



**COMPLETION REPORT FOR PROJECT: A5-04
OSRO/IRQ/404/UDG**

Participating UN Organization:

FAO – Food and Agriculture Organization of the United Nations
Programme/Project Manager
Name: Christian Miczaika
Address: Special Emergency Programmes Service (TCES) -Via Delle Terme di Caracalla -00153, Rome, Italy
Telephone: +3906 - 57055251
E-mail: Christian.Miczaika@fao.org

Sector

Agriculture and Food Security Sector
Sector Manager
Name: Rajan Chhabra

Address: PO Box 140008, Amman, Jordan
Telephone: +962 796507077

E-mail: rajan.chhabra@faoiraq.org

Project No. and Project Title: A5 – 04

OSRO/IRQ/404/UDG

Assessment, emergency, maintenance and rehabilitation of community irrigation schemes and restoration of water supply in rural areas.

Report Number: Final

Reporting Period:

23 July 2004 until 30 June 2008

Project Budget:

USD 16, 958,942

List Implementing Partners:

- Ministry of Water Resources
- Ministry of Agriculture
- Water User Associations

Project Coverage/Scope:

Iraq – Euphrates and Tigris Irrigation and Drainage Systems.

Abbreviations and acronyms:

MoA – Ministry of Agriculture
MoWR – Ministry of Water Resources
WUAs – Water User Associations

Project Duration/Closed Project:

Over All Duration:48 months
Original project dates:
06 July 2004 - 06 July 2006
Extended:12 July 2006 to 30 June 2008

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ACRONYMS

BOQ	Bill of Quantities
CTA	Chief Technical Advisor
MDGs	Millennium Development Goals
MoA	Ministry of Agriculture
MoT	Ministry of Trade
MoWR	Ministry of Water Resources
NPC	National Project Coordinators
WRISU	Water Resources and Irrigation Support Unit
WUA	Water Users Associations

1. PURPOSE

1.1 Main objectives, outcomes, outputs of the programme/project

1.1.1 Objectives

The overall objective of the project is to improve rural livelihoods through the restoration of adequate levels of water supplies in the project areas in order to assure an appropriate level of irrigated agricultural and livestock production and to safeguard water-needs for human consumption.

1.1.2 Outcomes

1. Built up Water Users' Associations (WUA) as well as strengthened selected government institutions responsible for water management in the country. It is necessary to promote fundamental changes in institutional arrangements and regulations that aim to allow existing public irrigation institutions to provide services to farmers on an economically sustainable basis and improve their performance in both economic and environmental terms.
2. The repair / restoration / replacement of a number of irrigation infrastructures and equipment making them operational. This is based on a priority list established after a need assessment carried out in close collaboration with the local communities and administrative and technical authorities.
3. The replacement or repair of malfunctioning parts of equipment. This will enable the safe water treatment and pumping units to operate at their designed operational capacities in order to provide water in deprived communities.
4. Adoption of technological innovations among irrigation farmers with a view to achieving greater efficiency in the use of water and soil resources and increasing agricultural production.
5. Improvement of the livelihood of people living in the project area by creating rural employment opportunities and raising incomes.

1.1.3 Outputs

Outputs related to Outcome 1: Built up Water Users' Associations (WUA) as well as strengthened selected government institutions responsible for water management in the country. It is necessary to promote fundamental changes in institutional arrangements and regulations that aim to allow existing public irrigation institutions to provide services to farmers on an economically sustainable basis and improve their performance in both economic and environmental terms

- An assessment made of the post-conflict capacities and resources available. This included the central and local authorities, technical institutions, companies earlier in charge of the planning, design, construction, equipment, operation, maintenance and management of major irrigation schemes or areas with major irrigation projects.
- Key institutions for project collaboration identified and assistance provided where required in strengthening their implementation capabilities.

- A Water Resources and Irrigation Support Unit (WRISU) established, staffed and operational at both central and regional levels in order to plan and implement the project together with the local technical institutions and authorities.
- WUAs are formally established and their members meet at regular intervals to ensure adequate maintenance and operation of the rehabilitated irrigation schemes, discussing water issues and coordinating all water-related activities.
- Funding requests prepared by the technical institutions and ready for submission to potential donors for the repair / replacement / restoration of other identified damaged infrastructure-items with a lower rank on the priority-list.

Outputs related to Outcome 2: The repair / restoration / replacement of a number of irrigation infrastructures and equipment making them operational. This is based on a priority list established after a needs assessment was carried out in close collaboration with the local communities and administrative and technical authorities.

- Joint assessments of the damage to the irrigation infrastructure and equipment carried out with central and local institutions. The resulting effect on the present and future food availability and water supply to the different population groups in the affected areas also measured.
- Local communities playing an active and decisive role in the identification of rehabilitation measures.
- A prioritized programme prepared for repair / rehabilitation / replacement of irrigation infrastructure and equipment based on the above joint needs assessments.
- A number of essential infrastructure-items repaired and operational again. It is estimated that 70 km of secondary and tertiary canals can be rehabilitated, while some 20 000 hectares of gravity irrigation schemes can be put back into production.
- Conditions created for these irrigation infrastructures to be properly managed and maintained by the users-beneficiaries and/or the concerned local institutions of the Ministries of Agriculture (MoA) and Ministry of Water Resources (MoWR).

Outputs related to Outcome 3: The replacement or repair of malfunctioning parts of equipment. This will enable the safe water treatment and pumping units to operate at their designed operational capacities in order to provide water in deprived communities

- Joint assessments carried out with central and local institutions of the damage to the water treatment/distribution infrastructure and equipment, and the follow on effect on present and future food availability and water supply to the different population groups in the affected areas.
- A prioritized programme prepared for repair / rehabilitation / replacement of water treatment/distribution infrastructure and equipment based on the above joint needs assessments.
- A number of essential infrastructure-items repaired and operational again.
- Conditions created for these safe water distribution infrastructures to be properly managed and maintained by the local communities.

Outputs related to Outcome 4: Adoption of technological innovations among irrigation farmers with a view to achieving greater efficiency in the use of water and soil resources and increasing agricultural production

- Extension workers and key farmers are aware of the significant potential for reducing conveyance and on-farm water losses during irrigation with an emphasis on water sufficient techniques such as dripper and sprinkler irrigation methods.
 - Farmers (male and female), and other community members trained on effective irrigation water management and efficient irrigation water use as above.
 - Availability of natural resources (land and water) increased through its more efficient use.
1. Outputs related to Outcome 5: Improvement of the livelihood of people living in the project area by creating rural employment opportunities and raising incomes.
- Improved health of communities due to provision of safe water and drainage.
 - Support to agricultural and livestock production through the provision of inputs.
 - Increased agricultural and livestock production due to increased water availability.
 - Short-term employment opportunities created by the infrastructure rehabilitation component.
 - Long-term employment opportunities created as consequences of above mentioned outputs.

1.2 The relation of the programme/project to the related UN Assistance Strategy to Iraq and how it supports Iraq national development goals and the Millennium Development Goals:

The project activities are integrated in the overall UN strategy for Iraq, which supports the Iraqi National Development Strategy and contributes to the Millennium Development Goals. It is designed to achieve the following outcomes:

- enhanced sustainable long-term food production and natural resource management;
- rehabilitated and reconstructed infrastructure;
- institutional development;
- enhanced employment and income-generation;
- enhanced environmental restoration and conservation.

1.3 Project Management arrangements

1.3.1 Programme/project implementation and supervision arrangements; indicate in-country and region based capacity of organization utilised

Implementation:

Given the high risk security context in which FAO Iraq Programme operates, over the years FAO has developed special operating mechanisms for remote management.

The project was implemented from the FAO Project Management Unit for Iraq, relocated in Amman where the Chief Technical Adviser is based and from Baghdad with assistance of National Project Coordinators (NPCs) and Resident Engineers. At the headquarters, the project was followed by a project manager and technical experts assigned to coordinate the overall planning and implementation of the project.

The primary implementing mechanisms utilized have been the Technical Implementation meetings held in Amman throughout the life of the project. The meetings served to enable face to face encounters between the representatives of FAO and the government counterparts for this project (MoWR and MoA). The meetings were also opportunities to discuss the problems as well as the achievements of the project while ensuring full transparency and accountability of activities throughout the project implementation.

FAO Iraq Management Unit relocated in Amman has played a major role in implementation and supervisory arrangements. Availing itself of the existing administrative and fully operational management structure in Amman, FAO was able to respond to the arising demands throughout the project implementation in a prompt and efficient manner.

Supervision/monitoring:

FAO availed itself of advisory services of a number of independent companies and individual consultants who were selected on a competitive basis to provide additional on site supervisory and monitoring services and when needed impartial advice on technical issues. These were based either in Iraq or abroad, employing either Iraqi or non-Iraqi nationals.

In order to ensure full transparency and accountability, already established and recognized FAO rules and procedures for procurement and recruitment of the project personnel have been followed. The endorsement of the Government of Iraq was obtained prior to initiation of any these actions during the project.

Furthermore, numerous ad-hoc meetings of a management nature were held in order to respond to the unpredictable security and political situation in Iraq which had a great impact on project implementation since 2004. Challenges were met by bringing interested parties to the negotiating table to discuss issues related to project implementation on a regular basis.

1.3.2 Main international and national implementing partners involved, their specific roles and responsibilities in project implementation and their interaction with the agency

For this project FAO cooperated closely with the Iraqi Ministry of Water Resource (MoWR) and with the Ministry of Agriculture (MoA). Throughout project implementation, the MoWR remained FAO's principle partner while collaboration with the MoA was developed in relation to training of the ministerial experts and extension workers during the final stages of project implementation.

The MoWR's initial role was to select the project sites for rehabilitation and provide, where possible, the basic survey reports and technical dossiers for the works to be done. Later on, in collaboration with the MoWR, FAO ensured timely recruitment of project personnel including the Project National Coordinator (NPC) to coordinate project activities from Baghdad and Erbil in collaboration with the MoWR counterparts.

Furthermore, the Iraqi Ministries were fully involved in FAO's procurement process as well as in all the stages of the elaborate undertaking of civil, mechanical and electrical rehabilitation works for the irrigation infrastructure and pumping stations. This was done through direct employment of MoWR Engineers to monitor and provide advice during the work implementation. Hence, responsibilities of the project implementation were in a certain sense co-shared with the MoWR.

In addition, through provision of specifically tailored training programmes and acting as partners, a number of selected international institutions have also contributed to project implementation. These are: Alterra- ILRI in Wageningen (the Netherlands), UNESCO (the Netherlands), Cranfield University (UK) and CIHEM (Bari, Italy). For further notes see paragraph on results.

1.3.3 Specific delivery mechanisms utilised

Technical assistance was delivered through a number of individual and company consultancy contracts in addition to advisory support from technical divisions at FAO headquarters in Rome, Italy. This involved ensuring extensive coordination on behalf of FAO with all the actors involved in project implementation as well as intensive follow up with counterparts from the MoWR, line ministries, site engineers and operating staff on all technical issues and details.

There are substantial elements of risk in the implementation of some of the irrigation projects being implemented by FAO in Iraq. This is due to potential incompatibility between new and existing 30 year old equipment when replacing or repairing pumps, motors, electrical control and auxiliary equipment in existing pumping systems and irrigation schemes. Such incompatibility could lead to the procurement of high value equipment that could not be fitted into the existing structure or system, or would not work once it had been installed. In addition, FAO cannot field international technical staff to pump station sites.

In view of the above, a full risk assessment analysis was undertaken and procedures for requesting proposals from suppliers were designed as follows to minimize risks:

1. Training was provided to the Ministry of Water Resources (MoWR) technical staff in order to establish an accurate data collection mechanism for describing the state of equipment and infrastructure currently in place;
2. Details collected on the BOQ, drawings and equipment (if any) currently in place were discussed with the Original Equipment Manufacturer (OEM) and /or MoWR;
3. The technical proposal submitted by the OEM or the engineering company was technically reviewed by MoWR, an FAO international expert in Amman, as well as by an international independent technical consulting firm contracted by FAO and by the FAO technical services at HQ before being accepted;
4. Performance of the installation company was closely supervised by MoWR, FAO site engineer and an inspection/supervision company.

Equipment was delivered directly by suppliers which were selected on a competitive basis through FAO's procurement process. FAO arranged inspection at loading and unloading point.

Delivery of international civil work services (contracts) for rehabilitation of irrigation schemes and pumping stations was also conducted via FAO's procurement rules where the best technical proposals were selected through a highly competitive process.

One hundred percent deliveries were achieved because of the underlying characteristics of the FAO's delivery mechanism which consisted of effective communication and close working relationship with contractors and counterparts of the Ministries on all levels at all times.

1.3.4 Intra cluster cooperation and goods/services other agencies supplied/ common services utilised

Because of the specificity of this agricultural project, there was no collaboration with other cluster agencies.

1.3.5 Arrangements for procuring and transporting programme/project inputs, to ensure local appropriateness and acceptability, as well as security and value-for-money under the circumstances – attach as annex 3 final lists of contracts awarded.

The standard FAO procurement procedures that consist of international and national competitive tendering for procurement of all goods and services have been followed for this project. However, in August 2004, FAO, in a written agreement with its key counterpart ministries, opted for strong involvement of the ministries in the procurement process. This involvement includes the following elements:

- Identification of inputs or services required undertaken jointly by FAO/Iraqi Line Ministry;
- Preparation of detailed specifications, Bill of Quantities, drawings, delivery time and destination undertaken by FAO and the Iraqi Line Ministry and endorsed by the latter;
- List of local potential suppliers provided by the Iraqi Line Ministry to be included by FAO in its invitations to bid;
- Tenders launched by FAO inviting local and international potential suppliers;
- Technical review of the offers received and preparation of recommendations carried out jointly by FAO/Iraqi Line Ministry and endorsed by the latter;
- Purchase Orders or Contracts issued by FAO;

1.3.6 Systems for programme/project monitoring (including financial tracking and accounting audit), quality control (including lesson learning, and corrections), and impact assessment; methods for data collection and monitoring

In-house financial systems have been used throughout project implementation to monitor budget expenditure. FAO's accounting rules and regulations applied.

For Monitoring and Payment Process for Goods and Services delivered in Iraq the following mechanisms were used:

1. Bill of quantities of executed works or goods prepared by the contractor were verified and confirmed jointly by the FAO Site Engineer/national project Manager and Representative of the line Ministry. An international independent inspection/supervision company contracted by FAO provided a separate report to FAO confirming conformity with contracts.
2. Banking and insurance services are still not available in Iraq and FAO financial transactions inside Iraq had to be made in cash, with its inherent control risk. Cash needed to run project operations in Iraq or for payment of Iraqi contractors was transferred from FAO relocated office in Amman to the contractors using the services of two brokers. FAO paid the required cash to the brokers only after receiving written notification from the contractors in Iraq certifying that they received the required cash from the brokers. By so doing, the brokers assumed full responsibility in case of loss of cash during the transfer process into Iraq.

Quality control was ensured by a number of tight mechanisms, such as a technical one, which was based on weekly updates, monthly summary reports with pictures, surveys and ad hoc site checks. Given the interdependent relationship between works that contractors were implementing and the basic conditions of the site that the Ministry had to ensure to enable such works (water levels), lessons learning mechanism was necessarily a part of project implementation. It was realised at a very early stage that the services of independent consultants and a supervisory company would be used extensively to provide and ensure quality control mechanisms.

As mentioned above, given the security situation in which it was impossible for FAO's staff to visit the sites for data collection and surveys, international and local companies were used. Companies worked with line ministries and FAO's national staff in all on site undertakings.

FAO is currently conducting evaluation on irrigation projects where the impact assessment will be made. Impact on food production and improvement of livelihoods can only be measure a one year or one crop production cycle after the completion of the rehabilitation works. The results are expected in mid 2009.

2. RESOURCES

Total approved budget and summary of resources used for the programme/project from the UNDG Iraq Trust Fund (and non-Trust Fund resources where applicable)

2.1 UNDG ITF funds received

USD 16 958 942

Project expenditure:

USD 16 863 793

Provisional Amount still available to date to the project at completion of activities:

USD 95 150

Provisional Use of Funds according to the ten broad categories:

Description	Budgets	Expenses	Balance
Salaries Professional + G.S	153 939	153 939	0
Locally Contracted Labour	177 774	177 774	0
Consultant	346 622	346 684	-62
Contracts	3 668 324	3 738 244	-69 920
Travel	247 201	247 201	0
Training	618 359	618 359	0

Expendable Procurement	5 314 965	5 314 965	0
Non Expendable Procurement	4 853 627	4 853 627	0
General Operating expenses	254 336	234 275	20 061
Security	301 536	97 981	203 555
Support Cost Account	1 022 260	1 080 744	-58 484
Total	16 958 943	16 863 793	95 150

Explanation of deviations of project expenditure versus original budget:

See detailed explanation provided under section 3.1 (outcome 1) on diverting of budget from Al-Thraima (Governorate of Qadisiya) irrigation scheme to Mosul Dam.

Approved budget revision:

The first budget revisions/extensions were submitted on 8 September 2007:

1. Staff:
 - 1.1 National Programme staff decreased by 540 564 at 74%;
 - 1.2 International Programme staff decreased by 47 445 at 18%;
 - 1.3 National and International staff decreased by 341 644 at 37%;
2. Contracts decreased by 2 800 192 at 44%;
3. Training decreased by 599 385 at 75%;
4. Equipment increased by 2 232 547 at 82%;
5. Supplies and commodities increased by 2 328 516 at 78%;
6. Travel decreased by 174 840 at 37%;
7. Programme subtotal decreased by 56 992 at 0%; and
8. Miscellaneous decreased by 56 993 at 14%

FAO requested an extension in time of 17 months.

The second budget revisions/extensions were submitted on 29 June 2008:

1. Contracts increased by 2%;
2. Equipment decreased by 2%;
3. Travel decreased by 3%; and
4. Miscellaneous decreased by 19%

Other funding sources available to the project:

None

2.2 Human Resources

- International: One Project/Programme Manager;
- National: One Project/Programme Officer; One Resident Engineer at each project site (including the services of FAO Officer in Charge in Baghdad who was the liaison officer for the MoWR and the MoA);
- Four contractor supervisors
- 30 Construction workers (drivers, operators, tradesmen)

2.3 Project Assets

- Surveying instrumentation including ten complete survey stations, computers and plotters to assist the MoWR in project design were purchased and delivered in September 2005, (USD 428 794). Training by the suppliers in the use of the equipment was carried out in Iraq in November 2005.
- Three aquatic weed harvesters (one of 10 m³ and two of 20 m³) were procured and delivered in October 2006 (USD 1 503 956). This equipment is being used to strengthen the weed control capabilities of the MoWR in rivers, canals and reservoirs, and training of operators was given in the USA in late June-early July 2006.
- Under this project, as agreed by both the MoA and the MoWR, improved seeds and fertilizers valued at USD 5.3 million were procured in 2004 and transferred to the MoA in early 2005
- Six diesel hydraulic crawler rigs for Mosul Dam were purchase for a total value of USD 2 850 000.

3. RESULTS

3.1 **An assessment of the extent to which the programme/project component/programme /project has achieved the outcomes and outputs expected**

2. Outcome: Built up Water Users' Associations (WUA) as well as strengthened selected government institutions responsible for water management in the country. It is necessary to promote fundamental changes in institutional arrangements and regulations that aim to allow existing public irrigation institutions to provide services to farmers on an economically sustainable basis and improve their performance in both economic and environmental terms.

FAO had planned a needs assessment survey on the capacity of existing water management institutions in Iraq, to be undertaken in the second half of 2005 through a national consultancy company. This was planned as a component of a comprehensive training programme submitted to the MoWR and MoA in January 2005. However, the needs assessment was not carried out despite MoA's approval, as the MoWR placed it on hold (and later cancelled it). Only part of the training programme submitted by FAO was conducted. Due to the lack of an official needs assessment, the project has been limited in its capacity development for the MoWR and to a much lesser extent for the MoA, and has largely relied on them assessing their own needs.

Due to the security situation, a Water Resources and Irrigation Support Unit (WRISU) could not be created as originally planned with staffing including three expatriate WRI specialists based in Iraq. However, a WRISU has been established in Amman with expatriate and national specialists working in the closest possible vicinity to project locations to facilitate project implementation.

The project approach was designed to be community driven, with the communities closely involved in identifying and participating in rehabilitation activities and being trained to become partly responsible for some of the water management activities. This was difficult to implement in a situation where community organizations concerned with irrigation development, such as WUAs, are practically non-existent and the project period (as well as the security situation) does not permit a thorough sensitization/mobilization campaign. It should also be noted that the creation of WUA was an important component of the original training programme proposed by FAO and as mentioned above this was put on hold (cancelled) by the MoWR.

Notwithstanding the above, the existing institutional arrangements and regulations for water management in the areas of the project sites were analysed and discussed with relevant ministerial staff on how to improve public institutions to better serve farmers and provide economically sustainable operational and maintenance support. It is unfortunate that promotion of fundamental institutional changes was limited to rehabilitation of physical infrastructure and rehabilitation of irrigation schemes and pumping stations by decision of the Government of Iraq.

3. Outcome: The repair / restoration / replacement of a number of irrigation infrastructures and equipment making them operational. This is based on a priority list established after a needs assessment was carried out in close collaboration with the local communities and administrative and technical authorities.

Five potential project sites were identified by the MoWR in 2004. However, soon after technical dossiers were completed for all the sites (see below) and tenders were issued for civil works, it was realised that due to the cost of works, which were substantially higher than estimated, works on only four sites could be implemented under this project. **Heran** and **Kalan** irrigation schemes were selected for construction works while **Mussaib** and **Thraina** irrigation schemes were selected for rehabilitation works. These together cover an irrigated area of around 23 145 hectares, benefiting an estimated 12 680 farming families. The selection of the sites was also an outcome of a thorough technical analysis completed by FAO of all five proposed sites. Detailed situation map, pre-feasibility and feasibility studies, technical dossiers which included description of the works, estimated costs and justification of the envisaged works were completed.

Heran Irrigation Scheme (Governorate of Erbil);

Area = 145 hectares; Number of farming families = 180; Value USD 216 000;

The civil works began in June 2005 and were completed at the end of January 2006. The contractual warranty period was also completed with the contractor making minor repairs to enable the irrigation scheme to return to its full capacity. An assessment study conducted by an independent company was undertaken in March 2007 and its conclusions show that the

cleaning and lining of the irrigation channels has had a positive effect on agricultural production. This is because water losses were decreased, annual maintenance costs of the channels were reduced and water availability needed for cultivation of agricultural land was increased. This took place despite the fact that this project area had been affected by intensive drought between 1998 and 2001. The rehabilitation of the irrigation scheme has improved the economic situation of farmers through the increase of water availability to agricultural lands and has thus contributed to an increase in farmers' income. However, the assessment study report also points out that farmers require training on proper usage of irrigation waters (appropriate rates) as well as to learn how to maintain irrigation rates correctly. See notes on the outcome 1. A specific training on WUA establishment and management was provided in 2007 under another irrigation project.

**Mussaib Irrigation Scheme and Pumping Station (Governorate of Babil);
Area = 3 000 hectares; Number of farming families = 2 500; Cost USD 2.9 million;**

Al Mussaib irrigation scheme, located in the Babylon Governorate, is mainly fed by the Euphrates river through a number of diversion canals. The main problem in this area is the build up of soil salinity as a result of inadequate drainage within the drainage network which was caused by the poor performance of the pump station situated on Drain 22. Hence, the key priority was the reclamation of the irrigated areas through the rehabilitation of the Drain 22 pumping station (replacing the pumps and associated electrical equipment) and rehabilitation of the irrigation scheme associated with this pump.

A pre-feasibility study and detailed technical dossier for this irrigation scheme were completed and a Condition and Data Survey Report was produced. Based on this, tendering for works was undertaken and the contract for civil works for rehabilitation of irrigation schemes was awarded in March 2006 while the contract for rehabilitation of the Mussaib pumping station (Drain 22) was signed in July 2006. The funds for its rehabilitation and training of operators were included under the rehabilitation of the whole irrigation scheme.

Delays were experienced as a result of errors found in the initial technical information provided by the MoWR and the subsequent need to change the technical specifications of the new pumps which were required for the pumping station, as opposed to simply bolting similar pumps onto the existing foundations. In fact, pumps and electrical control equipment experienced continuous problems caused by the previously made poor design, material selection and manufacturing standards dated 2003. Hence, in order to address such substantial issues various checks took place which delayed the countersigning of the contract by the pump manufacturer until 14 July 2006. However, the new equipment has now been manufactured and delivered, the foundations built with the mechanical and electrical equipment installed and tested.

**Al-Thraima (Governorate of Qadissiya);
Area = 20 000 hectares; Number of farming families = 10 000; Cost = USD 2 800 000;**

A detailed pre-feasibility survey and technical dossier were completed including BOQ, drawings and tender documents but the tender that was planned for signature for June 2006 was abandoned due to a request by the MoWR to replace the project by the urgent procurement of grouting machines for Mosul Dam. The reason for this was that the foundation conditions of this large dam required continual grouting to maintain the dam's stability. The existing machinery was old and unreliable and could not keep pace with erosion under the dam and control of the subsequent seepage. The funds earmarked for Al Thraima were thus identified by the MoWR as being required to procure new machinery for the dam. The request for change from Al Thraima to this procurement was formally received by FAO in June 2006 and the funds were sufficient to procure six of the ten grouting machines requested. The purchase order was issued in October 2006 and delivery was completed in May/June 2007. The increase made by the additional area has been estimated by the Mosul Dam authorities to be 254 000 hectares. The MoWR have indicated that they will complete the works at Al Thraima using their own resources and funds.

Kalar Irrigation Scheme (Governorate of Sulaymaniyah).

Unlike the other project sites, the MoWR provided a technical dossier of the proposed irrigation scheme. However, from the start there were serious doubts that the construction designs and plans prepared by the previous authority for this irrigation scheme were acceptable for the implementation of works under this project and under FAO's responsibility. The topographic survey carried out by the Sulaymaniyah Governorate authority covered only part of the proposed scheme. FAO was only requested to "fill-in" the main channel and the sprinkler area adjacent to the scheme. The technical dossier provided by the MoWR was incomplete and FAO, together with an independent company carried out field visits for spot checks. A pre-feasibility study was produced and shared with the Sulaymaniyah Governorate authority. FAO has argued that many evident mistakes have been made in topographic surveys and that available data was not usable for implementation of proposed rehabilitation works. A new detailed topographic survey was required but given that such undertakings were not practical under existing security situation and no funds were available to cover these additional activities, rehabilitation of this irrigation scheme was cancelled.

It could be argued that the conditions have been set at the above irrigation schemes rehabilitated by FAO for future establishment of WUA and development of community operation and maintenance of schemes by farmers and extension workers.

4. **Outcome:** The replacement or repair of malfunctioning parts of equipment. This will enable the safe water treatment and pumping units to operate at their designed operational capacities in order to provide water in deprived communities.

Grouting of Mosul Dam: (three northern governorates) request to replace malfunctioning equipment in order to stabilize the foundation of the Mosul Dam to allow the water storage to return to the design maximum was received. Six diesel hydraulic crawler rigs type B1-800 worth USD 2 850 000 were procured. This allowed for an additional 4 billion m³ of water to become available for power generation, irrigation and water supply. As estimated by the Mosul Dam authorities the additional area permitted to be irrigated was of 254 000 hectares. Furthermore, the generation of an estimated minimum of 750 mW (and up to 1 050 mW) was assured.

Background information on Mosul Dam:

The Mosul Dam is located on the Tigris River, about 50 km northwest of Mosul City and about 80 km south of the border between Iraq and Turkey. The earth filled dam wall is 4 km long and 113 m high, with a power house at the bottom outlet, plus a concrete lined gated spillway and a fuse plug secondary spillway between the main embankment and a secondary saddle dam. The original dam design was for a total storage capacity of 11.11 billion m³. The principle functions of the dam, in order of priority, are: flood water control, irrigation for up to an estimated 544 000 ha of downstream land and power supply generation up to a total demand capacity of 1050 MW (20 percent of Iraq's total power generation capacity and providing Mosul City with most of its power needs).

Dam construction commenced in 1981 and was completed in June 1986, with reservoir filling commencing shortly afterwards. During construction, potential foundation problems emerged with the occurrence of highly permeable karsitic limestone, with soluble gypsum and related anhydrite layers. Large caverns, fractures and voids were discovered under the river bed at depths of 80 to 100 m. The section of the dam affected comprises approximately 50 percent of the foundation width. As a consequence of these foundation problems, and to arrest the subsequent seepage, maintenance grouting of the foundation has been conducted continuously on a 24 hours basis per day, six days a week, by the MoWR since 1988. Grouting takes place on the dam wall embankment with diesel drilling rigs and via galleries that run throughout the base of the dam with electric drilling rigs. All these rigs drill down to the affected zone and grout is pumped into the area to seal it and arrest the seepage. The amount of grout used each year has varied between a maximum of 14 430 tonnes in 1987, to a minimum of 2 259 tonnes in 1996.

Researchers in the late 1980s estimated that, should the dam fail because of excessive seepage, a breach of up to 770 m wide would develop and the active storage of the dam would be released over a 16 hour period, with a peak flow of 553 000 m³/sec. The "dam break wave" would reach Mosul City in three to four hours and inundate it to a depth of 24 to 26 m. Baghdad would be flooded to a depth of 4 m some 48 hours later. Damage is considered "too large to estimate", but would be significant over the full width of the flood plain of the Tigris, between the dam and Baghdad, with considerable loss of life in areas immediately downstream of the dam, including the 1.7 million people living in Mosul City. Currently, to limit the risk, the dam wall maximum water level is pegged at 11 metres below full supply level. This has caused a significant shortfall in stored water (about four billion m³) which has not only reduced the generating capacity but also the irrigation area served to 254 000 ha.

In 2004 and in response to ongoing concerns regarding the condition, long term stability and safety of the Mosul Dam, the Coalition Provisional Authority contracted "Black and Veatch" and "Washington Group International" to study the dam seepage problem, identify and evaluate problems and recommend solutions. The 258 page study, dated August 2005, was made available by the MoWR to FAO.

Conclusions on the seepage were as follows:

- It is vital to maintain the dam in a safe condition, despite the highly problematical foundation conditions.
- Dam safety is a concern: piping could develop following differential settlement into dissolved and eroded areas.
- No current proven technology exists to create the "positive cut-off" wall required from dam crest to the estimated 200 m depth.
- Even with best practice and favourable geology, any grout curtain would have a finite residual permeability.
- The maintenance grouting programme is the only practical line of defence for the life of the dam wall.

Conclusions on the grouting programme were the following:

- Average drilling activity is now at about 50 percent of its 1987 level.
- Grout pumping productivity is generally between 15 percent and 50 percent of the production achieved in 1987.
- The action recommended was to introduce additional machinery and techniques, so that grouting production could be greatly increased above present levels, as needed, to meet the proposed design goals for maximum curtain closure.

Remedial grouting works by the dam construction contractor continued until 1988. After investigations, it was found that the grouting programme had to continue. The MoWR staff was trained in operating the drilling rigs and the MoWR received four drilling rigs from the contractor. In 1990, the MoWR purchased a further ten rigs. A total of 14 rigs were available (nine electric and five diesel), some of which are still used today.

In 2003, there were 12 operational rigs available, but following a problem with the purchase of spare parts in 2005, the number of fully operational rigs was reduced to two rigs (one each, electric and diesel). One electric rig is irreparable. The remaining seven electric and four diesel rigs are all well beyond their economic life; furthermore, they are operated below their specified efficiency levels and all of them require continuous maintenance. In 2000 the Government of Iraq procured five new rigs, which unfortunately were not adapted to the conditions of the Mosul Dam. They could not be used because the electric rigs were too wide for the subterranean galleries and the diesel rigs could not climb the slope of the dam wall embankment.

As requested by the MoWR, FAO therefore agreed to purchase additional rigs as follows:

- The rigs to replace/complement existing rigs, which are effectively the same models in use today, with modifications and upgrades that will improve efficiency and utility;
- The rigs procured in 1990 have proven durable in the conditions under the dam wall (steep slopes, high temperatures and limited access) and on the abutments.
- The technical staff (including eight mechanical engineers and the equipment operators) are familiar with all aspects of these rigs.
- The Mosul Dam project workshops and staff have already received training and have the expertise to repair and maintain the rigs effectively and efficiently.
- The electric rigs are the correct size for the dam wall galleries and the diesel rigs can climb the dam wall embankment which has a slope of more than 27 degrees.
- As part of the above-mentioned United States (US) Government intervention, the Governorates were contacted by FAO, together with the MoWR, to coordinate jointly the supply of the equipment required. The US Government had allocated and already spent USD 30 million to procure studies, other material, equipment and running costs in support of the grouting operation at Mosul Dam. The US spent more than USD 3 million in procuring spare parts for the existing still repairable rigs. However, no purchase of new rigs took place.

Accordingly in 2006, FAO purchased six drilling rigs as an emergency priority. The US Government fully supported the procurement of new rigs by FAO to increase the fleet of operational machines.

5. Outcome: Adoption of technological innovations among irrigation farmers with a view to achieving greater efficiency in the use of water and soil resources and increasing agricultural production.

As mentioned above, the setting up of WUA and on-farm training of the farmers was postponed by the MoWR as the physical capacity building through rehabilitation of irrigation schemes and reconstruction of the pumping station was seen as a priority. Comprehensive training programme proposed by FAO and rejected by the MoWR in its Phase II included training on modern crop irrigation (drip, sprinkler, ect.) Nonetheless, forty irrigation experts, staff of the MoWR and the MoA who were trained by FAO under comprehensive training programme at international institutions on issues related to water management were also exposed to the new technologies currently being used in on-farm water systems to achieve greater water efficiency and savings. These experts are capable of guiding the MoWR and the MoA on required methodology to be used for training of farmers and importance of setting up of WUA as well as to advise on the basic equipment needed by farmers.

Three weed harvesters were procured and delivered in 2004 under this project as a new technology to clean irrigation and drainage canals. This equipment is broadly specified in the project document as being required for capacity building in collaborating technical institutions. It was also requested in broad terms by the Ministry of Water Resources (MoWR) in the signed Progress Report of 28 September 2004 and the details were finalized at the technical meeting between FAO and MoWR on 17 to 19 December 2004. The equipment is used on some of the identified sites of this project as well as on the maintenance of the irrigation and drainage infrastructure within the country. Training at the supplier production site to two MoWR technicians and within the country was delivered for these items.

6. Outcome: Improvement of the livelihood of people living in the project area by creating rural employment opportunities and raising incomes.

Improvement of livelihoods of people living in the project area is a long term process and the desired outcome of the activities implemented under this project. As mentioned before, increased availability of water for agricultural, livestock and human use creates conditions allowing beneficiaries to remain on their land and increase agricultural and livestock output.

The FAO internal evaluation is currently being carried out and results are expected to be available by mid 2009. This will show the direct impact that this project has had on improving the livelihoods of people and the economy of the area. However, the creation of long term employment as result of the civil works and training undertaken during this project are subject to future policies and strategies by the MoWR and the MoA.

3.2 Main activities undertaken and achievements/ impacts:

The following activities were implemented:

- a) An extensive capacity development programme was drawn up and submitted to the MoWR and the MoA in January 2005 (worth USD 1.1 million). The training courses to strengthen technical institutions have been completed with four major courses arranged at four different institutions. One of these was funded under OSRO/IRQ/402/UDG and was completed in December 2005 and the other three were funded under this project, OSRO/IRQ/404/UDG. The latter are listed below:

Alterra-ILRI in Wageningen, the Netherlands: Ten Iraqi engineers attended this six-week course in “Soil, Drainage and Land Reclamation” from 9 January to 17 February 2006. The specific objectives of the course were:

- to reinforce basic land drainage engineering knowledge and skills;
- to enhance drainage knowledge and skills to:
 - manage drainage as an integrated component of large irrigation systems;
 - assess land with water logging and salinity problems, formulate and implement possible solutions;
 - place drainage and land reclamation within the context of integrated water resources management;
- to enhance computer skills to use remote sensing techniques for identification of problematic soils; and
- to develop project planning skills including preparation of project proposals and report writing.

UNESCO, the Netherlands: Ten Iraqi engineers attended this six-week course in “Agro-Hydrology” from 6 March 2006 to 15 April 2006. The training objectives were:

- to reinforce basic agro-hydrology knowledge and skills;
- to enhance agro-hydrology knowledge and skills to:
 - place irrigation and drainage within the context of integrated water resources management;
 - monitor and assess catchments problems, formulate and implement possible solutions to erosion and sedimentation problems in both the catchments and the river channels;
- to develop basic computer skills and data handling; and
- to develop project planning skills including preparation of project proposals and report writing

Bari, Italy: Ten Iraqi engineers attended this eight-week course in “Planning and Design of Modern Irrigation Systems” at CIHEAM from 06 March 2006 to the 30 April 2006. The specific objectives of the course were:

- to reinforce basic irrigation engineering and agronomic knowledge and skills;
- to develop irrigation knowledge and skills to plan and design modern irrigation systems, including sprinkler and drip irrigation and modern canal control technologies;
- to develop basic computer skills and data handling, using examples in irrigation; and

- to develop project planning skills including preparation of project proposals and report writing;

Cranfield University, the UK: Ten Iraqi engineers attended an eight-week course in “Management, operation and maintenance of large-scale irrigation and drainage systems” at Silsoe from 17 October to 09 December 2005. The training objectives were:

- to reinforce basic irrigation engineering and agronomic knowledge and skills;
- to develop irrigation knowledge and skills to;
 - manage, operate and maintain large, modern canal irrigation systems, including pumping stations;
 - support farmers with on-farm irrigation water management and maintenance;
 - assess the environmental impact of irrigation and drainage systems; and
- to develop basic computer skills and data handling using examples in irrigation and drainage.

b) The following inputs were procured:

- Surveying instrumentation including ten complete survey stations, computers and plotters to assist the MoWR in the project design have been purchased and were delivered in September 2005, (USD 428 794). Training by the suppliers in the use of the equipment was carried out in Iraq in November 2005.
- Three aquatic weed harvesters (one of 10 m³ and two of 20 m³) were procured and delivered in October 2006 (USD 1 503 956). This equipment will be used to strengthen the weed control capabilities of the MoWR in rivers, canals and reservoirs, and training of operators was given in the USA in late June-early July 2006.
- Under this project, as agreed by both the MoA and the MoWR, improved seeds and fertilizers valued at USD 5.3 million were procured in 2004 and issued to the MoA in early 2005
- Six diesel hydraulic crawler rigs for Mosul Dam were purchase for a total value of USD 2 850 000.

c) The following civil works services were arranged:

- TF/IRQ/CPA 168546-2005/TCES for civil works on Heran irrigation schemes for total amount of USD 216 546
- TF/IRQ/CPA 180935-2006/TCES for civil works on Mussaib irrigation schemes for the total amount of USD 992 673.50.
- TF/IRQ/CPA 179780-2005/TCES for civil works on Drain 22 pumping station for total amount of USD 2 812 318.

3.3 Implementation constraints, lessons learned from addressing these and knowledge gained from assessments, evaluations and studies that have taken place during the project:

Human capacity building and institutional change:

Irrigated agriculture is crucially strategic to the economy of Iraq and the general well-being of its people. However, recent events have resulted in severe damage to the irrigation and drainage networks across the country and there has been severe disruption to the Government organizations that historically have had responsibility for building, operating and maintaining them.

The MoWR and the MoA together have responsibility for all aspects of irrigation. MoWR is responsible for planning, designing, constructing, operating and maintaining the extensive irrigation (and drainage) networks throughout the country from the water source down to distribution level. The MoA is responsible for inputs to farms downstream of the distribution outlets such as extension services to farmers. Both Ministries have long experience of meeting these responsibilities, they have a wealth of detailed knowledge of irrigated agriculture and it is anticipated that the ‘corporate memory’ of these organizations is still strong in spite of recent events. However their capacity to deliver water services to farmers is severely curtailed and there is now an urgent need to re-build this capacity. It was the intention of FAO to assist the Authorities to do this by devising a Programme to develop the capacity of professionals, technicians and farmers to meet the Authority’s goals of supporting rural livelihoods and improving food security through improvements in irrigated agriculture.

Iraqi professionals, technicians and farmers have not had the opportunity during the past decades to receive up-to-date information on the latest developments taking place in irrigation in other countries. So, in addition to the anticipated needs for basic knowledge and skills training in traditional and modern irrigation technology and management, the Programme was also supposed to provide an opportunity to up date people on recent developments in irrigation taking place in other parts of the world such as the integration of engineering and agriculture in irrigation development, irrigation management transfer, irrigation demand management, the development of water user associations, and irrigation cost recovery. All these developments have come about as a direct result of acute water shortages in many parts of the world and the need to improve water use efficiency and reduce the costs of irrigation – factors which are very relevant to the situation in Iraq.

The potential impact of these issues on irrigation development in Iraq and on capacity needs will be quite profound in terms of human resources, knowledge, skills and attitudes. Future irrigation capacity needs will be very different from those at present. Therefore, although there are immediate short-term training needs to get rehabilitated systems up and running again, ‘more of the same’ may not serve Iraq well in the longer term. For this reason FAO believes that it is prudent to begin to build these issues into the various training courses and also to look ahead and consider what human resources will be needed and what knowledge and skills they must acquire to support future irrigation development, bearing in mind that it takes considerable time to develop human resources. For example, it can take up to ten years to produce a competent and experienced irrigation engineer. Answers will be needed to key questions such as:

- What capacity is available at present?

- What capacity is needed now and in the future?
- What are the capacity gaps that already exist and what gaps are likely to occur in the future?
- How can the gaps be filled? and
- How can the capacity be maintained and enhanced once it is in place?

It is also important to recognize that developing capacity is not just about educating and training individuals. It includes the building of good organizations and strong institutional structures within which individuals can work effectively and a socio-economic environment that encourages rather than discourages successful irrigation development. Individuals are rightly at the centre of capacity development but their working environment is an essential foundation on which individuals stand. They need knowledge and skills but they also need good organizations in which to work. If either of these is weak then it becomes difficult for individuals to work effectively on the key issues of efficient and effective irrigation water management.

Civil works:

The original technical dossiers for the projects prepared by the MoWR were incomplete and not up to international standards for technical and contractual formulation. A substantial amount of time was required to upgrade the dossiers in order to meet the appropriate standards for international tendering. Due to the adverse security situation, it was not possible to send FAO staff to collect the data. A private consultancy firm, with offices in Iraq, was employed to complete the technical dossiers, however even they faced severe difficulties in travelling and visiting the sites.

Implementation was also delayed due to the late identification of potential sub-project sites by the MoWR and by their repeated changing of equipment requirements and specifications. This was partly because no focal point had been initially appointed by the MoWR to coordinate inputs with FAO - seriously delaying the collection of information. In addition, communication between Amman/Jordan, Baghdad and the governorates where the projects were being implemented was difficult, causing delays in sending information to and from the field. To mitigate the problem, it was agreed to install communication facilities in Baghdad and the governorate.

Lessons learned from completed assessment studies:

During the assessment survey of Heran irrigation scheme conducted in March 2007 the following lessons were learnt:

- Some land owners in the project area imposed stringent conditions that discouraged tenants to fully exploit the land, sometimes leaving some agricultural land without cultivation, leading to a decrease in agricultural production and farmers' income.
- Poor agricultural practices by some farmers in the project area led to a decrease in area cultivated, in spite of water availability.
- The existence of conflicts between farmers concerning ownership of lands led to the abandonment of some agricultural land without cultivation,
- Lack of housing for all families in the villages where the project is located resulting in a reduction in man-power for agriculture.
- Shortage in provision of agricultural inputs such as fertilizers, farming tools and seedlings to the farmers for the purpose of maintaining and sustaining the agricultural process.

- Decrease in prices of agricultural crops on local markets. The low level of prices does not cover agricultural production costs leading farmers to leave some land uncultivated.
- Increase in fuel prices led to an increase in transportation costs and had a negative effect on farmers' incomes.
- Cheap imports of agricultural products led to decreased prices for farmers and reduced income. Consequently some agricultural lands were left uncultivated.
- Lack in agricultural facilities provided to the farmers for planting winter cycle crops, particularly plastic covers.

Most of these problems were outside the scope of the project, but these factors will be addressed in the training sessions of a current project, as selected persons from these irrigation schemes will be included, as well as in any future projects and capacity building.

3.4 Key partnerships and inter-agency collaboration, impact on results:

The key partner for FAO within Iraq in this project has been the MoWR with only a marginal involvement of the MoA to date, although the latter's involvement will increase in the future.

Approaches were made through the Amman office to collaborate with the World Bank who were also interested in the rehabilitation of community level irrigation systems in collaboration with MoWR through their Emergency Community Infrastructure Rehabilitation Project.

Approaches were also made to UNESCO to coordinate the training programmes being given by FAO and UNESCO with MoWR. However UNESCO informed FAO that the training that they were organizing was at a higher management and planning level.

There was some interaction with UNDP regarding the international negotiations on water rights with Turkey and Syria in an attempt to secure Iraq's water supply.

3.5 Cross cutting issues pertinent to the results e.g., gender disaggregation, policy engagement and participation of the public

Environmental considerations are an important element of this project with a reduction of water logging and salinisation of agricultural lands in the region being an important objective. Improving the drainage networks, in this case Drain 22 in Musseib, will avoid saline water (charged with residues from upstream agricultural areas) overflowing and contaminating downstream lands, discharging into the rivers and water supply canals resulting in environmental and health risks for the population.

Regarding participation of the public, all contracts have been opened up to private companies and specifically not been limited to parastatal organizations. The Heran scheme rehabilitation was entirely undertaken by the farmers themselves, employed by an FAO appointed contractor and supervised by the FAO North offices in the Kurdistan region and based in Erbil.

Both women and men have been selected by MoWR for attendance on the training courses. Through the training programme, attempts were also made to address policy issues in Human Resource Capacity Development in Iraq, however, these components have been put on hold by the MoWR until the straightforward training courses have been run.

4. FOLLOW UP ACTIONS AND SUSTAINABILITY

4.1 Priority actions that should be supported/implemented following completion of project to build on achievements and partnerships rectify shortcomings encountered and use the lessons learned during the project with strong emphasis on achieving sustainability of the outcomes:

There is significant modernization taking place in other parts of the world in irrigation and these changes will inevitably begin to impact on Iraq and may significantly influence the way in which irrigation develops in the future. Irrigation management, the development of water user associations and the effects this will have on irrigation management and on the work of government ministries both in terms of the way they operate in the future and on their staffing levels need to be thoroughly investigated. FAO believes that it is very important that human resource development is not overlooked in preference solely to the development of the equipment and infrastructure resources.

Under this project FAO made a proposal to undertake a comprehensive look at current and future capacity in irrigation both in engineering and agriculture as well as immediate options in training. In line with this the capacity development study, study tours and training have been developed. This is because FAO believes that one of the most important value added components that FAO brings to its collaboration in the development of countries is its capacity in human resource development. However, given that the FAO proposal for program, which was very much geared towards identifying the future direction that Iraq wants to take in the water resources and irrigation sub-sector, was rejected by the MoWR, the need to undertake such comprehensive needs assessment and capacity building programme remains.

Irrigation schemes which have not been rehabilitated under this project (Kalar and Al Thraima) should be given due attention.

The two funding requests already prepared for the WRI sub-sector by FAO build on the work done and should be considered:

- 1- Rehabilitation and Maintenance of Traditional Irrigation Schemes in Resettled Areas in Erbil Governorate that focuses on employment generation, valued at USD 3 million.
- 2- Hydrological Network Rehabilitation in Iraq, valued at USD 1.9 million. This proposal was initially drawn up in October 2003 and presented twice. UNESCO came up with the title “Water Master Plan for Iraq” which contains substantial elements of this original proposal.

4.2 Indication of major adjustments in the strategies, targets or key outcomes and outputs:

Firstly, a major change in targets/key outcomes of the project occurred when the MoWR requested FAO to abandon the work already initiated for the Al Thraima Irrigation Scheme (detailed survey, BOQ, drawings and tender documents) and replace this by the urgent procurement of grouting machines for Mosul Dam.

Secondly, this project, according to the original project document, was essentially a community based project where farming communities were to be closely involved in all the stages such as needs assessment, rehabilitation, operation and maintenance of canals through establishment of Water User Associations. However, from what has been reported in other sections of this report, the 'top-down' approach used by the MoWR and MoA, limited the use of available resources for the capacity building of the physical infrastructure. Hence, major adjustments in the outcomes for this project have occurred in human capacity building component.

4.3 Estimated Budget required:

Nil

5 ANNEXES

Annex 1 Key Performance Indicators – Log Frame Matrix

Objectives	Measurable indicators	Means of verification	Outcomes
<p>Development Objective</p> <p>Improving the water flow and drainage conditions of major agricultural irrigation areas and improving access by cleaning and lining canals, rehabilitating control gates, building roads and culverts, and rehabilitating the pumping station</p>	<p>Kms of canals cleaned and lined, roads and culverts built, rebuilding the pumping station and installation of new pumps</p>	<p>Resident Engineers weekly reports with photographs</p>	<ul style="list-style-type: none"> • 2,4280 ms of main canals cleaned • 26,000 ms of branch canals cleaned • 7790 m2 canals lined • 2.3 Kms roads built • 2 culverts built • 130 farm turnouts constructed • 1 water basin constructed • 1 rebuilt pumping station of capacity 8.0 m3/sec • Six diesel hydraulic crawler rigs for Mosul Dam • Three aquatic weed harvesters
<p>Immediate Objectives:</p> <p>To supply water to the agricultural land and avoid water logging, salinisation, and as such to allow presently unproductive lands to be cultivated again in major agricultural irrigation areas in order to improve crop yields in the already cultivated areas.</p>	<p>The number of Ha of land brought back into production</p>	<p>Satellite imagery surveys</p>	<p>Satellite images are being procured and will be made available to the evaluation team. The information obtained will be cross checked with survey at project site to determine the increase in the number of Ha under production and the subsequent increase in crop yields and overall production. This can only be done during the 2008 agricultural production (March to September)</p>
<p>Outputs :</p> <p>Cleaning and lining irrigation canals, rehabilitating control gates, building roads and culverts, and rehabilitating the pumping station to bring the area back to full capacity</p>	<p>Length of canals cleaned and lined, lengthy roads built, number of culverts built, Number of farm turnouts constructed, number of water basin constructed, Capacity of rebuilt pumping station</p>	<p>Measure length, area, capacity and number of the items as per the BOQ</p>	<p>The irrigation schemes and pumping stations were rehabilitated according to the contract BOQs to the quantities stated above, bringing 3,145 ha of agricultural irrigated land back into full production, improving agricultural production, increasing local employment and reducing poverty.</p> <ul style="list-style-type: none"> • Six diesel hydraulic crawler rigs for Mosul Dam • Three aquatic weed harvesters

Annex 2 PROJECT COSTS

CATEGORY	UNDG ITF approved budget	Actual COST	Percentage of Approved	Budget Revision approved (29 June 2008)	Percentage of revision
1. Personnel • including staff and consultants	686 095	678 397		678 335	-1%
2. Contracts • including companies, professional services, grants	3 791 082	3 738 244		3 668 324	-3%
3. Training	618 237	618 359		618 359	0%
4. Transport	0	0		0	0%
5. Supplies and commodities	5 314 965	5 314 965		5 314 965	0%
6. Equipment	4 781 986	4 853 627		4 853 627	1%
7. Travel	247 201	247 201		247 201	0%
8. Security	275 958	97 981		301 536	8%
9. Miscellaneous	127 618	234 275		254 336	50%
10. Agency Management Support	1 115 800	1 080 744		1 022 260	-8%
Total Expenditure	16 958 942	16 863 793		16 958 943	0%

Annex 3 List of contract awards by procurement method

- TF/IRQ/CPA 168546-2005/TCES for civil works on Heran irrigation schemes for total amount of USD 216 546
- TF/IRQ/CPA 180935-2006/TCES for civil works on Mussaib irrigation schemes for the total amount of USD 992 673.50.
- TF/IRQ/CPA 179780-2005/TCES for civil works on Drain 22 pumping station for total amount of USD 2 812 318.

Annex 4 - Pictures

Culvert



Pre-cast concrete lining for canals



Canals after cleaning



Canal Lining



Annex 3 Road Construction



Drain 22 Pumping Station



Drain 22 Pumping Station

