

# WATER FIGURES

TURNING  
RESEARCH  
INTO  
DEVELOPMENT

QUARTERLY NEWSLETTER OF THE  
INTERNATIONAL WATER MANAGEMENT INSTITUTE



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## ANNOUNCEMENTS

### The Comprehensive Assessment results out soon

This year the Comprehensive Assessment of Water Management in Agriculture completes its analysis of the past 50 years of water development, the challenges of water management and solutions for the way forward. Look out for the presentation of its results at Stockholm Water Week in August 2006.



# EDITORIAL

WATER FIGURES ISSUE 2 JUNE 2006



## MAINSTREAMING GENDER IN WATER MANAGEMENT FOR AGRICULTURE

This issue of Water Figures devotes much space to the Comprehensive Assessment of Water Management in Agriculture (CA) and the imminent launch of its findings after five years of intensive research and consultation. One aspect of this interaction that I was fortunate to experience is its involvement in the cross-cutting assessment of Gender Mainstreaming in Water Management for Agriculture.

The 1992 Dublin Principles for Water proclaimed that women play a central role in water management as the major providers and users of water. Since then, gender has found its place in the mandates and plans of organizations involved in Water Management. This has helped highlight the importance of gender analysis in improving resource management and reducing poverty. Still, in practice, most water management initiatives fail to effectively address gender and equity issues in the communities they work. Gender issues are often considered to be a separate concern, one that is left to the experts in the field.

In a collaborative effort to understand the concerns of and reservations about gender analysis in water management for agriculture, the CA formed a partnership with Both Ends, a Dutch NGO supporting local civil society organizations on sustainable livelihoods, and the Gender and Water Alliance (GWA) supported by Oxfam-Novib. It has engaged in a series of interactions with professionals, academics and policymakers involved in water management. The first of these was an invitation to a group of gender experts for an online brainstorm on the subject. This was followed by a critical review of the CA synthesis papers and the preparation of a synthesis report on Gender Mainstreaming in Water Management for Agriculture. A small group of gender experts also held individual meetings with the writers to discuss their reviews.

The second was an e-survey on the extent to which existing guidelines and manuals on Gender Mainstreaming are consulted. The results revealed that although a number of manuals and guidelines exist for agriculture and irrigation specialists, they are rarely put to use because they are either not easily accessible, or are not suitable to the specific contexts that practitioners work in. I was interested to learn just how much of a difference accurate translation of these resources into local languages makes to the participation of both men and women in projects. These findings were discussed in a two-day workshop of ten gender experts from across the world.

These events helped put together the "Minimum Agenda for Gender Mainstreaming in Agriculture", a document that sets out practical approaches for practitioners, researchers, policymakers and other stakeholders to ensure that the needs of both men and women are taken into consideration in their work. Following this, the three organizations held an open online discussion and the Minimum Agenda was offered as a starting point from which to build recommendations to improve gender analysis in the field of water management.

As one of the moderators of the discussion, I was able to encounter a range of perspectives and views, exemplifying the CA's focus on partnership and dialogue. And as someone new to the field of Water Management in Agriculture, my interaction with the CA, despite its overwhelming size, was a friendly and accessible one.

Samyuktha Varma **Editor**

The Minimum Agenda can be found at <http://www.iwmi.cgiar.org/assessment/Synthesis/minimumagendagender.htm>

### EVENTS

#### INTERNATIONAL WORKSHOP 'GOVERNANCE AND THE GLOBAL WATER SYSTEM'

Bonn, Germany, 20 - 23 June 2006  
[www.gwsp.org/gov\\_workshop](http://www.gwsp.org/gov_workshop)

#### WORLD WATER WEEK IN STOCKHOLM

20-26 August 2006 The theme for 2006 is "Beyond the River – Sharing Benefits and Responsibilities".  
[www.worldwaterweek.org](http://www.worldwaterweek.org)

#### 8TH INTERNATIONAL CONFERENCE ON MODELLING, MONITORING AND MANAGEMENT OF WATER POLLUTION (WATER POLLUTION 2006)

Bologna, Italy, 04 - 06 September 2006  
[www.wessex.ac.uk/conferences/2006/water06](http://www.wessex.ac.uk/conferences/2006/water06)



Photo Credit: Sharmi Jayawardena

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# Investing in Agricultural Water to Reduce Poverty and Stimulate Economic Growth in Sub-Saharan Africa

DOUGLAS MERREY, ARLENE INOCENCIO AND AKIÇA BAHRI

To intensify agricultural production, improve rates of agricultural growth and productivity, and ensure food and livelihood security, Africa's rural poor need investment in infrastructure development and capacity building. The Collaborative Program on Agricultural Water Investment Strategies in Sub-Saharan Africa: Trends and Opportunities, seeks to identify the specific areas where investment will support sustainable growth and reduce poverty in the region. IWMI is one of seven partners in this program. This article highlights some of the recommendations for governments, donors, investors and organizations.

## INVESTING IN "AGRICULTURAL WATER MANAGEMENT" (AWM)

In Africa, agriculture has the potential to be a major force behind economic growth and improve livelihoods for millions of people. Investing in AWM—the range of technologies and practices used to ensure that adequate water is available in the root zone when the crops need it—could be the way forward. AWM includes support for infrastructure and innovation in irrigation, drainage, watershed management, recycled water use, water harvesting and in-field water management. AWM helps increase agricultural employment and incomes by creating opportunities for smallholders to improve productivity. Investing in AWM can thus induce growth in local and national economies, provided that macro-institutional frameworks are strong and supportive. Although it takes time to create a favorable policy environment, the impacts of having legal and institutional support for AWM from governments can significantly improve agriculture productivity in Sub-Saharan Africa.

## DIRECT INVESTMENT TO WOMEN FOOD PRODUCERS

In much of Africa, women are major food producers: some studies suggest 70–80 percent of the food is produced by women farmers. Studies from the region also show that when given the same opportunities and resources as men, women produce the same results. The main obstacles that inhibit women's productivity and participation in agriculture are caused by gender-based inequalities in land tenure security and poor access to resources. Addressing the obstacles faced by women farmers is critical to agricultural growth in Sub-Saharan Africa. Therefore, targeted investment to vulnerable groups, such as credit and capital for women-headed rural households or women-led farms, can have a positive impact on livelihoods and food security and raise agricultural growth rates.

## INTEGRATED WATER AND LAND RESOURCES MANAGEMENT

Agricultural water investments set within basin planning ap-



Photo Credit: Sanjimi de Silva

proaches can optimize resources at the basin level. These approaches take a more holistic view of management, integrating both water and land resources. For instance, agricultural water projects set up within regional cooperation frameworks can help build participatory IWRM approaches and encourage transboundary cooperation. Examples of regional cooperation which are moving in this direction are the Organisation de Mise en Valeur de la Fleuve Senegal and the Nile Basin Initiative.

## PARTICIPATORY PLANNING OF DESIGN AND IMPLEMENTATION

The evidence is clear that water management projects planned, designed and implemented by empowered farmers or by specialist agencies in real partnerships outperform schemes built and managed by governments for farmers. Often, there is apprehension towards participatory approaches because the measurement of progress is sometimes slow, requiring investment in resources, time and expertise to assist in institution building. Projects in Sub-Saharan Africa can learn from well documented experiences of participatory projects in Asia.

## BUILDING CAPACITY

Strengthening institutions and building people's capacities across sectors and skill levels need to happen in parallel and are synergistic. Farmer organizations need to gain capacity to invest in and manage water supply systems. Investment in education will help institutions to be more innovative in the application of their research.

## TREATING AGRICULTURAL WATER INVESTMENTS AS A BUSINESS OPPORTUNITY FOR FARMERS

As investments in agricultural water reduce the risk and vulnerability of farmers, venturing into high-value crops is made more attractive for them. Governments will have to ensure that the preconditions for economic viability and sustainability can be satisfied. Specifically, governments can promote smallholder participation by developing the legal and institutional framework and investing in basic infrastructure and research and development suitable to smallholder farmers.

## POSITIVE HEALTH AND ENVIRONMENT OUTCOMES

Environmental and health concerns need to be established as important outcomes of projects, and integrated into project planning through assessments. Management during implementation and operation should include parallel efforts to build national awareness and capacity on relevant issues. Managing health and environment concerns are largely the responsibility of governments, and many countries have national policies that are responsible for regulation on these issues. When investment focuses on strengthening public sector institutional capacity, existing guidelines are better enforced, negative environmental impacts mitigated, and the health and wellbeing of people and their environment safeguarded. 

For more information on this program and its partners, visit: <http://www.iwmi.cgiar.org/africanwaterinvestment/index.asp>

# The CA: influencing what happens next

NADIA MANNING AND SAMYUKTHA VARMA

Photo Credit: Sanjini de Silva

## RECOGNISING THE WATER-FOOD-ENVIRONMENT DILEMMA

Water scarcity exists in a number of forms, all contributing to persistent poverty in the world today. More water is needed not only to produce more food but also to combat malnutrition and reduce poverty. But putting more water into the service of agriculture threatens environmental sustainability. There are difficult choices to make about how to manage water for food, environmental security and poverty reduction. Overcoming this is critical to meeting the millennium development goals on poverty, hunger and environmental sustainability.

Decision makers are continually confronted with conflicting messages about how to take action. There are sharp differences in understanding and opinions of the role of investments into small-scale and large-scale agriculture, and their impacts on poverty and environment; the role of trade; the prioritization of ecosystem water needs; and the role of agriculture itself in poverty alleviation. While both sides of the debate may often be valid, more information is needed to evaluate the merits of each approach when applied to different situations.

## COMPREHENSIVE ASSESSMENT: PROVIDING NEW KNOWLEDGE FOR BETTER WATER DECISIONS

The Comprehensive Assessment of Water Management in Agriculture (CA) was formed to help resolve this water-food-environment dilemma by bringing a diverse group of people together to assess the past 50 years of water development, the water management challenges communities are facing today, and the solutions people have developed. It critically evaluates existing knowledge, provides policy-relevant recommendations, and stimulates thought on ways to move forward. The assessment is organized through the CGIAR's Systemwide Initiative on Water Management (SWIM), and co-sponsored by the Ramsar Convention, FAO, the Convention on Biological Diversity (CBD) and the CGIAR. The results of this process are aimed at enabling agricultural communities, governments, and donors to make better investment and management decisions in water for agriculture. Over the past five years, the CA engaged in a complex process of dialogue, partnership, research, synthesis, review and outreach.

For knowledge synthesis, the assessment process was modelled along the lines of the Millennium Ecosystem Assessment and the Intergovernmental Panel on Climate Change (IPCC) processes. The CA aims at being scientifically rigorous while maintaining an open forum for knowledge sharing. A diverse group of researchers and practitioners from different regions and backgrounds were brought together to share knowledge and experience. Chapter teams comprising lead and contributing authors, with a broader consultative network—sometimes as many as 100 people per chapter—used a series of workshops, on-line consultations and two rounds of intensive reviews to develop their messages. There were several interactions among lead authors and cross-cutting health, climate change and gender teams to ensure the coherence of the entire document.

The assessment is built on the gap-filling and integrative research work of the first phase of the CA that sponsored over 30 projects. The main outputs of this phase are a set of peer-reviewed research reports, and a book series providing state-of-the-art analysis of topics such as rainfed agriculture, aquaculture-agriculture conflicts in the coastal zone, groundwater, water productivity, water pricing and water laws.

Outreach has been part of the entire process from the multi-stakeholder dialogues, to the interactive research projects, to the work of the large and diverse synthesis team. Further outreach of the CA messages is envisaged through four main avenues—policy dialogues, direct development implementation, further research, and dissemination to the general public. The CA has strong linkages with the Challenge Program on Water and Food, which is taking up CA recommendations on actionable research. The goal of the program is to move from assessment to action in order to influence what happens next.

## A PREVIEW OF SOME OF THE RESULTS

While the world's agricultural systems produce enough food today, there remain about 840 million malnourished people, the majority of whom rely directly on agriculture—smallholder farmers, fishers, livestock keepers, and the rural landless. For many of these people, better water management could make a considerable difference in their livelihoods.



Photo Credit Sharni Jayawardena

Past efforts to produce more food, fight poverty and promote economic development relied heavily on investments in hydraulic infrastructure—especially for irrigation and groundwater pumping. This has led to increased food production, positive impacts on poverty and economic growth, and lower food prices. But there have been large social and environmental costs. Rivers are running dry, and the groundwater boom that has supported many rural livelihoods in parts of the world is turning to bust. Decreasing water resources and water quality is not only placing a stress on ecosystems but also threatening the agricultural resource base. Today, about 2.3 million people live in areas of physical water scarcity—areas where water resources have been overextended.

Irrigation has played a major role in ensuring food supply globally and in acting as a springboard out of poverty, especially in Asia. But the conditions that justified large public investment in irrigation during the second half of the 20th century have changed radically, and the era of rapid expansion of public irrigated infrastructure is over. The challenge today is for irrigation to improve its role as the vehicle for food production by increasing water and land productivity in a way that is more equitable, supports more ecosystem services and builds resilience while mitigating environmental damage.

Rainfed agriculture produces 60% to 70% of the world's food, covers about 80% of cropland and serves most of the rural poor; yet insufficient attention has been given to managing water in rainfed areas. Creating an environment for high-return investments in practices like water harvesting and supplemental irrigation, combined with good agronomic practices, has a high potential to increase productivity to benefit the rural poor. In fact, the areas with the highest potential for water productivity gains coincide with areas of extreme poverty in rainfed areas of the semi-arid tropics marked by short-term dry spells and degrading soil fertility. The challenge here is to reduce water-related risks, especially short-term dry spells, rather than cope with absolute lack of water.

In addition to crop-based agriculture, water supports a number of other food production systems. A growing demand for livestock products offers opportunities for development, but also will place additional stress on water systems because of the increased need for water-consuming animal feed. An estimated 1.2 billion people rely on services of natural systems including fisheries; wetlands; forestry products; and gathered wild resources for food. Freshwater fisheries provide employment to millions of people and feed tens of millions more, but

are highly vulnerable to changes in river flows. This is a good reason to establish quality and quantity criteria for environmental flows which are necessary to sustain the ecosystems that support fisheries and other ecosystem services.

The primary reasons poverty, hunger, gender inequity and environmental degradation continue to afflict developing countries are not technical inadequacies, but political and institutional failings. Current policies and institutional arrangements are finding it difficult to deal with rising demand for scarce water. Institutional reform and strengthening is critical to developing and implementing solutions that work.

Equity and gender matter in water and agricultural projects. In many parts of the world, women are the major providers and users of water, but programs and policies do not adequately address their concerns in water management. Programs that take into account the gendered nature of farming, fishing and livestock, will go a long way in addressing the needs of the poor, and increase the value derived from each drop of water. This would include ensuring secure access to water for agriculture for poor women and men through, for example, targeted investments in pro-poor technologies for water capture, storage and delivery like treadle pumps, low-cost drip kits, and small-scale water harvesting. Multiple use systems for domestic and industrial use, fisheries and livestock, in addition to crops, have the potential to raise the value of water used in agriculture and to benefit more people.

Agriculture can support healthy ecosystems. Managing agricultural systems as agro-ecosystems to generate several ecosystem services in addition to food production, will maintain the wider resource base in support of human well-being. The Ramsar Convention on Wetlands classified irrigated rice land as a human-made wetland which can support high levels of biodiversity, be important for recharge of groundwater and flood control, and be the inspiration for many cultural activities. Similarly, wetlands are increasingly viewed as sources of water and land for agriculture, especially in sub-Saharan Africa, threatening important ecosystems, and raising conflicts with other ecosystem users. The wise use of wetlands, with agriculture as one ecosystem service, is essential to maintain wetland resources.

The final touches to the assessment are now being put, including the development of key policy-relevant messages. These will be presented and discussed at the Stockholm World Water Week 2006.



# IWMI-Tata Annual Partners' Meeting talks Water, Equity and Development

**Water, Equity and Development** was the overarching topic of the 2006 IWMI-Tata Annual Partners' Meeting held in Anand, Gujarat. It is a key event to deliberate on India's water sector—an opportunity for researchers to communicate directly with senior researchers, policymakers, development organizations and activists.

This year's discussions were based on a multi-location format for research adopted in 2005. It covered eight themes, ranging from **Dalits and Water** to the **Future of Indian Agriculture**. Theme "custodians" presented papers developed through a dynamic process of teamwork carried out by the IWMI-Tata Water Policy Program (ITP).

Some of the key points emerging from the discussions around the main topic of **Water, Equity and Development** are outlined by Sanjiv Phansalkar, Senior Researcher and ITP Team Leader:

- ◊ **Current social and institutional arrangements** on control over and use of water create inequities regarding access to water for sheer survival in several locations and specific social groups. Dalits face the brunt of these inequities in a number of rural locations and these inequities become more pronounced where there is greater water scarcity.
- ◊ **Inequitable access to water** for livelihoods is ubiquitous and again seems to be correlated with water scarcity. Poor and landless animal holders face problems accessing water for their animals in most of the western and southern parts of India. Migrant livestock owners too face the same problem except when social institutions come to their aid. These issues of subsistence and livelihoods security were handled through traditional mechanisms of mutual negotiations and informal arrangements. More intensified agricultural production, however, has altered these practices.
- ◊ **Fetching water** for the family, as well as watering and feeding animals of the household are typically the responsibilities of rural women. Women have to trudge long distances to access water. They also have to deal with those who own the water sources. Thus, water inequities have significant gender dimensions.
- ◊ **There are pronounced inequities** in access to and use of water for income generation and wealth creation. The difference between water control enjoyed by head-end farmers and tail-enders has been substantially documented in the research presented.
- ◊ **Research shows up** the effects of geogenic factors (possibly exacerbated by human action) such as the differential impacts

caused by the presence of fluorides or arsenic in groundwater on people with differing income status and coping strategies.

- ◊ **The actions of industrial actors** impose negative externalities on farmers. Because of the significant differences in the relative social and economic standing of the two sets of actors, this too becomes an issue of inequity.

**The IWMI-Tata Program** was set up in 2000 as a partnership with the Sir Ratan Tata Trust, Mumbai, to take up problem-solving, practical research with direct policy implications in the water sector. Arun Pandhi, Senior Programmes Manager of the Trust sees the collaboration with IWMI as synergistic. Both organizations want to see changes take place on the ground:

*In terms of impact, much of the work has been converted into large initiatives by the Trust itself. One example is the Central India Initiative. The central India belt is the poverty belt of India—90 percent of the country's poor live here. IWMI's core area of research here matched our core area of funding. The research formed the basis of a policy level document which was finally presented to the Planning Commission. Based on the study, we divided the region into four zones to convert the research findings into practical outputs. The Central India Cell was set up to implement the recommendations. The idea is to bring in other sources of funding as well, other players to upscale across the region; the larger player of course being the government. But the main thing is, before bringing in the larger players, we are testing in the field so we know what works and what doesn't.* ◊



Photo Credit: Sharni Jayawardena

For more information on the IWMI-Tata Water Policy Program visit: <http://www.iwmi.cgiar.org/iwmi-tata/Index.asp>



# Interview with Mutsa Masiyandima



Dr. Mutsa Masiyandima investigates the fragile balance between conservation and agriculture, and focuses on wetlands as the delicate interface between these two activities. She talks to Water Figures about the early days of the Pretoria office, her projects and the impact of IWMI's research in the region.

## **How did you become interested in looking at wetlands, and why are you researching wetlands at IWMI rather than at a research institute focusing more purely on the environment?**

My interest in wetlands developed during the course of my PhD research in West Africa. This work was based on a small catchment containing a wetland used for rice production. The catchment was typical of many wetlands in this region. It was apparent to me that water management for agriculture required researchers to look broadly at how farmers, particularly those not using formal irrigation systems, manage water.

What we are doing at IWMI with the wetlands and agriculture research is not mainstream environmental research. We are addressing the issue of utilizing wetland water for agriculture without impacting negatively on the many other ecosystem services provided by wetlands. In sub-Saharan Africa many farmers take to farming in wetlands as they lack access to irrigation infrastructure or other suitable land for cropping. And there are many challenges regarding water and land management for agriculture that these farmers face. In some cases the solutions required are not the same as for rainfed agriculture.

## **IWMI's first regional office in Africa was set up in Pretoria in 2000, and you were there from the beginning. Five years on, could you tell us about this experience?**

The Africa Regional Office was officially opened at the end of 2000. It started with three members of staff—Doug Merrey, Herve Levite, and me. Doug was the Regional Director; Herve and I played a supporting role. It was an exciting and challenging time. We had to find our niche and identify research areas where we could contribute the most without duplicating initiatives by others already working in the region. We also needed to show our partners and other beneficiaries of our research that we were doing relevant work, and that we would add value to ongoing programs. But as the office had limited capacity, we also had to make choices—what to focus on, where, and which partnerships would help us achieve the necessary impact.

The office grew substantially in the years following our arrival, peaking at about 13 researchers around 2002/2003. With

that growth, we obviously could add more depth and breadth to our research. More strategic partnerships were formed.

## **What's the impact IWMI's work has made in the region?**

Initially, our impact was felt most strongly in southern Africa due to our physical presence there. With the expansion and opening of the then Ghana office and more recently, the Addis office, we are able to do more, with far-reaching impact. Our research has influenced the debates on water and poverty in the region. In South Africa IWMI is increasingly engaged in debates on water allocation reform. We believe that IWMI's focus on wetlands and agriculture has made governments and conservation-focused agencies in the region more aware of the need to move away from purely conservation approaches and look at more holistic approaches to sustainable management of wetlands.

## **What projects are you currently working on?**

I am working on two projects. The first is a project supported by the Challenge Program on Water and Food on "Wetlands-based livelihoods in the Limpopo basin, balancing social welfare and environmental security". The project aims to analyze the tradeoffs among uses of wetland water for supporting livelihoods. We want to make wetland users, resource use planners, and policymakers aware of the tradeoffs made when allocating wetland resources (land and water) to different uses. This is a multi-partner, multidisciplinary project implemented by IWMI, the Institute of Water and Sanitation Development, the University of Zimbabwe, and University Eduardo Mondlane (Mozambique). Although the project is implemented in the Limpopo River Basin, we envisage a generic analytical approach that can be applied in many countries in southern Africa.

The second is another multi-partner, multidisciplinary project on "Sustainable Management of Inland Wetlands in Southern Africa: A Livelihoods and Ecosystems Approach" supported by the Global Environment Facility. We work with two international partners, the FAO and IUCN Regional Office for Southern Africa as well as governments, NGOs and universities in the region. The project aims to increase capacity for the management of wetlands in both government and non-governmental agencies in southern Africa through the generation of new knowledge on wetland functioning, and the development of sustainable land management options for wetlands.

With these two projects we hope to build on current knowledge and positively influence the way in which people view and manage wetlands. Ultimately, people should realize that wetlands can be managed in a way that enhances livelihoods and minimizes the negative impacts associated with their exploitation. 

For further information, email Mutsa Masiyandima [m.masiyandima@cgiar.org](mailto:m.masiyandima@cgiar.org)



Clearing wetland vegetation to plant food crops at Mholapitsi wetland, Limpopo Province, South Africa. Photo Credit Mutsa Masiyandima

## Recent Publications

For on-line access to IWMI Research Reports and Working Papers, see [www.iwmi.org/pubs](http://www.iwmi.org/pubs)



### IWMI RESEARCH REPORTS

1. **Van Koppen, Barbara; Moriarty, P.; Boelee, Eline.** 2006. Multiple-use water services to advance the millennium development goals. Colombo, Sri Lanka: IWMI. v, 44p. (IWMI Research Report 98)

### COMPREHENSIVE ASSESSMENT RESEARCH REPORTS

1. **Courcier, R.; Venot, Jean-Philippe; Molle, François.** 2005. Historical transformations of the Lower Jordan River Basin (in Jordan): Changes in water use and projections (1950-2025). Colombo, Sri Lanka: IWMI Comprehensive Assessment Secretariat. vi, 85p. (IWMI Comprehensive Assessment Research Report 9)

2. **Molle, François; Berkoff, J.** 2006. Cities versus agriculture: Revisiting intersectoral water transfers, potential gains and conflicts. Colombo, Sri Lanka: IWMI Comprehensive Assessment Secretariat. vi, 70p. (IWMI Comprehensive Assessment Research Report 10)

### IWMI Working Papers

1. **Bandaragoda, Jayatissa.** 2006. Institutional adaptation for integrated water resources management: An effective strategy for managing Asian River Basins. Colombo, Sri Lanka: IWMI. v, 22p. (IWMI Working Paper 107)

2. **Bandaragoda, Jayatissa.** 2006. Status of institutional reforms for integrated water resources management in Asia: Indications from policy reviews in five countries. Colombo, Sri Lanka: IWMI. v, 31p. (IWMI Working Paper 108)

### IWMI ARTICLES IN INTERNATIONALLY REFEREED JOURNALS

1. **Abdullaev, Iskandar; Ul Hassan, Mehmood; Manthrithilake, Herath; Yakubov, Murat.** 2005. Making water distribution more transparent: Application of the time-based water distribution method to tertiary canals in Central Asia. *Journal of Applied Irrigation Science*, 40(2):193-216.

2. **Amoah, Philip; Drechsel, Pay; Abaidoo, R. C.; Ntow, W. J.** 2006. Pesticide and pathogen contamination of vegetables in Ghana's urban markets. *Archives of Environmental Contamination and Toxicology*, 50:1-6.

3. **Kamara, Abdul; Kirk, M.; Swallow, B.** 2005. Property rights and land use change: Implications for sustainable resource management in Borana, Southern Ethiopia. *Journal of Sustainable Agriculture*, 25(2):45-61.

4. **Klinkenberg, Eveline; McCall, P. J.; Wilson, M. D.; Akoto, A. O.; Amerasinghe, Felix; Bates, I.; Verhoeff, F. H.; Barnish, G.; Donnelly, M. J.** 2006. Urban malaria and anaemia in children: A cross-sectional survey in two cities of Ghana. *Tropical Medicine and International Health*, 11(5):578-588.

5. **Lautze, J.; Giordano, Mark.** 2006. Transboundary water law in Africa: Development, nature, and geography. *Natural Resources Journal*, 45(4):1053-1087.

6. **Qadir, M.; Noble, Andrew; Oster, J. D.; Schubert, S.; Ghafoor, A.** 2005. Driving forces for sodium removal during phytoremediation of calcareous sodic and saline-sodic soils: A review. *Soil Use and Management*, 21:173-180.

7. **Qureshi, Asad Sarwar; Masih, Ilyas; Turrall, Hugh.** 2006. Comparing land and water productivities of transplanted and direct dry seeded rice for Pakistani Punjab. *Journal of Applied Irrigation Science*, 41(1):47-60.

8. **Qureshi, Asad Sarwar; Sarwar, A.** 2006. The potential of water harvesting for managing droughts in Pakistan. *Journal of Applied Irrigation Science*, 41(1):35-46.

9. **Schipper, Lisa; Boyd, E.** 2006. UNFCCC COP 11 and COP/MOP 1. *Journal of Environment & Development*, 15(1):75-90.

10. **Shah, Tushaar; Singh, Om Prakash; Mukherji, A.** 2006. Some aspects of South Asia's groundwater irrigation economy: Analyses from a survey in India, Pakistan, Nepal Terai and Bangladesh. *Hydrogeology Journal*, 14:286-309.

11. **Turrall, Hugh; Etchells, T.; Malano, H. M. M.; Wijedasa, H. A.; Taylor, P.; McMahon, T. A. M.; Austin, N.** 2005. Water trading at the margin: The evolution of water markets in the Murray-Darling Basin. *Water Resources Research*, 41(7):8p.

