



RESEARCH  
PROGRAM ON  
Water, Land and  
Ecosystems



Photo: Georgina Smith/CIAT

## Connected thinking, compelling solutions

WLE delivers sustainable agriculture solutions that enhance our natural resources – and the lives of the people who rely on them.

**“To succeed, the world must move forward on agriculture solutions that don’t just solve one problem, but that enhance sustainability and resilience as a whole. Only connected, can we thrive.”**

**Izabella Koziell, WLE Program Director**

### Our Challenge:

Agriculture is a major driver of environmental degradation and social inequity. More than 70% of global freshwater is used for food production, while 25% of the world’s land is already, or is on the way to being highly degraded.

Such environmental losses undermine agricultural productivity as well as resilience to climate change. The most negative impacts often hit the poorest and most vulnerable smallholder farmers, especially women.

At the same time, global food demand by 2050 is projected to increase 60% or more over 2006 levels. But current production systems risk our future. And too often, new solutions create or intensify other challenges. Without considering the interconnectedness of agriculture, short-term wins may contribute to long-term failure.

### WLE’s Response:

In response to these intractable challenges, WLE identifies and pilots agricultural and natural resource management solutions that enhance equity and sustainability. This is an ambitious and wide-ranging agenda, but a vital one. WLE works to transform agricultural food systems, delivering solutions that do not cause degradation, but drive the cure.

### WLE’s Approach:

Through connected thinking and compelling solutions, WLE’s research-for-development work considers not only the field, but also the landscape and system level impacts of agriculture: how decisions around soil, water, biodiversity and people interact and impact the big picture.

WLE is developing a growing portfolio of policy and technical solutions across sectors and scales. These connect and consider key ecosystems and natural resources: land, water, biodiversity; and how to manage these better to ensure we connect rural-urban environments, deliver gender equity, manage risks and trade-offs, and build capacity of farmers and decision-makers to develop and implement integrated solutions.

### WLE’s Consortium:

WLE works through numerous national, regional and international partners and leverages expertise from across CGIAR. Through these partners, the program provides evidence and solutions that can influence decisions on how agricultural interventions and investments are made.



# Impacts by 2022

# 1

## Degraded landscapes restored:

WLE aims to support more than 1.5 million farm households to restore more than 3 million ha of land, and sequester in soils an estimated 4 megatons of CO<sub>2</sub> emissions per year.

# 2

## Land and water solutions adopted and scaled:

WLE aims to foster more resilient, equitable and food-secure farming landscapes, benefiting 2 million households, as well as improving water use efficiency at scale, targeting a 5% increase in efficiency in irrigation.

# 3

## Sustainable rural-urban ecosystems:

WLE aims to increase water and nutrient-use efficiency on 4 million ha of urban and peri-urban lands, and improve nutrient- and water-use efficiency on 3.6 million ha through resource recovery from food waste.

# 4

## Resilience through policy and trade-off tools:

WLE co-develops and scales innovative policy mechanisms and institutional arrangements, aiming to benefit six million households by 2022.



Photo: Georgina Smith / CIAT

## Supporting Returns on Massive Soil and Water Management Investments

WLE research, capacity strengthening and policy engagement is supporting Ethiopia's delivery of more sustainable soil and water management. In 2017, Ethiopia approved a policy to make all water technologies tax exempt, with the government crediting WLE-supported work on irrigation technology and supply chain analysis as influential. On soils, researchers helped the government develop a revised 'Ethiopian Soil Strategy' to target soil fertility management interventions. Along with WLE work on integrated landscape management, the country will be well placed to ensure that benefits from its investments are maximized. This same integration process has great potential in other WLE partner countries.

## Improving Productivity and Livelihoods Through Smart Solar Irrigation

In India, solar power has been introduced as a more versatile, green alternative to electric pumps. But, without carefully designed programs, solar-powered pumps could further threaten groundwater resources as cheaper pumping costs increase water usage. Therefore, WLE has collaborated with CCAFS to work with regional policy makers on a system to treat solar power as a 'cash crop', with the local electricity company buying back surplus solar power from farmers. This way, farmers have an economic incentive to irrigate their crops efficiently, conserving groundwater and energy use. To curb transaction costs, WLE researchers supported the establishment of the world's first solar cooperative, enabling farmers to pool their excess energy and sell it back to the utility company as a cooperative. Now, WLE is working to ensure better shared benefits for women, and presenting business models to help these technologies and approaches scale out to African communities.



Photo: Prashanth Vishwanathan / CCAFS

## WLE's Research Themes



**Restoring Degraded Landscapes** works to restore degraded landscapes as well as enhance ecosystem services and related benefits, such as food, energy, clean water, carbon sequestration and livelihoods.



**Land and Water Solutions** works to strengthen the resilience of farming communities by developing productive agricultural land and water management solutions that can be sustainably applied at scale.



**Rural-Urban Linkages** addresses challenges related to urbanizing landscapes, such as ways to close water and nutrient loops by reusing organic waste and wastewater, and addressing city food system challenges, competition and pollution.



**Variability, Risks and Competing Uses** aims to reduce risks and losses from water-related disasters and to help farming communities manage trade-offs from competition over resources.



**Gender, Youth and Inclusivity** is a priority integrated across all research and is examined independently to ensure research and solutions result in impacts and benefits that are fairly distributed.



**Enhancing Sustainability Across Agricultural Systems** synthesizes WLE's learning and supports development decisions and investments for more sustainable agricultural landscapes by developing user-friendly approaches and tools to assess and manage effects at scale.

## WLE Responds to New, Interconnected Challenges

### Climate Change

WLE is working on solutions that manage climate related impacts such as droughts, water scarcity, floods and unpredictable weather. These include small-scale irrigation technologies to increase drought resilience, along with farmer-government-private sector platforms to better manage resource use. In Zimbabwe, this has led to 30% water use reduction and 25% yield increase, amidst unpredictable weather patterns. WLE also works to mitigate climate change by better understanding soil carbon storage. Up to 7 billion tons can be removed from the atmosphere each year through better farm soil management, WLE found. Researchers are identifying areas with the highest potential and supporting improved farming practices that reduce carbon loss from soils.

### Migration

In Africa and much of Asia, increasing male migration to cities has transformed agriculture, making it the domain of the women and elderly who stay behind. Male out-migration changes gender roles in agriculture and impacts the management of natural resources. WLE researchers are working to supply policy makers and investors with evidence on the consequences of migration on natural resource management so that new policies and investments can respond to these changes.

### Vulnerability of Smallholders, Especially Women

Rural communities such as women and poorer farmers often bear the brunt of climate impacts, resource scarcity and social change. Research to understand the factors that affect farmers' decisions can support the design of context-appropriate investments that strengthen smallholder farming's contribution to poverty alleviation, food security and equity. For example, WLE is boosting agricultural production by helping farmers access groundwater through irrigation technology. At the same time, WLE is developing tools and policies to protect those groundwater resources from depletion, and designing programs so that women and marginalized groups share in the benefits.

### Urbanization

By 2050, two thirds of the global population will live in cities. This is creating rapidly escalating challenges. Municipalities in developing countries are looking for solutions that decrease waste, reduce environmental pollution and recover costs of waste management. WLE is examining and piloting ways to turn waste into wealth and has supported the first commercial co-composting plant in West Africa that makes fertilizer from fecal sludge and organic waste. Researchers also helped Sri Lanka develop its new sanitation policy, incorporating options for recycling and reuse of human waste into safe, organic fertilizer.

## Where We Work

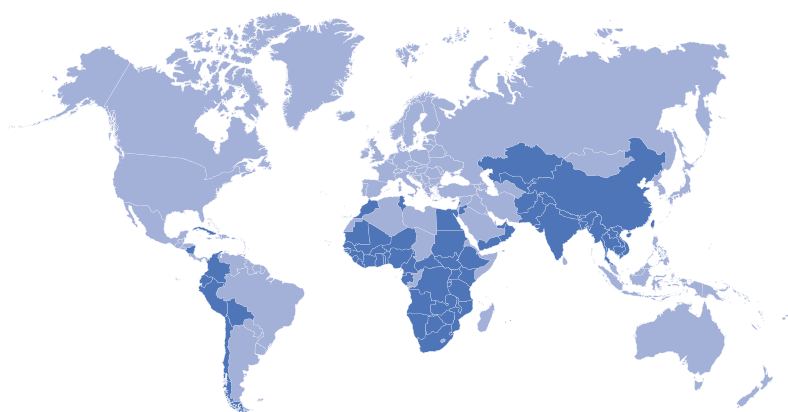


Photo: Hamish John Appleby / IWMI

# Global Partners for Impact

WLE is led by the International Water Management Institute (IWMI), and is supported by the CGIAR System Organization, a global research partnership for a food-secure future. The program combines the resources of 11 CGIAR centers, the Food and Agriculture Organization of the United Nations (FAO), the RUAF foundation, and numerous national, regional and international partners.

LED BY:



IN PARTNERSHIP WITH:



## Working to Achieve Global Goals

WLE has both played an active role in shaping many of the Sustainable Development Goal indicators and supporting the implementation of multiple SDGs.

The ambitions of the SDGs clearly echo WLE's approach to sustainable intensification of agriculture at all scales: Equitable development can only be achieved by considering, protecting and sustainably using the ecosystem services—that is, benefits such as soil, water, biodiversity and climate — on which we all depend.

Finding ways to assess and manage trade-offs and opportunities—balancing development, environmental conservation and other needs and rights—may be the most important contribution scientists from WLE and its partners are making to the SDG process.

WLE develops solutions and evidence that can support national governments and other actors to achieve the SDGs, particularly:



**SDG 2** on zero hunger, including SDG 2.4 on sustainable food production systems and resilient agricultural practices



**SDG 5** on gender equality



**SDG 6** on clean water and sanitation, including SDG 6.4 on increasing water-use efficiency



**SDG 11** on sustainable cities and communities



**SDG 13** on climate action



**SDG 15.3** on achieving a land degradation-neutral world

We would like to thank all donors who supported this research through their contributions to the CGIAR Trust Fund. <http://on.cgiar.org/CGIARFundDonors>

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