

GRID LINES

Sharing knowledge, experiences, and innovations in public-private partnerships in infrastructure

A demand-driven design for irrigation in Egypt

Minimizing risks for both farmers and private investors

Aldo Baietti and Safwat Abdel-Dayem

A new type of irrigation project, designed for the West Delta region of the Arab Republic of Egypt, promises to usher in an era of cost recovery and sustainable operation and maintenance. The project, which emphasizes involving private investors and the farming community, deploys several innovative mechanisms, such as a strategy to mitigate demand, commercial, and currency risks. Unlike the centrally planned projects of the past, this one is demand driven. The focus is on developing an irrigation network with features that farmers want and are willing to pay for.

The irrigation sector plays a vital part in food production and in the development of rural economies. But the sector has historically faced difficult challenges in mobilizing financing. Irrigation infrastructure is costly compared with the limited budgetary resources of developing countries. And even for the projects that have been funded—largely from public sources—maintaining the infrastructure remains a serious problem.

Cost recovery in the sector has been too low even to cover operation and maintenance. Indeed, most traditional irrigation schemes have been founded on massive public funding programs, which in many cases resulted in an unplanned, long-term fiscal burden on national governments. Many schemes were abandoned after a prolonged period of neglect.

What role have public-private partnerships played in the irrigation sector? A study was conducted in 2005 to document the experience (Tardieu 2005). In all, the study reviewed about 21 projects involving some level of private participation, mostly taking the form of service contracts for operation

and maintenance or financing schemes enabling farmers to invest in on-farm pumping equipment. The role of the private sector was limited because the projects dealt with smaller systems or with privately owned on-farm systems.

More recent projects are expanding the role of the private sector in financing and operation of large-scale irrigation projects based on the utility model. The Guerdane Concession Project, currently under construction in Morocco, is based on the build-transfer-operate public-private partnership. The West Delta Project, another large-scale project, is based on a design-build-operate partnership. This project introduces reforms in the sector as well as new approaches for project development, transaction design, and public-private arrangements.

The project concept

Since the late 1960s, with the support of the government, Egyptian farmers have been reclaiming desert land to compensate for the loss of agricultural land in the Nile Delta due to urbanization. One of those areas of land reclamation is the West Delta region, consisting of about 255,000 feddans¹ on the fringes of the Nile Delta. Through the exploitation of groundwater resources, the

Aldo Baietti is a senior financial specialist in the Energy, Transport and Water Department in the World Bank's Sustainable Network Vice Presidency.

Dr. Safwat Abdel Dayem is Professor Emeritus, National Water Research Center, and General Coordinator, West Delta Water Conservation and Irrigation Rehabilitation Project, Egypt.

TABLE 1

Advantages of a piped system

Feature	Piped system	Open-channel system
Cost	Generally costlier per unit of network	Traditional low-cost solution but high-fixed-cost element
Implementation	Very flexible. System can be adjusted to actual demand	Not adaptable to large variances in demand
Land acquisition	Minimal	Substantial. Can greatly reduce agricultural area
Commercial control	Strong controls for water theft, unaccounted-for water, and disconnection	Lower distribution efficiency, higher commercial risks
Environmental	Minimal impact	If not supervised closely, channels can become dump sites

area has developed into a flourishing agricultural economy since the early 1990s.

Today the area contributes \$300–500 million to the Egyptian economy annually, providing high-value fruits and vegetables to the domestic market and to export markets in the European Union. Moreover, the area is now home to 500,000 people and provides 250,000 jobs in the agricultural sector alone. But the rapid development has led to excessive exploitation of groundwater reserves. Groundwater pumping has gone deeper and become costlier as water quality has eroded.

Concern about the collapse of this thriving agricultural economy prompted the government to conceptualize a surface water irrigation project that would begin to replace groundwater pumping. The government also took the opportunity to adopt a bold set of reforms in the sector—part of a new approach to irrigation projects founded on full cost recovery, volumetric pricing, formalization of water entitlements, and private participation in financing and management.

Project preparation

To support the government's work, the World Bank commissioned a project assessment in 2004–05 using a grant from PPIAF. The assessment helped the government develop a conceptual framework and transaction model for implementing a surface water irrigation system that would recover costs and involve the private sector.

Adopting a demand-driven approach

The complexity of the project and the significant risks associated with it made clear that a

demand-driven approach was needed. The focus of preparation activities therefore shifted from producing demand forecasts and technical specifications to consulting with and surveying farmers to ensure that their needs and their willingness to connect and pay for services would guide the development of technical design options and financing alternatives along with commensurate tariffs. The West Delta approach put the farmers in the driver's seat. The aim was to give the farmers the opportunity to:

- Clearly formulate their expectations from a private provider on service and performance standards.
- Understand what the different options for service were, how much they would cost, and how they compared with existing arrangements involving groundwater pumping.
- Take an early stake in the preparation process, which would ultimately lead to more successful implementation.

Opting for a piped system

While an open-channel irrigation system is generally considered to be the most desirable and cost-effective choice, the consultation revealed a number of important considerations about construction cost that led to a reevaluation of the conventional logic. In addition to the costs of an open-channel and piped system being closer than previously thought, a piped system was found to better match the service needs of the farmers in the area and to offer distinct advantages for a private operator that would be expected to assume demand and commercial risks (table 1).

Moreover, a piped system would allow the private operator to better manage its cash flow. Because

The West Delta approach put the farmers in the driver's seat

TABLE 2**A fair allocation of project risks**

Type of risk	Operator	Government	Farmers
Demand	✓		
Planning and design	✓		
Construction	✓		
Operational and commercial	✓		
Water resource			✓
Foreign currency		✓	
Debt financing		✓	
Credit		✓	
Equity financing	✓		✓
Inflation			✓

Local investors are most active in South and East Asia

a piped system could be constructed in smaller, contained modules, it would reduce the “lumpiness” of the traditional investment profile for an irrigation project.

Establishing a water user council

In addition to carrying out extensive consultations with farmers in the area, the early preparation work also involved setting up a representative advisory group of farmers—a water user council—to participate in project preparation on behalf of all the beneficiaries. The water user council has taken an active part throughout the process, and it will continue to have a role during implementation, in monitoring the relationships and potential conflicts between farmers on such matters as water entitlements, water use, and alternating hours of irrigation.

The transaction

The public-private partnership for the West Delta Project is designed as a hybrid scheme based largely on the design-build-operate (DBO) model. The transaction essentially involves contracting a private operator to take over a concession area consisting of about 190,000 feddans in the southern part of the West Delta, to design and construct the system, and to assume full operational responsibility for 30 years, including the associated demand and commercial risks. The public sector will assume ownership of the assets and take on most of the financing-related responsibilities and risks. These include the currency risk associated with a potential devaluation of the Egyptian pound.

Indeed, much of the work of designing the public-private partnership focused on assessing and mitigating risks and determining which party should assume the risks. The financial analysis, supported by a dynamic financial model, looked at how a range of key variables would affect potential tariff levels.

The aim was to identify elements of the transaction that would minimize tariffs and mitigate risks. Preeminent among these risks are demand risk, related to the risk of continued groundwater pumping, and financing risks, including risks related to the ability to secure the longest possible maturities. Needless to say, the longer the terms for debt repayment, the lower the user tariffs.

Reducing demand risk

Demand risk would be a major obstacle for any private operator. To reduce that risk, and the risk of designing a system that exceeds demand, a “subscription period” was built into the project design phase. During this period farmers will sign up to be connected to the new network and pay a deposit to secure their commitment. After enough farmers have subscribed, the operator will design the system to reach those participating. The subscription deposits not only serve as proof of commitment; they also provide the private operator with additional capital to finance initial construction.

The question of how to structure the tariffs was again settled by carefully weighing the demand risk factors involved. The piped system would allow the use of volumetric tariffs, but a purely volumetric tariff, though it encourages efficient

use of piped water, may not sufficiently discourage conjunctive use of pumped groundwater and ensure the recovery of the fixed capital costs. With input from the water user council, stakeholders eventually settled on a two-part tariff: farmers would pay both an annual fixed fee based on the land area connected and a volumetric fee based on the amount of water used.

The two-part tariff should help the project maximize utilization efficiency and ensure positive cash flows, especially through the critical early years. More important, the flat fee will ensure the minimum revenue base the operator needs to meet its concession fee payments to the government—and ensure coverage for the government in repaying its loan—regardless of how much water is actually drawn through the surface water network.

Dealing with currency risk

The technical analysis determined that a project size of between 60,000 and 90,000 feddans would achieve unit costs within the affordability thresholds indicated by the farmers in the user survey. More important, the cost curve revealed that the network development costs would continue to drop marginally as the operator expands to 100 percent coverage. That means that the operator would continue to have an incentive to expand the network and connect additional farms, as its profit margin would also increase.

As suggested, one factor in the affordability equation is the maturity of financing. While local currency financing may be available in Egypt, it generally cannot be offered in the maturities needed to make the tariff affordable and the project viable. That means a need for foreign currency financing, which would introduce currency risk—a daunting obstacle to any project that generates revenue in local currency but must borrow in foreign exchange.

The government will support the financing for the initial 90,000 feddans (of the total 190,000 feddans of the concession area) through a \$175 million loan facility made available by the World Bank and Agence Française de Développement. The private operator can

draw on the loan facility to cover up to 85 percent of the initial construction costs, with the other 15 percent to come from the operator's own sources. Once the loan facility is exhausted, the operator is required to obtain its own financing to complete the expansion of the concession area.

Financing arrangements for the project are also designed to deal with the currency risk. The government will assume the currency risk related to the funds it initially makes available to the operator. The private operator's repayment obligation to the government is denominated in Egyptian pounds, while the government adds a premium of several percentage points to the operator's repayment obligation to cover its own currency risk exposure in repaying the dollar-denominated loan facility.

Conclusion

By April 2008 the project had reached the bidding stage, with a number of international and local firms participating. The West Delta Project sets important new precedents for the irrigation sector in Egypt and is already the source of some exciting developments: The project is using a streamlined, largely output-based procurement and disbursement procedure. Its preparation has involved farmers' groups to the greatest extent possible. And the transaction has introduced new ways to reduce the risks of both public and private partners.

The set of new approaches that are being pioneered in the West Delta Project represents a sustainable framework for private investment in large- and medium-scale irrigation—one that goes substantially beyond earlier approaches for involving private participation in the sector. That framework has already generated interest for possible use in new irrigation projects in Ethiopia, India, Turkey, and Zambia.

Note

1. One feddan equals about 0.42 hectares.

Reference

Tardieu Henri, et al. "Public-private partnership in irrigation and drainage: need for a professional third party between farmers and government." *Irrigation and Drainage* 55.3 (2005): 253–263.



GRIDLINES

Gridlines share emerging knowledge on public-private partnership and give an overview of a wide selection of projects from various regions of the world. Past notes can be found at www.ppiaf.org/gridlines. Gridlines are a publication of PPIAF (Public-Private Infrastructure Advisory Facility), a multidonor technical assistance facility. Through technical assistance and knowledge dissemination PPIAF supports the efforts of policy makers, nongovernmental organizations, research institutions, and others in designing and implementing strategies to tap the full potential of private involvement in infrastructure. The views are those of the authors and do not necessarily reflect the views or the policy of PPIAF, the World Bank, or any other affiliated organization.