

Global Research Division

In The Aftermath of the Indian Ocean Tsunami: IWMI's Response to the Crisis

IWMI's immediate response to the devastation of a large area of the Sri Lankan coastline included six emergency supply missions. The 'IWMI-Tsunami Relief Group' was formed to facilitate coordination and ensure fast and meaningful responses. In January 2005 IWMI launched an appeal to raise money to support the tsunami relief and rehabilitation efforts in Sri Lanka. The IWMI Tsunami Relief Appeal Fund received contributions from staff members and other individual donors as well as partner CG centres. The total support provided by the Fund amounted to US\$32,000.

In the days following the Tsunami, IWMI's Remote Sensing/Geographic Information Systems (RS/GIS) group collaborated with MapAction UK at the Sri Lanka Government's Center for National Operations (CNO). The team worked around the clock for over two weeks to create a constantly updated GIS database, providing mapping support for the Government of Sri Lanka and organizations involved in the relief effort.

Moving on from the relief phase, IWMI undertook a livelihoods-focused rapid needs assessment in the Hambantota district in southern Sri Lanka—one of the country's worst hit and poorest districts. IWMI has had a long-standing relationship with the district as most of its area falls within IWMI's Ruhuna Benchmark Basin. The study contributed to the post-tsunami rehabilitation efforts, including the preparation of a Master Plan for the Reconstruction and Recovery of the Hambantota District.

In all three districts of Sri Lanka's east coast, groundwater salinity and contamination of wells was recognized as a serious problem, but the technical expertise needed to assess its extent and implications was insufficient and advice

The impact of the December 2004 tsunami continues to be felt. It struck parts of South Asia and South East Asia with a force that was both unprecedented and unexpected. People were unprepared for what happened—and what followed. They lacked the capacity to mitigate its impact and manage its outcome.

urgently needed. IWMI responded to this need by providing guidance on groundwater and well cleaning to organizations and communities in the area. A research study on both the short-term and long-term impacts of salinization on groundwater and water supplies is being carried out in collaboration with the Water Resources Board and the Eastern University of Sri Lanka with financial support from Care International.



In the aftermath of the Indian Ocean tsunami, IWMI carried out groundwater contamination tests and provided guidance on well-cleaning practices to organizations and communities on Sri Lanka's east coast.

Pro-Poor Study

The Dynamics of Poverty

Lessons from a Study on Pro-poor Interventions in Irrigated Agriculture in Asia

Despite the massive investments in irrigation, technologies, institutions and policies that spurred the "Green Revolution" in Asia, poverty still persists in many Asian countries. IWMI scientists and national partners from six countries, namely Bangladesh, China, India, Indonesia, Pakistan and Vietnam, launched a major study in 2001, to uncover the linkages between irrigation and poverty. This study, the first of its kind in terms of geographic scale, coverage of issues and depth of research was sponsored by the Asian Development Bank. Study findings presented at a regional workshop in

August 2004 in Colombo, opened up a whole new dimension to the problem of poverty, pointing to the factors that perpetrate it and the options that can alleviate it.

In addition to offering a comprehensive framework for identifying and designing pro-poor interventions, the study provided a menu of pro-poor intervention options and a detailed set of specific actions and guidelines.

Irrigation and system performance has a definite impact on poverty in developing countries but it can be pro-poor, poor - neutral or even anti-poor, depending on certain conditions. Studies showed that Southeast Asian and Chinese systems showed a better performance than South Asian systems because there was land and water equity. The linkages between irrigation, gender, diversity and poverty were also explored in detail.

Factors that determine the poverty–reduction potential of irrigation

- The condition of irrigation infrastructure and its management
- Irrigation water allocation and distribution practices
- Access to resource-conserving technologies, cropping patterns and diversification to high value crops and enterprises.
- Access to support services like information, input and output marketing
- Access to land, land distribution and the quality of land.

Unless irrigation reforms are sharpened with a pro-poor focus, the poor are likely to be bypassed. The study identified the targeting of locations with higher densities of poor people and socio-economic groups for new investments. It recommended the design of investment models according to poverty types, as no single intervention suits all types. Irrigation packages should also be more comprehensive and support services should be provided to increase agricultural productivity.

Poverty Mapping

Examining the Incidence of Poverty

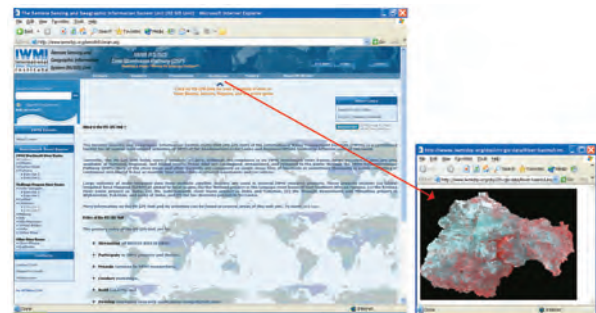
IWMI has developed poverty maps to assess spatial patterns of human poverty across geographic regions. These maps depict different dimensions of human well-being and help researchers to understand how much access poor people have to productive land and water resources within a river basin, while identifying target groups that could benefit from improved access to such resources. Poverty mapping also identifies the factors that contribute to poverty in different economic settings and under different farming systems, for example in irrigated or rainfed agriculture. Since agriculture is the dominant economic activity of rural people, poverty as a unit is associated with indicators such as land, water and soil as well as access to roads and markets. IWMI's research has shown that the provision of irrigation is effective in poverty alleviation. Finding the poor and identifying the spatial patterns are important in order to design interventions for different economic activities.

DSP–IWMI's Data Storehouse Pathway (IWMIDSP):

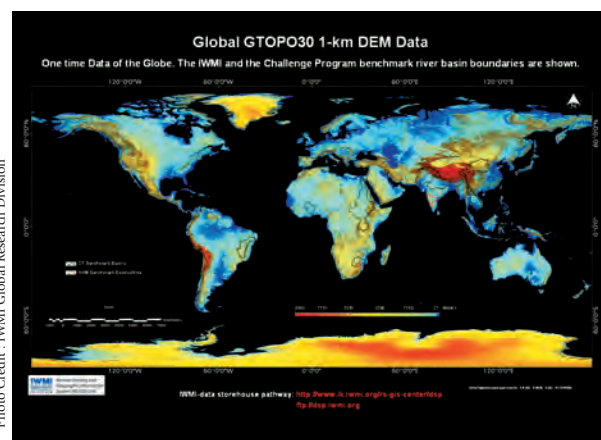
Opening a gateway to remote sensing and GIS data on river basins, nations, regions, and the world.

The IWMIDSP project offers, for the first time, an opportunity for accessing high quality science data in standard formats for rapid assessment, monitoring, and reporting on the conditions of river basins, nations, regions, and the world.

In order to facilitate high quality research, IWMI saw an urgent need to streamline all the data generated by the institute and create a knowledge bank that would be accessible to researchers across different regions of the world. To accomplish this goal, IWMI streamlined all its remote sensing, GIS, and other spatial data. This involved organizing IWMI data and the IWMI-generated knowledge base according to river basins, countries, regions, and the entire world. It also required synthesizing and making data easily accessible from various satellite sensor systems as a near-continuous time-series. The result was the IWMI Data Storehouse Pathway (IWMIDSP) with state-of-the-art technology. The main emphasis of IWMIDSP was to enhance research and provide a service to both IWMI researchers and external users. The Data Storehouse Pathway also serves programs such as the Challenge Program Water and Food. It is used by researchers from both national and international research centers. IWMIDSP already has 100 GB of baseline data for the Limpopo river basin as well as significant data for the Ruhuna, Krishna, and Ganges river basins. It allows users to access, browse, and download data from any part of the world at: <http://www.iwmidsp.org/>. Currently it has about 1000 members from over 50 countries.



A screen capture from the DSP. The system allows users from different parts of the world to access, browse through or download data



Benchmark river basins and IWMIDSP. The IWMIDSP is conceived as a goldmine for IWMI and CP benchmark river basins (shown above) around the world.

Africa

Improving Agricultural Productivity through Better Irrigation

The APPIA project (Improving Irrigation Performance in Sub-Saharan Africa) is helping farmers and extension services to increase irrigation efficiency. It is training a network of experts across the region to assess small-and medium-scale irrigation systems and devise strategies for their improvement. The framework for this development is a new approach, designed especially for the project, known as "Participatory Rapid Diagnosis and Action Planning for Farmer Managed Irrigation Systems". PRDA consists of an initial diagnosis of the main constraints of irrigation productivity and sustainability, made in consultation with the farmer, which is then used to plan measures to improve performance, through:

- **Enhancing irrigation practices and skills** among farmers through on-farm demonstrations and experiments.
- **Increasing farmers' access to markets** by setting up better channels of information and improving farmers' bargaining powers,
- **Planning cropping calendars**, quality controls and post-harvest processing.
- **Monitoring the results of action-plans** to determine if irrigation performance has actually improved.

In the future, the APPIA project will focus on scaling up and out its approach beyond the current pilot irrigation scheme in Ethiopia (8 schemes), Kenya (10 schemes) and West Africa (29 schemes).

The GLOWA Volta Project-Providing Technological Support for Water Management

Life in the Volta Basin is built around access to water. People in the basin depend on water for cultivation, brick making, watering their herds of cattle and domestic use. Every year, uncertain rainfall condemns them to a struggle for food and livelihood security.

The Volta Basin is a Benchmark Basin of the Comprehensive Assessment Program and Challenge Program.

The GLOWA Volta Project (GVP) is working on a science-based Decision Support System (DSS) to provide countries in the region with the necessary information to manage their water resources. The project is carried out in partnership with the Centre for Development Research (ZEF) of the University of Bonn. The GVP is funded by the Federal Ministry for Education and Research, with additional support from the Ministry of Science and Research of North Rhine-Westphalia.

APPIA is financed by a grant from the French government. The Regional Association for Irrigation and Drainage is implementing the project in West Africa, together with the two Regional Inter-State Schools in Water and Rural Engineering based in Burkina Faso. The IWMI sub-regional office coordinates the project in Ethiopia and Kenya, with support from national partners.

The "Paddies Paradox"-Irrigated Agriculture versus Malaria

Africa will face an acute shortage of food and widespread starvation by 2020. While irrigation holds the promise of greater food security, it also carries the threat of malaria. Flooded paddy fields become breeding grounds for malaria mosquitoes. Yet, research by IWMI and partners shows that in most of sub-Saharan Africa, the spread of malaria appears relatively stable. Although the potential for infection is higher in villages near rice fields, there are fewer actual cases of malaria than in the surrounding communities. Studies from Tanzania, Gambia, Burkina Faso and Cameroon also prove that income growth leads directly to better health. Relatively well-off farmers can afford to take simple, but effective protective measures—such as using bed nets and seeking appropriate treatment in time. Therefore, irrigated rice cultivation can even bring about a decline in malaria.



Photo Credit : Hugh Turral

A small scale irrigation project in Ethiopia. IWMI is coordinating the APPIA project in Ethiopia and Kenya. The project is helping farmers and extension services increase irrigation efficiency.

The Systemwide Initiative on Malaria and Agriculture (SIMA) takes an integrated approach to malaria. It involves experts from different sectors and research disciplines, on the premise that the spread of malaria is influenced by diverse issues including ecological, economic, social and cultural factors. SIMA partners include: IWMI, ILRI, IITA, WARDA, CIAT, ICIPE and IDRC, among others.

See also www.iwmi.org/sima

Key study recommendations

- Locally evaluate the feasibility of alternating wet and dry conditions in rice fields by changing flooding schedules or seasonally alternating rice cultivation with a dry-land crop, such as soya.
- Assess the potential of using cattle as "bait" to divert mosquitoes away from humans in settings where the main malaria mosquitoes prefer to feed more on cattle than people.
- Provide insecticide-treated nets to groups at high risk for malaria, such as pregnant women and young children.

Creating Inclusive Water Management Institutions—the South African Experience

Driven by the goal of redressing historical injustices, the National Water Act (NWA) of 1998 made profound changes to water management in South Africa. The new Catchment Management Agencies and Water Users' Associations (WUAs) were expected to empower the Historically Disadvantaged Individuals (HDIs), both women and men, of African and Asian origin.

The former white, large-scale commercial Irrigation Boards (IBs) were to be transformed into inclusive WUAs. However, only one sixth of the Irrigation Boards have become WUAs so far. Research by IWMI and its partners showed that commercial farmers only took the initiative to open up their organization to small-scale farmers when they were upstream or had to pay. In several cases, small-scale farmers were unaware that they were formally entitled to more water than they received. Yet, small farmers used a mere 10 percent of the water used by the large farmers.

Thus, several key issues must be addressed before the smaller players can have a significant role.

Defining WUAs and what they do

WUAs should be formally defined to include everyone sharing the same water resource—regardless of the fact that the former entitlement was for commercial agriculture only—since small-scale farmers, farm laborers and communities use the 'irrigation' water for multiple purposes.

Large-scale farmer members of WUAs need to be actively involved in developing the capacity of emerging farmers, for

instance, by sharing knowledge about efficient irrigation scheduling, technology and overall water resources.

A different water agenda for HDIs

Historically Disadvantaged Individuals (HDIs) are relatively unorganised and unable to voice their specific needs, such as the lack of well-maintained infrastructure. Furthermore, water restrictions on emerging farmers should be less severe during drought periods than on commercial farmers, who can cope better in these circumstances.

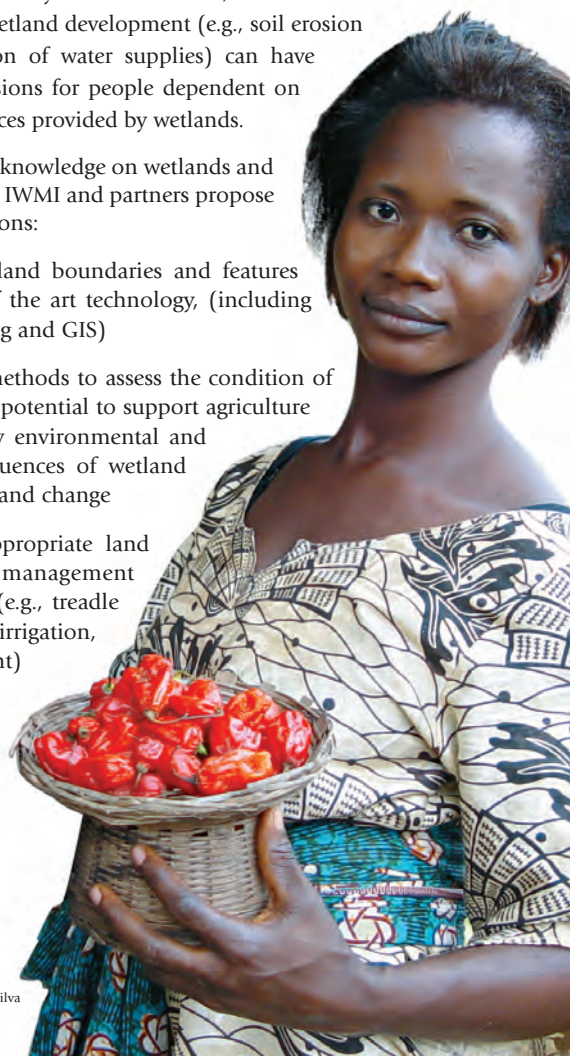
Wetlands – Supporting the Livelihoods of the Rural Poor.

A recent study of wetlands in Tanzania and Zambia, funded by the FAO Netherlands Partnership Program, and conducted jointly by FAO, IUCN and IWMI, recognizes that wetlands are at the heart of the livelihood strategies of many rural poor.

Wetlands are central to the lives of many rural African communities because they support livelihoods and provide food and water. The capacity of wetlands to retain moisture for long periods makes them a valuable resource for agriculture. Farmers take advantage of the year round availability of water in wetlands to diversify crops and cultivate during the dry season. However, the environmental impact of some wetland development (e.g., soil erosion and contamination of water supplies) can have negative repercussions for people dependent on the natural resources provided by wetlands.

To generate more knowledge on wetlands and the role they play, IWMI and partners propose the following actions:

- Mapping wetland boundaries and features using state of the art technology, (including remote sensing and GIS)
- Developing methods to assess the condition of a wetland, its potential to support agriculture and the likely environmental and social consequences of wetland development and change
- Evaluating appropriate land and water management technologies (e.g., treadle pumps, drip irrigation, gully treatment)
- Determining the possible impact of climate change on wetlands.



Asia

Fighting Drought–Towards a Better Prepared South Asia

Despite the frequent occurrence of droughts in South Asia, coordinated and well-planned drought mitigation strategies are lacking in the region. IWMI's Project on Drought Assessment and Mitigation—carried out as a short-term rapid assessment in India, Pakistan and Afghanistan—is nearing completion and is generating a range of beneficial outputs and identifying areas for future regional collaboration, study and development.

Project Outputs

- Drought Monitoring System. A prototype regional drought monitoring system (DMS) <http://dms.iwmi.org> based on remote sensing data. The DMS can track drought onset and development by monitoring ground vegetation conditions.
- A software for analysing drought with multiple options
- A regional rainfall database with over 90 monitoring stations and an average of 30-years of observations.
- A regional Drought Workshop held in Colombo in October 2004 brought together scientists and policy makers from Afghanistan, Pakistan and India, as well as donors, international organizations and observers from other countries.
- Project-Website: www.iwmi.cgiar.org/drought_assessment/index.asp

The project website contains an overview of project activities, links to partner websites, other drought-related websites and databases on drought-related literature. It hosts a drought monitoring system, project publications and general educational information on drought. It is expected to evolve, with time, into a unique drought resource portal for the region.

Future Directions

Although the initial study was limited to Southwest Asia, it is intended to expand drought research to cover the entire South Asia area in the future and develop a regional anti-drought community of practice. A South Asian Conference on Drought Management with high-level political participation is proposed as a regular means for dissemination of drought-related knowledge and exchange of experiences.

Detailed quantification and forecasting of drought risks throughout the region is identified as an important direction for future research. Development of a South Asian Drought Encyclopedia is also planned. The common thread uniting these long-term objectives is the firm conviction that there should be a shift from short-term ad-hoc strategies to consistent and sustained drought preparedness.

Introducing Canal Management Organizations and Canal Water Committees in the Ferghana Valley, Central Asia

In September, 2001, IWMI launched a project to introduce IWRM practices in the Ferghana Valley, parts of Kyrgyzstan, Tajikistan and Uzbekistan in Central Asia. For the first time, the concept of organizing water management along hydrographic, rather than administrative, boundaries was initiated. IWMI's partners in this project were the Scientific Information Center of the ICWC, and the ministries of Agriculture and Water Resources of Kyrgyzstan, Tajikistan, and Uzbekistan.

The Ferghana Valley Project focused on separating governance and management functions at the Canal and Water Users' Association levels. It promoted capacity building and identified opportunities for improving land and water productivity within existing resources, while ensuring stakeholder participation through intensive grassroots mobilization.

One significant outcome was the establishment of three new canal management organizations (CMOs), training staff in IWRM principles for water management, and providing other resources, such as manuals, guidebooks, models and other tools. The creation of CMOs is a new management concept for these countries. In Uzbekistan, this development was formally institutionalized. Another immediate result was the establishment of Canal Water Committees (CWCs) for each of the three pilot canals—another important water management innovation introduced by the project. The success of the pilot project has encouraged donors to fund another three year phase beginning in May 2005.



Water User Associations (WUAs) in Central Asia pool their resources for the operation and maintenance of irrigation and drainage systems within their jurisdiction.

Photo Credit: Iskandar Abdullaev

A new approach to assessing the risk of cadmium contamination in crops

The cadmium contamination of crops from industrial run-off or natural mineral deposits poses a serious threat to human health. The long-term consumption of polluted food, particularly rice, is known to result in irreversible kidney dysfunction. IWMI Southeast Asia, together with the Royal Thai Government, has adopted a proactive approach in tackling this issue

Over the past four years, IWMI and partners carried out an in-depth assessment of cadmium contamination of rice, and associated rotation crops in an isolated area close to the Thai-Myanmar border. In this area, the contamination was traced to suspended sediments in the irrigation waters of a river, which passes through a zinc deposit. The study developed a number of tools to assess the degree of contamination. These were:

- a simple model that explains the uptake of cadmium by rice grain using easily determined soil chemical properties, and

- a model that predicts the degree of contamination by suspended sediments for a cascading irrigation system based on total cadmium levels in the primary fields and irrigation sequence

The project also undertook a comprehensive survey of soil and rice grain cadmium levels, in order to produce a zoning map and policy brief that was submitted to national and provincial decision makers.



Photo Credit : IWMI Southeast Asia

IWMI and partners in Southeast Asia carried out an in-depth assessment of cadmium contamination of rice and associated rotation crops in an isolated area near the Thai Myanmar border. Photo shows a study area.

Sustaining Rice-Wheat Production Systems in Asia

IWMI's research in South Asia was funded by the Asian Development Bank, through the Rice-Wheat Consortium of Indo-Gangetic Plains (RWC), and implemented in cooperation with RWC-CIMMYT, IRRI, and the National Agricultural Research Institutions of Pakistan, India, Bangladesh and Nepal.

The Pakistan component of the project was conducted by IWMI in collaboration with the Pakistan Agricultural Research Council (PARC), On Farm Water Management Punjab (OFWM) and the University of Agriculture, Faisalabad (UAF).

Although rice and wheat are the staple food of more than a billion people in South Asia, stagnant productivity and degradation of resources, particularly the growing scarcity of water, pose serious challenges to future food security.



Photo Credit : IWMI Pakistan

IWMI is looking at options for increasing water productivity and improving crop management practices at field, farm and watercourse command levels in the Indo-Gangetic Plains.

The IWMI project in the Indo-Gangetic plains, which designed systems solutions for site-specific productivity and sustainability issues, was therefore a timely intervention. The Pakistan component, focusing on the Punjab rice-wheat zone, drew to a close last year. The three-year research program assessed the water saving potential of alternative wheat and rice stand-establishment and crop management practices at field, farm and watercourse command levels and the impact of such strategies on groundwater table and quality.

Recommendations:

- The development and promotion of suitable resource conservation technologies (RCTs) for rice-wheat cropping systems to ensure food supplies and more effective use of dwindling water resources.
- On-farm experiments—conducted with the farmer's active participation—to develop new technologies in tune with local socio-economic, water supply, agro-hydrological and institutional circumstances and facilitate speedy adoption.
- Long-term evaluations to ensure the sustainability of rice-wheat cropping systems, before new RCTs are recommended to the wider farming community.
- More research exploring soil salinity changes caused by the increased adoption of RCTs in the Indus basin.
- Further investigation to determine the impact of these technologies on real water savings and water productivity needs at field, farm and irrigation system/basin scales.

The Challenge Program on Water and Food

Moving from inception to implementation

The CGIAR Challenge Program on Water and Food (CPWF) moved from inception to implementation stage during 2004. Over 33 research projects with a total budget (including matching funds) of close to US\$ 60 million have now started in the nine benchmark basins. The program even completed its first external review, conducted by the CGIAR Secretariat and the CGIAR Science Council. Their joint report was accepted by the CGIAR Annual General Meeting in October 2004. The final review concluded that the three pilot challenge programs have helped to open up the CGIAR and bring in new funding, and have a good potential to help the CGIAR achieve its goals. The review recommended continued CGIAR support to the three pilot programs for the full five years of their first phase.

The review by the Science Council stimulated an internal reformulation of the CPWF Research Strategy, to give the program a clearer focus in expressing and presenting current work and in ensuring that the program will deliver on its promises. The new strategy was approved at the fifth meeting of the CPWF Steering Committee in Canberra in March of 2005.

The key recommendation in the revised strategy was to make a significant additional investment in strategic research at basin level. This investment has taken the form of "Basin Focal Projects". These will develop a scientific framework for evaluation and scaling up of interventions to alleviate poverty and hunger through improved water productivity. Pilot Basin Focal Projects will start in 2005 in four basins – the Mekong, Volta, Karkheh and Sao Francisco. CSIRO, IRD, IWMI and UC Davis have been invited to lead the development of each project, with support from the basin coordinators and other partners. A fifth "coordination project" will coordinate the four basin projects and ensure compatibility of approaches and methodologies across basins.



Farmers and researchers at farming trials at Serejeka, Eritrea. This is a CPWF funded project.



Photo Credit : Sanjini De Silva

CPWF and partners in action: Dr Winston Andah, CPWF Volta Basin Coordinator, and Esther Wahaga, SARI Social Scientist, discuss the impacts of water scarcity on livelihoods with villagers in the Kasalgo village, Tamale, northern Ghana.

Frank Rijsberman

Chair, CPWF Steering Committee

Making a Practical Impact

The CPWF has progressed enormously with its portfolio of 33 projects, led by 18 institutions (with over 150 partners) in the nine benchmark basins around which the CPWF continues to develop and build its capacity becoming operational. The CPWF's approach to fostering partnerships is demonstrated with 27% of the approved projects led by non-CGIAR institutions, especially NARES, and 45% led by organisations that are not members of the CPWF joint venture consortium.

As the first of the funded projects commenced implementation in June 2004, it's still too early to show how projects and synthesis research are integrated in the Program as a whole. However, some early results from different projects can illustrate the CPWF's practical impact.

- **'Coastal resource management for improving livelihoods'**, led by IRRI, Philippines. Farmers in Batiaghata, Bangladesh planted Aus (dry) season rice for the first time using water stored in the on-farm canal network. Working with the People's Committee of Bac Lieu province in Vietnam, farmers in Bac Lieu can cultivate crops into the drought period due to proper sluice operation. Poor farmers producing wicker handicrafts are being encouraged to harvest sea-grass, a nuisance weed in shrimp ponds, with the promise of exporting their products through interested companies in Ho Chi Minh City.
- **'Strategic innovations in dry land farming'** led by the Savannah Agricultural Research Institute, Ghana. Construction of domestic rainwater reservoirs in pilot sites in Ghana is nearing completion. This will enable verification of survey results that suggest that women in

Photo Credit : Stefania Grandi-ICARDA

farming households will use the time saved from not having to collect water, to invest in vegetable farming and other health and income generating activities.

- **'Livelihood resilience in dry areas'**, led by ICARDA, Syria. Several options for supplemental irrigation and water harvesting have been identified, while, a change of farmers' attitudes means that sheep manure is now viewed as a nutrient rather than a waste material and water pollutant. Generally the project is promoting institutional innovation in Iran through its ability to link organizations more easily as part of a partnership focused international program.



Photo Credit : Sanjini De Silva

CPWF Chair, and IWMI DG, Frank Rijsberman, examines a seriously silted up reservoir in the 'Mogtedo system', east of Ouagadougou, Burkina Faso. This system, which urgently needs rehabilitation, is managed by a farmer cooperative with little or no government support.

- **'Multiple water use'** led by IWMI, South Africa. The CPWF has enabled a multi partner approach to forming "learning alliances" in the Limpopo and Mekong basins, with other basins to follow. Action plans are identifying critical requirements in establishing multiple use systems, where the same water serves for use in drinking, hygiene and small-scale horticulture.
- **'Rainwater and nutrient use efficiency'** led by ICRISAT, Niger. Farmers in the Volta basin were exposed to some of the 'best bet' technologies being evaluated, while project partners have acquired skills in using decision support tools and improved their understanding of land degradation issues.
- **'Improving productivity in salt affected areas'** led by IRRI, Philippines. Germplasm exchange and distribution with NARES and other partners including elite lines with multiple tolerance to abiotic stresses has occurred. Field days for farmers in India, and training activities for 300 farmers in Vietnam have been completed. Egyptian partners have decided to implement the project from their own resources demonstrating commitment.

A feature of the CPWF is adding value to international public goods contents through a synthesis of research results, which has already produced several state-of-the-art papers, including two journal issues dedicated to CPWF papers. Other activities include travel grants to young scientists; facilitating interactions between NARES and advanced research institutes; researchers' networks formed in basins to facilitate dialogue; refinement of basin profiles; and continued dialogue with the global environmental change community.

Improving water productivity of cereals and food legumes in the Atbara River Basin of Eritrea.



Photo Credit : Stefania Gando - ICARDA