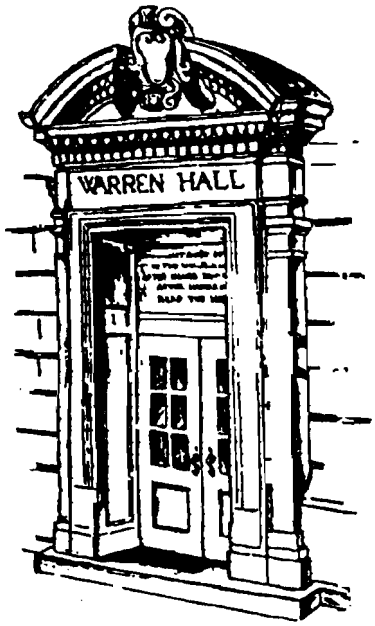

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Department of Agricultural, Resource, and Managerial Economics
Cornell University, Ithaca, New York 14853-7801 USA

CROP BUDGETS FOR THE WESTERN REGION OF UZBEKISTAN

Phillipe Chabot and Steven Kyle

ABSTRACT

This paper presents crop budgets for the most important grain and cash crops grown in the Aral Sea region of Uzbekistan. This region, comprised of the Autonomous Republic of Karakalpakstan and Khorezm Oblast, are 100% dependent on irrigation, and are still largely farmed via a command and control system inherited from the USSR. The crop budgets presented here are a first attempt to assess the relative profitability of the most important crops grown in the region, and to try to estimate the effects of the severely distorted prices faced by farmers.

Crop Budgets for the Western Region of Uzbekistan

Introduction

This paper presents crop budgets for the most important grain and cash crops grown in the Aral Sea region of Uzbekistan. This region, comprised of the Autonomous Republic of Karakalpakstan and Khorezm Oblast, are 100% dependent on irrigation, and are still largely farmed via a command and control system inherited from the USSR. The crop budgets presented here are a first attempt to assess the relative profitability of the most important crops grown in the region, and to try to estimate the effects of the severely distorted prices faced by farmers.

Cotton is the dominant crop in Karakalpakstan and Khorezm, as it is in the country as a whole, though production in the Aral Sea region accounts for only around 10% of national cotton production. Given the fact that agriculture accounted for 28.5% of GDP in 1995, between 40 and 50% of total employment, while providing between 2/3 and 4/5 of export revenues, it is clear that the development of agriculture in general has significant implications for the country as a whole as well as being the dominant sector in the western region. For this reason, successful reforms in the Aral Sea region can be important in terms of demonstrating possibilities for the whole country.

Other important crops in this area include rice, which has long been grown in the delta of the Amu Darya, cattle and fodder crops, and various horticultural products, most of which are produced on private plots rather than larger units. Wheat has recently become more important as state orders have been imposed to fulfill the central government desire for grain independence, particularly from Kazakhstan. Alfalfa is grown to feed cattle along with some maize, and cattle are also fed byproducts from cotton and rice production. Aquaculture is also practiced in Khorezm region in lakes in the east of the oblast.

In general, this paper shows that liberalization of the farm sector in the study area would be likely to result in a radical shift of incentives to grow the three main crops, cotton, rice, and wheat. At present, the combination of the state order system and controlled procurement prices severely depress and distort the incentives for agricultural production, and together with the lack of any charge for irrigation water, result in financial calculations of profitability that are very much at odds with calcualtions based on economic prices. Even with the elimination of the state order system, there are several important technological and policy options which have the potential to

dramatically improve performance, but it must be recognized that most technological interventions cannot be fully effective without an overall context of policy reform.

Output Trends

Tables 1 and 2 show agricultural output in Karakalpakstan and Khorezm for the past two years. It can be seen that cotton and grains are the dominant crops. Of grains, rice is the most widely cultivated but wheat has become increasingly important over the past few years. Tables 3 and 4 show the areas planted to the major crops.

Cotton is still produced almost entirely by the collectives, and its absence on private lands reflects the poor incentives inherent in the state order and pricing system. Table 5 shows returns on cotton producing kolkhozes in Karakalpakstan, where it can be seen that every one lost money last year and only one rayon had a positive result in 1995. Private sector producers concentrate on horticultural crops and livestock, together with rice. Tables 6 and 7 show figures for livestock breeding, where the large share of the private sector in the total is evident. Table 8 shows that livestock is the predominant activity of dekhan farms in Khorezm.

Yields in Karakalpakstan are quite low compared to those in other parts of Uzbekistan. Table 9 shows figures for the five regions, and it can be seen that the Aral Sea region lags behind all others by a substantial margin. The figures above indicate that Karakalpakstan is in fact lower still than that for the Aral Sea Region in general.

Declining yield is a particular problem in the cotton subsector and one that is recognized by the authorities. There are various reasons for this, including both economic and technical problems. Foremost in economic terms are the low prices received for seed cotton, as well as the difficulties and vagaries of state supply of fertilizers. One macronutrient, potassium, was not supplied at all in 1996 while supplies of phosphorus were negligible (see below). Foremost among technical problems are those associated with irrigation, with salinity, rising water tables, and hard pans being the most important.

It should be noted that yield figures from the soviet era may well be overstated and so cannot be regarded as a reliable benchmark from which to measure trends. However, it does seem that yields do have a downward trend in the cotton subsector.

Kyle and Chabot 1997 (`Agriculture in the Republic of Karakalpakstan and Khorezm Oblast of Uzbekistan', Cornell University Department of Agricultural, Resource, and Managerial Economics Working Paper 97-13) present a description of the resource base and policy context of agriculture in this region.

Cotton Marketing

The basis for cotton production and marketing is the state order. The state has a monopoly on cotton marketing and in the past set prices for the entire crop and required it all to be processed in state ginneries. Since 1995, the state has instituted a process whereby increasing shares of cotton target production will be procured at "free market prices". In fact, this program has been rendered largely ineffective in terms of providing adequate incentives at the farm level.

The general problem is one of excessive taxatation, both implicit and explicit. Cotton is sold on the world market for prices which are already discounted 4% due to consistent problems with timeliness of delivery and consistency of product. These exports are actually performed by state trading companies which typically deal with international cotton traders rather than directly with processors, since the latter have strict delivery requirements which Uzbekistan has trouble meeting. As noted above, Uzbek cotton is also subject to a further discount of 20% due to lack of appropriate grading.

This revenue is then taxed by the state at a rate of 32%. Payment from the trading companies to domestic producers is denominated in local currency. Here, a major implicit tax is imposed in the use of the official exchange rate. Currently, that rate is 61 soum/$. Given parallel rates of between 140 and 145, it may be estimated that this implies a substantial further tax of somewhere between 30-60% depending on the assumed equilibrium exchange rate. This calculation is in fact quite conservative considering that payments are sometimes delayed as much as 6 months, during which time the official exchange rate may have changed. It was impossible to verify, but if the previous official exchange rate of 55 is used since that was the rate prevailing when the cotton was contracted for export, the implied tax would be proportionately larger.

A further problem is the fact that payments are made in the form of bank transfers and not in cash. Currently, there is a 40% premium on cash transactions, so this constitutes a further implicit tax on farmers.

If we put all of these factors together farmers are receiving

less than 30% and possibly less than 20% of the true value of their cotton even when they are receiving the supposedly free market prices for part of their crop.

However, this is not the end of the story. It was widely reported that in those cases where producers failed to meet their target amounts, **all** of their crop was subject to state procurement at the state price. It was reported in Karakalpakstan that most producers in fact failed to achieve their targets and so were subjected to this problem. All in all, it is apparent that the supposed liberalization of the cotton market has had virtually no real effect on many farms and that in spite of any policy initiatives to the contrary, cotton farmers are still subject to state control to much the same extent as they have always been.

There is one caveat to this conclusion - Normally, cotton under state order is processed by the gin but no credit is given to the producing unit for byproducts such as seed and lint, nor are they returned to the producer. Since the value of these products is apparently included in the procurement price for "free" cotton, there will be some additional benefit at the farm level.

However, the overall picture is clear: there is substantial taxation of cotton, and the benefits of this taxation accrue almost exclusively to the central government and not to the Republic or oblast. At the farm level, cotton is a losing proposition, while gins do not appear to be making excess profits, and are in terms of the revenue flow only a collection point from which exports are made, with the revenue going to the central government.

Though state orders are slated to be phased out in 1998, it remains uncertain whether this means that farmers will be permitted to grow any crop they choose, or that only state order prices will be phased out but producers will still be required to produce planned quantities.

Marketing and Pricing of Other Crops

Horticultural and meat products are both free of state planning and can be grown and marketed at uncontrolled prices. Horticultural products in particular and livestock to some extent are therefore produced largely on private plots. Local markets had ample supplies of a wide variety of fruits and vegetables, as well as meat, and many of these were reported to originate in other parts of Uzbekistan, such as Samarkand, making it clear that interregional trade in these commodities is not a problem.

Rice and wheat are treated differently. As noted above, each of these commodities is produced according to state planning

directives. While other sources have maintained that rice has been liberalized, (See, e.g. the Uzbekistan Agricultural Baseline Survey), the state grain milling enterprise was unequivocal in stating that farmers were required to produce planned amounts. The plan target for each producing unit is divided in two parts. The first part is sold to the state at a fixed price, while the second part is provided at an "agreed" price negotiated between the seller and the state enterprise which mills the grain (Uzklebprodukt). Any farm which satisfies both the fixed price plan and the agreed price plan may then keep any excess to dispose of as they see fit - i.e. it may be used for own consumption, shipped to other regions, or exported from the country.

No wheat has ever been sold at the "agreed" price in Karakalpakstan, implying that achievement of planned amounts has never exceeded 50% since wheat was first planted by state order in 1993. (See Table 10 for these prices for the current year. The various grades of wheat are distinguished by gluten content.) Last year, only 5% of republic requirements were satisfied with local production, with the remainder imported from abroad. While a substantial amount of this wheat came from Kazakhstan last year, only a negligible amount came from this source in the current year, having been replaced from a variety of sources.

The republic is almost self sufficient in flour milling capacity, with a reported 500 tons/day produced out of a required 550 tons/day. This production comes from 4 mills (one in Takhitashi, two in Nukus, and one in Kungrad) with a theoretical capacity of 730 tons/day. The resulting flour deficit is filled with imports from a variety of sources. Flour prices are also set by the government (See Table 10). Bread prices are also controlled, and the current price of 15 soum for a 600 gram loaf (approximately $US 0.10 at the current parallel exchange rate) is quite low compared to world prices of flour and wheat.

In the case of rice, production plans are usually fulfilled and some farms have on occasion exceeded both the amounts planned at the fixed price and that at the agreed price, and so have qualified for license to ship the rice out of the republic. The price paid to farmers in the last harvest for unmilled rice was 18.5 soums/kg, while the agreed price was typically about 2-3 soums higher. Table 11 shows the structure of costs for rice processing. Last year, 24,752 tons were processed, most of this, (23,243 tons, rice classified as second grade.

Independent milling of both rice and wheat is permitted, with farmers allowed both to operate mills if they choose, or to take their crop to private companies to be processed if they choose. However, exports from the republic are not permitted unless, as noted above, the plan has been fulfilled. It was reported that independent milling of rice is commonplace, while that of wheat is not, giving the state an effective monopoly on processing of wheat.

Animal feed is also produced by the grain processing company, and is all sold at market prices. (Approximately 4-5 soum/kilo for cattle feed). There is some variation in this price both due to market factors and due to the varying composition of the feed, which is a mixture of milling residues and mineral and vitamin additives. It was reported that these additives were previously purchased from other parts of the FSU but are now produced in Uzbekistan. Unfortunately, the plant which produces them in Fergana, itself uses imported inputs and so has had output shortfalls which have affected production of feed in Karakalpakstan.

Input Supplies

Seeds

Cotton seed is provided by retention of 25% of seeds produced by gins while the remainder is crushed for oil. As noted above, there is an effort underway to improve seed production and certification through production by independent companies. This effort should be strongly supported to enable the multiplication of certified quality seed as needed by the producers.

Conversations with cotton breeders indicated that improved varieties are available (e.g. Chimbai 40 in Karakalpakstan, and Khorezm 126 in Khorezm as noted above) but that multiplication and distribution is a major bottleneck. However, plant varieties are released to the Ministry of Agriculture and Water, which then evaluates them according to a hierarchy of criteria. It wasreported in Khorezm that these, which amount to state ordered plant breeding objectives were, (in order of importance):

1. verticillium wilt resistance

2. fiber yield

3. early opening

4. fiber strength

It is notable that the only attribute related to quality ranks fourth and last in importance. General breeding targets in Karakalpakstan are increased yield, drought resistance, salt tolerance and disease resistance.

The current cotton improvement project (see above) will go far toward addressing problems in cotton seed multiplication and distribution. Implementation has been somewhat delayed, but the project is expected to be completed by the end of the year 2000.

For other crops a substantial share of requirements are satisfied by retention of own production, with the balance provided from state sources. This is particularly true in the case of wheat and rice. Horticultural crops rely to a significant extent on private suppliers, in line with their predominance in household plots.

For rice and wheat there is no apparent systematic seed supply system. Most of the producers interviewed relied at least to some extent on retaining a portion of their crop for seed. Vegetable and fruit seeds are freely available in the local markets, though these were clearly not certified or regulated in any way.

Machinery

A state enterprize, Uzselkhoztekhnika, is responsible for supplying and servicing tractors and other agricultural equipment. The current state of affairs is quite poor in many cases, with tractor fleets of 10 years of age or more. (See Table 12) In addition, there are significant problems with adequate maintenance and availability of spare parts. Table 13 shows figures for the current agricultural vehicle fleet in Khorezm, where it can be seen that less than 25% of tractors were actually functional.

The move over the past two years toward provision of machine services from centralized tractor parks is an unfortunate recreation of a soviet style institutional structure that has proven to be suboptimal in all other contexts where it has been implemented. If, as is the case in Uzbekistan, operators are employees of the machinery company, they lack incentives and knowledge to do the best possible job on any particular field. In addition there are inevitable coordination problems as the question of who gets priority on use of the machines is decided by administrators who are not familiar with individual farm level conditions and who are employees of the state.

The recent purchase of large Case tractors with a capacity four times greater than previously used machines is a move toward large scale, expensive equipment that is not suited for smallholder use. However, if these machines do in fact prove able to ameliorate the problem of a hard pan through deeper ploughing than smaller machines can accomplish, then they may well be worthwhile but it will be necessary for the government to achieve extremely high levels of machine use to make the fleet a viable economic proposition.

Given the fact that there is a justifiable agronomic rationale for deep ploughing together with the fact that no single farmer or collective could possible afford to buy one, it seems reasonable to continue to allow them to operate, unsubsidized, as independent

service contractors. (Currently, they operate on a contract basis but receive both implicit and explicit subsidies.) However, there is no economic rationale, and much negative experience, with machine tractor stations for smaller tractors. Further purchases of these by the central government do not seem justifiable and those that are already owned by the state could be sold off to private sector farmers as demanded.

It is interesting to note that virtually every independent farmer interviewed in the course of this mission either had, or was planning to get, his own tractor and other machinery. The desire for independence from centralized supply of machine services was near universal, underscoring the need for availability of tractors on the appropriate scale for these smallholders. Liberalization of imports of both new and used equipment could go far toward meeting this demand.

Fertilizers and other Agrochemicals

Both Khorezm and Karakalpakstan are areas in which soil is washed annually (or more than once annually) in order to leach out salts. This, together with frequent applications of irrigation water, means that fertilizers are also leached out of the soil and so must be applied at higher rates than would normally be the case. Researchers in Khorezm reported that plants actually use only around 45% of the amounts applied, thus justifying the high application rates recommended in the region.

Fertilizers and agro-chemicals are supplied by a state enterprise, Uzchemservis. This company exists primarily to service the needs of the collective sector, but will also sell to independent farmers if supplies are available. While domestic production capacity exists, there has been insufficient supply in recent years. Imports of a formula containing N=23 and P=23 produced in Kazakhstan have satisfied some of the demand, while former potash imports from Russia have been reduced to nil or a very low level until this year when 21,000 tons were delivered. (It was reported that farmers are often reluctant to use potassium since though it is a necessary nutrient, it is also a salt (KCl).)

Fertilizer availability has been a problem in recent years. Table 14 shows planned and actual fertilizer use in Karakalpakstan for 1996 and 1997, and also gives these figures for rice. While a breakdown for other crops was not available, it can reasonably be assumed that approximately 90% of the remainder was intended for cotton.) As can be seen, 1996 was an extremely bad year for fertilizer availability, with 62% of requirements satisfied for nitrogen, but only 6% for phosphorus, while no potassium was available at all.

Prices are relatively high, both because of withdrawal of

subsidies but also because of the need to transport supplies by rail through Turkmenistan. It was reported that Turkmenistan is imposing transit charges amounting to 25-30% of the final price. However, prices are still tied to the official exchange rate and so contain an implicit subsidy depending on the extent to which this diverges from the equilibrium rate.

Use of other chemicals is down by more than half over the past two years, in part due to higher prices but also due to problems with availability. Pesticides are imported from Germany, while domestically manufactured defoliants are unavailable because the factory lacks required imports to make them. It should be noted, however, that some of these chemicals are used primarily in conjunction with machine harvest. Growth regulators cause cotton plants to switch from vegetative growth to boll production and so result in fields where all plants are ready for harvest at the same time. Defoliants strip plants of leaves prior to machine picking so as to reduce the trash content of seed cotton. Neither of these are necessary if labor intensive methods are used instead of mechanical ones.

Uzchemservis is plagued by problems of non-payment by farmers who in turn are plagued by problems of non-payment for their crops. Thus there is a cascade effect of arrears, which in the end causes the system to default to one of physical planning since supplies are given to farmers without requiring a down payment.

It was reported that there exist deposits of bentonite within Karakalpakstan, and that the ore contains 4-5% potassium along with a variety of micronutrients. It was reported that it is feasible to mine up to 200,000 tons/year but that the necessary equipment is not available. Field trials with fertilizer from this source have been performed and it was possible to achieve a yield of 3.5 tons/ha. with cotton. A feasiblity study for the establishment of a mine has been prepared and sent to Tashkent.

Given past problems with fertilizer supply and distribution, there is a good case to be made for immediate withdrawal of the state from fertilizer distribution and marketing, an end to explicit or implicit subsidies, and encouragement of private sector companies in this area. The state company could continue to operate as a wholesale supplier from depots in Nukus and Urgench, open to all suppliers and in competition with any private sector suppliers who wish to operate.

Farm Budgets and Crop Choice

Farm budgets for the three most important crops, cotton, rice

and wheat, are presented in the appendix. Most of the information used to construct these budgets was collected during field visits in May and June of 1997 and was supplemented with various other sources as identified in the notes contained in the appendix. In general, it was not possible to differentiate between the techniques used in Karakalpakstan and those used in Khorezm, but it was nevertheless very clear that the general situation in the two areas differed in terms of yields and so the crop budgets reflect this fact.

Overall, Khorezm enjoys relatively better conditions, and consequently has higher yields for each crop than does Karakalpakstan. It is for this reason that the profitability of farming is substantially higher in Khorezm. This situation is even more pronounced due to the operation of the state order system, which imposes substantial financial penalties for non-fulfillment of the state order amounts. For this reason, Karakalpakstan, which failed to planned amounts for cotton, and which has remarkably low yields for wheat, showed negative financial returns for these crops.

Several different scenarios were computed. Each crop was first evaluated with respect to its current financial and economic net income, where border prices and an assumed equilibrium exchange rate of 100 soum/dollar were used. The shadow price of water was taken to be $3.33, which is SANIIRI's estimate of the actual cost of prividing 1000 cubic meters of water. Next, a scenario was computed using liberalized prices (with the exception of rice, which is already free of state order prices). Next is a scenario which assumes a 30% yield increase, to reflect the combined effects of some of the improved management and agronomic techniques as discussed above. Next is a scenario which includes a water payment, and finally, a scenario which combines liberalized prices, a 30% yield improvement, and a payment for water. (Rice was not assumed to enjoy the yield improvement in this scenario, since it is already produced at yield levels comparable to those elsewhere in the world and which cannot be expected to increase substantially.)

Tables 15 and 16 contain some summary results from the farm budgets and are presented in terms of soum. Given the fact that the equilibrium exchange rate is estimated to be 100 soum/$, these figures can be readily converted to current dollars by dividing by 100. The tables make it clear that cotton is always economically viable in both regions and is the preferred crop under fully liberalized conditions as depicted in scenario D. This result is quite robust, and comes through clearly in virtually any manipulation of the figures in any of the crop budgets. It is in strong contrast to the current financial return, which is negative in Karakalpakstan, and quite low in Khorezm. In fact, the financial return in Karakalpakstan was negative in all scenarios except that which postulated a 30% yield increase.

Rice as currently grown is the most attractive crop in financial terms, but generates much lower economic returns once the value of water is included in costs. It should be noted that water use here has been assumed to be 35,000 m3/hectare, the average usage reported by SANIIRI. If it is instead assumed to be 50,000 m3, as has been reported in some instances, rice is no longer financially viable under any circumstances which include payments for water.

Wheat is a losing proposition for farmers in both Karakalpakstan and in Khorezm. It remains the least preferred crop under all conditions and is not capable of generating a profit for farmers in Karakalpakstan even under the most optimistic of assumptions. It fares somewhat better in Khorezm, since yields there are half again as large as the (somewhat optimistic) assumption of 1.2 tons/hectare in Karakalpakstan.

In summary, it is clear that cotton is an economically attractive crop in the Aral Sea region, and that under liberalized conditions would be chosen by farmers facing realistic input and output prices. The current widespread enthusiasm for rice cultivation is apparently largely due to the fact that water is free. Rice would be likely to be grown in the Amu Darya delta and in Khorezm under liberalized conditions, but to a lesser extent than is currently the case. Wheat would not be grown at all by profit motivated farmers. It can be imported from Kazakhstan much more cheaply than it can be grown under current conditions in the Aral Sea region.

A final note is in order regarding water pricing, since this is perhaps the most contentious issue regarding liberalization of the agricultural sector in Uzbekistan. In order to allow a reasonable evaluation of the importance of water pricing in each of the cases presented, a final item was included labelled `Return to Water'. This item shows what price would have to be charged for water in order for the crop concerned to just break even. It can be seen that the returns to water are quite high in many cases, but that its value in production of wheat is in fact negative under many conditions.

Appendix

Farm Budgets

Notes to Farm Budgets

1. Estimated equilibrium exchange rate used throughout of 100 soum/$ based on estimates by World Bank staff. Current official exchange rate is 61 soum/$.

2. Cotton financial price from interviews at cotton gins, with farmers, and at oblast Ministry of Agriculture and Water.

3. Cotton economic price based on assumption of 30% fiber content in seed cotton with a $1500/ton price for cotton fiber; 60% seed content of seed cotton at a price of $100/ton. This yields a gross revenue of $510/ton of seed cotton. Ginning, transport and handling are estimated at $122 (based on 12,200 soum cost for ginning and transport according to field notes from interviews, converted at equilibrium exchange rate of 100 soum/dollar). This yields a net economic price per ton of seed cotton of $378.

4. World prices for rice from World Bank Commodity Markets and the Developing Countries. Wheat from current import price of Kazakh wheat adjusted for transport costs.

5. Yields per hectare taken from Goscomprognostat data. For Karakalpakstan, all yields taken as average of 1991-1996, with the exception of wheat, where 1996 was excluded as atypically low. For Khorezm, cotton was taken from 1996 figures, wheat from 1995 since 1996 was atypical, and rice taken as average of 1995 and 1996.

6. Seed financial costs taken from field notes in Khorezm and Karakalpakstan. Economic costs taken as price of improved cotton seed in USA without adjusting for transport cost on the assumption that the Cotton Improvement Project will soon be producing equivalent seeds domestically. Seed application rates taken from field interviews.

7. Manure application rates and prices taken from field notes.

8. Pesticide and fertilizer application rates taken from field notes. Financial prices from Agrochemservis. Economic prices taken from World Bank Commodity Markets and the Developing Countries, with the exception of price of potash imported from Kazakhstan which was taken at actual import price in dollars.

9. Machinery prices and usage taken from field notes at state machinery company and on farm interviews. Economic costs taken from USDA farm budgets for irrigated cotton. It was assumed that transport costs on a per hectare basis and amortized over the life of the machinery were negligible.

10. Fuel usage from field interviews. Prices taken from W. Van Harreveld's estimates based on information collected in May and

June of 1997.

11. Water application rates from SANIIRI except for wheat, which was taken from World Bank Farm Restructuring Study. Water price of \$3.33/1000 m^3 taken from SANIIRI estimate of shadow price of providing water.

12. Labor rates taken as average of field interview numbers and those from TACIS survey, which exclude all but on-field labor use.

13. Labor cost taken from current wage rates from field interviews.

14. Overhead and administration taken from field interviews.

15. Other costs taken from field interviews. Though these costs may be assumed to include pumping costs and miscellaneous expenses related to water management, further investigation will focus on disaggregating these figures.

Appendix

Farm Budgets

FARM BUDGET: COTTON

Initial Scenario:
Karakalpakstan

	Units	qty	Cost (som)	Fin. Total (som)	X/R 61 Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (30% state ord	ton	0.6	12500	7500	123	378	227	22680	37800
(70% 'agreed price'	ton	1.4	12500	17500	287	378	529	52920	37800
Total				25000	410		756	75600	
Costs									
Seed	kg	60	5.4	324	5	0.09	5.4	540	9
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
Amophos	ton	0.36	10500	3780	62	210	75.6	7560	21000
Kali/Potassium	ton	0.2	6283	1257	21	103	20.6	2060	10300
Manure	ton	20	250	5000	82	4	80	8000	400
Pesticides	liter	1	500	500	8	11	11	1100	1100
Total Agrochem.			24253	13359	219		267	26700	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	0	0	0	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		127	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				42775	701		727	72705	
Net Income				-17775	-291		29	2895	

			FARM BUDGET: COTTON		X/R 61		Initial Scenario: Khorezm	X/R 100	Econ
	Units	qty	Cost (som)	Fin. Total (som)	Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	Econ Total (som)	Unit Cost (som)
Total Revenue									
Main (30% state ord	ton	0.9	12500	11250	184	378	340	34020	37800
(70% 'agreed price'	ton	2	19200	38400	630	378	756	75600	37800
Total				49650	814		1,096	109620	
Costs									
Seed	kg	60	5.4	324	5	0.09	5.4	540	9
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
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Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	0	0	0	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		13	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				42775	701		614	72705	
Net Income				6875	113		483	36915	

FARM BUDGET: COTTON

Initial Scenario
Liberalized prices
Khorezm

	Units	qty	Cost (som)	Fin. Total (som)	X/R 61 Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (0% state orde	ton	0	12500	0	0	378	0	0	37800
(100% 'agreed price	ton	2.9	19200	55680	913	378	1,096	109620	37800
Total				55680	913		1,096	109620	
Costs									
Seed	kg	60	5.4	324	5	0.09	5.4	540	9
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
Amophos	ton	0.36	10500	3780	62	210	75.6	7560	21000
Kali/Potassium	ton	0.2	6283	1257	21	103	20.6	2060	10300
Manure	ton	20	250	5000	82	4	80	8000	400
Pesticides	liter	1	500	500	8	11	11	1100	1100
Total Agrochem.			24253	13359	219		267	26700	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	0	0	0	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		127	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				42775	701		727	72705	

FARM BUDGET: COTTON

Scenario B:
Improved Tech.: 30% yield inc.
Karakalpakstan

	Units	qty	Cost (som)	Fin. Total (som)	X/R 61 Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (30% state ord	ton	0.8	12500	10000	164	378	302	30240	37800
(70% 'agreed price'	ton	1.8	19200	34560	567	378	680	68040	37800
Total				44560	730		983	98280	
Costs									
Seed	kg	60	5.4	324	5	0.6	36.0	3600	60
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
Amophos	ton	0.36	10500	3780	62	210	75.6	7560	21000
Kali/Potassium	ton	0.2	6283	1257	21	103	20.6	2060	10300
Manure	ton	20	250	5000	82	4	80	8000	400
Pesticides	liter	1	500	500	8	11	11	1100	1100
Total Agrochem.			24253	13359	219		267	26700	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	0	0	0	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		127	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				42775	701		758	75765	
Net Income				1785	29		225	22515	

										Scenario B:		
				FARM BUDGET: COTTON						Improved Tech.: 30% yield inc.		
										Khorezm		
						X/R 61					X/R 100	Econ
					Fin.	Fin.	Econ		Econ	Econ	Unit
		Units	qty	Cost	Total	Total	Cost		Total	Total	Cost
				(som)	(som)	(USD)	(USD)		(USD)	(som)	(som)
Total Revenue											
	Main (30% state ord	ton	0.9	12500	11250	184	378		340	34020	37800
	(70% 'agreed price'	ton	2.87	19200	55104	903	378		1,085	108486	37800
Total					66354	1,088			1,425	142506	
Costs											
	Seed	kg	60	5.4	324	5	0.6		36.0	3600	60
	Fertilizer										
	Siltra	ton	0.42	6720	2822	46	190		79.8	7980	19000
	Amophos	ton	0.36	10500	3780	62	210		75.6	7560	21000
	Kali/Potassium	ton	0.2	6283	1257	21	103		20.6	2060	10300
	Manure	ton	20	250	5000	82	4		80	8000	400
	Pesticides	liter	1	500	500	8	11		11	1100	1100
	Total Agrochem.			24253	13359	219			267	26700	
	Machinery O&M				1055	17			21	2100	
	Machinery Dep.				5140	84			107	10700	
	Fuel & Lub	liter	370	18	6660	109	0.3		111	11100	30
	Total Machinery				12855	211			239	23900	
	Irrigation Water	000m3	16	0	0	0	3.33		53	5328	333
	Insurance				1500	25			15	1500	
	Labor	per day	111	114	12654	207			127	12654	
	Overhead/Admin.	lumpsum			333	5			3	333	
	Credit Costs										
	Other				1750	29			18	1750	
Total Costs					42775	701			758	75765	
					23579	387			667	66741	

FARM BUDGET: COTTON

Scenario C:
Payment for H20
Karakalpakistan

	Units	qty	Cost (som)	Fin. Total (som)	X/R 61 Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (30% state ord	ton	0.6	12500	7500	123	378	227	22680	37800
(70% 'agreed price'	ton	1.4	12500	17500	287	378	529	52920	37800
Total				25000	410		756	75600	
Costs									
Seed	kg	60	5.4	324	5	0.09	5.4	540	9
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
Amophos	ton	0.36	10500	3780	62	210	75.6	7560	21000
Kali/Potassium	ton	0.2	6283	1257	21	103	20.6	2060	10300
Manure	ton	20	250	5000	82	4	80	8000	400
Pesticides	liter	1	500	500	8	11	11	1100	1100
Total Agrochem.			24253	13359	219		267	26700	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	200	3200	52	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		127	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				45975	754		727	72705	
Net Income				-20975	-344		29	2895	

								Scenario C:		
	FARM BUDGET: COTTON							Payment for water		
								Khorezm		
					X/R 61				X/R 100	Econ
				Fin.	Fin.	Econ	Econ	Econ	Unit
	Units	qty	Cost	Total	Total	Cost	Total	Total	Cost
			(som)	(som)	(USD)	(USD)	(USD)	(som)	(som)
Total Revenue									
Main (30% state ord	ton	0.9	12500	11250	184	378	340	34020	37800
(70% 'agreed price'	ton	2	19200	38400	630	378	756	75600	37800
Total				49650	814		1,096	109620	
Costs									
Seed	kg	60	5.4	324	5	0.09	5.4	540	9
Fertilizer									
Siltra	ton	0.42	6720	2822	46	190	79.8	7980	19000
Amophos	ton	0.36	10500	3780	62	210	75.6	7560	21000
Kali/Potassium	ton	0.2	6283	1257	21	103	20.6	2060	10300
Manure	ton	20	250	5000	82	4	80	8000	400
Pesticides	liter	1	500	500	8	11	11	1100	1100
Total Agrochem.			24253	13359	219		267	26700	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	370	18	6660	109	0.3	111	11100	30
Total Machinery				12855	211		239	23900	
Irrigation Water	000m3	16	200	3200	52	3.33	53	5328	333
Insurance				1500	25		15	1500	
Labor	per day	111	114	12654	207		127	12654	
Overhead/Admin.	lumpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				45975	754		727	72705	

				FARM BUDGET: COTTON				Scenario D: Karakalpakstan Payment for water; reduce input use 1/3			
						X/R 61				X/R 100	Econ
					Fin.	Fin.	Econ	Econ		Econ	Unit
		Units	qty	Cost	Total	Total	Cost	Total		Total	Cost
				(som)	(som)	(USD)	(USD)	(USD)		(som)	(som)
Total Revenue											
	Main (0% state orde	ton	0	12500	0	0	378	0		0	37800
	(100% 'agreed price	ton	2	19200	38400	630	378	756		75600	37800
Total					38400	630		756		75600	
Costs											
	Seed	kg	40	5.4	216	4	0.09	3.6		360	9
	Fertilizer										
	Siltra	ton	0.28	6720	1882	31	190	53.2		5320	19000
	Amophos	ton	0.24	10500	2520	41	210	50.4		5040	21000
	Kali/Potassium	ton	0.13	6283	817	13	103	13.4		1339	10300
	Manure	ton	13	250	3250	53	4	52		5200	400
	Pesticides	liter	0.67	500	335	5	11	7		737	1100
	Total Agrochem.			24253	8803.39	144		176		17636	
	Machinery O&M				1055	17		21		2100	
	Machinery Dep.				5140	84		107		10700	
	Fuel & Lub	liter	248	18	4464	73	0.3	74		7440	30
	Total Machinery				10659	175		202		20240	
	Irrigation Water	000m3	11	200	2200	36	3.33	37		3663	333
	Insurance				1500	25		15		1500	
	Labor	per day	74	114	8436	138		84		8436	
	Overhead/Admin.	lumpsum			333	5		3		333	
	Credit Costs										
	Other				1750	29		18		1750	
Total Costs					33897	556		539		53918	
Net Income					4503	74		217		21682	

				FARM BUDGET: COTTON				Scenario D: Khorezm Payment for water; reduce input use 1/3		
	Units	qty	Cost (som)	Fin. Total (som)	X/R 61 Fin. Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (0% state orde	ton	0	12500	0	0	378	0	0	37800
(100% 'agreed price	ton	2.9	19200	55680	913	378	1,096	109620	37800
Total				55680	913		1,096	109620	
Costs									
Seed	kg	40	5.4	216	4	0.09	3.6	360	9
Fertilizer									
Siltra	ton	0.28	6720	1882	31	190	53.2	5320	19000
Amophos	ton	0.24	10500	2520	41	210	50.4	5040	21000
Kali/Potassium	ton	0.13	6283	817	13	103	13.4	1339	10300
Manure	ton	13	250	3250	53	4	52	5200	400
Pesticides	liter	0.67	500	335	5	11	7	737	1100
Total Agrochem.			24253	8803.39	144		176	17636	
Machinery O&M				1055	17		21	2100	
Machinery Dep.				5140	84		107	10700	
Fuel & Lub	liter	248	18	4464	73	0.3	74	7440	30
Total Machinery				10659	175		202	20240	
Irrigation Water	000m3	11	200	2200	36	3.33	37	3663	333
Insurance				1500	25		15	1500	
Labor	per day	74	114	8436	138		84	8436	
Overhead/Admin.	1umpsum			333	5		3	333	
Credit Costs									
Other				1750	29		18	1750	
Total Costs				33897	556		539	53918	

Initial Scenario: Karakalpak stan

FARM BUDGET: RICE

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Paddy Rice	ton	3	18000	54,000	885	325	975	97,500	32500
Total				54,000	885	325	975	97,500	
Costs									
Seed	kg	220	20	4,400	72	0.32	70	7,040	32
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	35	0	0	0	3.33	117	11,655	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				49,790	816		948	94,766	
Net Income				4,210	69		27	3,964	
Return to Water				120	2		4.11	446	

Initial Scenario: Khorezm

FARM BUDGET: RICE

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main	ton	3.5	18000	63,000	1,033	325	1,138	113,750	32500
Total				63,000	1,033	325	1,138	113,750	
Costs									
Seed	kg	220	20	4,400	72	0.32	70	7,040	32
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	35	0	0	0	3.33	117	11,655	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				49,790	0 816		948	94,766	
Net Income				13,210	217		190	27,527	
Return to Water				377	6		9	1,119	

									Scenario B: Karakalpak stan		
			FARM BUDGET: RICE						Improved Tech: 30% yield inc.		
										X/R 100	
					X/R 61	Econ	Econ		Econ	Econ Unit
	Units	qty	Cost	Total	Total	Cost	Total		Total	Cost
			(som)	(som)	(USD)	(USD)	(USD)		(som)	(som)
Total Revenue										
Main	ton	3.9	18000	70,200	1,151	325	1,268		126,750	32500
Total				70,200	1,151	325	1268		126,750	
Costs										
Seed	kg	220	26	5,720	94	0.43	95		9,460	43
Fertilizer										
Siltra	ton	0.66	6720	4,435	73	190	125		12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65		6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33		3,296	10300
Manure	ton	15	250	3,750	61	4	60		6,000	400
Pesticides	liter	1	700	700	11	12	12		1,200	1200
Total Agrochem.				13,980	229		295		29,546	
Machinery O&M				923	15	26.25	27		2,700	
Machinery Dep.				5,226	86	148.75	147		14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97		9,660	30
Total Machinery				11,945	196		271		27,060	
Irrigation Water	000m3	35	0	0	0	3.33	117		11,655	333
Insurance				1,585	26	-	16		1,585	
Labor	per day	68	114	7,752	127	1.75	78		7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6		628	512
Credit Costs										
Other				9,500	156		95		9,500	
Total Costs				51,110	838		972		97,186	
Net Income				19,090	313		296		42,868	
Return to Water				545	9	#	11.78		1,558	

Scenario B: Khorezm

FARM BUDGET: RICE

Improved Tech: 30% yield increase

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main	ton	4.5	18000	81,000	1,328	325	1,463	146,250	32500
Total				81,000	1,328	325	1,463	146,250	
Costs									
Seed	kg	220	26	5,720	94	0.43	95	9,460	43
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	35	0	0	0	3.33	117	11,655	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				51,110 0	838	705	972	97,186	
Net Income				29,890	490		491	71,143	
Return to Water				854	14		17	2,366	

									Scenario C: Karakalpakstan			
			FARM BUDGET: RICE						Payment for water			
											X/R 100	
						X/R 61	Econ	Econ	Econ	Econ Unit		
		Units	qty	Cost	Total	Total	Cost	Total	Total	Cost		
				(som)	(som)	(USD)	(USD)	(USD)	(som)	(som)		
Total Revenue												
	Paddy Rice	ton	3	18000	54,000	885	325	975	97,500	32500		
Total					54,000	885	325	975	97,500			
Costs												
	Seed	kg	220	20	4,400	72	0.32	70	7,040	32		
	Fertilizer											
	Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000		
	Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000		
	Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300		
	Manure	ton	15	250	3,750	61	4	60	6,000	400		
	Pesticides	liter	1	700	700	11	12	12	1,200	1200		
	Total Agrochem.				13,980	229		295	29,546			
	Machinery O&M				923	15	26.25	27	2,700			
	Machinery Dep.				5,226	86	148.75	147	14,700	14875		
	Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30		
	Total Machinery				11,945	196		271	27,060			
	Irrigation Water	000m3	35	200	7,000	115	3.33	117	11,655	333		
	Insurance				1,585	26	-	16	1,585			
	Labor	per day	68	114	7,752	127	1.75	78	7,752	175		
	Overhead/Admin	lumpsum			628	10	5.12	6	628	512		
	Credit Costs							0				
	Other				9,500	156		95	9,500			
Total Costs					56,790	931		948	94,766			
Net Income					-2,790	-46		27	3,964			
	Return to Water				120	2	#	4.11	446			

FARM BUDGET: RICE

Scenario C: Khorezm
Payment for water

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main	ton	3.5	18000	63,000	1,033	325	1,138	113,750	32500
Total				63,000	1,033	325	1,138	113,750	
Costs									
Seed	kg	220	20	4,400	72	0.32	70	7,040	32
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	35	200	7,000	115	3.33	117	11,655	333
Insurance				1,585	26	-	16	1,585	-
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				56,790 0	931		948	94,766	
Net Income				6,210	102		190	27,527	*
Return to Water				377	6		9	1,119	

FARM BUDGET: RICE

Scenario C-a: Karakalpakistan
inc. estmate of use of water;
w/ payment

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Paddy Rice	ton	3	18000	54,000	885	325	975	97,500	32500
Total				54,000	885	325	975	97,500	
Costs									
Seed	kg	220	20	4,400	72	0.32	70	7,040	32
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	50	200	10,000	164	3.33	167	16,650	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				59,790	980		998	99,761	
Net Income				-5,790	-95		-23	-3,278	

FARM BUDGET: RICE

Scenario C-a: Khorezm
inc. estimate of use of water
w/ payment

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main	ton	3.5	18000	63,000	1,033	325	1,138	113,750	32500
Total				63,000	1,033	325	1,138	113,750	
Costs									
Seed	kg	220	20	4,400	72	0.32	70	7,040	32
Fertilizer									
Siltra	ton	0.66	6720	4,435	73	190	125	12,540	19000
Amophos	ton	0.31	9950	3,085	51	210	65	6,510	21000
Kali/Potasium	ton	0.32	6283	2,011	33	103	33	3,296	10300
Manure	ton	15	250	3,750	61	4	60	6,000	400
Pesticides	liter	1	700	700	11	12	12	1,200	1200
Total Agrochem.				13,980	229		295	29,546	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	322	18	5,796	95	0.3	97	9,660	30
Total Machinery				11,945	196		271	27,060	
Irrigation Water	000m3	50	200	10,000	164	3.33	167	16,650	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	68	114	7,752	127	1.75	78	7,752	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				59,790	980		998	99,761	
Net Income				3,210	53		140	20,284	
Return to Water				264	4		6	739	

FARM BUDGET: RICE

Scenario D: K
1/3 reduced input use
w/ water payment

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Paddy Rice	ton	3	18000	54,000	885	325	975	97,500	32500
Total				54,000	885	325	975	97,500	
Costs									
Seed	kg	147	20	2,940	48	0.32	47	4,704	32
Fertilizer									
Siltra	ton	0.44	6720	2,957	48	190	84	8,360	19000
Amophos	ton	0.2	9950	1,990	33	210	42	4,200	21000
Kali/Potasium	ton	0.21	6283	1,319	22	103	22	2,163	10300
Manure	ton	10	250	2,500	41	4	40	4,000	400
Pesticides	liter	0.67	700	469	8	12	8	804	1200
Total Agrochem.				9,235	151		195	19,527	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	216	18	3,888	64	0.3	65	6,480	30
Total Machinery				10,037	165		239	23,880	
Irrigation Water	000m3	24	200	4,800	79	3.33	80	7,992	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	46	114	5,244	86	1.75	52	5,244	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				43,969	721		731	73,060	
Net Income				10,031	164		244	35,438	
Returns to Water				618	10	#	13.51	1,810	

FARM BUDGET: RICE

Scenario D: Khorezm
1/3 reduced input use
w/ water payment

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main	ton	3.5	18000	63,000	1,033	325	1,138	113,750	32500
Total				63,000	1,033	325	1,138	113,750	
Costs									
Seed	kg	147	20	2,940	48	0.32	47	4,704	32
Fertilizer									
Siltra	ton	0.44	6720	2,957	48	190	84	8,360	19000
Amophos	ton	0.2	9950	1,990	33	210	42	4,200	21000
Kali/Potasium	ton	0.21	6283	1,319	22	103	22	2,163	10300
Manure	ton	10	250	2,500	41	4	40	4,000	400
Pesticides	liter	0.67	700	469	8	12	8	804	1200
Total Agrochem.				9,235	151		195	19,527	
Machinery O&M				923	15	26.25	27	2,700	
Machinery Dep.				5,226	86	148.75	147	14,700	14875
Fuel & Lub	liter	216	18	3,888	64	0.3	65	6,480	30
Total Machinery				10,037	165		239	23,880	
Irrigation Water	000m3	24	200	4,800	79	3.33	80	7,992	333
Insurance				1,585	26	-	16	1,585	
Labor	per day	46	114	5,244	86	1.75	52	5,244	175
Overhead/Admin	lumpsum			628	10	5.12	6	628	512
Credit Costs									
Other				9,500	156		95	9,500	
Total Costs				43,969	0 721		731	73,060	
Net Income				19,031	312		407	59,001	

Initial Scenario: Karakalpakstan

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (50% state order	ton	0.6	7,140	4,284	70	224	135	13,464	22,440
(50% 'agreed price')	ton	0.6	14,280	8,568	140	224	135	13,464	22,440
Bi-product	ton	1.3	400	520	9	8	10	1,040	800
Total				13,372	219		280	27,968	
Costs									
Seed	kg	220	24	5,280	87	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	0	0	0	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				31,910	523		566	54,924	
Net Income				-18,538	-304		-287	-28,666	

FARM BUDGET: WHEAT

Initial Scenario: Karakalpakistan liberalized prices

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (0% state order)	ton	0	7,140	0	0	224	0	0	22,440
(100% 'agreed price')	ton	1.2	14,280	17,136	281	224	269	26,928	22,440
Bi-product	ton	1.3	400	520	9	8	10	1,040	800
Total				17,656	289		280	27,968	
Costs									
Seed	kg	220	24	5,280	87	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	0	0	0	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				31,910	523		566	54,924	
Net Income				-14,254	-234		-287	-28,666	

FARM BUDGET: WHEAT

Initial Scenario: Khorezm liberalized prices

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (0% state order	ton	0	7,140	0	0	224	0	0	22,440
(100% 'agreed price'	ton	2.7	14,280	38,556	632	224	606	60,588	22,440
Bi-product	ton	1.7	400	680	11	8	14	1,360	800
Total				39,236	643		619	61,948	
Costs									
Seed	kg	220	24	5,280	87	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	0	0	0	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				31,910	523		566	54,924	
Net Income				7,326	120		53	5,314	

Scenario B: Karakalpakstan
Improved tech.: 30% yield increase

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (50% state order	ton	0.8	7,140	5,712	94	224	180	17,952	22,440
(50% 'agreed price')	ton	0.8	14,280	11,424	187	224	180	17,952	22,440
Bi-product	ton	1.5	400	600	10	8	12	1,200	800
Total				17,736	291		371	37,104	
Costs									
Seed	kg	220	32	7,040	115	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	0	0	0	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				33,670	552		566	54,924	
Net Income				-15,934	-261		-195	-19,530	

Scenario B: Khorezm

Improved tech.: 30% yield increase

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (50% state orde	ton	1.75	7,140	12,495	205	224	393	39,270	22,440
(50% 'agreed price')	ton	1.75	14,280	24,990	410	224	393	39,270	22,440
Bi-product	ton	1.9	400	760	12	8	15	1,520	800
Total				38,245	627		801	80,060	
Costs									
Seed	kg	220	32	7,040	115	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	0	0	0	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				33,670	552		566	54,924	
Net Income				4,575	75		234	23,426	

Scenario C: Karakalpakstan

Payment for water

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (50% state order	ton	0.6	7,140	4,284	70	224	135	13,464	22,440
(50% 'agreed price')	ton	0.6	14,280	8,568	140	224	135	13,464	22,440
Bi-product	ton	1.3	400	520	9	8	10	1,040	800
Total				13,372	219		280	27,968	
Costs									
Seed	kg	220	24	5,280	87	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	200	1,800	30	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				33,710	553		566	54,924	
Net Income				-20,338	-333		-287	-28,666	

Scenario C: Khorezm
Payment for water

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (50% state orde	ton	1.35	7,140	9,639	158	224	303	30,294	22,440
(50% 'agreed price')	ton	1.35	14,280	19,278	316	224	303	30,294	22,440
Bi-product	ton	1.7	400	680	11	8	14	1,360	800
Total				29,597	485		619	61,948	
Costs									
Seed	kg	220	24	5,280	87	0.39	86	8,580	39
Fertilizer									
Siltra	ton	0.45	6,720	3,024	50	190	86	8,550	19,000
Amophos	ton	0.22	10,500	2,310	38	210	46	4,620	21,000
Kali/Potasium	ton	0.09	6,283	565	9	103	9	927	10,300
Manure	ton	20	250	5,000	82	4	80	8,000	400
Pesticides									
Total Agrochem.				10,899	179		221	22,097	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	157	18	2,826	46	0.30	47	4,710	30
Total Machinery				6,671	109		139	13,900	
Irrigation Water	000m3	9	200	1,800	30	3.33	30	2,997	333
Insurance				1,740	29		17	1,740	
Labor	per day	15	114	1,710	28	2	17		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				33,710	553		566	54,924	
Net Income				-4,113	-67		53	5,314	
					4		9	923	*

Scenario D: Karakalpakstan

Dec. input use by 1/3; liberalized prices; payment for water

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost (som)
Total Revenue									
Main (0% state order)	ton	0	7,140	0	0	224	0	0	22,440
(100% 'agreed price')	ton	1.2	14,280	17,136	281	224	269	26,928	22,440
Bi-product	ton	1.3	400	520	9	8	10	1,040	800
Total				17,656	289		280	27,968	
Costs									
Seed	kg	148	24	3,552	58	0.39	58	5,772	39
Fertilizer									
Siltra	ton	0.3	6,720	2,016	33	190	57	5,700	19,000
Amophos	ton	0.15	10,500	1,575	26	210	32	3,150	21,000
Kali/Potasium	ton	0.06	6,283	377	6	103	6	618	10,300
Manure	ton	14	250	3,500	57	4	56	5,600	400
Pesticides									
Total Agrochem.				7,468	122		151	15,068	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	106	18	1,908	31	0.30	32	3,180	30
Total Machinery				5,753	94		124	12,370	
Irrigation Water	000m3	6	200	1,200	20	3.33	20	1,998	333
Insurance				1,740	29		17	1,740	
Labor	per day	10	114	1,140	19	2	11		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				26,463	434		437	42,558	
Net Income				-8,807	-144		-157	-15,730	

Scenario D: Khorezm

Dec. input use by 1/3; liberalized prices;

payment for water

FARM BUDGET: WHEAT

	Units	qty	Cost (som)	Total (som)	X/R 61 Total (USD)	Econ Cost (USD)	Econ Total (USD)	X/R 100 Econ Total (som)	Econ Unit Cost] (som)
Total Revenue									
Main (0% state order	ton	0	7,140	0	0	224	0	0	22,440
(100% 'agreed price'	ton	2.7	14,280	38,556	632	224	606	60,588	22,440
Bi-product	ton	1.7	400	680	11	8	14	1,360	800
Total				39,236	643		619	61,948	
Costs									
Seed	kg	148	24	3,552	58	0.39	58	5,772	39
Fertilizer									
Siltra	ton	0.3	6,720	2,016	33	190	57	5,700	19,000
Amophos	ton	0.15	10,500	1,575	26	210	32	3,150	21,000
Kali/Potasium	ton	0.06	6,283	377	6	103	6	618	10,300
Manure	ton	14	250	3,500	57	4	56	5,600	400
Pesticides									
Total Agrochem.				7,468	122		151	15,068	
Machinery O&M				575	9		14	1,380	
Machinery Dep.				3,270	54		78	7,810	
Fuel & Lub	liter	106	18	1,908	31	0.30	32	3,180	30
Total Machinery				5,753	94		124	12,370	
Irrigation Water	000m3	6	200	1,200	20	3.33	20	1,998	333
Insurance				1,740	29		17	1,740	
Labor	per day	10	114	1,140	19	2	11		175
Overhead/Admin	lumpsum			1,050	17		11	1,050	
Credit Costs									
Other				4,560	75		46	4,560	
Total Costs				26,463	434		437	42,558	
Net Income				12,773	209		183	18,250	
Return to Water				2,329	38		34	3,375	*

Notes to Farm Budgets

1. Estimated equilibrium exchange rate used throughout of 100 soum/$ based on estimates by World Bank staff. Current official exchange rate is 61 soum/$.

2. Cotton financial price from interviews at cotton gins, with farmers, and at oblast Ministry of Agriculture and Water.

3. Cotton economic price based on assumption of 30% fiber content in seed cotton with a $1500/ton price for cotton fiber; 60% seed content of seed cotton at a price of $100/ton. This yields a gross revenue of $510/ton of seed cotton. Ginning, transport and handling are estimated at $122 (based on 12,200 soum cost for ginning and transport according to field notes from interviews, converted at equilibrium exchange rate of 100 soum/dollar). This yields a net economic price per ton of seed cotton of $378.

4. World prices for rice from World Bank Commodity Markets and the Developing Countries. Wheat from current import price of Kazakh wheat adjusted for transport costs.

5. Yields per hectare taken from Goscomprognostat data. For Karakalpakstan, all yields taken as average of 1991-1996, with the exception of wheat, where 1996 was excluded as atypically low. For Khorezm, cotton was taken from 1996 figures, wheat from 1995 since 1996 was atypical, and rice taken as average of 1995 and 1996.

6. Seed financial costs taken from field notes in Khorezm and Karakalpakstan. Economic costs taken as price of improved cotton seed in USA without adjusting for transport cost on the assumption that the Cotton Improvement Project will soon be producing equivalent seeds domestically. Seed application rates taken from field interviews.

7. Manure application rates and prices taken from field notes.

8. Pesticide and fertilizer application rates taken from field notes. Financial prices from Agrochemservis. Economic prices taken from World Bank Commodity Markets and the Developing Countries, with the exception of price of potash imported from Kazakhstan which was taken at actual import price in dollars.

9. Machinery prices and usage taken from field notes at state machinery company and on farm interviews. Economic costs taken from USDA farm budgets for irrigated cotton. It was assumed that transport costs on a per hectare basis and amortized over the life of the machinery were negligible.

10. Fuel usage from field interviews. Prices taken from W. Van Harreveld's estimates based on information collected in May and

June of 1997.

11. Water application rates from SANIIRI except for wheat, which was taken from World Bank Farm Restructuring Study. Water price of \$3.33/1000 m^3 taken from SANIIRI estimate of shadow price of providing water.

12. Labor rates taken as average of field interview numbers and those from TACIS survey, which exclude all but on-field labor use.

13. Labor cost taken from current wage rates from field interviews.

14. Overhead and administration taken from field interviews.

15. Other costs taken from field interviews. Though these costs may be assumed to include pumping costs and miscellaneous expenses related to water management, further investigation will focus on disaggregating these figures.

Tables

Table 1. Khorezm - Agricultural Production in 1995 and 1996 (tons)						
	Total		Kolkhoz		Private Farms	
	1995	1996	1995	1996	1995	1996
Cotton	304,694	290,042	304,694	290,042	--	--
Grains	202,762	249,925	179,605	217,716	23,157	32,209
Wheat	44,853	63,181	38,231	53,553	6,622	9,628
Rice	124,425	172,546	113,925	155,606	10,500	16,940
Corn	28,476	9,898	26,456	7,343	2,020	2,555
Potatoes	27,559	27,998	4,889	3,348	22,670	24,650
Vegetables	140,120	144,092	43,829	41,400	96,291	102,692
Melons	42,645	42,838	14,785	12,678	27,860	30,160
Fruits	35,862	36,589	12,833	12,074	23,029	24,515
Grapes	11,568	8,344	6,543	3,308	5,025	5,036

Source: Goscomprognostat

Table 2. Karakalpakstan: Agricultural Production, 1995-1996 (tons

	1995	1996
Wheat	34,056	20,532
Rice	141,912	201,562
Cotton	288,223	203,921
Potatoes	4,778	10,759
Vegetables	66,238	77,191
Fruit	4,171	4,541
Grapes	568	1,616

Source: Goscomprognostat

Table 3. Khorezm: Planted Area - 1996 (hectares)	
Wheat	28,847
Rice	44,561
Seed Corn	1,898
Other Grain	583
Cotton	100,967
Sunflower	44
Other Industrial	41
Potatoes	535
Vegetables	2,658
Melons	1,398
Fodder Crops	31,963

Source: Goscomprognostat

Table 4. Karakalpakstan: Planted Area 1996 (hectares)	
Wheat	33,927
Rice	100,288
Other Grains	10,635
Cotton	146,611
Potatoes	2,025
Vegetables	8,231
Melons	7,250
Fruit	2,739
Grapes	345

Source: Goscomprognostat

Table 5. Kaakalpakstan: Returns on Cotton Producing Kolkhozes, 1995-96

	1995	1996
	%	%
Turfbul	-26.6	-45.8
Beruni	-36.4	-49.6
Ellikalla	-29.1	-45.7
Amu Darya	-8.1	-40.9
Khodzeli	-6.0	-46.4
Shurmana	-11.9	-51.3
Kanlykul	-19.8	-42.5
Kungrad	-23.0	-31.1
Kegeili	+2.2	-58.4
Chimbai	-8.1	-43.7
Karauzyak	-22.6	-51.6
Tahtakupir	-36.3	-37.9
Bozatau	-3.7	-36.2
Total	-18.00	-44.7

Source: Ministry of Agriculture and Water

Table 6. Khorezm: Livestock Production 1995-96

	Total		of which: Private Plots	
	1995	1996	1995	1996
Cows	167,347	171,999	132,841	137,038
Pigs	12,494	7,418	726	831
Sheep and Goats	174,959	180,636	131,403	142,740
Horses	2,435	3,292	1,218	2,062
Camels	82	82	13	16
Rabbits	6,395	5,575	5,938	5,451
Poultry	1,540,250	1,365,380	540,000	560,000

Source: Goscomprognostat

Table 7. Karakalpakstan: Livestock Breeding, 1994-95

	1994		1995	
	Total	of which private plots	Total	of which private plots
Cows, bulls, calves	403,080	267,694	386,508	265,671
Sheep and Goats	487,156	219,574	485,819	219,584
Horses	18,214	7,449	18,127	7,867
Camels	4,913	2,242	4,997	2,334
Poultry	572,706	386,514	575,295	382,841

Source: Goscomprognostat

Table 8. Khorezm: Dekhan Farms by Type

	Number of Farms			
	Total	Crops	Livestock	Fish
1996	956	289	667	9
1997	1044	409	596	23

Source: Ministry of Agriculture and Water

Table 9. Average Yield of Specific Crops by Region (tons/hectare)						
	Fergana Region	Central Region	Southern Region	Desert Region	Aral Sea Region	Total
Cotton	3.0	2.5	3.4	3.5	2.0	2.8
Wheat (irrigated)	3.2	3.0	2.8	1.9	2.3	2.9
Rice	2.9	2.6	2.1	1.0	1.9	2.2
Alfalfa (irrigated)	12.5	10.6	11.3	15.4	10.1	11.8
Watermelon (irrigated)	16.2	13.1	13.2	13.3	12.3	13.7
Melon	16.5	9.1	11.2	9.2	6.9	8.7
Tomato	24.5	19.5	18.0	9.5	8.7	16.8

Source: Uzbekistan Agricultural Baseline Survey, July 1996.

Table 10. Karakalpakstan: Fixed Wheat and Flour Prices as of November 1996

Wheat		
Grade	soum/ton	$US at Equilibrium Exchange Rate
1	18,038	$180
2	16,430	164
3	14,467	145
4	12,500	125
5	11,140	111
6	10,374	104
Flour		
1	27,500	275
2	19,801	198
3	18,244	182

Source: Uzkhlebproduct

Table 11. Karakalpakstan: Rice Processing Costs, 1996

(soum per ton)

	Cost of Production	Including 10% Profit Margin	Including Taxes
Best Grade	31,416	34,558	40,779
1st Grade	29,030	31,933	37,681
2nd Grade	27,336	30,070	35,483
Broken	9,791	10,771	12,710
For Flour	4,079	4,487	5,295

Table 12. Average Age of Farm Vehicles (years)							
		Fergana Region	Central Region	Southern Region	Desert Region	Aral Sea Region	Total
Trucks	Main	14	9	9	10	9	10
	Associated	12	6	9	9	8	9
Tractors (wheeled)	Main	13	9	13	10	8	11
	Associated	10	8	9	10	8	8
Tractors (tract)	Main	12	8	9	9	9	10
	Associated	12	7	9	10	9	9

Source: Uzbekistan Agricultural Baseline Survey

Table 13. Khorezm: Farm Machinery, 1996

	(number of units)
Tractors	11,019
of which: Currently Functioning	2,215
Trucks	3,161
Cotton Picking Machines	789

Source: Ministry of Agriculture and Water

Table 14 Karakalpakstan: Fertilizer Use in 1996-97, kg

	Nitrogen			Phosphorus			Potassium		
	Planned	Actual	%	Planned	Actual	%	Planned	Actual	%
Total									
1996	50,810	31,620	62	19,870	1,250	6	22,300	0	0
1997	68,200	53,293	78	25,500	12,666	50	22,300	12,167	55
for Rice									
1996	16,896	10,710	63	6,497	139	2	6,605	0	0
1997	19,692	18,022	92	7,199	5,608	78	6,605	5,278	80

Table 15. Financial and Economic Costs of Crop Production (soum/ha)						
			Difference Between Economic Net Income and Current Financial Net Income			
	1996 Area (ha)	Current Financial Net Income	A	B	C	D
Karakalpakstan						
Cotton	146,611	-17,775	20,670	40,290	20,670	39,451
Rice	100,288	4,210	-246	38,658	-246	31,228
Wheat	33,927	-18,538	-10,128	-992	-10,128	2,808
Khorezm						
Cotton	100,967	6,875	30,040	59,866	30,040	48,827
Rice	44,561	13,210	14,317	57,933	14,317	45,791
Wheat	28,847	-2,313	7,627	25,739	7,627	20,563

A = Liberalized Prices
B = 30% Yield Increase
C = Payment for Water
D = Combination of A, B & C (except rice which does not include yield increase)

Table 16. Difference Between Economic and Financial Net Income (soum/ha)

			Difference Between Economic Net Income and Financial Net Income			
	1996 Area (ha)	Current Conditions	A	B	C	D
Karakalpakstan						
Cotton	146,611	20,670	7,270	20,730	23,870	17,179
Rice	100,288	-246	--	23,778	6,754	25,407
Wheat	33,927	10,128*	14,412*	3,596*	8,328*	6,923*
Khorezm						
Cotton	100,967	30,040	24,010	43,162	33,240	33,919
Rice	44,561	14,317	--	41,253	21,317	39,390
Wheat	28,847	7,627	-2,012	18,851	9,427	5,477

A = Liberalized Prices
B = 30% Yield Increase
C = Payment for Water
D = Combination of A, B & C

* - Negative economic return.

Figures

Figures 1 and 2 from Final Report for the Preparation Study of the Uzbekistan Drainage Project.

Figures 3 and 4 from TACIS WARMAP project Volume 4.

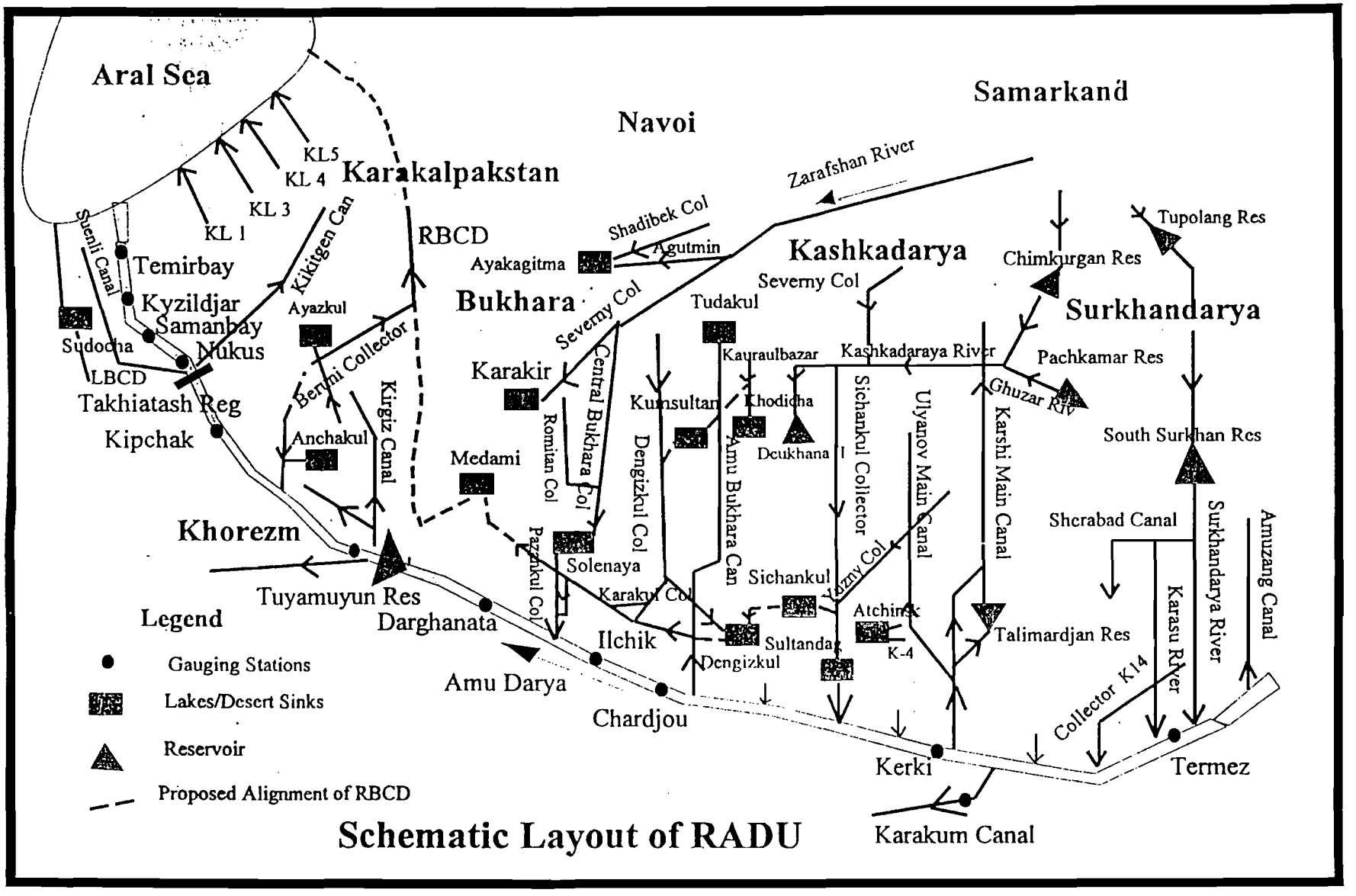


Figure 1
Schematic Layout of RADU

Figure 2
Water Balance Summary of Amu Darya Basin

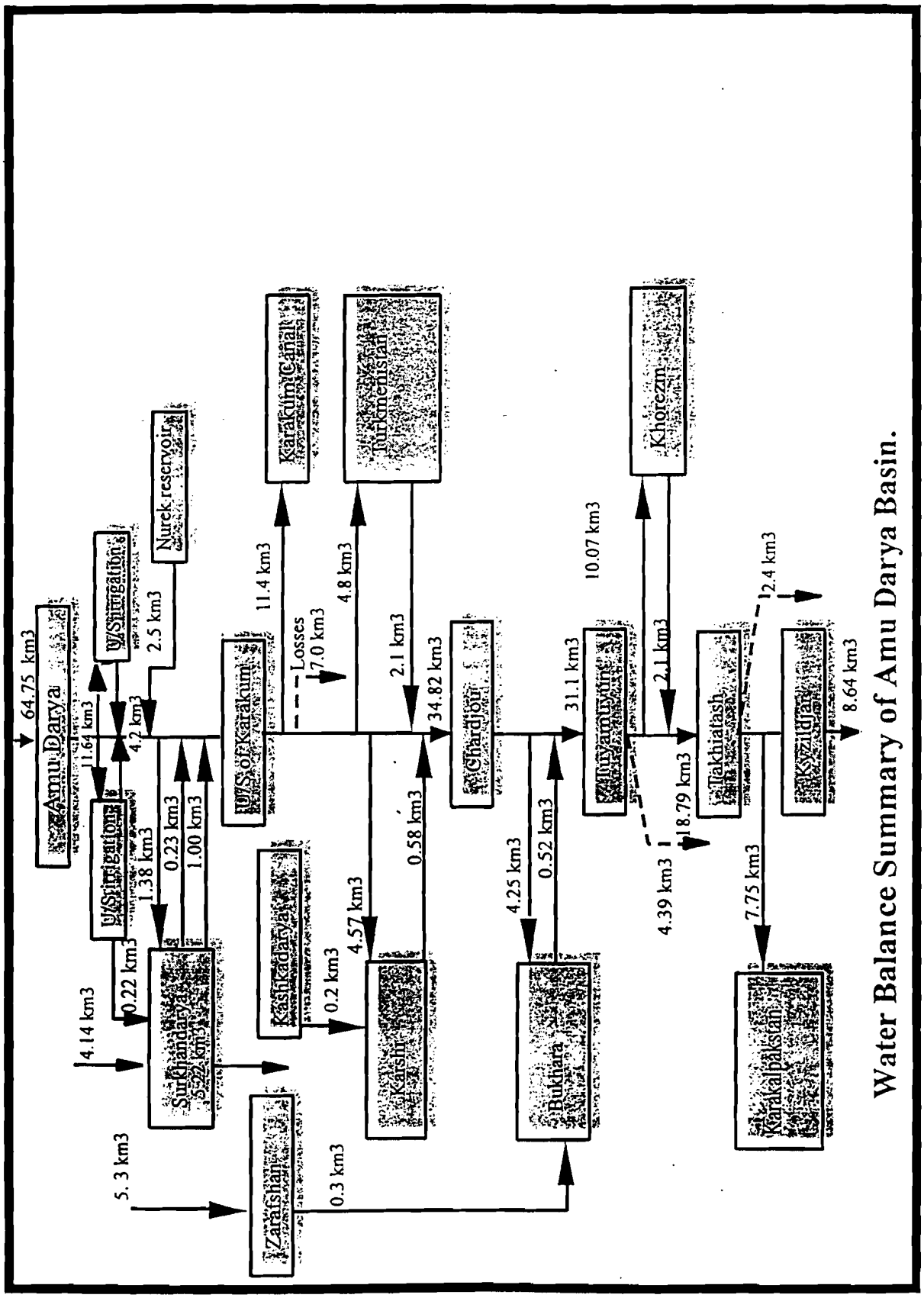
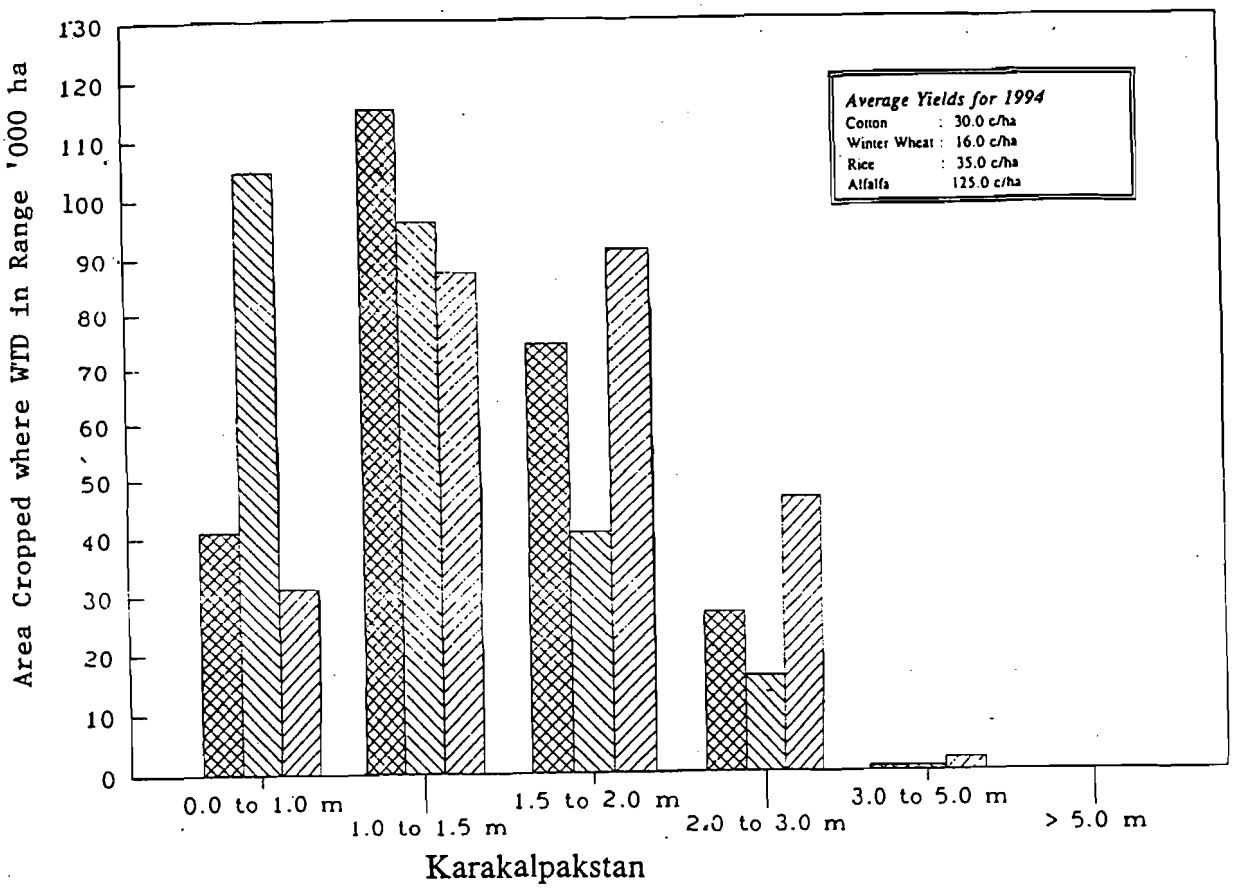
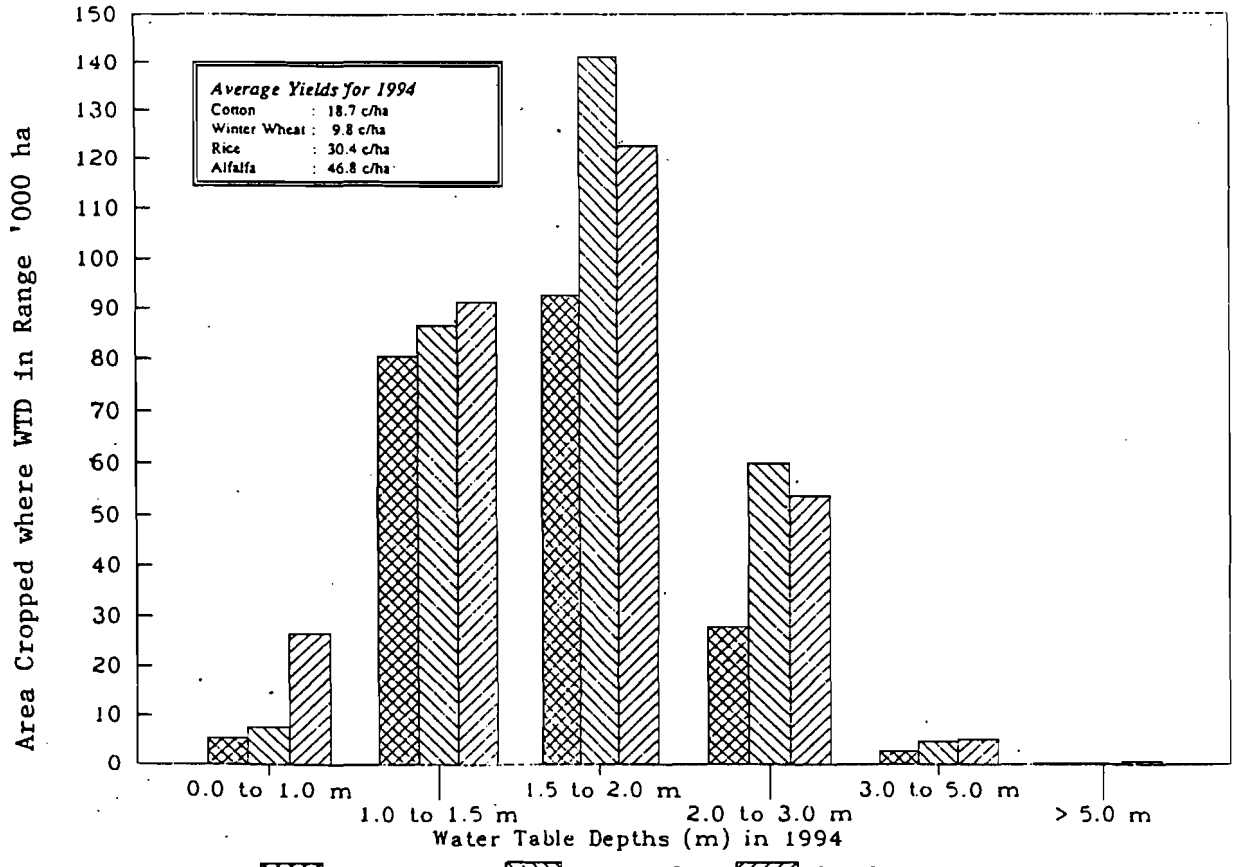


Figure 3
Water Table Depth and Crop Yields
Karakalpakstan and Khorezm

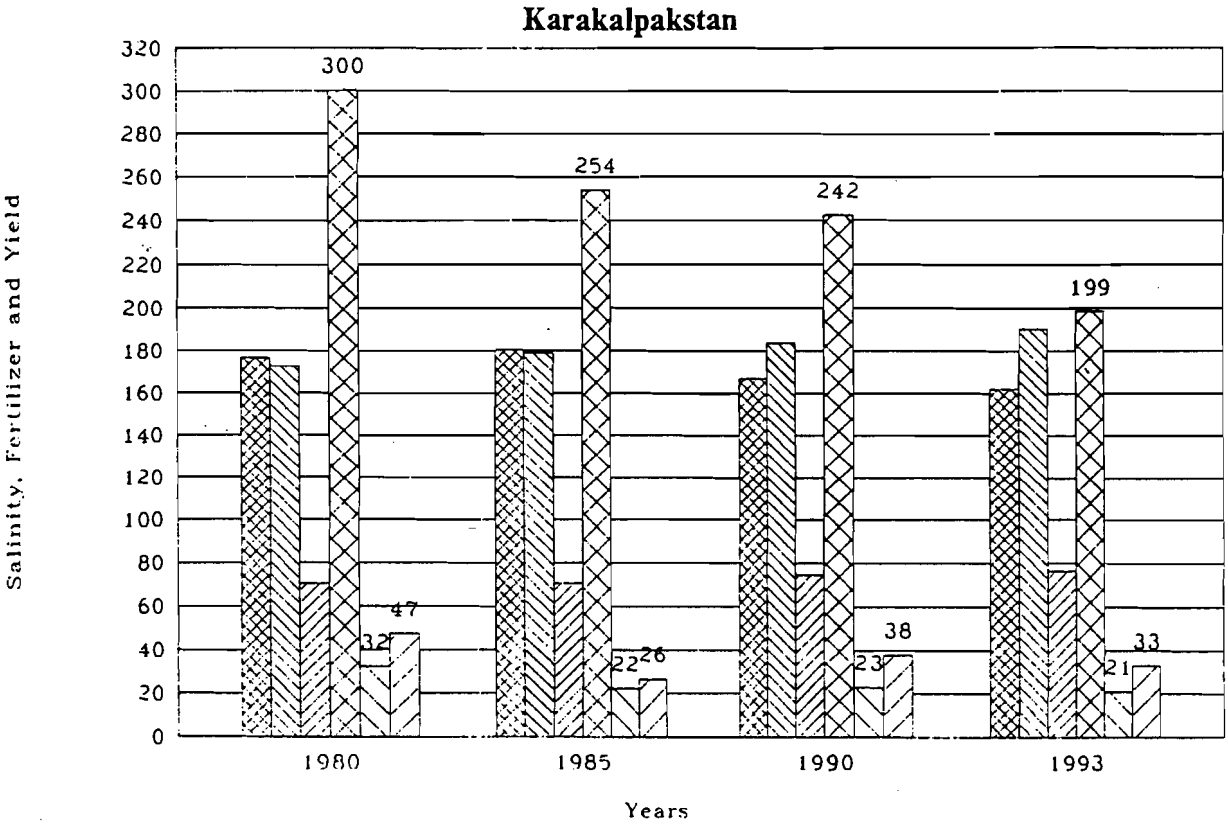


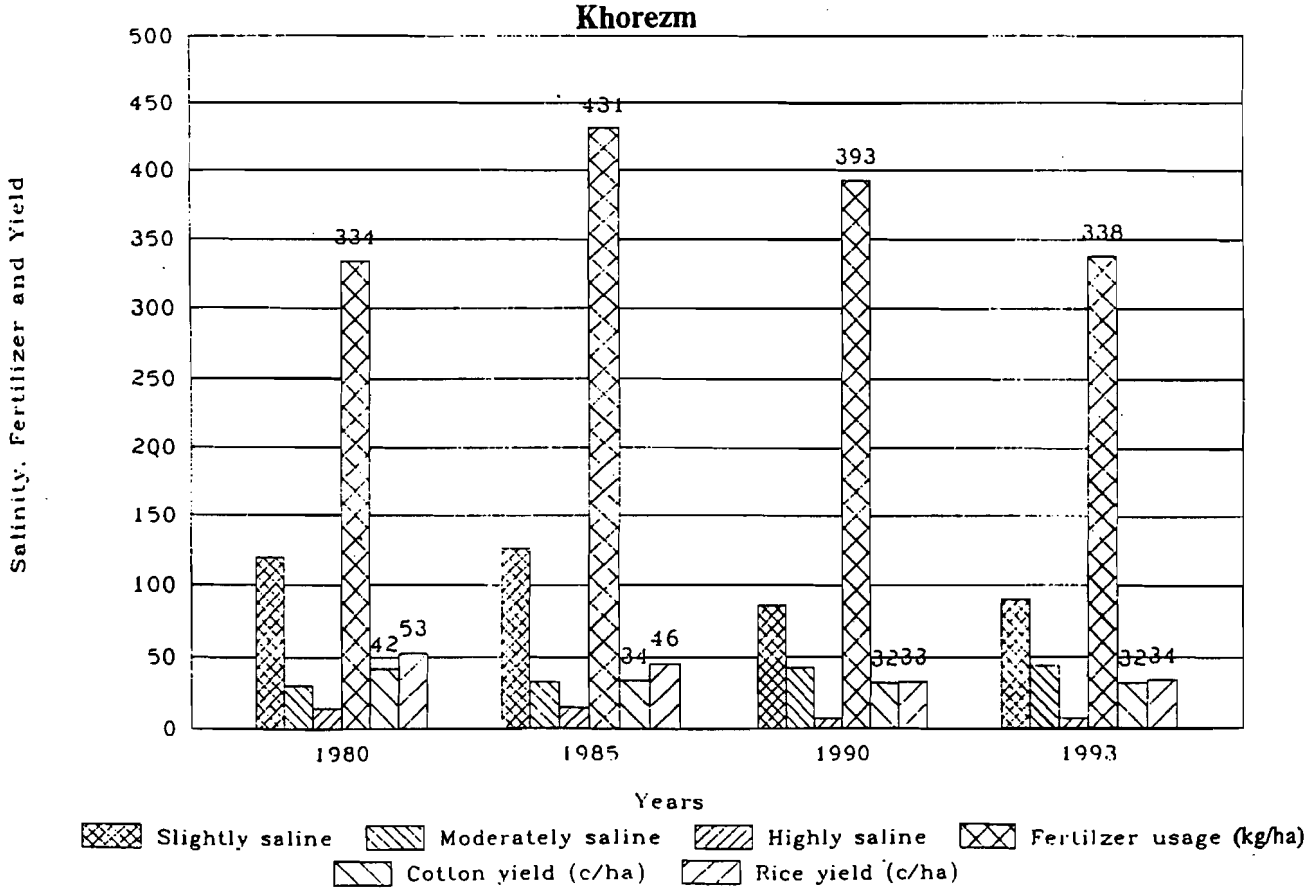
Karakalpakstan



Khorezm

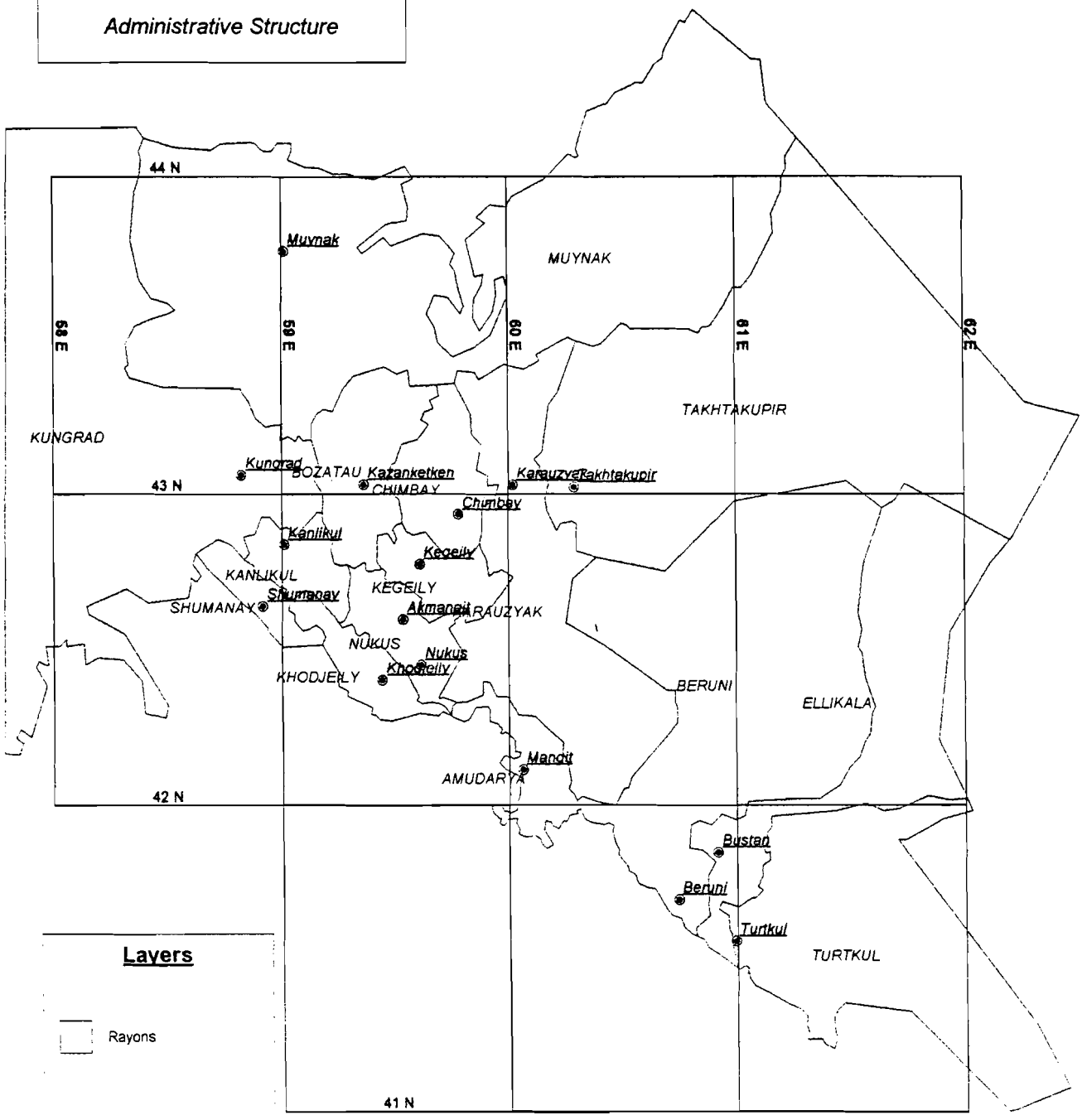
Figure 4
Soil Salinity, Fertilizer Use and Yield in Karakalpakstan and Khorezm





Karakalpakstan

Administrative Structure



Layers

Rayons

Raycenters

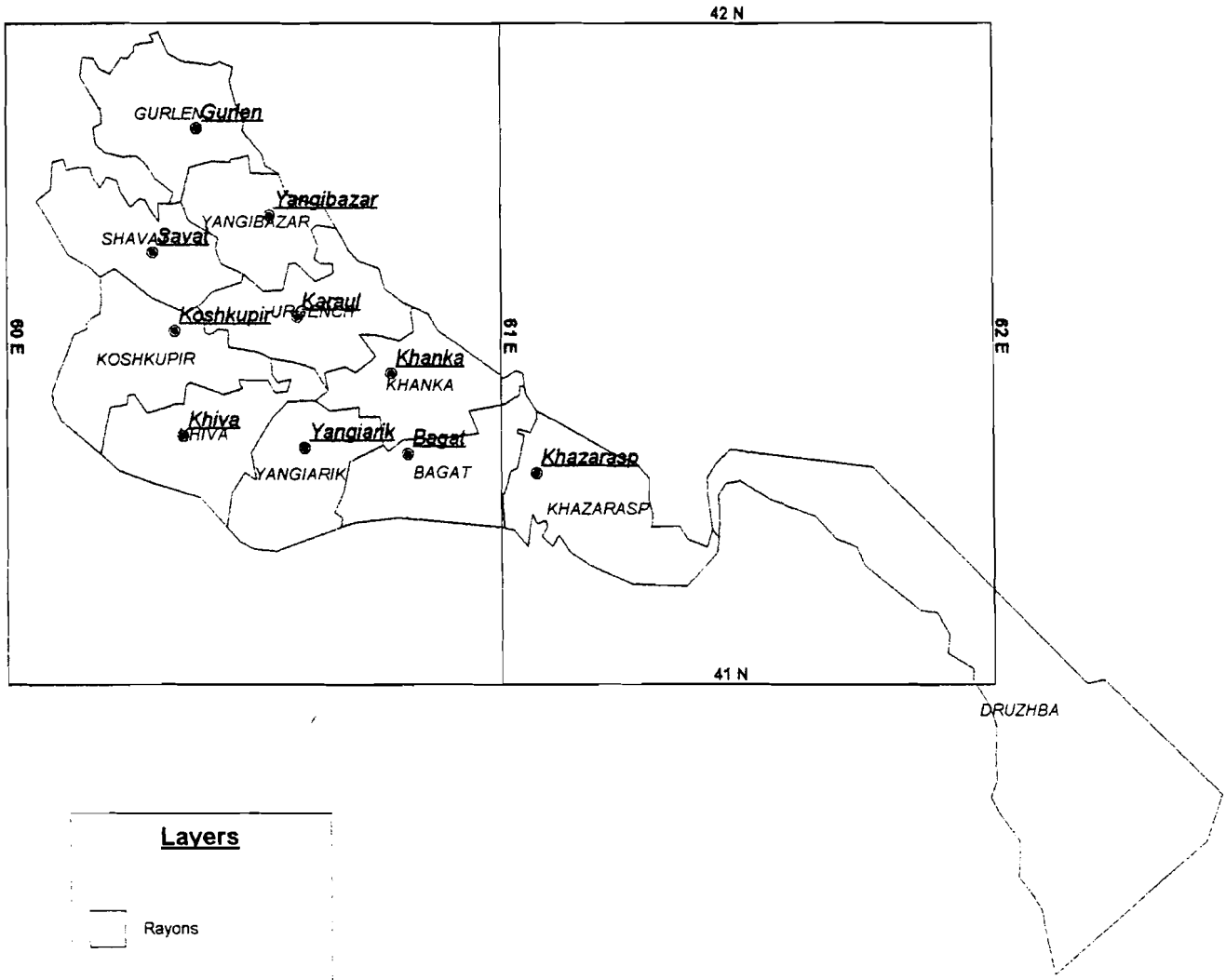
Grid 1degr.

KM

0 20 40 60 80

Khorezm Oblast

Administrative Structure



Layers

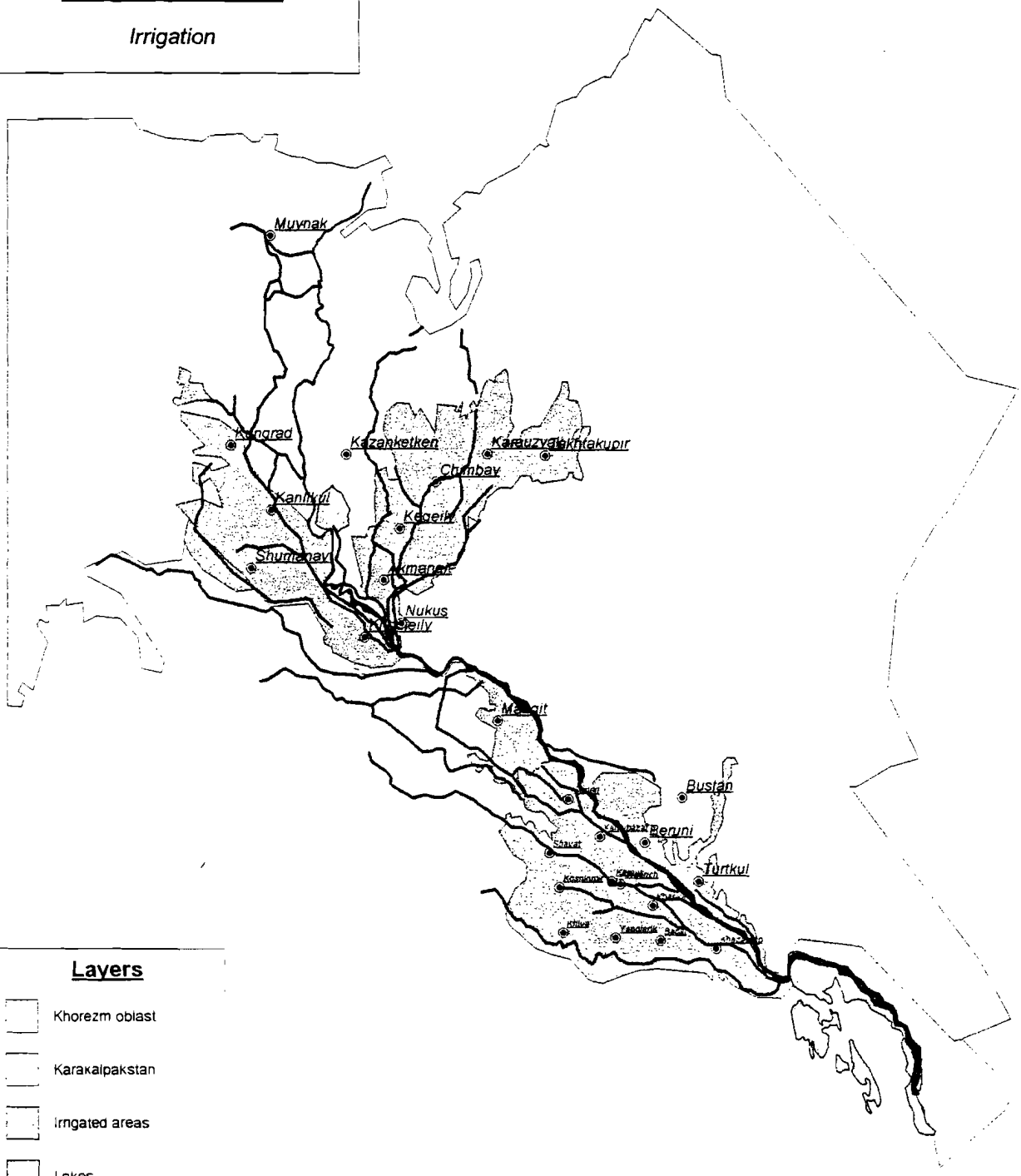
- Rayons
- Raycenters
- Grid 1 degree

KM

0 20 40 60 80

Aral Lake Zone

Irrigation



Layers

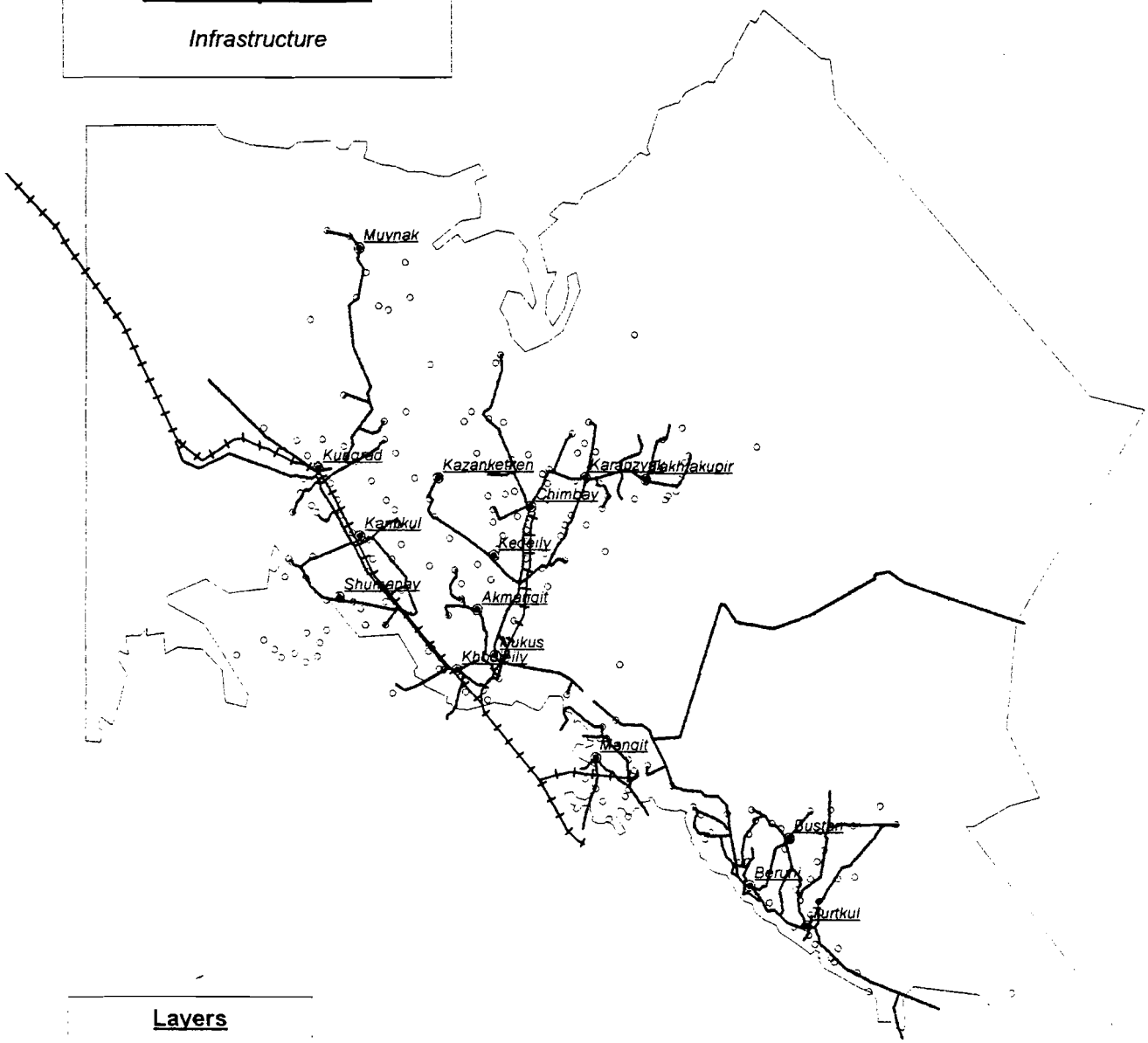
- Khorezm oblast
- Karakalpakstan
- Irrigated areas
- Lakes
- Amudarya
- Raycenters
- Main canals

KM

0 20 40 60 80 100

Karakalpakstan

Infrastructure



Layers

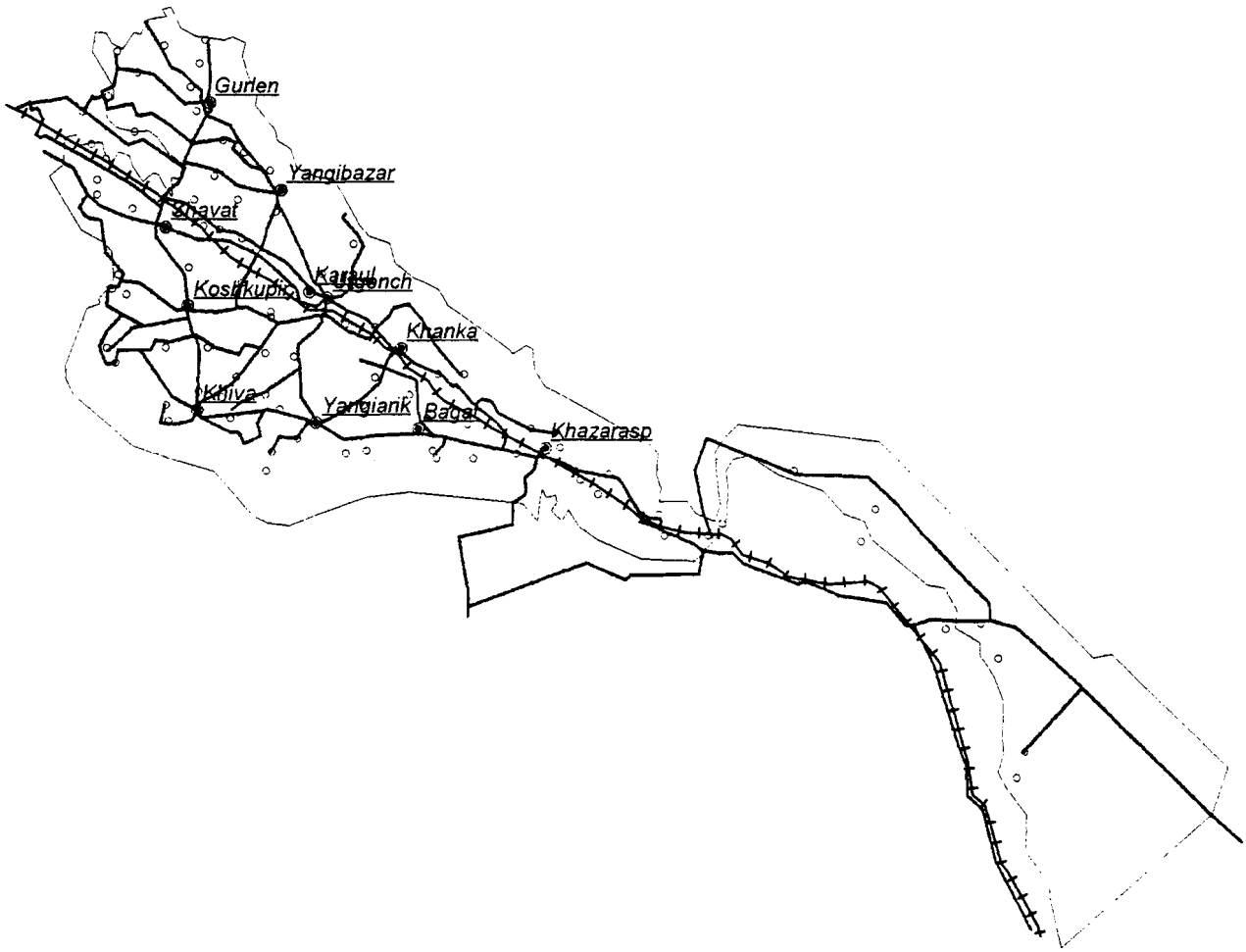
- Karakalpakstan
- Raycenters
- Settlements
- Main roads
- Railways

KM

0 20 40 60 80

Khorezm Oblast

Infrastructure



Layers

- Khorezm oblast
- Raycenters
- Settlements
- Main roads
- Railways

KM

0 20 40 60 80

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