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Report No. 18156

IMPLEMENTATION COMPLETION REPORT

CHINA

TARIM BASIN PROJECT

(CREDIT 2294-CN)

June 30, 1998

Rural Development and Natural Resources Sector Unit
East Asia and Pacific Regional Office

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CURRENCY EQUIVALENTS

Currency Unit = Yuan (Y)

1991	$1 = Y 5.32
1992	$1 = Y 5.42
1993	$1 = Y 5.73
1994	$1 = Y 8.50
1995	$1 = Y 8.30
1996	$1 = Y 8.30
1997	$1 = Y 8.30

FISCAL YEAR

January 1 - December 31

WEIGHTS AND MEASURES

Metric System

ABBREVIATIONS AND ACRONYMS

AH	Animal Husbandry
AI	Artificial Insemination
ICB	International Competitive Bidding
ICR	-Implementation Completion Report
NCB	National Competitive Bidding
O&M	Operations and Maintenance
PMO	Project Management Office
SAR	-Staff Appraisal Report
TBC	Tarim Basin Commission
TRBMB	Tarim River Basin Management Bureau
TRBMC	Tarim River Basin Management Committee

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PREFACE

This is the Implementation Completion Report (ICR) for the Tarim Basin Project, Credit 2294-CN. The IDA Credit for this project in the amount of SDR 93.8 million ($125 million equivalent) was approved on August 29, 1991 and made effective on January 22, 1992. The credit was fully disbursed, with the last disbursement taking place on September 5, 1997 and it closed on December 31, 1997.

The ICR was prepared by Daniel Gunaratnam (Principal Water Resource Specialist) in the China Resident Mission (EACCF), East Asia and Pacific Regional Office, and reviewed by Geoffrey Fox, Manager, Rural Development and Natural Resources Sector Unit of the East Asia and Pacific Regional Office (EASRD). *The Borrower has not provided its comments to the final ICR.*

Preparation of this ICR was begun during the Bank's final supervision mission November 18-30, 1997, and an ICR mission visited the region also during the same period. The ICR is based on materials in the project file and information provided during the ICR mission. The Borrower contributed to the preparation of the ICR by contributing views reflected in the mission's aide memoire (Annex A) and by preparing its own evaluation of the project's execution and initial preparation. Since the Borrower's ICR was too long to be included as an annex and a summary was not provided, the Borrower's ICR has been deposited in the project files.

CHINA

TARIM BASIN PROJECT

(CREDIT 2294-CN)

EVALUATION SUMMARY

Project Objectives and Description

1. The main objectives of the project were to support the Government's policy to speed up the development of China's poorer interior provinces through expansion of the irrigated area for crop production, improvement of agricultural services, and promotion of livestock development.

2. The project also incorporated measures to restore the natural ecology and to monitor environmentally sound development of the Tarim Basin. The project was particularly designed to assist ethnic minority herdsmen in raising livestock and to provide productive employment for women. The main features of the project were as follows: (a) irrigation and drainage for 200,000 hectares (ha) in the Yerqiang and Weigan basins; (b) hydropower development in the Yerqiang basin; (c) agricultural support services development for the Weigan and Yerqiang areas; (d) livestock support services development for the Weigan and Yerqiang areas; and (e) restoration of the Tarim River ecosystem.

3. The objectives were generally well designed, appropriately spelled out in the project documentation, and supported by all the stakeholders. Similarly, they appropriately reflected the Government's implementation capacity and were consistent with the Government's development strategy and the Bank's Country Assistance Strategy at the time of preparation.

Implementation Experience and Results

4. Essentially all physical targets for irrigation and drainage were achieved, and in many cases exceeded the targets set out during appraisal of the project. Much of the scope was expanded during the midterm review and even these revised targets were fulfilled.

5. The agricultural component also achieved all physical targets and in many cases exceeded the midterm revised upward plan for construction of experiment stations, agricultural extension stations, agricultural schools, agricultural machinery training centers, and seed calibration at county and other levels of governments. Overall investments in agricultural services and production reached 126 percent of the Staff Appraisal Report (SAR) level in Yerqiang and 134 percent in Weigan with some differences between counties and components. In each county of Yerqiang investments

were 100 to 140 percent of the SAR figure. In Weigan investments for each county ranged from 113 to 141 percent of the SAR estimates.

6. One of the most innovative components included under the agriculture component was the hail suppression subcomponent. Hail precipitation causes considerable damages to the Weigan Prefecture farms. All items for this subcomponent, including works and equipment procurement, were completed and commissioned by early 1995. The suppression of hail cloud formation using radar detectors and firing silver iodide crystals into the clouds worked very well to suppress 80 percent of the hail precipitation.

7. Overall investments in animal husbandry services and livestock production reached about 116 percent of the SAR's levels in Yerqiang and 123 percent in Weigan. A relatively large part of the expenditure is for the establishment of County and Township Stations. In the Yerqiang counties, investments ranged between 93 and 149 percent, with investments for County and Township Animal Husbandry Stations in excess of SAR values in two of the counties. In the counties of Weigan, overall investments ranged between 121 and 129 percent, with investments in County and Township Stations exceeding the target by 83 percent. Breeding station investments are above the target. Mixed Crop/Livestock investments also exceed the target by 43 percent.

8. IDA performance in the identification, preparation and appraisal was detailed and has been viewed as satisfactory. Overall, the IDA performance was greatly appreciated by the provincial government during the preparation phase. IDA's performance in project supervision has been satisfactory and helped resolve many of the implementation issues related to designs, financing and management of the project. The performance of the Borrower's implementation agencies, the Xinjiang Regional Project Management Office (PMO), in conjunction with prefecture and county PMOs, was generally satisfactory. The Borrower complied promptly and completely with all the covenants prescribed in the legal agreements except for the water charge covenant, which needs to be fulfilled by December 1999. Half-yearly progress reports, audited project accounts together with the auditors' reports were also regularly produced and received generally on time.

Summary of Findings, Future Operations, and Key Lessons Learned

9. **Overall Findings.** The project's overall outcome is viewed as highly satisfactory, since all the objectives of irrigation and drainage development, and agricultural/animal husbandry were achieved with a relatively high degree of sustainability. The overall economic rate of return of 33 percent is impressive and is almost the same as the SAR's estimate. Overall, the project succeeded in maximizing returns from scarce resources invested in improvement and expansion of irrigation and drainage systems and the expansion of agricultural and livestock production. The large increase in the coverage of extension services, machinery, feed supply and other services has benefited some 350,000 households. Crop yields and livestock production increased substantially from 1991 to 1997 due to the project. Per capita income rose from Y 400-610 in 1991 to Y 1,030-1,510 in 1997.

10. A total of 42,000 ha of newly reclaimed land were given to collectives (11 percent), farmers with proven crop production ability (18 percent) and small peasant farmers (71 percent). Overall, 104,000 households (420,000 people) benefited from additional farmland in the reclaimed area. Over 82 percent of the households were minority Uygurs and landholding increased in peasant households by 7.85 mu (0.523 ha), which is equivalent to 20 percent of their present land area.

11. The animal husbandry component has improved the coverage of animal health and production services for livestock belonging to 330,000 livestock owners. Overall income per head of sheep increased by Y 100.

12. The project was implemented with minimal negative environmental impact in the irrigation areas. In both Weigan and Yerqiang there is no evidence of salt accumulation in the entire agricultural areas because of the drainage schemes. In fact, soils in most irrigated areas are being desalinized and crop yields are increasing.

13. **Sustainability.** The Regional and Prefecture governments are committed to ensuring sustainability of the project. The Yerqiang and Weigan irrigation schemes have been in existence for many years and have operated successfully. Farmers have already realized substantial benefits from the completed works in terms of increased crop production. Lined canals have assured timely supply of water to farms while the drainage system has prevented salinization of soils. Detailed operations and maintenance (O&M) plans for the irrigation schemes have evolved over a 20-year period of operation. Water charges have increased from 0.2 fen/cubic meter (m^3) to 1.2 fen/m^3 between 1993 and 1996 and these charges are sufficient for initial O&M. However, water charges will increase to about 4.8 fen/m^3 by December 1999 to recover all the operating, maintenance and capital costs. Drainage schemes will also be managed by the counties under their water resources management offices, and there is already a collection of Y 2/mu from cultivated areas for routine and major maintenance of drainage systems.

14. Agricultural sustainability is assured because extension services have increased dramatically since the project. High-yielding seed production and processing stations have also been established in every county to provide high-quality seed to farmers. Farmers pay for all services and the payments are sufficient to maintain these services.

15. Animal husbandry services are sustainable since farmers have realized the value of these services and there is a huge demand. Costs for these services are all recovered through charges. All costs of veterinary services provided from each Township Station and Substation are recovered by charges that include preventive vaccinations, for which livestock owners pay.

16. **Future Operations.** The future operations of the project will require: first, the completion of all the unfinished on-farm structures on about 25 percent of the newly reclaimed areas by mid-1999. Second, water charges will have to be raised from 1.2 fen/m^3 to 4.8 fen/m^3 by December 1999 to ensure O&M is fully funded and there is full cost recovery.

17. The Regional Government should complete the evaluation of the seed production and processing enterprises with a view to corporatizing and commercializing these entities so that they are financially autonomous. The Regional Government should also undertake, by the end of 1998, special training for the financial staff at all levels in these seed enterprises given their current weakness in financial management skills.

18. IDA will continue to monitor the operation of project activities in conjunction with the supervision of the Tarim Basin II Project.

19. **Lessons Learned.** The key lessons learned are summarized below.

(a) The project increased crop yields by 20 to 47 percent in the stable areas and 68 to 118 percent in low-yield areas during the project's implementation period of six years. All the project's target yields at full development were matched or exceeded even before the project was completed. The lesson learned is that good irrigation and drainage systems, improved agricultural services and inputs can be immediately utilized by farmers to generate large increases in crop yields and production.

(b) The building of drainage systems concurrent with the irrigation systems has brought a great deal of benefit to ensure the desalinization of soils and therefore the stabilization of crop yields. The institutions for the maintenance of these drains through drainage management stations should be expanded to cover drains at main, branch and tertiary levels. Fee collection by drainage districts is an excellent idea and should be expanded to all counties.

(c) The project experience has shown that farmers are becoming increasingly market-oriented and are very receptive to extension service demonstrations and advice. This attitude places a heavy responsibility on the extension service to ensure that technical packages given to farmers represent the most cost-effective and least risk-development possibilities.

(d) Development of the mixed crop/livestock and fodder base components was successful and served as an example to other livestock-owning families. The benefits of this type of development in terms of family incomes and soil improvement are well understood but with market forces progressively determining land use, technicians and farmers need to be informed about the financial benefits and risks associated with the various production possibilities.

(e) Tremendous success was achieved in water savings through the lining of canals. An excellent real-time water monitoring system has been developed for the Weigan Irrigation System. This project's loss monitoring system should be expanded to cover both Yerqiang and

Weigan areas and should be used not only for monitoring losses but also for real-time operation of the irrigation system.

(f) This project has an innovative component to suppress hail formation and reduce crop loss. This component has worked successfully in reducing hail cloud formation 80 percent of the time. But sustainability of this component depends very much on the Government's support for O&M. The Akesu Prefecture should add its resources to the financial support from counties to ensure that all O&M requirements are met.

(g) With the movement toward a market-oriented economy the seed multiplication, cleaning, testing, treatment, etc. would be better left to the private sector and separated from the seed quality regulatory service, which should remain a responsibility of the Agricultural Bureau in the counties.

(h) Competitive bidding procedures used for works and goods procurement have achieved considerable savings in project costs and in general most of the works achieved good quality. To eliminate unqualified suppliers, more stringent methods of prequalification should be adopted to ensure that all bidders are qualified.

CHINA

TARIM BASIN PROJECT

(CREDIT 2294-CN)

PART I: PROJECT IMPLEMENTATION ASSESSMENT

A. PROJECT OBJECTIVES AND DESCRIPTION

1. The main objectives of the project were to support the Government's policy to speed up the development of China's poorer provinces in the north and west. The project was intended to expand the irrigated area for crop production, improve agricultural services, and promote livestock development in southern Xinjiang Autonomous Region, one of the poorer and less developed areas in China.

2. The project also incorporated measures to restore the natural ecology and to monitor environmentally sound development of the Tarim Basin. The project was particularly designed to assist Uygur herdsmen, an ethnic minority, in raising livestock and provide productive employment for women. The main features of the project were as follows:

(a) Irrigation and drainage improvement and expansion for 200,000 ha in the Yerqiang and Weigan basins;

(b) Hydropower development in the Yerqiang basin;

(c) Agricultural support services development for the Weigan and Yerqiang areas;

(d) Livestock support services development for the Weigan and Yerqiang areas; and

(e) Restoration of the Tarim River ecosystem.

The objectives were generally well-designed, spelled out in the project documentation, and supported by all the stakeholders. Similarly, they appropriately reflected the Government's implementation capacity and were consistent with both the Government's development strategy and the Bank's Country Assistance Strategy at the time of preparation.

B. Achievement of Project Objectives

3. The project objectives were achieved through implementation of the irrigation, drainage, agriculture and livestock components. Canal lining improved the efficiency of water delivery and saved about a 940 million m^3 of water. The water saved gave the counties the capability to expand the irrigated area by 73,000 ha and to provide additional land for cultivation by small farmers and thereby increasing their incomes. Drainage improvements lowered the groundwater table and reduced soil salinity on about 300,000 ha by transporting salt out of the cultivated area and thereby stabilizing crop yields. The strong performance of almost all subcomponents resulted in farm family incomes in Yerqiang increasing by about 64 percent and in Weigan by about 72 percent in constant terms. Over 80 percent of the beneficiaries are Uygur farmers.

C. Implementation Record and Major Factors Affecting the Project

Implementation Results

4. **Irrigation and Drainage.** Essentially all physical targets for irrigation and drainage were achieved, and in many cases exceeded the targets set out during the appraisal of the project. The scope of the project was expanded during the midterm review (e.g., irrigation canal lining was increased from 736 km to 1,076 km) and even these revised targets were fulfilled. Similarly, overall drainage canal lengths increased by 73 km, 8 percent of total drainage canals specified in the SAR. Improved canal lining has had a tremendous impact on delivering water more quickly and in greater volumes to farmers.

Table 1: Works Completed Compared with SAR Estimates

Description	Revised SAR Estimate/a		Actual Completed		%
	Yerqiang	Weigan	Yerqiang	Weigan	completed
Wasteland Reclamation ('000 mu)	630	570	630	570	100
Low-Yield Land Improvement ('000 mu)	931	825	931	825	100
Canal Lining (km)	558	518	563	537	102
	(387)	(349)			
Drainage Canals (km)	137	769	143	768	100
	(165)	(669)			
Wells (no.)	260	29	199	26	78

/a SAR estimates are shown in parentheses.

5. **Agriculture.** The agricultural component has achieved all physical targets and in many cases exceeded the midterm plan, which was revised upward. At the prefecture level, all planned construction has been completed for each of the types of stations, such as experiment stations, agricultural extension stations, agricultural schools, agricultural machinery training centers and seed calibration. At the county level, agricultural

extension stations have been constructed or rehabilitated; At the township level, some 89 of the 97 stations have been constructed. Similarly, agricultural machinery service/repair stations have been established at the county and township levels.

6. Overall investments in agricultural services and production reached 126 percent of the SAR level in Yerqiang and 134 percent in Weigan with some differences between counties and components. In each county of Yerqiang, investments were 100 to 140 percent of the SAR figure. In Weigan, investments for each county range from 113 to 141 percent of the SAR estimates.

7. Seed Farms have been established in five counties with seed processing plants and seed stations in all nine counties and one township. Development of the large-scale farms in the Weigan Basin have essentially been completed and about 70 to 80 percent have been brought under production. Cotton seed ginning and delinting plants have been established in all eight counties and one corn drying plant has been established in Yecheng County. Cotton seed ginning capacity has been increased beyond the plan figure in order to meet increased demand. The establishment of seed farms and seed stations is according to plan. Farmers are now using high-quality seed, resulting in uniformity of crop yields over all the counties.

8. **Animal Husbandry (AH).** Overall investments in animal husbandry services and livestock production have reached about 116 percent of the target level in Yerqiang and 123 percent in Weigan. A relatively large part of the investment is in establishment of county and township stations. In the Yerqiang counties, investments range between 93 and 149 percent of the SAR proposed investments for counties and townships. AH servicing stations investments range between 121 and 129 percent of the SAR values.

9. At the prefecture level, all research facilities for the Bahutai and Tuohai experimental farms and training facilities have been completed. AH extension stations have been established in all eight counties and in all 93 townships, with 19 substations to support the township stations.

10. Construction of artificial insemination(AI)/breeding stations is well below the plan level, with 31 of the planned 44 established. The decision to reduce the number of AI/Breeding Stations from the initial 54 in the SAR to 44 and subsequently to 31 is rational. The need for AI/breeding stations including sires, semen collection and insemination services was reduced because higher-quality semen became available through the prefecture and, consequently, insemination services are provided through township stations and substations.

11. **Ecology Restoration Component.** All four comprehensive monitoring stations for the Tarim River component have been completed including access roads, water supply, electricity supply and telephone communications. In addition, infrared remote sensing, hydrologic, meteorological, groundwater, and water quality monitoring equipment have been procured. Several control structures have been completed to transfer water from midstream to the downstream section of the Tarim River. Since the

completion of these structures, 25 million cubic meters (Mm^3) and 120 Mm^3 of water have been transferred downstream in 1995 and 1996, respectively. In addition, the Xinjiang Government has issued three regulations on the formation of the Tarim River Basin Management Committee (TRBMC) and the Tarim River Basin Management Bureau (TRBMB). These regulations define the scope of work and responsibilities for TRBMC and TRBMB. In the follow-up Tarim Basin II Project, TRBMB is going to be upgraded to a Tarim Basin Commission (TBC), which will have the authority to review and approve all future investments in water resource projects in the Basin and will also be able to invest directly in water resource projects.

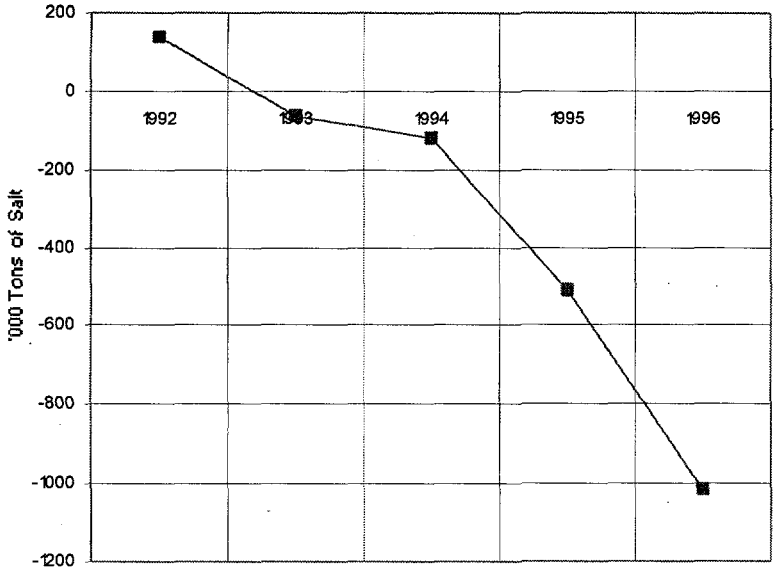
Benefits Accrued During Implementation

12. **Irrigation Component.** The canal lining component had an enormous impact on the project. The immediate observations by the farmers was that water delivery was four times faster than previously. The increase in the flow of water at the farm level was about three to four times faster than previously observed, and farmers were able to reduce the length of time required to irrigate their fields by 66 to 75 percent. Lining also reduced groundwater tables by about 1 to 2 meters and this resulted in reduction of soil salinity around the cropped areas. The largest impact of the 980 km of lined canals was the reduction in seepage of water (940 million m^3) in the two irrigation areas. These savings in water helped the counties to expand the irrigated area by 73,000 ha and also to supply additional water to about 113,000 ha of low-yield and stable areas. The increased irrigation water had an enormous impact on crop yields (see para. 18).

13. **Drainage/Environmental Benefits.** With the development of the drainage system, the annual drainage outflow increased from 115 Mm^3 in 1992 to 382 Mm^3 in 1996. As a result of the increase in drainage outflow, the total waterlogged area decreased from 56 square kilometers (km^2) in 1992 to 13 km^2 in 1996. The construction of drainage canals also increased the salt outflow from year to year. For example, in 1992 net accumulation of salt in the subproject area was 0.139 million tons. In 1994 the outflow of salt exceeded the inflow by 0.199 million tons, which is indicative that the entire area was desalinizing. In 1995 the net outflow of salt (outflow minus inflow) increased to 0.511 million tons, and in 1996 it increased to 1.015 million tons (see figure 1). The entire cropped area of 133,000 ha was desalinizing and crop yields in all the areas increased. This is one of the first large-scale drainage and irrigation systems in China where desalinization of waterlogged arid areas was proceeding as the project was being completed.

14. **Hail Suppression Benefits.** The hail suppression component was one of the most innovative components included in the project. It was very successful in reducing the formation of hail clouds. The cloud detection radar was installed and silver iodide rockets were use to suppress hail cloud formation. Hail damage area was reduced by about 90 percent (from 9,330 ha to 930 ha) in 1996 after this component was implemented in 1994/95. The damage reduction was estimated to be about Y 40-50 million. However, the major problem with the hail suppression station is that it is entirely supported by the county governments who, despite the value of the services of the station, are unable to

Figure 1: Salt Movement Out of the Basin
(+ve for accumulation -ve for movement out)



support it fully. It is important for this station to be supported by the prefecture government since the hail suppression area covers more than the three counties and there are significant social benefits outside the county's boundaries.

15. **Agricultural Benefits.** The performance of the agricultural development component has been satisfactory. Since 1990 the total cultivated area increased from 282,700 ha to 359,680 ha (27 percent increase), slightly in excess of the target area for both Yerqiang and Weigan. The cultivated area on stable cropland and low-yield land remained almost constant at 162,700 ha and 117,000 ha, respectively, while reclaimed areas accounted for the entire increase.

16. The cropped area increased from 386,100 ha to 450,290 ha, an increase of 16.6 percent, which is 93 percent of the SAR estimate. Both Yerqiang and Weigan were below the SAR estimate with regard to crop area and cropping intensity because there has been a significant shift in land use toward higher-value crops, with the result that cotton in 1996 occupied 195,810 ha; i.e., 43 percent of the crop area compared to 20 percent before. This change in cropping pattern has made an important contribution to the increase in farm family incomes.

17. Overall crop production increased 19 percent in grains, of which wheat increased by 14 percent. There was a 69 percent increase in cotton, with declines in production of oilseeds, vegetables, fruits/melons and alfalfa. Additional residues and crop by-products available for livestock feed are estimated to be about 250,000 tons.

18. As a result of the project, crop yields have increased to the final development production targets much faster than the rate anticipated in the SAR (see Table 2 for details). The yield increases were 20 to 47 percent in the stable areas and 68 to 118 percent on the low-yield lands. In stable areas, about 50 percent of the yield increase was attributed to additional inputs and another 50 percent was due to irrigation. In the low-yield areas, the yield increase was 40 percent due to additional inputs, 20 percent due to drainage and about 40 percent due to additional water.

TABLE 2. YIELD INCREASES PRE- AND POST-PROJECT

	Preproject 1989/90 (tons)	1995 & 1996 (tons)	SAR target at full development (tons)	Yield increase, 1989-95 (%)
Stable Area				
Wheat	4.05	4.8	4.75	20
Corn 2	3.9	5.4	4.9	38
Cotton	0.8	1.18	1.05	47
Low-Yield Area				
Wheat	2.2	3.7	3.7	68
Corn 2	3.1	4.45	4.5	43
Cotton	0.48	1.05	0.9	118
Reclaimed Area				
Wheat	NA	3.30	3.30	NA
Corn 2	NA	3.45	4.50	NA
Cotton	NA	0.85	0.90	NA

19. **Livestock Benefits.** Despite the slow start of animal production development in 1992 and 1993, current output exceeds the SAR estimates. The sheep population and the production of meat increased as shown below in Table 3. However, the goat population declined marginally.

TABLE 3: CHANGES IN LIVESTOCK POPULATION, OFFTAKE MEAT & FIBER PRODUCTION

Item	Unit	1990	1996	Increase	% increase
Sheep Population	'000 Head	2,627.8	3,115.3	487.5	19.0
Sheep Offtake	'000 Head	987.6	1,362.3	374.7	38.0
Goat Population	'000 Head	878.5	845.0	-33.0	-4.0
Goat Offtake	'000 Head	249.0	223.2	-25.8	-10.0
Meat Production	'000 Ton	18,157.0	28,714.0	10,557.0	58.0
Wool Production	Ton	3,560.0	5,283.0	1,723.0	48.0
Cashmere Wool	Ton	86.0	87.0	1.0	0.1

20. In Yerqiang the sheep and goat populations changed by 10 and -60 percent, respectively, while offtake changed by 36 and -17 percent and meat production by 44 percent. The decline in goat population was largely due to the decline in cashmere wool prices in the early 1990s. Weigan sheep and goat populations changed by 11 and 27

percent, respectively, offtake by 44 and -3 percent and meat production by 95 percent. Population increases have been partly due to purchases from outside the project area but most are attributed to improved reproduction rates, reduced mortality, increased feed availability and the desire by farmers and herdsmen to increase the size of their flocks and herds. Similarly, offtake, which is a measure of production efficiency, has increased because of improved reproduction and lower mortality and the meat production increase is the result of increased liveweight, carcass yield and carcass weight, which have increased by 2 kilograms (kg) and 3 to 5 kg for sheep and goats, respectively. Offtake of sheep has increased from 37 to 44 percent and goats declined from 28 to 26 percent because of low cashmere prices.

21. Livestock population increases, offtake, carcass meat production and wool production increases are all in excess of SAR target figures but cashmere wool production is only 13 percent of target. The total value of the livestock production increase for the total project is Y 268.12 million, which is considerably in excess of SAR targets.

22. The high level of success in livestock is due to the increased availability of crop residues and by-products, the improved coverage of animal health and production services. The success is also due to the successful implementation of specific project components, namely Mixed Crop and Livestock Farming, Pasture Improvement, Pasture Fencing, Fodder Bases and Fattening Bases. These specific project components involved the formation of collective groups, allocation of land and financing of collectives and individual households. In addition, there were special demonstrations to all collective groups.

Major Factors Affecting the Project

23. **Cost Increases.** In the first year of the project, 1991/92, the prices of construction materials increased by about 40 percent and, as a result, only 50 percent of the first year's program was completed. The provincial government modified the designs of the large canals and structures, thereby realizing cost savings of about 30 percent on these structures. In addition, the Government decided to procure all civil works and goods on the basis of competitive bidding, which resulted in further savings of about 15 to 20 percent. As a result of these changes, the Government was able to implement the overall program as planned for the next few years. However, at the time of the midterm review in November 1994, it was discovered that there were savings in the IDA Credit. Consequently, the scope of the project was expanded to cover the addition of 330 km of canal lining (30 percent increase), 125 additional groundwater wells (71 percent increase) and the addition of 55 km of 110 kV transmission lines (17 percent increase).

24. **Counterpart Funding.** In the initial years, counterpart funding was in short supply and when it appeared, it was usually well into the fiscal year. The counterpart funding came from several different central and regional government sources but in 1994 the Bureau of Finance decided to centralize the counterpart funding and to distribute it as

soon as the funds became available. This resulted in considerable improvements although some of the project components were still short of working capital. Only after the executing agencies obtained access to lines of credit from local banks did construction activities proceed smoothly.

25. **Procurement.** The use of the Bank Group's Procurement Guidelines had a profound impact on the project costs. The SAR estimated that only 68 percent of civil works and goods could be procured using international or national competitive bidding (ICB and NCB) procedures and another 32 percent would be procured using shopping or force account procedures. However, during project implementation the Project Management Office (PMO) found that competitive bidding procedures reduced cost by 10 to 25 percent and in most cases increased the quality of works and goods. In the Yerqiang Basin the resulting savings are estimated to be about Y 100 million. The PMO increased the ICB procurement of goods and works from the SAR level of 32 percent of all such items to 52 percent. There were, however, some cases where despite using ICB procedures , the lowest bidder produced very poor-quality goods as in the purchase of 15-ton trucks. Most of the poor suppliers could have been avoided by proper prequalification procedures.

26. **Disbursements.** In the first few years the disbursements were always much higher than the SAR estimates. In subsequent years the disbursements were slightly lower or on target as estimated, but in the last few years they again exceeded the SAR estimates. The last credit disbursement was on December 27, 1997.

D. Project Sustainability

27. The regional and prefecture government are committed to ensuring sustainability of the project, since the project represents a key element in their effort to increase foodgrain and cotton production, and to reduce the incidence of poverty in southern Xinjiang.

28. **Irrigation and Drainage.** The Yerqiang and Weigan irrigation schemes have been in existence for many years and have operated successfully. The crop yields in stable areas have increased due to further lowering of groundwater tables and additional water supply. The low-yield lands have already reached the yields of the stable area and the reclaimed areas have also registered substantial yield increases. Farmer interviews also disclosed that farmers have already obtained considerable benefits from the project and that they intend to line the on-farm canals in order to realize further improvements. Lined canals have assured timely supply of water to farms and the drainage system has assured that salinization of soils would be prevented.

29. For both these irrigation schemes , detailed operations and maintenance (O&M) plans have evolved over a 20-year period of operation. In addition, further revisions to the O&M plans have been made since the completion of the project. Yerqiang and Weigan have established O&M water institutions. At the prefecture level, the water management offices (Yerqiang and Weigan Water Management Offices) are first-level corporatized

water companies that allocate water for each county. The county water resource water management offices form the second-level water companies, which have several other branch- and township-level companies that receive and sell water to farmer-managed village organizations. At the village level, the farmers are organized according to production teams. The village water master and production team masters are elected by the farmers. The water allocation for each county, township, and village is fairly well defined, even under water shortage situations. Water charges have been increased from 0.2 fen/m^3 to 1.2 fen/m^3 between 1993 and 1996. Water charges will be increased by December 1999 to about 4.8 fen/m^3 to completely recover the O&M and capital costs.

30. Drainage schemes will also be managed by the counties under their water resource management offices, which have set up several Drainage Management Stations. Each of these stations will be staffed with about four staff who will be responsible for drainage management. There is already a collection of Y 2/mu in some counties for routine and major maintenance of drainage systems.

31. Agricultural sustainability is assured because the quality and coverage of the extension service increased dramatically under the project. Farmers have realized the value of these services. High-yielding seed production and processing stations have also been established in every county to provide high-quality seed to farmers. The Regional Government will corporatize all the various processing plants and seed farms after these have reached full production levels in 1999 and make them financially autonomous.

32. AH services are sustainable since farmers have realized the value of these services and there is a huge demand. Costs for these services are all recovered through charges. All costs of veterinary services provided from each Township Station and Substation are recovered by charges that include preventive vaccinations, for which livestock owners pay Y 6.0 per head of cattle and Y 4.5 for sheep; parasite control cost, Y 3 for cattle, Y 1 for sheep; and veterinary examinations, Y 8 to 14 for cattle and Y 2.5 for sheep. Treatment cost according to the disease is based on actual drug cost plus service cost calculated according to time spent. Similarly, grassland service costs are also recovered and they include advice to livestock owners on the harvest and conservation of forage and assistance with the management of natural and improved pastures. For pasture management, farmers pay Y 1.2 to 1.5 per head for cattle and Y 0.6 for sheep and goats.

E. IDA PERFORMANCE

33. IDA performance in the identification, preparation, and appraisal of the project was detailed and has been viewed as satisfactory. Overall, the IDA performance was greatly appreciated by the provincial government during the preparation phase. The preparation work was based on studies and designs performed by the prefecture design institutes over about 10 years prior to IDA's involvement. Many of the designs for the irrigation and drainage systems were already completed and several different hydraulic computer simulations and water balances were already carried out to verify the designs, including water availability. IDA verified the detail designs and water balances and

prepared detailed economic and financial analysis to verify the viability of the various irrigation, agricultural and livestock components.

34. IDA's performance in project supervision has been satisfactory. Seven supervision missions were undertaken over seven years—an average of one mission a year. The supervision missions made significant contributions to (a) financing works in the face of shortages of funds; (b) improving construction methods and achieving economy and efficiency by competitive procurement methods; (b) resolving technical issues; (c) providing counterpart funding and working capital for project activities; and (d) advising on design and scope changes. In most cases, the advice provided by the supervision missions had a positive influence on the project. Many project agencies realized the importance of the supervision recommendations and most of them were carried out. The missions were less successful in assisting the PMO to recruit overseas technical assistance and training using foreign experts.

F. Borrower Performance

35. The performance of the project's implementation agencies, the Xinjiang Regional Project Management Office, in conjunction with prefecture and county PMOs, was generally satisfactory. The various prefecture PMOs prepared comprehensive feasibility studies for each component that covered technical, financial, economic and institutional aspects. The technical agencies under the PMOs, such as the Water Conservancy, Agriculture and Livestock Bureaus at various levels of government, also prepared preliminary and detailed designs that were generally satisfactory. Project staff at the prefecture and county levels were generally committed to the project objectives and demonstrated project ownership. The project components were for the most part implemented in line with the agreed implementation arrangements and changes to designs were addressed as they occurred. Implementation in the first year was slow because of the extreme shortage of counterpart funds and lack of familiarity with IDA procedures. However, after the first year the project implementation was much more smoothly implemented. By the time of the midterm review (three years from the start) the project was well ahead of schedule for most components except the AH component, which was then adjusted to meet the actual requirements. Counterpart funding was always an issue and great effort was made by IDA missions to address this issue. Overall, the quality of works was excellent and the prefecture and county implementation agencies' performance was satisfactory.

36. The Borrower complied promptly and completely with all the covenants prescribed in the legal agreements except for the water charge covenant, which needs to be fulfilled in December 1999. A detail monitoring and reporting system was set up that indicated the progress and expenditures on all components. Half-yearly progress reports, audited project accounts together with the auditors reports were also regularly produced and received generally on time.

G. Assessment of Outcome

37. The project's overall outcome is viewed as highly satisfactory, since all the objectives of irrigation and drainage development, agricultural/AH growth were achieved with a relatively high degree of sustainability. The overall economic rate of return of 33 percent is impressive and is almost the same as the SAR estimate. Overall, the project has had a strong development impact through the mobilization of scare resources for the expansion of agricultural and livestock production. The large increase in the coverage of extension services, machinery, feed supply and other services has benefited some 350,000 households. Crop yields and livestock production increased substantially from 1991 to 1997. Per capita incomes have risen from Y 400-610 to Y 1,030-1,510 between 1991 and 1997.

38. A total of 42,000 ha of newly reclaimed land were given to collectives (11 percent), farmers with proven crop production ability (18 percent) and small peasant farmers (71 percent). Overall, 104,000 households (420,000 people) were affected. Over 82 percent of the households were minority Uygurs and landholding increased in peasant households by 7.85 mu (20 percent of their present land area).

39. The AH component has improved the coverage of animal health and production services for livestock belonging to 330,000 livestock owners. Other improvements include increased improved livestock feed and better feed utilization. There is also increased pasture production and improved genetic resources. Overall livestock production performance improved. Overall incomes per head of sheep increased by Y 100/head.

40. The project has also had a strong impact on the sustainability of the irrigation areas. In both Weigan and Yerqiang it was clearly demonstrated that there is no salt accumulation in the agriculture areas because of the drainage schemes. The hail suppression component dramatically reduced the number of hail events and crop loss per year by about 80 percent.

41. Lining of canals has considerably reduced the leakage of water. Farmers are able to receive water much more quickly and groundwater tables are considerably reduced and thereby local salinization is reduced.

H. Future Operation

42. The future operations of the project will require, first, the completion of all the on-farm structures on about 25 percent of the newly reclaimed areas. Second, water charges will have to be raised from 1.2 fen/m^3 to 4.8 fen/m^3 by December 1999 to ensure O&M is fully funded and there is full cost recovery.

43. Third, the Regional Government should complete its evaluation of the seed production and processing enterprises with a view to corporatizing and commercializing these entities. The Regional Government should also undertake, by the end of 1998,

special training for the financial staff in these seed enterprises, given their current weakness in financial management skills.

44. IDA will continue to monitor the operation of the project activities in conjunction with the supervision of the Tarim Basin II Project.

I. KEY LESSONS LEARNED

45. The key lessons learned from the project are summarized below.

(a) The project increased crop yields by 20 to 47 percent in the stable areas and 68 to 118 percent in the low-yield areas during the project's implementation period of six years. All the project's target yields at full development were matched or exceeded even before the project was completed. The lesson learned is that good irrigation and drainage systems, improved agricultural services and inputs can be immediately utilized by farmers to generate large increases in crop yields and production.

(b) The building of drainage systems concurrent with the irrigation systems has brought a great deal of benefit to ensure the desalinization of soils and therefore the stabilization of crop yields. The institutions for the maintenance of these drains through drainage management stations should be expanded to cover drains at the main, branch and tertiary levels. Fee collection by drainage districts is an excellent idea and should be expanded to all counties.

(c) The project experience has shown that farmers are becoming increasingly market-oriented and are very receptive to extension service demonstrations and advice. This attitude places a heavy responsibility on the extension service to ensure that technical packages given to farmers represent the most cost-effective and least risk-development possibilities.

(d) Development of the mixed crop/livestock and fodder base components was successful and served as an example to other livestock-owning families. The benefits of this type of development in terms of family incomes and soil improvement are well understood but with market forces progressively determining land use, technicians and farmers need to be informed about the financial benefits and risks associated with the various production possibilities.

(e) Tremendous success was achieved in water savings through the lining of canals. An excellent real-time water monitoring system has been developed for the Weigan Irrigation System. This project's real-time loss monitoring system should be expanded to cover both Yerqiang and

Weigan areas and should be used not only for monitoring losses but also for real-time operation of the irrigation system.

(f) This project has an innovative component to suppress hail formation and reduce crop loss. This component has worked successfully in reducing hail cloud formation 80 percent of the time. But sustainability of this component depends very much on the Government's support for O&M. The Akesu Prefecture should add its resources to the financial support from counties to ensure that all O&M requirements are met.

(g) With the movement toward a market-oriented economy, the seed multiplication, cleaning, testing, treatment, etc. would be better left to the private sector and separated from the seed quality regulatory service, which should remain a responsibility of the Agricultural Bureau in the counties.

(h) Competitive bidding procedures used for works and goods procurement have achieved considerable savings in project costs and in general most of the works achieved good quality. To eliminate unqualified suppliers, more stringent methods of prequalification should be adopted to ensure that all bidders are qualified.

PART II: STATISTICAL TABLES

TABLE 1: SUMMARY OF ASSESSMENTS

A. Achievement of Objectives	Irrigation				Agriculture			
	Substantial	Partial	Negligible	Not Applicable	Substantial	Partial	Negligible	Not Applicable
Macroeconomic Policies				X				X
Sector Policies				X				X
Financial Objectives	X				X			
Institutional Development	X					X		
Physical Objectives	X				X			
Poverty Reduction	X				X			
Gender Issues		X				X		
Other Social Objectives	X				X			
Environmental Objectives		X				X		
Public Sector Management				X				X
Private Sector Development				X				X
Other (Specify)								

B. Project Sustainability	Likely	Unlikely	Uncertain	Likely	Unlikely	Uncertain
	X			X		

C. Bank Performance	Highly Satisfactory	Satisfactory	Deficient	Highly Satisfactory	Satisfactory	Deficient
Identification	X			X		
Preparation Assistance	X			X		
Appraisal		X			X	
Supervision		X			X	

D. Borrower Performance	Highly Satisfactory	Satisfactory	Deficient	Highly Satisfactory	Satisfactory	Deficient
Preparation	X			X		
Implementation	X			X		
Covenant Compliance		X			X	

E. Assessment Outcome	Highly Satisfactory	Satisfactory	Unsatisfactory	Highly Unsatisfactory
Irrigation	X			
Agriculture	X			

TABLE 2: RELATED BANK GROUP LOANS/CREDITS

Loan/credit title	Purpose	Year of approval	Status
PRECEDING OPERATIONS:			
North China Plain Agriculture (Cr. 1261-CHA)	Irrigation Development & Land Improvement	FY82	Completed
Pi-Shi-Hang Chaohu Area Development (Cr. 1606/Ln. 2579-CHA)	Irrigation & Area Development	FY85	Completed
Northern Irrigation (Cr. 1885-CHA)	Irrigation Development and Improvement, and Settlement	FY88	Completed
Gansu Provincial Development (Cr. 1793/Ln. 2812-CHA)	Irrigation and Agriculture Development	FY88	Completed
Shaanxi Agriculture Development (Cr. 1997-CN)	Irrigation and Agriculture Development	FY89	Completed
FOLLOWING OPERATIONS:			
Irrigated Agriculture Intensification (Ln. 3337/Cr. 2256-CHA)	Irrigation and Agriculture Development	FY91	To be Completed in 12/97
Yangtze Basin Water Resources (Cr. 2710/Ln. 2874-CHA)	Irrigation and Area Development	FY95	To be Competed in 12/2001
Gansu Hexi Corridor (Ln. 4028/Cr. 2870- CHA)	Irrigation & Land Development, and Settlement	FY96	To Be Completed in 12/2006

TABLE 3: PROJECT TIMETABLE

Steps in project cycle	Date planned	Date actual
Identification	05/89	05/89
Preparation	09/89	09/89
Preappraisal	04/90	04/90
Appraisal	06/90	09/90
Negotiations	05/91	05/91
Board presentation	08/91	08/91
Signing	10/91	10/91
Effectiveness	01/92	01/92
Project completion	12/97	12/97
Loan closing	04/98	04/98

TABLE 4: LOAN/CREDIT DISBURSEMENT: CUMULATIVE ESTIMATE AND ACTUAL
(US$ million)

	FY92	FY93	FY94	FY95	FY96	FY97	FY98
Appraisal estimate	10.00	32.50	69.50	93.50	117.50	125.00	
Actual	9.99	30.44	56.88	84.56	112.74	135.01	135.92
Actual as % of adjusted estimate	99.9	93.7	81.8	90.4	95.9	108.0	108.7
Date of final disbursement						December 27, 1997	

IBRD/IDA Fiscal Year Semester	At Appraisal			Actual			Actual Project Cumulative, Compare with SAR (%)
	Disbursement Semestral (US$ million)	Cumulative (US$ million)	Project Cumulative (%)	Disbursement Semestral (US$ million)	Cumulative (US$ million)	Project Cumulative (%)	
1992							
First	-	-	0.0	8.10	8.10	6.0	100
Second	10.00	10.00	8.0	8.10	16.10	11.9	161
1993							
First	9.00	19.00	15.2	10.00	26.10	19.3	137
Second	13.50	32.50	26.0	10.00	36.20	26.7	111
1994							
First	18.50	51.00	40.8	12.40	48.50	35.9	95
Second	18.50	69.50	55.6	12.40	60.90	45.0	88
1995							
First	12.00	81.50	65.2	16.00	76.90	56.8	94
Second	12.00	93.50	74.8	16.00	92.90	68.6	99
1996							
First	12.00	105.50	84.4	17.20	110.10	81.3	104
Second	12.00	117.50	94.0	17.20	127.30	94.0	108
1997							
First	7.50	125.00	100.0	4.30	131.60	97.0	105
Second		125.00	100.0	4.30	135.90	100.0	109
Total	**106.00**	**106.00**		**135.40**	**135.90**		

TABLE 5: KEY INDICATORS FOR PROJECT IMPLEMENTATION

Project Item	Unit	SAR Estimated	Actual	% of Completed
1. Yerqiang Subproject				
A. Yuepuhu County				
Irrigation Component				
Laokana Canal Reconstruction	km	45.0	50.0	111.1
Land Reclamation	mu	12,000.0	12,000.0	100.0
Low-yielding land improvement	mu	7,600.0	7,600.0	100.0
Agriculture Component				
County Extension Station	m^2	2,750.0	2,750.0	100.0
County Seed Station Improvement	m^2	2,622.0	2,622.0	100.0
Cotton Seed Delinting	m^2	3,600.0	3,600.0	100.0
Low-yielding land improvement (fertilization)	mu	10,000.0	10,000.0	100.0
High-Yield Orchard	mu	1,000.0	1,000.0	100.0
Township Agriculture machinery Network	no.	1.0	1.0	100.0
Animal Husbandry Component				
Pasture fencing 5,000 mu	mu	5,000.0	5,000.0	100.0
Ordinary Township Stations	no.	8.0	8.0	100.0
County Service Center/PMO Office	m^2	1,633.0	1,633.0	100.0
Mixed Crop and Livestock	group	4.0	4.0	100.0
Forage Base	mu	1,000.0	1,000.0	100.0
B. Bachu County				
Irrigation Component				
Land Reclamation	mu	158,000.0	158,000.0	100.0
Low-yielding land improvement	mu	99,100.0	99,100.0	100.0
Canal Lining	km	65.0	65.0	100.0
Drainage canal construction	km	57.0	57.0	100.0
Well Field	no.	100.0	49.0	49.0
Agriculture Component				
County Agriculture Extension Center Improvement	no.	1.0	1.0	100.0
Township Agriculture Stations	no.	10.0	10.0	100.0
Seed Station Improvement	no.	2.0	2.0	100.0
Low-yielding land improvement (fertilization)	mu	55,800.0	55,800.0	100.0
Township Agriculture Machinery Stations	no.	2.0	2.0	100.0
County Agriculture Machinery Repairing Center	no.	1.0	1.0	100.0
County Agriculture Machinery Training Center	no.	1.0	1.0	100.0
County Agriculture Machinery Station	no.	2.0	2.0	100.0
Animal Husbandry Component				
Pasture Fencing	mu	15,000.0	15,000.0	100.0
Township Stations	no.	9.0	9.0	100.0
Xiamali Goat Experimental Station	no.	1.0	1.0	100.0
Mixed Crop and Livestock	group	14.0	14.0	100.0
County Service Center/equipment	no.	1.0	1.0	100.0
Forage Base	mu	3,000.0	3,000.0	100.0
PMO Living Facilities	m^2	400.0	400.0	100.0

Project Item	Unit	SAR Estimated	Actual	% of Completed
C. Maigaiti County				
Irrigation Component				
Land Reclamation	mu	132,000.0	132,000.0	100.0
Low-Yielding Land Improvement	mu	76,800.0	76,800.0	100.0
Canal Lining	km	87.2	87.2	100.0
Drainage Canal Construction	km	80.0	86.2	107.8
Irrigation Works for Forage Base	mu	9,000.0	9,000.0	100.0
Agriculture Component				
County Seed Station	km	2,370.0	2,370.0	100.0
Low-Yielding Land Improvement	mu	81,900.0	81,900.0	100.0
Cotton Seed Ginnery Improvement	m^2	4,350.0	5,889.2	135.4
Ordinary Township Stations	no.	9.0	9.0	100.0
County Agriculture Extension Center	m^2	200.0	200.0	100.0
Agriculture Machinery Component				
Township Machinery Stations	no.	2.0	2.0	100.0
Training Center for Agriculture Machinery	m^2	1,050.0	1,098.4	104.6
Agriculture machinery repairing center	m^2	500.0	400.0	80.0
Animal Husbandry Component				
County Service Center	m^2	1,233.0	1,334.0	108.2
Stud Farm	no.	1.0	1.0	100.0
No. 5 Township Experimental Station	no.	1.0	1.0	100.0
Pasture Fencing	mu	7,000.0	10,800.0	154.3
Mixed Crop and Livestock	group	27.0	27.0	100.0
Township Extension Stations	no.	8.0	8.0	100.0
Forage Base	mu	9,000.0	9,000.0	100.0
PMO Living Facilities	m^2	400.0	400.0	100.0
D. Shache County				
Irrigation Component				
Low-Yielding Land Improvement	mu	193,682.0	193,682.0	100.0
Land Reclamation	mu	189,000.0	189,000.0	100.0
Klowati Canal Rehabilitation and Lining	km	47.0	47.0	100.0
Well Fields	no.	50.0	50.0	100.0
Huangdi Canal Rehabilitation	km	40.6	40.6	100.0
Xinliuqu Canal Lining	km	27.0	27.0	100.0
Agriculture Component				
Shache Seed Farm	km	4,300.0	4,300.0	100.0
County Agriculture Extension Center	km	800.0	800.0	100.0
Township Extension Stations	no.	25.0	25.0	100.0
Low-yielding land improvement (fertility lacking)	mu	142,800.0	142,800.0	100.0
Township Agriculture Machinery Station	no.	3.0	3.0	100.0
Cotton Seed Delinting Workshop	no.	1.0	1.0	100.0
Animal Husbandry Component				
Township Animal Husbandry Stations	no.	28.0	28.0	100.0
Mixed Crop and Livestock	group	16.0	16.0	100.0
Pasture Fencing	mu	3,000.0	-	0.0
Animal Fattening Base	no.	1.0	1.0	100.0
PMO Living Facilities	km	600.0	600.0	100.0

Project Item	Unit	SAR Estimated	Actual	% of Completed
E. Zepu County				
Irrigation Component				
Land Reclamation	mu	57,000.0	58,000.0	101.8
Low-Yielding Land Improvement	mu	65,900.0	65,900.0	100.0
Zepu Well Fields	no.	60.0	50.0	83.3
Aktam Canal lining	km	7.0	7.0	100.0
Boscam and Boshengan Canal Connecting	km	11.0	11.0	100.0
Canal Lining and Rehabilitation	km	53.8	53.8	100.0
Agriculture Component				
County Agriculture Extension Station	no	1.0	1.0	100.0
Low-yielding land improvement	mu	14,300.0	14,300.0	100.0
County Seed Station	no.	1.0	1.0	100.0
Cotton Ginnery	no.	1.0	1.0	100.0
Zepu Farm Construction	no.	1.0	1.0	100.0
New Township Agriculture Extension Station	no.	10.0	10.0	100.0
Agriculture Machinery Component				
Township Agriculture Machinery Network	m^2	400.0	400.0	100.0
Agriculture Machinery Repairing Center	m^2	2,812.0	2,812.0	100.0
Animal Husbandry Component				
Ordinary Township Animal Husbandry Stations	no.	9.0	9.0	100.0
County Animal Husbandry Service Building	m^2	1,334.0	1,334.0	100.0
Mixed Crop and Livestock	group	8.0	8.0	100.0
PMO Living Facilities	m^2	400.0	400.0	100.0
F. Yecheng County				
Irrigation Component				
Land Reclamation	mu	82,000.0	82,000.0	100.0
Low-yielding land improvement	mu	130,600.0	130,600.0	100.0
Canal Lining	km	118.3	118.3	100.0
Xiaota Canal Extension	km	4.5	4.5	100.0
Well Fields	no.	50.0	50.0	100.0
110 kV Switch Yard	no.	1.0	1.0	100.0
Agriculture Component				
County Agriculture Extension Station	m^2	200.0	200.0	100.0
Ordinary Agriculture Extension Station	no	16.0	16.0	100.0
County Seed Station	m^2	2,000.0	2,000.0	100.0
Cotton Seed Delinting	m^2	4,600.0	4,600.0	100.0
Corn Drying Plant	m^2	5,000.0	5,000.0	100.0
Low-yielding land improvement (fertilization)	mu	52,200.0	52,200.0	100.0
Agriculture Machinery Repairing network	m^2	400.0	400.0	100.0
Seed Ginnery	m^2	2,150.0	2,150.0	100.0
Agriculture Machinery Repairing Center	no.	1.0	1.0	100.0
Agriculture Extension Training Center	m^2	1,200.0	1,200.0	100.0
Animal Husbandry Component				
Pasture Fencing	mu	5,000.0	5,000.0	100.0
Karbasman Semicoarse Experiment Station	m^2	2,398.0	2,398.0	100.0
Ordinary Animal Husbandry Extension Station	m^2	18.0	18.0	100.0
Mixed Crop and Livestock	group	10.0	10.0	100.0
Animal Fattening Base	no.	1.0	1.0	100.0
PMO Living Facilities	m^2	400.0	400.0	100.0

Project Item	Unit	SAR Estimated	Actual	% of Completed
G. Yerqiang River Management Office				
Kaqun Hydropower Station				
Powerhouse and Associated Structures	no.	1.0	1.0	100.0
Tailrace	km	3.2	3.2	100.0
Diversion Canal	km	12.6	12.6	100.0
Mechanical and electrical equipment	set	3.0	3.0	100.0
Metal Structure Manufacture and Installation	ton	427.0	427.0	100.0
Auxiliary Buildings	m^2	10,000.0	10,060.0	100.6
Transmission Line				
Shache Central Switchyard	kVA	2x10000	2x10000	100.0
Maigaiti Switchyard 110 kV	kVA	2x6300	1x6300	50.0
Maigaiti Switchyard 35 kV	kVA	2x5000	2x5000	100.0
Kaqun ~ Shache transmission line 110 kV	km	48.0	48.0	100.0
Shache ~ Pailou transmission line 110 kV	km	66.8	66.8	100.0
Pailou ~ Maigaiti transmission line 35 kV	km	10.2	10.2	100.0
Kaqun ~ Yechen transmission line 110 kV	km	48.0	48.0	100.0
East Bank Main Canal	km	28.3	28.3	100.0
Canal Lining	km	56.5	56.5	100.0
Observation well	no.	68.0	68.0	100.0
Equalizer Experiment Area	m^2	600.0	600.0	100.0
Training Center	m^2	6,100.0	7,500.0	123.0
Paise Substation	m^2	36.0	36.0	100.0
PMO Living Facilities	m^2	21.9	30.0	136.9
H. Prefecture				
Agriculture Component				
Agriculture Extension Center	m^2	1,000.0	1,000.0	100.0
Seed Inspection/Certification Center	m^2	1.0	1.0	100.0
Agriculture Machinery Training Center	m^2	102.4	102.4	100.0
PMO Living Facilities	m^2	400.0	342.0	85.5
2. Weigan Subproject				
A. Kuche County				
Irrigation Component				
Construction of Irrigation Canals	km	164.3	173.5	105.6
Construction of Drainage Canals	km	225.0	226.1	100.5
Management Buildings	m^2	960.0	1,240.0	129.2
Land Reclamation	mu	225,000.0	225,000.0	100.0
Low-yielding land improvement	mu	228,000.0	228,000.0	100.0
Road Construction	km	8.3	8.3	100.0
Pastoral and Irrigation Works	km	37.0	37.0	100.0
Agriculture Component				
Transmission Lines and one Switch yard 10 kV	km	48.0	40.0	83.3
Forest Belts	mu	5,000.0	2,000.0	40.0
Road Construction	km	20.0	20.0	100.0
Wells	no.	7.0	7.0	100.0
Civil works	m^2	3,049.0	3,049.2	100.0
Demonstration base	m^2	947.0	947.0	100.0
Agriculture Service Stations	m^2	2,060.0	3,502.0	170.0
Agriculture Extension Stations	m^2	2,280.0	3,108.5	136.3

Project Item	Unit	SAR Estimated	Actual	% of Completed
Agriculture Machinery Service Station	m^2	1,792.0	1,793.0	100.1
County Seed Station	m^2	740.0	692.5	93.6
Seed supply points	m^2	2,000.0	2,000.0	100.0
Animal Husbandry Component				
Feed mills	no.	1.0	1.0	100.0
Pump wells	no.	5.0	5.0	100.0
Shelters	no.	20.0	6.0	30.0
Breeding stations	no.	20.0	7.0	35.0
Dipping vats	no.	3.0	3.0	100.0
Township Station	no.	3.0	3.0	100.0
Township substations	no.	8.0	8.0	100.0
County Center	m^2	166.0	166.0	100.0
B. Xinhe County				
Irrigation Component				
Construction of Irrigation Canals	km	159.1	159.7	100.4
Construction of Drainage Canals	km	250.7	251.7	100.4
Management Buildings For Canals	m^2	800.0	800.0	100.0
Xinsha Main Canal Rehabilitation	km	64.6	64.6	100.0
Land Reclamation	mu	160,000.0	160,000.0	100.0
Low-yielding land improvement	mu	247,000.0	247,000.0	100.0
Pastoral Irrigation Works	Y 10,000	24.0	24.0	100.0
No. 2 Branch Canal Lining of Sangtam Farm	Y 10,000	16.9	15.4	91.1
Sangtam Road	km	20.1	16.1	80.1
Agriculture Component				
Sangtam Transmission Line	km	38.3	38.3	100.0
Low-voltage power supply line	km	20.0	20.0	100.0
Sangtam Windbreak Forest Belt	mu	5,000.0	710.0	14.2
Sangtam Road	km	20.0	16.6	83.0
Sangtam Farm Well/Switchyard	no.	7.0	7.0	100.0
Buildings	m^2	4,000.0	3,967.1	99.2
Seed Stations	m^2	5,443.0	5,443.1	100.0
Agriculture Extension Center and Stations	m^2	5,460.0	5,358.6	98.1
Agriculture Machinery Center	m^2	2,423.0	2,423.0	100.0
County Agriculture Machinery School /civil works	m^2	389.7	389.7	100.0
High Yield Agriculture demonstration Plots	mu	200.0	300.0	150.0
Animal Husbandry Component				
Manalik Pasture Improvement	mu	1.0	1.0	100.0
Shelters	no.	3.0	3.0	100.0
Pump wells	no.	1.0	1.0	100.0
Feed mills	no.	1.0	1.0	100.0
Dipping Vats	no.	3.0	3.0	100.0
Breeding Station	no.	10.0	10.0	100.0
Township Animal Husbandry Service Sta.	no.	7.0	7.0	100.0
PMO Living Facilities	m^2	1,133.0	1,133.0	100.0

Project Item	Unit	SAR Estimated	Actual	% of Completed
C. Shaya County				
Irrigation Component				
Construction of Canals	km	127.1	136.3	107.2
Construction of Drainage Canals	km	187.9	196.1	104.3
Forest Belt along Main Canal and Road	km	50.0	43.9	87.8
Land Reclamation	mu	185,000.0	185,000.0	100.0
Low-yielding land improvement	mu	350,000.0	350,000.0	100.0
Xinken Road	km	11.2	11.2	100.0
Agriculture Component				
Buildings	m^2	5,170.0	5,170.0	100.0
Transmission Line and Well	km	13.0	12.0	92.3
Low-voltage power supply line	km	12.0	14.0	116.7
Wells	no.	5.0	6.0	120.0
Windbreak Forest Belt	mu	2,800.0	2,861.0	102.2
Hailou General Service Station	m^2	500.0	1,334.7	266.9
County Agriculture Extension Demonstration Base	m^2	1,038.0	1,038.0	100.0
Agriculture Extension Stations	m^2	3,060.0	3,420.4	111.8
Seed Processing Plant	m^2	2,155.0	6,150.0	285.4
County Seed Station	m^2	2,200.0	2,200.0	100.0
Agriculture machinery center	m^2	1,108.0	1,108.0	100.0
High Yield Demonstration Area	mu	2,000.0	25,630.0	1281.5
Animal Husbandry Component				
Pasture Improvement	mu	2.5	2.5	100.0
Shelters	no.	24.0	2.0	8.3
Pump Well	no.	4.0	-	0.0
Dipping vats	no.	7.0	7.0	100.0
Breeding stations	no.	9.0	9.0	100.0
County Animal Husbandry Service Center	m^2	1.0	1.0	100.0
Township Stations	no.	1.0	1.0	100.0
Mixed Crop/livestock Expansion	no.	3.0	3.0	100.0
D. Baichen County				
Ahebulong Head Work	no.	10.0	9.8	98.0
E. Prefecture				
Irrigation Component				
Quality inspection center	m^2	1,545.0	1,545.0	100.0
Water/salt monitoring	no.	1,100.0	1,100.0	100.0
Construction of Canals	km	2.8	2.8	100.0
Agriculture Component				
One Radar Station, indictor shows the range of radar	km	500.0	500.0	100.0
Agriculture School	km	1,000.0	1,000.0	100.0
Kuche Experiment Station of Xinjiang AAS	no.	2,000.0	2,000.0	100.0
Animal Husbandry Component				
Cashmere Goat Base	m^2	2.0	2.0	100.0
Prefecture PMO	m^2	8,400.0	800.0	9.5
Management Building	m^2	800.0	800.0	100.0
Prefecture Training Center	m^2	4,000.0	-	0.0

Project Item	Unit	SAR Estimated	Actual	% of Completed
3. Ecology Restoration Subproject				
A. Basin Restoration Preparation Work				
Training of Main River Course	Y 10,000	181.0	181.0	100.0
Diversion Gate of Daxihaiz Reservoir	Y 10,000	10.0	10.0	100.0
Patam Diversion Gate	Y 10,000	29.0	29.0	100.0
Base Construction	Y 10,000	25.0	25.0	100.0
Well Field Construction	Y 10,000	80.0	90.0	112.5
Diversion Canal	Y 10,000	10.0	10.0	100.0
Irrigation works	Y 10,000	22.0	34.0	154.5
Infrared Remote Sensing	Y 10,000	140.0	153.0	109.3
Preparation of Monitoring Station	Y 10,000	74.0	80.0	108.1
Other Works	Y 10,000	20.0	20.0	100.0
B. Buildings				
Management Buildings	m^2	8,700.0	8,000.0	92.0
Aksu Management Division	m^2	1,500.0	600.0	40.0
Alar Station	m^2	807.0	807.0	100.0
Yinbaza Station	m^2	1,100.0	1,100.0	100.0
Tieganli Station	m^2	450.0	450.0	100.0
C. Instrument and Equipment				
Machinery and Equipment	set	605.0	605.0	100.0
Building Material and Fertilizer	set	2,000.0	2,000.0	100.0

TABLE 6: KEY INDICATORS FOR PROJECT OPERATIONS

Key Operation Indicators in SAR/Present Report	Unit	SAR Estimated	ICR Estimated
Yerqiang Subproject			
Wasteland Reclamation	'000 ha	42.00	42.07
Low-yield Land Improvement	'000 ha	62.05	62.05
Canal Lining and Rehabilitation	km	558.39	563.39
Drainage Canal Construction	km	137.00	143.20
Well Fields	no	260.00	199.00
Power Generation	MW	21.00	21.00
Energy Sales 1997	GWh	97.9	65.00
Power Sales at full operation	10^6 yuan	22.9	29.50
Operating Costs 1997	10^6 yuan	4.50	8.8.0
Power Tariff	fen/kWh	22.5 fen/kWh	45 fen/kWh
Total Production at Full Development			
Rice	'000 ton	31.3	37.7
Wheat	'000 ton	454.4	382.7
Corn	'000 ton	280.9	370.8
Cotton	'000 ton	99.2	161.5
Legumes	'000 ton	133.0	100.2
Vegetable	'000 ton	180.9	56.3
Household Income			
Reclaimed per household	Yuan	7,600	23,470
Low-yield per household	Yuan	4,282	4,190
Stable area per household	Yuan	5,329	13,900
Weigan Subproject			
Wasteland Reclamation	'000 ha	38.00	38.00
Low-yield Land Improvement	'000 ha	55.00	55.00
Canal Lining and Rehabilitation	km	517.97	536.96
Drainage Canal Construction	km	663.57	673.90
Well Fields	No.	29.00	26.00
Total Production at Full Development			
Rice	'000 ton	11.5	13.0
Wheat	'000 ton	168.2	142.9
Corn	'000 ton	141.10	157.8
Cotton	'000 ton	35.5	72.2
Legumes	'000 ton	136.6	35.5
Household Income at full development			
Reclaimed Area	Yuan	10,107	25,940
Low Yield Land	Yuan	3,906	20,800
Stable Area	Yuan	10,316	12,850

TABLE 7: STUDIES INCLUDED IN PROJECT

Study	Purpose as defined at Appraisal/Redefined	Status	Impact of Study
Model test/study of the intake structure	To verify the hydraulic design	Completed	The data obtained from the test have been used for the modification of the structure design
Model test for the prevention of frost damage in forebay	To find out the measures that have to be taken to protect the structures from damage due to freezing	Completed	The results from the test and study have been applied to guide the design and to optimize the selection of the pumps
Study of roughness under different linings	To optimize the measures of canal lining	Completed	The results of the study have been used for guiding the design and construction of the irrigation canals
Analysis of environmental impact due to various environmental factors and establishment of a mathematical model for monitoring environmental damage	To review the possible negative impacts on the environment and establish a model to monitor various environmental factors	Completed	The model has be developed and used for the monitoring
Study for the improvement of delinting equipment	To modify the existing equipment for energy saving and reduction of operating cost	Completed	The results have been used to improve the operation of the equipment and savings in energy and operating costs were observed
Study on irrigation system optimization	To establish a sound irrigation system for increasing the efficiency of water use	Completed	The results have been used for guiding the water management organizations to use the water more efficiently

TABLE 8A: PROJECT COSTS

No.	Description	Estimated at Appraisal		Actual/Latest Estimate	
		Y Million	$ Million	Y Million	$ Million
A.	**Yerqiang Subproject**	**490.4**	**93.9**	**783.6**	**113.2**
	Irrigation and Drainage	316.4	60.6	513.1	74.1
	Drain/Soil Monitoring	4.7	0.9	11.9	1.7
	Hydropower	115.4	22.1	175.4	25.3
	Agriculture Support Services	32.3	6.2	53.2	7.7
	Animal husbandry Support Services	21.6	4.1	30.0	4.3
B.	**Weigan Subproject**	**474.3**	**90.9**	**739.5**	**102.3**
	Irrigation and Drainage	400.5	76.7	666.4	92.2
	Drain/Soil Monitoring	3.5	0.7	2.0	0.3
	Agriculture Support Services	41.2	7.9	48.0	6.6
	Animal husbandry Support Services	16.8	3.2	7.7	1.0
	Mix Crop/Livestock Farming	7.1	1.4	6.6	0.9
	Pasture Development	5.2	1.0	8.8	1.2
C.	**Others**	**114.5**	**21.9**	**42.1**	**6.0**
	Technical Assistance, Studies and Training	9.8	1.9	28.4	4.1
	Agriculture Support Services	90.6	17.3	10.3	1.4
	Animal Husbandry Support Services	14.1	2.7	3.4	0.5
D.	**Ecorestoration/Environment**	**28.0**	**5.4**	**30.3**	**4.5**
	Total Project Cost	**1,107.1**	**212.1**	**1,595.6**	**225.9**

TABLE 8B: PROJECT FINANCING

Project Description	At Appraisal		Actual/Last Estimate	
	Y million	$ million	Y million	$ million
IDA	652.4	125.0	904.4	128.0
Region & Prefecture	197.9	37.9	285.7	40.5
County & Farmer	191.2	36.6	298.9	42.3
Central Government	66.2	12.7	106.6	15.1
Total	**1,107.1**	**212.1**	**1,595.6**	**225.9**

TABLE 9: ECONOMIC COSTS AND BENEFITS

Entity	Appraisal Estimate			Actual Estimate		
	FIRR (%)	NPV (Y million)/a	EIRR (%)	FIRR (%)	NPV (Y million)/a	EIRR (%)
Irrigation						
Yerqiang	-	1,326.0	36	26.1	2,057.0	36.4
Weigan	-	858.0	33	17.6	848.0	30.4
Seed Farm	24	6.3	29	17.0	2.2	23.0
Livestock						
Mixed Crop and Sheep		7.34	23		14.3	30.0
Pasture Based Sheep and Goat		30.08	30		31.0	40.0
Sheep Stud Farm	12	0.45		14	0.22	28.0
Seed Processing						
Seed Ginnery (new constructed)	24	6.99	39	21	6.06	30.0
Seed Ginnery (rehabilitated)	13	0.55	-	16	1.0	30.0
Cotton Seed Delinting	12	0.90	16.	14	1.89	18.0
Hydropower	**19**	**173.67**	**23**	**12**	**82.0**	**18.0**
Overall of the Project			**34**			**33.0**

/a Discounted at 12 percent.

TABLE 10: STATUS OF LEGAL COVENANTS

Agreement	Section	Covenant type	Present Status	Original fulfillment date	Revised fulfillment date	Description of covenant	Comments
Project	PA Schedule 2, Para. 1	5	C	At all times		PMO will be maintained and adequate qualified staffing at all levels	Has been in place since 1989 and successfully operated until the end of the project
	PA Schedule 2, Para. 2	1	C	Each year		Xinjiang will comply with the financial reporting requirement	All audit report have been submitted since the project started.
	PA Schedule 2, Para. 3	11	C	12/15 each year report to the Bank		Xinjiang will ensure that adequate supplies of fertilizer are made available to farmers	Fertilizer has been made available to farmers. A total of about 40,000 tons has been procured by the Regional Government. Reports have been submitted in the yearly supervision Mission which generally occurred in September.
	PA Schedule 2, Para. 4	11	C	03/15/92 provide report		Wasteland leases will give preference to landless or poor farm households	PMO gave us in September 1992 county by county allocation of land, which is mainly to the poor and landless within the townships. A more detailed report was provided in 1996
	PA Schedule 2, Para. 5	12	C	3/15/92 hold workshop and 03/15/93 develop guidelines		Extension guidelines will be prepared satisfactory to the Bank and utilize these for training	Extension guidelines were prepared in September 1991 after a workshop in Dec. 1990. Document was submitted to the IDA for review in March 1991. Subsequently the Government implemented the guidelines.
	PA Schedule 2, Para. 6	5		02/15/92 and for yearly reviews		Appoint an independent technical panel to review the project annually	The panel was first appointed 01/15/92 and in June every year there have been meeting. The last panel meeting was in August 1997. The panel has helped to reduce cost, revise technical components to meet objectives of the project.
	PA Schedule 2, Para. 8	12	C	06/15/93 and for yearly reports 03/15		Provide a report for comment each year showing price analysis and production incentives provided for farmers to grow cotton.	The PMO has provided cotton prices and their analysis each year. There national price increases have given a huge incentive to grow cotton. Grain areas have declined by 20% while cotton areas have increased by about 75%. There is no necessity to give incentives for producing cotton. *The covenant is irrelevant now.*
	PA Schedule 2, Para. 7	12	C	06/15/93 and reports 06/15 every year		Provide a report for comment each year showing analysis of prices for grain for previous year and ensure that incremental production is sold in the free market.	All incremental grain is sold in the free market since 1992. In fact there is only about 5% of the grain produced that is sold at negotiated prices. Despite the strong competition for grain from cotton and there has been a reduction grain area by 20% there has been an increase of grain production 6% every year since 1990 due to increased yield increases due to irrigation. The covenant seems to be irrelevant now.

Agree-ment	Section	Cove-nant type	Present Status	Original fulfillment date	Revised fulfillment date	Description of covenant	Comments
	PA Section 2, Para 9	2	NYD	12/31/95		Yehe Power Company internal cash generation will account for 15% YHPC capital expenditures starting from 12/31/95	Yehe Power Company was formed in 1994 and it was essentially corporatized and is financially autonomous. The company does have internally generated cash reserves. At this juncture YHPC has no hydropower investments in the basin.
	PA Section 2, Para 10.	2	NYD (have presented the plans)	12/31/99 and plan of O&M by 12/31/93		Charge water rates to recover all O&M and a portion of the capital costs; and provide a plan for O&M and for water charges by 12/31/93.	A plan to raise water charges was presented to the Mission 09/15/94. However water charges were raised from .2 fen/m^3 to .6 fen/m^3 in 1992 even as the project construction was started and when benefits were not realized. The prefecture government is now planing to corporatize the river basin management office to manage the entire water management so as to ensure accountability and there is full cost recovery.
	PA Schedule 2, Para 10.	2	C	NA		Ensure that charges for services for AH stations recover the costs of the services.	All animal husbandry services have implemented user charge which farmers have to pay for services

Covenant Class:
1 = Accounts/audits
2 = Financial performance/revenue generation from beneficiaries
3 = Flow and utilization of project funds
4 = Counterpart funding
5 = Management aspects of the project or executing agency
6 = Environmental covenants
7 = Involuntary resettlement
8 = Indigenous people
9 = Monitoring, review, and reporting
10 = Project implementation not covered by categories 1-9
11 = Sectoral or cross-sectoral budgetary or other resources allocation
12 = Sectoral or cross-sectoral policy/ regulatory/institutional action
13 = Other

Status:
C = covenant complied with
CD = complied with after delay
CP = complied with partially
NC = not complied with
NYD= not yet due

TABLE 11: COMPLIANCE WITH OPERATIONAL MANUAL STATEMENTS

There was no significant lack of compliance with an applicable Bank Operational Manual Statement (OD or OP/BP)

TABLE 12: BANK RESOURCES: STAFF INPUTS

Stage of project cycle	Planned		Revised		Actual	
	Weeks	US$'000	Weeks	US$'000	Weeks	US$'000
Preparation to appraisal	n.a.	n.a.	n.a.	n.a.	90.0	233.1
Appraisal	n.a.	n.a.	n.a.	n.a.	50.0	123.8
Negotiations to Board Approval	n.a.	n.a.	n.a.	n.a.	12.2	38.3
Supervision /a	31.5	55.2	28.7	59.2	84.7	238.1
Completion	7.0	19.7	7.0	18.0	11.4	51.8
Total	**n.a.**	**n.a.**	**50.5**	**173.990**	**345.025**	**794.637**

/a Since task budgeting began in FY96.

TABLE 13: BANK RESOURCES: MISSIONS

Stage of project cycle	Month/ year	No. of persons	Days in field	Specialized staff skills represented /a	Performance rating: Imple-mentation status /b	Performance rating: Devel-opment objectives	Type of problems /c
Identification	05/89	2	9	FTM, EO			-
Preparation	09/89	2	14	FTM, PE			-
Preappraisal	04/90	11	24	FTM, EO, FA, AG, LS, PE, GS, IE, EN, RS, FS			
Appraisal	09/90	8	19	FTM, FA, AG, LS, DR, PE, GS, IE			-
Supervision 1	09/91	1	8	FTM	N/A	1	-
Supervision 2	05/92	3	8	FTM, PS, DS	1	1	-
Supervision 3	09/92	7	8	FTM, PS, EN, LS, WS, IE, GS	2	2	-
Supervision 4	10/93	4	9	FTM, AG, IE, GS	1	2	-
Midterm Review	10/94	3	10	FTM, IE, GS			-
Supervision 5	11/95	5	7	FTM, PS, IE, GS, EO	HS	2	-
Supervision 6	12/96	4	8	TM, ID, WR, IE	HS	S	-
Supervision 7	06/97	5	10	TM, EO, AN, GS	HS	S	
Completion	11/97	7	11	FTM, PS, LS, FA, PS, IE, GS	HS	S	-

/a TM: Task Manager; FTM: Former Task Manager; LS: Livestock Specialist; AN: Anthropologist; AG: Agriculture Specialist; IE: Irrigation Engineer; EO: Economist; ID: Institutional Development; PS: Procurement Specialist; FA: Financial Analyst; EN: Environmentalist; GS: Groundwater Specialist; DR: Drainage Specialist; PE: Power Engineer

/b 1: Highly satisfactory; 2: Satisfactory.

/c Typical problems included: implementation delays in technical assistance and studies.

ANNEX A: ICR MISSION'S AIDE MEMOIRE

1. A Bank Mission composed of Messrs./Mmes. D. Gunaratnam, Zhang Chaohua, Wang Xiaolan (Bank); and P. Jiang, D. Masterton , Hu Shunong and Zhang Weizhen (Consultants) visited Xinjiang Province November 19-30 to discuss implementation completion of the project. The Mission visited the project sites in southern Xinjiang (Weigan and Yerqiang), had discussions with the PMOs at Regional, prefecture and county levels to review the completion of the project. The Mission had a final wrap-up meeting with members of Regional PMO members and Vice Governor on November 29, 1997. The Mission would like to thank the provincial authorities for the courtesy, cooperation and hospitality extended to the Mission during our stay in Xinjiang. The following summarizes the topics discussed and the agreements reached.

Project Implementation

2. **Irrigation and Drainage.** The ICR Mission noted that almost all the physical works for the drainage and irrigation, land reclamation, low yield land improvement are completed. The progress of all works is as follows:

Description	Revised SAR Estimate		Actual Completed		%
	Yerqiang	Weigan	Yerqiang	Weigan	completed
Wasteland Reclamation ('000 mu)	630	570	630	570	100
Low-Yield Land Improvement ('000 mu)	931	825	931	825	100
Canal Lining (km)	558	518	563	537	102
Drainage Canals (km)	137	769	143	768	100
Wells (no.)	260	29	199	26	78

3. All the physical works have been completed except for some 10 to 15 percent of field structures for the reclaimed areas and a smaller percentage for low-yield land improvement have still to be completed. In addition, there are a total of 61 wells that need to be installed in Yerqiang. The canal lining completed for both Yerqiang and Weigan is more than planned in the project. The lining length does not include many lateral and sublateral canals undertaken by the farmers. In general the works undertaken were of good quality and the impacts were very significant. **The only outstanding issue seems to be the completion of the on-farm structures for the reclaimed areas and some of the low-yield areas and additional wells for Yerqiang basin in particular.**

4. The impact of irrigation canal lining construction and drainage canal construction are very significant. Based on the information provided a total of 980 km of canal lining was constructed and the estimated amount of water saved is about 940 million m^3 per

year. This is about 1 million m^3 of water per km of canal lined. The lining of a small section of canals were affected by frost heave but performed well after the repairs. The lining of canals has dramatically reduced the losses and shortened the time of water delivery by 75 percent. Although the physical works have been completed and operations and maintenance of all the systems have begun it is noted that water charges are still very low and are unable to meet the major repair and depreciation requirements.

5. Weigan Basin Management Office has installed a real-time water flow monitoring system for the Weigan Irrigation Water Management Bureau. The system comprises of 52 canal elevation tele-observation points, covering the Weigan Irrigation Project, with 29 transmitters sending out signals for every 1 m^3 change in canal elevation and one monitoring center which collects flow data from transmitters and processes the data before saving in corresponding data bank. Upon successful testing, the system will be put into operation in the next spring irrigation season. Using the system, more flexible and optimal water dispatching water among three counties in Weigan River Basin and more efficient water use are expected. **The mission would encourage that Weigan Basin Management Office complete the monitoring system for the whole Weigan and Yerqiang Irrigation Systems and also to use it to monitor the drainage flows.**

6. **Salt and Water Monitoring.** The Mission was extremely impressed with the work undertaken by Tsinghua University for the saltwater monitoring of both basins and the results of the study are very significant in establishing a stable and sustainable oasis. The main areas covered by the study are as follows:

- (a) Basinwide fundamentals
  - (i) Identification of land utilization by satellite images for remote sensing
  - (ii) Meteorological observation
- (b) Water and salt balance of Weigan and Yerqiang irrigated areas
- (c) Groundwater monitoring
- (d) Soil, water and salt monitoring in the top 1m soil
- (e) Monitoring of the effects of drainage canals
- (f) Evaporation from bare soils with shallow water tables
- (g) Water and salt monitoring information systems
- (h) Estimation of water consumption of different types of lands
- (i) Groundwater balance
- (j) Transformation between surface water and groundwater

7. **Agricultural Component.** At prefecture the level all planned construction has been completed for experimentation, agricultural extension, agricultural school, agricultural machinery training and seed calibration.

8. At the county level, 5 (6 planned) agricultural extension stations have been established and 1 (1 planned) rehabilitated. At the township level 89 (97 planned) stations are in place.

9. Agricultural Machinery Service Stations have been established in 6 (6 planned) counties and in 10 (10 planned) townships, with Machinery Repair Stations in 4 (3 planned) counties, Machinery Training Stations in 2 (1 planned) counties, and 6 sets (6 planned) of Agricultural machinery have been provided.

10. Seed farms have been established in 5 (5 planned) counties with Seed Processing Plants and Seed Stations in 9 (8 planned) Counties and 1 (1 planned) township. Development of Kqilik, Sangtamand Xinken farms in Weigan are 92 percent, 82 percent and 100 percent complete respectively, but 20 to 30 percent of the crop land is yet to be brought into production and establishment of windbreaks in Kqilik and Sangtam is only 40 percent and 14 percent complete respectively because of high seedling mortality due to poor soil conditions.

11. Cotton Seed Ginning and Delinting plants have been established in 8 (8) counties and one Corn Drying Plant established in Yecheng county. Cotton seed ginning capacity has exceeded the planned figure in order to meet increased demand, and the seed farms and seed stations are established as planned.

12. The total investment in agricultural services and production has reached 126 percent of the target level in Yerqiang and 134 percent in Weigan with some differences between counties and components. Investments are 100 percent to 140 percent of the planned for different counties in Yerqiang while in Maigaiti a big cost saving on low yield land improvement reduced total investments to about 78 percent. In Weigan the actual investments for each county range from 113 to 141 percent of the planned.

13. **Development of Agricultural Services** Agricultural extension services development has been carried out according to the plan. Thanks to the 89 additional Township Agricultural Extension Stations, services have been made more readily available to about 350 ,000 agricultural households. However, due to difficulties in preparation of specifications and tender documents the provision of some equipment is behind schedule. The construction of agricultural extension stations is on schedule, the staffing of those stations at Township level has not been done as recommended in the SAR. The numbers of staff assigned to township stations compared to the SAR targets are 382 to 492 for Yerqiang and 201 to 248 for Weigan. The number of technical staff in township stations has not been increased as proposed and the extension worker-farmer ratios are far below the proposed level, i.e. 1:1050 for Yerqiang and 1:600 for Weigan. **The mission noted during the visits to County and Township stations in Yerqiang that some county stations have excessive staff while most township stations are inadequately staffed, and some townships have extension worker-farmer ratios of lower than 1:2,000.**

14. **Animal Husbandry** The animal husbandry component has had a significant impact on the local economy. At the prefecture level all Research Facilities for Bahutai and Tuohai Experimental Farms and Training Facilities have been completed. Such investment items not implemented in the Weigan counties as Livestock Shelters,

Watering Wells, Dip Vats and Artificial Insemination/Breeding Stations have been debited to Akesu Prefecture but it is not clear whether these facilities are located in Baichen County.

15. Animal Husbandry Extension Stations have been established in 8 (9 planned) counties and in 93 (93 planned) townships with 19 (19 planned) Substations.

16. The number of Artificial Insemination/Breeding Stations established is 31 in comparison with the planned 44, including 5 in Baichen County. However, the decision to reduce the number of Stations from the initial 54 in the SAR to 44 and subsequently to 31 is rational. The services of Artificial Insemination/Breeding Stations including sires, semen collection and insemination services become less needed because high quality semen is made available through the Prefecture and then insemination service is provided by township stations and substations.

17. Only 2 (2 planned) livestock feed mills have been established compared with 9 in the initial SAR plan. The decision to reduce the number of small local mills is logical because of the establishment of large livestock feed mill facilities at Prefecture level. The four Roughage Ammoniation Plants initially planned for Yerqiang were all eliminated as the increase in liquid ammonia price made roughage treatment not viable.

18. Other items with variations in target levels include Livestock Shelters: 44 actual against 80 planned , Watering Wells: 8 actual against 12 planned. The reason is that livestock-owning families have been able to build more modest shelters and wells using their own labor and materials at lower cost. Although the number of shelters and wells financed through the project is reduced the total number including those constructed by farmers from their own resources is higher than the planned figure.

19. Establishment and expansion of Livestock Breeding farms for supply of improved genetic material, Kuche, Bahutai and Tuohai at Prefecture Level and Karbasman, Xamaili and Maigaiti at County Level have been conducted. Although work at Kuche is said to be complete, machinery purchase, pasture improvement and forage/fruit tree cultivation are all below the target levels. For the two farms visited, i.e. Maigaiti and Kuche, targets for livestock numbers and output of improved genetic stock have not been met. The cash flow statement for Maigaiti Stud Farm shows a steady increase in net profit although costs do not include investments, financing costs or depreciation. Nevertheless, based on the limited information available during the visit to Maigaiti it is likely that gross income in 1997 including manure value will exceed the stated figure by Y 30,000 to Y 50,000.

20. It is clear that the benefits of the animal husbandry component have been realized. Those benefits include: (a) increased coverage of animal health and production services; (b) increase in livestock feed available and improved feed utilization; (c) increased pasture production; (d) improved pasture utilization; (e) increased livestock population and improved genetic resources; (f) improved production performance; and (g) increased production and farm family incomes from livestock.

21. **Restoration of the Tarim River Ecosystem**. The ecosystem restoration component has been finished. Most of the monitoring stations, management buildings, equipment procurement, along with several controlled gates for the Tarim River have been completed. A detailed infrared remote sensing map has been completed for the whole Tarim River Basin. Civil works for the Daxihaize Reservoir, Patam Diversion Gate, etc. have been completed and about 25 million m^3 of water was transferred to the lower reach in 1996 and about 120 million m^3 in 1997. As for institutional reform the Xinjiang Government has issued three regulations on the formation of the Tarim River Basin Management Committee (TRBMC) and the Tarim River Basin Management Bureau (TRBMB) with letters stating the detailed requirements for the scope of work and responsibilities of the TRBMB. In the follow-up Tarim Basin II Project the TRBMB is going to be upgraded to a Tarim Basin Commission (TBC) which has the rights to invest in projects.

22. **Financial Management.** The mission is pleased with the Provincial PMO's good recording system of the project's financial accounting information. The mission noted that up to the end of 1996 the shortage of counterpart funding had been a constantly constraint comparing with the smooth physical construction of this project. Although the counterpart funding has been put into place in 1997 and the project has been completed, the mission would still like to emphasize the absolutely importance of the timely counterpart funding. Especially with the Tarim II Project, the Bank expect the firm commitment from the government on this counterpart funding issue.

23. The mission is informed that the average replenishment time from the Bank to the borrower's Special Account is 20 days and the borrower is quite happy with this arrangement. However, due to the borrower's heavy dependence on reimbursement from the Special Account, the borrower suggests the total amount in the Special Account be increased from US$7 million to US$10 million.

24. The mission is pleased to know that the internal audit system from the county, prefecture up to the autonomous region has been operating strictly under the related rules and regulations. Training on auditing issues has been provided to all the auditing staff involved at each level. The autonomous region auditing bureau reviews every underlying document to the SOE such as procurement material, invoices and bills of lading and evidence of payment. The mission feels the accounting system and audit controls are adequate.

25. The mission paid the field visits to the three project counties in Weigan and two counties in Yerqiang area, and met with the finance staff in the enterprises financed the Bank such as the Kaqun Hydropower Station and the Seed Station in Weigan and three seed farms, two cotton ginnery plants in Yerqiang. The mission was informed of the detailed sources and amounts which would be allocated to the repayment fund. The mission would like to congratulate on the accountability of the government to fulfill its debt payment responsibility.

26. The mission noted that most of the enterprises visited did not have a complete financial management system in place due to various reasons. One of the major reasons is that those enterprises just started operation and the ownership status for most enterprises is not very clear status in terms of the ownership. The mission was assured that after the project is fully completed by December 1997, the Xinjiang Regional Government will conduct detailed evaluation of each component of this project including fixed-asset evaluation, ownership determination. **Xinjiang Regional Government confirmed that after the evaluation of the enterprises, they will be corporatized and commercialized with financial autonomy. Xinjiang Government also assured that it will undertake a special training for the financial staff in those enterprises given their current weakness in financial management skills by the end of 1998.**

27. **Project Covenants** The mission noted the following Credit Agreement that is outstanding and need to be fulfilled:

> Project Agreement Section 2 para. 10 states "*Charge water rates to recover all O & M and a portion of the capital costs; and provide a plan for O & M and for water charges by December 31, 1993.*" Despite that the water charges increased by about 600 percent from 0.2 fen/m^3 in 1991 to 1.2 fen/m^3 in 1995 which is far inadequate for full cost recovery. **Therefore, the present charges need to be further increased by 400 percent to 4.8 fen/m^3 by December 31, 1999.**

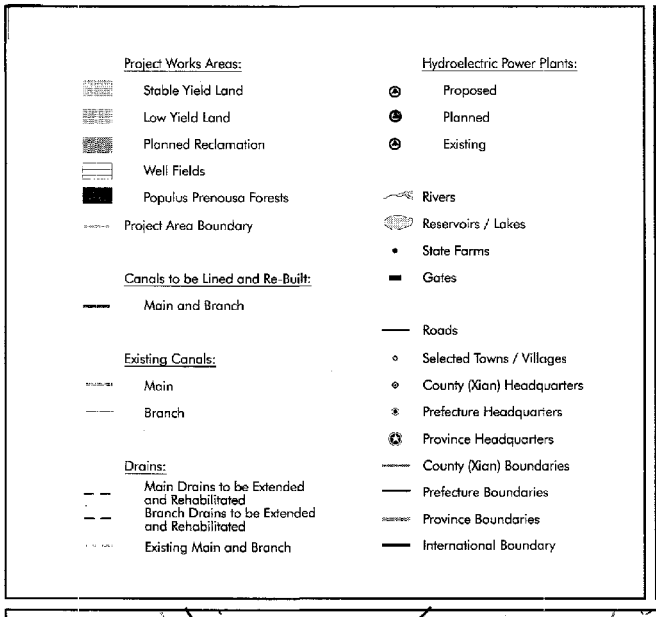
28. **Follow-up Actions: The only follow-up action is the completion of the on-farm structures for the reclaimed areas (25 percent of the area) and some of the low yield areas (10 to 15 percent of the area) for both Yerqiang and Weigan Basins and completion of installation of additional wells for Yerqiang Basin in particular. In addition the mission would recommend the continuation of the Salt and Water monitoring systems as it is important to monitor early warning of salinization in any part of the basin.**

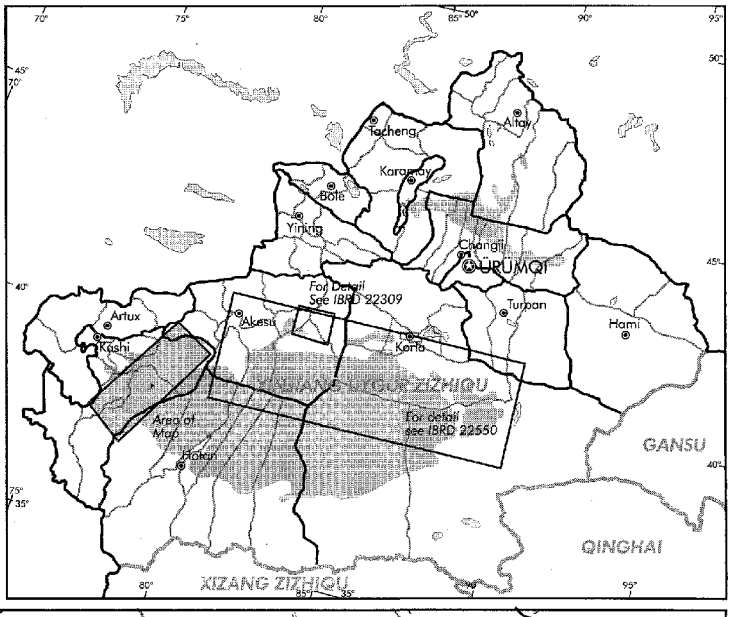
MAP SECTION

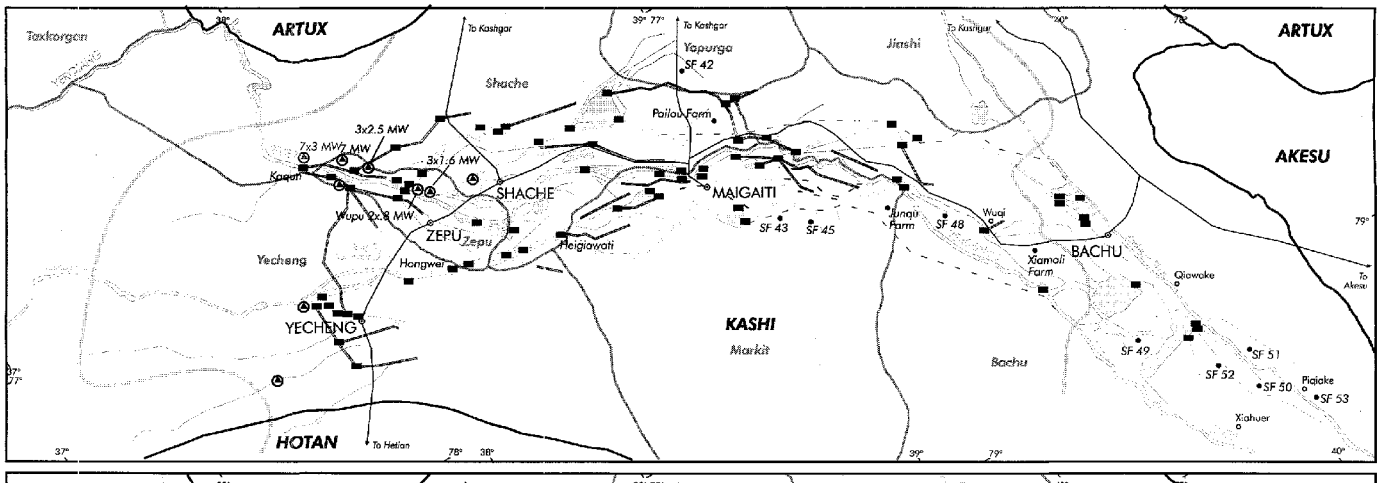
CHINA

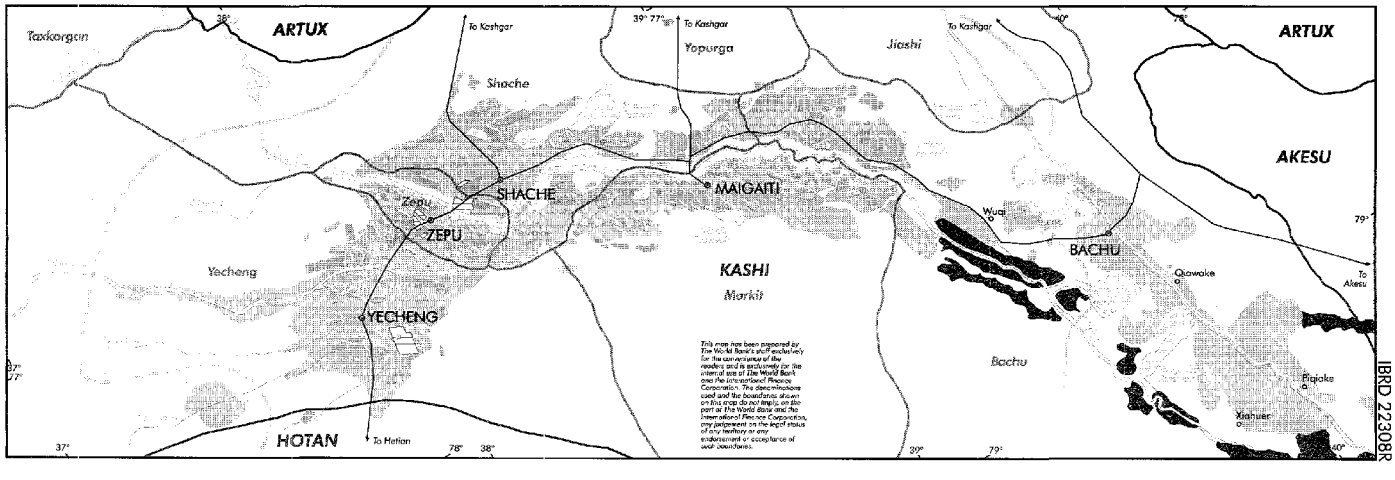
TARIM RIVER BASIN PROJECT

YERQIANG RIVER BASIN SCHEME









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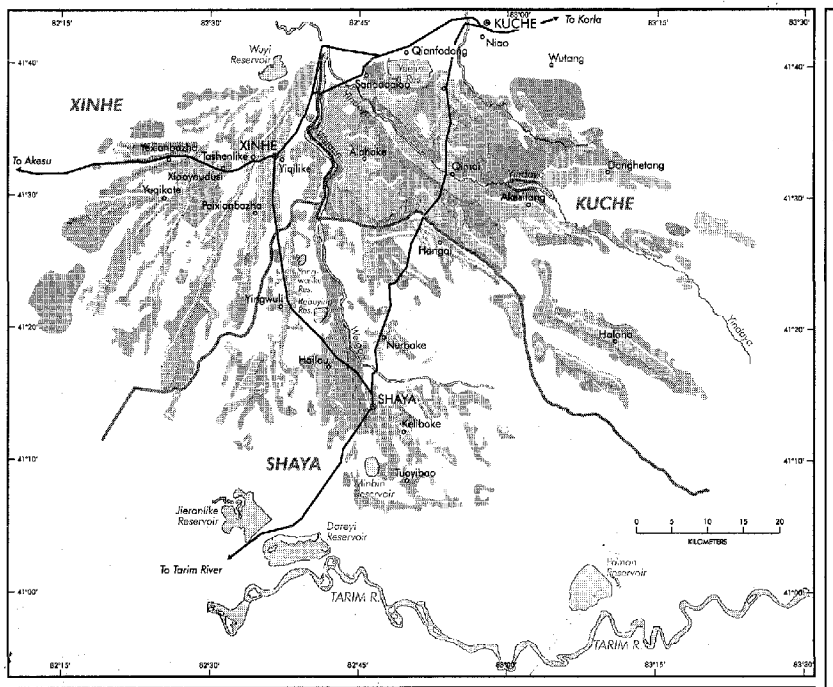

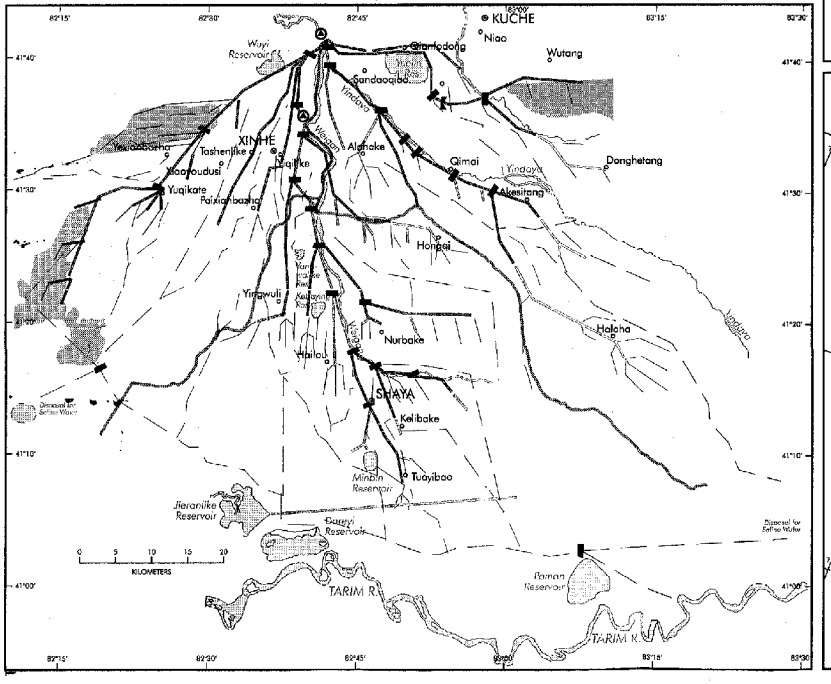

CHINA
TARIM RIVER BASIN PROJECT
WEIGAN RIVER BASIN SCHEME

Project Works Areas:
- Stable Yield Land
- Low Yield Land
- Planned Reclamation

Canals to be Lined and Re-Built:
- Main and Branch

Existing Canals:
- Main
- Branch

Main Drains:
- To be Extended and Rebuilt
- Existing

- Rivers
- Reservoirs / Lakes
- Hydroelectric Power Plants
- Gates / Structures
- Roads
- Selected Towns / Villages
- County (Xian) Headquarters
- Prefecture Headquarters
- Province Headquarters
- County (Xian) Boundaries
- Prefecture Boundaries
- Province Boundaries
- International Boundary

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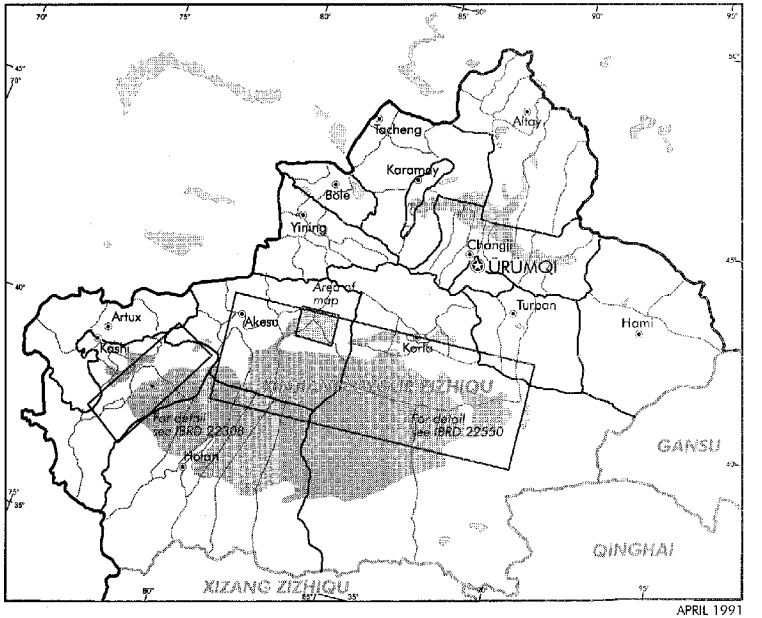

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CHINA
TARIM RIVER BASIN PROJECT
ECO-RESTORATION COMPONENT

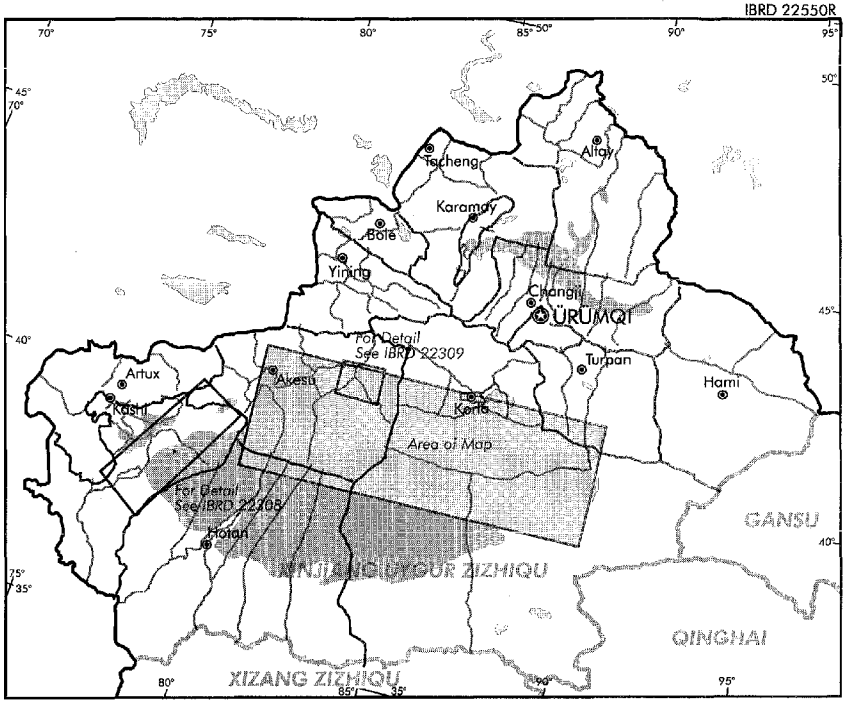
Proposed Offices:

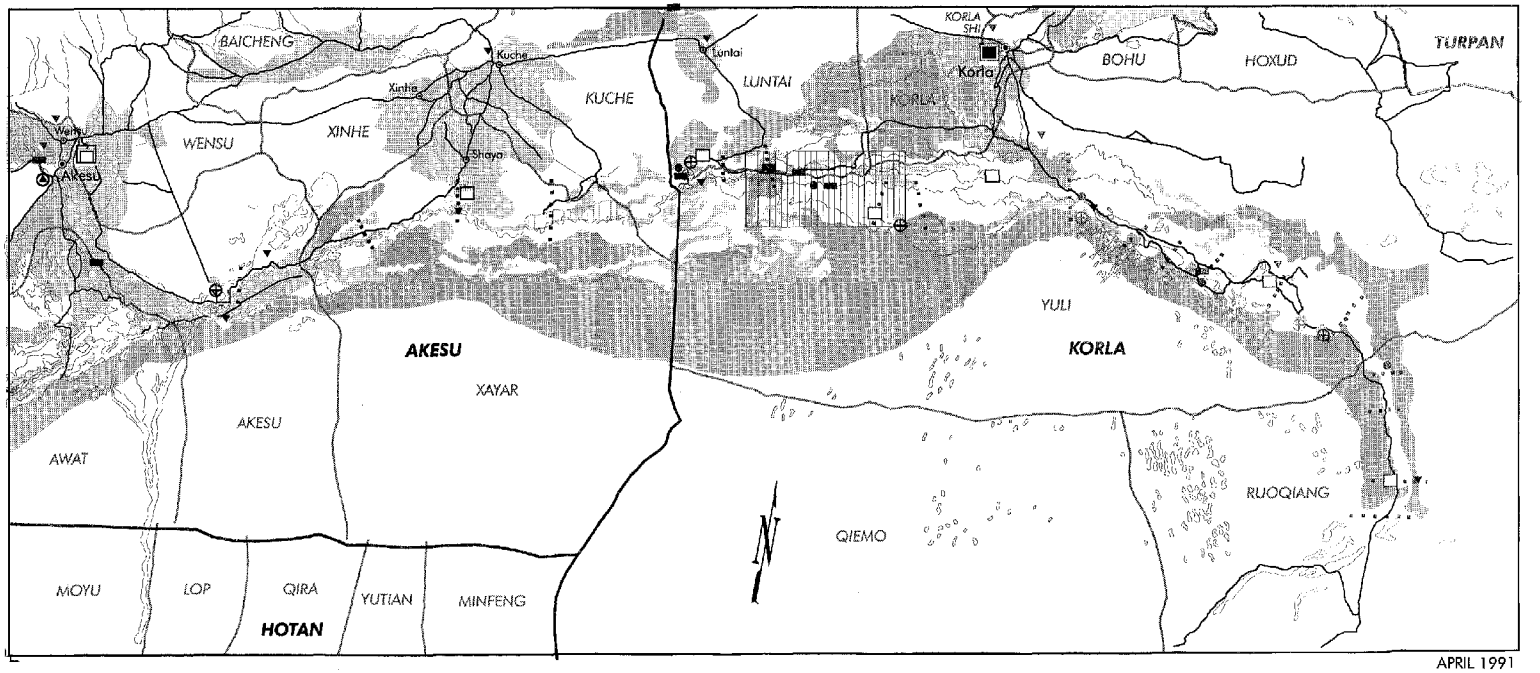
- Comprehensive Monitoring and Management Stations
- Management Office
- Management Bureau

Proposed Monitoring Stations:

- Existing Meteorological Stations
- Planned Meteorological Stations
- Existing Hydrological Stations
- Planned Hydrological Stations
- Planned Water Gates
- Hydro Power Plants
- Groundwater Sounding Well
- Groundwater Balance Stations
- Forest, Shrub, and Grass Monitoring Points
- Natural Protection Zone of Populus Prenousa Forest

- Irrigated Areas
- Populus Prenousa/Euphretica Forests
- Desert
- Intermittent Lakes / Rivers
- Existing Roads
- Project Road
- Selected Towns / Villages
- County (Xian) Headquarters
- Prefecture Headquarters
- Province Headquarters
- County (Xian) Boundaries
- Prefecture Boundaries
- Province Boundaries
- International Boundary





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