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Water for Food

IMPROVING SERVICES FOR THE POOR

IDA at WORK



THE WORLD BANK

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Irrigated agriculture has been vital to meeting escalating food demands and has driven rural development and poverty reduction in developing countries. Yet pressures on agricultural water are intensifying. The immediate challenge is how to meet ever-rising food demands while at the same time increasing farmer incomes, reducing poverty, and protecting the environment, all from an increasingly constrained water resource base. The need to confront this challenge through improved agricultural water management (AWM) has never been greater.

This booklet describes how the International Development Association (IDA), the concessional lending arm of the World Bank, has assisted the poorest countries in stimulating agricultural growth and rural development through enhanced AWM. It also provides several detailed examples of how countries have succeeded in implementing innovative AWM initiatives that have resulted in tangible benefits.

Improving AWM is crucial for poverty reduction, particularly in Africa, and it requires both the financial and technical support that IDA provides. The World Bank remains committed to confronting the challenges and to consolidating and extending the many achievements to date. We look forward to working with other donor agencies and partners towards this common goal.



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IDA at WORK

Agricultural Water Management for Rural Development and Poverty Reduction

Irrigated agriculture has been a driver of agricultural growth, food security, and rural development. Over the last 40 years, agricultural production has risen dramatically, primarily through yield increases under irrigated conditions. Higher productivity levels have had a direct impact on many of the 70 percent of the world's poor who live in rural areas, the vast majority of whom are dependent on agriculture for their livelihoods and welfare.

Notwithstanding the tremendous achievements, many challenges remain. Poverty levels are still daunting in rural areas. The strong demographic and increased income push to food demand is expected to continue, while at the same time the water resource base is becoming increasingly constrained; environmental stresses are growing; and the potential impacts of climate change on agricultural systems are looming.

The International Development Association (IDA) of the World Bank is working to meet these challenges, guided by the Bank's three corporate strategies—for Rural Development, Water Resources Management, and the Environment. These strategies highlight the critical role of higher water productivity in agriculture and its effect on rural development and poverty reduction. IDA support has had a profound impact on client countries: In the period 1994–2004, IDA contributed to agricultural water projects that directly benefited over 60 million people.

Building on a long history of engagement, IDA is committed to consolidating past achievements and tackling new challenges by assisting client countries to develop sustainable agricultural water management systems that support agricultural growth, ensure global food security and alleviate poverty.

At a glance

- Approximately 18 percent of the world's total farmed area is now irrigated, meeting about 40 percent of global food demand. Over the next 25 years, irrigated agriculture is expected to provide 60 percent of the extra food needed.
- Yields of irrigated crops have increased two to fourfold over the last four decades.
- Irrigated agriculture accounts for 70 percent of water withdrawals world-wide, but competition from other sectors for limited supplies is increasing and environmental pressures are mounting.
- IDA funded 47 projects with an agricultural water management component, totaling US\$976 million, during 2004–2007.
- Agricultural water projects supported by IDA and the World Bank directly benefited up to 12 million rural households, or 60 million people, during 1994–2004.

Sectoral Context

The context of demand and supply for water in agriculture is undergoing a significant transformation. Increases in agricultural production have thus far been driven by both expansion of area under irrigation and higher yields. In developing countries, agricultural area under irrigation has doubled over the past 40 years and irrigated yields have risen two to fourfold. Although the pace of irrigation expansion is slowing, the contribution of irrigated agriculture is expected to increase and supply close to 60 percent of world food demand over the next 25 years. Meeting these demands given rising constraints to water availability, competition for limited water from other sectors, and environmental pressures requires increasing the productivity of water—that is, gaining more yield and value out of each unit of water—through enhanced agricultural water management.

Due to the changing context, lessons learnt, and globally low levels of investments in the late 1990s and early 2000s, interventions have been re-directed away from a narrow focus on irrigation and drainage and towards a broader approach, referred to as *agricultural water management (AWM)*. The World Bank has taken the lead in committing to this new approach by recently calling for a re-engagement in AWM. By its nature, agricultural water management lies at the crossroads of four inter-related areas—water resources, agriculture, rural development, and the environment. As such, it is central to the larger goals of poverty reduction, growth of livelihoods, and wealth creation. AWM accounts for the wide diversity found in agricultural systems, including in terms of irrigated and rainfed areas; large, medium and small

schemes; surface and groundwater use; types of crops and agronomic practices; forms of irrigation and water harvesting technologies; institutional and management structures; and market orientations.

The key priority areas of AWM include:

- **Developing financially-viable irrigation schemes;**
- **Fostering irrigation-based community-driven rural development;**
- **Creating effective and sustainable institutional arrangements;**
- **Increasing water productivity;**
- **Improving linkages to input supply and marketing chains;**
- **Supporting integrated water resources management;**
- **Factoring poverty and gender concerns systematically into AWM.**



Initiatives in AWM are challenging for a number of reasons. They require integrated interventions in many areas—from policies and institutions to technologies, management structures, and agronomic practices. They involve coordination at every level—from the macro-economic, where policies and programs for water resources, agriculture, the environment and rural development need to be harmonized to the local, where investment needs to be based on profitable and sustainable farming founded on workable institutional arrangements. Finally, addressing AWM requires drawing on a range of tools, including analytical studies and technical assistance, work in community development and public participation, and investments in technology and infrastructure. IDA is uniquely positioned to provide the breadth of expertise, long-term support, and tailored solutions that are needed, given these complexities, to develop sustainable AWM systems.

IDA CONTRIBUTIONS

IDA lending for projects in AWM has remained relatively stable over the past 10 years. Over the period 2004–2007, IDA funded 47 projects with an AWM component. Lending specifically for AWM components totaled US\$553 million, which amounted to 60 percent of full project cost. Over the same period, the largest share of lending went to South Asia (45 percent) followed by East Asia and Sub-Saharan Africa (both at about 20 percent). However, these shares mask a dramatic change in annual lending patterns, specifically to Africa: during the period 2003–2007, lending increased more than fivefold, reaching US\$78 million. This reflected a new focus on Africa, where improvements in AWM have the potential to make the greatest impact.

IDA draws on the full range of interventions in order to foster the sustainable use of water resources in agriculture. The goal is single-minded: To assist in meeting the ever-rising demand for food while at the same time increasing farmer incomes, reducing poverty, and protecting the environment, all from an increasingly constrained water resource base. IDA's support has been instrumental in reaching this goal, as demonstrated by positive on-the-ground results.





Developing financially-viable irrigation schemes

Establishing efficient, least-cost water service delivery that meets farmers' needs includes rehabilitating and modernizing existing schemes, as well as developing new schemes that are technically sound and appropriate for local conditions. It requires improved cost-recovery through the installation of water fees, systems to improve collection rates, and proper accounting and allocation procedures. Complementary institutional and economic incentives, such as secured water and land tenure and an appropriate mix of taxes and subsidies, are also used to ensure sustainability of investments. New conditions are thereby created, which allow all actors—farmers and farmers organizations, public agencies, local governments, and private sector service providers and investors—to play an active role in the sector.

In Mali, IDA assistance was central to transforming an inefficient and underperforming Office du Niger (ON)—which refers to both the 60,000 hectare scheme and the agency that manages it—into a financially sustainable and highly productive system. The package of complementary reforms included scheme modernization; introduction of new technologies; land tenure reform; institution of water tariffs; liberalization of rice pricing, marketing and processing; and institutional changes that gave more decision-making power to the farmers and streamlined the ON agency. By the late 1990s, paddy yields had quadrupled, total production had risen sixfold, incomes had increased dramatically (while supporting a five times larger population), and agriculture had diversified. Maintenance of irrigation infrastructure was fully paid for by farmers, who had organized themselves to be centrally involved in scheme management, and the ON agency had cut staff from over 2000 to less than 400. A buoyant

private sector had emerged, making a sustainable living out of milling, trading, and transporting rice; providing farmers with credit; manufacturing farm equipment; and selling farm inputs. The ON started to become an attractive opportunity for private investors.

Fostering irrigation-based community-driven rural development

Community-driven development (CDD) is an approach that gives control over planning decisions and investment resources to community groups and local-level government entities. The approach operates on principles of local empowerment, demand-responsiveness, and greater downward accountability. The objective is broader development, which is placed in the hands of communities who identify priority areas of interventions and undertake the needed actions to address them. In irrigated agriculture, this might be an intervention to improve the reliability of water supply or to reduce the costs of operation, with the purpose of spurring agricultural growth and rural development.

IDA assistance is helping to stimulate poverty-reducing rural growth in Nigeria's fadama lands, or irrigable areas, using an integrated CDD approach. Through a participatory and socially-inclusive process, community organizations comprised of all fadama users—including farmers, pastoralists, fishers, hunters, gatherers—are encouraged to take charge of their own development agenda. Fadama users select specific investments, such as for small-scale irrigation or marketing facilities, and have the responsibility to implement, operate and maintain them. Transferring full control over resource development and management to the users is expected to increase both the productivity of the fadama and rural incomes. In the first year alone, incomes of those who participated in the project rose by almost 60 percent.

Creating effective and sustainable institutional arrangements

Effective institutional arrangements are those that empower farmers and give them more responsibility, redefine the role of government agencies as one of facilitator and regulator, and harness the energies of the private sector. Emphasis is placed on decentralization, financial viability and accountability of water service providers, empowerment through rights and responsibilities of water users and their organizations, the use of incentives, and innovative mechanisms to bring in the private sector.

IDA was a catalyst for the development of the Kyrgyz Republic's new Water Code of 2005, aimed at improving the management of the country's water resources. It is now assisting the country in implementing the Water Code through reforms to improve the technical and financial performance of the Department of Water Resources (DWR) and to support farmer water users association (WUA) development. The objective is to transform DWR into an efficient and client-oriented bulk water supplier, and at the same time to enable farmers to become partners in the management of irrigation systems, including decisions about how funds are used. In the longer run, as WUAs are strengthened and provided the additional legal backing required to take on further responsibility, the DWR will begin to limit itself increasingly to overall irrigation policy, planning and regulation.

IDA is assisting Pakistan in enhancing the performance and long-term financial viability of irrigation in the North West Frontier Province. To this end, and drawing on lessons learned both within Pakistan and internationally, focus is placed on irrigation management transfer and participatory irrigation management. Under the transfer of management model,

irrigation management is fully transferred to farmer organizations (FOs) after completing an agreed period of joint management. This includes a contract executed between the government agency and FO, which clearly defines the terms of transfer and the specific roles of both parties. Under the participatory irrigation model, a federation of WUAs is formed to become centrally involved in irrigation management, and in the planning, design and implementation of select irrigation works, including sharing a portion of the costs. FOs and federated WUAs are not only given the capacity, but also the formal authority, to undertake effectively their new functions, including levying and collecting water charges. These institutional reforms—in addition to interventions including irrigation system improvements and the promotion of techniques to enhance on-farm water use efficiency—are expected to create the necessary conditions for a more efficient, productive and sustainable irrigation system.

Increasing water productivity

Increasing water productivity—in both irrigated and rainfed areas—requires a combination of interventions, including institutional changes that empower farmers, technological improvements, and investments to intensify and diversify agricultural production and increase farming productivity.

In 1997, IDA proposed an action agenda to address the management of scarce water supplies in Yemen. Discussions within Yemen on the agenda culminated in the adoption of a National Water Strategy, the passage of a Water Law, and the creation of a new Ministry of Water and Environment. Within this new legal and institutional framework, IDA is currently assisting Yemen to tackle one of the sector's most critical problems, groundwater mining

in agriculture that is threatening the future of large parts of the rural economy. The approach focuses on technical and institutional-building investments targeting water conservation and productivity in agriculture. On the technical side, the objective is to enhance aquifer recharge and to improve irrigation conveyance and on-field efficiency so as to optimize beneficial use and sustain incomes, while at the same time reducing groundwater pumping. On the institutional side, the aim is to strengthen the capacity of farmer water user groups and government agencies to manage surface and groundwater resources in partnership and on a sustainable basis. Crop yields per unit of water are expected to increase, while at the same time achieving a water savings of 47 million cubic meters a year, equivalent to about 1.8 percent of the country's renewable water resources.

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Improving linkages to input supply and marketing chains

Assuring that investments in AWM are financially sound for the beneficiary farmers requires looking beyond the water sector to both the supply of complementary agricultural inputs and the access to marketing infrastructure and services. Increasing agricultural productivity and profitability is dependent on the timely availability of seeds and fertilizer, access to credit, extension services and training, and capacity building for new on-farm irrigation technologies. Shifts from low-value farming to higher-value agriculture can occur only if products are able

to reach markets (including availability of basic infrastructure, such as roads) at a competitive price.

IDA assisted Burkina Faso in piloting small-scale private irrigation development through the provision of support services necessary to develop a profitable irrigation sub-sector in the country. Interventions spanned the full chain of production, including on-farm demonstrations of small-scale irrigation equipment and techniques; promotion of markets for small-scale irrigation products, inputs and services; and facilitation of access to financial services. The provision of private irrigation and related services was piloted through APIPAC, an umbrella group that brought together the many actors in the irrigation and fruit and vegetable sub-sectors. APIPAC grew to include diverse categories of stakeholders, from producers to traders and exporters, working together to develop technical and commercial solutions. Access to credit was improved through the establishment of a guarantee facility. 184 loans were granted—distributed amongst production, post harvest operations, and marketing—benefiting 42 professional organizations and 19 individual investors.

Supporting integrated water resources management

AWM should be placed within an integrated water resources management (IWRM) framework through participatory planning that assesses economic, environmental and social trade-offs and ensures optimal utilization of water at the basin and sub-basin scale. AWM projects can also promote IWRM by serving as an entry point for dealing with broader water management issues, as has been the case in, for example, China, Pakistan and Egypt.

IDA helped catalyze a fundamental change in China's approach towards water resources management through two projects in the Xinjiang Uygur Autonomous Region. The first project focused on



enhancing AWM to improve farmer livelihoods in the Tarim River Basin. This led to a second and broader project, designed to create conditions of controlled development, allocation and use of water resources in the basin. The project resulted in China's first fully functional integrated river basin management system, including the establishment of an intra-provincial river basin management structure and a water quota system, with an allocation of water to the environment. The "top down" and "bottom up" approach fully involved all key stakeholders in the reform process and created a genuine understanding and commitment to IWRM. Amongst the many positive results at the end of the projects, the flows of the Tarim River into its terminus point, Lake Taitema, were completely restored. The rapid desertification of the traditionally "green corridor" was reversed. Increased crop yields and diversification into higher-value crops were generated through better management of water resources. More than 200,000 Chinese households benefited directly, and nearly 70 percent of people in the project area were lifted out of poverty.

IDA is assisting Karnataka State, India, to improve the productive potential of selected watersheds and their associated natural resource base and to strengthen community institutional arrangements for natural resource management on a sub-basin basis. Soil and water conservation works on over 200,000 hectares have been completed through participatory watershed management across 7,000 communities and over 700 micro-watersheds. Groundwater availability has risen to between four and six months out of the year, and groundwater yields have increased by nearly 1,000 liters per hour. As a result, crop yields have improved by approximately 24 percent, and crops have become more diverse. Average annual household income has increased by over 65 percent.

IDA is supporting Uzbekistan in its efforts to address the root causes of low water use efficiency

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and soil salinization and water-logging in South Karakalpakstan (SK). These problems have been threatening agricultural production and livelihoods in SK, one of the poorest regions in Central Asia. As significantly, they have been jeopardizing the environmental integrity of the Amu Darya River, which has been the direct repository of highly saline drainage effluent. The approach combines technical and institutional investments, with a particular focus on providing adequate drainage and effluent disposal systems and on improving irrigation and drainage practices. It is anticipated that these interventions will have significant effects, both within SK and beyond. Within SK, agricultural productivity and incomes are expected to increase due to reductions in soil salinity levels and water-logging. Beyond, the safe disposal of drainage effluent will improve the quality of the Amu Darya and allow Uzbekistan to meet its obligation under an agreement signed with Turkmenistan for rational use of Amu Darya's water resources.

Factoring poverty and gender concerns into AWM programs

Poverty and gender concerns have been incorporated into AWM programs in order to ensure that interventions generate beneficial impacts for the most vulnerable sectors of society and contribute to poverty reduction.

Various measures have been used in IDA-assisted projects to target women. The Fadama project in Nigeria seeks to give voice to women's concerns by fully involving them in the development of community plans, encouraging the employment of female extension agents, and proactively supporting women's organizations involved in project-related activities. In Karnataka State, India, the majority of members in self-help groups that were promoted under

the project are women. These groups have already mobilized over US\$4 million in savings to help establish small businesses. More than 60 percent of the groups are linked to commercial financial institutions.

While IDA projects are inherently pro-poor, IDA has also addressed acute cases of poverty, including those resulting from situations of crisis. In Sri Lanka, IDA assisted in restoring irrigation schemes and rural roads in the war torn North-East Province. Hundreds of small irrigation schemes were restored, bringing nearly 22,000 hectares of pre-war farmland back into cultivation. This operation helped to resettle displaced communities and brought food security to 33,250 conflict-affected people. In Tanzania, IDA assisted in improving water access and use by low-income smallholder farmers, who had been suffering from several years of below-average rainfall. Over 5,000 farm families benefited from improved irrigation and drainage facilities and annual household incomes increased almost fourfold.

Factors contributing to positive results

Several factors have driven these positive results, including IDA's ability to:

- *Leverage donor funds and coordinate donor support:* IDA involvement in a project has often been a catalyst for mobilizing support from other donors. These partnerships have successfully drawn on comparative advantages that have increased the effectiveness of assistance.
- *Engage for the long-term:* IDA's sustained commitment allows for the strategic planning and continuity that is often required to build partnerships and bring about genuine reform.
- *Tailor projects:* IDA's flexibility to address the specific needs of its client countries is reflected in the diversity of its portfolio, including projects that

pilot innovative initiatives, provide relief from civil strife and natural disaster, and support long-term reform programs.

- *Draw from operational experience and analytical work:* The extensive knowledge base built by IDA from both decades' worth of lessons learned and analytical studies provides for the intelligent design of projects.
- *Provide non-lending services:* IDA's effectiveness in combining direct investment with technical and advisory work has been central to producing tangible positive results.

By 2030, food demand will double as world population increases by an additional two billion people and consumption patterns change. At the same time, a critical input into agriculture—water—is under severe pressure, which if not alleviated could have potentially far-reaching effects on the possibilities for agricultural growth and rural development.



Looking ahead

By 2030, food demand will double as world population increases by an additional two billion people and consumption patterns change. The increase in food demand will come mostly from developing countries. At the same time, a critical input into agriculture—water—is under severe pressure, which if not alleviated could have potentially far-reaching effects on the possibilities for agricultural growth and rural development. Faced with the current situation, governments, farmers and other stakeholders must make serious and urgent choices regarding the management of agricultural water. These choices have to strike a balance between water demands across a range of sectors, rural development and poverty alleviation, and environmental sustainability.

IDA's decades of experience provide guidance on the direction that future investment should take in AWM in order to accelerate improvements in productivity and pro-poor growth.

Focal areas of support will include:

- *Taking a comprehensive view:* For farmers, the needs are obvious. They must have reliable access to water, cost-effective means of growing their crops, and available markets. Reforms will, therefore, be required both within and beyond the water and agriculture sectors.
- *Balancing intensification and expansion:* increased yields and production in existing irrigated areas are key, but there is still some potential for expansion of irrigated area, which could increase by up to 40 million hectares over the next 25 years (an annual average of about 0.5 percent). Investments will have to be both practical and sensitive to environmental and social concerns.
- *Ensuring maximum water productivity and agricultural returns at all scales of irrigation:* Options exist for improving returns to investment

and farmer incomes at all scales of irrigation through an integrated package of selective physical upgrading, agronomic improvements and institutional reforms. The aim is to develop sustainable, efficient and demand responsive water-delivery service, on the largest to the smallest scale systems.

- *Improving water management in rainfed agriculture:* Managing water in rainfed areas would have a significant impact on poverty alleviation. Priorities for investment include research and the transfer of technology, the development of market outlets, and physical investments in rural infrastructure and water control systems.
- *Adapting to the impacts of climate change:* Changes in precipitation, temperature, and the incidence of extreme events (floods and droughts) as a result of climate change pose significant risks to the sustainability of agriculture and the livelihoods of the poor in rural areas. Ensuring that systems are made more resilient to such effects will require incorporating adaptation measures into future investments.

Focus on Sub-Saharan Africa

The case of Sub-Saharan Africa (SSA) requires special attention. Eighty-five percent of SSA's poor live in rural areas, most of whom are dependent on agriculture. Yet agriculture in the region remains largely a subsistence activity, production has not kept pace with population growth, household income required to afford purchased food cannot be generated, and the numbers of malnourished people are continually rising.

Agricultural growth has taken place primarily through the extension of low-yielding, rainfed cultivation. Only four percent of agricultural land is under irrigation—by far the lowest proportion of any region in the world—but water withdrawals for

agriculture represent less than three percent of total renewable resources. Rainfed agriculture is already adversely affected by extreme rainfall variability, and this is likely to be aggravated by climate change. SSA is the most urgent and critical case, and it is in this region where changes in AWM could potentially have a profound impact.

The World Bank and IDA have heeded the call for action, as reflected in the dramatic increases in lending for SSA. In 2007, The World Bank — in partnership with representatives from 32 African countries and several multilateral organizations — confirmed its commitment to scaling up further agricultural water development in Sub-Saharan Africa. The Africa Business Plan on AWM, which is currently under preparation, will define the World Bank's operational strategy for investing in viable and sustainable AWM projects that are designed for maximum profitability, poverty reduction and growth.

Faced with the current situation, governments, farmers and other stakeholders must make serious and urgent choices. . . . These choices have to strike a balance between water demands across a range of sectors, rural development and poverty alleviation, and environmental sustainability.



Mali's Farmers Benefit from Improved Irrigation along the Niger River

Challenge

A landlocked country mostly desert and subject to drought, Mali must manage water resources in ways that provide the maximum benefit to its growing population. The Niger River and the rich green plains it flows through are critical to the entire nation's economy and to the population's supply of food. However, the agency mainly responsible for irrigation management—the Office du Niger—dates back to the colonial era, and functioned in ways that added to the farmer's costs and lowered production of rice and other basic food staples.

Approach

Restructure the Office du Niger and reform its irrigation policies. Modernize and rehabilitate irrigation canals. To improve farmers' incomes, liberalize markets in rice and push for land tenure reforms.

Results

Expanded and more efficient irrigation led to higher yields and incomes for Malian farmers. Rice production rose sixfold, and other food crops such as onions and tomatoes increased substantially.

Highlights:

- In 2005, GDP growth reached 6.1 percent, resulting from an increase in cereal and rice production in 2005–06 (14 percent) and improved terms of trade.
- Increased income for 182,000 farmers reached by the program.
- Rice production increased from 98,000 to 271,000 tons.
- 57 km of canals and drains were rehabilitated and modernized.
- Per-hectare yields increased by 205 percent, and the economic rate of return for farmers jumped to 30 percent, from 16 percent.
- Increased production of other food crops. Onions rose from an insignificant base to a level of 71,000 tons. Production of tomatoes, potatoes and maize also increased.
- Increased water fee collection rates to 97 percent, from 60 percent. Water fees are retained in the areas where they are collected; at least 50 percent are used for maintenance while only 10–12 percent are transmitted to Head Office for general use.
- Improved financial standing of the Office du Niger—crucial to thousands of Malian farmers.
- The Mali government gained critical experience and confidence in pushing through key institutional reforms.
- Participation was strengthened through farmer membership on management committees and overseeing performance contracts.
- The project transferred credit responsibility from Office du Niger to the State Agricultural Bank and stimulated private investment in farm infrastructure. Credit was initially used for equipment, oxen and fertilizer, with repayment rates of over 95 percent.
- Greater transparency in land management increased farmers' sense of land security even in the absence of land titles.



IDA Contribution

- The total project cost was US\$240 million, of which IDA provided US\$48.8 million.
- The Bank played an active role in maintaining both close donor coordination and a strong partnership with government. IDA's convening role and strategic focus and support for policy and institutional reforms were critical in sustaining reforms that generated some near-term hardships, including staff layoff from the Office du Niger, which was withdrawing from commercial activities that the private sector could handle more efficiently.
- Technical support throughout the Office du Niger restructuring was crucial to returning this institution to a financially sustainable position.
- The success of the project led other donors to finance related work. Altogether, the Bank's investment leveraged 250 percent more investment from other donors.

Next Steps

To lock in the gains and ensure their sustainability, it will be necessary to work for: Increased cost recovery to ensure the maintenance of all infrastructure; mechanisms to build up the availability of long-term financing for would-be private investors in the Office du Niger zone; continued investment in rural roads to facilitate input purchase and distribution; and programs to strengthen farmers' organizations, particularly their ability to obtain affordable inputs and to collaborate on marketing strategies.



IDA assistance was central to transforming an inefficient and underperforming Office du Niger into a financially sustainable and highly productive system.

Community-Driven Development Improves Welfare in Nigeria's Irrigated Areas

Challenge

The rural sector in Nigeria employs about 70 percent of the country's labor force, generates one-third of its gross domestic product (GDP) and accounts for about 5 percent of its total exports. However, the majority of the rural population remains poor and incomes today in rural areas are lower than they were 20 years ago. Farming systems are predominantly upland subsistence agriculture that are highly dependent on the vagaries of weather, while the potential for irrigation remains vastly underdeveloped. Growth in the agricultural sector has been further stymied by inadequate infrastructure (roads, marketing facilities, etc.), poor agricultural and financial services, and tensions between various fadama (irrigable land) group users, particularly farmers and pastoralists.

Approach

The ongoing second Fadama project aims to increase sustainably the incomes of fadama users—those who depend directly or indirectly on fadama resources (farmers, pastoralists, fishers, hunters, gatherers, and service providers)—by empowering communities to take charge of their own development agenda and by reducing local-level conflicts over the fadama.

The project adopts an integrated community-driven development (CDD) approach whereby community organizations comprised of all fadama users are encouraged to develop participatory and socially-inclusive Local Development Plans. These plans serve as the basis for the financing of community sub-projects.

Results

The decentralized, demand-driven approach of the project is designed to stimulate poverty-reducing growth in the fadama economy.

The project is expected to increase the supply of rural infrastructure through the financing of, for example, small-scale irrigation systems, feeder roads and marketing facilities, that fadama users consider as priorities, and which they agree to implement, operate and maintain. Producers' associations will be empowered to purchase their own agricultural research and advisory services, resulting in demand-driven research and extension and better access to input and product markets. Conflict between fadama users will be reduced by ensuring that all groups are included in participatory processes for creating and implementing Local Development Plans.



Highlights:

The second Fadama project builds on the positive impacts made under the first Fadama project, which aimed to increase farmer incomes and contribute to food security and poverty alleviation in fadama areas, primarily by making agricultural production less dependent on erratic rainfall. The main achievements include:

- Development of 30,000 hectares under small-scale irrigation.
- Creation of over 9,200 fadama user groups (FUGs) and capacity-building through training activities ranging from well drilling and maintenance to book-keeping (over 59,000 FUG members were trained).
- Increased cropping intensity and production stability; substantial increases in returns per hectare (up to fivefold in some cases) and in technology adoption.

The design of Fadama II draws heavily on the key lessons learned from Fadama I. The expected outcomes of Fadama II are:

- Increased productivity of fadama resources and higher incomes, with potential benefits flowing to over two million people in the project area. Participation in the project increased the income of beneficiaries by about 59 percent in the first year of project operation.
- Shift in the relationship of the state to its citizens by transferring control over resources and decision-making to communities, and by making advisory services tailored to and accountable to users.
- Creation of permanent capacity among fadama groups to identify, design, implement, operate, maintain, and evaluate local-level development projects.

- Reduction of conflict and insecurity among fadama users who learn to respect each other's rights to a common resource pool.
- Improvement in the management of natural resources and critical eco-systems, helping to ensure that fadamas are able to support livelihoods and biodiversity in the long-term.

IDA Contribution

- The total project cost of Fadama I was US\$105.9 million, with IDA contributing US\$67.5 million; The total project cost of Fadama II was US\$125.37 million, with IDA contributing US\$100 million.
- IDA is in a unique position to develop projects having a potentially wide impact on agricultural growth and rural development in Nigeria, given its significant experience in the country, as well as with projects using a community-driven development approach.
- IDA support has helped Nigeria to implement its broad national strategy for raising rural productivity and incomes through a focus on rural infrastructure, rural finance, agricultural research and advisory services, and improved mechanisms for conflict resolution.

Next Steps

The Nigerian government has indicated its resolve to continue implementing the integrated community-driven approach in light of positive concrete results obtained thus far. It is planning to extend the program to cover all fadamas nation-wide. IDA has committed an additional US\$40 million for the third fadama project, which is currently under preparation.

The projects are considered best practice and are serving as successful examples for possible replication in other parts of the world.

Promoting Agricultural Water Management in China's Tarim Basin

Challenge

The 1,300-kilometer long Tarim River in China does not flow to the sea but terminates at a lake system called Lake Taitema in the poor and arid Xinjiang Uygur Autonomous Region (XUAR)—China's largest autonomous region, representing an area approximately four times the size of France. After 30 years of unsustainable water use, Lake Taitema had dried up completely.

Approach

A first project set out to increase agricultural production (and improve farmer livelihoods) through better water resource management and agricultural intensification. Building on the first project and on numerous technical innovations, the second project established China's first "basin-wide" sustainable water resource management system. At the conclusion of the two projects, the flow to the lake had been restored, and it now covers 200 square kilometers.

Results

Better management of water resources led to higher crop yields, diversification into higher-value crops and increased social status and employment opportunities for many women. The rapid desertification of a traditionally "green corridor" was halted, then reversed.

Highlights:

- *Poverty reduction:* Within the project area, nearly 70 percent of people were lifted out of poverty. More than 200,000 farmer households benefited directly and farmers' average income rose across the five prefectures and, most significantly, in the two poorest prefectures of Kizilsu and Hotan.
- *Water conservation:* Lining canals with concrete over geo-membranes to prevent leakage increased water-conveyance efficiency from 60 percent to 95 percent saving an estimated 600–800 million cubic meters of water each year. This water was reallocated to environmental, municipal and industrial uses and enabled the reclamation of land and the expansion of irrigation to more than 41,000 hectares of new farmland.
- *Land reclamation and low yield land improvement:* From 1998 to 2003, an additional 41,460 hectares of land was reclaimed as irrigation land, while the productivity of more than 123,000 hectares of low yield irrigated land was substantially increased. This contributed to an increase in production of 220,000 tons per year of wheat, 82,000 tons of cotton and 116,000 tons of maize. Higher value crops such as fruit (apples, apricots, pears and grapes), oil seeds, melons, vegetables and alfalfa were planted on about 148,000 hectares of land.
- *Institutional reforms:* The projects resulted in the first fully functional integrated river basin management system in China building on initiatives that



predated the projects. Institutional reforms and innovations included: Strengthening a river basin commission that is trying to set annual water use quotas for each of the sub-basins; a strengthened basin management bureau that monitors water withdrawals and delivers water downstream to the green corridor; and new mechanisms in the prefectures and counties to translate water quotas into individual water allocations to farmers.

- *Environmental revitalization:* Around 1.7 billion cubic meters of water was returned to the lower reaches of the River Tarim, restoring 300 kilometers of the watercourse that had run dry. Forest cover in the area increased by over 30 percent and grassland by 15 percent, which contributed to halving the socio-economic costs from wind and sandstorms.
- *Promoting Technical Innovation:* The projects introduced important technical innovations that contributed significantly to the overall success. Notable among these were water and salt modeling; the use of evapo-transpiration management concepts; the use of geo-membranes to line canals and prevent leakage; the wide application of integrated pest management techniques; laser-guided grading to support water savings and increased agricultural productivity; the adoption of community-driven, “bottom-up” land and water management processes; the use of water tariffs based on volumetric water use; and the establishment of many farmers’ water user associations as an integral part of the reforms.

IDA Contribution

- The total project cost for the first Tarim Basin project was US\$212 million, of which IDA provided US\$125 million; the total cost of the second project was US\$272.6, of which IBRD provided US\$90 million, IDA provided \$60 million and the government provided US\$122.6 million.
- Through direct investment, policy and technical assistance, IDA helped to catalyze a fundamental change in the country’s approach towards water resources management. The results demonstrate that a complex, economically and environmentally-sustainable integrated water resources management approach can be achieved, at scale, in a poor area of a developing country. The experience also shows that it takes a sustained effort to bring about genuine reforms and build partnership. In this case, it took two major IDA interventions over a period of 10 years.

Next Steps

The principles implemented under the projects can be applied to most river basins within China and worldwide. The Tarim River Basin is a desert region bordered by Mongolia, Afghanistan, Pakistan, Tajikistan, Kyrgyzstan and Kazakhstan and the approaches used so successfully in this region may be equally effective in other arid areas. A number of delegations, including one from Pakistan, have visited the Tarim Basin and are considering similar programs.

Egypt's National Drainage Program Fosters Rural Growth

Challenge

Agriculture in Egypt provides nearly 36 percent of national employment, and it is crucial to the livelihoods of many of the two-thirds of the poor who live in rural areas. Egypt's agricultural sector is almost completely dependent on the Nile and the irrigation water that it provides. However, a low level of investment in drainage was unable to keep pace with more intensive and extensive irrigation, and agricultural productivity was severely affected by problems of water-logging and salinity. Major investments in drainage were needed in order to support sustainable agricultural development, reduce rural poverty, and ensure the well-being of the population.

Approach

IDA's involvement with drainage in Egypt was initiated in 1970 under the Nile Delta I Project, the first IDA operation in the agriculture sector. Subsequently, five more IDA projects focusing on drainage were implemented, including the National Drainage Project (NDP), the second phase of which is currently underway.

The primary objective of the series of projects has been to increase agricultural productivity of irrigated land by improving drainage efficiency and controlling water-logging and salinity, thereby increasing crop yields and rural incomes. Associated with this, the projects have aimed to build the institutional capacity of the Egyptian Public Authority for Drainage and Projects (EPADP) in order to increase its effectiveness and efficiency in implementing the drainage program.

Results

Upon finalization of the second phase of the NDP in 2008, the six IDA-assisted projects will have contributed to the full installation of modern agricultural drainage throughout the country, representing a total of 3.2 million feddans (about 1.4 million hectares). Achievements made under the previous projects will be extended to the area covered by NDP, including the prevention of crop yield losses, improvement in soil quality through reduced salinity, and lowering of the water table. Impacts will be felt beyond increased agricultural productivity and rural incomes, including better environmental and health conditions. The capacities of the EPADP will be enhanced and local farmer groups will be empowered to participate more fully in drainage activities.

Highlights:

- *Increased crop productivity and rural incomes:* The projects have helped to improve crop productivity and incomes of small-holder farm families. For example, in the first phase of the NDP, yields of major crops were increased up to 20 percent on over 312,000 hectares. The second phase of the NDP alone is expected to benefit 400,000 farm families.
- *Higher cost recovery and sustainability:* In the existing cost sharing arrangement, investment costs in subsurface drainage are substantially recovered from beneficiary farmers. Recovery is expected to remain at very high rates; in the first phase of NDP, capital cost recovery exceeded target levels.
- *Strengthened institutional capacity:* EPADP will be further strengthened through provision of training and technical assistance to staff, resulting in improved standards of implementation, quality control, maintenance and monitoring.

- *Enhanced Farmer Participation:* The EPADP has established over 2,000 drainage Collector Users Organizations since the early 1990s. Additional organizations will be developed, along with procedures for participation of beneficiaries in the O&M of drainage systems, in coordination with existing irrigation associations.
- *Improved environmental protection and public health:* Reduced water-logging and salinity have reversed environmental degradation, as well as eliminated breeding habitats for bilharzia and malaria. These trends are expected to continue under the current project. An Environment Unit has been established in EPADP, which will coordinate environmental activities with other agencies, provide training to EPADP staff, and prepare and implement site-specific environmental mitigation plans.

IDA Contribution

- Over the course of the six IDA-assisted projects, IDA has contributed over US\$270 million to Egypt's drainage program.
- The long-term commitment of over 35 years of IDA support has provided the continuity required for rational planning and implementation of the massive drainage program, as well as the flexibility to accommodate drainage needs as they have arisen.
- IDA and World Bank participation in the drainage program has been a catalyst for the mobilization of very substantial and sustained donor involvement, including Germany, the Netherlands, USAID, the African Development Bank, and the Islamic Development Bank. These partnerships have successfully drawn on comparative advantages and have increased the utility, relevance, and leverage of IDA assistance.

Next Steps

An extensive sector policy dialogue should commence on the recovery of O&M costs in irrigation and drainage. The current high level of subsidies is crowding out essential government investment in existing irrigation and drainage infrastructure and diverting attention from reform efforts.

Continued support should be given for institutional reform and integrating irrigation and drainage operations. The Ministry of Water Resources and Irrigation is increasingly facing a shortfall of funds and will need to streamline its multiple units to cut costs, increase coordination, and enhance productivity. There are strong Egyptian champions for change, and development partners should continue to work with them in order to consolidate the many achievements made thus far.



Restarting Irrigated Agriculture in Sri Lanka's Conflict Zones

Challenge

Until the war between the government of Sri Lanka and the Liberation Tigers of Tamil Eelam erupted in the 1980s, the North-East Province had enjoyed a higher level of agricultural development than most other parts of the country. It was a surplus rice-producing area and had an advantage in the production of vegetables, fruits and other cash crops. Nearly two-thirds of the pre-war population depended on agricultural farming, livestock raising and deep sea fishing for their livelihood. With the war came damage to irrigation schemes, collapse of village-level institutions such as farmers organizations, loss of rural market access roads, mass displacement of communities, all resulting in a substantial decline in agricultural production.

Approach

Restoring irrigation schemes and rural roads was key to resettling displaced communities and ensuring their food security. The project addressed this primary need. The project was designed as a simple community-based operation and implementation was tailored to address to the degree possible the operational constraints of a volatile security situation.

Results

Food security was ensured for about 33,250 conflict-affected people—including those returning who had been displaced—in 396 villages in the project region. This was achieved through the rehabilitation and restoration of productive capacity of about 369 small irrigation schemes, which brought about 21,944 hectares of pre-war farm lands back into cultivation.

Highlights:

- Production of rice, which is the staple food of the people, increased by 90,113 metric tons in the life of the project (1999–2005).
- Access of 83,250 households (341,000 persons) in 375 villages to farms and markets improved through the rehabilitation of nearly 1,294 kilometers of rural roads.
- 19,400 families have been provided with drinking water facilities through the construction of wells in the project villages.
- In order to take care of the rehabilitated irrigation schemes and coordinate better cultivation inputs, 371 traditional farmers organizations were revived.
- The project supported the communities, through 317 women rural development societies, to begin about 18,957 household-based livelihood support activities.
- Livelihood support to women's groups made the project more inclusive and created potential for improved livelihoods at household level.
- The project provided about 379 community centers in the villages.

IDA Contribution

- The total project cost was US\$131.6 million, of which US\$25.5 million came from IDA, US\$5.10 million from the government and US\$1.0 million from local communities.
- This was the first large-scale donor-funded rehabilitation program successfully launched in the North-East region after the conflict intensified in the 1980s.
- IDA took on substantial risk by pioneering development assistance to the region through the design and implementation of this project at a time when the region was still classified as "in-conflict," and even though parts of the project area were not under government control.

- Pragmatic and innovative approaches were built into the design and implementation mechanisms which greatly helped the project to reach and deliver assistance successfully to the target beneficiaries, while ensuring transparency and strengthening accountability.
- This project provided an unprecedented opportunity to the North-East Provincial Council (NEPC) to build skills and capacity of their staff for large scale rehabilitation and reconstruction interventions with major donors. Implementation of the project has helped other donors to consider NEPC as an able institution and to anchor subsequent large-scale donor programs with it. The implementation success in the first two years improved donor confidence in engaging in the conflict areas and catalyzed further rehabilitation and reconstruction assistance to the region.

Next Steps

A US\$65 million repeater project was approved in mid-2004 to extend the development assistance initiated under the project to about another 85,000 conflict-affected people during a six-year period. The design of the project is based on the lessons, implementation experience and the development outcomes generated from the first project. It is shifting focus from restarting subsistence-level agricultural production to improved agricultural production and commercial agriculture. However, the recent escalation of hostilities in the project area may make this shift difficult.



Restoring irrigation schemes and rural roads was key to resettling displaced communities and to ensuring their food security.



