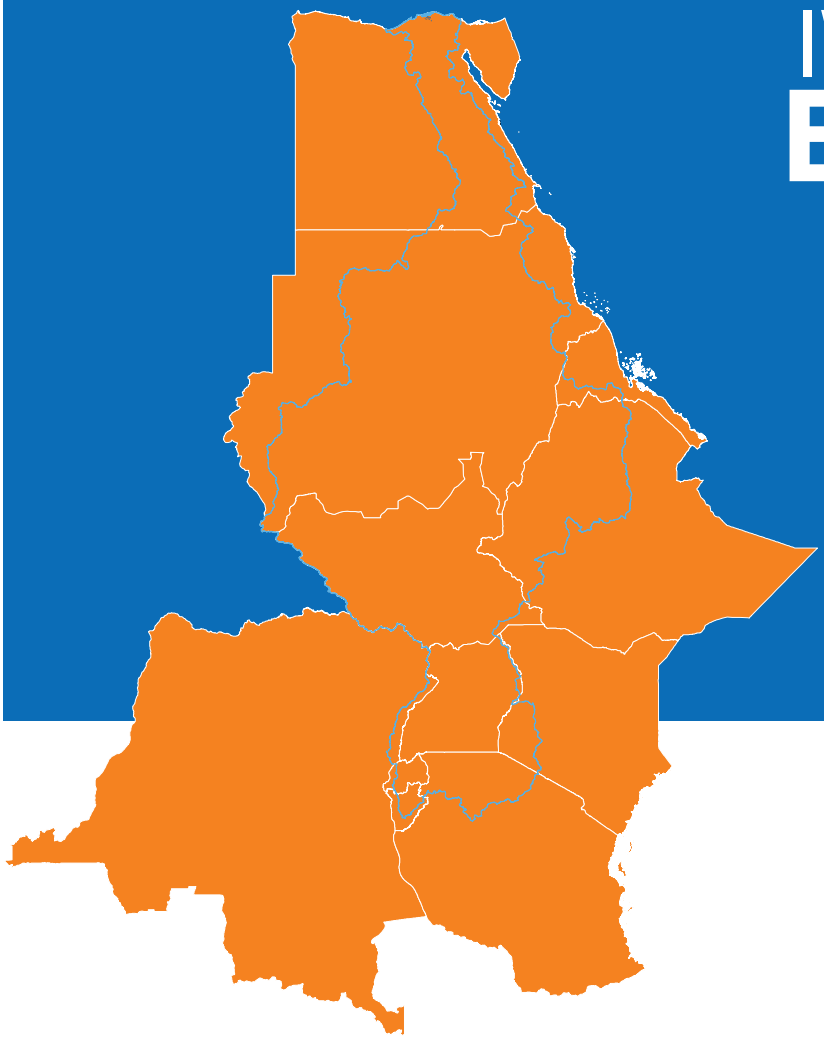

IWMI Research
East Africa

Water availability

Landscapes and ecosystems

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IWMI
International Water Management Institute

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IWMI in East Africa

Despite having significant water and land resources, East Africa is one of the world's most food-insecure regions. There are multiple reasons for this, but inadequate investment in water infrastructure and storage, and inappropriate policies in some areas are significant contributors. Research conducted by the International Water Management Institute (IWMI) seeks to contribute to evidence-based strategies and solutions to the agricultural water management challenges that contribute to this lack of food security.

The Nile River Basin dominates Eastern Africa, and it continues to be one of the benchmark basins for IWMI's broader research agenda. Over 70% of the people living in this region depend on subsistence rain-fed agriculture for their livelihoods. This situation is becoming more precarious with increasingly unpredictable rainfall patterns. Appropriate management and development of the region's water and land resources is crucial to reducing poverty, improving food security and increasing economic growth.

The East Africa and Nile Basin Office of IWMI is based in Addis Ababa, but the Institute collaborates with national, regional and international partners. Its research portfolio aims to support the Agriculture and Rural Development Strategy and Food Security Action Plan of the East African Community.

Water availability

Challenge: Rainfall over much of Eastern Africa is highly seasonal. Consequently, many communities are plagued by lack of water in the dry season. If more water could be stored in ways that are easily retrievable by farmers, many would be able to grow an extra crop or support cattle, which will hugely improve food security and incomes. Improved access to water could also open up opportunities for introducing irrigation technologies, which can treble farm yields. Irrigated agriculture currently accounts for only 5% of arable farming across sub-Saharan Africa.

Solutions: IWMI's research looks at water storage and access options at all levels, but takes a holistic view. We continually seek to integrate wider environmental and development concerns into our approach:

- On small farms, researchers are exploring how best to catalyze uptake of new innovations, such as pumps and farm ponds.
- Increasing groundwater use could underpin an explosive growth in farm productivity. IWMI has mapped groundwater availability across the continent, and can use its skills in hydrological modeling to make recommendations for the sustainable use of groundwater resources.
- Improved rainwater harvesting and management offer further options for many households.

- Technical improvements in water access will need to be underpinned by capacity and institutional strengthening to enable all stakeholders to actively contribute and share in the process.
- At the river basin scale, IWMI looks at the needs of competing water users, including hydropower generation, and seeks to find ways to maximize equity and sustainability across all communities. This emphasis on the water-food-energy nexus enables policy advice to be tailored to address specific needs and make informed decisions about trade-offs.

Landscapes and ecosystems

Challenge: Eastern Africa hosts a huge variety of landscapes. Almost everywhere, however, the pressures of economic development and population increases are beginning to degrade natural systems. As a result, problems such as soil erosion and salinity are becoming more common.

Solutions: The challenges facing communities and ecosystems cannot be addressed in isolation. IWMI conducts research at the landscape scale to get a comprehensive overview of all the factors involved in influencing resource management. The *AFROMAISON* project is a good example of this cross-disciplinary approach. The project, funded by the European Union with IWMI as a leading partner, is a multinational initiative that aims to develop realistic strategies for integrated natural resource management in five African countries (Ethiopia, Mali, Tunisia, South Africa and Uganda). It produced a 'toolbox' of policy advice and innovation that can help communities manage existing pressures and adapt to the impacts of a changing climate.

AFROMAISON project: http://www.afromaison.net/

Modernizing food production through value chain development

Challenge: Simply producing more food will not, on its own, be sufficient to deliver food security and prosperity to the region. Agricultural expansion must be achieved sustainably, if the ecosystems that underpin it are to be maintained. Modernization and mechanization of agriculture will clearly play an important role in this process, but a more holistic view can take into account the costs and risks of innovations, as well as the benefits. This may mean that we need radical changes in how agriculture is valued and financed.

Photo: Mastewal Degefa

Photo: Simon Langan/IWMI

IWMI research:

Local solutions to regional challenges

● **IWMI office**

"East Africa is undergoing tremendous change. The accelerating pace of development is throwing up huge opportunities, but also great challenges. Our interdisciplinary approach to research can help shed light on the complex trade-offs that will need to be made to improve livelihoods, bolster regional food security and protect the environment. It is a great privilege to lead IWMI's dynamic team of researchers and engage with our many partners at this exciting time."

Simon Langan, Principal Researcher - Agricultural Water Management and Head of Office, IWMI, Addis Ababa, Ethiopia

"My work in the Nile Basin examines the integration of livelihoods, landscapes and decision making on the use and management of water and land resources. It also involves looking at the socioeconomic, cultural and institutional dimensions of the use and management of natural resources. The research contributes to a broader understanding of people-landscape relationships, thereby contributing to designing policies that can improve livelihoods as well as maintaining environmental sustainability."

Mengistu Dessalegn, Researcher – Social Sciences, IWMI, Addis Ababa, Ethiopia

"As a social scientist working in the Nile and Volta regions, my primary work is carrying out participatory research activities that include local stakeholders from farmer to regional government level. The data collected in this way feeds the relevant sociocultural information about Integrated Water Resources Management (IWRM) and Natural Resource Management (NRM) practices to the policymakers, and while doing so this also helps to empower the local populations as it gives them an often unique opportunity to have their say about interventions in the areas they inhabit."

Liza Debevec, Researcher - Social Sciences, IWMI, Addis Ababa, Ethiopia

"A major cause of poverty in the Ethiopian Highlands is the increasing scarcity of water and land resources. In addition, the soils often have quite particular water-related characteristics that are unsuitable for many traditional crops. So, we have been exploring alternative crop options that fit better. These include, for example, growing rice in areas that are extensively waterlogged. Our research has demonstrated effective ways to increase crop and livestock productivity, leading to improved and more resilient rural incomes in the Blue Nile River Basin."

Teklu Erkossa, Researcher – Land Resources Management, IWMI, Addis Ababa, Ethiopia

"Biophysical scientists working in development are often criticized for lacking a human element in their work. So, in Ethiopia, we are actively attempting to represent people's cultural values and landscape perceptions within hydrological models. We recognize that there are many valid forms of knowledge about the environment, and it's strengthening our ability to understand the roots of many water resources challenges and to then work alongside communities to find tailored solutions."

Tracy Baker, Researcher – Hydrology/Hydrological Modeling, IWMI, Addis Ababa, Ethiopia

Source:
National boundaries: GADM database of Global Administrativ

"In our work on smallholder private irrigation in Ethiopia, we looked at the economics of promising technologies and practices. Many farmers in the region struggle to gain access to water during the dry season. If simple innovations, such as pumps and ponds, were more widespread, more food could be grown and farmers could make more money. The *AgWater in Challenging Contexts* project, funded by IFAD, is looking at how to make this happen for poor rural families. We do this by analyzing the barriers and benefits to smallholder water use. We then develop and test guidelines for assessment of the benefits and risks of agricultural water management interventions. Our results show that farmers who invest in these technologies are able to boost their incomes."

Gebrehaweria Gebregziabher, Research Economist, IWMI, Addis Ababa, Ethiopia

"Closing off areas of land, known as exclosure, reduces land degradation and promotes natural regeneration. Our study followed the establishment and use of these exclosures on communal grazing lands to see if more areas should be protected in this way and, if so, how this would benefit rural farmers. Our results showed that the excluded land had less soil erosion and improved vegetation cover. Exclosures also sequester carbon dioxide, which helps in efforts to mitigate climate change and were also shown to help diversify farmer incomes through activities such as bee-keeping."

Wolde Mekuria Bori, Researcher - Land Resources Management, IWMI, Addis Ababa, Ethiopia

"Ethiopia's agricultural water challenge is less about water scarcity and more about the management, storage and delivery of water for effective use. At IWMI, we work with farmers and other partners to identify solutions to these challenges. As part of our research process, we engage with many people in Ethiopia, discussing problems, perspectives and solutions, and helping to support capacity building at all levels. We work to provide scientifically based knowledge and guidance that is relevant to subsistence agriculture. We also focus on developing improved strategies for commercial crop irrigation."

Valentine Joseph Gandhi Bavanirajan, Researcher - Social Sciences, IWMI, Addis Ababa, Ethiopia

"LIVES is both an exciting and challenging project. It is exciting because the project aims to transform Ethiopian smallholder agriculture, both livestock and irrigated agriculture producers, through the introduction and demonstration of new technologies, increased capacity through appropriate training and knowledge sharing, and both diagnostic and action research, all in the areas of production, supply of inputs, services, marketing and processing. It is challenging because the project involves many stakeholders, requires regular monitoring, recording and skillful management, and goes outside of the traditional CGIAR research approach."

Fitsum Hagos, Researcher – Social Sciences, IWMI, Addis Ababa, Ethiopia

"The *IMPACT2C* project, funded by the European Union, is assessing the impacts of climate change on the available water resources and their allocation in the Nile River Basin, using mathematical models. The work involves using the latest 'state-of-the-art' predictions of changes in temperature and rainfall, downscaled to high-resolution spatial scales. These are used in computer models to predict how water availability will change over time and space."

Alemseged Tamiru Haile, Researcher - Hydrology/Hydrological Modeling, IWMI, Addis Ababa, Ethiopia

IMPACT2C project: http://www.hzg.de/science_and_industrie/eu_projects/fp7/climate/012508/index_0012508.html.en

"The *ALTER: Alternative Carbon Investments in Ecosystems for Poverty Alleviation* is a three-year research-into-use project which sets out to examine whether investments in soil carbon can be used to alleviate poverty. This could be achieved by restoring, enhancing or protecting the goods and services provided by ecosystems in regions where soils are degraded or under threat of degradation. The project is working in contrasting study sites in Uganda and Ethiopia. Solutions to soil degradation are not simple and require a much better understanding of the perspectives of local people and the role of national policies."

Kindie Getnet, Research Economist, IWMI, Addis Ababa, Ethiopia

ALTER project: http://www.espa.ac.uk/projects/ne-k010441-1

e Areas (http://www.gadm.org)

Photo: Neil Palmer

Photo: Sven Torfinn/Panos

In addition, farmers will need improved connections to markets in order to sell what they produce and minimize food waste. In parts of East Africa, as much as one-third of all the food that is produced never makes it to the market. If farmers can further add value through on-farm food processing then there is a real potential to lift more and more people out of poverty. This will protect the ecosystems that underpin agriculture and deliver food security for future generations.

Solutions: IWMI works with national and international partners on delivering holistic innovations that will improve food security, protect the environment and alleviate poverty. The *Livestock and Irrigation Value Chains for Ethiopian Smallholders (LIVES)* project, implemented by IWMI and the International Livestock Research Institute (ILRI), aims to improve the incomes of smallholder farmers through value chain development in livestock (dairy, beef, sheep and goats, poultry and apiculture) and high-value irrigated agricultural commodities (fruits, vegetables and fodder). Sustainable expansion of small-scale irrigation is critical in this regard. IWMI is working with the United States Agency for International Development (USAID) and Texas A&M University on the Feed the Future Innovation Lab for Small-scale Irrigation project, trialing and modeling different types of interventions in Tanzania and Ethiopia (and Ghana in West Africa).

LIVES project: http://lives-ethiopia.org

ICT and technological innovation

Challenge: There is relatively little data on the region's hydrology and climate. Poor infrastructure hampers systematic record keeping, and leaves many farmers, policymakers and extension workers in the dark. Smallholders, in particular, often struggle to get timely and accurate information on weather and water availability.

Solutions: New analytical tools such as remote sensing and computer modeling are now allowing researchers to measure water productivity on a hitherto unimaginable scale. This information can help target investments in infrastructure to ensure maximum returns on regional food security and improved farm incomes. Combining satellite remote sensing and mobile phone technology is also creating huge opportunities. Data can be easily collected and managed, and then used to keep farmers informed of relevant trends in climate and weather. IWMI also

makes use of community data collection, encouraging local people to manage their own resources themselves.

IWMI uses its expertise in geographic information systems (GIS) to accurately map water use and availability. For example, the Institute has worked with local Sudanese researchers to help them use GIS data to map flooding. This technique can be used to advise farmers on how best to make the most of floodwaters to grow extra crops. By using mobile phone networks, this information can be sent directly to farmers. For instance, the *Smart ICT for Weather and Water Information and Advice to Smallholders in Africa* project, implemented by IWMI and eLEAF, and funded by the International Fund for Agricultural Development (IFAD), uses satellite imagery, combined with other data, to produce practical agricultural information for farmers. This information is sent to farmers via mobile phone text messages and is customized to their individual needs.

Smart ICT project: http://www.smartict-africa.com

Climate change

Challenge: By 2050, it is predicted that more than half a billion people living in the Nile River Basin could be affected by a decline in the availability of freshwater. Climate-induced rainfall variability and increased heat stress will further intensify existing water resource problems. Recurring droughts and floods will lead to the loss of lives, loss of rural livelihoods and food insecurity.

Solutions: Much of the technologies required for climate change adaptation already exists. Implementation of these technologies requires new approaches to policy and management. IWMI researchers, in partnership with governments, nongovernmental organizations (NGOs) and international research institutions, are identifying 'no regrets' adaptation strategies that will help to safeguard water supplies and ensure food security. IWMI's innovative work on water storage, for instance, emphasizes the need to include natural infrastructure, such as wetlands, as part of any water security plan. By offering communities a range of storage options, resilience in the face of climate shock can be enhanced.

Building capacity

Challenge: Eastern Africa desperately needs to train and retain more water management professionals.

Solutions: IWMI is committed to collaboration with government departments and universities across the region. For example, IWMI is a partner in The Netherlands Initiative for Capacity development in Higher Education (NICHE) program, which aims to improve education in water resources management in Ethiopia and forge strong links with universities.

IWMI also provides opportunities for young scientists to further their studies and develop their skills. The Institute's East Africa and Nile Basin Office in Addis Ababa has supervised over a dozen PhD students in the last 10 years. The *LIVES* project (see above) alone supports 100 MSc students.

IWMI also makes use of indigenous knowledge, working with local people to capitalize on their deep understanding of the area in which they live. By sharing this information more widely, communities can make more informed decisions on how best to manage natural resources for the benefit of all.

Nuffic/NICHE website: http://www.nuffic.nl/en/capacity-building/niche

Photo: Simon Langan/IWMI

Photo: Matthew McCartney/IWMI

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Find out more:
www.iwmi.org
For project details, databases, publications and communication materials.

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