



Research Highlights 2017-2018:  
CGIAR Research Program on Water, Land and Ecosystems



Online 2017-2018 highlights: [wle.cgiar.org/highlights17](http://wle.cgiar.org/highlights17)

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The CGIAR Research Program on Water, Land and Ecosystems (WLE) is a global research-for-development program connecting partners to deliver agricultural solutions that protect our natural resources – and the people who rely on them. WLE brings together 11 CGIAR centers, the RUFAT Foundation, and numerous national, regional and international partners to find integrated, sustainable intensification in which a thriving ecosystem system resilience and human well-being. WLE is led by the International Water Management Institute (IWMI) and partners, and supported by CGIAR, a global research partnership for a food-secure future.

# ANATOMY OF A THRIVING ECOSYSTEM

Connected thinking, compelling solutions for our food future



## THRIVING FORESTS

Kenya loses about 19,000 hectares of forest each year, in part because of widespread use of charcoal for cooking. This is no different in the country's refugee camps, but the 185,000 people living in the Kakuma and Kalobeyei camps have few options for acquiring charcoal. Instead, women source firewood from surrounding woodlands, risking their safety and causing conflict with host communities. WLE supported training for women on how to make briquettes from organic waste. This economically empowered them, while reducing pressure on forests.

## EQUITABLE OPPORTUNITIES

83% of the women using a new water scheme in Nepal named not having to travel far to fetch water a main benefit. But, contradictory to initial assumptions, these women could not use the time they saved to generate income; they spent it doing regular housework. The truth about women in agriculture is often obscured by assumptions that derail well-intended development interventions. WLE research demonstrates that projects can only be successful in increasing gender equity when based on deep understanding of local contexts and gender dynamics.

## HEALTHY LANDS

Restoring 12% of degraded agricultural land could increase smallholder incomes by \$35-40 billion. In the Ethiopian Highlands, WLE-supported scientists are working with local communities to reclaim deep gullies, caused by heavy rains, by filling them with stones and adding the right grasses and trees to prevent erosion. The Ethiopian Bureau of Agriculture has adopted the approach, applying it in two additional watersheds, and planning further expansion.

## RICH BIODIVERSITY

Doubling the number of ladybugs in Chinese cotton fields could yield an added value of \$300 million. Being the natural enemy of pests attacking cotton, ladybugs represent a green alternative to pesticides. WLE research found that decreasing pesticide use increases the number of ladybugs, pollinators and other important insects, adding economic value. The next step is to build awareness among farmers and policy makers of the hidden economic potential of biodiversity, paving the way for a virtuous cycle that benefits both farmers and ecosystems.

## FLOOD RETENTION

Floods in Sri Lanka led to an estimated \$4.3 million in damages and losses in 2016 alone, and worldwide urban floods cost billions of dollars each year. Wetlands—an under-valued piece of natural infrastructure—can help mitigate flood impacts. In Sri Lankan capital Colombo, wetlands can store enough water to fill 27,000 Olympic swimming pools. WLE partners are working to understand and raise awareness of the great value of urban wetlands—already recognized by Colombo, which is vying to become one of the first Ramsar-accredited 'wetland cities'.

## SMART SOLUTIONS ACROSS SECTORS

About 70% of the world's population will reside in cities by 2050, forcing us to confront climate impacts on urban food supply, volatile food prices, disrupted supply chains and changes in consumption patterns. WLE partners study the resilience of city region food systems in Ghana, Burkina Faso and Sri Lanka. They propose options for "short food supply chains," such as through urban agriculture, and private sector investments. These foster sustainable solutions for urban food security without trade-offs for rural hinterlands.

## NUTRIENT CYCLING

An area about the size of the European Union is under cultivation in and around the world's cities, and soils are deteriorating fast. In Sri Lanka, WLE-supported scientists are establishing sustainable models for replenishing soils by co-composting organic city waste and fecal sludge, turning it into safe, marketable fertilizer. This could enhance the financial sustainability of hundreds of existing municipal compost plants and boost urban food security, while also solving sanitation and environmental challenges.

## KNOWLEDGE OF INTERCONNECTIVITY

Ecosystem services—nature's contribution to water purification, pollination or nutrient provision—bring enormous economic benefits. Losses to services due to land use change alone have been estimated at up to \$20.2 trillion per year. WLE-supported researchers are promoting ecosystems-based approaches to agriculture that don't just do no harm, but add value to ecosystems. Training 112 people on how to use tools to determine what impact a certain decision might have on water provision, sediment retention or other ecosystem services led more than one third of trainees to use these tools in their work later on.

## SUSTAINABLE PRODUCTION

When the value of banana exports in Laos more than tripled between 2013 and 2016, the leap was reportedly accompanied by excessive pesticide use, causing fish death and illness among plantation workers. WLE scientists found particularly high pesticide concentrations in soil and water on banana plantations. When presented with the findings, the Lao government invited the scientists to help draft a new policy on sustainable plantation management.

## LOCAL EMPOWERMENT

Producing about 60% of the country's rice, the Mekong Delta is known as Vietnam's rice bowl. Here, farmers grow up to three rice crops each year, which is harming water, soils and biodiversity. WLE-supported researchers trialed a participatory research methodology that made villagers aware of how rubbish disposal, pesticide use and intensive farming harm local livelihoods. Realizing this, the participating farmers have made adjustments to put less pressure on natural resources.

## CARBON STORAGE

Potential exists for removing up to 6.8 billion tons of carbon dioxide from the atmosphere each year for several decades through better soil management. Techniques such as composting, mulching, zero tillage, agroforestry and other natural solutions are showing good promise for carbon sequestration. Maps developed by WLE partners show where and how much carbon could potentially be stored in all available cropland soils globally. This could make a very valuable contribution towards the Paris Climate Agreement goals.

## FERTILE SOILS

About 40% of soils in sub-Saharan Africa are low on nutrients. In western Kenyan villages, WLE scientists have developed digital maps, accessible through smartphones, that pinpoint areas of nutrient deficiency. Communities learned to use the maps to identify where to add nutrient supplements or lime to the soil. Researchers have also developed fast and low-cost soil analysis methods based on soil-plant spectroscopy to influence investments in and policies on soil health.

## FLOURISHING RIVERS

Nearly 1/4 of global rivers no longer drain year-long into the sea due to dams and other infrastructure obstructing flows. But a certain amount of water is needed in rivers for ecosystems to thrive—a concept known as environmental flows. WLE-supported scientists developed a new online tool to calculate the relationship between surface water, environmental flows in rivers, and groundwater replenishment. This data can underpin decisions on water in pursuit of the UN's SDGs.

## PLENTIFUL GROUNDWATER

Groundwater contributes to about 44% of irrigated food production worldwide, but over-pumping threatens this precious resource. In Vietnam, coffee farmers rely heavily on groundwater for irrigation, drilling ever deeper as they face more frequent droughts. WLE research is finding that by improving irrigation efficiency and recharging groundwater reserves, water use can be made more sustainable, without compromising the quantity or quality of coffee production.

## LIVELIHOOD PROVISION

Small-scale irrigation in Africa could be expanded to 7.3 million hectares, significantly boosting food security, nutrition and incomes. But smallholders struggle to access energy to run pumps. Small, solar-powered pumps provide a cheaper, climate-smart alternative. WLE-supported researchers developed viable, attractive business models for solar irrigation to avoid over-dependence on public funds as well as maps that identify sustainable groundwater pumping zones.

