



IWMI Research South Asia

Revitalizing irrigation

Improving agricultural water productivity

Climate change and adaptation

Urban and peri-urban agriculture

Transboundary water transfers

Groundwater

Environmental flows



Photo: Faseeh Shams/IWMI

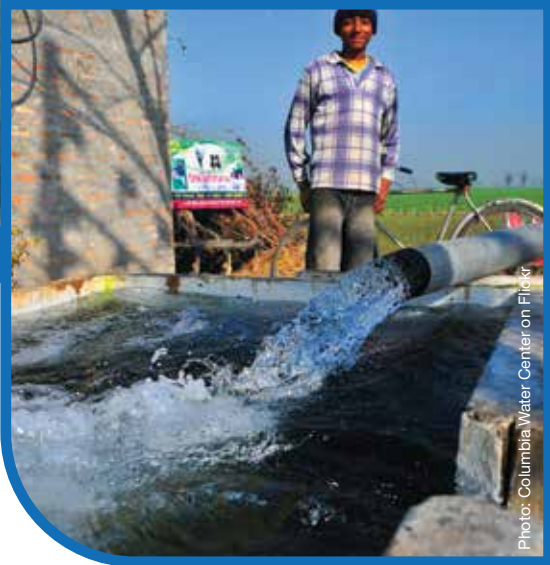


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Revitalizing irrigation

Many of the irrigation systems in the region are expensive, overly complex and poorly run. Despite massive investments in public irrigation systems over the years, the yields of many of these systems are much lower than expected.

More than one billion rural people live on less than USD 2 per day. Malnourishment is still a challenging issue. Dynamic economic growth across the region is luring many away from agriculture to seek better livelihoods in urban areas, which may have profound consequences for the region's long-term food security.

Solutions: South Asian agriculture could be made more productive and profitable by improving the performance of the large canal-based irrigation systems that dominate many rural areas. IWMI's research is looking at management models that can deliver improved and sustainable irrigation performance. Research has shown that irrigated land is about 2.5 times more productive than rainfed agricultural land.

Introduction

South Asia has a rich history of water innovation marked by ancient tanks, canals and other hydraulic systems. Massive public investments were also made in newer surface irrigation schemes. These irrigation systems served the region well during the Green Revolution of the 1960s and 1970s in averting widespread food shortages.

However, today, the region faces another potential crisis because of rising water demands from a swelling population, climate change, underperformance of existing public systems and over-pumping of water in many areas.

Research carried out by the International Water Management Institute (IWMI) sheds light on the key challenges and the possible solutions to produce more food with less water, and achieve a balance between human and environmental needs.

Improving agricultural water productivity

Agriculture uses nearly 70% of all available developed freshwater resources. Water scarcity is an acute problem in many areas and is compounded by rapid population growth. In India, for example, water demand is forecast to equal water availability by 2025. In the Indus-Ganges Basin, only about 8% of the cropland is highly productive, making regional food security fragile. The challenge for South Asia's small farmers is to produce more food with less water.

Solutions: IWMI explores how practical simple changes in water policy and practice can help grow more food, protect natural systems and reduce poverty.

IWMI's research examines how farmers can reduce water use and improve yields through more timely irrigation, technologies such as drip irrigation, new crop varieties, soil management and rainwater harvesting.

New analytical tools such as remote sensing and computer modelling are allowing researchers to measure water productivity on a scale previously unimagined. This information can help target infrastructure investments to improve farm incomes and ensure regional food security.

The potential to increase water productivity is high in South Asia, as evidenced by successes elsewhere. For instance, thanks to well-targeted investments, China produces three times more food than India using less water.

Climate change and adaptation

By 2050, it is predicted that more than *one billion* people living in river basins flowing from the Himalayas could be affected by a decline in the availability of freshwater. Climate changes resulting in rainfall variability and heat waves will further intensify existing water resource problems. Recurring droughts and floods will lead to loss of lives, loss of rural livelihoods and food insecurity. For example, wheat yield losses due to climate change are expected to double from 2025 to 2050.

Solutions: Much of the technology needed for climate change adaptation already exists. Implementation of these technologies requires new approaches to policy and management.

IWMI researchers, in partnership with governments, non-governmental organizations (NGOs) and international research institutions, are identifying "no regrets" adaptation strategies that will help safeguard water supplies and food security. The strategy ranges from public policy analysis to water storage options to economic incentives to improve water productivity.



IWMI research:

Local solutions to regional challenges

PAKISTAN

“We are working with farmers to strengthen their abilities by bringing in new ideas, products and technologies, such as information and communications technologies (ICT). Pakistan has a well-developed mobile phone network, which, for example, could be used to help farmers manage water more effectively.”

Arif Anwar, Principal Researcher - Irrigation/Head of Office, IWMI, Lahore, Pakistan



INDIA

“The use of solar pumps for irrigation is taking off in India. They could be a great boon to farming, but ‘free’ power might lead to over-pumping of aquifers. The Solar Power as a Remunerative Crop (SPaRC) project promotes sustainable groundwater management by allowing farmers using solar-powered pumps to sell excess electricity generated back to the grid. State governments in Gujarat and Haryana have expressed their interest and a new pilot cooperative has been set up to identify whether transaction costs can be made economically viable.”

Tushaar Shah, Senior Fellow, IWMI, Anand, India



“IWMI’s research in India has had a significant impact on water policy. We are committed to innovative science and providing evidence-based solutions for emerging national priorities. These include managing climate-related disaster risks, new business models for waste and wastewater management, revitalizing irrigation systems and sustainable intensification of agriculture. We seek strong partnerships with national and international research and development agencies, so that we can continue to develop quality knowledge products and build capacities.”

Alok K. Sikka, IWMI Representative - India and Principal Researcher, New Delhi, India



“IWMI has intensified its efforts in the Ganges River Basin. Our research on the importance of environmental flows for maintaining river ecosystems is widely appreciated and forms the basis of new policies of the government. In addition, the Healthy Ganga - Cleaner Water and More Productive Ecosystems project (implemented by the CGIAR Research Program on Water, Land and Ecosystems [WLE]) is developing practical solutions for cleaning the river, and making productive use of the liquid and solid waste.”

Bharat R. Sharma, Emeritus Scientist, IWMI, New Delhi, India



“Our work on wetlands has helped to show that they provide important ecosystem services such as flood control and water purification. However, they are neglected and often under pressure from development. Currently, we are promoting the restoration and ‘wise use’ of wetlands, especially among the low-income groups, with support from the Government of India. The government is keen to see that wetland conservation is promoted in every state, and we have been invited to support these activities.”

Priyanie Amerasinghe, Senior Researcher: Human and Environmental Health, IWMI, India



NEPAL



“The complex link between migration, agriculture and water management is a critical issue for IWMI and its local partners in South Asia. Male out-migration is now essential for marginal and tenant households to meet their subsistence needs, and this leads to the feminization of agriculture. Although this can potentially empower women, they continue to encounter constraints in accessing irrigation, a task which has long been a male domain. Male-dominated canal management committees now struggle to find enough members, yet they offer few opportunities for women. Our research can offer new solutions.”

Fraser Sugden, Senior Researcher - Political Economy and Water Governance, IWMI, Kathmandu, Nepal

INDIA



“We are entering bold new terrain in the Ganges River Basin with our pilot project on ‘Underground Taming of Floods for Irrigation’ (UTFI). This is a chance to address the two major water challenges of seasonal flooding and groundwater depletion through one intervention. So, this is why the trial now under way in Rampur District is very important. Its verification and replication would bring meaningful benefits for both rural and urban communities alike.”

Paul Pavelic, Principal Researcher – Hydrogeology, based at IWMI, Vientiane, Lao PDR, and working on the UTFI project in India

SRI LANKA



“In my work in hydrological modelling, recent advances in satellite remote sensing are tremendous breakthroughs. We will soon know much more about the quantities of surface water stored in Sri Lanka. Such knowledge will be invaluable in helping policymakers and farmers plan for future rainfall variability under climate change.”

Nishadi Eriyagama, Water Resources Engineer, IWMI, Colombo, Sri Lanka



“In my work in managing floods and droughts, we are promoting new products and tools that allow governments to better plan their investments in development. Particularly relevant are flood-risk mapping, index-based flood insurance, drought monitoring systems and climate hazard risk assessment. These will help policymakers and local communities to address the impacts of climate change, and can enhance the resilience of agriculture.”

Giriraj Amamath, Sub-theme Leader: Water-related Disaster Risk Management, IWMI, Colombo, Sri Lanka



Rapid urbanization is creating huge challenges for the management of water and waste in urban areas. IWMI is looking at decentralized, business-oriented models for the reuse of urban waste, such as fecal sludge, wastewater and municipal solid waste, which can create jobs, reduce pollution and improve sanitation. We are exploring how valuable products such as fertilizer and fuel can be derived from waste and contribute to improved financial sustainability of waste management.”

Krishna Chaitanya Rao, Researcher – Business Model Analysis and Enterprise Development, IWMI, Colombo, Sri Lanka

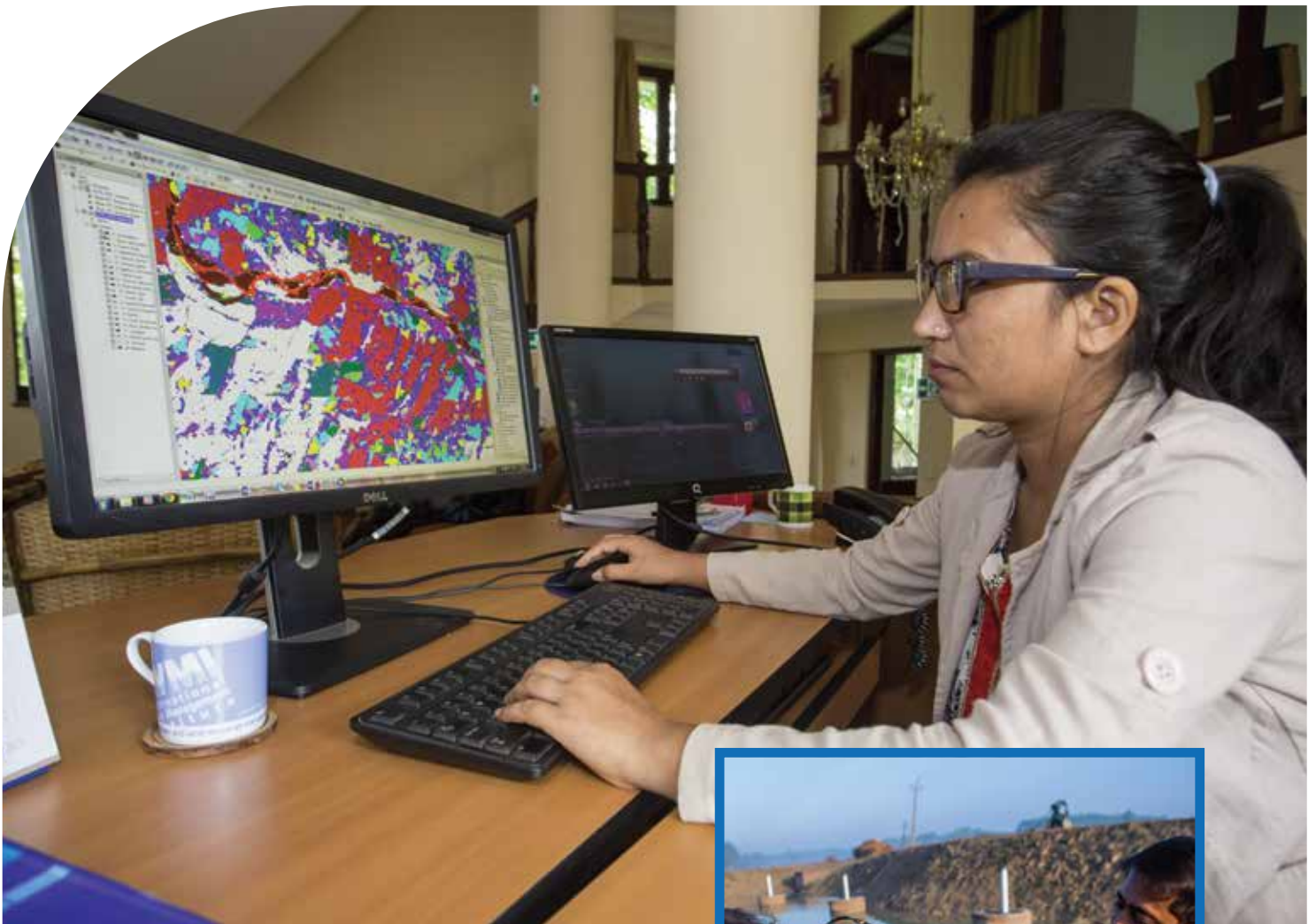


Photo: Sharad Maharjan/IWMI

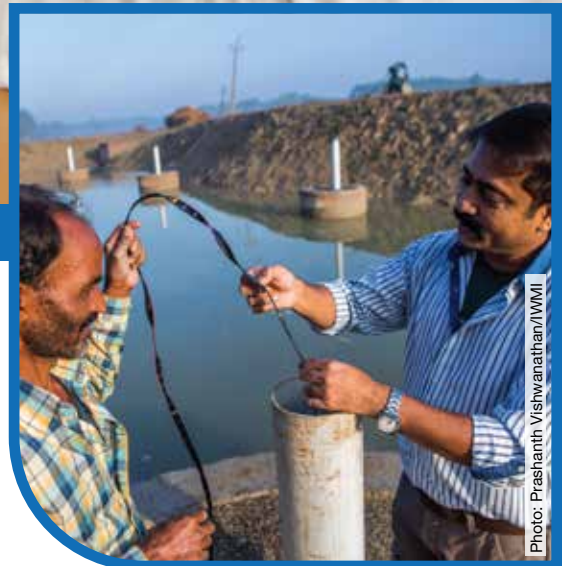


Photo: Prashanth Vishwanathan/IWMI

Urban and peri-urban agriculture

Urban and peri-urban agriculture has much to contribute to food security, poverty reduction, better nutrition and green space in growing cities in South Asia. Government officials are beginning to understand the need to include urban agriculture in city management strategies. However, urban farmers are often forced to use contaminated water or sewage to grow their crops, which can be harmful to human health.

Solutions: IWMI's research looks at how urban and peri-urban farmers can safely use polluted runoff and fecal waste in agriculture. The Institute is also developing innovative business models that use the cash generated from converting human waste to valuable compost to fund urban sanitation projects.

Transboundary water transfers

Almost all of the large river basins of South Asia - the Indus, the Ganges, the Brahmaputra and

others - traverse national or provincial boundaries, raising the potential for conflict, resulting in a sub-optimal use of the resource, and making it more difficult to manage floods and droughts.

Solutions: Evidence suggests the imperative to share water resources is an ideal platform for promoting cooperation, mutual trust and transparency. IWMI's global perspective on transboundary issues enables it to identify best practices from across the world that can inspire water managers and policymakers to cooperate across South Asia's river basins. In South Asia, IWMI's research has contributed to an active debate on large-scale surface water transfers, such as India's National River-Linking Project. Improved information sharing among riparian countries helps ensure the optimal management of water boundaries.

Groundwater

Groundwater use has grown exponentially in large parts of South Asia, leading to rapidly-depleting water tables. Groundwater use is the major driver of agricultural growth in many regions. Such overexploitation and falling water tables are seen in the Indo-Gangetic Basin, the world's most intensively irrigated region and home to more than 600 million people. Sustainable groundwater management is a challenge. Not only must the local hydrology be understood, the complex interrelation of politics, economics and other social conditions all play a significant role. Subsidies for diesel and electricity, for instance, have a profound effect on groundwater use, but lie outside the water sector.

Solutions: IWMI scientists seek to identify local solutions to sustainable groundwater use that suit farmers, policymakers and environmentalists. Properly managed groundwater recharge technologies, for instance, can help make small-scale agriculture more productive and sustainable.

IWMI also identifies best practices and investment strategies in parts of South Asia that have an abundance of groundwater, but its potential has often been neglected. In part, this is because so much attention has been given to areas of overexploitation, and, in part, because people are unaware of or have no incentives to make the necessary investments.

A proper understanding of the relationship between water and energy (known as the water-energy nexus) can help alleviate problems.

Environmental flows

Environment is the silent stakeholder of water allocation. However, water demand for human use is increasingly coming into conflict with environmental requirements.

Solutions: IWMI's research recognizes that well-functioning natural systems underpin humanity's well-being, both in rural agriculture and urban life.

IWMI's computer-based Global Environmental Flow Calculator helps to quantify water demands. The Institute has worked with national partners to undertake the first-ever comprehensive environmental flow assessment in the Ganges, where religious and cultural dimensions were incorporated. By working out the environmental flows needed to maintain healthy ecosystems, disputes between stakeholders can be resolved and trade-offs negotiated.



Photo: Peter Casler on Flickr



Photo: Chhandak Pradhan/IWMI

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Find out more:

www.iwmi.org

For project details, databases, publications and communication materials.

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