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***APRP TRANCHE II WATER POLICY
BENCHMARKS AND BACKGROUND
DOCUMENTATION***

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Water Policy Reform Team

International Resources Group Winrock International

Water Policy Benchmarks and Background Documentation for APRP Tranche II

I. Benchmark Statements

Drainage Water Reuse

The GOE will develop and approve new policies, regulations, and criteria to promote drainage water re-use with appropriate incentives and technical support.

National Strategy Regarding Irrigation Improvement

The GOE will develop a national strategy for improving water use efficiency and agricultural productivity through irrigation improvement projects. This strategy will include priorities for implementing the desired improvements.

Water User Associations

The GOE will develop a policy to allow the formation of water user associations in areas that have not participated in the Irrigation Improvement Program, and begin to promote such associations.

Water Use on Rice

The GOE (MPWWR and MALR jointly) will establish a strategy for the optimal water use for rice production

Water Use on Sugarcane

The GOE (MPWWR and MALR jointly) will establish a strategy for the optimal water use for sugarcane production.

II. Background Documentation

Drainage Water Reuse

A. Background

Reuse of water from drains for agriculture is practiced extensively across the Nile Delta. Each year, officially sanctioned reuse of drainage water approximates 4 billion cubic meters (unofficial reuse of drainage water over and above this amount by farmers occurs but has not been quantified). Annually, about 12 billion cubic meters of drainage water flows to the Mediterranean Sea through the northern lakes, transporting more than 30 million tons of salt from the Nile system.

Drainage water is an important part of the irrigation supply in the Nile Delta. However, when the national demand for Nile water begins to exceed the fixed annual supply from the Aswan High Dam, pressures will build for increased reuse of drainage water. A new policy package will be developed to guide the increased reuse of water from drains.

B. Policy Issues to be Addressed in Tranche II

To increase reuse of drain water in the Nile Delta, several important policy issues need to be addressed:

- The environmental effects of extensive drainage water reuse. Drainage reuse in the lower part of the Delta constitutes a threat to soil conditions for high agricultural crop production and to the health of farmers. The maintenance of drain water quality at an environmentally acceptable level will be the key for more drainage water reuse in the Delta.
- Treatment and/or separation of municipal and industrial (M&I) wastewater, particularly industrial wastewater. Treatment of M&I wastewater will serve to preserve the environmental integrity of drainage water, sustain crop production and soil conditions, and reduce the amount of drainage water used to transport and dispose pollutants.
- Intermediate drainage water reuse. At present, most official reuses are conducted by mixing drainage water with canal water at pump stations on main drains. These pump stations play a major role in drainage water transportation and distribution, but have reached a limit, under current operating criteria, for more reuse development. The centralized mixing processes also unnecessarily spread poor quality water, upstream to downstream, when pollutants are discharged along a main drain. More effective drainage reuse in the Delta may be achieved by pumping water from second-level and third-level drains, i.e., intermediate reuse, to facilitate localized demands. The completed Beheira conservation strategy studies of the Water Resources Strategic Research Activity and the on-going work of the Drainage Research Institute (programs supported by the African Development Bank and the

Netherlands Government) provide a reference base for the planning of intermediate reuse.

- Possibilities for modifying the current MPWWR drainage water reuse policies, regulations, guidelines, and law enforcement, particularly with respect to safe drain water reuse and distribution of pumping along lower order drains by private individuals.

Other problems and issues related to reduction of drain water volume are the effects of IIP programs, the introduction of zero-discharge on-farm irrigation techniques, etc.. These programs will undoubtedly affect drainage flow patterns in the Delta and need to be addressed in an integrated manner along with other water conservation policies.

C. Benchmark for Tranche II

The GOE will develop and approve new policies, regulations, and criteria to promote drainage water re-use with appropriate incentives and technical support.

D. Verification Indicators

The GOE will issue new policies, regulations, and criteria on drainage water re-use.

E. Expected Results

Based upon the issuance of a drain water reuse policy package, including reuse criteria, regulations, and associated institutional modifications, more quantity and better quality of drainage water will be available for re-use in the Nile Delta.

F. Studies to be Conducted

Studies will be carried out to address issues of :

- evaluation of current drainage reuse practice;
- assessment of different mechanisms for promoting drainage reuse; and
- environmental, institutional and legal aspects of drainage water reuse.

National Strategy Regarding Irrigation Improvement

A. Background

Further development of Nile River water resources within Egypt must concentrate on conservation and augmentation to meet the water needs of irrigation expansion and the rapidly growing population. Irrigation water is diverted and used in perhaps several cycles from the Aswan Dam to the northern Nile Delta before the remaining flows are discharged to the Mediterranean Sea. These multiple reuse cycles are the basis for high basin level efficiency. It has been suggested that water savings can be realized only where irrigation return flows are lost to salt sinks or by exploiting drainage flows.

This approach accepts the current level of operation and management of the irrigation delivery and on-farm water management systems in Egypt. The fact that there are drainage flows available for exploitation implies there are excessive operational losses in canals and large return flows from irrigation applications. There is nothing wrong with drainage water exploitation. However, this addresses only symptoms of the real problem: 1) inadequate local delivery system resources and infrastructure to measure, control, and manage water distribution all the way to the mesqa level, and 2) inadequate water distribution and management by farmers once they receive water in the mesqas.

Basin scale analyses do not inherently deal with problems of water management and distribution at subregional and local levels and ignore the spatial and temporal value of irrigation water at these levels. Egypt's local irrigation districts and many (if not all) irrigation directorates distribute water in canals and distributaries by maintaining flow levels at specific points in the various watercourses. The volume of water delivered or the discharge in these watercourses is unknown because canal and mesqa cross-sectional parameters have changed over time. Currently, water is not quite well managed/delivered based on local or directorate demand estimates. Depending on the season, operational losses may be quite high, or serious maldistribution occurs (head-end and tail-end effects, etc.).

Low on-farm irrigation efficiencies result in excessive irrigation return flows (surface runoff and deep percolation losses). While it is true that these return flows do eventually reenter the Nile system over much of its length and contribute to downstream water supply, they are degraded quality waters which have lost the original intended value (in time and space) of their diversion.

Local irrigation delivery and on-farm water management improvement projects can result in reduced diversions, thereby resulting in water available for immediate local reallocation and distribution (as opposed to the time delay and spatial departure of return flows reentering the system). Losses to non-beneficial evapotranspiration are reduced. Agricultural productivity increases. Water quality is preserved for downstream uses.

Irrigation improvement projects (IIP) have been implemented on about 100,000 feddans under the Irrigation Management Systems (IMS) Project. Adequate baseline data were not collected and detailed evaluations were not carried out to fully document the impacts of IIP and identify the most feasible alternatives to include in the package of water conservation measures. In addition, continuous flow (as opposed to rotational deliveries) in branch and other distributary canals was implemented, but unfortunately, not fully evaluated in IIP command areas.

Other issues regarding IIP include: concerns that the implementation is too slow, arbitrary methods for prioritizing and selecting areas for implementation, public vs. private sector involvement in construction/rehabilitation, should mesqa renovation be included or left completely to farmers, and what is the appropriate level of water user association development and involvement.

B. Policy Issues to be Addressed in Tranche II

A national strategy for irrigation improvements should integrate physical (structural), managerial, operational and institutional components in a policy package to address improvements in both the irrigation delivery (from main canal to branch canal levels) subsystem and on-farm water management subsystem. Other components to consider include: farm-level water allotments; local water user participation in planning, management and decision-making in water delivery operations; and cost recovery for sustainability (see Table 1).

The package needs to be flexible to allow adaptation to the significant site differences in Egypt's irrigated agriculture (i.e., not all components of the package may be needed in all areas). The framing and focus of benchmark components considers the following issues in coordination with other proposed Tranche II policy benchmarks:

- physical structure (canals, gates, regulators, turnouts, etc.) improvement and maintenance to improve water distribution, control, and management; to allow water measurement; and to minimize operational losses in the irrigation delivery system;
- equitable distribution and delivery of specific water allotments to the farm gate with enforcement of the delivery of allocations along the entire system, canal to the farm gate;

Table 1. Matrix of irrigation improvements.

Component	Water Delivery	On-Farm Water Management	Local Participation	Cost Recovery
Physical	x	x		x
Management	x	x	x	
Operation and Maintenance	x		x	x
Institutional	x		x	

- development of resources (trained manpower, vehicles, flow measurement equipment, computers, etc.) to fully establish capabilities at the irrigation directorate and irrigation district levels to calculate daily water demands, measure flows, and manage water distribution with deliveries more closely following demand;
- farmer organization into water user associations (WUAs) responsible for mesqa rehabilitation, maintenance, and cost recovery, as well as enhancement of local participation in water delivery planning, management and decision-making;
- on-farm water management improvement programs including technical assistance for physical on-farm irrigation system improvements and irrigation decision making education and support;
- implementation and evaluation of continuous flow;
- identification of areas where improvements are not needed or are not economically feasible.

Because IIP-type projects have been shown to improve the equity of water distribution, those farmers previously short of water receive a more firm supply and may consequently change their cropping choices. There is a concern that this will lead to an increase of rice production area. Farmers must realize the relative value and scarcity of water through an appropriate set of costs for water delivery service and constraints on the volume of water allotted and actually delivered. A water allocation/water delivery policy should be integrated into the national strategy for irrigation improvement.

Drainage and drainage water reuse issues and policies must also be carefully coordinated with policies for national irrigation improvement. Drainage water volumes should be expected to be reduced under the integrated policies for irrigation improvement of this benchmark. Consequently, quality of available drainage water will be reduced. Drainage infrastructure should be carefully

analyzed and improvements/additions made to enhance effectiveness of agricultural leaching.

C. Benchmark for Tranche II

The GOE will develop a national strategy for improving water-use efficiency and productivity through irrigation improvement projects. This strategy will include priorities for implementing desired improvements.

D. Verification Indicators

The adoption and publication of a national strategy for irrigation improvement projects.

E. Expected Results

The strategy should consider improvements in physical structures, institutional enhancements, a water allotment policy, a cost recovery program, and farm-level involvement in local and regional decision-making. The strategy should also assign priorities to policies and areas for implementing the desired improvements.

A integrated package of irrigation improvement practices at the directorate, district and farm levels is expected to result in enhanced water distribution which yields: 1) improved crop production, 2) greater profitability for farmers, and 3) more sustainable agriculture. More water will become available for efficient, equitable local distribution rather than being lost from the local area as non-beneficial ET and irrigation return flow.

Systematic extension and implementation of this package will result in reduced diversions and more water left in the mainstem for allocation to other uses, including irrigation expansion, dedication to aquaculture in the lakes of the northern Delta, or others.

The degraded water quality conditions that currently occur throughout the delivery and drainage systems when excessive irrigation return flows mingle with polluted drain flows will be reduced. This will result in river and canal flows of equal or better water quality than currently exist.

F. Studies to be Conducted

Conduct an evaluation of the current status of irrigation improvement projects in Egypt, including:

- continuous flow;
- downstream control;
- mesqas renovation and rehabilitation;
- WUAs;
- single lifting point;

- IAS; and
- cost sharing.

Water User Associations

A. Background

Water user associations (WUAs) provide a local forum and means for cooperatively administering and financing sustainable efficient management, operation, and maintenance of local (mesqa) and regional irrigation and drainage systems. Associations can provide farmers with a greater voice in local decision-making and a forum for implementing cost recovery programs.

About 1,000 water user associations have been established in Egypt, in conjunction with the Irrigation Improvement Program (IIP). That program involves the improvement of mesqas by raising the canals and lining them with concrete, or replacing earthen ditches with buried pipelines. In addition, single-point pumping stations have been installed at the head end of the improved mesqas.

The Ministry of Public Works and Water Resources requires that farmers in IIP areas form water user associations, to facilitate repayment of system improvement expenditures and to operate and maintain the improved mesqas and single-point pumping stations. Several studies have reviewed the experience gained in forming and managing water user associations in IIP areas.

Within Egypt, water user associations have not yet been formed in non-IIP areas. Therefore, no local information is available regarding the potential benefits of establishing water user associations in non-IIP areas within Egypt. The farm-level economic incentives for forming water user associations in non-IIP areas need to be examined before these associations are promoted in those areas. Without clear economic incentives, it may be difficult to form, operate, and sustain successful water user associations.

B. Policy Issues to be Addressed in Tranche II

Successful water user associations can increase the role of farmers in operating, maintaining, managing, and financing local water delivery systems. It may be possible to achieve these goals by establishing associations in areas that have not participated in the Irrigation Improvement Program. However, the Government of Egypt does not yet have a policy allowing the formation of water user associations in those areas.

Due to limits on resources earlier available, information should be gathered in areas where successful associations are still operating and in areas where associations were formed during implementation of the Irrigation Improvement Program, but are no longer in operation. Analysis of the success and failure of water user associations in Egypt will be helpful in describing the potential role of associations in non-IIP areas.

C. Benchmark for Tranche II

The GOE will develop a policy to allow the formation of water user associations in areas that have not participated in the Irrigation Improvement Program, and begin to promote such associations.

D. Verification Indicators

The GOE will develop a policy to allow the formation of water user associations in areas that have not participated in the Irrigation Improvement Program, and begin to promote such associations.

E. Expected Results

Farmers will be allowed to form water user associations in non-IIP areas.

F. Studies to be Conducted

Study the feasibility of forming WUAs in areas which have not participated in IIP.

Water Use on Rice

Water Use on Sugarcane

A. Background

Historically, the allocation and distribution of water in Egypt's Nile River irrigation system have been made by canal commands. Allocations were adjusted to the area served, nationally mandated cropping patterns, and constraints inherent in design capacities of intake structures and control structures along canals. The gross areas allocated by government for specific crops have been modified over the years following completion of Aswan High Dam and in recognition of a net increase of irrigated area of about one million feddans.

Allocations of crop areas have been issued and applied with varying levels of success nationally, within canal commands and at the mesqa level. Policies were adopted for punishing those who deviate from government mandated cropping patterns. However, farm level penalties have not been enforced uniformly and national policy regarding rice and sugarcane areas has not been successful in limiting the area planted to these crops. The continuance of broad government mandates of cropping patterns are contrary to previous and current economic and agricultural sector reform efforts aimed at the development of a free market economy in Egyptian agriculture.

The focus on rice and sugarcane in this benchmark statement results from the perception that these crops use much more water than other crops and therefore their area should be restricted to free up water for other crops or uses. Individual farmers must account for a range of incentives and disincentives at work at the farm level when deciding which crops to grow. These include physical or delivery system constraints, regulatory and management factors, and subsistence and marketplace factors. A focus on allocating or mandating cropped area is inconsistent with current economic reform policy activity in Egyptian agriculture.

Rice

Egypt produces more rice than is consumed allowing a portion of the crop to be exported annually. It is an attractive crop for farmers because of the relatively higher returns per feddan, the lack of water delivery service cost recovery, and the lack of adequate controls on the volume of water farmers may obtain.

A de facto allocation of water per unit area is implied in the design capacity of main canals and intake works and is often quoted based on an assumption that rice will be grown on a maximum of 60% of the area served. This de facto allocation of water fails at some point within the delivery system, resulting in inefficient allocation of water among farmers at the distributary canal and mesqa levels. Farmers producing rice at the head ends of distributaries and mesqas often divert larger volumes of water per unit area than the average the system was designed to deliver. Consequently, with

large areas planted to rice in the initial reaches of a command area, downstream water users suffer shortages and the financial burdens of developing supplemental water supplies.

Additional factors affecting design allocations of water include the effects of improper maintenance on canal and mesqa cross sections, unauthorized mesqa outlets and unauthorized pumping from canals or mesqas. Main canals are operated by delivering measured discharges and volumes of water. However, the remainder of the system is operated by maintaining water levels at key points in the system. The volume of water delivered or the discharge in many watercourses is unknown because canal and mesqa cross-sectional parameters have changed.

Rice is a reclamation crop in the northern Delta. Rice is the crop of choice in areas composed of heavy clay soils having extremely low porosity. In other areas, rice in the crop rotation every two to three years serves to leach salts from the soil back to the saline shallow water table thereby allowing other crops to be grown. Upflux of water and salts during the production of these other crops, using current production methods, permits re-salinization the crop root zone.

One study has suggested that leaching under paddy rice in the north and overdraft of the water table aquifer in the southern Delta region reduces the piezometric pressure gradient of the water table aquifer from south to north and encourage seawater intrusion (WRSR-14). Thus, monitoring and control of water pumpage to the south coupled with adequate volumes of good quality leaching water and drainage all must be addressed in a coordinated manner to maintain sustainable crop production in this area.

The MPWWR has attempted to place an upper limit on the annual area of rice production. The focus on limiting the area of cultivation may result because the current condition of canals and control structures is inadequate for efficient regulation of water allocations. From 1987-93 the Ministry's targets ranged from 0.90 million feddans to 1.08 million feddans. The actual area in production was often in excess of these limits by more than 200,000 feddans during these years. In 1995-96 an area of about 1 million feddans was allocated by growing zones. The allowable rice area in each zone decreases progressively from a maximum of 50% of croppable area in zone 1 in the northern Delta to 10% of cropped area in zone 5 in the southern Delta. Penalties to farmers violating the allocation were set at approximately LE 500/feddan, the estimated economic value of the excess water diverted for rice compared to other crops (LE 0.10/ m³ x 5000 m³).

Sugarcane

Sugarcane has a growing season of nearly one year resulting in high total crop ET. Estimated consumptive use of sugarcane is approximately 5000 m³ per feddan per year more than alternative annual crop rotations which might be produced in middle and upper Egypt (although land lies fallow for 1-2

months during the intervals between crops with these alternative annual rotations).

Irrigation diversions for sugarcane have been estimated to average as high as 17,000-18,000 m³ per feddan, reflecting inadequate water management in mesqa water distribution and on-farm application systems. Small individual farm holdings in intensively cropped sugarcane areas prevent efficient water delivery and distribution to the farm and efficient on-farm distribution and application. In addition, small plantations of sugarcane experience higher consumptive use due to edge effects.

Water quantity and quality savings could be realized by concentrating sugarcane on large plantations in those canal areas with many small plots of sugarcane. Large plantations are amenable to laser-leveling and improved surface irrigation methods. Sugarcane also is adaptable to drip irrigation, an efficient irrigation method compared to surface flooding.

It is estimated that approximately 90,000 feddans of sugarbeets will be produced in Egypt in 1997-98. Sugarbeets have different agroclimatic requirements compared to sugarcane and are cultivated mostly in the lower Nile Valley and Nile Delta. Thus, they are not a direct substitute crop for sugarcane in upper Egypt, although sugarbeets are being successfully cultivated as far south as El Minya in middle Egypt. Sugarbeet processing plants have been established in several governorates and in one instance (El Minya) sugarcane processing machinery has been adjusted to allow processing of sugarbeets.

B. Policy Issues to be Addressed in Tranche II

Based on the above review, the following issues should be considered:

1. Introduction, and adoption of less water-intensive varieties/crops such as shorter season rice varieties having reduced crop water requirements, upland rice varieties and production practices and sugarbeets;
2. Potential for water conservation in the cultivation of sugarcane rests with modifications of irrigation practices and reduction of total water requirements. Water lost to non-beneficial evapotranspiration (ET) will be freed up for other uses;
3. Since a portion of the rice crop is exported, monetary incentives within the production and marketing system are important factors in determining the area dedicated to rice cultivation;
4. Need to frame and adopt water allotment policies which account for companion water, agricultural, and market policies;
5. Empowerment of farmers, WUAs and groupings of WUAs to cooperatively administer water allotments within distributary canal and mesqa service areas;
6. Mandated crop area allocation targets are inappropriate and contrary to policies relaxing constraints on cropping choices by farmer.

C. Benchmarks for Tranche II

The GOE (MPWWR and MALR jointly) will establish a strategy for the optimal water use for rice production

The GOE (MPWWR and MALR jointly) will establish a strategy for the optimal water use for sugarcane production.

D. Verification Indicators

Adoption and publication by the GOE of a strategy regarding water use on rice

Adoption and publication by the GOE of a strategy regarding water use on sugarcane.

E. Expected Results

Strategies should consider policy analyses and development for the potential use of farm-level water allotments to encourage farmers to use less water when irrigating rice and sugarcane, the potential role of new rice varieties, and potential market impacts.

An effective, but limiting, water allocation system will address equitable water delivery throughout canal commands and to the farm level. Along with companion policies to be developed in the agricultural, marketing and cost recovery spheres, farmers will face an appropriate set of incentives to use water efficiently.

F. Studies to be Conducted

- A study of water resources and market issues regarding rice and sugarcane from the perspective of farmers, field irrigation engineers, and Ministry staff and officials.
- A study that examines the potential role and feasibility of a water allotment program, and the ability to control water flows and volumes, in promoting more efficient use of water in agriculture and enhancing productivity. The study will incorporate results of the study of the current water supply and delivery system.