



IWMI Research West Africa

Increasing food production in healthy and resilient environments

Business opportunities for resource recovery and reuse

Water and women

Irrigation from shallow groundwater

Rainwater management

Investing in rice

Water, energy and food

Biotechnology and water supply

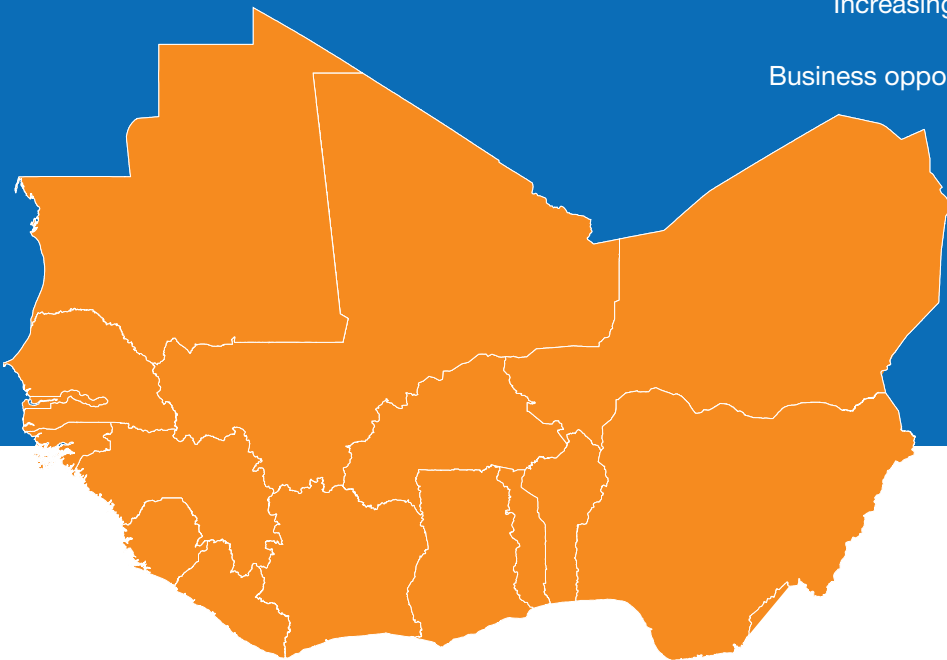




Photo: Felix Antonio



Photo: Nana Kofi Acquah

Increasing food production in healthy and resilient environments

Introduction

Research carried out by the International Water Management Institute (IWMI) in West Africa particularly targets the water security of poor farmers in rural and peri-urban areas. It contributes to the development of evidence-based strategies and solutions for using water more productively and sustainably under changing conditions of availability. The research agenda addresses local constraints to achieving food security, improved human and ecosystem health, and economic empowerment of smallholder farmers.

IWMI supports the Agricultural Policy of the Economic Community of West African States (ECOWAS) through collaboration with national, regional, subregional and international partners. The Institute's research also targets the goal of the West Africa Agricultural Productivity Programme (WAAP) towards achieving at least 3% annual growth in sustainable agricultural productivity. At a national level, IWMI collaborates with government ministries and national agricultural research organizations, and also works closely with a wide array of development partners, civil society organizations and private sector enterprises.

In recent years, gains in agricultural productivity in Africa have been disappointing. Meanwhile, the demand for food is rising rapidly. To address this gap, the development of irrigation will be vital. However, water supplies are under increasing pressure. Intensifying agriculture will also put a strain on fragile topsoils, potentially leading to catastrophic erosion, unless sustainable practices are adopted. New approaches are required to increase food production whilst ensuring healthy and resilient environments.

Solutions: IWMI researchers are developing, testing and implementing locally-appropriate, robust and affordable soil and water management innovations. These will enable African farmers to increase food production. They will also help to achieve the sustainable use of irrigation water, conserve soil fertility and reduce pollution of freshwater reserves. As with many of its approaches, these build on existing traditional practices and irrigation strategies.

A further concern is foreign direct investment (FDI) in agriculture in sub-Saharan Africa, which has led to the acquisition of millions of hectares of land. Yet, a number of pertinent questions remain unanswered about its likely impacts on water resources, food security and livelihoods. IWMI researchers and partners are working to better understand the impacts of large-scale investments. The aim is to develop policy options for leasing agricultural land that leads to equitable benefit sharing between investors, current land users and affected communities without compromising ecosystem services.

Business opportunities for resource recovery and reuse

West Africans generate millions of tons of waste every day. This is often rich in water, nutrients and energy. Meanwhile, millions of smallholders in the region struggle with depleted soils, lack of water and limited access to energy. Although composting and wastewater reuse are well known processes, most initiatives aiming at resource recovery and reuse (RRR) heavily depend on subsidies and remain small, often not surviving beyond their pilot phase. A new approach is needed to implement viable solutions at scale which support livelihoods, enhance food security, support green economies and contribute to cost recovery in the sanitation chain.

Solutions: IWMI's RRR research is piloting a novel, market- and reuse-oriented approach to sanitation called 'Design for Reuse'. Through market analysis, institutional support and innovation in business models, it looks at the best way to use applied technologies for maximum agronomic impact and safety.

Exploring ways to profitably convert fecal sludge into effective pelletized fertilizer, for instance, is a central research goal. Related projects look at wastewater reuse in irrigation, aquaculture in wastewater maturation ponds and the use of biogas. The research is being used to develop practical training materials for business schools and investment catalogues for donors.

Water and women

Women farmers too often find themselves denied the same access to water and other resources that men enjoy. An understanding of how women can be supported in agriculture, by ensuring their access and rights to resources, can make a huge difference not only to their livelihoods but also to their standing in society.

Solutions: The needs of marginalized and vulnerable groups, such as women, are a central theme of IWMI's research activities. The Institute has pioneered innovations such as the multiple-use water services (MUS) approach. In poor communities, individual water sources are used for a range of activities. A single pump or reservoir may serve for washing, drinking, cattle, crops and more. MUS is a participatory approach that takes the many domestic and productive needs of water users as the starting point of planning, designing and delivering water services.

In Burkina Faso, IWMI is studying the effects of water reforms at a grassroots level. The Institute is investigating the link between water users' associations (WUAs), gender and the established local water committees (Comités Locaux de l'Eau [CLEs]), which are the institutional structures for integrated water resources management at the local level in Burkina Faso. The study will compare WUAs in several parts of the Volta River Basin and link household water access to agricultural production.



Photo: Nana Kofi Acquah

IWMI research:

Local solutions to regional challenges

● IWMI office



"IWMI research in West Africa explores biophysical, socioeconomic and institutional solutions to address local water management constraints. In collaboration with many partners and colleagues from other IWMI offices, our research contributes to improved human and ecosystem health, and the economic empowerment of various people, including smallholder farmers and local entrepreneurs. We achieve this through a suite of solutions developed across several projects and programs, including the CGIAR Research Program on Water, Land and Ecosystems (WLE) which has a regional focus on the Volta and Niger river basins."

Olufunke Cofie, Head, IWMI West Africa

"The majority of existing waste treatment plants in Ghana do not operate as designed. Often, there is little money for operation and maintenance. We are working to address this using *design for reuse*, an innovative market-oriented approach that seeks to generate cash from waste. For example, we are using effluent from a rehabilitated treatment plant to create fertilizer for crop production, and to produce fish in the wastewater maturation ponds. The revenue generated will be used for the operation and maintenance of the plant, easing the burden on households and the authorities who would otherwise have to fund wastewater and fecal sludge treatment."

Philip Amoah, Senior Researcher - Resource Recovery and Reuse, IWMI West Africa



"In sub-Saharan Africa, the recent trend in large-scale agricultural land acquisition by foreign investors can represent an opportunity or a threat for the local population and their access to resources, especially water. The research challenge is to investigate the legal, political, socioeconomic and environmental dimensions of large-scale land deals, provide rigorous scientific information and analyze policy options. The political challenge for decision makers is to use the research results and address the issue with adequate policies. The stakes are high and the success will likely depend on the ability of researchers and policymakers to speak the same language and work closely together."

Yoro Sidibe, Post-Doctoral Fellow - Economics, IWMI West Africa



"Sanitation is a key challenge for growing cities, but safe reuse and recycling of waste is possible in low-income countries. If human waste can be converted into valuable fertilizer, the income generated can then be used to improve access to sanitation. A decade of research at IWMI has led us to attempt to demonstrate this approach in Ghana in partnership with the public and private sectors."

Josiane Nikiema, Researcher - Environmental Sciences, IWMI West Africa



"We are working in Ghana to better understand how to bridge the gap between the need for fertilizers for agriculture and the need to more effectively manage large quantities of waste. As part of IWMI's research into resource recovery and reuse, we are evaluating the value of different organic wastes as fertilizers. We are working to find the best possible combination of these, that is both high in nutrients and sanitized, for use with specific crops. We are keen to demonstrate the potential for organic wastes such as fecal sludge to be used as an effective alternative to mineral fertilizer."

Surendra Pradhan, Post-Doctoral Fellow - Agricultural Reuse, IWMI West Africa



Ghana

Accra



“The key objective of IWMI’s research is to inform decisions and actions that will have a positive development impact; reducing rural poverty, improving food security, nutrition and health, and helping to manage natural resources more sustainably. We strive to ensure that the outputs of our research answer the questions, and knowledge needs, of the many research users we engage with, be they small-scale farmers or national policymakers. In West Africa, as in other parts of the developing world, our approach to impact puts people - research users and the ultimate beneficiaries - at the heart of research-for-development efforts.”

Thor Windham-Wright, Research Uptake and Communications Coordinator – Africa



“The idea of deriving wealth out of what is considered as sheer waste has always fascinated me. In my research work, I have come across innovative waste-to-resource business ideas and it is evident that these have tremendous potential in low-income countries. Imagine all the waste in the cities of low-income countries converted into some sort of useful product. We need to learn about what drives the success of waste-to-business models and how we can export this success to other regions.”

Solomie Gebrezgabher, Researcher – Economics, IWMI West Africa



“We’re working on a project that aims to provide recommendations for the scaling-up of shallow groundwater irrigation technologies in the White Volta River Basin. We’re working closely with iDE, other nongovernmental organizations, organizations in the sector and farmers to expand pilot-testing, enable out-scaling of more profitable and water-efficient technologies, and to create better opportunities for sustainable and profitable smallholder irrigation enterprises. It is envisioned that this knowledge will in turn induce changes in national irrigation policies, and increase the effectiveness of local and international investments in shallow groundwater irrigation systems.”

Pamela Katic, Researcher - Economics, IWMI West Africa



“Agriculture in Northern Ghana suffers from a combination of high rainfall intensity and intervening dry spells. We are working to find ways to help farmers manage and balance these two extremes, reducing crop stress, and improving agricultural productivity and related livelihoods. We’ve developed a physical model using buckets of water that directly emulates an electronic model, so farmers themselves directly simulate the various approaches to managing agricultural water on their fields. They’re then in a better position to weigh up options. Through this, and by also engaging farmers, extension agents and others in training and interactions in the field, we’re helping to provide alternative and effective solutions to some of their most pressing agricultural challenges.”

Tim Ellis, Senior Researcher - Agricultural Water Management, IWMI West Africa



“The construction of the Akosombo and Kpong dams on the Volta River has led to many economic benefits, but has negatively affected downstream communities through the regulation of water flows. Communities have adjusted and restoring the old system is no longer desirable, as areas previously flooded are now being used. However, small changes in the operations of the two dams could improve the downstream livelihoods. Restoring the low flows, for instance, would reduce hydropower production somewhat, but it would also reduce aquatic weeds and waterborne diseases. Saltwater intrusion would also increase and this would benefit the once prosperous clam industry. With our partners, we are looking at how to adjust water flows to achieve the best balance between these two competing outcomes.”

Marloes Mul, Researcher, Hydrology and Water Resources, IWMI West Africa



Photo: Joe Romzo/IWMI

Irrigation from shallow groundwater

Only 5% of agricultural land in sub-Saharan Africa is irrigated. Shallow groundwater resources are significantly underused as a source of water for irrigated agriculture in many parts of sub-Saharan Africa, including the White Volta River Basin. More extensive and sustainable use of this resource could boost farm incomes and improve regional food security.

Solutions: IWMI scientists are working in the Atankwidi catchment of the White Volta River Basin to identify and introduce affordable and relevant technologies for accessing shallow groundwater. At the same time, the study team is also exploring how to improve the profitability and market access of agricultural products. The project has enabled local people to assess, discuss and pinpoint the most appropriate and effective shallow groundwater irrigation options for their circumstances. Partners are now developing a decision support system for targeting investments in small-scale pump-based shallow groundwater irrigation systems in other locations in the White Volta River Basin.

Rainwater management

In the Volta River Basin, many communities remain vulnerable to water scarcity and variability. Finding solutions to these vulnerabilities partly requires improved rainwater management. Farmers use small reservoirs to help better manage the periods

of drought and floods, by trying to ensure that water is more consistently available for their crops and animals throughout the year. There are more than 1,700 small reservoirs scattered across Burkina Faso and Ghana. Initially built as watering holes for cattle, small reservoirs have come to serve multiple purposes, but population growth and climate change are putting further pressure on limited rainwater resources.

Solutions: IWMI and its partners are validating and adapting techniques for managing water for food at local and sub-basin levels. The project will enhance innovation and learning on water management for food production within and between the Volta and Niger basins. It will analyze the resilience of socio-ecological systems of small reservoirs and the trade-offs between productive uses as well as the health and ecological implications of reservoirs to ensure that they can effectively support dry-season crop and livestock production.

A different kind of problem is faced in the Benue and Niger river basins in Nigeria, where communities and farmland are prone to severe flooding. IWMI researchers are responding to a direct request from the Federal Ministry of Agriculture and Rural Development, Nigeria, to provide guidance on simultaneously improving dry-season farming through integrated agricultural water management (AWM) solutions and providing flood mitigation on the Benue and Niger rivers. IWMI is working to provide fact-based evidence, on the extent and pattern of flooding, to guide decision making on flood response and the development of AWM solutions to support flood recession agriculture.

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Investing in rice

Rice has become a staple food for many people in West Africa and the demand for it continues to increase. Around 70% of this demand, however, is met through imports. Large-scale rice production in the region, using irrigation, is on the increase, but has met with mixed levels of success. Thus, there is an urgent need to examine the economic and livelihood impacts of large-scale irrigation in West Africa, as a means to improve the way in which ongoing and future irrigation development projects are undertaken.

Solutions: IWMI is examining how and why there is considerable variation in the performance of irrigated rice production in the region by looking at investment patterns, and productivity and equity impacts. The results of this work will provide guidance to improve the way in which large-scale irrigated rice cultivation is undertaken in West Africa.

Water, energy and food

In recent years, the interconnectedness of water, energy and food has been given much prominence. In the Volta River Basin, the huge Akosombo Dam is a clear demonstration of the economic benefits of such projects. The electricity it supplies powers much of Ghana, and the water it stores has opened up irrigation opportunities. Its construction, however, displaced thousands and its operation continues to adversely affect the livelihoods of downstream communities.

Solutions: IWMI looks at the costs and benefits of constructing and managing large-scale water infrastructure, and seeks to find

trade-offs that maximize benefit sharing. IWMI played a leading role in the setting up of the Ghana Dams Dialogue (GDD), a unique discussion forum that seeks to achieve potential development gains from dams while minimizing the costs to dam-affected communities. IWMI researchers are also looking at how the Akosombo and Kpong dams are managed, in order to determine whether economic growth and poverty reduction can be improved through the restoration of downstream ecosystems, food systems and livelihoods.

Biotechnology and water supply

With rapid economic development, water quality is becoming a central issue across West Africa. Biotechnology has the potential to play an important role in treating polluted sources and thereby help respond to the challenge of water scarcity. However, at present, there is little awareness of the benefits of these technologies, and few attempts have been made to adapt them to local circumstances.

Solutions: IWMI partnered in an initiative which promoted access to biotechnological solutions such as lagooning, land treatment, phytodepuration (using plants to clean water) or constructed wetland systems. These approaches can remove pathogenic microorganisms and degrade organic pollutants, so that wastewater can be recycled for irrigation and domestic use.

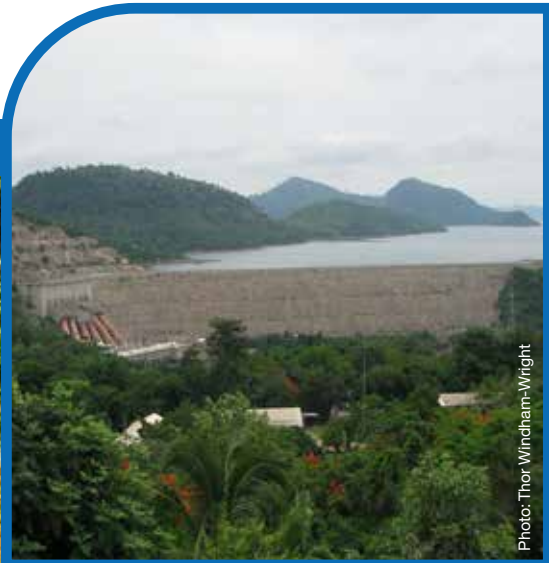


Photo: Thor Windeham-Wright

Photo: Peter Caster/CGIAR

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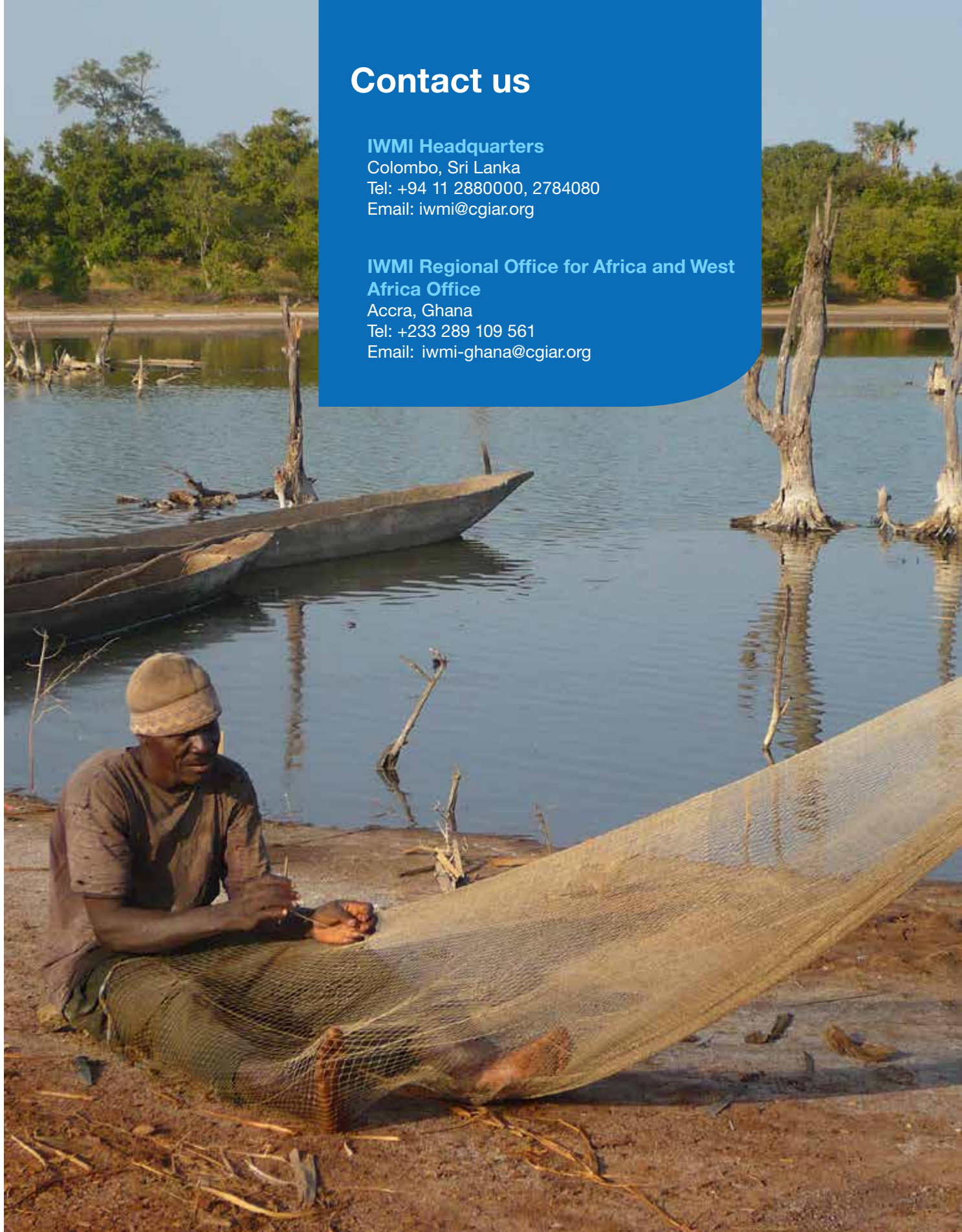


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Find out more:

www.iwmi.org

For project details, databases, publications and communication materials.

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IWMI is a member of the CGIAR Consortium and leads the:



RESEARCH PROGRAM ON
Water, Land and Ecosystems