0	0	0	0
Rice mill & storage		477	381	0	0	0			
Farm machinery			5,906	1,969	0	0	0	0	0
Debt Service, Construction Loan									
(30 Years @ 2.5%)					326	326	326	326	326
Rice mill, 4 yrs @ 4.5% c/				39	239	239	239	239	
Interest on Farm machinery loan									
(55% of $7,875,000 @ 4.5%)					195	195	195	195	195
Interest Operating Loan 4.5%		5	5	39	39	39	39	39	39
Net Financing		2,294	9,923	3,293	-\(760\)	-\(760\)	-\(760\)	-\(760\)	-\(521\)
			Net Benefit After Financing						
Total		147	147	1,357	2,082	2,082	2,082	2,082	2,321
Without Project		147	147	147	147	147	147	147	147
Incremental		0	0	1,210	1,935	1,935	1,935	1,935	2,174
Wages Paid as Production Cost		57	57	249	249	249	249	249	249
Net Income/Household $		294	294	2,311	3,354	3,354	3,354	3,354	3,698
FIRR to All Resources Engaged %	=		15.9 d/						

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

Figures

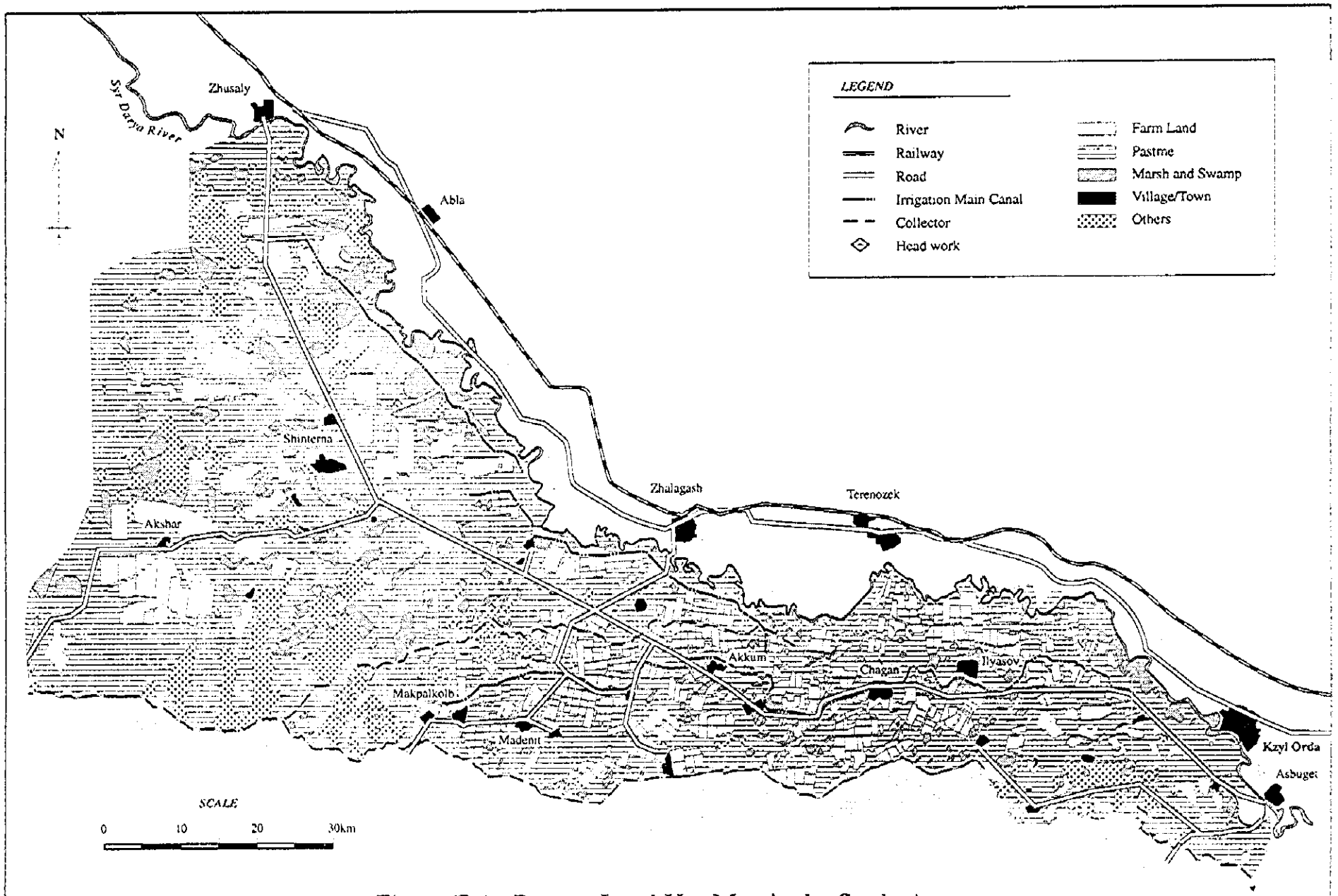
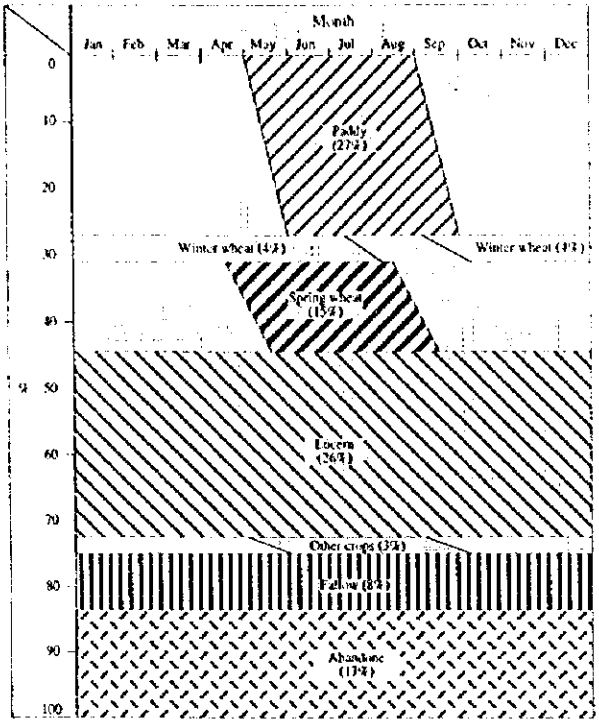
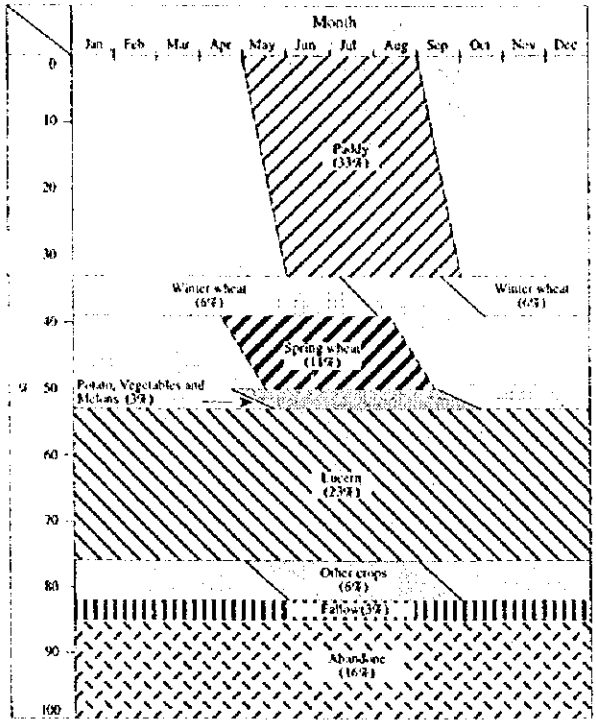


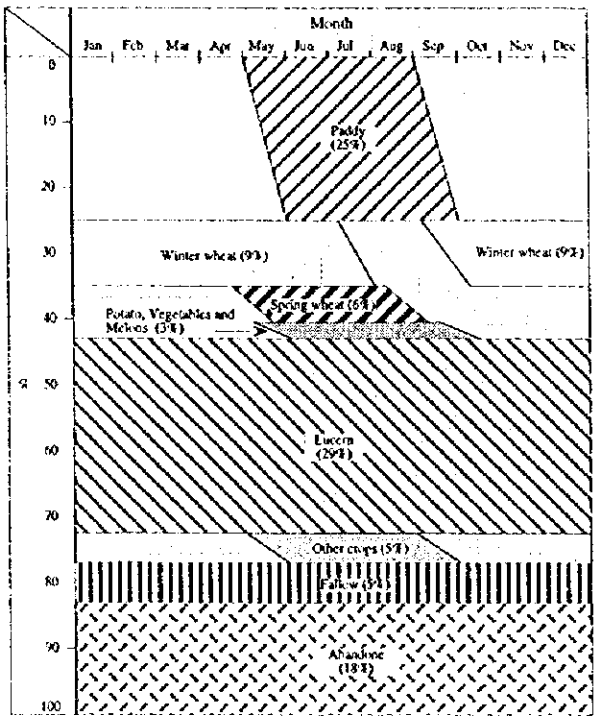
Figure E-1 Present Land Use Map in the Study Area



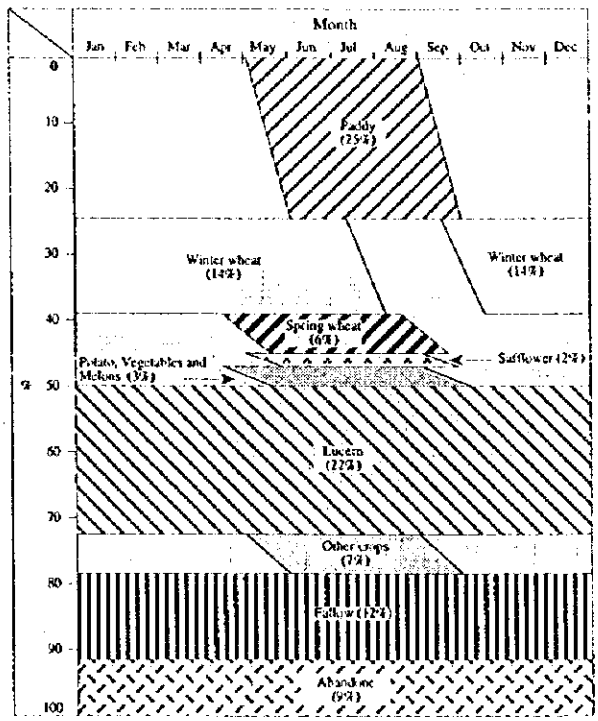
Syrdarya Raion



Terenozek Raion

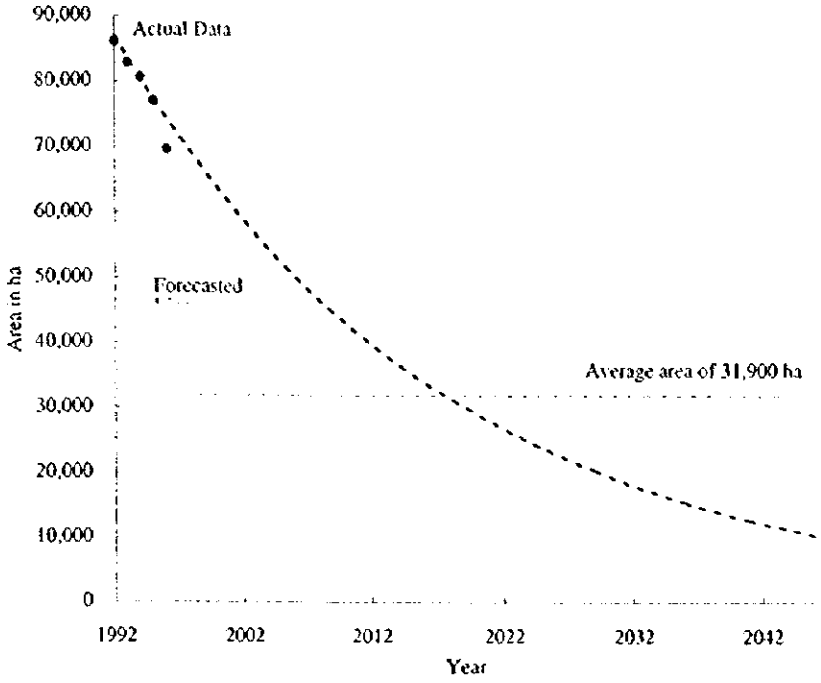


Zhalagashi Raion



Karnakshy Raion

Figure E-2 Present Cropping Pattern in the Study Area



Estimated Project Area

Projet Life	Year	Area in ha	Projet Life	Year	Area in ha
	1992	85,178	24	2020	28,934
	1993	80,938	25	2021	27,818
	1994	78,688	26	2022	26,745
	1995	75,075	27	2023	25,714
	1996	67,693	28	2024	24,722
1	1997	71,499	29	2025	23,769
2	1998	68,741	30	2026	22,852
3	1999	66,090	31	2027	21,971
4	2000	63,541	32	2028	21,123
5	2001	61,090	33	2029	20,308
6	2002	58,734	34	2030	19,525
7	2003	56,469	35	2031	18,772
8	2004	54,291	36	2032	18,048
9	2005	52,197	37	2033	17,352
10	2006	50,184	38	2034	16,683
11	2007	48,248	39	2035	16,039
12	2008	46,387	40	2036	15,421
13	2009	44,598	41	2037	14,826
14	2010	42,878	42	2038	14,254
15	2011	41,224	43	2039	13,704
16	2012	39,634	44	2040	13,176
17	2013	38,106	45	2041	12,668
18	2014	36,636	46	2042	12,179
19	2015	35,223	47	2043	11,709
20	2016	33,864	48	2044	11,258
21	2017	32,558	49	2045	10,823
22	2018	31,302	50	2046	10,406
23	2019	30,095			
				Average	31,888 ha
				say	31,900 ha

Figure E.3 Forecast of Irrigation Area

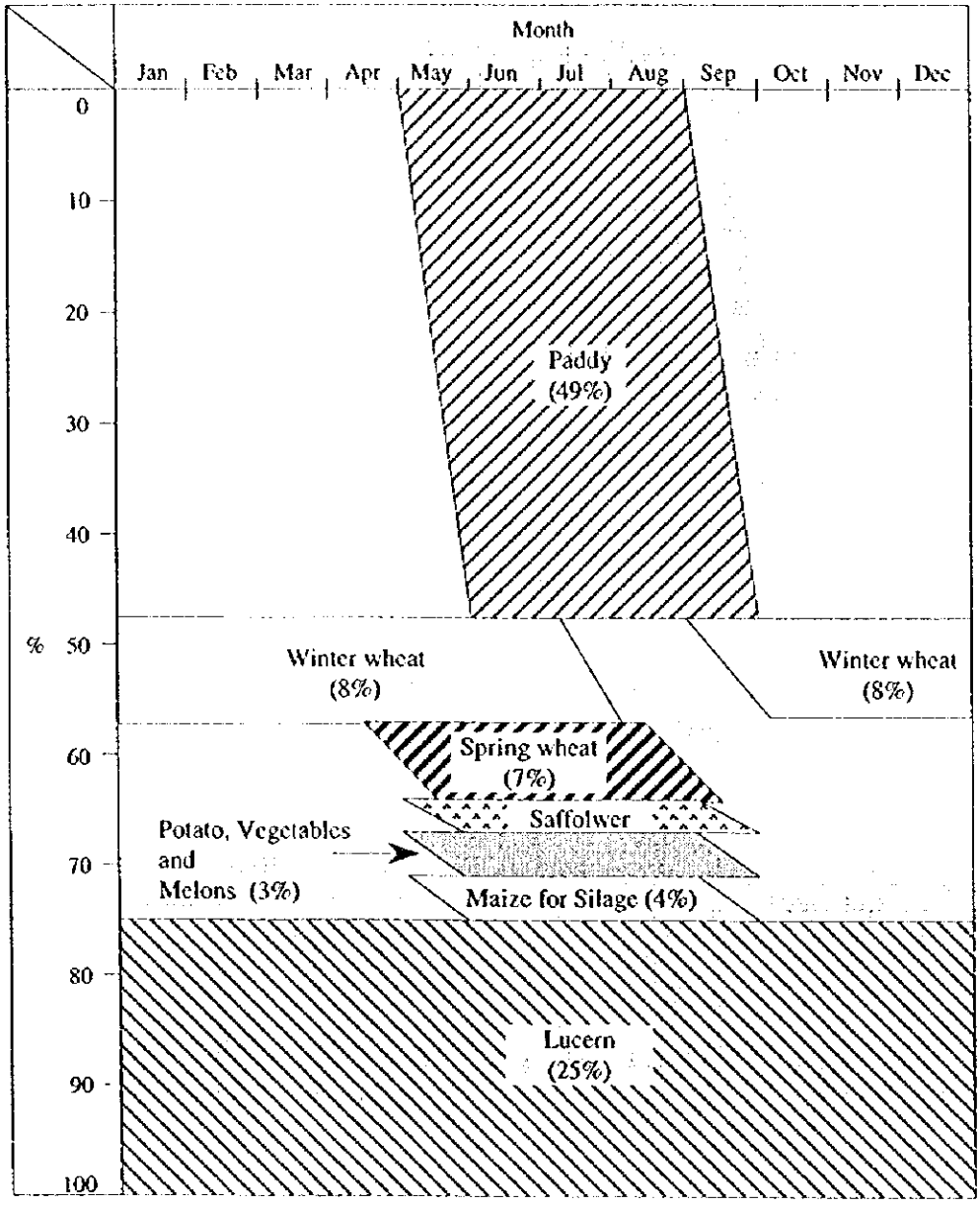


Figure E-4 Cropping Pattern in the Study Area under with Project Condition

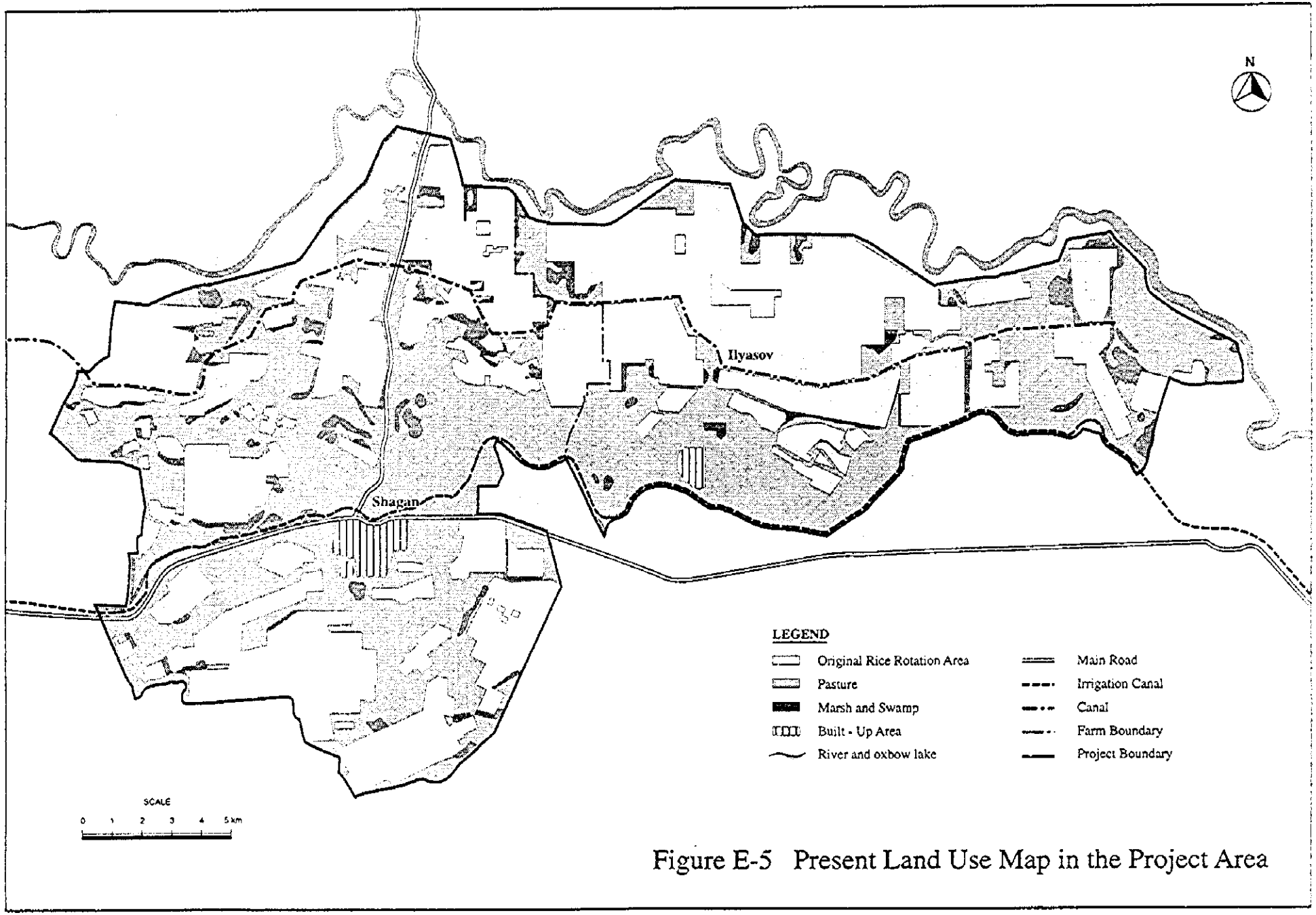


Figure E-5 Present Land Use Map in the Project Area

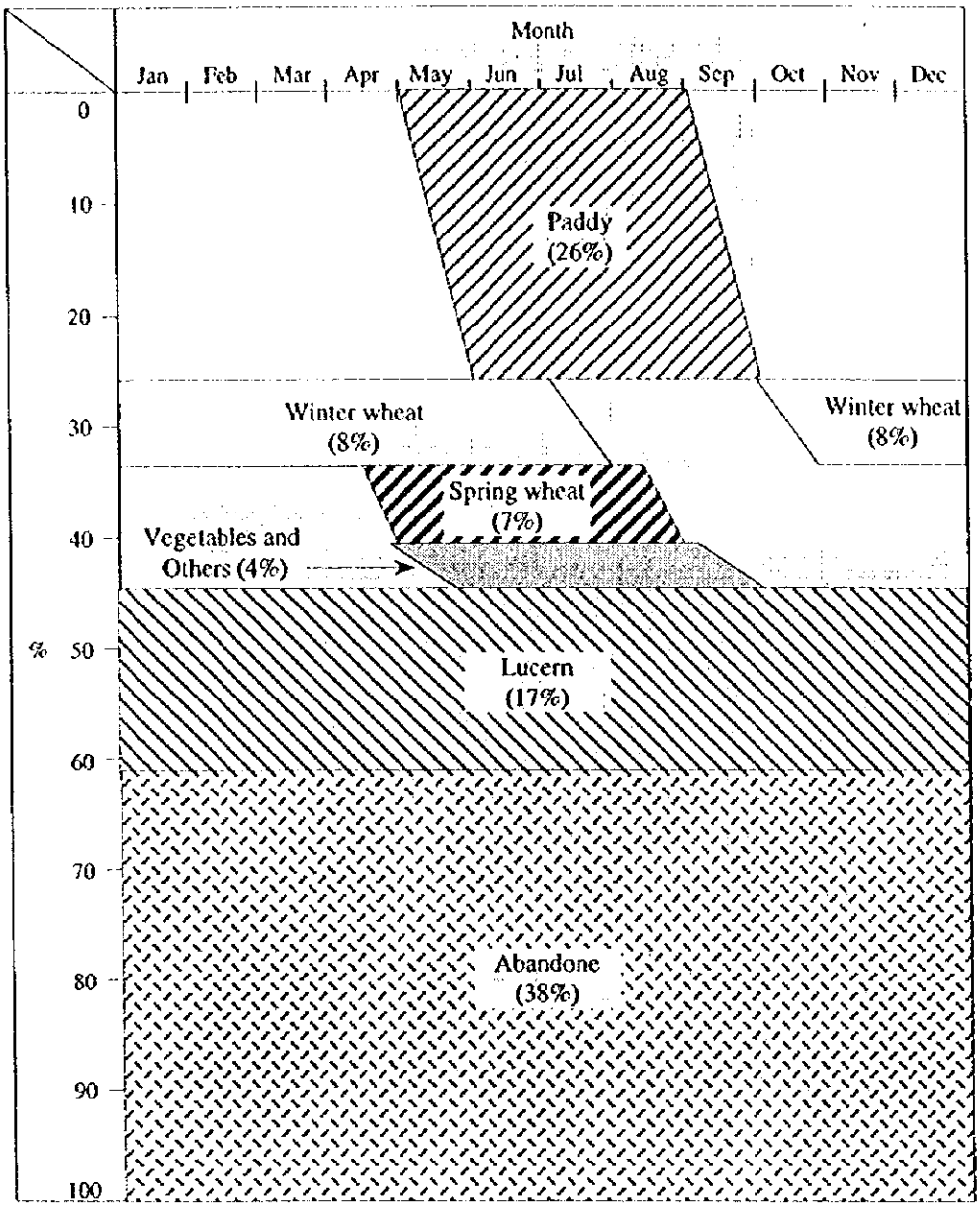


Figure E-6 Present Cropping Pattern in the Project Area (1996)

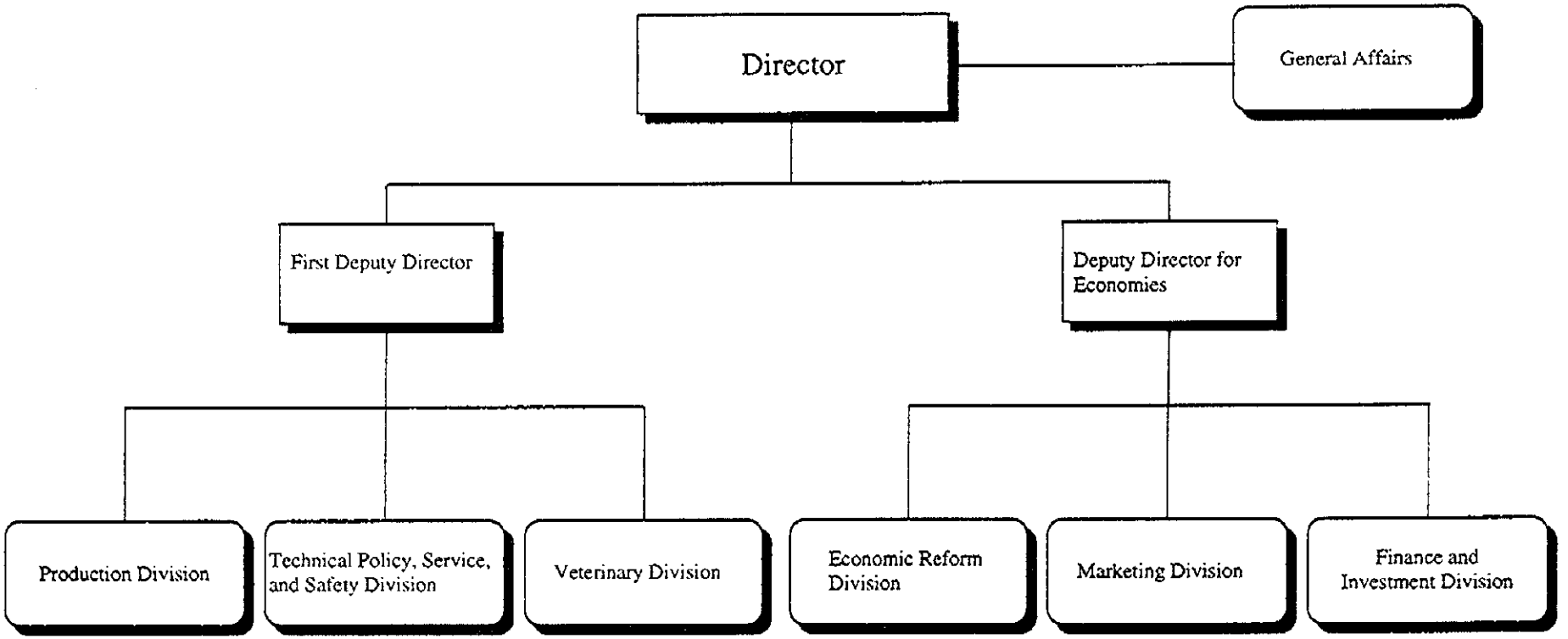
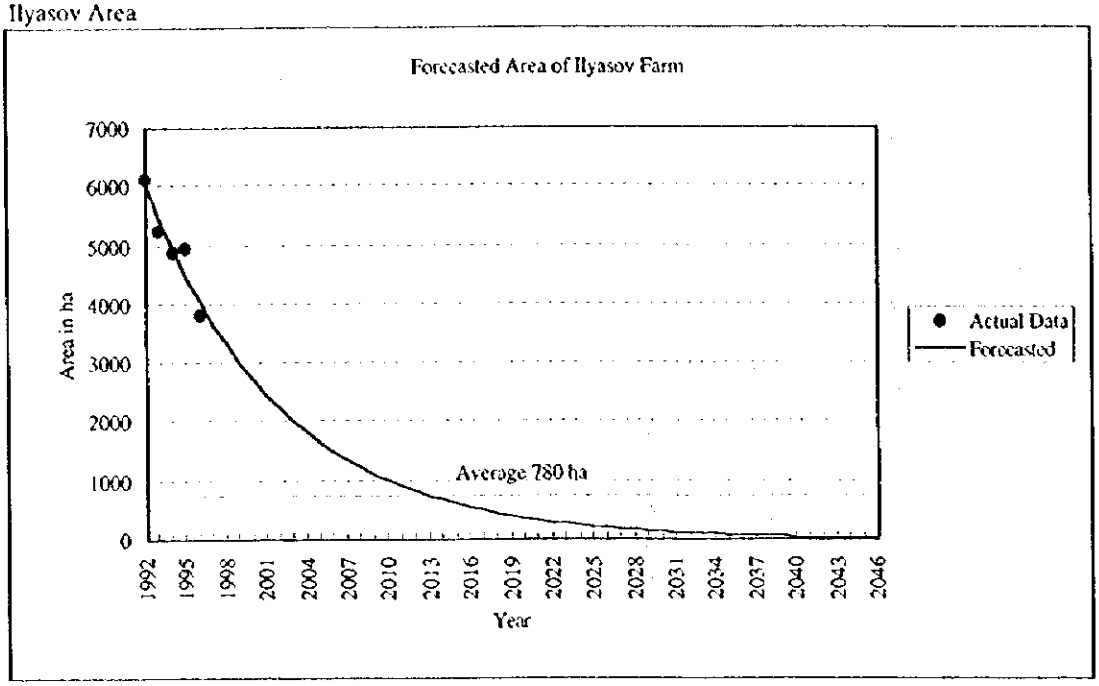
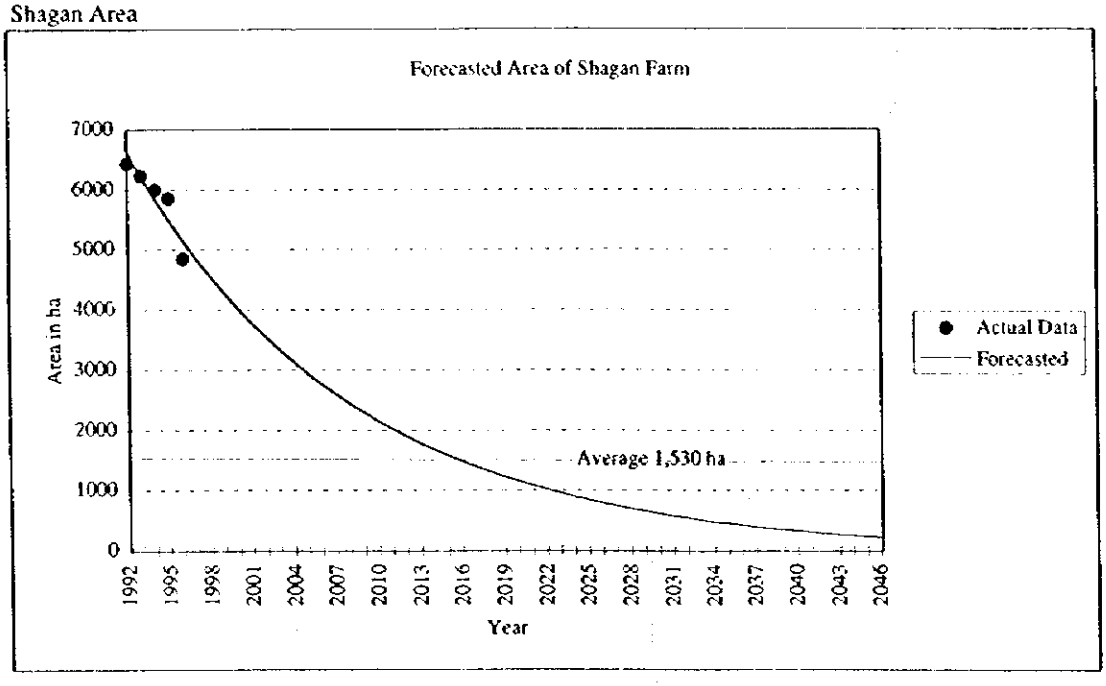


Figure E-7 Organization Chart of Kzyl-Orda Oblast Department Agriculture

Ilyasov Area



Shagan Area



Irrigation Area

unit: ha

Year	1992	1993	1994	1995	1996
Ilyasov Farm	6108	5240	4890	4960	3821
Shagan Farm	6438	6230	6000	5850	4855

Figure E-8 Forecasting of Irrigation Area in Ilyasov and Shagan Area

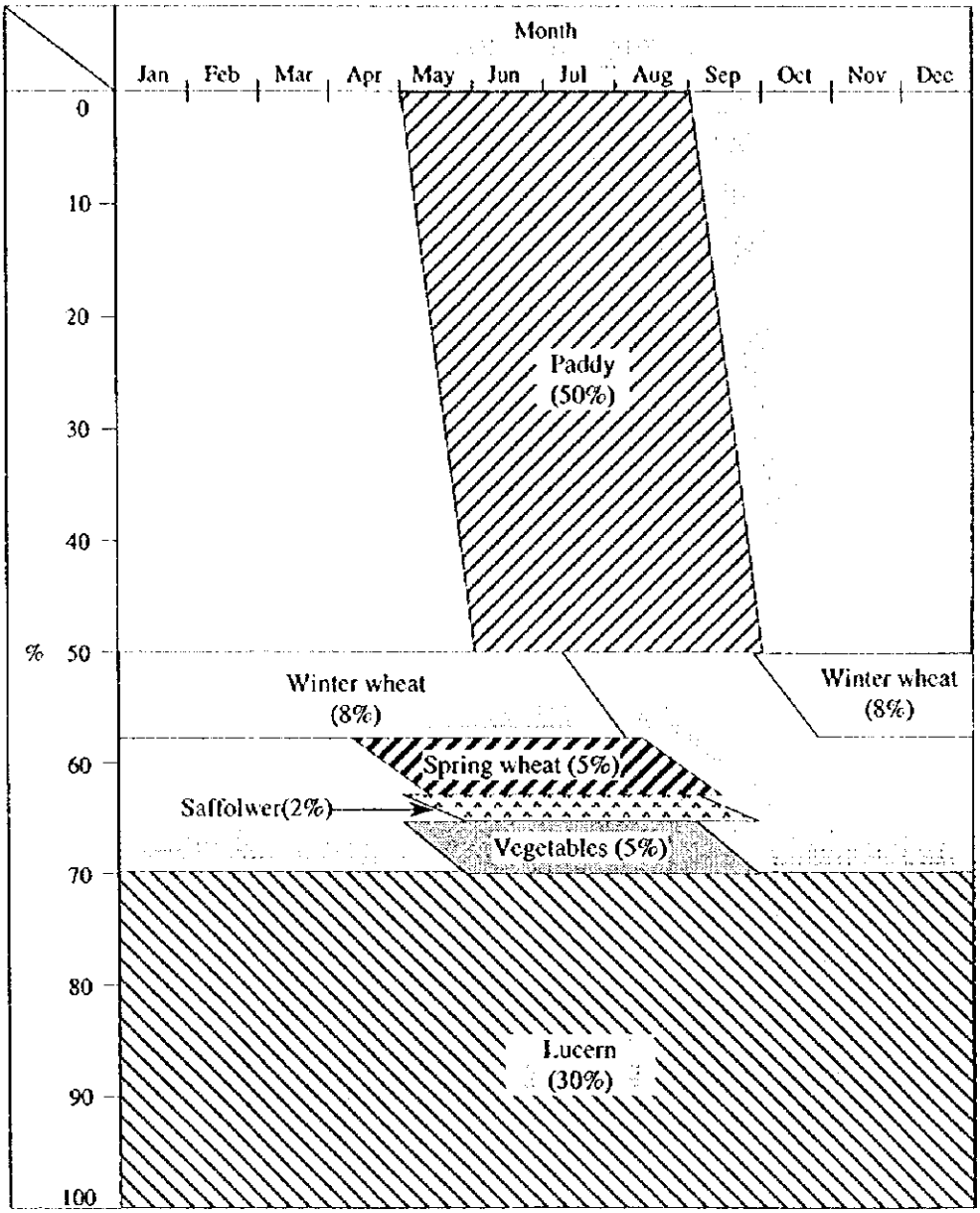


Figure E-9 Cropping Pattern in the Project Area under with Project Condition

ANNEX - F

IRRIGATION AND DRAINAGE

ANNEX F

IRRIGATION AND DRAINAGE

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ANNEX F

IRRIGATION AND DRAINAGE

1 INTRODUCTION

This Annex F presents the irrigation and drainage aspects of the Master Plan Study on the Kzyl-Orda Left Bank Massive Irrigation Area of some 430,000 ha gross including an irrigation area of 90,000 ha, and the Feasibility Study on the Priority Project, both conducted within the framework of the Kzyl-Orda Irrigation/Drainage and Water Management Project. This has been prepared based on the findings, data and information collected in the course of the said Studies.

2 MASTER PLAN STUDY

2.1 Present Irrigation Condition

2.1.1 Irrigation Area and System

(1) Irrigation Area

The Kzyl-Orda Massive Area, consisting of the Left Bank and Zhana Darya Irrigation Systems on the left bank side, and the Right Bank and Aitek Irrigation Systems on the right bank side of the Syr Darya river, extends over 4 Raions (Districts), Syrdarya, Terenozek, Zhalagash, and Karmakshy, nearly in the central part of Kzyl-Orda Oblast.

The Left Bank Massive Irrigation System has been originally planned and designed to irrigate an area of 142,400 ha on the left bank of the Syr Darya river. It was partially completed in 1969, using the intake already constructed to irrigate an area of 20,000 ha including 9,000 ha for paddy cultivation before the completion of the whole system. The present system commands a smaller area of some 87,000 ha due to modification of some distribution canal networks, according to the Oblast Committee on Water Resources. The irrigated area, however, is reported to be 77,510 ha only including a paddy cultivated area of 30,730 ha on average in the last 5 years. This shows a decrease of about 4,100 ha or 4.7 % of the total service area per annum, as indicated in Table F.1.

(2) Irrigation System

The Kzyl-Orda Left Bank Massive Irrigation System is of the run-of-river type diverting water from the Kzyl-Orda Headworks, were was completed in 1957, to supply the Right Bank Irrigation System. The irrigation canal network of the Kzyl-Orda Left Bank Irrigation System, which is basically organized to supply water to the farms, consists of the Left Main Canal, two Branch Canals (Right and Left), distributors (inter-farm/on-farm canals), field canals, and field ditches. Distributors are further classified into the inter-farm canals and on-farm canals. The inter-farm canal supplies irrigation water to more than two farms by crossing successively the boundaries between the farms from upstream to downstream, while the on-farm canal serves only one farm.

The Left Main Canal and Right Branch Canal up to the regulator PK-420 are operated and maintained by the Oblast Committee on Water Resources, and the Left Branch Canal and inter-farm canals are managed by the Raions Management of Water-economy System. The operation and maintenance of on-farm canals, field canals and field ditches are the responsibility of the respective farms.

The Left Main Canal traverses nearly the central part of the Study Area to the west and bifurcates to Right and Left Branch Canals at Sta. 899. The Right Branch Canal runs toward the northwest along the Syr Darya river in the northwest of the Study Area, and delivers water

to part of the service area in Zhalagash Raion and the whole service area in Karmakshy Raion. The Left Branch Canal traverses the southwest part of the service area in Zhalagash Raion. The inter-farm/on-farm canals branch off from the Main and Branch Canals. A list of inter-farm/on-farm canals is given in Table F.2.

A location map of the major irrigation canal network in the Kzyl-Orda Left Bank Area is given in Figure F.1 and schematic diagrams of existing irrigation systems from the Left Main Canal, and the Right and Left Branch Canals are shown in Figures F.2 to F.4, respectively.

2.1.2 Existing Irrigation Facilities

(1) Headworks

The Kzyl-Orda Headworks are a barrage type of diversion structure built on the Syr Darya river and composed of a flood sluice equipped with 5 radial gates of 17 m wide and intakes to divert about 30 m^3/s of water to the right bank area, including the domestic water supply quantity for Kzyl-Orda city, and 228 m^3/s to the left bank areas. The intakes for both the right and left bank irrigation areas are equipped with 2 roller gates and 6 roller gates of 5.0m wide, respectively. Scouring sluices are provided under the floor of the left side intake. All gates had been operated by remote control system for some time, but at present they are controlled by local system due to the lack of spare parts. There are many water leakages through the bottom and sides of gate leaves and holes in the skin plates. It seems to be difficult to control precisely by those gates the water quantities flowing through the intakes and released to the downstream areas.

(2) Canals

All canals are unlined and have a trapezoidal section. The side slope of canals varies from 1:1.5 to 1:2.0, depending on the design canal discharges. Side slope protection works by concrete panels are provided for a section of about 33.8 km of the Left Main Canal and 0.2 km of the Right Branch Canal, as shown in Table F.3, but these protection works have mostly collapsed.

All the canal sections are shaped irregularly. The side slope of the Left Main Canal and Right and Left Branch Canals are heavily eroded, especially at the curved sections. The Left Main Canal section width is widened by 1.6 - 36.6 m by erosion. The annual volume of sediment and erosion is estimated to be 0.31 MCM and 0.32 MCM, respectively, based on the route survey data conducted in the course of the Study and in 1976.

Unlined Branch Canals and inter-farm/on-farm canals are also heavily silted and eroded due to the absence of maintenance works. All gates of regulators are operated manually because of power supply suspension. Head gates of inter-farm/on-farm canals are timeworn and mostly not operational. At the on-farm level, all canals are covered with thick vegetation and have an irregular shape. Gates of turnouts are missing or not operational.

(3) Canal Structures

To distribute water, regulating structures and head gates for inter-farm/on-farm canals are constructed on the Main, Branch and inter-farm canals. Head gates are equipped at the starting point of each inter-farm and on-farm canal. Most gates of regulating structures and head gates, however, are operated mostly not by electric motors but manually, even though electric facilities are equipped for gate operation. Water measurement facilities, called Hydro-posts, are built at/within about 100 m below each head gate, to measure the discharges every 10 days for use as basic quantities to charge water fee. Major elements of the regulators and head gates maintained by Kzyl-Orda Oblast Committee on Water Resources are listed in Table F.4.

Other structures, such as spillway, aqueduct, bridge, road crossing, check, turnout, etc. are also constructed but in a small number, except checks and turnouts in the farms. The major canal structures including regulators and head gates on the Main and Branch Canals are 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

Source : Kzyl-Orda Oblast Committee on Water Resources

(4) On-farm Facilities

The farm lands in the Study Area are divided into several crop rotation areas of about 600 ha to 900 ha each. Irrigation water is conveyed to the crop rotation areas through inter-farm/on-farm canals and distributed to several irrigation rotation areas with an area of about 60 ha to 120 ha each. Each irrigation rotation area consists of 2 to 8 irrigation land units and obtains water from field canal or directly from an on-farm canal. Each irrigation land unit, consisting of several field plots with a size of about 0.9 ha to 2.8 ha or 2.2 ha on average, has an area of about 12 ha to 15 ha. Field ditches, which deliver water to each field plot, are located along or between the irrigation land units. The density of field canals and field ditches is estimated at 11.2 m/ha and 31.0 m/ha, respectively, based on the survey result in the selected area. All such field canals and field ditches, however, are shaped irregularly and covered with thick vegetation due to the absence of regular maintenance. A typical layout of on-farm facilities is illustrated in Figure F.5.

Each field plot is equipped with one inlet to receive irrigation water from the field ditch and one outlet to drain excess water to the field drain. The inlet and outlet are made of concrete pipes with a diameter of 20 cm. The configuration of plots is considered to be a constraint in the irrigation and drainage practices, which bring about a deep water depth locally within one plot.

2.1.3 Present Irrigation Practices

(1) Irrigation Method

Gravity irrigation by open channel is practiced in the whole Left Bank Irrigation System. Pumps are also used by the farms for irrigation at several places to supply water to elevated farmlands or supplement water in the case of drought. However, due to shortage of fund for operation and maintenance, most pumps are not operated.

At the field level, the surface irrigation method is commonly practiced. Water is supplied in rotation from plot to plot to a depth of 10 cm to 15 cm and at an interval of 10 to 15 days for paddy plot. Then, the water depth is lowered by about 2 to 3 cm, according to an Agronomist from the farms. This quantity of water is equivalent to a field water depth requirement of about 5 to 8 mm/day or about 7,000 m^3/ha for the cropping period on an average. The water depth in the plot is managed by providing a lower bank in front of the drain outlet or manually choking the outlet pipe with soil. Irrigation water for upland crops other than paddy is practically expected from the groundwater contribution but in drought periods, is supplied from field ditches by flooding or corrugation (contour ditch) irrigation method.

(2) Irrigation Efficiency

Conveyance efficiency of the Left Main Canal is estimated at 86.4 % based on 10-day discharge measurement records of the Oblast Committee for Water Resources, which varies from 25 % to 99 % depending on the canal discharge. This efficiency is low compared to the

efficiency of more than 90 % required by the Construction Norms and Rules 1986. Furthermore, present overall irrigation efficiency in the Left Bank Massive Irrigation System is estimated to be about 15 % on an average for the last 5 years, based on the data of planted area and water supply obtained from Kzyl-Orda Oblast Water Resources Committee, as follows:

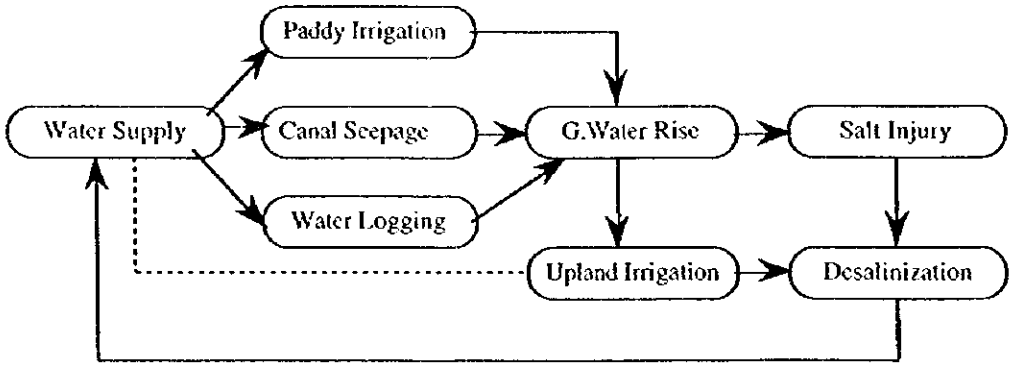
Item	1992	1993	1994	1995
Planted Area (ha)	85,178	80,938	78,688	75,075
in which Paddy (ha)	32,880	32,769	32,825	27,603
N.W.R. (MCM)	322.86	313.28	216.35	271.63
Water Supply (MCM)	2,009.67	2,257.85	2,163.09	1,829.79
Efficiency (%)	16.1	13.9	14.6	14.8

Note : N.W.R. is Net Water Requirement for crops

(3) Constraint in Water Supply

The water supply for paddy is reported to be 21,800 m^3/ha at the field and the diversion water requirement to be 37,000m^3/ha assuming an irrigation efficiency of 60%. As compared to the practical field water supply (7,000 m^3/ha) stated previously, the present water supply is extremely big in quantity and results in low irrigation efficiency.

This oversupply of water is practiced taking into account leaching of salt in the soil. In fact, paddy is the main crop in the rotational cropping schedule. However, such excessive water supply results in raising the groundwater table due to seepage water from canals, water logging in low-lying land, percolation water from paddy fields, etc. Salt water, which is brought from the soils, dries up and condenses into salt on the ground surface. Salt is accumulated in the topsoil due to ill drainage of the field high groundwater table, and so on. This circulation is illustrated below:



2.2 Present Drainage Condition

2.2.1 Drainage Area and System

(1) Drainage Area

The drainage area in the Study Area consists of the Kuvan Darya , Zhana Darya river, Karmakshy and Syr Darya river basins (Figure F.1), as detailed below:

(unit : km²)

River Basin	Drainage Area		
	Total	w/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 Drainage A	1,078.8	1,078.8	73.6
Syr Darya River	179.0	179.0	-
Total	4,760.0	4,300.0	870.0

(2) Drainage System

Major collectors (drainage canals) in the Kuvan Darya river basin are the North Main Collector planned to traverse from the northeast to the southwest of the Kzyl-Orda Left Bank Area, and the South Main Collector which runs along the southern boundary of the Left Bank Area. After both collectors join at Sta.1304 on the South Main Collector, they become the Kuvan Darya river which runs to the west. However, the North Main Collector is disconnected at Sta. 443 by the Right Branch Canal, because of difficulty in construction of a crossing culvert. Therefore, the North Main Collector consists of two collectors, the Upstream North Main Collector and Downstream North Main Collector, bounded by the Right Branch Canal at present. The excess water in the upstream area of the North Main Collector is conveyed by the diversion drainage canal running in parallel with the Right Branch Canal on the left bank of the Syr Darya river and finally joins the Right Branch Canal downstream of the PK 371 regulator.

The Zhana Darya river basin is located to the south of the Kzyl-Orda Left Bank Massive Area and finally joins the Kuvan Darya river downstream and outside the Study Area. Water from the small area of Kirov, Syrdarya Raion in the east of the Massive Area is drained into the Zhana Darya river basin.

The Karmakshy drainage system is divided into three drainage areas by the East Karmachinsky Collector, West Karmachinsky Collector, and Chokes Collector. All those collectors run toward the southwest and/or the west and their drainage water flows into the depression used as a retarding basin and mostly percolated into the ground, except for the East Karmachinsky Collector which is narrowly joined by the South Main Collector. The Chokes Collector's drainage area may be sub-divided into two sub-drainage areas served by the Chokes Collector No. 1 and another named Chokes Collector No. 2 in the northern area.

The Syr Darya river basin area is located between the Syr Darya river and the flood protection dike/diversion canal of the North Main Collector/Right Branch Canal. This area is frequently inundated by floods from the Syr Darya river but suffers no particular damage, because no cultivated land exists.

The drainage canal system in the Kzyl-Orda Left Bank Massive Area consists of (i) main collectors, (ii) inter-farm and on-farm collectors, (iii) field collectors and field drains. At the field level, the field drains are located on the other side of field ditches in the plots or between the field ditches. The field collectors collect excess water and discharge it into the inter-farm or on-farm collectors. The inter -farm collectors collect the excess water from field collectors, passing through the boundary of two farms and reaching upstream farms, while the on-farm collectors are located within the area of one farm. The general features of the major collectors are listed in Table F.5.

The density of field collectors and field drains is estimated to be 19.8 m/ha and 28.5 m/ha, respectively, based on the survey data collected from the selected areas.