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PROJECT PERFORMANCE ASSESSMENT REPORT

IRAN

TEHRAN DRAINAGE PROJECT (LOAN 3479-IR)

AND

IRRIGATION IMPROVEMENT PROJECT (LOAN 3570-IR)

November 11, 2004

Sector, Thematic, and Global Evaluation Group
Operations Evaluation Department

CURRENCY EQUIVALENTS

Currency Unit = Iranian Rials

1992-93	US$1.00	=	Rials 70 official rate at project approval
	US$1.00	=	Rials 600 or 1,400 for categorized imports
2001	US$1.00	=	Rials 8,000 at project completion

ABBREVIATIONS AND ACRONYMS

CAS	Country Assistance Strategy
EDO	Engineering and Development Organization
ERR	economic rate of return
FY	fiscal year
IAS	Interim Assistance Strategy
ICB	international competitive bid
ICR	Implementation Completion Report
IDA	International Development Association
KWPA	Khudastan Water and Power Authority
MoE	Ministry of Energy
MoJA	Ministry of Jihad and Agriculture
MWPA	Mazandaran Water and Power Authority
O&M	operation and maintenance
OED	Operations Evaluation Department
OMC	operation and maintenance company
PBO	Planning and Budget Organization
PPAR	Project Performance Assessment Report
PWA	Provincial Water Authority
RWC	regional water company
SAR	Staff Appraisal Report
TBM	tunnel boring machine
WUA	water user association
WUCC	Water User Consumer Cooperative
WUG	water users group

FISCAL YEAR

Government: March 21–March 20

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OED Mission: Enhancing development effectiveness through excellence and independence in evaluation.

About this Report

The Operations Evaluation Department assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, OED annually assesses about 25 percent of the Bank's lending operations. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons. The projects, topics, and analytical approaches selected for assessment support larger evaluation studies.

A Project Performance Assessment Report (PPAR) is based on a review of the Implementation Completion Report (a self-evaluation by the responsible Bank department) and fieldwork conducted by OED. To prepare PPARs, OED staff examine project files and other documents, interview operational staff, and in most cases visit the borrowing country for onsite discussions with project staff and beneficiaries. The PPAR thereby seeks to validate and augment the information provided in the ICR, as well as examine issues of special interest to broader OED studies.

Each PPAR is subject to a peer review process and OED management approval. Once cleared internally, the PPAR is reviewed by the responsible Bank department and amended as necessary. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the OED Rating System

The time-tested evaluation methods used by OED are suited to the broad range of the World Bank's work. The methods offer both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. OED evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (more information is available on the OED website: http://worldbank.org/oed/eta-mainpage.html).

Relevance of Objectives: The extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). *Possible ratings:* High, Substantial, Modest, Negligible.

Efficacy: The extent to which the project's objectives were achieved, or expected to be achieved, taking into account their relative importance. *Possible ratings:* High, Substantial, Modest, Negligible.

Efficiency: The extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. *Possible ratings:* High, Substantial, Modest, Negligible. This rating is not generally applied to adjustment operations.

Sustainability: The resilience to risk of net benefits flows over time. *Possible ratings:* Highly Likely, Likely, Unlikely, Highly Unlikely, Not Evaluable.

Institutional Development Impact: The extent to which a project improves the ability of a country or region to make more efficient, equitable and sustainable use of its human, financial, and natural resources through: (a) better definition, stability, transparency, enforceability, and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Institutional Development Impact includes both intended and unintended effects of a project. *Possible ratings:* High, Substantial, Modest, Negligible.

Outcome: The extent to which the project's major relevant objectives were achieved, or are expected to be achieved, efficiently. *Possible ratings:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Bank Performance: The extent to which services provided by the Bank ensured quality at entry and supported implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of the project). *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower assumed ownership and responsibility to ensure quality of preparation and implementation, and complied with covenants and agreements, towards the achievement of development objectives and sustainability. Possible ratings: Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

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Contents

This report was prepared by George T. Keith Pitman, who assessed the projects in December 2003. The report was edited by William Hurlbut, and Soon-Won Pak provided administrative support.

Principal Ratings and Key Staff Responsible

IRAN: TEHRAN DRAINAGE PROJECT (LOAN 3479-IR)

	*ICR**	*ICR Review**	*PPAR*
Outcome	Satisfactory	Satisfactory	Satisfactory
Sustainability	Highly Likely	Likely	Likely
Institutional Development Impact	Modest	Substantial	Substantial
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate OED product that seeks to independently verify the findings of the ICR.

Project	*Task Manager*	*Division Chief/ Sector Manager*	*Country Director*
Appraisal (1994)	Mario A. Zelaya	Alistair J. McKechnie	Ram K. Chopra
Completion (2001)	Mathewos Waldu	Emmanuel Forestier	Joseph P. Saba

IRAN: IRRIGATION IMPROVEMENT PROJECT (LOAN 3570-IR)

	*ICR**	*ICR Review**	*PPAR*
Outcome	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Sustainability	Highly Likely	Likely	Likely
Institutional Development Impact	Substantial	Substantial	Modest
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate OED product that seeks to independently verify the findings of the ICR.

Project	*Task Manager*	*Division Chief/ Sector Manager*	*Country Director*
Appraisal (1994)	Aizad Khan	Nkozi N. Okonjo-Iweala	Ram K. Chopra
Completion (2001)	Adel Bichara	Salah Darghouth	Joseph P. Saba

Preface

This is the Project Performance Assessment Report (PPAR) prepared by the Operations Evaluation Department (OED) for the Iran Tehran Drainage Project and the Irrigation Improvement Project. The Tehran Drainage Project was approved in May 1992 for a Loan of US$77.0 million and closed, fully disbursed, two years behind schedule in December 2000. Total project costs at completion were US$111.3 million. The Irrigation Improvement Project was approved for a Loan of US$157.0 million in March 1993 and was closed, fully disbursed, on schedule in June 2003. Total project costs at completion were US$311.7 million.

This report is based on the Implementation Completion Reports (ICR) prepared by the Middle East and North Africa Region (Report No. 22189 dated May 2001 and No. 23335 dated December 2001), the Memoranda and Recommendations of the President, Staff Appraisal Reports, loan documents, project files, and discussions with Bank staff. An OED mission visited Iran in December 2003 and met stakeholders to discuss the effectiveness of the Bank's assistance with development and financing partners, project implementing agencies, private sector agencies, and beneficiaries. The cooperation and assistance of central government, Tehran Municipality and regional officials and staff, nongovernmental stakeholders, and other interested parties are gratefully acknowledged.

Although Iran had graduated from the Bank in the mid-1970s, it rejoined in 1991 as a result of the adverse economic impact of the Iraq-Iran War and these two projects were part of the first round of lending 1991-1993. Subsequently, the economy experienced significant difficulties and further Bank lending was suspended until 2000. In these circumstances, a more thorough evaluation than the ICR was required and would serve as input into a possible forthcoming Country Assistance Evaluation (CAE) for Iran. Additionally, the project raised issues of sustainability because of challenging socio-economic and national budget conditions, reliance on subsidies, and institutional restructuring needed to facilitate either beneficiary management or ownership.

Following standard OED procedures, this draft PPAR was sent to the borrower for comments, but none were received.

Summary

The Islamic Republic of Iran's Tehran Drainage Project and the Irrigation Improvement Project were approved in 1992 and 1993 respectively. The projects shared a common objective to better manage water resources and improve the capacity and transparency of responsible sector institutions.

The outcome of the Tehran Drainage Project is rated as satisfactory. Urban flooding was minimized. Through successful transfer of tunneling technology and good management, the project constructed deep drainage tunnels below the city to collect surface runoff and discharged it safely away from the urban area. Although Tehran Municipality used a modest amount of technical assistance for project planning and implementation of the civil works (through partnerships with local consulting firms), it did not accept the idea that the Bank's external advice was needed to ensure sound financial management and the related project component was unsuccessful.

Overall institutional development impact is rated substantial, however. A municipally-created and owned but autonomous project management company is now responsible for all planning and technical aspects of drainage works in Greater Tehran and is successfully implementing a master plan for Tehran drainage using equipment provided by the project. Although Tehran Municipality resisted the Bank's efforts to reform its financial procedures, it is slowly making improvements to its financial management under internal pressures from the Iran Audit Organization and the City Council.

Efficiency is rated substantial. Benefits resulting from the project are substantial – about US$19 million a year – and the economic rate of return (ERR) is estimated to be 20 percent (the financial rate of return is estimated at 28 percent).

Sustainability is likely. The very high quality of engineering and construction and the passive nature of the mostly subterranean drainage infrastructure will ensure the sustainability of the project works over its 30-year economic life. Even though funding of adequate maintenance – mainly cleaning and removing debris and sediment – is uncertain because this has been devolved to each of the 21 districts of Tehran, the Municipality is addressing this problem.

The outcome of the Irrigation Improvement Project is rated as moderately satisfactory. This balances substantial achievement on physical targets, agricultural extension, and development of local-level irrigation management institutions against negligible progress on institutional objectives at the national level. At completion, the project achieved improvements to irrigation over an area of 84,600 hectares and increased water use efficiency. Trial farms showed high potential for on-farm water saving but this has yet to be adopted by farmers, highlighting the importance of further efforts to increase the effectiveness of agricultural extension services. Even so, net farm income rose as a result of the project by more than 40 percent.

Institutional development is rated as modest. Extensive overseas and local training improved the capacity of sector organizations to manage irrigation, particularly at the local level, as well as providing buildings and vehicles. Farmers' participation in water management and cost-recovery through water user groups was successfully initiated on a wide scale. Irrigation fees cover about three-quarters of the total operation and maintenance expenses, the balance being subsidized by the government. While there is room for increases in water fees, the government is reluctant to act. Capacity-building did little to foster a more coherent approach to agriculture and water management or facilitate better coordinated planning at the central level between the Ministry of Energy and the Ministry of Jihad and Agriculture. Attention given by these organizations to cross-cutting and comprehensive water management issues that involve social concerns and environmental management remains minimal.

Overall efficiency is rated as substantial as the weighted average ERR is estimated to be about 16 percent. Across the four subprojects assisted, the ERR ranged from 7 to 23 percent respectively.

Sustainability is likely. Infrastructure engineering and design is of high quality, robust and is well maintained. Water users' and farmers' groups are successfully managing the operation and maintenance of tertiary irrigation canals and are highly motivated because of their increased incomes.

Bank and Borrower performance is rated as satisfactory for both projects. Experience with this project confirms a number of OED lessons:

- It is essential to understand sector institutions, their governance, incentive structures, and interrelationships before finalizing an investment operation. A first step is to ensure that all stakeholders are identified and participate in project design. Failure to do so risks that some objectives will not be fully owned and that lack of cooperation among key organizations will jeopardize their achievement.
- Whatever water infrastructure is provided or improved, a fundamental requirement for sustainability is building adequate technical and beneficiary capacity to allow integrated operation and maintenance and a dispute resolution mechanism. This is particularly important when management is devolved hierarchically and separated between a public service provider and private users groups.
- Many countries have excellent human and technical resources, particularly in the private sector, and good project design needs to carefully balance the type, scale, and use of external and internal consultants. Too much foreign technical assistance undermines local ownership and causes resentment; too little risks inadequate capacity-building.

- Water conservation is difficult to achieve if the water fee structure is not linked to volumes of water used. In turn this requires investment in water measurement, monitoring and recording equipment and a willingness to abandon the crop and area basis for charging, as it provides no incentive to farmers to conserve water.

Gregory K. Ingram
Director-General
Operations Evaluation

1. Background

1. This report assesses the performance of two of the Bank's infrastructure development projects implemented during Iran's tumultuous economic environment in the middle and latter part of the 1990s, a period when the Bank suspended new lending. A major evaluation challenge was to determine if the post-2000 political and economic reforms had improved the environment for infrastructure and institutional development. Findings from this evaluation provide insight into how Iranian organizations and institutions performed and the ability of the government to deliver sustainable infrastructure development. As such, this will also support an overall Country Assistance Evaluation (covering the past 10 years) being prepared by the Operations Evaluation Department of the World Bank to inform the first full Country Assistance Strategy planned for fiscal 2005.[1]

2. Iran is about a fifth the size of the United States and has a population (2002) of 66 million, the same as Egypt. Tehran lies on the southern slopes of the high Alborz mountains that form Iran's northern boundary adjacent to the Caspian Sea. Originally a small city of about 200,000 people in the 1920s, Tehran expanded northwards and uphill from its valley location and now has 12 million people living between 1,100 and 1,900 meters elevation. This position and rapid unplanned urbanization, allied with heavy spring snowmelt and periodic storms, increased the hazard from flash floods that periodically inundated the old city center in the valley. While arable lands only comprise a tenth of Iran's area, agriculture accounts for 19 percent of GDP and 30 percent of employment. Outside the mountain areas of the north and west, rainfall is highly irregular and irrigation is essential for crop production. Government's long term objectives are to increase water availability to agriculture by 9 percent and expand irrigated area by 30 percent.

3. Iran graduated from the Bank when the 1973/74 oil price rise dramatically improved its resource situation. However, it began borrowing again in the early 1990s following the Iraq war, a devastating earthquake in 1990, and the Bank's positive response to a program of government-initiated economic reforms. Thus, during the period 1990-1993, the Bank made six loans to Iran, totaling US$843 million. The two projects being assessed were included in this first round of lending.[2]

4. In 1996 Bank lending was suspended until 2000 because of backsliding on the reform agenda as government's attention was diverted by a series of severe balance-of-payments problems, and a foreign exchange crisis. A sharp drop in oil prices in 1998/99 induced a second external payments crisis, debt rescheduling, and delays in the implementation of public investment projects. The economy improved following political reforms in 1998. Thereafter a substantial drop in indebtedness and an improved fiscal situation provided a more stable macroeconomic environment. This represented a shift away from the crisis

1. The first Country Assistance Strategy (CAS) formed part of the February 1993 Memorandum and Recommendations of the President to the Executive Directors for the Irrigation Improvement Project (Report P-5947-IRN). An interim CAS dated December 2001 (Report No. 22050-IRN) supported the Bank's reengagement in Iran.

2. The other four projects were: the Iran Earthquake Recovery in 1991; the Sistan Flood Control; the Power Sector Efficiency; and the Health and Family Planning projects in 1992.

management mode that prevailed during the 1990s and enabled the Bank to restart lending in the early 2000s. The Bank's reengagement followed its endorsement of the Third Five-Year Plan (2001-2005), which addressed many of the economy's structural, social, and environmental problems. These included rectifying pricing system distortions, privatizing and reforming public enterprises and the financial sector, emphasizing employment over direct social assistance, and improving efficiency, transparency, and effectiveness of existing programs.

2. The Projects

Objectives

5. The Tehran Drainage Project and the Irrigation Improvement Project shared a common objective: to better manage water resources. In Tehran, infrastructure was provided to divert flood water away from flood-prone areas. In the irrigation sector new and rehabilitated infrastructure was built to better manage scarce water resources for agricultural production. Both projects also aimed to improve the implementation capacity of responsible sector institutions and upgrade the technology used to produce project benefits. In the case of Tehran, this focused on tunneling. The irrigation project focused on better water management utilizing farmers' water user groups, upgrading agricultural research and extension, and improving overall environmental management. Full details of project objectives, components, and costs are given in Table 1.

Implementing Arrangements

6. The **Tehran Drainage Project** was executed by the Technical Development Executive of Tehran Municipality. Its in-house Technical and Engineering Consulting Organization looked after all aspects of design while its Engineering and Development Organization (EDO) managed construction services. The Chief Engineer of the EDO headed the Project Implementation Unit (PIU).

7. The **Irrigation Improvement Project** had a far more complex managerial structure in which implementation was shared between two ministries and the Department of Environment - and this proved to be problematic. The Ministry of Energy (MoE) was responsible for the provision of irrigation infrastructure from the supply source down to units of 60 ha.[3] The Ministry of Jihad and Agriculture (MoJA) was responsible for on-farm development and agricultural development. MoE's responsibility is discharged through 16 semi-autonomous Regional Water Companies that are publicly owned. In turn, the RWCs are responsible for cost-recovery from beneficiaries and contract-out many of their maintenance responsibilities. Regionally, the MoJA's activities are managed by 24 Provincial Agricultural Departments that supervise county agricultural offices, which manage 700 local agricultural service centers. At appraisal, it was generally agreed that the capability and equipment of the

3. The MoE is charged with managing Iran's energy and water resources, and is responsible for construction, operation and maintenance of dams, primary and secondary irrigation water distribution systems serving units of more than 60 hectares.

MoJA's regional staff had to be significantly strengthened and this accounts for the US$40 million budget allocated for this activity in Table 1. The Department of Environment was primarily engaged through management of supporting environmental studies and its field offices in the four project areas.

Table 1: Project Objectives, Components, and Costs

Objectives	*Components*	*Costs (US$, million)*	
Tehran Drainage Project		**Appraisal**	**Actual**
1. Provide storm water drainage to divert floods away from flood-prone areas of the city for the protection of human life and property.	■ A trunk tunnel under Khayam street comprising 10 km of concrete lined tunnel	46.12	49.04
	■ Lateral drains and appurtenance structures to intercept rainwater runoff collected in gullies in central Tehran	1.25	13.99
	■ A main interceptor and outfall system comprising a tunnel, open channel and retention reservoir	43.37	38.77
	■ Acquisition of 14 ha for project works	0.13	1.28
2. Transfer appropriate technology for the construction of tunnels.	■ Technical assistance for construction management and for municipal revenue and financial studies	4.00	4.45
3. Strengthen the institutional capacity of the Tehran Municipality though technical assistance for project planning and implementation and for sound financial management.	■ Provision of maintenance equipment and spares	0.75	3.91
	■ Physical and price contingencies	19.10	-
	Total Project Cost	***95.62***	***111.36***
Irrigation Improvement Project		**Appraisal**	**Actual**
1. Enhance water resources management through the rehabilitation and improvement of irrigation and drainage systems.	■ Improvement and upgrading of four irrigation and drainage systems covering 90,600 ha	120.80	169.60
	■ On-farm development of subsurface drainage, land leveling and pilots for demonstration of improved water management including farmer organization	26.30	83.90
2. Upgrade research and extension in order to raise crop output, farm incomes and foreign exchange through increased crop production.	■ Institutional strengthening of the Agricultural Service Centers and intensification of agricultural services to the four systems and in Tajan covering a total area of 107,000 ha	40.20	5.30
3. Improve the planning and implementation capacity of the sector institutions, including the Ministry of Agriculture and Ministry of Energy.	■ Strengthen environmental management	3.40	1.80
	■ Provide offices, housing, transport, training and technical assistance	69.60	51.10
	■ Resettlement	0.20	0.00
	■ Price and physical contingencies	51.10	-
	Total Project Cost	***311.60***	***311.70***

8. Taking account of the types of physical works involved, the MoJA took the lead on two subprojects (Behbahan and Morghan), and the MoE on the other two (Zarrineh Roud and Tajan). To guide implementation of the irrigation project, a central-level Project Steering Committee was established. Chaired by a Deputy Minister of Economy and Finance and deputy ministers from each implementing ministry, the steering committee coordinated separate liaison offices set up in ministries of Energy and Agriculture and called upon representatives of the Department of Environment as needed. For administrative reasons, procurement of central consultants for the whole project was allocated to the Ministry of Energy. All other procurement was by either MoJA's Provincial Agricultural Departments or the MoE's Regional Water Companies.

Implementation

9. Both projects experienced significant delays.

Tehran Drainage Project

10. Made effective in October 1992, the project had to be extended for two years primarily because of difficulties in selecting and approving supervision consultants (which took four years), bidding procedures and related foreign exchange issues for contractors, land acquisition for project works, and import of a tunnel boring machine from Canada. The design of the engineering contracts required extensive repackaging to keep them within budget. The first major contract only attracted three bidders at twice the appraisal estimate and, after extensive and prolonged review, these were declared non-responsive by the Bank. Subsequently, the works were repackaged. Instead of the one ICB (international competitive bid) contract using highly technical tunnel boring machines, the works were split into one tunnel contract and two other contracts using less sophisticated cut-and-cover techniques. New bids were satisfactory and physical works started in early 1996. Apart from a few managerial problems within the project implementation unit, latterly the only problem was that the appointment of a new mayor delayed approval of land acquisition and thus completion of works. The project was officially inaugurated by the President of Iran and the Mayor of Tehran in January 2000.

11. As a result of these delays, Tehran Municipality started some of the works on its own account. At mid-term review, in July 1996, only US$5.07 million had been disbursed compared with the US$73 million expected at appraisal, and it was proposed to use estimated project savings of US$19.5 million to increase the Bank's participation in financing the holding reservoir and outlet works and finance construction of new headworks tunnels for US$9 million. An alternative proposal to build a water treatment works to ensure that the quality of drainage water could be used for irrigation was not supported by the Bank as it was outside the scope of the project.[4] By project completion there were no overall project savings because of delays and unforeseen events. Specifically, the newly constructed Shrine of Imam Komeini required relocation and redesign of the terminal reservoir and outlet pipe, requiring

4. Instead, the Bank recommended that it should not be used for irrigation.

more than twice the land acquisition planned. The overall cost overrun, covered by Tehran Municipality, was 14 percent or US$15.8 million.

Irrigation Improvement Project

12. Although the project became effective in April 1993, progress was stalled until 1996. The main reasons were poor coordination among the key ministries, minimal counterpart funding, lack of knowledge of Bank procurement procedures, inadequately staffed project liaison offices, and delays in agreeing on selection and appointment of the central consultants responsible for managing implementation. By 1995, the Bank gave notice that, unless implementation improved, the project would be suspended. The Project Steering Committee first met only in July 1995. While this helped to kick-start implementation, subsequently each ministry was left to manage its own share of the project. Both MoE and MoJA continued to experience problems even though the pace of implementation picked up. Within these ministries, provision of adequately qualified staffing was an issue until late into the project, as was timely provision of audit statements. Externally, Iran's Planning and Budget Organization (PBO) continually tried to micro-manage the project by second-guessing each ministries' budget and procurement planning. It was only after 1995 that the PBO recognized that the project was a multi-year exercise and budgeted accordingly – even then causing significant delays through lengthy procurement approval processes. Lack of timely counterpart funding caused the Bank to increase its funding of civil works to 60 percent of costs compared to the 40 percent stipulated in the Loan Agreement.

13. Delays increased costs and reduced the scope of the project. As work only effectively started in 1997, inflation in the interim period greatly increased the cost of constructing irrigation and on-farm works. Thus, following mid-term review, the irrigated area covered by project was cut by more than a third from 90,600 hectares to 58,000 hectares. Even so, costs of irrigation and on-farm works rose from US$147 million at appraisal to US$254 million by completion. As a result, the budgets for agricultural research and extension, and for environmental studies were reduced.

14. Although agreed at negotiations, government was unwilling to use foreign consultants at the level envisaged at appraisal. The international experts for the Dam Safety Review Panel were only appointed in 1996. Environmental studies were particularly affected – the Food and Agriculture Organization, for example, was only subcontracted in April 2000 after five years of negotiation and this affected the utility of the outputs produced. Despite these problems, the project closed on schedule.

3. Evaluation

15. **Bank lending overcame internal and external financial constraints on development projects.** A key finding of the Bank's economic and sector work was that among lower-middle income countries, Iran had an exceptionally low level of external debt relative to its income and exports.[5] With its abundant natural resources, and both recent and

5. World Bank. 1991. Iran-Reconstruction and Economic Growth. Report No. 9027-IRN in 2 volumes. July 30, 1991.

proposed economic reforms, Iran was considered to have strong potential for long-term growth that could be realized through additional loans for needed investments while maintaining its low relative indebtedness. In consequence, the Bank in its first 1993 Country Assistance Strategy agreed to increase investment lending gradually to about US$600-700 million for 3 to 4 projects per year and help mobilize other international resources to support Iran's economic reforms.[6]

16. Bank financing overcame local budget problems. In both projects, assured and regular Bank funding attracted good contractors and enabled significantly larger projects to be completed in a timely way. Without the projects, the official view was that the same works would have been done in a piecemeal way over 20 or more years, thus muting the impact of the investments and a sector-wide approach. Additionally, there was a strong view, particularly in irrigated agriculture, that the Bank synergized organizations involved and demonstrated the efficacy of its multi-sectoral approach.

17. **The projects were highly relevant to Iran's development agenda in the early 1990s.** Government's reforms, articulated in its First Five Year Plan (1988-93), aimed at increasing reliance on market mechanisms, enhancing the role of the private sector in the economy, expanding social safety net programs, and elevating the attention given to human resources development. At the same time, Iran had huge reconstruction and development needs following the 1978-88 Iraq war and a severe earthquake in northern Iran in June 1990. Following an approach from government that was concerned that the large backlog of reconstruction and development expenditures was held back by lack of finance, the Bank agreed to undertake a program of economic and sector work.

18. **The outcome of the Tehran Drainage Project is rated satisfactory while the outcome of the Irrigation Improvement Project is rated moderately satisfactory.** These differing outcomes reflect generally unsatisfactory performance on institutional development and its greater importance in the Irrigation Improvement Project. Project ratings on the projects' relevance, efficacy, and efficiency that were used to judge outcome are shown in Table 2. The basis for individual ratings is elaborated below. The evaluation of overall Bank and Borrower performance (paras 60 to 62) follows the detailed evaluation of each project.

TEHRAN DRAINAGE PROJECT

Counterfactual.

19. At the time of appraisal, about 4 million people lived over an area of 80 square kilometers in central Tehran. The poorest million of this population resided in and around the Shehr-e-Ray, the lowest-lying and oldest commercial area of the city. This area also attracted almost two million visitors each day and housed significant storage of transit and trade goods. In the absence of the project, this central area was flooded several times each year for up to 10 hours at a time from upstream flood runoff because of inadequate drainage capacity

6. The 1993 CAS was presented to the Bank's Board of Executive Directors with the Irrigation Improvement Project. Memorandum and Recommendations of the President. Report No. P-5947-IRN, February 19, 1993.

in the Ferouzabad canal, originally a natural gully locally called *jubes*. Relatively small-scale collector drains (the Navab main drain, and an inverted siphon drain near the railway station) constructed earlier only served to move the flood problem to the lower areas, increasing their severity. In addition to disruption of commerce and communications, flood discharges damaged stocks and vehicles, foundations of public and private buildings, underground services, and housing. The lack of a sewerage system meant that flood waters were contaminated with raw sewage and wastewater from commerce and small industry and posed serious clean-up and public health problems. In addition, large volumes of sediment and rocks were eroded from upstream areas and further exacerbated flooding and clean-up. The total annual costs of flood damage in 1992-93 were estimated to be about US$9.5 million and it was projected that these would almost double by 2005 because of increased upslope urbanization.

Table 2: Ratings for Achievement of Major and Minor Project Objectives

Objectives	Relevance	Efficacy	Efficiency	OUTCOME
Tehran Drainage Project				
Physical				
1. Provide storm water drainage to divert floods away from flood-prone areas of the city for the protection of human life and property.	**High**	**High**	**Substantial**	**Highly Satisfactory**
2. Transfer appropriate technology for the construction of tunnels.	**Substantial**	**High**	**Substantial**	**Satisfactory**
Institutional				
3. Strengthen the institutional capacity of the Tehran Municipality though technical assistance for project planning and implementation and for sound financial finance management.	**High**	**Modest**	**Not rated**	**Unsatisfactory**
Overall rating	***High***	***Substantial***	***Substantial***	***Satisfactory***
	Relevance	**Efficacy**	**Efficiency**	**OUTCOME**
Irrigation Improvement Project				
Physical				
1. Enhance water resources management through the rehabilitation and improvement of irrigation and drainage systems.	**High**	**Substantial**	**Substantial**	**Satisfactory**
Institutional				
2. Upgrade research and extension in order to raise crop output, farm incomes, and foreign exchange through increased crop production.	**Substantial**	**Modest**	**Substantial**	**Moderately Satisfactory**
3. Improve the planning and implementation capacity of the sector institutions, including the Ministry of Agriculture and Ministry of Energy.	**Substantial**	**Modest**	**Not rated**	**Unsatisfactory**
Overall ratings	***Substantial***	***Modest***	***Substantial***	***Moderately Satisfactory***

20. Apart from measuring inputs and outputs (disbursements and physical progress) there was no attempt to establish a monitoring and evaluation framework to determine achievement of project objectives relating to technology transfer and alleviation of flooding – even though data on flooding and its impacts and costs could have been collected.[7] Inconsequence. OED had to rely on inspection, interviews and anecdotal information.

Relevance

21. **The high relevance of the objective to improve financial management of Tehran Municipality was affirmed by the project's experience.** An audit undertaken by the national Audit Organization of the Ministry of Economic Affairs and Finance in 1995 noted "there are no internal controls and procedures with respect to the determination, collection and receipt and payments of levies charged…"; and that the Tehran Municipality did not implement a Comprehensive Accounting Manual required by Iranian law and continued to employ cash accounting. Consolidated financial statements were not prepared. Additionally, the audit found that the Municipality had entrusted certain activities to non-accountable corporations and organizations it had established. As a result of these and other findings, the Auditors were unable to "express any opinion on the financial statements."[8] Annual Audits to the end of the project carried the same opinion.

22. **Although a relevant concern at appraisal, the need for technical assistance to improve project planning proved to be less than anticipated.** While technical assistance was needed to help preparation of contract packages to meet the Bank's procurement requirements, most project planning was successfully conducted by Iranian consultants with modest support from foreign consultants. Even though the OED mission was told the Bank seemed unaware of Iranian tunneling and contracting expertise, use of specialist consultant support to guide utilization of the new underwater tunnel boring machine was highly relevant.[9] Currently, technical assistance is not needed because of the high technical competence of local planners, consulting engineers, and contractors

Efficacy

23. Overall efficacy is rated substantial.

Objective 1: Urban flooding in central Tehran was minimized by the project

24. **Infrastructure constructed was appropriate and effective.** The project's system-wide and integrated approach completed part of the city-wide drainage infrastructure master

7. Each of Tehran's 21districts is responsible for flood alleviation and clean up. However, there is no systematic recording by either these districts of the central municipality of property, goods or communications damaged or the extent of flooding even though these data are available from insurance claims, tax records etc.,.

8. Islamic Republic of Iran Audit Organization. Audit of Tehran Municipality, December 15, 1995.

9. Interviewees told the OED mission that Iran had developed significant planning and tunnel boring expertise during the construction of Tehran Metro. The first stage started in 1986 and involved digging 54 kilometers of tunnels. The Metro was commissioned in the period 2000-03

plan. As such, it considered the drainage needs from the highest to lowest elevations (693 meters) to mitigate the drainage problem in central Tehran.[10] The project constructed the Khyam main drainage tunnel over a length of 9.6 kilometers and this fed into a retention reservoir through a 1.8-kilometer long and 4.6-meter diameter tunnel. The retention reservoir discharged to the Kan river south of Tehran through a 13.5-kilometer long and 1.6 meter diameter tunnel. With its own funding, Tehran Municipality extended the tunnel headworks above the Khyam tunnel by two branches of 3 and 6.8 kilometers to intercept a greater catchment area. As a result of these tunnels and appurtenant structures (flood intake shafts, street drain inlets, and manholes), flooding in central Tehran and Shehr-e-Ray has been brought under control. Increased drainage induced by the tunnels lowered the water table under central Tehran and is an additional benefit.

Objective 2: Transfer of tunnel technology was successful

25. The upper 4 kilometers of the Khyam tunnel were above the water table but 35 meters below street level while the lower 5.6 kilometers, averaging 27 meters below ground level, was below the water table. This significant technical challenge of the submerged tunnel to bidders on contact was one of the primary reasons that the initial bids were double appraisal estimates (para. 10). This problem was resolved by repackaging the single contract into three contracts and reducing the risks to potential bidders through provision by Tehran Municipality of an earth pressure closed shield tunnel boring machine (TBM) able to operate below the water table. The TBM was financed by the project and imported from Canada in 1997. Technical assistance provided relevant tunnelling expertise and training for local counterparts.[11]

26. Project staff and municipal officials were very positive about the utility of the TBM and the high quality of technical knowledge and advice provided by the foreign tunnelling consultant. The local consultant's team managing the TBM maintain it in excellent order, and since the project closed they have used it to construct further tunnels to extend the deep drainage system.

Objective 3: Institutional capacity of Tehran Municipality was only modestly enhanced

27. Although Tehran Municipality used a modest amount of technical assistance for project planning and implementation of the civil works (through partnerships with local consulting firms), it did not accept the idea that external advice was needed to ensure sound financial management. The Bank was keen to get the revenue base and financial management studies implemented by external consultants but was unable to overcome the resistance of Tehran Municipality. After first resisting the concept, the Municipality was subsequently unable to agree on the terms of reference for the study and later undertook to do it internally,

10. The drainage problem was mitigated, not solved, because very extreme weather events could still produce flooding. The main tunnels were sized to pass a 1 in 30 year flood; major drains 1 in 20 years and secondary drains 1 in 5 years.

11. The was substantial Iranian tunneling experience already available in Iran: the Iran Metro and in the building of hydropower dams and outlet tunnels. This was overlooked as it was in a different sector. and accounts for the "substantial" rating of efficiency on this objective rather then "high".

a position the Bank reluctantly accepted toward the end of the project. The view expressed to OED by Tehran Municipality was that they would not allow foreigners access to their accounts because it was and is a confidential internal matter. Thus, the high efficacy of engineering and planning-related technical assistance is balanced by the negligible progress on financial issues, and overall efficacy on this objective is rated modest.

Efficiency

28. **Efficiency is rated substantial.** The project, even though modified to resite the terminal reservoir away from the site of Khomeiny's Shrine, was completed with budget savings. These savings, as well as additional funding from the Municipality, enabled additional headwork collector tunnels to be constructed. Benefits resulting from the project are substantial – about US$19 million a year – and the ICR estimated the economic rate of return to be 20 percent (Annex B) and the financial rate of return 28 percent.[12] Benefits could have been higher if drainage water, which is heavily polluted, had been treated and effectively used to supplement irrigation.[13] Money spent on technical assistance for the TBM could have been reduced if locally available resources had been more fully utilized (footnote 11).

Institutional Development Impact

29. **Overall institutional development impact is rated substantial .** Tehran Municipality created the municipally-owned but autonomous Khakriz Ab Company to be responsible for all planning and technical aspects of drainage works in Greater Tehran. This company housed the project implementation unit that managed procurement and recruited a private-sector contractor to effectively supervise project works. During OED's discussion with Khakriz Ab it was clear that the company was professionally run and successfully implementing a master plan for Tehran drainage. The Municipality successfully used the Bank's loan to increase the skills of its staff to make substantial infrastructure improvements to the city. Although Tehran Municipality resisted the Bank's efforts to reform its financial procedures, it is slowly making improvements to its financial management under pressure from the Iran Audit Organization and the City Council.

Sustainability

30. **Sustainability is likely.** The very high quality of engineering and construction and the passive nature of the mostly subterranean drainage infrastructure will ensure the sustainability of the project works over its 30-year economic life. The risk of damage to

12. Benefits include reduction of damage to houses and other buildings, stocks, bridges, sidewalks and streets, telephone infrastructure, Tehran Railway station, properties along the Firouzabad Canal, and crop damage in the farming areas south of Tehran. Savings also accrued from reduction of clean-up costs and economic and commercial disruption.

13. At mid-term review the Bank considered using project savings to build a water treatment plant for the drainage water but decided this was outside the scope of the project. In part, this decision was conditioned by the lack of interest by the Ministry of Jihad and Agriculture and the Ministry of Energy.

concrete tunnel linings from increased groundwater pollution is small, and while the earthquake hazard is known, the risks are not. Technical knowledge and skills required for operation and maintenance are readily available within or through Khakriz Ab. However, funding of adequate maintenance – mainly cleaning and removing debris and sediment – is uncertain because this has been devolved to each of the 21 districts of Tehran. The municipality is aware of the problem but, to date the issue is unresolved (para 29). As far as OED could determine, none of the districts systematically plans for maintenance of deep drains, reacting only to emergencies – very much a case of "out of sight, out of mind." Although it does not threaten sustainability, a growing street garbage problem causes obstruction of surface drains and sometimes small-scale local flooding. When washed into the drainage system it ends up in the terminal reservoir and its clearance has greatly increased maintenance costs. The Municipality is acutely aware of the garbage problem and is promoting development of a solid waste management plan to deal with it.

IRRIGATION IMPROVEMENT PROJECT

Counterfactual.

31. The project was designed to improve irrigation and drainage systems in four subprojects serving a net irrigable area of about 90,600 hectares. Within these areas incomplete project infrastructure, and poor operation and maintenance, jeopardized reliable and timely water supply. Unlined canals and unleveled fields reduced water use efficiency and created drainage problems. Agricultural extension was top-down and ineffective. These factors constrained agricultural production and thus farmers' incomes. In the absence of the project, agricultural production would be constrained by physical/engineering problems over 51,050 hectares and poor agronomic and water management skills over the whole area.[14] Average cropping intensity over the 90,600 hectares was 90 percent.[15] Crop yields were generally 30 to 50 percent below potential yields in the same agro-climatic conditions.[16]

32. In the absence of the project it was expected at appraisal that these conditions would continue and that agricultural production would deteriorate by one percent a year in three of the four subprojects. The government had begun a program of phasing-out agricultural subsidies and financial sector liberalization that would affect availability of agricultural credit and cost of inputs. Although monitoring and evaluation of the project sites was initiated, no "without treatment" control sites or methods were established to enable a

14. Thirty eight thousand seven hundred hectares were already irrigated and 800 ha were under orchard. Of the residual area of 51,050 ha, over half (27,550 ha) needed significant upgrading of irrigation infrastructure (tertiary channels, lining, water control structures etc.), and 16,000 ha were saline or waste in need of land leveling and drainage. 7,500 ha were rainfed only.

15. Cropping intensity is an index of land use. If only one crop is grown over an area per year, the cropping intensity is 100 percent. If two crops are grown over the whole area – for example, summer wheat and winter vegetables – the cropping intensity would be 200 percent.

16. The major crops in terms of area are wheat, barley, alfalfa. Average wheat yields were 2 to 2.5 tons/ha compared with potential yields of 3.5 to 4 tons/ha (determined from MOJA's experimental farms). Barley yields were 1.5 to 3 tons/ha (average 2.2) and the potential was 3 to 4 ton/ha. Alfalfa yields were 3 to 4 ton/ha and the potential was 4 to 6 ton/ha.

realistic counterfactual, including background trends and exogenous effects, to be determined.

Relevance

33. **The project's objectives were and remain relevant to the sector strategies of Iran and the Bank.** Major soil and water resources were and continue to be untapped or underutilized, and there remains substantial scope to increase yields by introducing improved technology. Although the project improved irrigation and drainage infrastructure and networks, much remains to be done. Water resources remain poorly utilized because there is still a large amount of incomplete infrastructure and inadequate technology, both leading to low water-use efficiency (30 percent on average for the country). The objective to improve cross-sectoral cooperation and institutional development in managing Iran's water, agriculture, and environment was reaffirmed during execution of the projects and is a key element of government's ongoing Third Five-Year Development Plan for 1999-2004. The government emphasized decentralization and participatory involvement at the local level. This is to be matched by a decline in its participation in the operation and maintenance of irrigation schemes and a renewed focus on increasing productivity and farm incomes in agriculture.

34. The needs of the water resources and agricultural sectors were highlighted in the Bank's Agricultural and Natural Resources Management Sector Note of January 2001 and its Interim Assistance Strategy (IAS) of May 2001. The IAS supports the government's priorities of economic reforms, social protection, environmental and natural resource management and advocates a comprehensive river basin approach to water resource management. The IAS states that any new Bank involvement in water management and agricultural development of a river basin should link watershed management of the basin's upper reaches with conservation and integrated management of water resources in the lower reaches. In the lower reaches where water resources are used for irrigation and urban water supply, surface and ground water resources need to be conjunctively managed in order to support irrigation development and maintain sustainable environment management and urban water supplies. A key challenge is to improve the operation and maintenance (O&M) efficiency of the rural and urban hydraulic infrastructure, particularly in Tehran. These include declining water availability and its deteriorating quality, low water-use efficiencies, salinity, water logging and drainage, inadequate O&M, limited cost recovery, and lack of institutional coordination.

Efficacy

35. **Overall efficacy is rated substantial, but only just so**. This balances substantial achievement on physical targets, agricultural extension, and development of local-level irrigation management institutions against negligible progress on institutional objectives at the national level.

Objective 1: Management of irrigation and drainage systems and water resources improved.

36. **Original physical targets were substantially achieved**. Even though the total area of 87,500 hectares targeted for improvement was reduced by over a third at mid-term review because of cost escalation, at completion the project achieved improvements over a net area of 84,600 hectares because of efficiency improvements and design modifications. The MoE constructed or rehabilitated about 600 kilometers of main and secondary canals and 504 kilometers of drains serving 54,500 hectares.[17] The area developed by the MoJA was 33,900 hectares and included 15,400 hectares of subsurface drainage and land leveling over 8,400 hectares. Cost escalation caused cancellation of 7,900 hectares of subsurface drainage, 6,800 hectares of tertiary irrigation and 430 hectares of land leveling. Some of the works proposed were also cancelled when detailed site investigation showed these were not necessary.[18] Physical works inspected by OED were well-designed and construction quality was high.

37. **Improved infrastructure facilitates better water use**. Lining of the main and secondary canals has reduced water losses and markedly improved conveyance efficiency from about 70 to over 90 percent. With improvements in the tertiary irrigation system and better on-farm water management, this has increased overall water use efficiency to over 42 percent – before the project, overall efficiency was in the range 20-30 percent.[19]

38. **Pilot water management studies show low on-farm water use efficiency**. Trials conducted by the general consultants over the four cropping seasons 1999-2000 in the Behbahan and Moghan subprojects demonstrated that significant water savings – 42 percent on average – could accrue from better farmer management. And average field application efficiency increased from 28 to 58 percent.[20] Reduced water application also led to higher crop yields, ranging from 7 to 73 percent. When standardized (in kilograms of yield per cubic meter of water) overall improvements in water use efficiency averaged 139 percent (ranging from 76 to 257 percent). These results highlight the importance of increasing the effectiveness of agricultural extension services.

39. **But lack of volumetric water sales limit farmers' incentives to conserve water.** As part of the modernization process, insufficient attention was given to equipping canals, diversions, and outlets with devices to measure discharge. This is the result of adopting gated water control structures that make flow measurement difficult and require manual operation. Consequently, following national practice, farmers and individual water user groups (WUGs)

17. The total area covered by both agencies combined was 87,400 ha, but this included a common area of 2,800 ha served by MoE's primary and secondary canals and MoJA's tertiary canals, land leveling and/or drainage.

18. For example, at Behbahan the presence of subsurface gravel beds preclude construction of lateral drains and only collector drains were needed – this led to cost savings of 25 percent.

19. Personal communications from Herve Plusquellec after visiting Iranian irrigation systems, May 2004. For the Moghan subproject Plusquellec estimates primary and secondary conveyance efficiency to be 90 percent, tertiary distribution 85 percent, and on-farm application 40 percent.

20. Three treatments (20 ha total) were set up with three repetitions and reference in each season at Behbahan and Moghan. The main variable was the interval between irrigations; subsidiary variables included different field preparations and plant layout.

are only charged for water by MoE according to the area and crops grown in each season, despite the clear evidence that too much water is being used.[21]

40. **Maintenance of facilities is well-managed and overhead costs have been reduced.** The high quality of the engineering of new and rehabilitated infrastructure is robust and this has minimized maintenance costs. And since 1992, the MoE has created a number of Operation and Maintenance Companies empowered to employ consultants to plan and supervise maintenance programs carried out by contractors on the primary and secondary irrigation canals. Tertiary maintenance is normally undertaken by farmers and water users' groups under contract to the OMCs using 10 to 15 percent of the water user fees collected. These newly introduced arrangement appear to be working well.

41. **Environmental concerns were addressed but need to move beyond studies.** Environmental studies successfully heightened awareness of water quality issues and wetland conservation. Agrochemical, surface water and groundwater quality monitoring programs were developed under the MoJA's Agricultural Research and Education Organization and specific wetland and wildlife investigations were undertaken by consultants supervised by staff of the Department of the Environment embedded with the MoE/MoJA subproject implementation teams.[22] In all, 24 studies were completed and two – a census of migratory birds and establishment of a gazelle sanctuary – were cancelled. These programs were significantly under-funded by MoE and MoJA (who held the purse-strings), and got off to a late start (para. 14) because of their low institutional priority. This meant that most studies were completed just as the project was ending and funds ran out. In consequence, none of the proposals has been implemented.

Objective 2: Crop production and farm incomes increased

42. With assured and timely water and improved agricultural extension services, crop production increased. Improved agricultural extension was brought about by 4,620 individual courses that reached 33,500 farmers. Table 3 summarizes project achievements according to the results of monitoring studies carried out by the project consultants.

43. Agricultural research under the project demonstrated that higher productivity increases were also feasible through better management of fertilizer, pesticides, and improved cultivation. The results from six pilot villages (spread over the four subprojects), where the Agricultural Research and Education organization implemented improved extension services, show significant income gains (Table 4). However, on a larger-scale, what is normally experienced is that actual on-farm yield improvements are about half of those found under intense supervision.

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21. Each province has standards that relate irrigation fee to crop type and yield with allowances being made for reduced yields due to pests, drought, or salinity. The fee-setting process is the responsibility of the agricultural extension organization and water fees are collected by project Operation and Maintenance Companies that subcontract this service to the private sector.

22. Major studies included Marun Fish Management, and environmental management plans for the 527,000 ha Shadegan Marshes near Behbahan and the Lake Uromiyeh National Park adjacent to the Zarinneh Roud subproject.

44. Individual farmers and farmers' groups interviewed by OED confirmed that in all cases their incomes had increased as a result of project interventions (land consolidation, leveling, irrigation, and better extension). For example, at Behbahan, farmer Ibrahim, who was earlier only able to irrigate a quarter of his own 7 ha and barely sustain his family, is now irrigating all his land and saving regularly.

Table 3: Increased agricultural productivity, 1993-2003

Subproject	*Area (ha)*	*Cropping Intensity*		*Average Yield Increase*
		Before	*After*	
Behbahan	11,500	88	129	38
Moghan	35,600	104	138	49
Zarrineh Roud	36,000	70	81	90
Tajan	7,500	95	117	48
Overall	-	*90*	*113*	*64*

Source: Liaison Office of MoJA and Yekom Consulting Engineers, December 2003

Table 4: Improved income with better extension services on pilot farms

Pilot	*Crop*	*Chemical Fertizer (kg/ha)*	*Herbicide (kg/ha)*	*Pesticide (kg/ha)*	*Yield Increase (kg/ha)*	*Net Increase in Incomes (Rials/ha)*
Moghan/Parsabad	Cotton	na	-60	-60	+860	na
	Silage	-174	-0.7	-1.5	+640	+100,000
Moghan/Bileh Savar	Cotton	-84	-.03	-4.8	+113	+790
	Soya	-176	0	-3.0	+920	+1,000,000
Tajan/Joibar	Rice	-27	-1.8	Not used	+503	+2,650,000
Tajan/Sari	Rice	-225	0	-2.1	+404	+1,500,000

Source: Liaison Office of MoJA and Yekom Consulting Engineers, December 2003

45. Based on monitoring results conducted for the ICR, the increase in net farm income ranges from 40 percent to over 200 percent (Table 5). While it is clear that much of this increase may be attributed to the project based on farmers' feedback, the effects of overall improvements in the economy on farming are unknown because of the lack of control sites and monitoring to determine "without project" trends and exogenous influences (para 32).

Table 5: Farm incomes increased

Subproject	*Before Project (Rials '000)*	*After Project (Rials '000)*	*Increase projected in SAR (%)*	*Increase at the end of the project (%)*
Behbahan	8,400	29,500	153	251
Moghan	17,100	36,000	153	110
Zirrineh Roud	3,500	11,100	346	217
Tajan	7,200	10,100	165	40

Source: ICR, Annex 7.

Objective 3: Capacity improvements of sector organizations was good at the local level but poor central coordination remains an issue

46. The project provided extensive overseas and local training to improve the capacity of sector organizations' capacity as well as providing buildings and vehicles to subproject management facilities – a major issue given Iran's political isolation. As with environmental activities, training was initially given a low priority in the budget allocation process and many proposals were delayed or cancelled by the Budget and Planning Office of the Ministry of Finance. The MoE did not fully utilize the opportunities available to improve management, engineering and other technical courses – only 522 staff participated against the 877 planned – and the proposed international short courses in Iran and overseas study tours were cancelled. Conversely, the central level MoJA staff attended 80 percent more local short-courses than planned. Like MoE, however, they cut back on overseas fellowships although they did undertake six study tours. Most importantly, MoJA increased the number of local short courses for subproject staff in the regional offices and utilized 108 staff months on overseas short courses.

47. The feedback to the OED mission was that these courses – particularly those in agriculture – made a very important contribution to updating participants on advances in technical, engineering, and managerial knowledge outside Iran. However, the focus of training and courses was primarily technical and followed the distinctly different interests of the MoE and MoJA. The attention given to the cross-cutting and comprehensive water management issues that involve the social sciences and environmental management was minimal. Consequently, capacity-building did little to foster a more coherent approach to agriculture and water management or facilitate better coordinated planning at the central level between MoE and MoJA.

Efficiency

48. **Overall efficiency is rated substantial.** The counterfactual was modified during the ex-post ICR economic analysis by dropping the assumption that agricultural productivity would have continued to decline in the absence of the project; MoJA data showed that yields remained stable. On this assumption and taking account of agricultural productivity increases observed (but not water savings or other environmental impacts), the weighted average economic rate of return over 25 years was estimated to be about 16 percent. The efficiency of

the Zarrineh Roud subproject is modest at best. It had the lowest ERR of about 7 percent because of the extensive concrete lining of most irrigation canals by MoE. However, extensive water savings (which were not taken into account in the ERR) will have significant and positive environmental benefits on the Lake Umriah ecosystem. Behbahan is modestly economic at about 9 percent primarily because of its constrained water supply. Moghan and Tijan subprojects had ERRs of 22 and 23 percent respectively. However, the Tijan ERR was bolstered by inclusion of the benefits of improved extension by the project over 21,000 ha of rainfed area.

Institutional Development Impact

49. **Institutional development impact is rated as modest.** While the performance of field-based organizations and formation of farmers' and water users' groups was excellent, capacity-building did little to foster a more coherent approach to agriculture and water management or facilitate better coordinated planning at the central level between the Ministries of Energy and the Ministry of Jihad and Agriculture. Attention given by these organizations to cross-cutting and comprehensive water management issues that involve social concerns and environmental management remains minimal.

50. **Participatory water management was successfully introduced but is fragile.** Before the project, farmers were individually billed for water by the Provincial Water Authorities (PWAs) through their operational management companies that covered about a third of projects classified as modern. OMCs were only accountable to the PWA; their income was derived from the center, not the users; and they were only concerned with O&M of the primary and secondary distribution systems. Water fees collected were submitted to the central treasury. As noted above (para. 39), there were few incentives for water economy. As a result, agricultural production was risky because water supplies were irregular and sometimes short. In addition, some water user groups were reestablished to replace traditional water groups that had become defunct as modern concrete systems required nothing from them. Also many believed fees paid to OMCs covered the whole system and therefore were unwilling to do operation and maintenance activities.

51. The project addressed these problems in two ways. First, it set up pilot water user groups in the Bebahan and Tajan subprojects. Second, the relationship between the OMCs and the WUGs and farmers' representatives was made more participatory with representatives of the latter groups being represented on various OMC committees. In the north, at Tajan, seven WUGs covering the newly irrigated area of 647 hecatares have formed the Nomouneh Tajan Water Users Cooperative Company; another 130 WUGs cover 7,763 hectares of rehabilitated irrigation systems. In the southwest, nine WUGs covering 650 hectares have formed the Behbahan Water Users Cooperative Company. Both water user consumer cooperatives (WUCCs) have legal status and are active. Because both groups formed late in the subprojects, they were not involved in either the planning or implementation stage and still look to government for leadership.

52. The Behbahan WUCC, established since 2001, has legally enforceable contracts with each of its 161 members for the delivery of water it receives from OMC and it collects their fees for OMC. Interviewed farmers report that the WUCC committee works well in their

interests. Farmers were very happy with the improvements brought by the project, especially the 8,000 hectares of land leveling and consolidation, and were very positive about the impact of the improved agricultural extension service brought about by consultants training MoJA staff who, in turn, trained farmers. A major problem experienced by the WUCC committee in terms of upgrading knowledge and management is that only about 20 percent of farmers have education above the primary level.

53. At Behbahan, the WUCC perceives that, in contrast to MoJA, the MoE (represented by the Khudastan Water and Power Authority, KWPA) has no interest in their concerns. Water shortages from the secondary canal have led to some unresolved disputes in the tail-end areas. Complaints to MoJA are referred to the KWPA and nothing happens – this appears to be a symptom of poor cooperation between the two ministries. An informal agreement between the WUCC and operation and maintenance company on a share (10 to 15 percent) of irrigation fees to pay for tertiary-level O&M activities fell through because the Regional Water Company would not authorize it. While a way around this problem has been temporarily negotiated, it has undercut the Behbahan WUCC's trust in the KWPA.

54. In the Tajan subproject, the working relationship with the Mazandaran Province operation and maintenance company (MWPA) seems more one of equals. In exchange for a 50-year O&M contact, the MWPA has authorized a 15 percent fee to the Nomouneh Tajan WUCC for O&M services and has given them a 20 percent discount on repayment of capital investment costs. In each of its three years of operation the WUCC has collected 100 percent of the water fee. Revenue from all the WUGs within Tajan, however, is not quite as good. In 2001 it was 65 percent of billings, 70 percent in 2002, and 90 percent is expected in 2003.

55. In each of the three subprojects visited, irrigation fees cover about three-quarters of the total O&M expenses, the balance being subsidized by the government through MoE. However, water fees could be increased without hardship to farmers and cover full O&M costs. The revealed preference of a randomly selected farmer, farmer Ali Asan (Box 1), shows that he is willing to pay more than three times the official irrigation tariff.

Box 1. Farmers are willing to cover full costs of operation and maintenance

In Tajan, Ali Asan farms 3.5 hectares of which 3 hectares lies outside the subproject area and the irrigation this provides. The half hectare inside is planted with rice that yields about 4 ton/ha and on which he pays a 200,000 Rials (US$25) water fee. He irrigates the 3 hectares outside the subproject area from his own 25-meter deep centrifugally-pumped tubewell that cost 5 million Rials to construct, has a life of 5 years, and costs 2.5 million Rials a year to run. He total annual costs are therefore about 3.5 million Rials or about 1.2 million Rials/ha. He grows orchards, cotton, and vegetables on this land. If he had been billed for receiving water from the subproject he would have paid between 208,000 Rials/ha for cotton and 483,000 Rials/ha for orchard – on average about 300,000 Rials/ha. Thus, his revealed preference is that he is prepared to pay three times the official irrigation tariff for surface water – providing the supply is as reliable as his well water.

Interview December 8, 2004.

56. **Agricultural extension was rejuvenated and reorganized**. In 2001, the government merged the Ministry of Jihad and the Ministry of Agriculture. Thus animal services, forest

fisheries, and natural resources formerly under the MoJ merged with the crops and horticulture services provide by the Ministry of Agriculture (MoA). Subsequently, in 2002, the MoJA completely reorganized and decentralized research and extension to reduce the dominance of research and give more prominence to extension. Under these changes it is expected that program development will shift from central to provincial level and that research will become more aligned to farmers' needs. The intention is that field-level committees would feed back demand-led research proposals to the provincial programming committees. In turn, this would feed upwards into a national policy committee as appropriate.

57. Interviews by OED show that these organizational changes are hard to discern in the field. Research still dominates and receives the lion's share of budget – some 5,200 professional staff conduct over 3,000 research activities under 28 national institutes, 53 research centers, and 360 research stations and farms. Most of the project's funds went into equipping research stations and farms and training – and that was at the very end of the project. At the field level, scientific staff are hard to retain because of relatively poor conditions for families, inadequate transport, and uncertain budgets. Lack of email and computers curtails effective networking and development of synergy from local research. While there were significant improvements linking research to extension to farmers in the pilot projects, it is unclear how far this is being replicated on a larger scale.

58. **An integrated approach to water resources management is lacking.** The coordination difficulties experienced in implementing this project remain. Key organizations – MoE, MoJA, and DOE continue to act independently on key water resources management and conservation issues at the central level. In the provinces, there is a more collegial approach, but MoE and its engineering focus dominates.

Sustainability

59. **Sustainability is likely.** Infrastructure engineering and design is of high quality and robust.[23] Farmers are highly motivated because of their increased incomes and willingly cooperate with MoE and MoJA on operation and maintenance. Unlike many countries, the OED mission saw no tampering or damage to water regulation and diversion structures. Water fees are sufficient to cover 60 to 80 percent of the actual operation and maintenance costs, the balance being met by subsidies from the center. Realized billings exceed 80 percent in all the subprojects visited and it is reported that they are 100 percent in the Mogham subproject. The Operation and Maintenance Companies are effective in their task. Water users' and farmers' groups are successfully managing the operation and maintenance of tertiary irrigation canals.

23. There is one exception. In the Berbahan subproject a section of the main canal (not built by the project) built over gypsiferous soils and strata collapsed and disrupted irrigation supplies to 4,000 ha assisted by the project. This is currently under repair.

OVERALL BANK AND BORROWER PERFORMANCE

60. **Bank performance is rated as satisfactory for both projects.** Technical design was sound and appropriate, particularly for the Tehran drainage project. More attention could have been given to broader issues of water resources management and conservation, on which irrigation depends. However, appraisal of both projects was hampered by the Bank's inexperience in Iran and inadequate knowledge of the implementing agencies. At appraisal, the Bank seemed unaware of the external perception of high risks for foreign involvement in Iran and its insistence on international competitive bidding was problematic and adversely affected realistic procurement planning. There was clearly a breakdown of understanding over the study of municipal finances, but technical assistance for tunneling was at the right level and appropriate given high local capacity. In the irrigation project there was almost no consultation with proposed project beneficiaries and the process was very top-down. The Bank over-estimated the implementing agencies' willingness to cooperate and coordinate in the irrigation sector and underestimated needed support for environmental management. The Bank should have been more demanding of the borrower, particularly for the irrigation project. Following its thorough mid-term review, during which most of the initial shortcomings were addressed, implementation significantly improved and led to a successful outcome. The reintroduction of water user groups for modern irrigation was very successful, as were the pilots to introduce better on-farm water management and agronomic practice. Thus, on balance, the Bank's performance is rated satisfactory.

61. **Borrower performance was uneven in both projects; overall it is rated satisfactory, but only marginally so.** The Tehran Drainage project had strong ownership, except on issues of municipal finances. Counterpart funding was both timely and adequate, as was procurement. On balance, borrower performance was marginally satisfactory because of the unwillingness to reform finances.

62. While project correspondence indicates initial high borrower ownership of irrigation project objectives, once the project was approved it became the hostage of the central budget organization that had not been involved in either project identification or appraisal. In part, the budget and planning organization's position was the result of a substantial increase in rehabilitated or new irrigation and drainage projects, which rose from 90 in 1988 to 230 in 1997. This lack of strategic targeting spread financial resources too thinly and, thus, the first few years of implementation were dominated by a lack of adequate counterpart funding and serious procurement delays over procedural issues. This was exacerbated by a high turnover of key staff in the MoE and MoJA and very poor central coordination. Both MoE and MoJA were unable to see beyond their own areas of interest (primarily engineering and agriculture) and, as a result, environmental aspects of the project were sidelined and starved of funding. Performance within the MoE and MoJA and their provincial agencies improved during the life of the project and both eventually delivered good quality products, meeting most major engineering, agricultural, and development objectives. At the provincial level, project ownership is high and staff are generally effective.

4. Findings and Lessons

Findings

63. The Tehran Drainage and Irrigation Improvements Projects supported the government's resolve to address water resources and environmental management in Iran and devolve management to provinces and beneficiaries. While there were significant advances in the provision of well-engineered infrastructure to manage water, and the creation of institutions to operate and maintain irrigation facilities, the projects only covered about 20 percent of the areas requiring good water management, and much remains to be done. The two biggest problems highlighted by the Bank's experience are a lack of comprehensive and integrated planning and management of Iran's water resources, and insufficient attention to water conservation and pricing. Water conservation in particular requires more attention to awareness raising at the center and provincial level, and through greater involvement of beneficiaries in water planning decisions at the field level.

64. The lack of a comprehensive approach means that water resources management is dominated by hydroelectric power and irrigation organizations and that there is little attention to identifying environmental requirements and conserving water. Not only do these organizations control water resources planning, they all implement projects, manage cost recovery, and regulate. There are clear conflicts of interest and duplication of effort. In Tehran, this means that the drainage master plan remains unintegrated in a regional water strategy and that opportunities to conserve water and minimize costs are ignored. Indeed, the MoE is independently trying to address the problem of high groundwater levels through installation of drainage wells when there is spare capacity in the main collector drain constructed by the municipality. Although Tehran's drainage water is proposed for agriculture, neither the need for water treatment nor coordination with the MoJA has been thought necessary.

65. In the irrigation sector, neither MoE nor MoJA show much concern for the environmental impact of their projects or related agro-ecological issues. Not only does this lead to inefficient water allocation and use, it diverts attention from watershed management. Current overgrazing of rangelands, deforestation, and cultivation of marginal lands is threatening both water conservation and increasing the risks of flooding, soil erosion, and loss of wetland resources. The government set up a High Council for Water in 2001 to facilitate creation of institutions for better national water management – perhaps even a separate Ministry for Water – but, to date, this has been successfully resisted by the MoE as it has the most to lose.

66. Iran is a water-short country and the projects demonstrated there are ample opportunities for water conservation. Currently, 92 percent of Iran's developed water resources are used for irrigation, and slightly under half, 3 million hectares, is managed by the MoE through an extensive network of diversion dams and reservoirs to supply modern irrigation to 1.6 million hectares. Within this area, the MoJA is actively constructing tertiary irrigation systems to cover 0.7 million hectares and undertaking on-farm development on 0.4 million hectares. Clearly the Bank's Iran experience shows that the first priority is to improve

irrigation infrastructure in existing projects to increase conveyance efficiency. A second priority is to attend to land constraints – land consolidation and leveling – and expand agricultural extension services to disseminate water conserving practices developed on the pilot farms. However, until pricing incentives to improve water conservation are taken seriously by policymakers, any progress is unlikely.

67. The Bank's Interim Assistance Strategy (IAS) of May 2001 supported the government's stated priorities of economic reforms, social protection, environmental and natural resource management. The IAS advocated a comprehensive river basin approach to water resource management and attention to improving the O&M efficiency of the rural and urban hydraulic infrastructure. In response, the MENA region is preparing an FY05 project to introduce an integrated river basin approach to land and water resources management in the Alborz river basin of Mazandaran province, where the Government of Iran is currently constructing a medium-sized dam. Issues to be addressed include watershed management, inter-sectoral water conflicts in ground and surface water usage, extended support for water user groups, and environmental and social assessment.

68. The government was very positive about the Bank's ability and comparative advantage on knowledge transfer and institutional capacity building. They want more of this assistance, especially in integrated water resources management at the basin level and in environment and social assessment. From the Bank's side, the combination of technical assistance and investments would provide the opportunity to develop its status as a knowledge institution in line with the Bank's Water Resources Sector Strategy (2003). The preparation of the proposed project is fully consistent with the objectives outlined in the Country Water Resources Assistance Strategy and the Urban Water Supply and Sanitation Project under preparation.

Lessons

69. Experience with this project confirms a number of OED lessons:

- It is essential to understand sector institutions, their governance, incentive structures, and interrelationships before finalizing an investment operation. A first step is to ensure that all stakeholders are identified and participate in project design. Failure to do so risks that some objectives will not be fully owned and that lack of cooperation among key organizations will jeopardize their achievement.

- Whatever water infrastructure is provided or improved, a fundamental requirement for sustainability is building adequate technical and beneficiary capacity to allow integrated operation and maintenance and a dispute resolution mechanism. This is particularly important when management is devolved hierarchically and separated between a public service provider and private users groups.

- Many countries have excellent human and technical resources, particularly in the private sector, and good project design needs to carefully balance the type, scale, and use of external and internal consultants. Too much foreign technical assistance undermines local ownership and causes resentment; too little risks inadequate capacity-building.

- Water conservation is difficult to achieve if the water fee structure is not linked to volumes of water used. In turn this requires investment in water measurement, monitoring and recording equipment and a willingness to abandon the crop and area basis for charging, as it provides no incentive to farmers to conserve water.

Annex A. Basic Data Sheet

IRAN: TEHERAN DRAINAGE PROJECT (LOAN 3479)

Key Project Data *(amounts in US$ million)*

	Appraisal estimate	*Actual or current estimate*	*Actual as % of appraisal estimate*
Total project costs	95.6	111.3	116
Loan amount	77.0	77.0	100
Cofinancing	-	-	-
Cancellation	-	-	-

Cumulative Estimated and Actual Disbursements

	FY93	*FY94*	*FY95*	*FY96*	*FY97*	*FY98*	*FY99*	*FY00*	*FY01*
Appraisal estimate (US$M)	0.3	19.2	41.9	66.5	75.4	76.8	77.0	77.0	77.0
Actual (US$M)	-	-	-	4.4	18.4	35.0	54.6	73.3	77.0
Actual as % of appraisal	-	-	-	6	24	45	70	95	100

Date of final disbursement: 6/30/2001

Project Dates

	Original	*Actual*
PCD	-	9/13/91
Appraisal	-	2/3/92
Board approval	-	5/28/92
Effectiveness	8/4/92	10/30/92
MTR	3/15/95	6/22/96
Closing date	12/31/98	12/31/00

Staff Inputs (staff weeks)

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US$ ('000)
Identification/Preparation	18.8	55,000
Appraisal/Negotiation	14.1	44,500
Supervision	95.7	326,400
ICR	7.0	25,000
Total	135.6	450,000

Mission Data

Stage of Project Cycle			*Performance Rating*	
Month/Year	*Count*	*Specialty*	*Implementation Progress*	*Development Objective*
Identification/Preparation				
10/91	*3*	Sanitary Engineer, Financial Analyst, Tunnel Specialist		
1/92	*7*	2 Sanitary Engineers, 2 Financial Analysts, 1 Economist, 1 Environmentalist, 1 Tunnel Specialist		
Appraisal/Negotiation				
2/92	*7*	2 Sanitary Engineers, 2 Financial Analysts, 1 Economist, 1 Environmentalist, 1 Tunnel Specialist		
Supervision				
11/92	*2*	Sanitary Engineer, Tunnel Specialist	S	S
2/93	*1*	Sanitary Engineer	S	S
5/93	*1*	Sanitary Engineer	S	S
8/93	*2*	Sanitary Engineer, Financial Analyst	S	S
1/94	*2*	Sanitary Engineer, Financial Analyst	S	S
9/94	*3*	Sanitary Engineer, Financial Analyst, Economist	U	S
4/95	*2*	Sanitary Engineer, Financial Analyst	U	S
12/95	*2*	Sanitary Engineer, Financial Analyst	U	S
6/96	*2*	Financial Analyst, Sanitary Engineer	U	S
6/97	*2*	Financial Analyst, Sanitary Engineer	S	S
11/97	*2*	Financial Analyst, Sanitary Engineer	S	S
9/98	*2*	Financial Analyst, Sanitary Engineer	S	S
12/98	*2*	Financial Analyst, Sanitary Engineer	S	S
5/99	*2*	Financial Analyst, Sanitary Engineer	S	S
1/00	*2*	Financial Analyst, Sanitary Engineer	S	S
7/00	*2*	Sanitary Engineer, Financial Analyst	S	S
11/00	*1*	Financial Analyst	S	S
ICR				
11/00	*1*	Economist,	S	S
2/01	*1*	Sanitary Engineer	S	S

Other Project Data

Borrower/Executing Agency:

FOLLOW-ON OPERATIONS			
Operation	***Loan no.***	***Amount (US$ million)***	***Board date***
Teheran Sewerage Project	4551	145	5/18/00
Water Supply Sanitation Project	-	279	5/25/04
Environment Management Support Project	4688	20	4/8/03

IRAN: IRRIGATION IMPROVEMENT PROJECT (LOAN 3570)

Key Project Data *(amounts in US$ million)*

	Appraisal estimate	***Actual or current estimate***	***Actual as % of appraisal estimate***
Total project costs	311.7	311.7	100
Loan amount	157.0	157.0	100
Cofinancing	-	-	-
Cancellation	-	-	-

Cumulative Estimated and Actual Disbursements

	FY94	***FY95***	***FY96***	***FY97***	***FY98***	***FY99***	***FY00***	***FY01***	***FY02***
Appraisal estimate (US$M)	12.4	38.0	61.7	84.1	104.8	123.8	138.2	157.0	157.0
Actual (US$M)	-	0.2	7.4	18.4	39.0	57.2	103.5	152.2	157.0
Actual as % of appraisal	-	-	11	21	37	46	75	96	100

Date of final disbursement: 12/31/01

Project Dates

	Original	***Actual***
PCD		9/30/91
Appraisal		11/11/92
Board approval		3/16/93
Effectiveness	4/29/93	4/29/93
MTR	9/10/97	3/18/98
Closing date	6/30/01	6/30/01

Staff Inputs (staff weeks)

Stage of Project Cycle	*Actual/Latest Estimate*	
	No. Staff weeks	*US$ ('000)*
Identification/Preparation	88.8	92.5
Appraisal/Negotiation	322.4	1,311.1
Supervision		
ICR	10.0	30.0
Total	421.2	1,433.6

Mission Data

Stage of Project Cycle				*Performance Rating*	
	Month/Year	*Count*	*Specialty*	*Implementation Progress*	*Developmt Objective*
Identification/Preparation					
	Identification: October 1991 1/	2	E, A		
	Preparation: Jan./Feb. 1992	6	A, IE, WRS, EX, E, ES		
Appraisal/Negotiation					
	Pre-Appraisal: June/July 1992	10	IE, OP, ES, A, S, IL, A, IF, EC, EX		
	Appraisal: Oct./Nov. 1992	5	IE, OP, ES, A, S		
Supervision					
	June/August 1993 2/	5	IE, IE, P. FN, E	U	U
	December 1993	2	IE, A	U	U
	July 1994	2	IE, A	U	S
	October 1994	1	IE	U	S
	April 1995	2	IE, ES	U	U
	September 1995	1	DS	U	U
	November 1995	2	IE, ES	U	U
	June 1996	3	IE, A, ES	U	S
	December 1996	2	A, EX	U	S
	May 1997	5	OP, IE, A, ES, M&E	S	S
	November 1997	2	IE, ES	U	S
	March 1998 (MTR)	5	IE, A, IE, A, E	S	S
	November 1998	6	IE, A, ES, IE, A, P	U	S
	April 1999	5	IE, DR, A, A, ES	S	S
	January 2000	6	IE, IE, DR, ES, P, A	S	S
	June 2000	3	IE, A, E	S	S
	November 2000	3	IE, IE, DR	S	S
ICR					
	June, 2001	2	E, A	S	S

AE = Agricultural Economist; E = Economist; EC = Ecologist; ES = Environmental Specialist;
IL = Institutional Legal Expert; S = Sociologist; OP = Operations Officer; P = Procurement Specialist;
IE = Irrigation Engineer; A = Agronomist; DS = Dams Specialist; EX = Extension Specialist;
M&E = Monitoring and Evaluation Specialist; DR = Drainage Specialist; WRS = Water Resources Specialist

1/ A joint WB/FAO-CP mission, composed of an Economist and an Agronomist, took place in July 1991 to agree with the GOI on the concept of an Irrigation Rehabilitation Project.

2/ Including project launch workshop

Other Project Data

Borrower/Executing Agency:

FOLLOW-ON OPERATIONS

Operation	*Credit no.*	*Amount (US$ million)*	*Board date*
Alborz Integrated Land & Water Management	-	120	01/2005 (proposed)

Annex B. Iran: Teheran Drainage Project (Loan 3479)

Actual Project Costs (local and foreign costs) for different components of the project

Project	*Costs US $ (financed by the World Bank)*	*Costs US$ (Financed by Municipality)*	*Total Costs US $*
Tunnel 1	10,241,271	6,011,784	16,253,056
Tunnel 2	26,023,764	6,765,458	32,789,222
Tunnel 3	12,946,348	5,305,881	18,252,229
Pipeline	7,429,463	4,775,107	12,204,570
Retention Reservoir	5,029,375	3,282,166	8,311,541
Northern Head Branches	8,346,114	5,564,076	13,910,190
Supervision (Consultant)	3,077,243	1,374,950	4,452,193
T.B.M.	3,906,421		3,906,421
Total	77,000,000	33,079,422	110,079,422

Source: Government of the Islamic Republic of Iran

Note: Source The detailed costs given in the above table differ slightly from those presented in the Preface and Annex A that are derived from the World Bank's databases.

Economic Rate of Return (Rls millions)

Year	*95*	*96*	*97*	*98*	*99*	*2000*	*2001-2027*
Costs							
Civil works							
Tunnel 1	4,386	9,649	8,772	3,216	3,216	0	
Tunnel 2&3	1,584	7,394	7,394	19,276	11,619	5,545	
Pipeline & Reservoir	0	0	0	14,421	14,421	13,572	
Northern head branches	0	0	0	307	2,071	28,298	
Supervision (Consultant)	344	898	841	1,576	1,409	2,574	
Operation & Maintenance	**0**	**0**	**0**	**0**	**0**	**2,160**	**2,160**
Total costs(Economic Cost)	**4325**	**12289**	**11649**	**26575**	**22423**	**35723**	**1480**
Benefits							
Khayam area of Tehran							
Buildings						1273	8487
Stocks						76	508
Bridges, sidewalks, streets						227	1515
Telephone infrastructure						85	568
Sedimentation, debris removal						77	512
Time spent, prep. & clean-up						243	1617
Traffic distribution						1415	9437
Railway station damage						107	711
Total benefits, Khayam						**2230**	**23354**
Shahr-E-Ray							
Buildings						1844	12293
Stocks						77	513
Bridges, sidewalks, streets						547	3650
Telephone infrastructure						44	296
Sedimentation, debris removal						107	711
Time spent, prep. & clean-up						79	527
Traffic distribution						69	461
Properties near canal						221	1472
Total benefits, Shahr- e-Ray						**2988**	**19922**
Total benefits						**3914**	**32457**
Net benefits	**-4325**	**-12289**	**-11649**	**-26575**	**-22423**	**-37809**	**30978**
Economic Rate of Return	**20%**						

Annex C. Iran: Irrigation Improvement Project (Loan 3570)

Performance Indicators (MOJA)

Indicators	*SAR*	*Actual*
A. Input indicators		
Total number of contracts	12	12
Total disbursement (%)	44	53
Counterpart funds (Rials billion/US$ million)	na	na
B. Output Indicators		
Number of hectares improved	na	32,900
Number of research themes undertaken	na	716
Number of demo plots	na	956
Number of farmers		
Total farmers	46,000	33,500
Farmers reached by extension	na	33,500
Training		
Number of programs	na	4,620
Number of participants	na	92,400
Cropping intensity (%)		
Behbahan	112	129
Moghan	122	138
Tajan	125	117

Performance Indicators (MOE)

Indicators	*SAR*	*Actual*
A. Input indicators		
Disbursement (%)	100	100
Counterpart Funds (%)	100	100
Number of contracts awarded		
Works	14	14
Goods	8	7
Consultancy	7	7
Contract Value (Rials billion)	385	385
B. Output Indicators		
Civil Works		
Length of rehabilitated and new canals (km)	1,132	601
Length of rehabilitated And new drains (km)	854	504
Areas improved (ha)	58,000 (at MTR)	54,500
Value of goods purchased (US$ million)	1	11
Training programs		
Number of programs	81	55
Number of participants	1,100	1,100
Studies		
Number of studies contracted	7	11
Number of studies completed	-	6

MOE Training Programs

Type of training	*Programs Proposed*	*Programs Completed*	*Number of Participants*	
			Proposed	*attended*
Category I				
- Seminars and workshops	5	2	200	90
- Management courses	18	18	200	118
- Engineering courses	24	24	250	218
- Technical courses	12	11	220	89
- M. Sc.	7	-	7	7
Sub-total	66	55	877	522
Category II & III combined				
- International short courses in Iran	8	-	160	-
- Overseas study tours	7	-	70	-

MOA Training Programs

Type of training	*Unit*	*SAR estimates*	*MTR*	*Actual*
Central Level				
Local short-courses	S/m	120	150	220
Overseas short-courses	S/m	170	188	129
Fellowships	S/y	24	32	7
Workshops	No	60	70	46
Study Tours	No	0	6	6
Sub-projects level				
Local short-courses	S/m	460	460	500
Overseas short-courses	S/m	180	172	108
Fellowships MOJA&MOE	S/y	55	71	2
Workshops	No	116	96	59
Study Tours	No	0	6	6

S/m = staff months; S/y = staff years.

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