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IMPLEMENTATION COMPLETION AND RESULTS REPORT
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ON A

CREDIT

IN THE AMOUNT OF {SDR 16.2 MILLION
(US$ 21.3 MILLION EQUIVALENT)

TO THE

REPUBLIC OF YEMEN

FOR AN

IRRIGATION IMPROVEMENT PROJECT

June 25, 2009

Sustainable Development Department
Middle East and North Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2008)

Currency Unit	=	YRial
	=	US$1
US$1.55663	=	SDR 1
US$1	=	200 YRial

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ADP	agriculture Demonstration Program
APL	Adaptable Program Loan
CAS	Country Assistance Strategy
DCA	Development Credit Agreement
EMP	Environmental Management Plan
FAO	Food and Agriculture Organization
FM	Financial Management
GDI	General Directorate of Irrigation
GOY	Government of Yemen
IC	Irrigation Council
ICR	Implementation Completion Report
IDA	International Development Association
IIP	Irrigation Improvement Project
IMT	Irrigation Management Transfer
LWCP	Land and Water Conservation Project
MAI	Ministry of Agriculture and Irrigation
M&E	Monitoring and Evaluation
MIS	Management Information System
MOF	Ministry of Finance
MOPIC	Ministry of Planning and International Cooperation
MWE	Ministry of Water and Environment
NWRA	National Water Resources Authority
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objectives
PIM	Participatory Irrigation Management
PIU	Project Implementation Unit
PMU	Project Management Unit
PPU	Project Preparation Unit
SA	Social Assessment
SC	Steering Committee
TDA	Tihama Development Authority
WSSP	Water Sector Support Project
WUA	Water User Association
WUG	Water User Group

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REPUBLIC OF YEMEN
IRRIGATION IMPROVEMENT PROJECT

CONTENTS

1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

According to several archeological and historical evidences, Yemen is the first country in the world where spate irrigation was practiced. This unique system witnessed its zenith during the Shebean period in the first millennium BC. The intense development of trade after the Islamic period may have promoted the spread of spate irrigation from Yemen to other arid and semi-arid regions. By the late 1990s, use of Yemen's water resources was deemed to be unsustainable, due not only to the overexploitation of the non-renewable groundwater resources but also to the neglect of traditional irrigation systems fed by the (relatively renewable) spate waters. To help address this issue, the Government of Yemen (GOY) through the Ministry of Agriculture and Irrigation (MAI) undertook to prepare an Irrigation Improvement Project (IIP) and to implement it with assistance from the International Development Association (IDA) under an Adaptable Program Lending (APL) credit. The project was planned to be prepared and implemented in two phases, namely (i) **Phase I**, covering schemes in two wadis (Zabid in Hodeidah governorate and Tuban in Lahej governorate) with a total command area of about 26,000 ha, and (ii) **Phase II**, covering schemes in five other main wadis (Bana, Hassan, Mawr, Rima'a and Siham) with a total command area of about 64,000 ha, and/or smaller schemes in other wadis (Hijr, Ahwar, Meifa'a, Surdud, Harad and Raysan) that would meet the selection criteria.

IIP Phase I preparation studies were themselves undertaken in two phases. Phase 1 comprised an inventory survey, characterization and preliminary study of spate irrigation schemes in five wadis (Mawr, Zabid, Tuban, Bana and Hassan). Through a ranking analysis, two of these wadi schemes (Tuban and Zabid) were selected for more detailed study in Phase II. The rationale was that the two selected schemes would provide the best opportunity to serve as models or pilots for developing and demonstrating the participatory irrigation management (PIM) approach to decentralization and transfer of irrigation scheme management responsibilities to appropriate local institutions. To execute the preparation studies for the selected Wadi Zabid and Wadi Tuban schemes, a Project Preparation Unit (PPU) was formed within the MAI. National and international consultants were engaged by the PPU to undertake the studies in Yemen. A Japanese grant managed through the World Bank provided the principal funding for project preparation. GOY, the World Bank, IFAD and FAO/IC contributed additional funding and/or resources.

Following on from project preparation, the IIP Phase I Project Appraisal Document (PAD) was finalized and issued on August 9, 2000. Financing of the total project cost of US$25.60 million was planned to be provided by: (i) an IDA credit of SDR 16.2 million (US$21.3 million equivalent, 83.2%); (ii) direct contributions from beneficiaries totaling US$1.2 million (4.7%), and (iii) GOY contributions from its own resources amounting to US$3.10 million (12.1%). The project implementation period was planned to be 5 years.

Government-level institutional arrangements for project implementation, as envisaged at appraisal, included: (i) the MAI as the agency to assume overall authority and responsibility on behalf of the GOY, (ii) a Steering Committee (SC) to oversee implementation, comprising the

Minister of the MAI as chairman and five further key persons including the project director; (iii) a central Project Management Unit (PMU) in Sana'a for coordination and general supervision, led by the project director and staffed by technical, procurement, financial, administrative and monitoring and evaluation (M&E) personnel; and (iv) two Project Implementation Units (PIUs), one in Zabid and one in Tuban, for supervising implementation activities at the project sites, each staffed by a director, an engineer, an agriculturalist, an institutional specialist and an accountant. The PIUs were to work closely with the relevant regional agencies, the Tihama Development Authority (TDA) in Wadi Zabid and the Lahej Regional Agricultural Office (RAO) in Wadi Tuban.

The project commencement date was January 1, 2001 and the credit effectiveness date was January 18, 2001. Earlier, in July 2000, the PMU in Sana'a was established with a director and staff including specialists (civil servants or consultants) in the fields of irrigation, agronomy, institutional development, publicity, procurement, financial management and M&E. PIUs in Zabid and Tuban were formed at the same time. The PMU and PIUs remained fully operational during the execution of the project. Also, in July 2000, the SC was established under the chairmanship of the Minister of the MAI and included the Deputy Minister of the MAI, the Deputy Minister of the Ministry of Planning and International Cooperation (MOPIC), the Deputy Minister of the Ministry of Finance (MOF), the Director General of the General Directorate of Irrigation (GDI), the Director General of Planning & Monitoring MAI, and the PMU director member/secretary. Project implementation was eventually carried out over a total period of 8 years with essentially no change in total project cost. The project closure date was December 31, 2008.

1.2 Original Project Development Objectives (PDO) and Key Indicators

The PDOs of the APL Phase I project were to ensure: (i) sustainable and efficient water conveyance, distribution and use in the two spate irrigation schemes of wadis Tuban and Zabid, through rehabilitation and PIM; and (ii) increase in agricultural productivity and rural incomes, through implementation of an intensive agriculture demonstration program (ADP). The key indicators are as follows:

Key Indicators	**PAD Targets**
Indicators for both PDOs (i) and (ii): ▪ Number of established and empowered water user organizations (attributed mainly to Component B (PIM), as explained below). ▪ Incremental rural areas benefiting from the spate rehabilitation / modernization and flood protection works (attributed mainly to Component A but also to Components B, C and D, as explained below in Section 3.2).	▪ 443 WUGs (230 Tuban and 213 Zabid); 32 WUAs (16 Tuban and 16 Zabid); 2 ICs (1 Tuban and 1 Zabid). ▪ Improved irrigation and flood control on 26,000 ha (11,000 ha Tuban and 15,000 ha Zabid).
Indicator for PDO (ii) only: ▪ Increased productivity per hectare and farmer income (attributed mainly to Component C (ADP) but also to Components B and D, as explained below in Section 3.2).	▪ Increased productivity and incomes from 5,000 ha of demonstration farms.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and Reasons/Justification.

There has been no considerable revision as to the key PDOs and respective indicators. However, some of the indicators were rephrased or simplified per the approved Development Credit Agreement (DCA) amendments that have taken place during the project lifetime. Sections 1.7 and 2.3 below elaborate on these DCA amendments and on the associated revision of the indicators, respectively.

1.4 Main Beneficiaries

The direct project beneficiaries identified in the PAD are the farmers, farm workers and families whose livelihoods will have been improved by the project interventions. These beneficiaries were estimated to total 150,000 people in 27,000 households. Other identified beneficiaries include:

a) The MAI including regional agencies;

b) Water user organizations established and empowered by the project, including canal-level water user groups (WUGs) and water user associations (WUAs) and two wadi-level Irrigation Councils (ICs); and

c) Non-irrigation (domestic) water supply users, mostly in the surrounding rural areas, benefiting from the reduced over-extraction of groundwater resulting from the project.

1.5 Original Components

The project's original components, all relating to interventions in the Wadi Tuban and Wadi Zabid areas, were:

a) Rehabilitation, Improvement and Protection of Spate Irrigation Infrastructure (Component A), including rehabilitation and improvement works for irrigation systems, flood protection works and roads, together with associated surveys, hydraulic modeling, detail design and construction supervision;

b) Irrigation and Environment Management and Participatory Irrigation Management (Component B), covering: (i) establishment of and support for PIM organizations, (ii) development of spate irrigation management systems including water management information systems (MIS), flood warning systems, spate management model and hydrological monitoring, (iii) provision of operation and maintenance (O&M) equipment, and (iv) environmental mitigation and enhancement measures, including groundwater and hydraulic monitoring, upper watersheds study, and Wadi Tuban soil salinity/sodicity study/mapping;

c) Intensive Agriculture Demonstration Program (Component C), covering large scale demonstrations for agriculture improvements and associated extension services development and support including technical assistance (TA); and

d) Institutional Strengthening and Capacity Building (Component D), covering irrigation sector institutional and legal framework development support, Phase II project preparation, and establishment of and support to the PMU and PIUs.

1.6 Revised Components

None, but there were changes within components as explained in Section 1.7 below.

1.7 Other Significant Changes

A number of amendments to the DCA) were made during the course of the project. Firstly, in August 2003, the DCA was amended to allow for Component A improvements covering:

a) Rehabilitation (including asphalting) of existing service roads for improved canals and access roads connecting the project-served villages and market centers within the project area;

b) Community participation works, through permitting civil works of less than US$10,000 per contract and up to an aggregate amount not exceeding US$1,200,000 to be executed directly through the concerned WUAs; and

c) Shopping for small works, through permitting works of less than US$30,000 per contract and up to an aggregate not exceeding US$500,000 to be procured under lump-sum fixed-price domestic contracts awarded on the basis of shopping for three quotations.

About two years later, in October 2005, the DCA was amended and the closing date was extended from June 30, 2006 to June 30, 2007. Then, in June 2007, the DCA was further amended and the closing date was extended from June 30, 2007 to December 31, 2008. The extensions were to allow for: (i) completion of civil works; and (ii) applying some project design changes aimed at improving project impact, as explained below. The changes were effected through DCA amendments only (rather than through first-order project "restructuring" involving changes to the PDOs or substantial project design changes). These DCA amendments were as follows:

a) October 2005 (as a result of the "Mid Term Review" undertaken in late 2004). To help expedite the then-lagging civil works (Component A), the amendment allowed for increased farmer ownership via administration/execution of community-level spate irrigation works at the community level, through clarification of the 2003 amendment relating to WUA contract works. The clarification defined the arrangements for cost sharing (in cash and in kind). Details are provided in Annex 2. The amendment also simplified the disbursement condition included in the original DCA which specified that civil works could start only after WUA establishment. Scheme headworks and main canals

were deemed to be public infrastructure, and the disbursement condition was amended to be applicable only in the case of the (quasi-private) secondary and community-level tertiary canals. This allowed for headworks and main canal works to be started in advance of establishment of WUAs for the lower-order canals; and

b) June 2007 (to make use of project cost savings). It was decided that available unused project funding should be directed towards applying lessons learned and piloting fresh development ideas in a third wadi (Wadi Ahwar in Abyan Governorate). Wadi Ahwar was shown to enjoy more favorable enabling conditions than either Wadi Zabid or Wadi Tuban. Activities introduced into the project included: (i) completion of feasibility study and designs for rehabilitation of the wadi's spate diversion system and flood protection works (including application of fresh ideas for developing the potential for "conjunctive use" involving also groundwater usage to help to improve the socio-economic viability of spate irrigation), all to be implemented under the recently-approved Water Sector Support Project (WSSP); and (ii) execution of small urgent works for protection of villages from flooding and for rural water supply. Details are provided in Annex 2.

Why/how were the funds allocated to Component B significantly decreased, and those allocated to Component A significantly increased, without compromising the PDOs?

Per the ICR review meeting, the IDA task team was requested to elaborate on why/how the IDA/GOY funds allocated to Component B were significantly decreased, while those allocated to Component A were significantly increased, without affecting the PDOs. The sections below provide elaborations. Throughout the project lifetime (FY2000 to FY09) there have been three main causes which inevitably changed the funds allocated to Components A and B, as follows.

(1) Cost reductions under Component B and cost increases under Component A:

Project cost savings in IDA commitments were estimated at US$3.5 million in FY07/FY08 (comparing cost estimates between FY2000 and FY2007). These savings helped to reallocate funds across project components, particularly from Component B to Component A. The origins of the cost savings were:

a) Savings in goods and equipment, due to GOY/MAI obtaining water gates from a parallel Japan-funded grant rather than from IIP. This reduced the IDA allocation intended for funding the Goods/Equipment under Component A and also helped reduce corresponding IDA funds allocated to Component B(iii) ("provision of O&M equipment", which would have cost US$3.8 million per the PAD). To effect these savings, IDA disbursement Category 1 on Goods/Equipment was officially revised from SDR 2.4 million (per original DCA) to SDR 0.9 million; and

b) Other technical savings (in consultancy services), particularly due to resorting selectively[1] to hiring national rather than international consultants across IIP components. At

[1] During implementation the Borrower and implementing agency have been reticent as to using "Borrowed funds" to recruit international consultants.

appraisal, in hindsight the appraisal teams envisaged a sizable number of international consultants (man/days) particularly under Component B. Gradually, as the project progressed (and particularly after the Social Mobilization Teams achieved progress under Component B), the MAI and IDA teams reworked the consultancy plans by FY04, in order to make use of the on-the-job knowledge/skills accruing to the national consultants and to MAI/PMU/PIUs. For instance, GDI executed the "upper watersheds" study (under Component B(iv)), which would have otherwise cost US$0.3 million (per the PAD) if executed by international consultants. The same applies to the groundwater and hydraulic monitoring activities and the "soil salinity/sodicity" study in Tuban (which per the PAD would have cost US$0.6 million and US$0.2 million respectively), both under Component B(iv).

While the above are deemed positive (efficiency-caused) cost savings, on the negative side the following issues have also resulted in reducing the cost of Component B while increasing the cost of Component A (as explained further in Section 2.2 below):

a) Subcomponent B(ii) on "improving spate water management" (US$0.9 million per the PDA) was not duly implemented (particularly in Wadi Tuban), due to the lack of capacity at NWRA and MAI/GDI needed for the two agencies to cooperate toward executing the activities, and

b) Funds allocated to Category 2 on civil works (for Component A) were increased due to escalated price/physical contingencies, often associated with the delay in contract execution (which attributes to lack of capacity of national contractors as noted below in Section 2.2).

(2) Community contribution to capital and O&M costs:

Also, starting FY05, the community contributions (which thanks to the 2003 and 2005 DCA amendments were made "targeted", to sustain the feeder subsystem) helped to reduce the respective IDA allocation to Components A and B (subcomponent B(iii) on "provision of O&M equipment"). These contributions amounted to a total of US$0.3 million in FY09. Empowering the communities through these two DCA amendments also helped achieve (procurement/efficiency related) cost savings across project components.

(3) Lately added GOY funds and utilization of the unallocated IDA category:

Corresponding to the aforementioned savings from IDA, in FY07 the GOY additionally allocated US$0.30 million to support Component A (particularly for Wadi Ahwar). Also the project utilized the unallocated category, by reducing it from SDR 1.6 million to SDR 200,000 in FY08 in order to top up Category 2 on civil works (Component A).

The above cost savings/reductions considerably helped in funding the new activities in Wadi Ahwar, per the 2007 DCA amendment as explained above.

The changes to the M&E indicators associated with the above design changes are presented below in Section 2.3.

Justification for not undergoing a first-order project restructuring:

Had the above changes, reallocations and simplifications been made all at once at some point in time, GOY and IDA teams might have considered a first-order project restructuring[2]. Since much of these changes occurred sporadically throughout the project lifetime, the GOY and IDA teams effected them by resorting to amending the DCA and the respective project documents (including ISRs during FY04 to FY09), per the following.

The DCA amendments and category reallocations (August 2003 and October 2005) were effected in consistence with the following guidelines:

"Minor changes are approved by Country Directors (CDs). Such changes may include modifications limited to changes in executing units or denominations, implementation plans and schedule changes, new action plans to bring the project back on track, new reporting requirements (or other adjustments to improve implementation), loan closing dates, implementation dates that under the terms of the legal agreement may be put into effect by notice, or a reallocation of loan proceeds that do not affect the project's design, scope, or expected outcome. Minor changes are proposed, approved and documented through the routine ISR updating process and can be counted towards pro-activity for purposes of project "upgrading" in the Region's judgment, but not for labeling as restructuring. These cases may also require legal amendments".

However, the DCA amendment made in June FY07 was effected through the Regional Vice-President's (RVP's) approval, which is consistent with the following recent guidelines (2006):

"*Second-order restructurings* are those where the project design or implementation arrangements are significantly modified (e.g., including reallocations of inputs and/or changes in outputs) but there is no change in PDOs or associated outcome targets. Under the new procedures, second-order restructurings are approved by Regional vice presidents (RVPs)".

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

a) Conformity with country and sector policies and strategies. The project formulation conformed well to the Bank's Country Assistance Strategy (CAS), primarily through its strong provisions for: (i) improved water management and irrigation infrastructure

[2] *First-order restructurings* are those which involve modifications in project development objectives or associated outcome targets (including any underlying related changes). Such restructurings require approval by Executive Directors under the absence-of-objection procedures.

sustainability; and (ii) enhanced agricultural productivity for poverty reduction. It also addressed well key government irrigation sector priorities relating to sustainability improvements for spate irrigation systems and corresponding institutional decentralization and user participation.

b) Relevance and appropriateness of project objectives, components and design. The project's two PDOs, presented at Section 1.2 above, reflect well and succinctly the priority development areas indicated above. The four project components likewise explicitly address the priorities of physical and operational water management improvements and sustainability coupled with increased agricultural production for enhanced rural community incomes. With regard to the two wadi spate irrigation schemes selected for project interventions, there was at the time of project preparation a full awareness of highly significant and heavily entrenched socio-economic inequities prevailing in the Wadi Zabid area. It was also clear from the various interactions with system users and prospective beneficiaries at that time that the potential for achieving a successful project outcome from the point of view of sustainable and equitable water management arrangements in that wadi area could be considered rather limited. It might have been better to select a less problematic pilot scheme for the Phase I project. On the other hand, there was a strong desire to proceed with interventions in this otherwise high priority scheme and to thereby ameliorate to the extent possible the unfavorable situation of the disadvantaged downstream scheme users.

c) Soundness of institutional and implementation arrangements. The formulated institutional arrangements for project implementation, covering a central PMU and two wadi-based PIUs overseen by a SC chaired by the Minister of MAI, as described at Section 1.1 above, would seem to have been both simple and effective. Also, seemingly most appropriate were the principles formulated for establishment of water user organizations, particularly WUAs at secondary canal level, and of joint system management entities, namely the ICs at wadi level, all aimed at helping to secure the long-term sustainability of the improved schemes. The requirement that WUAs be established prior to disbursements for corresponding civil works, which was set as a credit condition, became an important issue during implementation. The condition was aimed at ensuring that there would be participation, consensus and commitment on the part of the users relating to planned scheme improvements and subsequent systems O&M before the making of heavy physical infrastructure investments, and it arose largely as a consequence of the perceived problematic inequitable socio-economic situation in the Wadi Zabid area. An intensive user mobilization and WUA formation program was formulated and planned for execution during the first year of the project, in parallel with participatory planning and design of scheme improvements, and a substantial budget provision was made to cover this and subsequent PIM developments. In the event it appears that the overall program and process was not given the expected prioritization and importance, and that the corresponding budget provision was reallocated largely to physical works items. This comment extends also to most of the various other formulated non-works interventions (e.g. for water resource monitoring and management improvements, O&M equipment provisions, environment-oriented operations, and institutional strengthening). A notable exception seems to have been the ADP, which is reported to have been fully implemented

and to have led to significant positive agricultural productivity impacts. It may be that the generally poorer-than-expected implementation performance on institutional development aspects, and the delays in disbursements for civil works, resulted largely from implementation period constraints, as outlined in Section 2.2 below. On the other hand, some may consider that, during project preparation, a greater degree of subtlety, flexibility and/or pragmatism in this area could perhaps have been applied, as it seemingly was later on, following the mid-term review, when the WUAs establishment condition for disbursements for civil works was modified to allow works for headworks and main canals to proceed in advance.

d) Application of previous lessons learned. The comprehensive nature and relatively large scope of the designed PIM and institutional development components of the project resulted from previous lessons learned about the need for beneficiary participation and joint management in the development and usage of irrigation systems in order to achieve sustainability over the long term. It remains to be seen whether the reduced importance given to this in terms of priority and scope of interventions during implementation will still lead to the desired long-term sustainability of the physical infrastructure investments and of the related enhanced agricultural productivity.

e) Identification and mitigation of risks. Risks relating to potential farmer and government agency shortfalls in terms of capacities and contributions were identified and addressed as part of project formulation. At the more fundamental level of underlying government commitment to irrigation sector institutional reform and support of corresponding improvement measures, it was established that these were indeed generally in place. What was perhaps insufficiently addressed was the risk that such commitment and support would not continue into implementation at the same high level and would not translate into timely and effective program implementation actions.

f) Choice of lending instrument**:** After considering the water management "Log-Frame"**,** the preparation/appraisal teams considered the APL as the most relevant instrument because IIP's phase 1 (APL1) needed to test fresh ideas which were not tested before in Yemen's coastal wades. These included concepts such as the PIM concept (Component B) and the "more-crop-per-water-drop" concept (Component C). Proven successful, APL2 would then replicate these ideas on other wades which use spate water.

2.2 Implementation

From its commencement in 2000, project implementation was constrained by design-related difficulties (particularly the pre-requisite condition of establishing the WUAs prior to design and execution of the civil works) and/or by other major externalities. These either slowed down implementation progress or made it difficult for the impacts of conventional irrigation system improvements to "trickle down" to a large number of end use beneficiaries. These difficulties and externalities included:

a) Abnormal unpredictable droughts (particularly in Wadi Tuban, which was deemed to have suffered a 1-in-50 year drought several times in the last decade);

b) Frequent social unrest in the south (Wadi Ahwar);

c) Sluggish national contractors (particularly those who had other larger and more lucrative contracts with the GOY and hence lacked incentives to expedite their IIP contracts);

d) Chronically inequitable upland-lowland water rights issues in the west (Wadi Zabid, associated largely with the regressive social and land distribution situation prevailing there);

e) The inherent difficulties of spate water management, stemming from the inability to readily store spate water, due to the abrupt and erratic nature of flash floods, and to therefore prevent large losses of water to the sea or to desert fringes, leading to the situation whereby incremental agricultural benefits cannot often offset the large investments needed to improve the physical systems; and

f) The insufficient capacity at NWRA (the water regulator) and MAI/GDI (the water user), particularly affected the implementation of Subcomponent B(ii) on "Improving Spate Water Management". This issue has been insurmountable in the medium term, but has been addressed per the design of the recently-approved WSSP (2009-2014).

In response to the challenges presented by these constraints, and to try to raise the return on project investments, efforts to re-focus and diversify the IIP components began in 2003. A heavy focus on the irrigation subsector and on costly conventional rehabilitation of spate irrigation infrastructure was modified to develop and follow a more comprehensive cross-sectoral approach (mostly through the 3 DCA amendments explained at Section 1.7 above). Decisions and actions taken on this covered:

a) Rehabilitation and asphalting of key service roads for canals as well as farm-to-market roads, to raise the return on investments and to improve the well-being of the rural inhabitants;

b) Improvement of community engagement through the indicated DCA amendments;

c) Rehabilitation of flash flood and environment protection works;

d) Revisiting the ADP component with a view to increasing crop yield per cubic meter of water (rather than only increasing yield per hectare);

e) Empowering the ICs and WUAs to apply the GOY-enacted Water Law;

f) Preparation (through an international QCBS bid) of a master plan for surface-/groundwater conjunctive use in a third "more promising" wadi (Wadi Ahwar), aiming at low-cost harvesting of the spate water and increasing the inter-seasonal subsurface storage volumes (useful for non-irrigation uses and for counteracting sea water intrusion). The master plan is to be executed under the recently-approved WSSP; and

g) Addressing the capacity and inter-agency cooperation issues between NWRA and MAI as part of the design of the recently-approved WSSP.

Consequently, by the mid of FY2008, IDA's Implementation Status and Results (ISR) Implementation Performance (IP) and PDO ratings had been raised from "MS" to "S" because there had been major progress in all of the aforementioned undertakings and components and in meeting most of the target outcomes or DCA milestones. The only exception to the latter used to correspond to the spate irrigation infrastructure component (Component A). The mixed performance on this component (due to the above-listed difficulties and externalities including tardiness of national contractors) had been the main reason for "MU" and "MS" ratings on previous ISRs (from late FY06 to late FY07). However, even with this component there was good progress gradually achieved during FY2007 and FY2008 because :(i) 70% of the lands targeted in the PAD were irrigated (due largely to high spate floods in the 2007 season, especially in Wadi Zabid); (ii) most of the main civil works were complete, and (iii) ICs and WUAs helped to address the water rights issue, particularly in Wadi Tuban. Further details are given in Annex 2.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

In the first 5 years of IIP implementation, the PMU employed an M&E officer who assisted the MAI and the IDA ISR teams with M&E. In the last 3 years however, the PIUs in Zabid and Tuban became the main direct sources of M&E data flow to the PMU, while the PMU's M&E officer gradually phased out due to health reasons.

The M&E activities were supposed to be supported by MIS and Geographic Information System (GIS) applications. These, together with flood warning systems, spate management models and hydrological monitoring systems, made up the spate irrigation management improvement package provided for under the project's Component B, and were established and tested. However, the project was unable to make these high-technology systems function as intended. The needed hydrological data could not be obtained, and the generated results could not be applied, because of a lack of cooperation between the MAI/IIP and the Ministry of Water and Environment (MWE)'s National Water Resources Authority (NWRA), particularly in Wadi Tuban. The NWRA, as the water resources regulation agency, is mandated to monitor and assess water resources availability. Measures to resolve this information flow and interagency cooperation issue have been formulated as part of the design of the recently-approved WSSP.

In Wadi Zabid, the IIP executed a civil-works contract for drilling four groundwater monitoring wells. The data from these wells, together with further needed water resources information obtained by the Wadi Zabid PIU with help from the TDA, were useful for monitoring of groundwater drawdowns over the life of the project. The groundwater drawdown is an important indicator for the project's Component B Environmental Management Plan (EMP), and when reduced it would indirectly reflect IIP success in improving the management and use of surface water. The good cooperation with the TDA in Wadi Zabid was in contrast to that with the NWRA branch in Aden which is mandated to address Wadi Tuban, and lacked the capacity and the incentive to cooperate with the Wadi Tuban PIU in the provision and collection of water

information. It is noted that the rainwater and flood flow gauges in Wadi Tuban, for which NWRA was responsible, were sabotaged several times during the project's lifetime.

Also under the project's Component B EMP, a water resources assessment was undertaken as part of an upper watershed study executed by the GDI with TA from IDA and FAO/CP. The results of the assessment were helpful in the M&E exercises undertaken by the PMU and IDA, particularly for Wadi Zabid.

To help secure sustainability of IIP interventions, the project provided assistance to the two ICs to closely monitor the performance of the established WUAs. Three broad performance indicators were established, namely (i) institutional, (ii) financial, and (iii) technical. Details of the adopted community-based M&E approach are given in Annex 2.

Commensurate with the design changes presented above in Section 1.7, MAI and IDA teams started by 2005 to revisit and simplify the M&E results framework as per the PAD. Per the PAD Annex 1 (dating back to 2000):

a) The APL and PDO indicators became no longer consistent with the APL milestones per the (amended) legal DCA; and

b) Some of the key indicators stated in Annex 1 (main-system spate schemes completed, cost sharing completed) became no longer directly attributed with the indicators listed in the PAD main text (on page 4: increased water availability, adequate financing of O&M of spate schemes, decentralization of government service).

The following Table 1 presents the revised and simplified M&E indicators.

Table 1: Revisited/Simplified Indicators
(comparing the PAD with the ISRs of FY05 to FY09)

APL and PDO indicators per the PAD of 2000 (Annex 1 Results Framework)	**Revisions and simplifications associated with the design changes, per the DCA amendments. Reflected in MAI progress reports and in IDA ISRs starting FY05.**
APL purpose 1: Sustainable spate water management: APL purpose 1 indicators: • GOY budget contribution reduced to zero • Farmer organizations manage the schemes **PDO leading to APL purpose 1:** • Effective spate water control and conveyance structures, and • Effective PIM	PAD indicators no longer precise, as per the DCA amendment in 2005 GOY would still shoulder the O&M for the main system, while WUAs gradually takeover the subsystem. Hence, ISR PDO indicator was simplified to reflect the corresponding DCA milestones, thus: "Spate water management improvements by at least 80%" (inferred by the PMU reports on the % increase in on-farm water availability across the wadi).

Indicators reflecting the PDO: • Head-works and main canals of spate schemes rehabilitated, and • WUAs and ICs established and agreed cost sharing paid	Indicators no longer precise, as the 2003 DCA amendment added the rehabilitation of roads and community/subsystem works, and after the 2005 DCA amendment re cost sharing. Hence the ISR intermediate indicator was simplified accordingly. Targets were set at: • A range 80% to 100% completion of all project-introduced infrastructure as consistent with the DCA, and • 100% formation and empowerment of the agreed number of WUAs and ICs (32 WUAs and 2 ICs 2).
APL purpose 2: Improve agricultural productivity: APL purpose 2 indicator: Increased crop yield and cropped area **PDO leading to APL purpose 2:** **Improved rural incomes** Indicator reflecting the PDO: increased agricultural productivity of spate schemes	PAD indicators not precise due to unclear cause-and-effect attribution (increased productivity helps to increase rural incomes). Thus, the ISR PDO indicator was simplified to reflect the number of hectares improved due to ADP (for which yield has increased by at least 30%), as compared to the PAD target of 5,000 hectares.

2.4 Safeguard and Fiduciary Compliance

Safeguard policies. The only safeguard policy triggered was **Environmental Assessment (OP 4.01, BP 4.01, GP 4.01).** The Environmental Category was: **B, Partial Environmental Assessment and EMP Requirements**. At appraisal there were no major environmental issues arising from the partial EA completed for the IIP. The project was to have beneficial impacts on the environment, since it would increase the reliability of spate irrigation water and reduce overdraft of groundwater aquifers. However, due to changes in the pattern of water distribution as a result of rehabilitation of spate irrigation infrastructure, it was thought that reduction of recharge to certain areas could occur. On the other hand, improved water distribution was expected to result in a reduction of groundwater use in those areas. These benefits were deemed to outweigh any minor adverse environmental impacts (soil quality, waterlogging, water quality) resulting from agricultural activities in the improved areas.

Results from implementation of the EMP: The project has been satisfactory in the area of EMP execution. With regard to "hardware", all of the village/wadi protection (or so called "environmental protection") civil works have been completed. On the "software" side, progress has been satisfactory on the main items addressed by the EMP: (i) groundwater monitoring; (ii) environmental awareness and participatory management; and (iii) building the knowledge base

on soil salinity/sodicity in Wadi Tuban. However, the cooperation between NWRA-Aden and Lahej RAO, the Wadi Tuban scheme operating agency, needs to be improved to allow for easy and timely provision of and access to the NWRA-Aden spate data, especially from the wadi's Dukaim station. The upper watershed management study activity progressed well and included a remarkably good contribution from GDI. The study and mapping of soil salinity and sodicity in Wadi Tuban, including formulation of mitigation alternatives, was finalized, and study results were presented at a participatory workshop. The major finding of this study was that irrational groundwater use should be phased out and should be replaced by spate water usage and conjunctive use, since otherwise the over-drafting of groundwater beyond the safe yield level will result in further intrusion of seawater and hence further salinization of the wadi's fertile soil. The Tuban IC has attempted to respond to this finding through prioritizing spate irrigation diversions to the saline land areas, in order to ensure the needed flushing of salts. Details on environmental and social monitoring and related capacity building issues are given in Annex 2.

Procurement. Per the last two ISR missions and the ICR mission the procurement rating has been "Satisfactory".

Procurement performance: The procurement performance has been rated satisfactory in the last four years. The PMU has complied with the DCA. The post-review reports reflected the capacity of the PMU/PIUs to undertake procurement per WB guidelines. Also, Yemen IPR (Independent Procurement Review) reflected a satisfactory performance. The lessons learned are documented in Section 6 below.

Financial management (FM) and disbursement. Per the last two ISR missions and the ICR mission the FM rating has been "Moderately Satisfactory".

FM and disbursement performance: The FM performance was initially rated satisfactory until December 2006, when the rating was downgraded to moderately unsatisfactory. Afterwards, the PMU complied with the DCA, particularly the financial covenant related to submission of annual audit reports and audited quarterly interim financial reports. The audit reports were unqualified. The Audit Report Compliance System reported no accountability issues from all the audit reports. The management letters included some recommendations to enhance the FM and accounting of inventory, asset register, advances, etc., which the PMU satisfactorily applied to its practices. The lessons learned are documented in Section 6.

2.5 Post-Completion Operation/Next Phase

As mentioned above, interventions in a third wadi, Wadi Ahwar in Abyan Governorate (7,000 ha), were added to the IIP during the later period of the project to serve as an advance introduction to the recently-approved WSSP (2009-2014). The IIP closing date extension from June 2007 to December 2008 was perceived by GOY and IDA to be a "bridging phase" between IIP and WSSP, rather than a fully-fledged APLII. The IIP's APL Phase II will *defacto* be incorporated into the WSSP. During the bridging phase, uncommitted IDA funds resulting from Phase I cost savings were used to pilot fresh ideas relating to cross-sectoral conjunctive use of surface- and groundwater in the Yemeni coastal plains. Based on an extensive comparative study

of 5 candidate wadis[3], Wadi Ahwar was selected for use of these funds for urgent flood protection, canal cleaning and village water supply works, and for execution of a major feasibility study for wadi-wide interventions to be implemented under WSSP.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The project development objectives continued to have a high relevance throughout the duration of the project, and the urgency of meeting these objectives was confirmed by the episodes of severe water stress that were experienced in the project areas. Design and implementation aspects were also kept highly relevant through modifications as needed in response to emerging constraints to progress and to achievement of objectives (examples being the arrangements for community-effected contracts and the shift in water management focus towards conjunctive use of water resources).

3.2 Achievement of Project Development Objectives

Despite the previously mentioned difficulties and externalities, and due to the introduced remedies and amendments discussed in Section 2.2 above, there started to be improved progress towards meeting the PDOs from 2005. By the end of 2008, 70% to 100% of the intended outputs of all four project components had been achieved (see Annex 2). This progress helped also towards meeting the APL's milestones/outcomes specified in the DCA (see Section 3.4 below). In addition, as per the 2007 DCA amendment, the feasibility study for Wadi Ahwar (including a "conjunctive use" study) was completed, with results to be applied under the recently-approved WSSP. Hence, by the closing date, the project was deemed satisfactory. PDOs/outcomes attributed to component outputs are summarized in Table 2 (2a and 2b) below.

Because Component B has undergone major cost savings (which helped to increase the allocation to Component A as explained above in Section 1.7), Table 2(b) separately provides further details on the PDO-to-outputs attribution for Component B.

[3] The comparative study was undertaken under IIP to identify a priority wadi on the basis of the highest scores achieved against the following criteria: (i) annual flood water availability; (ii) readiness of farmers to be organized and to form WUAs; (iii) poverty and lack of development projects; and (iv) absence of chronic upland/lowland water rights/allocation issues.

Table 2(a): Attributing the PDOs/Outcomes to Component Outputs

PDO/outcome: **Main outputs (by principal IIP Components)**	**Sustainable water resources management**	**Improved rural income and livelihood**
(a) PIM (Component B)	• Target number of WUGs, WUAs and ICs formed and empowered. • An egalitarian electoral process instituted for WUA leaders and key members (and partially for the 2 ICs, since the IC chairman has been the regional governor). • Major responsibilities/tasks devolved to WUAs/ICs as listed in Annex 2.	• Administration of community contracts transferred to WUAs, helping to improve production and incomes.
(b) Spate irrigation, flood protection and farm-to-market road works (Component A)	• Flood protection works provided (expressed in cost per capita and/or area protected). • Groundwater overexploitation in Zabid reduced. • Soil sodicity/salinity study in Tuban completed and applied. • Hydro-meteorological monitoring and annual water balance carried out. • MIS/GIS established. • Upper watershed plan prepared. • Legal study on upland-lowland water rights (Al-Gabarty rules etc) and on irrigation sector reform executed • O&M manual produced for IIP works and for handover to TDA (Zabid) and Lahej RAO (Tuban). • Wadi Ahwar feasibility and conjunctive use studies completed. • Wadi Ahwar urgent civil works (flood protection, potable water supply and canal cleaning) carried out.	• Runoff harvesting improved by spate infrastructure works (expressed in ERR exceeding 10% or proxy C/O ratio less than 10). • Service and access roads improved, helping to increase farm revenues (expressed in increased number of vehicles passing per month).
(c) Agricultural demonstration; more "crop per drop"; on-farm water monitoring (Component C)	• Two soil moisture kits purchased and used. • Reduced water use per hectare, or at least increased yield per hectare without increased water use per hectare. • Self adoption of successful ADP techniques has occurred in 20% to 30% of non-ADP command areas (depending on the type of introduced ADP technique). Self adoption of the improved maize variety has occurred in almost 100% of the Zabid command area.	• Yields improved and incomes increased (validated by the ex-post Independent Assessment of ADP (2008) and the end-user Rapid Appraisal Survey (2005)).

Table 2(b): Attributing the PDOs/Outcomes to Outputs from Component #B (Irrigation and environmental management and PIM):

Project Components	Outcome/Impact indicators	Outcome achieved	Impact
Component B: Participatory Irrigation Management (PIM)	**Establishment of WUGs and WUAs:** ❑ A total of 230 WUGs were established in Tuban ❑ A total of 213 WUGs were established in Zabid ❑ A total of 16 WUAs were established and became operational in Tuban ❑ A total of 16 WUAs were established and became operational in Zabid	❑ 32 legally recognized community level water organizations were established and became operational, ❑ About 23,000 framers are now members of WUAs, ❑ Water users participation in to the overall project planning and implementation work was attained, ❑ Women participation in WUAs was achieved.	❑ About 23,00 are now using their WUAs to make their voices heard , ❑ Water users were able to contribute to participatory community works and O&M costs of the project, ❑ Created sense of program ownership among beneficiaries, ❑ Created sense of accountabilities and information sharing among water users. ❑ Allowed 20% women to be member of WUAs and are now able to participate in decision making processes.
	Establishment of IC for scheme level management: ❑ Two Irrigation councils (ICs) composed of WUAs members and local government have been established and became operational.	❑ The ICs have adopting the new Water Law, ❑ Developed their Bylaws and adapting them to the local conditions, ❑ Developed their respective Regional Executive Legislations.	ICs are now regulating and enforcing: ❑ Water right, ❑ Over irrigation, ❑ Waterways pollutions.
	O&M cost shares paid: ❑ Tuban WUAs shared 71% of the O&M costs ❑ Zabid WUAs shared 82% of the O&M costs	❑ Of the total of 23 million YR of O&M costs the two wads WUAs have contributed about 19 million YR. ❑ Farmers had committed to make regular contributions towards routine O&M works.	❑ WUAs were able to effectively maintain irrigation infrastructures for the last five year. ❑ WUAs demonstrated some degree of self reliance and the prospect for program sustainability.
	Community level participatory contacts: ❑ In Turban 75 community work contracts were signed between WUAs and the project, ❑ In Zabid 96 community work contracts were signed between WUAs and the project,	❑ A total of 151 community work contracts were completed by Tuban and Zabid WUAs, ❑ Tuban WUAs had fully completed all community work contracts while Zabid WUAs completed 75% of their contracts, ❑ Each framer had contributed 30%, in cash or in kind, toward the total cost of the participatory contracts.	❑ Poor farmers were able to benefit from the participatory contracts by making in kind contribution in place of cash, ❑ The nature of the contract provided for farmers opportunities to have hands on experience on some the irrigation work thereby transferring skills and knowledge, ❑ WUAs' gained more experience how to engage their members into small community work contracts.

3.3 Efficiency

a) Project-level economic analysis. The ex-post (ICR report) analysis findings take into account only the incremental crop production benefits attributed to IIP, which was the case at the ex-ante appraisal (PAD). The ex-post economic IRR from the project's incremental impact has been estimated at 16.6%, which compares favorably to the ex-ante estimate of 11.2%. The regional economic IRR for Tuban and Zabid are estimated at 14.2% and 18.4 respectively, compared to the corresponding PAD estimates of 9.6% and 12.9%. See Annex 3 for further details; and

b) Farm-level financial analysis. The ex-post (ICR report) farm-level financial analysis indicates that, due to the IIP, farmer income has improved by 45% to 89% (depending on farm size and on upland-versus-lowland location). See Annex 3 for details.

The two main causes of the good economic and profitability results are:

a) Improved crop production, firstly as a result of the ADP (Component C) and of the self-adoption of the ADP's most successful techniques on non-ADP areas, and secondly as a result of the spate system rehabilitation works (Component A); and

b) Diversification by farmers of their cropping pattern to include more higher-value crops (particularly in Wadi Zabid), ascribed to the increased water delivery resulting from the spate system works and also to the advisory service provided through the ADP.

With the spate system works only (i.e. without the ADP), the IRR would drop from 16.6% to 13.3% (NPV would drop from YR 1,432 million to YR 647.5 million). With the on-farm ADP only (i.e. without the off-farm spate system works), the IRR would drop only to 14.3% (NPV would drop to YR 784 million). These results show the importance of the ADP relative to the spate system works, and that off-farm system works should be complemented by other interventions to enhance socioeconomic viability. Further results of attribution of benefits to interventions are shown in Table 3 below.

Additional (non-crop related) benefits have been considered as follows:

a) After adding increased livestock production resulting from increased fodder production attributed to the IIP, the economic IRR increased from 16.6% to 20.7% (NPV becomes YR 2,302 million). The added present value of benefits due to livestock would be around US$4 million;

b) The flood protection works add benefits of at least US$10 million (avoided damage, estimated at 2% of the value of household properties, assuming occurrence of at least two abnormally-high floods during 20 years);

c) The present value of benefits from rehabilitating the access roads is at least US$2.4 million (the present value of saved costs, estimated using a reduced cost of transportation of farm produce, assumed at US$3 for transport of 1 ton along 100 km of roads); and

d) The present value of benefits from increasing groundwater recharge is US$5 million (the recharge increment due to increased spate diversions is estimated at a 3 million m3/year minimum and is valued at an inter-sectoral shadow price of water of at least US$0.3/m3).

A relationship of subproject costs to subproject benefits is given in Table 3 below.

Table 3: Attributing Benefits to Type of Intervention

Cross-cutting components and their costs	**Separable subcomponents**	**Cost of separable subcomponents**	**Benefits (from cross-cutting plus separable activities)**
PIM (Component B) US$1.3 million Institutional Development (Component D): US$0.3 million PMU (Component E): US$4.3 million	Spate systems rehabilitation	US$14 million	US$30 million (US$26 million from added crop production plus US$4 million from added livestock)
	Access roads (benefits estimate here is the minimum benchmark, excluding increased production)	US$2.3 million	US$2.4 million minimum (reduced cost of transporting farm produce)
	Flood protection	US$2.4 million	US$10 million minimum (avoided property damage)
	Groundwater recharge	0	US$5 million
	ADP	US$1.0 million	US$5 million

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

The basis of this rating is as follows:

a) The aforementioned project-level ERRs as well as farm-level Financial Rate of Returns (Section 3.3 above and Annex 3);

b) Project unit rates (US$2,000 to US$3,000/hectare) which compare favorably with MNA/IDA norms for irrigation rehabilitation and management projects; and

c) The "intermediate outcomes" (which lead to achievement of the two PDOs) as expressed by project's scores against the DCA-predefined milestones. The DCA milestones aimed at verifying that there had been satisfactory successes with implementation of the IIP Phase I APL, to serve as a trigger for moving ahead with a Phase II APL. The percentage achievement for each of these milestones is shown in Table 4 below. The achievements have come at the expense of extending the IIP's closing date twice, but the overall cost of the project was not increased (although the incremental operation costs for project staff

and IDA supervision were inevitably increased). Furthermore, there were cost savings (explained above and in Annex 2) which enabled the adding of new irrigation improvement activities (through a DCA amendment in 2007).

Table 4: Scores on the IIP DCA Milestones (or Intermediate Outcomes)

DCA milestone to be achieved towards the end of IIP Phase I	Accomplishment
WUAs corresponding to the main canal, all of the secondary canals and all of the tertiary canals in the Wadi Tuban and Wadi Zabid scheme areas created and fully operational.	100%
Transfer of irrigation management responsibilities for all of the secondary and tertiary canals in the Wadi Tuban command area completed.	Mixed (70% to 100%).
The process of transferring irrigation management responsibilities for all of the secondary and tertiary canals in the Wadi Zabid area **commenced.**	100%
Farmers **commenced** paying their share of O&M costs of irrigation schemes in the Wadi Tuban and Wadi Zabid areas.	100%
The Borrower paid its share of O&M costs of irrigation schemes in the project area.	100%. However, post-IIP sustainability of GOY financing of the recurrent costs is questionable due to GOY budget constraints. This warrants a follow up under the recently-approve WSSP.
An IC in the Wadi Tuban area established and fully operational.	100%. But post-IIP sustainability is debatable.
The process of establishing an IC in the Wadi Zabid area **commenced**.	100%
60% of the rehabilitation works under Part A(i) of the project (Zabid command area) completed and 80% of the rehabilitation works under Part A(ii) of the project (Tuban command area) completed.	100%
80% of the rehabilitation and improvement works under Part A(iv) (Wadi Ahwar command area, added through a DCA amendment in 2007) completed.	100%

However, given the challenges and shortcomings discussed above in Section 1.7, Section 2,2, and Section 2.3, the indicated outcomes rating of moderately satisfactory is deemed relevant. This rating is fairly consistent with the PDO and Implementation Progress (IP) rating of the ISRs of the last two years (presented below in Table 5).

Table 5: ISR Ratings in the Last Two Years Before Project Closure

ISR date	PDO rating	Implementation Progress rating
12/28/2006	Moderately Satisfactory	Moderately Satisfactory
06/21/2007	Moderately Satisfactory	Moderately Satisfactory
12/05/2007	Satisfactory	Satisfactory
06/17/2008	Satisfactory	Satisfactory
12/19/2008	Satisfactory	Satisfactory

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

Social assessment at appraisal. As indicated in the PAD (2000), the SA at appraisal found that the following social conditions applied:

i) Poverty. More than 28% (Tuban) and 35% (Zabid) of families lived below the poverty line (US$203). Many people suffered visibly from extremely poor hygiene, the absence of sanitation facilities, and inappropriate knowledge of hygienic measures for handling and consuming food and water. The rural population also suffered from limited access to food, and malnutrition and anemia were widespread;

ii) Farmer organizations as the key to sustainability. Water users had a long-standing tradition of self-reliance, but current dependence on government for O&M was at the root of the present poor prospects for sustainability of the schemes. There were positive farmer attitudes towards overcoming this dependence by forming autonomous WUAs with responsibility for O&M, ultimately up to the level of ICs for scheme management; and

iii) Reconciling different interests within user organizations. It would be necessary to ensure in developing the water user organizations that poor farmers had a voice and that they would not be captured and dominated by large landholding interests. The challenge was to facilitate the cooperation of rich and poor members under what might, at times, be difficult circumstances. Continued consultation with water users, and in particular with downstream farmers, at every stage of the scheme improvement process, was considered crucial.

Social development assessed for the ICR report. The project approach to PIM, including the establishment and support of water user organizations and joint scheme management entities, and the setting up and application of physical and financial arrangements for schemes O&M, as detailed in Annex 2 in the section entitled “IIP as a “Process” Project”, was an important agent for social development, along with the physical infrastructure and agricultural demonstration interventions. The ICR mission’s social assessment results are summarized below and presented in more detail in Annex 5.

i) Poverty and income impact. The preliminary economic return analysis and discussions with farmers suggested that there had been a 50% to 80% increase in farm products which in turn has increased farmer incomes at the levels of both owners and sharecroppers. If distributed equitably, farmer income increases might lead to reduced poverty in the project area. However it is important to note that net farm income is distributed according to the shareholding of each farmer. In principle, in Tuban the

distribution is 2/3 to sharecroppers and 1/3 to landlord, while in Zabid it is 2/3 to landlord and 1/3 to sharecroppers[4];

ii) Gender Impact. The IIP used the PIM concept and component to incorporate the voice of women into project design and implementation processes, thus creating the opportunity for women to participate in project operation and benefits. The project accomplishments in advancing gender equality included significant participation by women both as beneficiaries and as development and management actors both on- and off-farm, primarily and more directly in Wadi Tuban and less directly in Wadi Zabid; and

iii) Social development outcomes. The concepts of user participation and empowerment were the key operational principles guiding day-to-day IIP implementation practices and fostering equity considerations**.** Water users and their representatives have revealed that the project beneficiaries feel a strong sense of program ownership and common purpose. The spate irrigation infrastructure improvements and agricultural demonstration programs have led to marked crop area, production and income increases. Road improvements have provided and enabled much easier and greater access to markets, to gainful off-farm employment, and to basic public services including electricity, communications, health and education, and have also led to higher land values.

(b) Institutional Change/Strengthening

The IIP was able to create capacity at individual, community and institutional levels. The project succeeded in stimulating a desire for institutional improvement, assisting with the realization of the corresponding institutional changes, and providing means for helping to secure a long-term sustainability for these changes. Accomplishments in this regard are summarized below and described more fully in Annex 2.

i) Initiation and development of institutional changes. Social surveys, awareness programs and institutional assessments undertaken under the project served to introduce and generate acceptance of the concepts of PIM, water users cooperation and organization, sustainable O&M, suitable legal frameworks for water management, water distribution equity, and gender equality. Institutionalization of these concepts was advanced through establishment of water user and joint system management entities (WUAs and ICs), and through institutional strengthening and capacity building for these and higher level irrigation sector agencies (e.g. GDI); and

ii) Provision of support for ensuring institutional sustainability. A capacity for perpetuating support to the WUAs was provided through the training of trainers for imparting of all of the skills needed for WUA functioning, including not only technical water management

[4] The cost distribution in both Wadis is 2/3 to landlord who shoulders the irrigation/farming costs (diesel, spare parts, etc.) and 1/3 to farmer. This can be reversed if the farmer shoulders the irrigation/farming cost, thus sharing the 2/3.

and O&M but also planning, budgeting, financial management, administrative, information management and communication capabilities. Also imparted to water users, through the establishment and operation of Farmer Design Committees (FMCs), was knowledge and experience in: (a) identifying and prioritizing of community irrigation and infrastructure problems; (b) formulating of technical and financial modes and arrangements for implementation of solutions; (c) interacting with the responsible GOY regional agencies for design and cost estimate preparations; and (d) implementing projects through contracts. WUA O&M manuals and cost contribution levels and procedures have been prepared and applied, and community-based M&E systems run by the ICs have been set up and made operational. Informational and financial discontinuity in the management transition from PMU/PIUs to MAI/regional agencies at project closure, whereby key staff involved in the transition may not be contributing adequately due to non-payment of salaries, has been identified as an important potential deficiency.

(c) Other Unintended Outcomes and Impacts (positive or negative)

On the agricultural production side, one important identified project benefit that was unforeseen (or at least unquantified) at the time of appraisal is the increase in livestock production resulting from increased fodder production. Other important non-crop benefits quantified at Section 3.3 above (avoided damages due to flood protection works, reduced costs of transportation due to access roads rehabilitation, and incremental volume and value of stored water resulting from increased groundwater recharge) were at appraisal either explicitly or implicitly recognized as potential benefits but were not quantified separately. The increased focus on road improvements certainly seems to have led to important and most welcome improved access to and availability of public services for the project area communities. Finally, the initial interventions towards a rational surface/groundwater conjunctive use policy and mode for water resources management in spate irrigation areas are most significant, but it was unfortunate that this agenda could not be advanced in the Wadi Tuban and Wadi Zabid areas, due to the unfavorable social or other conditions in those areas.

Impact on surface/groundwater conjunctive use and relevance of climate change:

Per the ICR review meeting the task team was requested to make a statement as to IIP overall impact on surface/groundwater conjunctive use, and the lessons learned as to the impact of climate change on jeopardizing PDOs of similar irrigation projects. The following points respond to this, and build on the details given in respective sections above and in Annex 2.

a) Groundwater in the IIP three command areas (as in most coastal areas) is renewable, as it is seasonally being replenished by the infiltrated spate water. Thus, it does not represent the dire resource depletion situation of the highlands where groundwater is non-renewable;

b) Although IIP did not introduce groundwater-recharge works, the spate-related interventions under components A and B have enhanced the recharge to groundwater (as the latter proved to be almost a constant fraction of the spate runoff diverted into the wadi

through IIP, without which this runoff would have been lost to the sea, wadi fringes, or to evaporation);

c) In the three command areas, IIP increased the usable recharge to groundwater by at least 3 million m3/year, of which the benefits (from using this groundwater in the low/off spate season) is assessed at about US$5 million/year;

d) For Wadi Ahwar, IIP studies indicated that it can be more socio-economically viable to further enhance the recharge to groundwater if small low-cost recharge/sub-surface dams are executed (under the recently-approved WSSP) upstream the spate diversion structures (where the sediments flushed from the upper watersheds is not as dense as those sediments accumulating in the downstream). However, the project-formed WUAs and IC should ensure that these structures introduced in the uplands will leave enough water for the lowland farmers;

e) IIP has not duly quantified the enhanced conjunctive use in Wadi Tuban, due to the challenges discussed above in Section 2 (particularly as to implementing subcomponent B(ii) on improving water monitoring). In Zabid, the PIU managed to establish a better IT-based MIS and monitoring system, and the results indicated that IIP improved the conjunctive use in Zabid (as verified by reducing the groundwater table drawdown during the spate season); and

f) The impact of climate change on IIP command area in Tuban was significant, as the wadi has been encountering recurrent (1:50 year) drought spills. This signals the importance of "climate-proofing" the irrigation projects in Yemen at the outset (preparation/appraisal stages). It also signifies the importance of the current AAA work undertaken by the World Bank-MENA region on the cross-sectoral adaptation to climate change in Yemen.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

The ICR mission undertook three independent beneficiary surveys, of which the objectives were to: (i) help with the project-level economic analysis and the farm-level financial profitability analysis; (ii) learn how farmers had spent the increased income attributed to the project interventions and how this had improved their well-being; and (iii) help determine the project's impact on gender. Findings and details of these surveys are presented in conjunction with the discussions on economic and financial analyses (Section 3.3 above and Annex 3) and on social assessments and developments (Section 3.5 above and Annex 5). Also summarized in Annex 5 are the other beneficiary surveys undertaken during the course of the project, the results of which also helped in the preparation of this ICR report.

4. Assessment of Risk to Development Outcome

Rating: **Significant**

Table 6: Assessment of Risks to Intended Development Outcomes

Risk deterring the (component) outputs from reaching the two PDOs	PDO 1 - Sustainable water resources management	PDO 2 - Increased productivity and rural income
Component A - Rehabilitation and modernization of rural infrastructure (canals, access roads, flood protection works).	High risk, due to abnormal/unpredictable droughts in southern Yemen (Tuban). Mitigation. IIP undertook the diversification remedies discussed under Section 2.2 above.	None.
Components B and D - Advancing the PIM process and MAI agencies institutional development.	Medium risk, due to chronic inequitable upland-lowland water/land distribution status in western Yemen (Zabid). Mitigation. (i) The Tuban IC helped towards resolving this issue (as explained in Annex 2), and (ii) the recently-approved WSSP aims to tackle social and water/land rights issues in key basins/wadis.	None.
Component C - ADP pilot farms.	Medium risk, due to increased productivity per ha (meeting PDO 2) resulting from increased water use per ha (compromising achievement of PDO 1); see details in Annex 2. Mitigation. (i) Following advice from IDA/FAO teams, IIP purchased and applied two soil moisture kits in monitoring water use associated with the ADP; results indicated that, with careful irrigation advisory service, productivity can increase without increased water use, and (ii) The recently-approved WSSP aims to address this issue widely through an intensive "Irrigation Advisory" subcomponent.	None.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: **Moderately Satisfactory (has been discussed at the ICR review meeting)**

The Borrower teams have indicated satisfaction on the whole with IDA performance during project preparation and appraisal. For instance, in the Borrower's ICR report the implementing agency cited full involvement and competence on the part of the appointed Task Team Leader (TTL) at that time. However, per IDA's latest assessment, the ICR review comments at Section 2.1 above imply some reservations with respect to the selection of a project wadi (Wadi Zabid), the practicality of the formulated civil works disbursement condition, and the identification and mitigation of risks associated with continuing GOY commitment and support. Much of these design-related issues do not relate exclusively to Bank performance prior to implementation (particularly those caused by unforeseeable externalities, or those attributed to governance or GOY capacity). Nevertheless, per the discussion at the ICR review meeting, and due to the three

DCA amendments effected during implementation (which could have been partly avoidable if factored in at entry), the rating of Moderately Satisfactory is deemed relevant.

(b) Quality of Supervision

Rating: **Satisfactory**

The IDA and Borrower teams have also indicated high satisfaction on the whole with IDA performance during project implementation, citing TTL competencies and supervision teams' effectiveness and constructiveness, and highlighting the DCA amendments, fund reallocations and time extensions as assisting greatly with project implementation and completion. Reservations emerging from the ICR review could relate to issues of timeliness, firmness and pressure with regard to early interactions with GOY in attempting to secure proper commitment and attention to implementation of PIM and other non-works items, perhaps through engagement of separate specialist consultants (as originally envisaged) and greater use of the corresponding allocated funds. The rating of Satisfactory could again be considered conservative.

(c) Justification of Rating for Overall Bank Performance

Rating: **Moderately Satisfactory (has been discussed at the ICR review meeting)**

Combining the previous two performance ratings leads to the indicated rating of Moderately Satisfactory for overall Bank performance.

5.2 Borrower Performance

(a) Government Performance

Rating: **Moderately Satisfactory (has been discussed at the ICR review meeting)**

In the Borrower's ICR report it is indicated that early critical PIM activities including WUAs formation were delayed due to a decision to engage a single large consulting firm with international leadership to undertake all major implementation activities. Preparations for this and the subsequent procurement took 1½ years. Planned prior preparatory activities, including topographical and social surveys, public awareness campaigns, initial social mobilization, and formulation of cost-sharing frameworks (particularly for landowner/sharecropper divisions), were all postponed also, pending commencement of the main consultancy contract. Causes outside of project control are cited for all of this, the most direct one being non-release of the needed local funds. It was understood that the release of local funds was made dependent on parallel use of international credit funds, and it was supposed, as noted below, that during the course of the project, the PMU was pressured by GOY to minimize the use of international credit funds for PIM, EMP, institutional strengthening and other non-works items. As mentioned in

Section 2.1(d) above, it remains to be seen whether this shortfall in GOY commitment and support[5] will impact on the long-term sustainability of the project interventions.

(b) Implementing Agency or Agencies Performance

Rating: **Satisfactory**

Within a framework of limitations set perhaps largely by external agencies and factors, the PMU and two PIUs have successfully managed the implementation of a sizeable internationally-funded project within the MAI's irrigation department. Direct implementation through the MAI's regional agencies was also seemingly successful (perhaps more so through the TDA than through the Lahej RAO). It was noted in the Borrower's ICR report that the granted project extensions essentially covered the initial implementation delay only; implementation proper could be said to have been effected within both schedule and budget. The scope of the project infrastructure works was expanded both within the original project area (additional road improvement works) and to a new project wadi (covering urgent water supply network extensions, flood protection works and canal clearing). Conversely, as mentioned above, PIM, EMP, institutional strengthening and other non-works items aimed at securing long-term sustainability would seem to have been given reduced importance and lowered cost allocations, perhaps largely but not necessarily exclusively due to external GOY pressures. Sustainability may still be achievable, but perhaps not with the same certainty or timeliness that would have been desired. The Borrower's report mentions the large number of various types of contract let and completed satisfactorily and to requirements. It also credits the international consulting firm's effectiveness in ensuring quality and in training local personnel, and highlights the active cooperation provided during IDA and other technical and supervision missions. Certainly it seems that a good project management capability has been created and institutionalized within the MAI, which bodes well for future similar project initiatives and interventions.

(c) Justification of Rating for Overall Borrower Performance

Rating: **Moderately Satisfactory (has been discussed at the ICR review meeting)**

In spite of the perceived satisfactory performance of the implementing agency, combining the two performance ratings above leads to the indicated rating of Moderately Satisfactory for overall Borrower performance.

6. Lessons Learned

The project provided a number of lessons that should prove relevant in the preparation and implementation of future similar projects in Yemen, as follows:

[5] The Borrower did not provide adequate funds to the PMU between appraisal and effectiveness, as needed to enable the PMU to prepare for the bidding process particularly for the TA consulting firm. This substantially contributed to the delay in contracting the firm and hence the delay in implementation.

Lesson 1: Improvement of spate irrigation management needs not only hardware interventions (rehabilitation and modernization of infrastructure) but also institutional development and information management measures. Also, due to the absence of inter-seasonal surface water storage, spate diversion and conveyance improvement works cannot (at unit costs as high as US$3,000 to US$4,000/hectare) be economic unless they are complemented by: (i) on-farm agronomic and irrigation enhancement techniques and advisory services to help raise water productivity, (ii) flood protections works, and (iii) conjunctive use works (low-cost sub-surface dams or recharge dams at appropriately defined upstream and downstream wadi locations), to help increase the availability of groundwater for rural non-irrigation uses and to counteract sea water intrusion.

Lesson 2: The project's PIM and ADP components have resulted in very tangible progress towards achieving sustainable and efficient spate irrigation management (PDO 1) and increasing agricultural productivity and rural incomes (PDO 2). To further develop and greatly extend these successes, they should be enhanced and replicated in other promising wadis under the recently-approved WSSP. Some conclusions deriving from the project's and the country's irrigation subsector PIM and cost-sharing experiences that may help in the formulation of further developments in this area are as follows:

a) WUAs and ICs could play important roles in: (i) providing services that are responsive to farmers' needs, (ii) facilitating expansion of irrigation coverage, and (iii) scheduling water deliveries that are timelier and match crop water requirements better;

b) Farmers participation and cost sharing creates a sense of increased ownership of irrigation schemes, since through this farmers: (i) become more proactive in dealing with emerging problems, and in resolving long-standing social and technical problems that GOY agencies previously failed to resolve, and (ii) start to speak openly on controversial issues such as water rights that no longer provide equity between upstream and downstream users;

c) In the absence of sound water rights, rehabilitation and improvement of irrigation infrastructure would not contribute substantially to improved equity of water distribution between upstream and downstream users. In addition, the relationships between landlords and sharecropper/tenant farmers should be better defined and standardized with regard to assignment of O&M responsibilities and distribution of costs and benefits, with a view to preventing exploitation of poor farmers;

d) GOY can provide farmers with three key incentives to participate in cost sharing and to organize themselves into WUAs, namely: (i) complete and transparent notification in advance of the expected costs and benefits to farmers opting into the PIM process; through public awareness and social mobilization activities prior to any physical intervention; (ii) entrusting farmers with meaningful participation in the planning, design, implementation, supervision and O&M of secondary (distribution-level) as opposed to primary (conveyance-level) irrigation systems; and (iii) similarly complete and transparent public communications on resulting net production and revenues after completion of the physical interventions; and

e) Beneficiary contributions to capital and O&M costs can relieve pressure on government budget obligations and contingent liabilities.

Lesson 3: Basin committees established by MWE/NWRA cannot be deemed as equivalent to or fungible with the ICs established by MAI/IIP. The former function as top-down (mostly appointed) "normative regulators" whereas the latter function as bottom-up (democratic) scheme management overview entities largely comprising representatives of wadi WUAs. The MAI's ICs have proved that they can develop needed water "bylaws" (subsequent to enactment of the MWE/NWRA Water Law in 2003) by tailoring the Water Law to local needs. The ICs can also assist NWRA in applying these bylaws in progressing towards better basin-level integrated water resources management (IWRM).

Lesson 4: Resulting from lessons learned from the ADP, the IDA team cautioned MAI against increasing crop yield per hectare at the expense of unfavorable increases in water use per hectare. If the "more-crop-per-drop" goal cannot be achieved in conjunction with increased crop yield per hectare, then the increase of land productivity and farmer income sought by the ADP should be achieved at least with a "same-drop-per-crop" approach. Preliminary water quantity monitoring results (from both groundwater-fed and spatewater-fed ADP farms) suggested that the ADP has increased productivity and farmer income without increasing water usage per hectare. For ADP activities planned for Wadi Ahwar in 2009 under WSSP, IDA and MAI have agreed on the importance of adding an "Irrigation Advisory" ("less-drop-per-crop") subcomponent to the ADP ("more-crop-per-drop") component. The IDA team assisted the PMU in preparing Terms of Reference (TOR) for ADP activities in Wadi Ahwar, and agreed with GOY/MAI that an advanced follow-up version of the ADP that includes the "Irrigation Advisory" subcomponent would be implemented in Wadi Ahwar under the WSSP.

Lesson 5:. For future comparable projects including the WSSP, IDA, other donors and GOY should specifically assure the financial sustainability of, and the modalities needed for, adequate O&M of provided works and procured equipment. Such projects should include a subcomponent that would ensure: (i) sufficient budget for recurrent costs during project lifetime and after project closure to sustain the headworks, primary system and related equipment, through a clear and precise agreement to be reached between MAI, MOF and MOPIC; and (ii) sufficient revolving funds "ring fenced" by the pertinent IC to sustain the secondary and community systems, raised through O&M fees collected from users with the help of the WUAs, and with provisions for partially bailing out the poorer farmers (tenants/sharecroppers) as needed through application of an increasing-block fee structure whereby richer farmers/landowners effectively cross subsidize poorer ones. Arrangements for this should be documented in the project's Operational Manual and reflected in the legal DCA before project initiation. At project closure, or at the time of handover from PMU/PIUs to the line ministry of the provided works and equipment, the related O&M responsibilities and budgeting arrangements should be clearly documented in a "Handover Operational Manual". The manual should distinguish the responsibilities of the line ministry (MAI) for the headworks and primary system (and related GOY recurrent costs budgeting) from the responsibilities of the operators and users (ICs and WUAs) for the secondary and community systems (and the related O&M self financing). While ownership of both the primary and the secondary/community system assets (works and

equipment) may remain with MAI, the ICs and WUAs can be assigned the responsibility for undertaking and self-financing O&M of the secondary/community system assets.

Lesson 6: Procurement-related lessons. Procurement performance of MAI could have been further improved had IDA task team recommended a well-developed, comprehensive Operational and Procurement Manual, with all the details and requirements at the outset for smooth project implementation. The Procurement Manual should have included more detailed TORs and job descriptions for the Procurement Specialist, PMU and PIU staff and taken into account role of GOY's High Tender Board. Also, it should have included clear procurement procedures. Considering the lack of experience of the PMU in implementing IDA projects, the Procurement Manual should have provided step-by-step procurement procedures, preparation of the bidding documents, RFPs and essential document flow, review, clearance and approval process, procurement plans, and organizational structure for the PMU and PIUs. Furthermore, the PMU staff should have been provided extensive training and coaching on the foregoing needs. On the other hand, IDA should have strictly enforced the initial requirements/covenants on staffing, Procurement Manual, staff training, prior to project effectiveness and disbursements.

Lesson 7: FM-related lessons:

a) The FM performance could have been better rated had the IDA task team recommended a well-developed, comprehensive operational and FM manual, with all details and requirements at the outset for smooth implementation. The FM Manual should have included more detailed TORs and job descriptions for the Finance Manager, PMU and PIU staff and taken into account role of the MOF Representative to minimize any delays in implementation. It should have also included detailed procedures for accounting of contributions in kind;

b) Considering the lack of experience of the PMU staff in implementing IDA projects, the FM Manual should have provided more details, step-by-step disbursement process, preparation of financial chart covering essential document flow, cash flow, review, clearance and approval process, warehouse/store system, assets movement controls, Disbursement and Procurement Plans, and organizational structure for the PMU and PIUs. Furthermore, the PMU staff should have been provided extensive training and coaching on the foregoing needs. On the other hand, IDA should have strictly enforced the initial requirements/covenants on staffing, financial and accounting system, FM Manual, staff training, prior to project effectiveness and disbursements. This could have been effected also during/post the mid-term review; and

c) During project implementation, IDA (FM) supervision team should have recognized the difficulties (inaccurate IFRs, inventory system, and clearing of advances) of the PMU and PIU financial staff and provided options, i.e., allocating funds for consultants to provide help for inventory system, PIU coordination and accounting procedures, advances, and other financial related challenges faced. The IDA FM team should have listened to any requests from the financial and accounting staff or probed into the cause of the issues, which could have been discussed and resolved during supervision or at the mid-term review. The task team should have reallocated funds for a consultant to assist the PMU in

resolving the challenges it faced. In addition, there should have been close FM monitoring to provide guidance to the PIU FM staff and accountants by the Country FMS and his staff.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

IDA received no comments from the Borrower or from the implementing agency on the draft version of this ICR (dated May 20, 2009). However, the views which they shared with IDA earlier during the ICR missions (January 2009 and April 2009) were reflected in the Borrower's ICR report, and thereof, are covered by the discussions in previous sections above.

(b) Cofinanciers

None.

(c) Other partners and stakeholders

The involvement of and collaboration between all stakeholders including end beneficiaries, the line ministry, regional and local authorities, and professionals from a wide range of disciplines, both male and female, has represented real partnership. It has helped to engage the entire civil society in participatory planning, design, execution and O&M of improved infrastructure systems, including through a sharing of both investment and recurrent costs, and in the realization of significant production and financial benefits to all parties.

ANNEX 1: Project Costs and Financing

(a) Project Cost by Component (in USS Million equivalent, including IDA and GOY contributions up to March 2009).

Components/Subcomponents	Original DCA Cost Estimate		Mid-Term Cost Estimate		Final/Actual Cost (Dec08/April09)		
	(USD M)	(% of tot.)	(USD M)	(% of tot.)	(USD M)	(% of tot.)	(% of org.)
A. Rehabilitation and Improvement of Spate Irrigation Infrastructures							
1. Wadi Tuban	6.70	26	6.57	28	8.10	31	121
2. Wadi Zabid	5.60	22	7.61	33	10.10	38	180
3. Wadi Ahwar	0.00	0	0.00	0	1.15	4	
Subtotal Rehabilitation and Improvement of Spate Irrigation Infrastructures	**12.30**	**48**	**14.18**	**61**	**19.35**	**75**	**157**
B. Participatory Irrigation Management (PIM)							
1. Formation of PIM Organizations (WUAs and SMUs)	3.00	12	2.71	12	0.20	1	7
2. Improvement in Spate Irrigation Management	0.90	4	0.86	4	0.10	0	11
3. Improved O&M on Irrigation Infrastructures	3.90	15	1.72	7	0.90	3	23
4. Environment Oriented Operations	1.10	4	0.18	1	0.10	0	9
Subtotal Participatory Irrigation Management (PIM)	**8.90**	**35**	**5.47**	**24**	**1.30**	**5**	**15**
C. Institutional Strengthening							
1. Improved Legal Framework	0.30	1	0.05	0	0.10	0	33
2. Support to Government Irrigation Related Institutions (MAI, GDI, TDA ...)	0.50	2	0.19	1	0.10	0	20
3. Other Wadis Preparation Studies	0.50	2	0.50	2	0.10	0	20
Subtotal Institutional Strengthening	**1.30**	**5**	**0.74**	**3**	**0.30**	**1**	**23**
D. Intensive Agricultural Demonstration Program	**0.54**	**2**	**0.84**	**4**	**1.00**	**4**	**185**
E. Project Management Unit (PMU)	**2.54**	**10**	**1.87**	**8**	**4.30**	**15**	**169**
Total Project Cost	**25.58**	**100**	**23.09**	**100**	**26.25**	**100**	**103**

Notes

1. Component/subcomponent numbering and structure, and all cost values in USD M, are taken from the Borrower's ICR report.
2. Component/subcomponent numbering and structure, and original DCA cost estimate values, correspond closely to the PAD.

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		3.10	4.00 per GOY estimate March 09	%129
International Development Association (IDA)		21.30	22.00 per GOY estimate March 09 24.79 per IDA-FM ICR report of May 09	%114
Local Farmer Organizations		1.20	0.30 GOY report	%25

ANNEX 2: Outputs by Component

Component A: Rehab of spate irrigation and flood protection infrastructure in wadi Tuban and Zabid, including rehab of key farm-to-market roads; and urgent rehab of village protection and rural water supply works in Wadi Ahwar. This component involved civil works, goods/equipment (only for Wadi Tuban), and consultancy services (the latter included a topographical survey, detailed designs and construction supervision).

Until 2005 this component was relatively lagging behind schedule due to the disbursement condition entailing that the works can only start after the WUAs and two ICs have been established (under Component B) in Tuban and Zabid.

For the irrigation 2007 season (ending November 2008), the total incremental areas irrigated through this component have been about **17,700 hectares** due to the good rates of spate base flow and flood flow experienced this year, and due to the project's interventions. Irrigated areas amounted to 13,106 hectares **(90% of command area)** and 4,600 hectares **(50% of command area)** in Zabid and Tuban respectively.

By the closing date (December 31, 2008), regarding the development impacts, for the 2008 flood seasons, the incremental areas irrigated through this component amounted to 5,205 hectares (25% of command area) and 1,075 hectares (10% of command area) in Zabid and Tuban respectively. This is attributed to the project's interventions. The total base flow cum flood flow has been 81 MCM/annum in Zabid, while this total has been quite low in Tuban (hence, the low incremental area in Tuban). For the flood of 100 MCM/annum that occurred in Zabid in 2007, the project's interventions helped irrigate an incremental area of about 10,000 hectares, and the unit cost of the interventions amounted to US$2,000/hectare, which is well within the MNA norms for comparable projects. By the closing date, the disbursement on civil works reached:

a) 93% and 81% of the planned sums for Zabid and Tuban respectively. Much of this gap between disbursed and planned sums ascribes to cost savings rather than to delay in physical progress. The physical progress is actually higher than 95% in the two wadis;

b) 94% of the planned sums for the farm-to-market roads (also the gap is due to cost savings, as the physical progress is 100%);

c) 84% for the WUA contracts; and

d) 100% for the urgent civil works in Wadi Ahwar, including four contracts for water supply, flood protection, and cutting of "Masqeet" trees in the main canals.

Component B: Irrigation and Environmental Management and the PIM. This component involved consultancy services, training and procurement of goods.

Environmental Management Plan (EMP) and Social Measures:

Safeguard policies triggered:

Policy	Triggered
Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)	Yes

Environmental Category: B, Partial Environmental Assessment and EMP requirements:

There are no major environmental issues per the partial EA completed for IIP. The project has beneficial impacts on the environment as it increases the reliability of spate irrigation water, and reduces overdraft of the groundwater aquifers. However, due to changes in the pattern of water distribution as a result of rehabilitation of spate irrigation infrastructure, reduction of recharge to certain areas was sought to occur. On the other hand, improved water distribution should result in reduction of groundwater use in those areas. These benefits have been expected to outweigh any minor adverse environmental impacts (soil quality, water logging, water quality) arising as a result of the agricultural activities in the improved areas.

Provisions made by the project to ensure compliance with applicable safeguard policies:
The proposed project followed the World Bank guidelines OP 4.01 on environmental assessment and adhered to the requirements of the GOY for such projects, as outlined in the Environmental Protection Law, No. 26 enacted by the Parliament in 1995 and the National Environmental Action Plan (NEAP) prepared by the Environmental Protection Council (EPC) in 1996.

Environmental and Social Monitoring and the related Capacity Building:

The EMP aimed at establishing the conditions required for sound environmental management in the project area. It incorporated three main components.

a) Environmental Awareness and PIM. This covers: (i) promoting (through participation and capacity building) local knowledge and awareness of the major issues threatening the well-being of wadi populations, particularly in terms of sustained water availability; and (ii) encouraging participatory management of natural resources by the institutions established under the project. The project included a major subcomponent on PIM, as explained below. This approach was meant to be supported by systematic monitoring of water characteristics, information campaigns, training and support to the fledgling water management institutions;

b) Groundwater. In order to minimize groundwater depletion (which although barely to be linked to the project is nonetheless the most significant environmental problem in the Zabid area), the EMP supports a groundwater management system which would rely on data collected from the monitoring of water levels and quality in the project area. In order to monitor any changes to quality or quantity of groundwater in the Zabid area, where there is currently over-pumping, detailed analysis and modeling of water resources and water quality monitoring are to be carried out. An awareness campaign would also be included to inform the users about the impact of groundwater use, and measures to sustain that use. These actions have been included in project costs. Most of the problems can be mitigated through technically simple measures that can be implemented through the

involvement of the WUAs and ICs once they are aware of the limits to the use of groundwater resources. Involvement of the water users and studies in monitoring the impact during the project would help improve water resources management in the project areas; and

c) Building the Knowledge Base. The EMP incorporates three studies (of which numbers (i) and (ii) are already programmed under other components of the project): (i) soil salinity/sodicity mapping study to avoid soil sodicity occurrence and advise farmers on irrigation practices will be undertaken for the Tuban area; (ii) upper watershed management study will be carried out to assess the status and trends of erosion, review experience of watershed management so far and formulate a strategy and a program to reduce erosion in the catchment areas of the wadis; and (iii) sand dune fixation study, if is not implemented through the Land and Water Conservation Project (LWCP), to assess the need for further action to arrest sand dune movement and protect project farming areas.

Results from implementation of the EMP:

Environmental Management Plan:

Thus far, there has been a satisfactory progress as to executing the EMP. In terms of "hardware", all of the village/wadi protection (or so called: environmental protection) civil works have been completed. In terms of "software", progress has been satisfactory as to the main subcomponents of the EMP: groundwater monitoring; environmental awareness and participatory management; and building the knowledge base regarding the soil salinity/sodicity in Tuban. However, NWRA-Aden and IIP-PIU-Lahj needed to improve their cooperation so that IIP could easily/timely obtain the spate data from NWRA-Aden, especially regarding Dukaim station in Tuban. The Upper Watershed Management study progressed well, with remarkably good contribution from GDI. The study on the Soil Sodicity/Salinity Mapping (including the mitigation alternatives) in Wadi Tuban has been finalized. Its results have been presented at a participatory workshop, and the IC in Tuban has applied its findings in the field.

Environmental and Social Monitoring and the related Capacity Building:

Environmental Awareness and Participatory Management

Systematic monitoring of water resources characteristics and training of pertinent institutions and fledgling entities (e.g., WUAs and ICs) have been fairly progressing. This has been inferred by the PMU quarterly and annual reports and by the field visits.

Surface-water and groundwater monitoring

The PMU has obtained the required metallic staff gauges from the water monitoring unit at GDI by the ex-LWCP and were sent to the two PIUs for installation. These are to be installed upstream and downstream of all wadi weirs and downstream of main off-takes and scour sluices at weirs. In Wadi Tuban the staff gauges were installed in Al-Arais, Ras Al-wadi Beizag and Faleg Iyadh diversion weirs. In Wadi Zabid eleven sites for installation of staff gauges were

specified by the PIU in coordination with the O&M specialist of the TA consultants (five sites at the five diversion structures and six at canal bifurcation structures). Installation has started in weirs # 3 and 4 and installation at the remaining sites awaits completion of the rehabilitation works at diversion structures # 1 and 3.

Groundwater monitoring has been undertaken through TDA in Zabid and NWRA/GDI in Tuban. Data for drawdown, Electric Conductivity (EC), and pH are available for Tuban; and data for drawdown and EC are available for Zabid; both on a monthly/quarterly basis. However, for this data to be functional there is a need to stream it into the MIS of the project.

Compared to previous years, there has been an obvious increase in groundwater recharge due to completion of the spate works particularly in Zabid. However, due to cultivation of water-intensive cash crops under the ADP component, it is reported that there has been a significant net increase in groundwater discharge in some of the ADP areas. The Bank's task team requested the ADP consultants to meter water usage for the ADP farms, toward increasing productivity per unit of water (as opposed to merely increasing productivity per unit of land). This has recently been done, and the results (particularly in Zabid) showed that crop productivity per hectare has been increased without increasing water use per hectare.

This subcomponent B1 also established and tested A Geographic Information Systems and Management Information System (GIS and MIS), flood warning and hydrological monitoring system, and spate management models. However, due to the lack of cooperation between MAI/IIP and NWRA (being under MWA, and entrusted to monitor the water resources availability), particularly in Tuban, the project could not obtain the hydrological data needed to make these high-tech systems function as intended. Add to this the fact that, to act on the results of these systems, the regulator (NWRA) and the water-user agency (MAI) needed to cooperate much better. All these information and inter-ministerial issues have been dealt with as part of the design of the recently-approved WSSP.

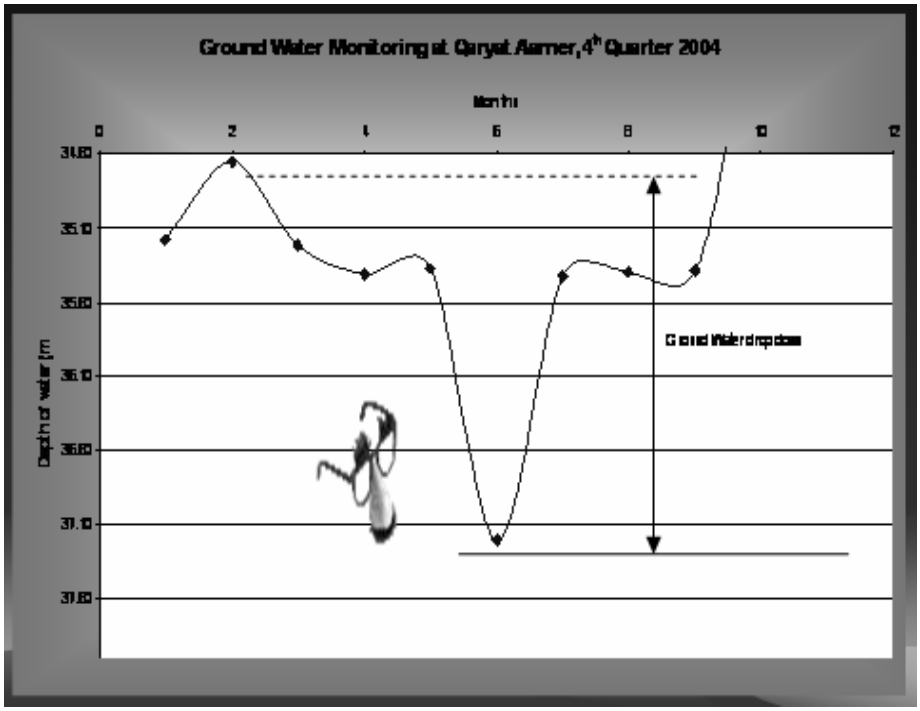

Figure 1: Groundwater Monitoring under IIP

Building the knowledge base: the soil salinity/sodicity study and the upper watershed management study

The study on the Soil Sodicity/Salinity Mapping (including the mitigation alternatives) in wadi Tuban has been finalized and its results have been presented at a participatory workshop. The consultant carried out random field sampling and laboratory analysis of soil and water samples taken from the study area. Based on the results, the consultant prepared a working paper in Arabic and English which was presented and discussed at the workshop, with participation of the beneficiaries and stakeholders of wadi Tuban (the study area).

The Upper Watershed Management Study has also progressed well, with a very good contribution from the GDI. The study utilized the resources in GDI and the lessons from the Land and Water Conservation Project (LWCP).

By factoring in the existing lessons and the results of the studies obtained from related closed/ongoing projects, the Scope of Work and (accordingly) the budget of the two aforementioned studies have been rationalized (thus favorably saving time/resources).

Through holding a wadi-wide workshop, the Tuban Irrigation Council (IC) acted on effectuating the recommendations of the "Salinity and Sodicity" study prepared under IIP. The study's results have been presented at a participatory workshop, and the IC in Tuban has attempted to apply its findings in the field. The major finding is that irrational groundwater use should be phased out and should be replaced by utilization of spate water and conjunctive use, otherwise over-drafting the groundwater beyond the safe yield will result in further intrusion of seawater

and hence further salinization of the wadi's fertile soil. The Tuban IC attempted to respond to this through prioritizing the irrigation diversions onto the saline lands, in order to safeguard the needed flushing of salts.

Figure 2: Application of the Soil Sodicity/Salinity Study

Participatory Irrigation Management (PIM):

Implementation of the PIM component, including formation and empowerment of ICs and Water WUAs has progressed as planned. The project met all target 443 **WUGs** (230 in Tuban and 213 in Zabid), 32 WUAs (16 in Tuban and 16 in Zabid) and two ICs in Wadi Zabid and Tuban. The IC has been very active in Wadi Tuban.

For the investment/rehabilitation works, the IIP-PIM introduced (by 2005) an in-kind cost-sharing approach via WUA-administered contracts. To enable low-income farmers to share the capital costs of the project, the project divided civil works into two categories:

a) Priority works to be fully financed by the project (government funds and loans). These works include feeder roads and flood/environmental protection works, which are deemed public goods outside the canal system and thus require no earmarked user fees; and

b) Participatory works, requiring 10 percent of farmers' contribution to rehabilitation/ improvement capital costs. This percentage was agreed between the project government team and farmer representatives (initially the WUGs; eventually the WUAs). Farmers were allowed to contribute this percentage in kind: labor and material. In this arrangement, each WUA would implement 1–2 small community contract(s) up to US$10,000 per contract to an aggregate US$1.4 million per project. To persuade irrigation end-beneficiaries to contribute 10 percent in kind, the project guaranteed that the unit rates of the contracts awarded to WUAs would be 30 percent cheaper than those implemented by

the national/regional contractors. (These rates otherwise would have embodied significant profit margins for the WUA-contractors.) This percentage thereby represents the total contribution from end-beneficiaries and, intrinsically, from the WUA-contractors.

This PIM subcomponent also provided O&M equipment and spare parts for O&M of the IIP spate schemes, which were leased (by the PIUs) on a gradually-phasing-out basis to the implementing agencies (TDA in Zabid and MAI regional office in Tuban) during IIP's initial periods, then were eventually leased to the WUAs.

The legal study for water rights in Zabid was finalized through active contributions from Zabid IC and WUAs. In Zabid, the upstream-downstream water rights issue persisted and the IC could not significantly contribute to resolving it. The IC has been more or less in a "dormant" stage and IDA requested H. E. the Governor of Hodeidah (being the Chair of the IC) to make the IC proactive by holding regular meetings and coming up with solutions that ensure fairness and equity in water distribution between upstream and downstream users.

Comparably, the IC in Tuban has achieved a remarkable accomplishment by adopting the new Water Law, developing its Bylaws for Wadi Tuban, and adapting them to the local conditions (through developing the respective Regional Executive Legislations). The IC thereafter acted on the Water Law by taking a number of enforcement and corrective measures in the field against:

a) The violators of water rights (by closing down the upland diversions that blocked water from flowing downstream);

b) Polluters of waterways, and

c) Over-irrigators.

Also, the IC in Tuban applied in 2008 the recommendations of the "Salinity and Sodicity" Study (completed by the project), through prioritizing the irrigation diversions onto the saline lands, in order to safeguard the needed flushing of salts.

The PIU in Wadi Ahwar was established in 2008 with essential staff, office equipment and furniture as well as transport means. The Ahwar's PIU made an excellent achievement by completing the formation of the WUGs on Foad-Weir main canal in a record time (6 months). This was faster than the process of forming the WUGs in Zabid and Tuban, thus confirming the findings of the assessment study which ranked Wadi Ahwar the first amongst 7 wadis, in terms of readiness of the communities to get together toward addressing their water issues. Also, the PIU in Ahwar has started forming Ahwar's IC and formal WUAs, yet this will be fully completed under the recently-approved WSSP phase.

Cost-sharing achievements under the PIM

a) For capital investments, the WUAs have shared the cost of the participatory works and the WUAs contracts by 10% and 30% respectively, in cash or in kind; and

b) For the O&M, the WUAs shared the costs by an average 73% (70.78% in Tuban and 76.40% in Zabid) of the cost of O&M of the works and equipments introduced by IIP.

However, challenges remained high as to increasing the membership of the WUAs and as to enhancing the water rights system in Zabid, as explained below.

Challenges remaining as to the PIM

WUA formation vis a vis membership

Although the target number of WUAs has been formed, the membership percentage has been relatively modest, but gradually increased particularly after completion of the participatory and community civil works (as this encouraged the farmers to subscribe to the WUAs). Membership in Tuban and Zabid has ranged from 10-49% and 10-63% respectively. The reason for this modest membership in Tuban is the lack of spate water and also the fact that most farmers are civil servants where farming is not necessarily the mainstay of the households. The reason for the modest membership in Zabid is that the current water rights system often avails mainly a few, big landlords especially in the upstream.

However, even when the percentage of subscribing farmers (i.e., membership percentage) is low, with all of the formed WUAs the minimum "quorum" has always been met, as the subscribing always own more than 50% of the WUA's command area.
The WUA rulings do apply to the members as well as to the non-members, and the non-members do not benefit from the rebates offered on the members on the O&M user fees.
Water rights in Wadi Zabid and the legal study

In mid-2006, violations in the upstream deprived 2400 hectares in the downstream from water, only to the advantage of 540 hectares in the upstream, which are owned by a few families. It has been agreed that the IC (in cooperation of the pertinent WUAs) should work on rectifying this situation by revisiting the "Gabarty rule" (customary rights based on seasonal water rotations between upstream and downstream agricultural areas). This system used to work in the past because: (i) the water control structures used to be earth works (whereon water could breach or overtop, thus reaching the downstream) as opposed to the current concrete works; and (ii) currently farmers have been shifting to water-intensive cash crops like Mangos and Bananas as opposed to subsistence crops that used to be grown in the past. This upstream-downstream effect is particularly problematic at times of small floods as opposed to big floods which can usually meet the demands downstream.

A legal consultant was hired to help the IC in addressing this issue, through undertaking a comprehensive study of the Gabarty system vis-a-vis the needed amendments. The study (completed in end-2006) suggested various remedies to deter upstream users from overusing water, including applying punitive ascending over-usage fees. The study warranted follow up and implementation by TDA (from the technical stance) and by the Zabid IC and the governor (from the regulatory and enforcement stance). However, it is becoming clear that reversing the past/present upland-lowland water allocations may be too difficult, as this simply means

expropriating part of the land ownership for the upstream landowners. Nevertheless, the findings of this legal study remained useful to help in arresting any further misuse of water rights.

Component C: Agricultural Demonstration Program (ADP): This component involved consultancy services and procurement of goods.

The ADP has been satisfactory despite an inevitable 2-year delay at the start of IIP, as by mid-2008 it was successfully **completed on 4,005 hectares (out of the PAD's target 5,000 hectares),** and with a unit cost of **about US$260/hectare.** To assess the impact of introduced technologies on productivity, dissemination, adaptation, and farmers' income and family livelihood, the PMU engaged a team of Independent Consultants to carry out an ex-post assessment, which has been documented by the project. In general, the outcomes are very positive. For example, the average productivity of cotton has increased by about 50%, sorghum by 49% for grain and 34% for fodder, sesame by 53%, tomatoes by 62%, and onion by 73%. The outcomes of the study also revealed that the number of farm animals increased by 40% (largely due to the increased productivity of sorghum fodder). These outcomes have directly or indirectly improved farmers income and the well-being of their families.

Table 2.1: Yield and Farm Revenue Increases Due to Improved Farming Practices:

Planned Project Estimates vs. Actual Measurements (%)

Crop	**Planned yield increase** *(%)*	**Measured yield increase (end 2005)** *(%)*
Cotton	13 Zabid 15 Tuban	45–100
Sorghum grain	5	Up to 98
Sorghum fodder	4 Zabid – 8 Tuban	Up to 44
Sesame	10	Up to 55
Maize	18 Zabid	62–97 Zabid
Cucurbits	3 Tuban	Up to 200
Tomatoes	20	87
Onions	20	12 to 25
Eggplant	20 Tuban	44
Red chilies	20 Tuban	NA
Banana	10–15	NA

Crop	Planned yield increase *(%)*	Measured yield increase (end 2005) *(%)*
Mango	10	NA
Okra	15	25
Water melon	NA	28 Zabid

Self adaptation of the successful ADP techniques in the non-ADP farms

The self adaptation of the ADP has occurred on an average of 20% to 30% of the non-ADP command area (depending on the type of the introduced ADP technique). In Zabid, the self adaptation of the improved Maize variety has occurred almost on 100% of the command area. A high adaptation rate is also reported for the ADP-introduced new varieties of mangoes and cotton.

Ensuring that ADP does not increase productivity at the expense of increasing water use

A fast-tracked follow-up study addressed the water consumption associated with the improved techniques. The project procured and utilized two Soil Moisture Kits for monitoring the water use associated with the ADP techniques in Tuban and Zabid. This responded to a request from the IDA ISR missions, which cautioned IIP against increasing crop yield per hectare at the expense of increasing water use per hectare. If the **"more-crop-per-drop"** goal inevitably cannot go on pars with increasing crop yield per hectare, then, the increase of land productivity and farmer income sought by the ADP should at least be achieved in line with a **"same-drop-per-crop"** approach. The preliminary water monitoring results (both on ADP's groundwater-fed and spate water-fed farms) suggested that ADP has increased productivity and farmer income without increasing water usage per hectare.

For the ADP activities planned in Wadi Ahwar in CY2009 (under WSSP), IDA and MAI agreed on the importance of adding an "Irrigation Advisory" (less drop per crop) subcomponent to ADP (more crop per drop). The IDA Task Team assisted the PMU in preparing the related ToRs for the ADP activities in Ahwar. IDA agreed with MAI that the ADP will be replicated in Wadi Ahwar under the WSSP as follows:

a) on at least 100 hectares during CY2009;

b) targeting the spate season peaking in July 2009 (since March to September 2009 would mainly involve irrigation on spate water; September to March mostly on groundwater);

c) including at least two or three farm plots irrigated by groundwater;

d) by building on ADP's documented experiences from Zabid and Tuban, and by introducing the Irrigation Advisory activities;

e) for unit costs up to US$500/hectare (Irrigation Advisory will be added to ADP under the recently-approved WSSP); and

f) by utilizing the two Soil Moisture Kits for monitoring water usage (rather than using the common/current auger hole method).

Component D: Institutional Strengthening and Capacity Building. This component involved consultancy services, training and procurement of goods.

This component achieved the following outputs:

a) Supported Yemen's Irrigation Sector: by providing an institutional assessment of the irrigation institutions, including the GDI; and providing technical assistance to the GDI preparing guidelines for the PIM program in Yemen. This technical assistance included on-the-job training to GDI and to other pertinent agencies based on the results of the sector assessment;

b) An inventory and assessment of the dams and of the bulk water resources in the upper watershed of Tuban and Zabid, which affect the performance of the spate systems. This study was undertaken by GDI with TA from IDA and FAO/CP;

c) A Legal Framework Development Support: including TA to GOY in preparing the irrigation law/bylaws, as needed toward the intended far-reaching sector reform, including scaling up the PIM all over the country. This work also comprised completing a legal study (which included conducting questionnaires to the wadi's inhabitants) on the chronic upland-lowland water rights issues in Wadi Zabid[6];

d) Staff of the TDA being the partner agency co-executing the project in Zabid with the help of Zabid's PIU) were trained on the job on maintaining the hydro-metrological MIS in Zabid;

e) Preparing and implementing the O&M manual for IIP's spate irrigation works, including developing the related MIS and GIS for the two wadis;

f) A comparative assessment of the socio-economic viability of spate interventions in seven candidate wadis (which resulted in electing Wadi Ahwar as explained above); and

[6] The *Al-Jabarty* system in western Yemen, including in Zabid, has been adopted by farmer groups as a *defacto* rubric for managing the upland-lowland spate-water rights. Very surprisingly, as part of this legal study, the Yemeni and IDA teams could not find any official documentation or any anecdotal evidence of the *Al-Jabarty* rulings. However, to date, his rulings are still successfully practiced in western Yemen.

g) Support to the PMU and the three PIUs in Wadi Zabid, Wadi Tuban and Wadi Ahwar.

Institutional Change/Strengthening

The IIP was able to create capacity at individual, community and institutional levels. The project succeeded in stimulating a desire for institutional improvement. Accomplishments in this regard are described below.

Major responsibilities/tasks devolved to WUAs/ICs include: (i) consultations with farmers (WUGs/WUAs) on prioritization and design of most project interventions; (ii) WUA-executed community contracts of up to US$10,000 in value; (iii) WUA cost sharing of the participatory works (10%) and of the WUA works (30%) in cash or in kind; (iv) cost sharing by farmers (through WUAs) of the O&M costs of the works and equipments introduced by IIP (around 74%); (v) efforts by Tuban IC in developing and enforcing the water bylaw (water rights etc.); (vi) attempts by Zabid IC to advance implementation of all 4 components; (vii) contributions from the WUAs and ICs to M&E as outlined further below; and (viii) advances with development of gender awareness and equity.

The project cultivated the ground for institutional transformation. While preparing the ground for change, IIP:

- Conducted Basic Social Survey. The survey has provided a solid base for introducing the concept of PIM among project beneficiary, government agencies, regional and local institutions.
- Conducted awareness programs and created water users organizations. A total of 228 comprehensive multi-stakeholders community awareness campaigns were conducted in project areas in both wadis and this has:
  - Created 443 Water Users Group (WUGs).
  - Formed 32 Water Users Associations (WUAs).
  - Created sense of awareness among women.
  - Brought greater understanding among farmers about the importance of the rehabilitation, maintenance and sustainability of their infrastructures.
- Supported capacity building programs to strengthen the Irrigation Sector. Under its institutional strengthening and capacity building support the project assisted in:
  - assessing the capacity of irrigation institution including General Directorate of Irrigation (GDI).
  - enhancing GDI's capacity in developing, planning and preparing guide lines for the PIM program.
  - conducting the upper water shed study in two wadis.
  - conducting the soil and salinity study for Zabid area.
  - preparing the water law and its execution procedures.
  - conducting the legal study for modification of water rights in Wadi Zabid.
  - undertaking rapid assessment study of phase II wadi.
  - providing consultancy work for the water resources assessment and for the preparation of detailed design for major works of Wadi Ahwar.

- Irrigation Councils. ICs are the highest authority of water users' organizations and acts as the Executive and Administrative Authorities in each wadi (riverbed).

Strengthening water users' institutions and cultivating the enabling environment for change was seen as an important imperative to WUAs sustainability. Approximately 20 percent of total project costs were directed towards building the capacities and capabilities of Water Users Organizations. This has led to:

- Capacity enhancement interventions tailored to WUAs needs. A total of 3200 trainees were provided 8053 training days in technical, financial administrative skills such as:
  - finance, administration and O&M.
  - planning and budgeting for their operations.
  - building their own data-base.
  - communication.

- Farmers Design Committee. Farmers were given the opportunity to co-design and co-implement contracts. The FDC served to transfer skills and know-how to water users. The approach has contributed to:
  - Creating and operationalizing 32 farmers design committees.
  - Implementing 189 communities' projects for total contracts amounting to US$1,366,320. This includes 10% of farmers' contribution to the projects' total civil work cost.
  - Identifying irrigation problem and prioritizing those problems.
  - Designing, implementing mode and cost-sharing arrangements with the WUA Board of Directors.
  - Collaborating with PIU in preparing detailed designs and cost estimates for completion of total canals within the working area of the WUA.

- Operation & Maintenance work. Irrigation stakeholders in the two wadis have participated in the IIP design, cost-sharing, and implementation stages. As a result:
  - Wadi Zabid and Wadi Tuban WUAs have been working closely with the project implantation units (PIUs).
  - Zabid WUAs have contributed YR9,503,000 towards O&M total costs. This amount represents 71% of the last five years O&M total costs.
  - Tuban WUAs have contributed YR10, 358.891 towards O&M total costs. This amount represents 76% of the last five years O&M total cost.
  - The IIP prepared an O&M manual to assist the principal users in order to operate the irrigation system effectively.
  - The principal users have also benefited from extensive training on how to use this manual and how to implement it.

- Community-Based Monitoring and Evaluation System. To maintain sustainability, the IIP ensured that ICs closely monitor the performance of the WUAs. The project has established three broad performance indicators: (i) institutional, (ii) financial, and (iii) technical.

Challenges:

- In absence of advance planning and adequate transitional arrangements upon project completion, project staffs, WUAs and ICs will pay huge costs such as: project professional and support staffs working without salary for more than three months. This seems to have been the case upon IIP operation termination.
- Planning ahead on time on how to sustain the best of the project staff and institutional memory is critical and should not be undermined as it may result to loss of experienced and passionate staff.
- The tendency of different organizations with potential to protect their turf and cause transitional difficulties must be discussed and prevented a head of time.

Lesson Learned:

- The advancement of the PIM concept into the IIP project process prompted the GOY to create enabling legal and institutional environments.
- If appropriate training is given and organizational capacity is built community level organizations can serve as reliable and natural development partners.
- Cost-sharing arrangement is important for increasing beneficiary ownership and accountability.
- PMU and PIU staffs with deep understanding of local needs and culture can cement trust and collaboration between project and project beneficiaries.

DCA Amendments and closing date extensions

In August 2003, the DCA was amended to permit the following improvements under Component A:

a) Rehabilitation of existing service and access roads connecting the project-served villages and market places within the project area;

b) Community participation: Permitting civil works less than US$10,000 per contract, and up to an aggregate amount not exceeding US$1,200,000, to be executed directly through the respective WUAs; and

c) Shopping of small works: Permitting works costing less than US$30,000 per contract, up to an aggregate not exceeding US$500,000, to be procured under lump-sum, fixed-price contracts awarded on the basis of quotations obtained from three qualified domestic contractors in response to a written invitation.

In November 2005, the DCA was amended and the closing date extended from June 30, 2006 to June 30, 2007.

Part of the DCA/PAD APL1 milestones were amended to tackle the delays encountered due to previously-unforeseen externalities (e.g., abnormal droughts in Tuban), as follows:

a) Permitting that civil works (under Component A) to be done on secondary and tertiary canals (thus in addition to primary-canal and headwork levels per the original DCA);

b) Clarifying the aforementioned community contracts (% expenditures to be financed is: 60% by IDA, 30% by beneficiary farmers in cash or in kind, and 10% by the GOY); and

c) The milestones for moving to APL II were amended to stipulate that the transfer of O&M (being a disbursement condition in the original DCA) is only needed at the secondary and tertiary canals rather than also at the main canals (per the original DCA: Section 4.07). The reason is that the main canals (as opposed to tertiary and secondary canals) are deemed public infrastructure, hence warranting much less engagement or cost sharing by the end users.

These amendments helped increase ownership at the community level and helped expedite completing the civil works in the spate component and the progress of ADP Component, by allowing the WUAs established by the project to administer executing small contracts (less than US$10,000, with an aggregate sum not exceeding US$1.2 million).

In June 2007, the DCA was re-amended and the closing date was re-extended from June 30, 2007 to December 2008 in order to:

a) Ensure completing the civil works; and

b) Utilize the uncommitted IDA funds (due to project cost savings) in piloting fresh ideas for cross-sectoral conjunctive use of surface and groundwater in Yemen coastal plains. Based on an extensive comparative study a third wadi, “Wadi Ahwar" in southern Yemen was elected for utilizing these funds in executing urgent flood-protection and water-supply works and in undertaking a major feasibility study for wadi-wide interventions.

In anticipation of introducing the recently-approved WSSP (2009-2014), the aforementioned second extension of IIP was perceived by GOY and IDA as a “bridging phase”, rather than a full-fledged APL II. The IIP’s full-fledged APL II phase will defacto be subsumed under the recently-approved WSSP.

Identification of the origins of the cost savings as estimated by MAI at mid-2007:

As of the IIP-APL1 effectiveness in January 2001, there has been project savings in IDA commitments, which are estimated to reach about US$3.5 million by the current closing date (end June FY07). The origins of the savings have been as follows:

a) Savings in goods and equipments due to obtaining gates from a Japanese grant rather than from the IIP credit, and due to technical efficiency savings as well as savings obtained from local (as opposed to international) procurement. To effect these savings, Category 1 of the credit proceeds has been revised from SDR 2.4 million (at original DCA) to SDR 0.9 million;

b) Savings in Project management Costs[7] (Category 4): from SDR 1.5 million to SDR 400,000; and

c) Utilization of the unallocated category: reduced from SDR 1.6 million to SDR 200,000.

Corresponding to the aforementioned IDA savings, the GoY additionally contributed US$0.34 million (e.g., about 9% of the total).

Additions to project description per the DCA amendment 2007:

The IDA savings (plus GOY co-financing) have been utilized through a 18-month extension phase, to jumpstart irrigation modernization and cross-sectoral conjunctive use facilities of water resources management in Wadi Ahwar. This addition did not involve any changes to the PDOs nor to the associated outcome targets. On basis of a comparative, multi-criteria feasibility study (performed under Yemen IIP APL1), "Wadi Ahwar" has been elected for utilizing the funds saved from the current APL1. According to the study, around US$3.5 million out of the APL1-IDA saved funds, in addition to GOY co-financing of US$0.34 million (9% of total), were to be utilized through the 18-month extension phase. An extension to the closing date from June 30, 2007 to December 31, 2008 deemed necessary to utilize the IDA savings and also to completed a few of the pending civil work contracts.

Table 2.2: Number of Contracts Executed by the IIP from 2001 to 2008

Type of Contract	Prior-Review Contracts	Post-Review Contracts	Total
Goods (all Components A to C)	6	18	24
Consultancy Services (all Components A to C)	14	12	26
Works (Component A)	23	8	31
Total	**43**	**38**	**81**

IIP as a "Process" Project (the non-infrastructural outputs)

Formulation of Water-User Organizations toward Cost Sharing

The IIP was articulated around the Participatory Irrigation Management (PIM) concept. The project prompted the GOY to create enabling legal and institutional environments to establish

[7] Expenditures incurred by PMU and the PIUs on account of utility charges, rent for office space, maintenance of vehicles, fuel, office supplies, banking charges, communication services, audit costs, travel costs, salaries and labor costs and other consumables but excluding salaries of officials of the Borrower.

two main irrigation-user organizations: WUAs and ICs. Each WUA is in charge of implementing PIM in its respective irrigation command area.

The WUA would: (i) provide reliable and sustainable irrigation services, (ii) perform maintenance and rehabilitation; (iii) collect fees from beneficiaries; and (iv) develop the capability for self-reliant O&M. At later, more advanced stages, ICs were established in both Wadi Zabid and Wadi Tuban with potent representation from the WUAs. The ICs act as the High Executive and Administrative Authorities in each wadi (riverbed). The ICs are responsible for: (i) applying the IC's by-laws and implementing its executive procedures; (ii) coordinating activities between government authorities that continue to be in charge of O&M of head works/primary canals and the WUAs in charge of O&M of the secondary and tertiary systems; (iii) protecting water-user rights and resolving conflicts and pending issues; and (iv) monitoring the social, financial, and technical performance of WUAs. The ICs represent the local government, WUAs, and the MAI (through its Regional Development Authority/Agriculture Office).

The project initiated the PIM approach through undertaking a comprehensive awareness program to inculcate the concept of PIM in farmers' minds and to clarify the roles and responsibilities of irrigation beneficiaries within their representative user groups. The program targeted all relevant stakeholders, including farmers (owners, sharecroppers, and tenants), government officials, and local councils. As a result of the program, informal WUGs were formulated at the onset, which later metamorphosed into formal WUAs. ICs were formed at an advanced stage of IIP. The project then developed various training activities to build the managerial and technical capabilities of the WUAs and ICs.

PIM called for farmers' participation in overall project activities starting from decision-making to completion of the rehabilitation and improvement works, as well as farmers' contribution of 10 percent of investment costs in kind. Thereafter, farmers would take over responsibility and financing for the O&M of secondary and tertiary canals.

IIP's Approach to Community Cost-Sharing of Off-Farm Investments

For the investment/rehabilitation works, as mentioned earlier, the IIP introduced an in-kind cost-sharing approach through community-implemented contracts. To enable low-income farmers to share the capital costs of the project, IIP divided civil works into two categories:

a) *Priority works* to be fully financed by the project (government funds and loans). These works include feeder roads and flood/environmental protection works, which are deemed public goods outside the canal system and thus require no earmarked user fees; and

b) *Participatory works*, requiring 10 percent of farmers' contribution to rehabilitation/ improvement capital costs. This percentage was agreed between the project government team and farmer representatives (initially the WUGs; eventually the WUAs). Farmers were allowed to contribute this percentage in kind: labor and material. In this arrangement, each WUA would implement 1–2 small community contract(s) up to US$10,000 per contract to an aggregate US$1.4 million per project. To persuade irrigation end-beneficiaries to contribute 10 percent in kind, the project guaranteed that the unit rates of

the contracts awarded to WUAs would be 30 percent cheaper than those implemented by the national/regional contractors. (These rates otherwise would have embodied significant profit margins for the WUA-contractors.) This percentage thereby represents the total contribution from end-beneficiaries and, intrinsically, from the WUA-contractors.

Farmers' Response to Joining WUAs and Sharing Capital Costs

One major incentive for farmers to join WUAs was to vest the farmers with the authority to co-design and co-implement spate subprojects. Due to past, persistent centralized subsidies of irrigation in Yemen, farmers at first felt little incentive to buy in to the idea of forming WUAs under the project, especially since spate irrigation depends on erratic floodwater that is becoming ever more scarce and less predictable.

However, through IIP's public awareness program, many farmers have come forward and joined the WUAs. The farmers pay subscription and annual fees and play an active role in selecting the types of irrigation structures needed and contributing to subsequent implementation/supervision of civil works contracts.

Farmers became more interested after they were vested with the right to participate in decision-making and (as explained above) to directly implement small contracts in which they would cost-share the rehabilitation and improvement works. The project's Credit Agreement included a prerequisite that civil works could not start before establishing the respective WUAs.

Farmers also exhibited willingness to share costs of *on-farm improvements* after the project evidenced improved yields and profits. The ADP demonstrated the improved irrigation and agronomic practices at the on-farm level. The demonstrations were conducted with 360 farmers and 590 farmers at Wadis Zabid and Tuban, respectively. An additional 1500 farmers were involved in the associated awareness campaigns. As a result of the various on-farm interventions, some crop yields increased up to 100 percent. In a "Rapid Appraisal Survey" conducted by IIP in March 2005, farmers rated the overall outcome of ADP as highly satisfactory. They expressed willingness to share 25 percent and 50 percent of the on-farm costs of improved technologies for the spate and tube-well demonstrations, respectively.

Backstopping the WUAs and Tackling PIM Implementation Difficulties

The project provided the needed training and necessary administrative, financial, and technical backstopping to WUAs. Primarily due to their weak legal and financial status at start-up, WUAs experienced various obstacles in actualizing their roles. These difficulties called for creating options to empower the WUAs in carrying out the community contracts. For instance, it proved difficult for the WUAs to issue bank/commercial guarantees for the community contracts. Alternatively, they were permitted to issue guarantee letters endorsed by the governors.

Backstopping the WUAs included the following activities:

a) A training program has been carried out for each WUA Board of Directors and for their Auditing and Inspection Committees to enable them to understand the legal status,

objectives, and administration/financial management of O&M activities. The emphasis has been sustainable O&M;

b) Irrigation Management Transfer (IMT) Agreements were prepared in Arabic and were endorsed by the governors;

c) The project team has trained the WUAs' construction managers on contracting procedures as *well as procedures covered* in the Project Operations Manual;

d) The WUA representatives have participated in three workshops at the regional and national levels on institutional assessment of the irrigation sector; and

e) The draft bylaws for establishing the ICs have been approved by the project's inter-ministerial Steering Committee, thus hastening the establishment of an IC for each of the two wadis.

Approximately 30 working papers and operational manuals have been prepared by the training consultants for the project's PIM component.

The cost of training and WUA-backstopping in the IIP has been considerable, amounting to approximately 20 percent of total project costs. The GOY could seek to scale up the PIM concept after the completion of Bank-supported projects. If so, the GOY would need to secure financing for such software-type investments from the sovereign resources allocated to rural extension and research. From international experience, this is deemed one of the examples for "virtuous" subsidies that a "lean-and-mean" government (as opposed to the private sector or end-beneficiaries) could shoulder.

Status and O&M Roles of WUAs/ICs, and Expected Progress

Promising results have been observed thus far as irrigation stakeholders in the two wadis participated in the IIP design, cost-sharing, and implementation stages.

All WUAs in Wadi Zabid and Wadi Tuban have been established and become fully operational with active boards of directors, proper bookkeeping, and bank accounts. The WUAs have worked closely with the PMUs and the project consultants during the design and implementation of the rehabilitation and improvement activities. As part of the WUAs, Farmer Design Committees (FDCs) have been elected (with the facilitation of existing Farmers' Organizations, or FOs) to determine priority ranking of rehabilitation needs and to participate in their design.

The WUAs have efficiently been implementing the participatory contracts (section 2.2) and signing IMT Agreements for all secondary and tertiary canals. More importantly, they started to contribute to O&M costs of the secondary/tertiary system (as it has been agreed that the O&M costs of the main system be shouldered by the GOY). The IIP has prepared an O&M manual including a detailed inventory of required O&M items and a description of how WUAs could prepare O&M plans/budgets and collect O&M fees. The WUAs have been attending an extensive training program on how to use this manual and how to implement it. Thus far, WUAs

have been collecting user fees for heavy-equipment rentals to carry out immediate O&M of the secondary/tertiary canals. The fees collected are deposited in WUAs' bank accounts and disbursed out of these accounts. Thus far, O&M fees are collected ad hoc since O&M of the IIP-introduced works have not been fully handed over to the two ICs and to the regional line agencies. However, it is reported that farmers are paying their contributions and that the collection process is transparent.

The ICs also have started to hold regular meetings and discuss issues related to water rights and water distribution. The role of the WUAs and the ICs will become more obvious after completion of the rehabilitation/improvement works. *One sign of WUAs' effectiveness in Wadi Zabid was that they managed to persuade powerful farmers to restore canal cross-sections and to remove the control works that they had unilaterally, subjectively placed in the canals to extend their irrigated areas.*

To summarize, thus far, IIP has been deemed a successful "process" project, in testing and scaling up the PIM concept. The beneficiaries formed grassroots-level WUAs and wadi-level ICs that have been successfully:

a) Participating in decision-making and in selecting design options;

b) Contributing to capital investment costs and to implementation of civil-work contracts; and

c) Gradually taking over responsibilities for the recurrent financing and O&M of the secondary and tertiary systems.

The viability of this "process" project is to be assessed based on its far-reaching impacts. They include financial sustainability; natural-resource-base sustainability; reduction of avoidable transaction and overhead costs; and piloting, transferring, and scaling up best practices. Most of the off-farm rehabilitation and improvement activities are in progress. Thus, it is too early to draw conclusions on the quality of irrigation services provided by ICs/WUAs, as opposed to those previously provided by corresponding government entities.

Community-Based Monitoring and Evaluation System

To maintain sustainability, the IIP ensured that ICs closely monitor the performance of the WUAs. The project has established three broad performance indicators: (a) institutional, (b) financial, and (c) technical.

a) *Institutional performance indicators* include: (i) representation (percentage of farmers subscribing for membership of each WUA); (ii) transparency and accountability (whether the chair and members of the WUA executive body were properly elected; whether the executive body meets and produces minutes of meetings; whether WUAs members are being timely informed of the executive body decisions; whether WUAs adopted proper Internal Rules and Regulations and bookkeeping concerning managerial, financial, and

technical aspects); and (iii) authority (the degree to which WUAs have the power to execute their decisions);

b) *Financial performance indicators* monitor whether WUAs are willing and able to collect/receive adequate funds to cover O&M and whether WUAs maintain proper bank accounts and accounting records; and

c) *Technical performance indicators* monitor whether WUA members master the O&M and supervision plans and are well informed of their foreseen costs.

However, WUAs and ICs needed to be further empowered to fully undertake the M&E, and ICs may need to be bottom-up rather than top-down entities. This can be done under the recently-approved WSSP.

The Water Law enacted in 2003 enunciated that WUAs and ICs need to be established and need to contribute to the Wadi Integrated Water Management Plans, which are adopted by the GOY. With technical backstopping from the regional line agencies and local authorities/councils, WUAs and ICs need to gradually take over the role of overseeing service provision and facilitating the application of water-related incentives and regulations. They also can be entrusted with more monitoring/benchmarking roles in coordination with the regional line agencies, and with more enforcement roles in coordination with local authorities.

Nonetheless, the best alternative for a monitoring/benchmarking/planning body would be the technical secretariat of a basin committee. The basin committee would be based on hydrological boundaries. Its board would be composed of water-user groups/federations, local authorities, local line agencies, and NGOs. This composition would reduce the immense forgone resource-economic costs posed by the administrative boundaries; and would limit the transaction costs posed by assigning monitoring/benchmarking roles to mono-user water groups.

ANNEX 3: Economic and Financial Analysis

Table 3.1: Summary of Benefits and Costs

Activities	Financial Analysis		Economic Analysis	
	(Million YR)	(Million US$)	(Million YR)	(Million US$)
PAD - Net Present Value *	n/a	n/a	234	1.2
PAD - Internal Rate of Return	n/a		11.2%	
ICR - Net Present Value *	823	4.1	1,432	7.2
ICR - Internal Rate of Return	12.6%		16.6%	

* At 10% discount Rate.

A. Background

The IIP was designed for ensuring sustainable water resource management in both Wadi Tuban (in Lahej Governorate) and Wadi Zabid (in Hodeidah Governorate), contributing to increase agricultural production, household incomes and food security in the project areas. Sustainable and efficient water conveyance, distribution and use in the two irrigation schemes would be achieved through the rehabilitation, improvement and protection of the spate irrigation infrastructure, covering an area of 26,000 ha, and institutional changes based on the concept of participative irrigation management (PIM). In parallel, an intensive on-farm demonstration program would enhance the economic viability of the proposed works, improving the sustainability of agriculture by increasing the capacity of farmers to self-finance and manage the O&M of the system. Beneficiaries were expected to be 27,000 mostly poor households (150,000 people) of farmers, farm workers and their families whose livelihood depend on the 26,000 ha of net command areas in both wadis.

The PAD estimated the Economic Rate of Return (ERR) of the IIP at 11.2% and the Net Present Value (NPV) at US$ 1.17 million considering 10% as the discount rate. The analysis was carried out for both Tuban and Zabid wadis showing ERRs of 9.6% and 12.9% respectively. Estimations were based on flows calculated for both the “with” and “without” project scenarios. Conversion Factors (CF) were used for correcting financial prices for the economic evaluation. Financial impact on farmers was also analyzed based on crop budgets and farm models prepared for both wadis. Farmers incomes would increase as a result of an intensification of agricultural production (increase in both yields and cropping intensity) and the average incremental incomes per ha of net command area was expected to reach about US$50 and US$56 in Tuban and Zabid areas, respectively.

The impact of the project in some of its dimensions (environmental, social, and institutional) is difficult to measure properly at this early stage, when implementation is just completed. However, the adopted methodology for this ICR assessment, as in the PAD, was to conduct a cost-benefit analysis based mainly on the direct increased agricultural production resulting from the project investments, mainly from: (i) the expansion of the irrigated area as a result of the rehabilitation of the spate irrigation structures to reach areas were water was not available, and the supporting infrastructure (mainly rehabilitation and pavement of roads) which helped to

create an enhanced environment for development; and (ii) the adoption of new production technologies through the IPP financed on-farm Agricultural Development Program (ADP). **Non-quantified expected benefits** expected and mentioned in the PAD included: (i) production shifts to higher value crops; (ii) increased value of land; (iii) increases of groundwater recharge; (iv) improved equity in water distribution and hence, in income; (v) prevention of rural emigration through creation of job opportunities for the landless; (vi) improved food security in poor areas suffering from malnutrition; and (vii) savings in transportation costs (improved roads)

B. The ICR new assessment

Sources of production data. In order to characterize and calibrate the productive situation in both project areas, an assessment of the impact of the ADP was conducted in October 2007 by an external consultant, in collaboration with the Agricultural Research Authority (ARA) and the Public Corporation for Agricultural Services (PCAS)[8]. The findings of this study were updated during the ICR mission with a rapid follow-up of a sub-sample of 28 farmers selected from the 177 originally cases sampled in the Zabid valley. The mission also conducted a two-day field visit to the Zabid project area.

Prices. World Bank commodity price forecasts from March 2009 were used to estimate 2008 constant economic prices of traded inputs and outputs. Given that the Yemen Rial is determined in the open market, and trade restrictions are not significant, it was assumed that domestic prices in general tend to correspond to border economic values. The only case in which a significant distortion was perceived in the market prices with respect to border prices was with sorghum grain, for which a CF of 0.6 was applied for the economic analysis. Shadow prices for rural labor were estimated at 70% of the prevailing market wage rate, while for skilled labor, the market rate was assumed to reflect its opportunity cost. While the project would increase on-farm and off-farm employment in the project areas, unemployment and under-employment are not expected to vary significantly. Financial prices were equated to economic prices in the case of other tradable and all non-tradable goods and a standard conversion factor of unity was applied toward the project's economic costs and benefits.

Analysis Framework. The financial viability of the IIP investments was analyzed within the framework of the most common production systems in the project areas and considering small and medium size family households in the highlands, midlands and lowlands. Financial prices at the farm gate were used in calculation of costs and revenues, as perceived in the survey and field visits. Input and output prices were set at 2008 constant values, as was the real exchange rate, throughout the 20 year time horizon used in the analysis (2001 – 2020). The financial discount rate was assumed to be 10%.

Yields. The following Table 3.2 shows the average yields obtained in the main cultivated crops in the project areas, both by ADP and control farmers, as seen in the field surveys and observations. From the surveys it appeared that between 20 and 30% of the farmers had adopted the most relevant innovations disseminated by the ADP. Although it is expected that the

[8] Assessment Study of the Impact of Agricultural Demonstrations Program on Production and Income in Zabid and Tuban Valleys (Final Report), Dr. Khaled Qasim Qaid, October 2007.

adoption rate will continue in the next years, for the sake of a conservative estimation of project benefits, it was assumed that only about 30% of the farms would increase yields by adopting the project promoted technologies.

Table 3.2: Observed Crop Yields With and Without ADP (2007 – Survey)

Crops	Zabid		Tuban	
	Control farms	ADP farms	Control farms	ADP farms
Cotton	1,160	1,750	1,265	1,860
Sorghum Grain	600	820	630	840
Sorghum Fodder	7,400	9,150	6,550	8,480
Maize	800	1,350	770	1220
Sesame	625	985	540	800
Watermelon	10,000	15,500	8,120	11,320
Okra	5,800	8,500	6,260	10,220
Tomato	11,200	18,800	11,200	17,450
Onion	14,100	27,050	15,780	24,700
Mango	12,700	22,300	14,460	27,170
Banana	22,250	33,600	-	-

Crop Budgets. The financial impact on farmers' income was analyzed with the help of detailed crop budgets and farm models illustrative of typical farming situations in both wadis. Models and budgets were developed using FARMOD software. Crop budgets were built with the information obtained in the original and updating surveys, and through field observations (Tables 1- 12 in project files). They detail the representative partial budgets involved in each major crop, including: (i) crop yields and inputs used per ha, both in the pre-existing technology (without the project) and when the new technologies and spate irrigation conditions were introduced (with the project); and (ii) the financial budget resulting from the physical quantities of products and inputs, and the market (financial) prices received by farmers for their production, or paid by them for the required inputs and services.

Average crop budget for the two project wadis show the “with” and “without” project scenarios based on the results obtained from the 2007 and 2009 updating Surveys. Twenty four crop models (12 for each wadi) and 3 farm models were constructed to estimate the financial impact of the project at the beneficiaries’ level. The following Table 3.3 show the main results indicators derived from the Wadi Zabid crop models detailed in Tables 1 to 12 in the project files.

Table 3.3: Main Indicators for Crop Model Results in Wadi Zabid

Crop	Gross Revenue		Input Costs		Labor Costs		Net Income	
	2003	2007	2003	2007	2003	2007	2003	2007
Cotton	125.6	181.1	75.9	91.2	30.8	36.4	18.9	53.5
Sorghum Grain	156.0	220.4	38.6	49.3	28.7	30.8	88.7	140.3
Sorghum Fodder	131.4	163.8	28.5	49.5	35.1	39.2	67.8	75.1
Maize	103.0	160.0	22.1	22.2	29.4	26.6	51.5	111.2
Sesame	100.0	157.6	19.4	22.8	23.1	23.1	57.5	111.7
Tomato	784.0	1,316.0	286.4	344.8	116.2	138.6	381.4	832.6
Watermelon	400.0	620.0	160.3	194.3	28.0	35.7	211.7	390.0
Okra	348.0	510.0	170.3	163.7	93.9	90.3	83.8	256.0
Mango	762.0	1,098.0	563.4	736.3	93.5	108.1	105.1	253.7
Banana	667.5	1,008.0	492.4	688.0	67.2	176.4	107.9	143.6

Land use. Due to the long deferred maintenance of the flood control and spate irrigation systems in Zabid and Tuban, most of the structures were not operating and water rarely reached the farms outside the highlands. In 2003 less than 12,000 ha were irrigating with spate water (in Tuban 7,720 ha and in Zabid 4,234 ha). Land use intensity was only about 40% of the agricultural land in the command areas. With the rehabilitation of the systems and the participatory irrigation management (PIM) approach induced by the IIP, the spate irrigation system is now serving two times the land irrigated before rehabilitation. The physical improvements, as well as the WUAs induced management, are now resulting in more evenly distributed spate water, reducing the concentration of the resource in well located areas of wealthier farmers. Now, water flows downstream were the poor are concentrated. Improvements are also preventing bursting of flood water when the existing earthen ogmas were destroyed. As shown in the following Table 3.4, in Zabid, besides an increase of irrigated area from 4,271 ha to 10,852 ha, there is a significant increase in higher value crops (banana and mango) which mean that now, as water is secured, there is more value produced per drop of water. In Tuban, the expansion of irrigated area went almost entirely to a low value crop as sorghum fodder or grain.

Table 3.4: Spate Irrigated Areas in the Project Areas in 2003 and 2007

Crops	Wadi Zabid		Wadi Tuban	
	Before IIP 2003	After IIP 2007	Before IIP 2003	After IIP 2007
Cotton	250	200	559	743
Sorghum Grain	1,300	3,100	250	1,000
Sorghum Fodder	500	2,006	6,564	10,806
Maize	170	600	-	-
Sesame	170	700	267	439
Watermelon	174	100	-	6
Okra	200	200	-	19
Tomato	31	36	70	102
Onion	6	10	50	60
Mango	700	1,300	80	137
Banana	770	2,600	-	-
TOTAL	4,271	10,852	7,840	13,312

Aggregate Benefits. The resulting incremental agricultural production costs and benefits obtained at the wadi level were aggregated in both scenarios: "with" and "without" project, according to the evolving importance of each production activity. It was conservatory assumed that no further significant changes in yields, planted areas and/or cropping patterns will occur until 2020. In addition, as was done in the original PAD's economic and financial analysis, other non-agricultural evident benefits were not quantified, as those benefits mentioned in paragraph 3 above. The aggregation of the agricultural incremental production and related costs, provide a very conservative overall estimate of the project net benefits to be compared with the IIP investment costs.

Project cost[9] has been about US$28.4 million, of which beneficiaries' contribution was US$0.3 million, the GOY contributing with US$4.2 million and the IDA credit financing about US$23,9 million. The costs (US$ 1.5 million) and benefits of the IIP investments in Wadi Ahwar – not included in the original IIP design - were excluded from the ICR economic and financial analysis because there was no time for: (i) the preliminary results to begin to show up as the works was concluded at the end of the implementation period; and (ii) the ICR team to process the scarce information available.

C. Economic and Financial Results

Financial Results. At the farm level, benefits and costs were analyzed in both scenarios in order to measure the financial impact of the project at the beneficiaries' level, based on the incremental net family revenue of these household models. Table 3.5 shows the main indicators for Wadi Zabid and the details are presented in Tables 13 to 15 in the project files. Typical small and medium size farms have increased their income in about 45 to 89% depending on the farm size and location (lowlands, midlands or highlands). The increased income resulted from a combination of vertical and horizontal expansion of the farm, due to spate water being made available more frequently and to a 30 to 40% adoption rate of the technological innovations disseminated by the IIP ADP as verified by the impact assessment study.

Table 3.5: IIP Impact over the Beneficiaries' Income in Wadi Zabid

Farm Model	Household Benefits		
	Without IIP	With IIP	Income Increase
Small Farm in Lowlands	243,000	459,000	89%
Small Farm in Midlands	323,000	467,000	45%
Medium Farm in Highlands	344,000	628,000	83%

[9] Goods cost: US$1.1 million. Civil-work costs: US$7.12 million, US$5.45 million, US$1.6 million, and US$1.3 million for Zabid, Tuban, Ahwar, and WUA contracts respectively. Flood control costs: US$1.15 million, US$0.26 million and US$1.0 million for Zabid, Tuban and Ahwar, respectively. Roads rehab costs: US$1.5 million and US$0.8 million for Zabid and Tuban, respectively.

From investment in rehabilitation of existing spate structures and works in the wadis, benefits expected originally from a modest crop yield increase (2%) due to the rapid speed with which spate flows would be able to move from one part of the scheme to the next after rehabilitation; and from moderate expansion (10 percent in Zabid and 35 percent in Tuban) in irrigated areas based on improved management of surface water. According to the PAD, beneficiaries' incomes would be increased by only US$50 to US$5 per ha in Tuban and Zabid command areas, respectively. Estimations derived from the farm models presented above show that income increases per ha reached more than US$460 per ha in all models indicating that the impact has exceeded several times what was originally expected.

Project Economic Analysis. As can be seen in Table 6 the overall economic rate of return of the project was estimated by the ICR team at 16.6%. Using a discount rate of 10 percent, the project NPV is YR 1,432 million (US$7.2 million). In calculating the ERR for the project about 5% of project costs diverted to improvements in Wadi Ahwar were excluded as it is early to quantify benefits. Economic benefits for 95% of the IIP investments were mainly obtained from: (i) the significant expansion of the irrigated areas in both wadis that were increased from 12,000 ha to 24,000 ha (100% far more than expected at appraisal); (ii) the increased diversification towards higher value fruit crops (mainly mango and banana) in the Wadi Zabid, from about 1,500 ha to 4,000 ha; and (iii) the significant increase in crop productivity coming from the adoption of new production technologies induced by the project ADP demonstration fields. In sum, more adequate and secure water delivery and improved technology.

Regional Economic Analysis. From the analysis of the separated valley analysis, the results shown by both wadis are similar but not the same. They are both positive but in a different degree: Zabid reaches an ERR of 18.4% while Tuban shows only 14.2%. What determines the difference in the economic results is mainly the strong crop diversification process observed after rehabilitation in Wadi Zabid towards higher value fruit crops (mango and banana area grew from 1,470 ha to 3,900 ha) which are more intensive crops in the use of capital and labor than the traditional sorghum that still occupies about ninety percent of the Wadi Tuban command area.

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Sustainability of project benefits is expected to be high, given that the increase in spade water availability and use efficiencies, together with the PIM approach introduced by the project. The strong dynamic attitude shown by WUAs assuming the O&M of the system infrastructure is already having a significant effect on the spate water service delivery and as a consequence on farmers' incomes. It is expected that with the formal transfer of O&M responsibilities to the WUAs, the more efficient and responsive management of the spate water diversion and distribution infrastructure would also allow for a more sustainable use and life of the groundwater resources in both valleys, since the IIP monitoring wells are beginning to show significant recuperation of the water table.

Table 3.6: Project Summary

ECONOMIC BUDGET (AGGREGATED) (In YR Million)	Without Project 1 to 20	1	5	10	15	18 to 20
Main Production						
Grains	150	150	232	471	471	471
Mango	603	603	627	764	1,278	1,743
Banana	514	514	567	2,359	2,359	2,359
Other	107	107	118	139	139	139
Vegetables	138	138	134	145	145	145
Forage	924	924	1,196	1,914	1,914	1,914
Sub-total Main Production	2,435	2,435	2,874	5,793	6,306	6,771
Production Cost						
Investment	-	-	24	152	-	-
Operating	1,745	1,745	1,977	4,057	4,444	4,614
Sub-Total Production Cost	1,745	1,745	2,002	4,209	4,444	4,614
Other Costs						
Improvement of Spate Irrigation Infrastructure	2	90	985	6	6	6
OUTFLOWS	1,747	1,835	2,986	4,215	4,450	4,620
Cash Flow	688	600	-112	1,577	1,856	2,151
IRR = 16.6%, NPV = 1,432.28						
PRODUCTION AND INPUTS (Aggregated)						
(In Units Million)						
Main Production (In 000 Tons)						
Grains	1	1	2	4	4	4
Mango	10	10	10	13	21	29
Banana	17	17	19	79	79	79
Other	23	23	26	29	29	29
Vegetables	3	3	3	3	3	3
Forage	51	51	67	107	107	107
Water Use						
Irrigation Pumping (In million m3)	32	32	35	66	70	70
Spate Water (In million m3)	34	34	44	88	88	88
Labor (In million days)	0.687	0.687	0.839	1.616	1.679	1.710
Water Productivity (In YR/m3)	10.3	9.0	-1.4	10.2	11.8	13.6

ANNEX 4: Bank Lending and Implementation Support/Supervision Processes

(a) Task Team Members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Supervision/ICR			
Ahmed Shawky M. Abdel Ghany	Senior Water Resources Specialist	MNSSD	
Jamal Abdulla Abdulaziz	Senior Procurement Specialist	AFTPC	
Naji Abu-Hatim	Senior Rural Development Specialist	MNSSD	
Nabila Ali Al-Mutawakel	Program Assistant	MNCYE	
Josephine Salang	Senior Program Assistant	MNSSD	
Moad M. Alrubaidi	Financial Management Specialis	MNAFM	
Ayman Ibrahim El-Guindy	Procurement Specialist	MNAPR	
Akram Abd El-Aziz Hussein El-Shorbagi	Senior Financial Management Specialist	MNAFM	
Safa'a Abdulkareem Rawiah	Program Assistant	MNCYE	
Trayambkeshwar P. N. Sinha	Lead Operations Officer	MNSSD	
Wendy E. Wakeman	Lead Social Development Specialist	MNSSD	
Seifu Mehari	Social Development Specialist	MNSSD	ICR only
Juan Morreli	Economist (FAO/CP)	MNSSD	ICR only
Michael Sandoz	Irrigation and Drainage Specialist (FAO/CP)	MNSSD	ICR only

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	US$ Thousands (including travel and consultant costs)
Lending		
FY99		107.40
FY00	60	376.97
FY01	17	49.25
FY02	8	10.12
FY03	1	12.78
FY04		0.00
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
Total:	**86**	**556.52**

Supervision/ICR		
FY99		0.00
FY00		0.11
FY01	6	35.70
FY02	14	73.49
FY03	18	61.92
FY04	28	109.64
FY05	21	101.14
FY06	22	66.25
FY07	29	133.98
FY08	22	96.39
FY09	9	0.00
Total:	**169**	**678.62**

ANNEX 5: Beneficiary Survey Results

The ICR mission has undertaken three independent beneficiary surveys as follows:

a) A survey to help in working out the project-level economic analysis and the farm-level financial profitability analysis (i.e., Section 3.3 in the main text and Annex 3);
b) A survey to help figure out the project's impact on gender (Section 3.5(a) in the main text and Table A5.1 below); and
c) A survey to learn how farmers spent the increased income attributed to the project and how this improved their wellbeing (Section 3.5(a) in the main text and Table A5.2 below).

The findings of these surveys are presented in the economic and social assessments under Sections 3.3 and 3.5(a) respectively and in the below Tables 5.1 and 5.2.

The following paragraphs also summarize the other beneficiary surveys undertaken throughout the project, of which the results have helped in completing this ICR.

Table 5.1: Independent Quantitative Assessment of the ICR Mission on Role of Gender

Degree to which women benefited from IIP		
No.	**Farmers names**	**Benefited degree**
1	Ali husin Alhendi	Fair
2	Fauz Abdu Haroon	High
3	Mohamed Saleh Qadib	very high
4	Solyman Yahya Mohamed	High
5	Saieed Alkonyni	Fair
6	Abduallah Mohamed bacheer	very high
7	Mahmod Alaidaroos	High
8	Mohamed Hamid Saiev	High
9	Ahmed Obid Agaach	very high
10	Mohamed Salem Mahraqi	Fair
11	Mohamed Farag Dawah	Poor
12	Mansor Mahraqi	High
13	Hasan Mohamed Mahraqi	High
14	Naser Galeb Mahrus	High
15	Mohamed Khayri	Poor
16	Solyman Agach	High
17	Hosyin Esa Qadib	very high
18	Ahmed Ali Sayaah	Fair
19	Eyach Saeid afifi	Fair
20	Salem Abdu Mogahed	High

Degree	No.	(%)
very high	4	20
High	9	45
Fair	5	25
Poor	2	10
Total	20	100

Table 5.2: Independent quantitative assessment of the ICR mission on how the farmers have spent the increased income attributed to IIP

No	Farmer's Name	Buy/rent a new land		Build/add a new house		Buy a new house equipment		Buy a new pump/car		Send daughters and sons to school		Go for hajj	
		2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
1	Ali Husin Alhendi	Yes	no	no	yes	no	yes	yes	no	yes	no	yes	no
2	Fauz Abdu Haroon	No	yes	yes	no	yes	yes	yes	no	yes	yes	yes	no
3	Mohamed Saleh Qadib	No	no	no	yes	yes	yes	no	no	no	no	no	no
4	Solyman yahya Mohamed	yes	yes	no	yes	no	no	yes	no	no	no	yes	yes
5	Saieed Alkonyni	no	no	no	yes	no	yes	no	no	no	no	no	yes
6	Abduallah Mohamed Bacheer	no	yes	yes	yes	no	yes	no	no	no	no	no	no
7	Mahmod Alaidaroos	no	no	yes	yes	yes	yes	yes	yes	no	yes	no	yes
8	Mohamed Hamid Saiev	yes	yes	yes	yes	yes	yes	no	no	no	no	no	yes
9	Ahmed Obid agaach	no	no	no	yes	no	yes	no	no	no	no	no	yes
10	Mohamed Salem Mahraqi	no	no	no	yes	no	yes	no	no	no	no	no	no
11	Mohamed Farag Dawah	no	no	no	no	no	no	no	yes	no	no	no	no
12	Mansor Mahraqi	no	no	no	yes	no	yes	no	no	no	yes	no	no
13	Hasan Mohamed Mahraqi	yes	no	no	no	no	yes	no	no	no	no	yes	no
14	Naser Galeb Mahrus	no	no	no	no	no	yes	no	no	no	no	no	yes
15	Mohamed Khayri	no	yes	no	yes	no	yes	yes	yes	no	yes	no	no
16	Solyman Agach	no	no	no	no	yes	yes	no	no	no	no	no	no
17	Hosyin Esa Qadib	no	no	no	yes	no	yes	no	no	no	yes	no	yes
18	Ahmed Ali Sayaah	no	no	no	yes	no	yes	no	no	no	no	no	no
19	Eyach Saeid Afifi	no	no	no	no	no	yes	no	no	no	no	no	no
20	Salem Abdu Mogahed	no	no	yes	no	yes	yes	no	no	no	no	no	no

Basic Social Survey at the beginning of IIP:

A Basic Social Survey was conducted after IPP commencement in order to prioritize farmers problems and interests, understand the social aspects of spate irrigation, and identify local needs, which have all informed the design of IIP components, especially the PIM.

Rapid Appraisal Survey conducted in March 2005

Farmers rated the overall outcome of ADP as highly satisfactory. They expressed willingness to share 25 percent and 50 percent of the on-farm costs of improved technologies for the spate and tube-well demonstrations, respectively.

Beneficiary Survey on the results of ADP at the end of the project:

To assess the impact of introduced technologies on productivity, dissemination, adaptation, and farmers' income and family livelihood, the PMU engaged a team of independent consultants to carry out this assessment, including a beneficiary survey. The study validated the incremental outcomes achieved by the ADP, directly or indirectly, on farmer income and well-being.

Poverty Impacts, Gender Aspects, and Social Development

ICR mission social assessment results are as follows:

Poverty and income impact: The preliminary economic return analysis and discussions with farmers suggested that there is 50% - 80% increase in farm products which in turn increases farmers' income at all levels – owner and sharecroppers. If distributed equitably, the increase in farmers' income might lead to reducing poverty in project area. However, it is important to note that, farm net income is distributed according to the share holding of each farmer: In Zabid, 2/3 is given to the landlord, 1/3 to the sharecropper. In Tuban, 2/3 is given to sharecroppers and 1/3 to the landlord.

Agricultural Demonstration Program (ADP) component has caused 20,293 farmers to shift from traditional farming methods to more sustainable and productive farming techniques. So far the ADP component has:

- Enhanced farm productivity, increased farmers' income, expanded their asset bases, enabled each farmer to make new investments and provided surplus cash that allows saving for future use.
- Increased farm animal production by 40% resulting in increasing farm income to an average of 96,000 YR per annum.
- Increased net income from cotton by an average of 244% in Zabid and 35% in Tuban.
- Increased the maize net income by 189% in Zabid.
- Increased sorghum crop by substantial amount: an increase of 387% and 300% in grain in Zabid and Tuban respectively as well as an increase of 468% and 200% in fodder in Zabid and Tuban respectively.
- Increased sesame net income by 28% in Zabid and by 47% in Tuban.
- Increased watermelon net income 106% in Zabid.

- Increased mango crop by 43% in Zabid and 312% in Tuban.
- Enabled farmers to invest in housing and building improvements as well as undertake farm upgrading activities.
- Enhanced farmers' ability to acquire new assets such as: a) motorcycles, televisions sets, furniture, radios, video players and cell phones.
- Enabled farmers to plan for investment opportunities, unforeseen emergency matters – such as family illness, unexpected farm infrastructure repair as well as maintenance of equipment and house improvements.
- Increased education expenditure for school going children as farmers are now able to buy more text books and other educational material for their children.
- Increased medication spending as farmers now can afford to purchase modern medicines rather than the use of traditional cure approach.
- Improved varieties and quality of food available for household consumption and thereby enhancing family nutritional intakes.

Gender Impact: The IIP has used the Participatory Irrigation Management concept to incorporate the voice of women in its project design and implementation processes. This has opened the opportunity for women to participate in the project operation and benefits. The project accomplishment in advancing gender equality can be summarized as follows:

Women participation in IIP:

- A significant representation of gender amongst beneficiaries is observed particularly in Wadi Tuban (e.g., participation as sharecroppers, harvesters, and labor who alleviate cropping over-density).
- In Tuban, 1,671 women are participating in farming activities and in elections process of WUAs leaders. Women beneficiaries represent 20% of the total farmers.
- Wadi-Tuban WUAs have hosted gender awareness programs for the general public particularly targeting women and children within their WUAs. This has significantly shaped women's role participation in farm activities.
- Women are now occupying management position in WUAs.
- Women are given the role of training specialists which mirrors the multifaceted roles of gender in the project.
- The project has also partnered with the *Rural Women Development Department* of MAI in Wadi Tuban and encouraged and fostered WUAs women engagement into various agricultural activities including: animal husbandry and wide range of micro-finance programs.
- Women from the Tuban project's WUAs were honored at a tribute on the *International Food Day* for their distinguished participation in agricultural activities and for their active role in forming women groups.
- The Gender Unit in Tuban has been taking leading roles as to raising awareness of women and children especially within the WUAs. The Unit coordinated with the other donors the development of Small-Income projects, regarding: (i) preparation of action plan on local education; (ii) preparation of an action plan on developing livestock production (with cost sharing by 40%) in cooperation with the Agricultural and Fisheries Development Fund; (iii) obtaining finance from the French Embassy for supporting and scaling up the high-quality livestock production and distribution

amongst greater number of women; and (iv) coordinating with the Groundwater and Soil Conservation Project to obtain a drip-irrigation network for small farms operated by women.

Extent of Benefits to women:
During the ICR mission, a quick sample survey was conducted in Zabid. The purpose was to determine to what extent women have benefited from the increased agricultural income which would make possible an increase in the household's ability to acquire new assets and make new investments. (The quick sample survey was done in Wadi-Zabid areas covering framers who have benefited from the IIP intervention) The survey outcome suggested that 66 percent of women have reasonably benefited from the increased agriculture income, have acquired new assets and made investments in their respective households (see Annex 5, Table 5.1 and Table 5.2).

Social Development Outcomes: The concepts of users' participation and empowerment were the key operational principles of IIP's day-to-day practices**.** Discussions with water users and their representatives revealed that the project beneficiaries feel strong sense of program ownership and common purpose. Furthermore they have benefited from greater access to basic public services as a result of a road constructed under the project's sub component. The following describes the key social development accomplishments of the project.

Community engagement and benefits:

- Secured the active participation of beneficiaries in the project design and implementation phases from its inception stage. This has led beneficiaries to view the project as a joint development effort between their community and IIP.
- Increased spate irrigated land due to IIP intervention in Zabid from 4,234 ha to 10, 806 ha representing a 72% increase in the command area. This was a result of regular spate flow which increases farm output and income despite the share holding of sharecroppers is less in Zabid than Tuban.
- Provided the opportunity for water users to form their water users associations, elect their associations' leaders and hold those they have elected accountable.
- Used the PIM concept to engage water users in irrigation infrastructure operations & maintenance activities.
- Cultivated and created the needed capacity for advancing and implementing Participatory Irrigation Management concept. This has cemented cordial relationships and openness among WUAs, PIU, PMU, ICs as well as farmers.
- Instilled a sense of obligation among beneficiaries to abide by and enforce those WUAs rules which they were involved in crafting.
- Provided opportunity to 44% and 24% sharecroppers (low-income farmers) in Zabid and Tuban respectively to participate in the project. This has opened the opportunity for low-income farmers to participate in community work contracts by allowing them to make in-kind contributions in situations where they are unable to make cash contributions.
- Modified the role of women in project areas as many women are now involved in farm activities which allow men to undertake additional off-farm activities.

Community Empowerment

Irrigation Management Transfer (IMT) [The important agenda of the GOY under PIM is to promote the development of Water Users' Associations (WUAs) and to transfer the responsibility for operation and maintenance (O&M) of irrigation facilities to these (WUAs). To facilitate this, the "Transfer and Support Agreement" were drawn with the WUAs.] approach was used to empower water users by transferring secondary and tertiary irrigation canals management responsibilities to WUAs . This has led to:

- Thirty-two agreements signed and implemented successfully in the two wadis.
- Enhanced the association's ability in undertaking and sustaining O&M of irrigation infrastructures.
- Governors' endorsement of the IMTs that have been agreed and signed by WUAs.
- Creating an Operational Manual on how to handle O&M works.

Community Partnership

The project crafted innovative community cost sharing arrangements. A total of 151 off-farm investments were carried-out through community-implemented contracts of which:

- Wadi Tuban farmers have implemented 75 community projects contracted for the total value of US$590,659.
- Wadi Zabid farmers have implemented 76 community projects contracted for the total value of US$678,663.

- For those WUAs who are unable to cover 30% of their cash contribution toward community contracts, additional works were added to make up for the cash shortfall. This was done via self execution (in-kind contributions) and has led the two wadis completed 18 works for the total amount of US$77,227.
- Under the 30% cash contribution arrangements the two wadis WUAs were able to contribute total US$19,771. This amount represents additional contributions in situations where the project original contract estimation becomes inadequate to cover the initial total cost.

Access to road, education, health, electricity and information:

- The Rehabilitation work of irrigation infrastructures along with Road Construction have provided IIP's direct and indirect beneficiaries with access to wide range of basic services.
- It has linked farmers to local and regional markets. This has led to less travel time and fuel consumption, lower transportation costs, quicker delivery of perishable farm products to market; the products are still fresh and receive higher prices.
- It has opened greater access to educational opportunity, health services to girls and boys and the community as a whole.
- The road has attracted electricity connection into the project area and thereby providing the community as whole to have access to electricity and communication.
- It has created off-farm income generating activities as well as employment opportunities to about 27,000 households' who are living within the vicinity of the project in the two wadis.

- Land price increased in areas where road was constructed and spate is made available while land price decreased where spate flow was diverted and road access was not improved.

Challenges:

- Water right remains problematic in Zabid. This may pose many challenges to Zabid's WUAs and IC.
- Expanding women role and responsibilities will continue to be a challenge.
- Operation and maintenance may prove a bit difficult in the future if the ICs are not given full control over equipment needed to execute WUAs requests.
- Sharecroppers share is very low in Zabid and there may be a need to revisit and reconsider the issue. In the absence of such an adjustment poor farmers may not be able to get the larger share of their benefits.

Lessons Learned:

- Beneficiary participation from the inception of the project is essential if the project is to bear fruit.
- Putting beneficiaries in the driver's seat while designing and implementing the project is essential to win community support and collaboration.
- While supporting farmers with new farming techniques proved to be paramount, equally important to consider are other complementary activities such as road as key input to enhancing agricultural project success and its contribution to poverty reduction efforts.
- In the case of Tuban where sharecroppers share is higher drought is affecting their agricultural yield. Therefore, future intervention should consider the regularity/availability of spate in all wadis. This criteria has been applied when qualifying Ahwar for project intervention and it would be useful to adapt similar practice in the future as it will lead to better investment and intervention.
- The role of women in agricultural activities and in the process of allocating income gains from farm product into asset, investment and saving is essential.

ANNEX 6: Stakeholder Workshop Report and Results

Workshop on selecting a "promising" wadi to replicate the IIP's successful interventions in the follow-up phase (under WSSP):

In mid-2007 a stakeholder workshop was organized by IIP to seek stakeholders' feedback for finalizing the comparative study that was undertaken in the same year. The study aimed to elect the promising wadi in which IIP (in its 2nd follow-up phase) can build on the successful lessons from Zabid and Tuban. The study compared 5 candidate wadis, to prioritize the wadi that scores highest at the following criteria: (i) availability of flood water/annum; (ii) readiness of farmers to get organized and form WUAs, (iii) poverty and lack of donor projects; and (iv) no presence of chronic lowland-upland water rights/allocation issues. At the workshop the stakeholders agreed to the selection of Wadi Ahwar (see Table below).

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TABLE A6.1: PREVAILING CONDITIONS IN SELECTED WADIS WITH REGARD TO DIFFERENT PARAMETERS FOR SELECTION OF PHASE II WADIS

PARAMETERS	WADI BANA	WADI AHWAR	WADI MAWR	WADI RIMA	WADI SIHAM
I. Water Resources Related & Irrigation Engineering Aspects					
- Command Area (km^2)	33600	7000	26000	14520	9980
- Averge Annual Surface Flow (Mm^2)	120	55	191.35	75.8	70.05
Total Score (Out of 30 points)	**15**	**25**	**25**	**15**	**25**
II. Socio-Economic Aspects					
- Average Household Living Condition Index (Housing, Drinking	4	2	2	3	1
Water & Sanitation, Electricity, Cooking Medium, Durable Assets)	4	2	2	3	1
- Access to Education & Health Services					
Total Score(Out of 10 points)	**8**	**4**	**4**	**6**	**2**
III. Agriculture Aspects					
- Cropping Intensity (%)	3	2	2	3	2
- Average Crop Inputs Use Index	2	1	2	2	1
- Average Crop Productivity Index	2	1	2	3	1
Total Score(Out of 10 points)	**7**	**4**	**6**	**8**	**4**
IV. Agro-Economic Aspects					
- Crop Budgets	4	5	3	5	3
Total Score(Out of 10 points)	**4**	**5**	**3**	**5**	**3**
V. Legal and Institutional Aspects					
- Appropriateness of prevailing Water Rights (Max. 15 points)	12	10	5	5	5
- Soundness of Land Tenure Systems (Max. 20 points)	17	18	8	8	10
- Prospects for Organizing WUAs and Promoting PIM (Max. 5 points)	4	3	1	2	4
Total Score(Out of 40 points)	**33**	**31**	**14**	**15**	**19**
Grand Total Score(Out of 100 points)	**67**	**69**	**52**	**49**	**53**
Overall Ranking of Wadis	**2**	**1**	**4**	**5**	**3**

ANNEX 7: Summary of Borrower's ICR and/or Comments on Draft ICR

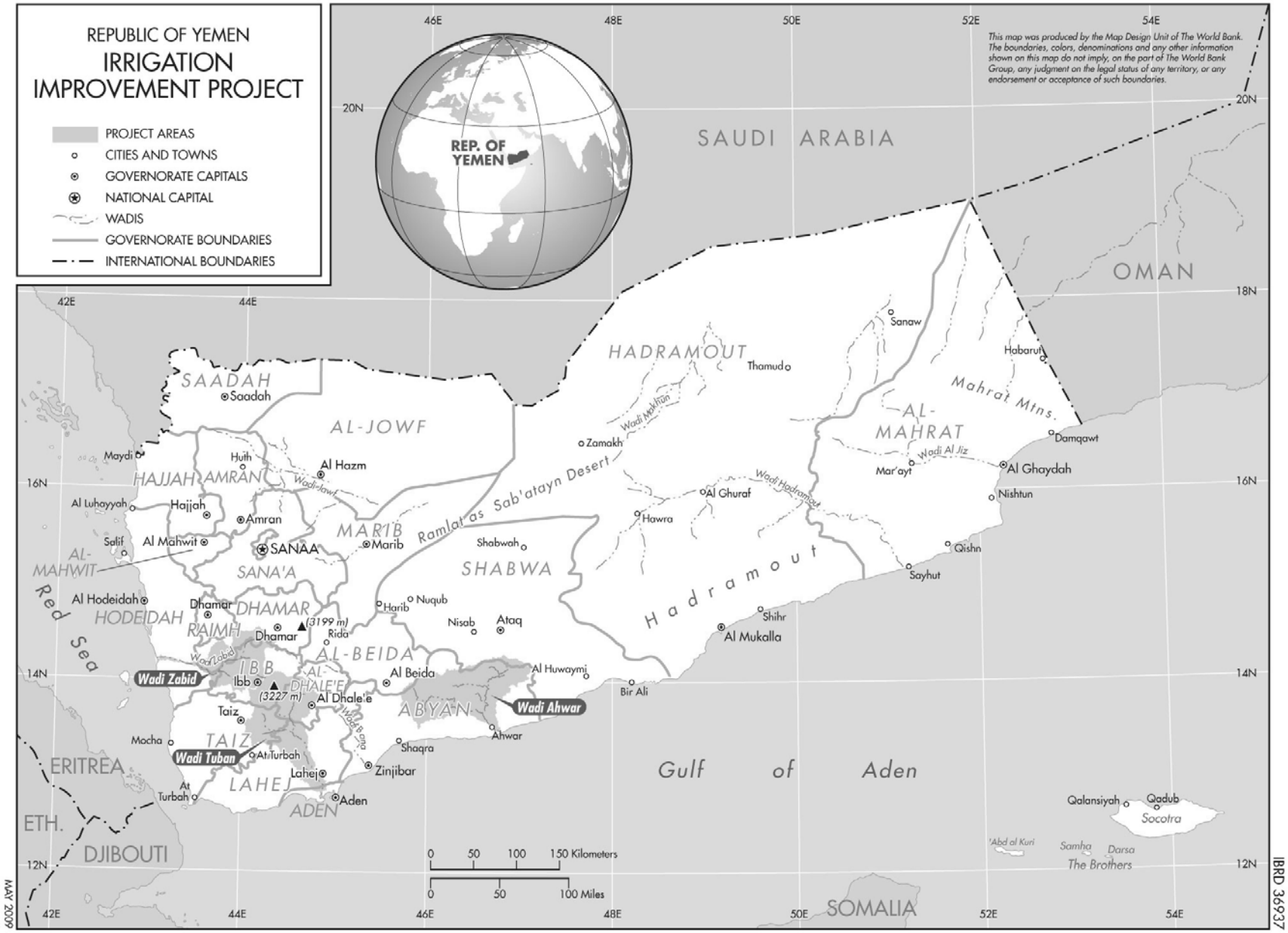
No comments were received.

ANNEX 8:. Comments of Co-financiers and Other Partners/Stakeholders

No comments were received.

ANNEX 9: List of Supporting Documents

- ICR Detailed Economic Analysis.
- Staff Appraisal Report No. 20720-YEM
- Development Credit Agreement (Cr. 3412-YEM)


REPUBLIC OF YEMEN
IRRIGATION IMPROVEMENT PROJECT
PROJECT AREAS
CITIES AND TOWNS
GOVERNORATE CAPITALS
NATIONAL CAPITAL
WADIS
GOVERNORATE BOUNDARIES
INTERNATIONAL BOUNDARIES
REP. OF YEMEN
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YEMEN
ERITREA
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SOMALIA
Gulf of Aden
Red Sea
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HAJJAH
AMRAN
Huth
Al Hazm
Maydi
Al Luhayyah
Hajjah
Amran
Wadi Jawf
MARIB
Marib
Ramlat as Sab'atayn Desert
SANAA
SANAA
AL-MAHWIT
Al Mahwit
Salif
SANA'A
Shabwah
SHABWA
HADRAMOUT
Thamud
Sanaw
Habarut
Mahrat Mtns.
AL-MAHRAT
Zamakh
Wadi Masilah
Wadi Al Jiz
Mar'ayt
Damqawt
Al Ghaydah
Nishtun
Al Ghuraf
Hawra
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