

Expert Consultation Workshop: Upgrading the irrigation system in Gezira Scheme, Sudan

HRC-Wad Medani, 21 – 26 February, 2016

EXECUTIVE SUMMARY

The responsibility for irrigation in the Gezira Scheme has recently been transferred from the Ministry of Agriculture to the Ministry of Water Resources, Irrigation and Electricity (MoWRIE) up to and including the field outlet pipes (FOP). It will require a major effort of MoWRIE and the other stakeholders to upgrade the system to an acceptable level and to establish an adequate operation and maintenance services. When these activities have been implemented successfully, the step to modernize the system and its water management can be taken.

From February 21 to 26, 2016, a workshop was held at the Hydraulic Research Centre (HRC) in Wad Medani. This one week consultation workshop focused on identifying the major problems in the Gezira Scheme and on formulation of key requirements to upgrade the irrigation system. About 40 participants, all with a rich experience in the Scheme, and four experts with a large international experience contributed to the Workshop.

During the workshop, the improvement of Gezira Scheme was proposed to be implemented in two stages:

- Stage 1. Upgrading the existing system with most urgently needed interventions (three years);
- Stage 2. Modernization of the irrigation system by changing/replacing water control structures, water management practices and water charging systems.

Concentrating on stage 1, the workshop:

- Identified the major technical, agronomic, organizational and financial problems, and the human resource needs.
- Recommended a set of possible solutions.
- Developed draft work and budget for five priority interventions.
- Suggested critical operation and maintenance requirements to keep the upgraded system in good condition.

The main outcomes are presented in this summary. Further details are given in the main text of the report and its annexes.

The start: problem identification

Taking stock of their vast knowledge and experiences as well as drawing from international

and regional lessons, the workshop participants detailed the following major problems.

Technical aspects of irrigation

- Large number of minor canals are either silted or over dug; many of the structures (off takes, intermediate and Field Outlet Pipes (FOPs) are at best only partially operational.
- Abu Ishreens are oversized due to unauthorized widening of sections by farmers; they are heavily infested with weeds as they are rarely, routinely maintained.
- Poor water distribution is visible in the scheme – while some areas where excessively irrigated, some other regions are deprived of water due to the poor technical status of the minor canals and FOPs.
- There is over supply in the main and major canal systems. This has created turbulent flow and erosion of canal embankment, contributed to sedimentation and drainage problems, and exposes the Gezira Scheme and some villages to flood damage risk particularly during the wet season.
- The drainage infrastructure is in demand of major repair and in some instances reconstruction: three of the five escape drains are non-functional, the majority of the drainage pumps are non-operational, the protective and collective drains along with their crossings and other structures have aged - they were also not designed for the current much higher drainage requirements.

Agronomic:

- Farmers have complete freedom to grow whatever crop they want whenever they so desire. This makes it impossible to plan and implement any irrigation schedule.

Organisation:

- While by the Constitutional Decree 32, the MoWRIE has solidified its responsibility for up to and including the FOPs; clear operational organizational structure and decision-making system is not yet in place.
- At Abu Ishreen and field system, there are many unknowns: who has overall responsibility? Who decides on the cropping pattern, submission of indents, repair and maintenance works? How is the use of pumps justified and their use controlled and managed?

Financial aspects:

- The irrigation fee in Gezira Scheme ranges from 100 to 150 SGD per feddan; which is lower as compared to similar schemes such as in the Niger where the fees vary from 25 to 35 USD per feddan, though in Pakistan is around 5 to 10 USD.
- Authorities are usually less motivated to invest into the collection of low irrigation fees.

Human resources and services:

- The Gezira scheme is currently suffering from acute staff shortage (a) the minimum estimated requirement is 125 engineers whereas only 60 are in place (b) at least 350 new recruits are needed to manage the 30,000 FOPs along the 1750 minor canals, and (c) several hundred of unskilled labourers should also be hired to provide various supportive services.
- There are no well-planned set of on-job training and capacity building programmes for the staff of the Gezira Scheme.
- Field houses, transportation and communication facilities are inadequate.

The follow-up: recommending solutions

The solutions proposed by the workshop participants to address the identified problems are as summarized below. These are supposed to be upgrading solutions (Stage 1), i.e., to improve the irrigation system to an acceptable level. Next, would be modernization of the irrigation system to be implemented in Stage 2.

Technical aspects of irrigation:

- Bring back the minor canals and Abu Ishreens to their 2008 design through sediment and weed removal, cross-sectional modifications or both.
- Sediment and weed removal has to be done following surveying before and after the irrigation season, and an engineer should supervise the desilting process. This minimizes the risk of oversizing or deepening the canals.
- Mechanical approach should be used for weed removal as this has been successful in the past (DEMAS in the 1980's). Alternative chemical and biological mechanisms could be pilot tested.
- Night storage is preferred to continuous system at the minor canals - this will, however, require strict implementation of the opening and closing schedules of the FOPs. Shifting to a continuous system will result in major costly infrastructural modifications and replacements.
- Maintain the current irrigation schedule of 7 to 14 days - do not shift to complete on-demand system, i.e. providing water to the farmer whenever he requests - this is not of urgent need and its implementation would require full automation.
- Formulate the water levels in the main, branch and major canals related to the required levels in the minors. Maintain Lacey's non-silting and non-scouring velocities.
- Drainage investment should only be considered after proper water management has been put in place. There is a need here for major repair work of the escape, collective and protective drains along with their structures including crossings and bridges.
- Determine the requirements for staff gauges, flow measurements and other information for upgrading purposes.

- The removed sediments can be used for brick production. This is a successful business in India, and can be tested in Gezira.
- Explore the possibilities for reducing inflow during the high sediment load period (15/07 to 15/08), to at least actual demand by the crops. One option discussed is to adjust the cropping calendar so that crops with the least irrigation demand are grown in the specified time. In New Halfa, ground nuts is sown during May.

Agronomic:

- Restrict crop choice in a Nimra to one crop or similar crops that have the same irrigation requirement and schedule.
- Cropping of 50% of the area is to be fulfilled as a design constraint.
- Canal closure from March 31 to May 22: (a) complete closure from March 31 to April 7, and (b) partial closure to supply drinking water through specified canals in the period April 8 to May 22.
- Provision of indents at FOPs by the block inspectors (Department of Agriculture) to MoWRIE.
- Annual determination of crop type and cropped area and schedule by the Block inspectors in consultation with MoWRIE is a MUST. Approval by the “Higher Committee for the use of the Blue Nile Waters” meeting.
- The block inspector (Department of Agriculture), should develop suitable mechanisms that promote effective follow-up of the Higher Committee with respect to crop planning.

Organization:

- The Blok inspectors (Department of Agriculture) is responsible together with farmers for upgrading, operation and maintenance and all other activities at Abu Ishreen and field level.
- The Gezira scheme management should have simple organizational structure with the minimum possible hierarchical levels to facilitate timely decision making. It is important to have four committees in place each responsible for (1) whole scheme (2) major and main canal, (3) minor canal including FOPs and (4) Abu Isheeen and field system.
- MoWRIE needs to take care for timely warning of stakeholders when the closure of canals after March 31 will be re-introduced;
- The Ministry of Roads and Bridges should get license or approval from the MoWRIE for building roads, crossings and bridges that have effect on the irrigation and drainage system of the Gezira Scheme.

Financial aspects:

- The irrigation fees are low and need to be revised - a committee comprising of representatives from the Ministry of Finance, the MoWRIE and the Department of

Agriculture and farmers should determine the irrigation fee that should be paid by the farmers drawing from international and regional experiences and on the basis of the actual upgrading and operation and maintenance costs.

- Generate additional income by promoting the multiple use of the Gezira Scheme such as fisheries, tourism, tree plantation, brick industry, industries and livestock.

Human resources:

- The minimum required technical staff, 70 additional engineers and 350 FOP operators should be in place as soon as possible.
- Services including (field) houses, transportation & communication facilities should be improved.
- Regular training and capacity building programmes should be organized.

Guiding implementation: preparing work plan and budget

In four groups, the participants translated their set of recommendations into a draft work plan and budget focusing on four major priorities. Table 1 gives the details.

Table 1: Tentative Work plan and preliminary budget for five priority interventions

Priority interventions	Estimated cost in SDG/feddan	Estimated total cost in SDG for the total area (2.2 Million feddan)	Annual budget and time frame								
			2016 budget	% of work accomplished in 2016		2017 budget	% of work accomplished in 2017		2018 budget	% of work allocate for 2018	
				I	II		I	II		I	II
1. Upgrading The minor canals and structures including: <ul style="list-style-type: none"> • 25% of total no. Of offtakes (1500) • 60% of total no. of intermediate structures (3473). • 80% of total no. Of FOPs (30000). 	217	478 280 000	239 140 000	20	30	143 484 000	20	10	95 656 000	15	5
2. Human Resources and Services: <ul style="list-style-type: none"> • new recruitments include 70 engineers, 350 gate operators; 700 to 1000 unskilled labourers; • organizing at least one training programme annually • Improved housing ,offices equipment , communication facilities 	390	856 900 000	514 140 000	40	20	299 915 000	20	15	42 845 000	5	
3. Sediment and weed removal	67.5	148 390 000	103 873 000	50	20	29 678 000	10	10	14 839 000	5	5

<ul style="list-style-type: none"> • First two reaches of minor canals covering 50% of the total 7 to 10 km length • 50% of Abu Ishreens 											
4. Upgrading main canal: <ul style="list-style-type: none"> • Gantry crane gates at kilo 57,77, 99, 108 	34	74 800 000	7 480 000		10	26 180 000	25	10	41 140 000	35	20
5. Start the complete upgrading of all protective and collective drainage systems - 25% of work is to be accomplished. Having a proper water management system in place is a precondition	8.5	18 700 000				3 740 000		20	14 960 000	30	50
Total budget	717	1 577 070 000	86 4633 000			502 997 000			209 440 000		

Keeping the system in good condition: recommendations with respect to operation and maintenance

The following recommendations for operation and maintenance (O&M) were formulated:

Technical aspects of irrigation:

- Strict opening and closing of FOPs by MoWRIE will be very important.
- A special irrigation schedule needs to be agreed upon among MoWRIE, the Department of Agriculture and the farmers in times of heavy rainfall or any other special condition.
- In future, indiscriminate increase in the size of Abu Ishreens should be prevented.
- Mechanical methods for weed control are recommended. Information manuals for weed control would have to be provided - focus has to be on good management of water and regular maintenance to reduce occurrence of weeds.
- Promote brick production to benefit from the heaps of sediment removed from the Scheme.
- Periodically determine to what extent over supply can be reduced to prevent damage in drains, canals, farms, roads, houses and wastage of water as much as possible.
- Regular maintenance of all drains to keep them in an operable condition.
- After an excessive wet period, drainage has to be organized in such a way that normal irrigation schedules can be applied afterwards.

Cropping pattern:

- Farmers need to abide by agreed cropping schedules with the Block Inspector and the after consultation with MoWRIE.

Organization:

- The responsibility for O&M works needs to be in line with the responsibilities for upgrading.
- Prevent that irrigation canals are running at their capacity when wet periods are being expected.
- MoWRIE is responsible for the maintenance of the protective drains in the scheme and the villages within the scheme. This responsibility has to be properly implemented.
- The state government is responsible for the funding of drainage in other villages.

Financial aspects:

- Farmers should pay the agreed irrigation fees. These agreed fees need to be sufficient to keep the system in a good condition and that they are at a reasonable share of farmers in O&M costs. International experience is that the irrigation fees have to be capped at 5 to 10% of the gross income of farmers.
- The fees for O&M have to be set at such a level that a certain reservation is made to fund calamity repair and maintenance work.
- The best criterion agreed upon is a fixed amount of irrigation fee per feddan, dependent on the crop (to be annually revised as necessary).
- A certain budget has to be set aside to fund replacement of structures and equipment.
- More involvement of private sector would be good, but requires a very competent procurement authority.

Human resources:

- As outlined in the above