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Towards an Efficient Water Management for a Sustainable Development of Water Resources in Egypt

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Integrated Irrigation Improvement and Management:

Towards an Efficient Water Management for a Sustainable Development of Water Resources in Egypt

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Summary of Presentation

Nowadays, Egypt is facing increasing strategic challenges *of improving the productivity and sustainability of water use, rather than augmenting water supply* to meet the ever-increasing population growth. As mentioned in the Egypt country assistance strategy (CAS) of thr World Bank, the three most critical tasks are to:

- Increase the productivity of agriculture and the incomes of the rural poor in a sustainable manner;
- Have a more systematic approach to the development of agricultural exports.
- Manage the looming water scarcity with the related water quality issues due to water-logging, salinity and degradation by pollution.

A recognition that better water management is essential for maintaining a viable agricultural sector while facing ever-increasing demands and competition among other water use sectors. This drew the attention of the Ministry of Water Resources and Irrigation (MWRI) as the custody of water resources in Egypt to adopt effective programs. Water management is best improved by an integrated package of services and technical assistance that respond to users demand.

As prerequisites, major strategic tasks have been set up. These tasks comprise, outlining the overall regulatory and policy framework, inter-sectoral cooperation, coordination and integration regarding implementation of integrated planning of water resources, establishment of efficient economic mechanisms that reveal maximum return per unit water and agricultural land, introduction of public-private partnership (ppp) in line with the core principles of integrated water resources management (ecological, *participation*, and financial principles), raising awareness of all stakeholders, joint/full management transfer to those who seem to be marginalized for the publicity of sharing responsibilities in MOM approach together with decentralized decision-taking (*subsidiarity*) and horizontal integration (*hydrological boundaries*), and finally paying more attention to the best management practice through bridging research and practice.

Milestones and benchmarks for sustainable use of water resources were defined. Standards and guidelines together with the most appropriate technological interventions are settled and accommodated as preventive and conservative actions aiming at optimizing the efficiency of water resources. Starting from the beginning, the journey of water from the abstraction point till it reaches the end user throughout a vast watercourses, not only needs those standards and guidelines and the appropriate technology but also the necessary performance benchmarking and M&E programs and the corresponding operational rules during the delivery. Likewise,

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both law enforcement and raising awareness about water ethics are vital milestones along the in-off water journey especially at the end user.

In this context, Egypt has been conducting a cluster of endeavors to introduce modernized tools and instruments, intended for integrated water resources management. Among these endeavors is the introduction of water user organizations, which generated more than 5,000 Water User Associations operating and maintaining tertiary canals (meska) and about 150 Water Boards participating in the prioritization of maintenance and rehabilitation works, needed for the delivery system. Water user organizations have contributed to system modernization and improvement in 140,000 hectares, where irrigation improvements projects took place. Water user organizations at the different hydraulic levels have been positive, and these elements were incorporated into the formulation of the project institutional development design. As a result, the number of farmers conflicts was drastically reduced, irrigation cost was reduced by 20% as well as irrigation time by about 50%. Moreover, a remarkable increase in crop production was reported in the order of 5 to 15%.

A new approach for system modernization and integrated management has been developed and thoroughly studied from different perspectives. It directly addresses the issue of highest priority to Egypt farmers, which is the equity in water allocation (distribution) through some mechanisms that insure the efficient use and management of water and land resources for agricultural production. A more and up scaled participatory planning and decision making process is expected to develop substantially under the given approach through the creation of capable water user organizations at the command level.

The approach will be implemented step-wisely in the Nile Delta to address in an integrated way the user involvement key issues with respect to irrigation and drainage. Integrated water anagement improvement will start in two full command areas (Mahmoudia and Meet Yazid), covering a gross area of 210,000 ha, or about 10% of the irrigated area in the Nile Delta.

The first objective of the Integrated Irrigation Improvement and Management Project (IIIMP) is to improve irrigation and drainage systems, from a physical and operational point of view. Beyond the improvement of irrigation and drainage structures, IIIMP also intends to promote Integrated Water Resource Management (IWRM). The five components of IIIMP that are to be taken into account are as following:

- *Improved and Integrated Water Management;*
- *Institutional Development and Capacity Building;*
- *Project Management, Coordination and Integration;*
- *Environmental Mainstreaming; and*
- *Improved On-Farm Water Management.*

A brief description for each component will be illustrated herein after:

Component 1: ensures that the proper technical structures and procedures are available to support a sustainable optimization of water resource use. Irrigation and drainage networks as well as pumping stations have to rehabilitated and/or upgraded to improve the water delivery to water users. Component 1 will thus also focus on improving the operational and maintenance procedures as critical requirements to ensure the cost-efficiency and sustainability of the investments.

Component 2: is the exact counterpart of Component 3 as it focuses on how to empower water users through organizations that allow them to solve their internal disputes, assess their

needs and priorities and consolidate them so that they can more easily be taken into consideration by decision-makers. Simultaneously, a transfer of responsibilities can be considered so as to let water users deal with local issues and let managers focus on higher scale issues. This process combines empowerment and responsabilization of water users: they are no longer beneficiaries or recipients but actors within a process.

Component 3: focuses on promoting of IWRM at command area level. The objective is to empower local decision-makers by providing them the data, tools and organizational structure that allows them to manage water resources and structures at their level. Within the relevant governmental entities, this should take place in a cross-sectoral, decentralized and participatory manner:

- Cross-sectoral so as to ensure appropriate consideration for all technical, social, environmental, and economic conditions, and to limit duplication and contradiction between the activities of various governmental agencies;
- Decentralized so that low-level decisions are taken locally and based on field knowledge instead of being delegated higher up in the hierarchy; this obviously implies that the higher levels of management focus on developing a proper regulatory and policy framework in order to guide local decision-makers; and
- Participatory so as to involve water users whose needs and priorities have to be properly identified and addressed for effective results, while their contribution can significantly improve management practices and reduce costs.

Component 4: looks into the environmental impacts of the project. The objective is to identify and mitigate those while also looking at how the project can contribute to improving environmental conditions in general (and notably water quality issues).

Component 5: complements the irrigation improvements by focusing on water users and having them take advantage of the enhanced water delivery conditions. One of the concerns of water management in Egypt is to increase irrigation use efficiency to cope with the looming national water scarcity. On-farm activities are the key to increasing water use efficiency while improving returns from farming activities and thus the welfare of rural populations.

It is expected at the end of the project that water productivity enhancements will be increased by 15%, there will be a measurable increase in on-farm income for the 380,000 farm families benefiting from the project, and the performance of agencies and user groups involved in all water management activities will be mainstreamed.

Design criteria to be introduced for system modernization under the project will lead to a marked reduction in the estimated improvement cost at tertiary-level and bring the improvement package more into line with international norms. Likewise, extensively applied but relatively minor incremental investments in on-farm water management and irrigated agriculture improvements will result in substantial incremental benefits. Experience has suggested that significant cost-savings could be achieved by, for instance, substituting the current practice of using diesel pumps by electric pumps, even though the latter would require augmentation of the power grid in the project areas. The grouping of small tertiary canals for service from a single pump house would also be considered.

A detailed project implementation plan that outlines the project structure within the concerned agencies, the roles and responsibilities of implementing institutions, and the activities of operation and maintenance institutions has been developed and strengthened the project feasibility and reduced project risks. This covers implementation arrangements for water

management system and land productivity improvements as well as institutional developments and environmental mainstreaming.

Form efficient integrated water management perspective, The Integrated Irrigation Improvement and Management Project (IIIMP) will build on the success stories of upstream projects. There are many upstream projects of which the most important ones are listed hereinafter: LIFE Integrated Water Resources Management Project, National Drainage Projects (NDPs), Irrigation Improvement Projects (IIPs), Water Boards Project (WBP), and the Pump Stations Rehabilitation Projects (PSRPs) where they introduce the best suite M&E programs, performance Benchmarking, and new fine tuning instruments in different processes and mechanisms. The design of IIIMP will involve corresponding activities to promote IWRM, within the context of the proposed command areas. Integrated water resources management districts are the closest clear example for the tool whose aspects are best fit in the IIIMP vision and objectives. The formation of Integrated Water Management Districts (IWMDs) is a new approach but does not necessarily present a novelty to Egypt

IWMDs represent in a sense a return to the past against the fragmentation of the past thirty years. IWMDs are also a modern tool towards subsidiarity: it is widely accepted that water management policies can be made more effective by assigning O&M responsibilities to localized coordination entities. Among various merits of establishing IWMDs, integrating district water management activity will introduce new procedures for planning and implementing operations and maintenance activities at the IWMD. Outputs from this activity would be referred to as the following:

- An updated water budget for each district including all inflows and outflows;
- A salt budget for each district where salinity in drainage water is a problem;
- A flow monitoring system for each district which tracks surface inflows and outflows from the district on a real-time basis;
- A routine maintenance plan for district water distribution and drainage facilities, developed jointly with the District Advisory Committee;
- A water operations plan for the District developed jointly with the District Advisory Committee including surface water, groundwater, and drainage reuse (mixing) flows; and
- A plan for working with BCWUAs to reduce solid waste disposal in canals and drains.

The Ministry of Water Resources and Irrigation (MWRI), with support from bilateral and international technical cooperation, has over the past 15 years established 5,360 meska-level water user associations (WUAs) whom are allocated as 3,928 in Nile Delta, 1,357 in Middle Egypt, and 75 in Upper Egypt, and about 150 branch canal water users associations (BCWUAs) or functionally similar water boards (WBs) on secondary canals. Promotion of Water User Organizations (WUOs) have included several MWRI efforts with international support. These efforts differ with regards to stage in the development cycle (pilot vs. replication), scope (smaller area vs. national), level of the WUA (meska, branch canal, main canal, district, entire command area) and goals of the WUA (facilitation of improvement, representation to government, O&M). The promoted exercise of establishment and empowerment of water user organizations (WUOs) and Water Boars (WBs) extremely brought the following benefits:

- More effective implementation of structural improvements;
- Better conflict resolution as the communities themselves solve internal disputes over resource allocation; this allows MWRI engineers to focus on the efficient management of the system instead of being regularly involved in users disputes;

- More equity in resource allocation as social cohesion within the communities is reinforced through peer pressure; likewise the enforcement of irrigation regulations will be much strengthened by the existence of water user organizations (WUOs);
- Better decision-making as water users needs are identified, integrated and formalized by WUA leaders and representatives, and taken into consideration by MWRI managers;
- Improved use efficiency as water users become partially responsible for the management of services and resources and not only beneficiaries or recipients of these; and
- Reduction of Operations and Maintenance (O&M costs with the transfer of some responsibilities to water users.

The project will address the environmental impacts identified by a combination of preventive actions and mitigation measures, including environmental monitoring, benchmarking and institutional capacity building together with step-wise piloting of essential works and equipment for the collection and safe disposal of solid wastes.

Using the with- and without-project approach, the project economic rate of return and net present value were estimated. Water savings are expected to reach about 22% or 838 million m^3 / year at project maturity. Notwithstanding, assigning no economic value for the water saved, the project would have an economic rate of return of 20.5%. The net present value at a discount rate of 12%, that represents the opportunity cost of capital, was estimated at about US$141 million.

The project will include a tertiary level improvement cost sharing mechanisms between the government and beneficiaries. For pumps, pump houses and auxiliary equipment, farmers will pay the cost of the improvements in installments over a three-year period, without interest. For tertiary canal, quaternary canal and drainage improvements, farmers will pay the cost of the improvements in installments over a twenty year period, without interest. In both cases, payments include 10% to cover administrative expenses.

In conclusion, the newly introduced modernization and integrated management approach, and its model project will become a best management practice for efficient water allocation as well as a clear poverty alleviation mechanisms for rural areas in Egypt.
Expected merits of introduction of the IIIMP can be Summarized as per the following table.

Per-beneficiary expected outcomes and merits of the IIIMP

Beneficiary	Outcomes
Irrigation Sector	**Water saving of about 22% (830 MCM/Year).** **Possibility of using the saved water with a value of 5500 CM/fed/year for cultivating about 145000 fed of high-cash crops.**
Irrigation Improvement and Agriculture Sectors	**Operation cost will be reduced to about 50% together with improving the water management at secondary, tertiary, and quaternary levels as a result of pump electrification.** **Increase the efficiency of field irrigation from 45% to 60% which means an increase in irrigation water (500 MCM/year).** **Add new agriculture land as a result of changing from open meska system improvement to a buried pipeline ones (achieve an annual return of about (US$1350/fed/year).** **Increase the main conventional summer and winter crops by about 12% as a result of the continuous flow application which insures a daily continual water demand per fed of about 30 CM/fed/day.**
Drainage Sector	**Improve the drainage conditions as a result of introducing modified drainage system at field level. This will improve the crop pattern other than rice which are cultivated beside rice (expected increase in cotton price = US$110/fed) achieving an incremental of the annual return of about MUS$ 8).** **Saving a water volume of about 2500CM/fed/season in case of cultivating the short-period life-time span rice. (in case of cultivating 50% of the improved 103,000 fed with this kind of rice, the water saving will be 125 to 130 MCM/rice season.**
Users Organization	**Undertaking the responsibilities of O&M at tertiary level by WUAs will result in saving their cost which was evaluated as US$ 2.5/fed. Expected saving /year = MUS$0.5/year).** **Reduce the violations of rice cultivation.**
Environment sector	**Reduction in the deteriorated value of agriculture land (form US$90 to US$45/fed/year) as a result of water quality improvement to be maintained with the project implementation.** **World Bank 2004, (agriculture land degradation due to negative environmental impact resulting from deteriorated water quality is count to 1% of the overall GDP.**