CGIAR

RESEARCH PROGRAM ON
Water, Land and Ecosystems

LED BY:
IWMI
International Water Management Institute

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CGIAR Research Program on Water, Land and Ecosystems (WLE)

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Connected Thinking, Compelling Solutions

WLE is a global research-for-development program connecting partners to deliver sustainable agricultural solutions that enhance our natural resources and the wellbeing of people. WLE brings together CGIAR Centers, the UN Food and Agriculture Organization (FAO), the RUAF Global Partnership, and numerous national, regional and international partners to find integrated solutions.

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.

Email: wle@cgiar.org | Website: wle.cgiar.org | Thrive Blog: wle.cgiar.org/thrive

LED BY:

IWMI International Water Management Institute

IN PARTNERSHIP WITH:

Bioversity International · CIAT · FAO · ICRISAT · CIFOR · CIP · RUAF · ICARDA · IFPRI · World Agroforestry · ILRI · WorldFish

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Participating Centers: Alliance of Bioversity International and CIAT, ICARDA, ICRAF, ICRISAT, IFPRI, IWMI, RUAF Global Partnership

ACRONYMS

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
AGNES	African Group of Negotiators Experts Support
AGRF	African Green Revolution Forum
ALWM	Agricultural land and water management
CBD	Convention on Biological Diversity
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CIAT	International Center for Tropical Agriculture
CoSAI	Commission on Sustainable Agriculture Intensification
CRFS	City-region food system
CRP	CGIAR Research Program
FAO	Food and Agriculture Organization
FCDO	Foreign, Commonwealth & Development Office
FSM	Fecal sludge management
FTA	CGIAR Research Program on Forests, Trees and Agroforestry
GYI	Gender, Youth and Inclusion
IBFI	Index-based flood insurance
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	World Agroforestry Centre
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
ISC	Independent Steering Committee
IWMI	International Water Management Institute
MARLO	Managing Agricultural Research for Learning and Outcomes
MC	Management Committee
MELIA	Monitoring, Evaluation, Learning and Impact Assessment
MENA	Middle East and North Africa
OICR	Outcome/Impact Case Reports
PMU	Program Management Unit
POWB	Plan of Work and Budget
RRR	Resource recovery and reuse
SADMS	South Asian Drought Monitoring System
SAI	Sustainable agricultural intensification

SLO	System Level Outcome
SoLAR	Solar Irrigation for Agricultural Resilience
UNFSS	United Nations Food System Summit
W1/W2	Window 1 / Window 2 funding sources
WASAG	Global Framework on Water Scarcity in Agriculture
WASH	Water, Sanitation and Health
WLE	CGIAR Research Program on Water, Land and Ecosystems
WUA	Water users' association

EXECUTIVE SUMMARY

WLE's vision is a world in which agriculture thrives within supportive, vibrant ecosystems while delivering enduring prosperity for farming communities. In 2020, this vision might often have seemed distant: COVID-19 and its socio-economic consequences, such as food shortages and rising poverty, combined with droughts, floods, continuing deforestation and soil degradation, bore little resemblance to that thriving world. Yet the trials of 2020 only reinforced the critical importance of such a vision and the research that flows from it.

Amid a new spirit of rethinking and renewing built infrastructure, our work on the *natural* infrastructure that complements it continues to gain global recognition – for instance, on the critical role of wetlands in maintaining productive ecosystems and providing vital services such as flood regulation. Yet interventions and innovations at the level of natural resources take years to mature and impacts are methodologically challenging to measure. Therefore, we prioritize outcome-level assessments for accountability and learning. Points of relevance to the COVID-19 pandemic in our program, in particular, are collected this year in section 1.2.2.b.

This Annual Report documents a firm foundation for results in all five Strategy impact areas of the One CGIAR Research and Innovation Strategy, demonstrating the relevance of WLE within the "systems transformation approach for food, land and water systems" that it maps out.

- We support **Environmental Health and Biodiversity** with a suite of decision-support tools for sustainable land management. Our work shows the potential for collective action by stakeholders to reduce groundwater mining, halt soil erosion and achieve zero deforestation (OICR). We are contributing to Convention on Biological Diversity target-setting, and unlocking green investment through our Commission on Sustainable Agriculture Intensification (CoSAI).
- Our keys to **Poverty Reduction, Livelihoods and Jobs** are equitable, farmer-led irrigation and drought and flood risk management. The South Asian Drought Monitoring System framework has scaled out to more countries in Asia and Africa (OICR), while we have helped extend index-based flood insurance to combat impoverishment.
- CoSAI contributes to **Nutrition, Health and Food Security** through the UN Food Systems Summit processes. We demonstrated a gender-sensitive participatory methodology to harness women's and men's ecosystem knowledge towards sustainable food security. Small-scale irrigation is also critical; in Ethiopia we identified value-chain-based uptake pathways. And in India, some 5,000 professionals will be trained on business models for fecal sludge management, connecting sanitation with nutrient recovery for agriculture (OICR).
- We integrate **Gender Equality, Youth and Social Inclusion** into multi-disciplinary programs for insights into the roots of exclusion. Among others, we sought answers in gender-transformative restoration interventions, solar irrigation deployment, rural-urban food systems and wetlands management. More details can be found in sections 1.3.1 and 1.3.2.
- Finally, almost every aspect of WLE contributes to **Climate Adaptation and Mitigation**. Land and water management investment options, including mapping high-potential areas for solar irrigation (OICR) and increasing business capacities to recover resources from urban waste, contribute to this area. CoSAI, meanwhile, has participated at the highest level of climate action during COP26 preparations. These and other climate achievements are explored in section 1.3.4.

Part A: NARRATIVE SECTION

1. Key Results

1.1 Highlight Global Progress and Achievements

WLE primarily contributes to System Level Outcome (SLO) 1, "reduced poverty" and SLO 3, "improved natural resources systems and ecosystems services". Less directly, WLE also contributes to the health and nutrition benefits of SLO 2. Impacts of natural resource innovations often take years to mature and be measurable (Table 1); and such impact measurement is methodologically challenging. Therefore, WLE prioritizes completing outcome-level assessments for accountability and learning.

Regarding the SLO target of assisting 5.74 million people (50% women) to exit poverty, CCAFS and WLE/IWMI, with partners, created the South Asian Drought Monitoring System (SADMS). Since 2018, SADMS has provided real-time drought severity data at the micro level to southern Indian states to inform drought contingency plans, leading to increased crop yields and incomes. As a result, the SADMS framework has been scaled out to other Asian and African countries (OICR). In recognition of SADMS and its positive contribution to helping farmers exit poverty, IWMI received the Geospatial World Excellence Award 2020, the first time a CGIAR Center has won this accolade.

WLE also contributes to the SLO target of increasing water and nutrient use efficiency by 5% over 24.07 Mha. WLE/IWMI and CCAFS supported pilot testing of a solar power model in which farmers' cooperatives own solar pumps for irrigation and sell surplus power to the electric grid. This model is now a major component of a USD 50 billion project in India and a smaller, parallel one in Gujarat State. An external evaluation estimated that by 2040 some 600,000 farmers will adopt this model in Gujarat, and projected that water use will be reduced by 14,300 m^3 per year, mostly from aquifers, potentially reducing or reversing groundwater mining.

Further, this solar power model contributes to achieving the target of a 5% reduction in agriculture-related greenhouse gas emissions. By replacing diesel with solar power, in Gujarat alone, by 2040, implementation of the government program will generate discounted benefits from greenhouse gas emissions reductions valued at over USD 1 trillion.

WLE also contributes to capacity development, with close to 5,700 individuals trained in WLE tools and practices in 2020. For example, training has been given on new tools and models to identify how to improve ecosystem services and inclusiveness in sustainable agriculture programs. In 2021 and 2022, some 5,000 professionals in India will be trained in WLE/IWMI's business models for energy and nutrient recovery from fecal sludge (OICR).

1.2 CRP Progress towards Outputs and Outcomes (spheres of control and influence)

1.2.1 Overall CRP progress

In 2020, the devastation caused by COVID-19 combined with droughts, floods, serious food shortages, continuing deforestation, soil degradation, water scarcity and sanitation crises reinforced the critical importance of WLE's research. WLE/IWMI work on "natural water infrastructure" to complement built infrastructure, including demonstrating the critical role of wetlands in maintaining productive ecosystems and vital services such as flood regulation, the game-changing potential of solar-powered irrigation, and new business models making recycling of waste at scale financially feasible, continues to gain global recognition.

WLE's Commission on Sustainable Agriculture Intensification (CoSAI) has participated in preparations for the United Nations Food System Summit (UNFSS) and Climate Change Conference (COP26). CoSAI is a partner in the UK Foreign, Commonwealth & Development Office (FCDO) Transforming Agricultural Innovation for People, Nature and Climate Campaign, aimed at unlocking billions in sustainable agriculture investments. WLE is also contributing to preparations for the Convention on Biological Diversity (CBD) through target-setting for biodiversity in agriculture.

Outcomes. WLE's 13 Outcome/Impact Case Reports (OICRs; Table 3) for 2020 demonstrate progress towards achieving 8 of its 11 planned outcomes:

- The Land and Water Solutions (LWS) Flagship produced seven OICRs, contributing to its two planned outcomes (1, 2, 3, 4, 5, 6, 7).
- The Restoring Degraded Landscapes (RDL) Flagship has four OICRs (1, 2, 3, 4) contributing to two of its three planned outcomes.
- The Enhancing Sustainability (ESA) Flagship produced two OICRs (1, 2) contributing to each of its planned outcomes.
- The Managing Resource Variability, Risks and Competing Uses (VCR) and Rural-Urban Linkages (RUL) Flagships each have one OICR (1, 2) contributing to a planned outcome.

Some of WLE's more important achievements included:

Solar irrigation. Solar energy costs have rapidly decreased while availability of technology has increased. WLE/IWMI's work with CCAFS and the Tata Foundation on solar irrigation in South Asia is achieving significant outcomes, as is the case in sub-Saharan Africa: WLE/IWMI's tool for mapping potential areas for solar-powered irrigation is being tested and applied by private sector firms to expand their supply chains (OICR). WLE/IWMI issued four Swiss Agency for Development and Cooperation innovation grants in South Asia to test new solar irrigation business model bundles to enhance efficiency, sustainability and inclusiveness. WLE is testing several business and financing models in Ghana and Ethiopia.

Irrigation to expand food security. Expanding sustainable small-scale irrigation is critical to achieving food security in sub-Saharan Africa, especially in response to climate change. To that end, WLE researchers identified effective irrigation technology value chain-based scaling pathways in Ethiopia. The World Bank published a WLE paper on accelerating sustainable irrigation expansion, while the African Development Bank published a WLE paper showing that policies aimed at encouraging farmer-led irrigation in Ethiopia should combine public and private investments and consider the socio-economic conditions of households and their agricultural practices.

Managing droughts and floods. While floods, drought and periodic hunger have always existed, climate change is exacerbating their frequency. WLE/IWMI worked with CCAFS, NGOs, governments and private sector partners to extend the use of both the Index-based Flood Insurance (IBFI) program in Bangladesh and the South Asia Drought Monitoring System (SADMS) for drought prediction. Using cutting-edge remote sensing tools and algorithms, SADMS provides real-time data on drought severity at micro level, enabling preparation of contingency plans. This system is being expanded in India and other Asian and African countries (OICR). In future, as the effectiveness of information-sharing platforms improves, real-time data on floods and drought will be used both by farmers to plan their activities and by insurance firms offering IBFI to farmers.

Restoring degraded land. WLE's work is showing the potential for collective action by stakeholders to curb climate change, reduce groundwater mining, halt soil erosion (Ethiopia, India) and achieve zero deforestation while maintaining biodiverse habitats. In Central and Latin America, governments and private sector firms are moving towards zero deforestation with WLE/Alliance support (cacao, oil palm). In Colombia, WLE/Alliance leadership of a multi-stakeholder platform prompted dairy giants to join the zero-deforestation movement (OICR).

Gender. WLE has largely succeeded in integrating work on gender and social inclusion into multi-disciplinary projects (section 1.3.1):

- RUL/RUAF/IWMI has published on gender-responsive approaches to rural-urban food systems through a special issue of *Urban Agriculture Magazine* targeting implementers and policymakers. It draws attention to the complex, gendered dynamics of urban food value chains. RUL is also implementing a gender-responsive project on nutrient and energy recovery in six refugee camps in East Africa.
- In South Asia, both watershed projects in the arid, drought-prone regions of North India and projects aimed at scaling out solar irrigation have documented the deep-rooted patriarchal challenges to providing socially inclusive and gender-equal livelihoods and are testing strategies to overcome these barriers.
- An RDL/Alliance "inclusive restoration" project offers stakeholders ways to learn lessons on gender-transformative restoration interventions.
- Finally, WLE's gender specialist plays a leading role in the CGIAR GENDER Platform Steering Committee.

Towards One CGIAR. The 2030 One CGIAR Research and Innovation Strategy proposes "a systems transformation approach for food, land and water systems". WLE's research and capacity development program has created a firm foundation for achieving results in all five impact areas. For example:

- WLE, with partners, has produced a suite of tested decision-support tools for sustainable land management that will support the *Environmental Health and Biodiversity* impact area.
- Agricultural land and water management solutions and investment options including solar irrigation and increasing business capacities to recover resources from urban waste for intensified food production contribute to the *Climate Adaptation and Mitigation* impact area.
- WLE/Alliance demonstrated a gender-sensitive participatory methodology to harness the ecosystem knowledge of local women and men and identify sustainable agricultural intensification. pathways to achieve the *Nutrition, Health and Food Security* impact area.
- WLE's work with multiple partners on promoting equitable farmer-led irrigation development contributes to the *Poverty Reduction, Livelihoods and Jobs* impact area.
- Integrating gender and inclusion into broader programs leads to deeper insights on the roots of gender inequity and possible solutions, creating a firm foundation for work on *Gender Equality, Youth and Social Inclusion*.

1.2.2.a Progress by flagships

1.2.2.a.1 Flagship 1: Restoring Degraded Landscapes (RDL)

RDL aims to enhance landscape ecosystem services, contributing to vibrant agro-ecosystems and the benefits they provide, like food, energy and clean water. It generates solutions for restoring degraded land and

protecting land from degradation (**outcome 1.1**). Examples include:

- Open-source information platforms to support landscape restoration and sustainable use in El Salvador, Ethiopia and the Ganges region.
- Use of an RDL water investment planning platform, expanded in Honduras and now being adapted for other countries including in sub-Saharan Africa (OICR).
- In the Peruvian Amazon, identification of business models to reduce deforestation; and in Colombia, support to dairy farmers to endorse a zero-deforestation agreement (OICR).
- Strategies to improve gender inclusion in landscape restoration programs.

RDL generated evidence on performance of restoration programs in Ethiopia and Colombia as a basis for recommendations on policies and interventions (**outcome 1.2**). In Ethiopia, to accelerate uptake of soil fertility recommendations, RDL/Alliance is supporting the use of big data analytics and digital tools (OICR).

To strengthen capacities to use soil health monitoring and evaluation frameworks (**outcome 1.3**), RDL/ICRAF provided training in five countries on using new technologies like soil spectroscopy and contributed to creating a 30m resolution soil properties map of Africa (iSDASoil).

1.2.2.a.2 Flagship 2: Land and Water Solutions for Sustainable Intensification (LWS)

LWS generates sustainable, inclusive agricultural land and water management (ALWM) solutions and scaling approaches (**outcome 2.1**) at landscape/watershed scale. For example, ALWM scaling, including solar irrigation, is achieved through public and private partnerships with solar irrigation firms. LWS/IWMI piloted and scaled business models and solar irrigation innovations through scaling grants (up to USD 750,000) awarded in different agro-ecological, social and economic settings (sub-Saharan Africa, South Asia). Outreach events stimulated policy debates on farmer-led irrigation, irrigation service delivery and water productivity assessment and improvement.

In Bundelkhand, a central Indian region identified as highly vulnerable, WLE/ICRISAT'S watershed learning site has demonstrated improved productivity, sustainability and livelihoods, and produced scientific evidence quantifying the hydrological impacts. WLE/ICRISAT also documented gender transformation impacts of an integrated water management approach. An interdisciplinary framework using archeology, history and collective action demonstrated significant potential for enhancing India's agricultural resilience and sustainability.

LWS/IWMI/ICRISAT are improving the performance of irrigation schemes (**outcome 2.2**) in Zimbabwe and Central Asia. In Zimbabwe, integrating agricultural innovation platforms and smart water management tools has brought major improvements in productivity and incomes. The Uzbekistan Government is investing heavily in reducing irrigation energy costs (OICR) and improving water management (OICR) based on WLE/IWMI recommendations.

1.2.2.a.3 Flagship 3: Sustaining Rural-Urban Linkages (RUL)

RUL supports a circular economy and resilient urban food systems. In 2020, RUL/IWMI emphasized resource recovery and reuse (RRR) capacity development at the waste, sanitation and agriculture interface (**outcome 3.2**). In Bangladesh, a Technical Assistance Hub supported 11 cities with advanced fecal sludge and solid waste treatment and reuse options. In Ghana, over 70 public and private sector representatives were trained in fecal sludge management (FSM); in Sri Lanka, some 200 compost producers and users were trained in new

waste-based compost standards, and 280 representatives (48% women) from food services were trained in waste reduction.

WLE/IWMI's RRR business modules are being explored by 22 universities. In India, the Water, Sanitation and Hygiene (WASH) Institute adopted WLE RRR business models to train nearly 5,000 professionals (OICR). In Ghana, a fourth WLE-facilitated waste-to-resource partnership started operations. RUL also addressed gender inequality in Ghana by integrating gender dimensions along RRR value chains.

City work under **outcome 3.1** was affected by COVID-19 (Section 1.2.2.b). Pandemic shocks were added to the analysis of food system resilience and the city-region food system (CRFS) vulnerability assessment in five cities. However, fieldwork stopped due to restrictions and revision of methodologies to accommodate COVID-19-related indicators.

1.2.2.a.4 Flagship 4: Managing Resource Variability, Risks and Competing Uses for Resilience (VCR)

VCR seeks to improve management of water resource variability, including flood and drought relief (**outcome 4.1**) and managing water competition (**outcome 4.2**).

For **outcome 4.1**, VCR/IWMI worked with CCAFS and partners to extend use of index-based flood insurance (IBFI) and the South Asia Drought Monitoring System (SADMS):

- Following Cyclone Amphan, 4,000 farmers in Bangladesh received insurance payments.
- SADMS was extended to Afghanistan, Sri Lanka and sub-Saharan Africa (OICR).
- IBFI and SADMS were recognized through the awards to IWMI of a GEO SDG and the Geospatial World Excellence Award 2020, respectively.

For **outcome 4.2**, VCR/IWMI and partners used Kenya's Tana River Basin to demonstrate the value of optimized multi-objective tradeoff analysis in understanding the interactions between natural and built assets, and selecting river basin interventions that appropriately trade off their services.

VCR/IFPRI/IWMI and partners also provided policy advice for resilience and enhanced ecosystem services, including:

- A background paper for African climate negotiators, and support to the African Ministers' Council on Water with groundwater analyses.
- With WorldFish and FAO, published guidance on integrating fisheries within irrigation systems.
- Training courses in support of SDG 6.4.2.
- Completed research on environmental flows for the Inner Niger Delta, with extension to the Limpopo with ESA.

1.2.2.a.5 Flagship 5: Enhancing Sustainability Across Agricultural Systems (ESA)

Development challenges are complex. ESA applies systems approaches to support managing synergies and tradeoffs at multiple scales. To enhance institutions' capacity to design and manage effective policies and programs for delivery against multiple SDGs at landscape level (**outcome 5.1**), ESA with partners:

- Co-developed a cross-CGIAR knowledge brokering framework for integrated landscape management.
- Synthesized insights and recommendations from 104 integrated landscapes initiatives.
- Contributed to training on landscape systems approaches of researchers and decision makers from 10

institutions and 10 countries.

- Launched the Commission on Sustainable Agriculture Intensification (CoSAI), which initiated its first study, "Estimating investment in innovation for sustainable agriculture intensification". CoSAI engaged with stakeholders through a Round Table dialogue at the African Green Revolution Forum (September 2020).

To identify and incorporate synergies, tradeoffs and uncertainties in food and agricultural programs (**outcome 5.2**), ESA with partners:

- Employed ESA tools in Ethiopia, Zambia, India and Uganda aimed at balancing agricultural and natural resource management programs.
- Contributed to preparing the Convention on Biological Diversity (OICR) and UN Food Systems Summit (dashboard).
- Adapted and employed decision-support tools with private sector partners to leverage the potential of agrobiodiversity for multifunctional food systems (OICR).

1.2.2.b Relevance to COVID-19 by flagship

1.2.2.b.1 Flagship 1: Restoring Degraded Landscapes (RDL)

RDL undertook its review meeting using an online platform. Likewise, in some projects, in-person interviews with key stakeholders were replaced by phone interviews. RDL postponed some field activities, and some conferences where RDL expected to participate were postponed to 2021. The activities most affected by COVID-19 were training and monitoring missions. However, RDL adapted by involving local teams more heavily and providing training remotely and in smaller groups.

Multi-stakeholder platforms in Tanzania working on land restoration supported the shift from community meetings to dissemination of climate change and land restoration messages to next users and farmers through radio, webinars, WhatsApp and text messages. Radio and social media channels were able to reach up to 60% women and young farmers because of easy-to-use technology and ownership of mobile phones. However, the use of webinars for the engagement of women and young farmers was less successful because of the technical limitations, limited access to the infrastructure and low digital skills.

RDL/IFPRI performed a global survey on how seed availability and markets have been affected by COVID-19 and how farmers were coping and changing their decision making and plans for upcoming seasons. Analysis is continuing, but preliminary observations indicate that the seed sector was heavily affected by COVID-19 globally and this in turn affected the way farmers will operate in the coming seasons. Results also indicate that due to restrictions in movement, proximity became a very important aspect for seed acquisition. Hence community seed banks and local seed businesses played a key role in ensuring seed security for smallholders.

With COVID-19 disrupting lives, we made a case for urban agriculture that has since received wide readership; some countries have already started to put greater effort into this area.

1.2.2.b.2 Flagship 2: Land and Water Solutions for Sustainable Intensification (LWS)

COVID-19 impacted the work plans of LWS projects: fieldwork had to be postponed, survey instruments had to be adapted, and workshops and conferences had to be changed to an online format.

Two rapid assessments were launched to understand how earlier donor investments have supported rural

households during the COVID-19 pandemic. Data from Ethiopia show that investment in small-scale irrigation supported households' access to water for sanitation, hygiene and vegetable production. A study in Myanmar showed that 1.5 years after project implementation, the water users' association (WUA) has managed to overcome COVID-19-related restrictions. The WUA developed a strong community buy-in. Sub-group representatives inform the farmers about the water schedule and fee payment via phone calls and loudspeakers, boosting transparency. Information on operation, maintenance and water schedules is also being posted on Facebook (OICR).

The annual research meeting (two webinars) of LWS was an essential element to share project progress, research highlights and innovations as well as to discuss policy impacts. The focus was on "Unlocking Value in Irrigation Systems" under **outcome 2.2** (improved management of new and revitalized medium- to large-scale irrigation schemes). LWS was able to:

- Discuss and consolidate irrigation-related activities across the portfolio.
- Identify emerging knowledge gaps related to irrigation and scaling of solutions, which will be addressed in 2021.
- Relate LWS work to the global discourse on how irrigation is linked to poverty alleviation, food security, climate change adaptation and sustainable ecosystem development.

1.2.2.b.3 Flagship 3: Sustaining Rural-Urban Linkages (RUL)

There were significant adaptations in two regards, with the first one resulting in significant delays.

First, to capture the vulnerabilities to and impacts of a pandemic like COVID-19, the methodologies of the lead projects under **outcome 3.1** were revised to strengthen the urban food security vulnerability assessments. These were adapted to address pandemics alongside climate change, and in a wider group of cities. City inventories were made (resulting in a series of blogs and a publication) and the methodology documents were updated with a set of tools and COVID-19-related indicators.

Second, due to fieldwork restrictions, work shifted to webinars and publications, virtual training and blog posts, with the tools to be finalized in 2021.

1.2.2.b.4 Flagship 4: Managing Resource Variability, Risks and Competing Uses for Resilience (VCR)

All of the work conducted by VCR contributes directly to building resilience. Although focused primarily on water hazards, building resilience broadly can contribute to coping strategies across the spectrum of hazards that people face. In 2020, VCR/IFPRI contributed early on with blogs (see also here and here) and presentations highlighting the need for adequate access to water supply, hygiene and sanitation to fight COVID-19. In addition, WLE/IWMI worked with the Government of India on a modified South Asian Drought Monitoring System (SADMS) using remote sensing to show the state of maturity of crops and thereby identify areas that needed to be harvested but were potentially at risk due to COVID-19 lockdowns.

We also worked with the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) to couple extreme weather forecasts with crop information to highlight where crops might be at risk from forecast extreme weather events (cyclones). This was linked with information on the number of COVID-19 cases in likely affected regions. These products provide governments and their agricultural extension services with information that can help coordinate and plan harvests and disaster preparedness measures during a pandemic.

In addition, we contributed to an online webinar organized by the Indian National Institute of Urban Affairs on how COVID-19 could shape river management strategies of the future.

1.2.2.b.5 Flagship 5: Enhancing Sustainability Across Agricultural Systems (ESA)

The travel restrictions related to COVID-19 impacted the work plans of ESA projects: fieldwork for case studies in the Limpopo Basin and India had to be postponed, and workshops and conferences had to be changed to an online format.

ESA expanded and strengthened online capacity building and tools to better anticipate and manage tradeoffs, synergies and uncertainties in agricultural landscapes and natural resource management. In these courses and learning modules, ESA made connections to COVID-19 and included examples from COVID-19-related situations and related implications.

Building on the assessment of how to better bridge evidence and decision making, the ESA/IFPRI team assessed and identified lessons for human survival from a pandemic and a global environment under stress.

1.2.3 Variance from Planned Program for this year

A new LWS/VCR project, Water4Ag, was initiated in May 2020 as part of the Working Group on Agricultural Water Use (chaired by IWMI) of the Global Framework on Water Scarcity in Agriculture (WASAG). LWS and VCR also developed a new integrated water storage agenda for increased resilience as part of Water4Ag, to be launched in 2021.

To strengthen understanding of the ecosystem health-COVID-19 interface, VCR/IFPRI organized, with the Bridge Collaborative (ESA), a policy seminar on the role of the agriculture-ecosystem health interface, with more than 1,200 online attendees.

An increased demand for synthesis of landscape approaches led to new investments to integrate insights, data and actions from CGIAR landscape initiatives. ESA's capacity building workstream was expanded to develop interactive online learning modules. Further, with FTA and CCAFS, the agro-ecological transitions research area was elaborated, with a new bilateral project and the development of a One CGIAR initiative.

Some RUL outcomes could not be fully realized. For example, the World Bank's proposed investment in fecal sludge treatment facilities in Sri Lanka did not receive governmental priority. This was proposed as a World Bank investment with WLE/IWMI support.

In addition, the 2020 Plan of Work and Budget formulation of one milestone under **outcome 3.1**, "Ten towns or cities created Urban Food Policies or Strategies", has been changed. The actual targeted outcome is on capacity development towards achieving policy changes, but not the changes themselves. This is consistent with the outcome, which is "Improved capacity of urban stakeholders to implement evidence-based policies and practices in support of urban food security and resilience".

1.2.4 Altmetric and Publication highlights

WLE research supported 130 peer-reviewed publications in 2020.

Since CGIAR adopted this indicator in 2017, WLE has implemented a range of steps to improve scores and

tracking. Across CGIAR, systems are still being improved by Centers and CRPs to bolster results and reliable measurement.

Among the high-performing articles mapped to WLE in 2020 were:

- Forest and woodland replacement patterns following drought-related mortality (PNAS), providing an emerging picture of post-drought ecological trajectories based on field indicators of forest dynamics. Cited in news and shared via hundreds of social media posts. Altmetric: 155.
- Global and regional potential of wastewater as a water, nutrient and energy source (Natural Resources Forum), based on synthesis of wastewater data and providing insights into the global and regional potential of wastewater as a water, nutrient and energy source. Cited by news outlets and blogs and shared through social media. Altmetric: 89.

To promote solutions and insights to broader audiences, new WLE publications were launched in the Resource, Recovery and Reuse Reports series:

- Training manual for fecal sludge-based compost production and application
- Introducing co-composting to fecal sludge treatment plants in Benin and Burkina Faso
- Business models for fecal sludge management in India

WLE also launched new publications in the Research for Development Learning Series:

- Community water management and agricultural extension services
- Shifting gender relations in agriculture and irrigation in the Nepal Tarai-Madhesh

Key guides, reports and working papers WLE contributed to include:

- Increasing the benefits and sustainability of irrigation through the integration of fisheries
- A joint stocktaking of CGIAR work on forest and landscape restoration
- Gender in urban food systems
- Global change and investments in smallholder irrigation for food and nutrition security in sub-Saharan Africa (chapter)
- Including food systems, biodiversity, nutrition and health in the post-2020 Global Biodiversity Framework, for the CBD

WLE scientists also contributed to publications related to various international processes and reports:

- Background paper for African climate negotiators
- World Bank WLE paper on sustainable irrigation expansion
- African Development Bank WLE paper on farmer-led irrigation in Ethiopia
- Water and nutrition: Harmonizing actions for the United Nations Decade of Action on Nutrition and the United Nations Water Action Decade
- Climate change and land: IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems
- World Water Development Report 2020: Water and Climate Change (chapters 4 and 12)
- Pathways to sustainable land-use and food systems – FABLE 2020 Report

1.3 Cross-cutting dimensions (at CRP level)

1.3.1 Gender

WLE completed an internal systematic analysis of gender and social inclusion research across WLE Flagships and projects. Insights from this work show a progressive shift in understanding gender – from an earlier, limited focus on gender as women, to understanding how gender inequalities intersect with poverty, age and other disparities across sectors, institutions and communities. The examples below show that WLE is helping build stakeholders' gender knowledge and capacity and informing policy and practice on gender-inclusive ecosystem restoration, agricultural land and water initiatives, and the interface of rural-to-urban transitions.

Gender and social inclusion dimensions are now prominently reflected in flagship milestones and products, as the following examples show:

- An RDL/Alliance "inclusive restoration" project enables diverse stakeholders in Ethiopia to analyze research from restoration projects, policies and interventions and co-learn lessons from gender-transformative restoration interventions.
- Using text mining of restoration related documents, RDL/ESA/Alliance found that while gender-responsive landscape restoration is acknowledged globally, policy, program and implementation documents and guidelines remain largely gender-blind.
- LWS/ICRISAT found that deep-rooted patriarchal norms, traditions and practices impact the implementation of watershed projects in the arid, drought-prone regions of North India.
- The newly launched Solar Irrigation for Agricultural Resilience (SoLAR) project will document the barriers and challenges to socially inclusive and gender-equal livelihoods through solar photovoltaic deployment in South Asia.
- A PIM/WLE-hosted webinar on the gender dynamics of migration and irrigation governance in Nepal highlighted how male out-migration has multi-faceted effects on the agency of women (spouses).
- RUL/RUAF/IWMI published a special issue of *Urban Agriculture Magazine* on gender-responsive approaches to rural-urban food systems, which draws attention to the complex, gendered dynamics of urban food value chains.
- RUL/IWMI/ICRAF/CIAT are implementing a gender-focused project in East African refugee camps, where women and children make up the majority of inhabitants. Initial findings focus on practices used to produce food and cooking energy sustainably.
- In Myanmar, a VCR/IWMI project aimed at identifying and addressing the root causes of gender inequality in wetlands management has developed a conceptual framework and methodology to be implemented by Helvetas in the Gulf of Motamma.
- ESA/Alliance designed a gendered ecosystem services approach to identify novel and locally relevant strategies for jointly improving food security, nutrition and conservation and applied this in the Barotse Floodplain of Zambia.
- ESA partners drew lessons from the culturally grounded indicators of resilience in social-ecological systems in a variety of settings. These examine gendered access to opportunities and resources, and recognition of women's knowledge, experience and skills at household, community and landscape levels.

For WLE's Gender, Youth and Inclusion (GYI) team, important strategic developments include:

- The WLE/GYI leader joined the CGIAR GENDER Platform Steering Committee, its advisory body on the

Evidence Module, and leads one of the two task groups of the Alliance Module.
- The WLE/GYI team co-authored two chapters in a forthcoming GENDER Platform publication that highlights next generation gender-agriculture insights.
- WLE/GYI leads one, and is a partner on another, GENDER Platform grant on generating gender-transformative evidence for inclusive food systems.
- On the "inclusive restoration" project, RDL/Alliance/ICRAF are strengthening the technical capacity of Ethiopian stakeholders from the Environment, Forest and Climate Change Commission and the Sustainable Land Management Program of the Ministry of Agriculture, to integrate gender into landscape restoration projects and programs.

The only problems encountered related to the impact of COVID-19 on field research.

- In Myanmar, a socially inclusive and gender-transformative wetlands project addressed this by engaging a local consultancy, pointB, to lead the primary research. This contributed to local capacity strengthening but the quality was impacted by the current political crisis.
- In Nepal, primary research is being conducted through digital podcasts coordinated and managed by the Nepal Forum of Environmental Journalists. WLE researchers co-designed an inclusive, gender-responsive structure for their radio programs.

1.3.2 Youth and other aspects of Social Inclusion/"Leaving No-one Behind"

WLE contributions to knowledge, advocacy and training on youth include:

- LWS traced the impact of COVID-19 on migration trends in China, Ethiopia, Kyrgyzstan, Moldova, Morocco, Nepal and Thailand, and found they have been severely affected. Overall, there has been little return migration because of significant travel barriers and many migrants choosing to remain and seek work in host countries.
- The ESA decision analysis process, including applications of Bayesian networks, has combined inclusive participatory processes through which various groups, including youth, engage with developing actionable foresight models that capture tradeoffs, uncertainties and challenges. These have been applied in various settings, for example in collaboration with WeForest in Ethiopia.
- WLE researchers have contributed to FISH/IWMI-led research in Myanmar evidencing how aspirations, opportunities and challenges for youth are based on historical and structural inequalities in the food system and deep-rooted gender norms and identities (forthcoming).
- A LWS/IWMI study on the gendered dimensions of youth migration and agrarian transformation demonstrated that male youth out-migration is determined by diminishing agricultural opportunities and aspirations for social mobility.
- Research in Ethiopia showed that establishing a national migration policy and improving bilateral arrangements with receiving countries would enable more positive impacts from migration and youth remittance income.
- In Nepal, WLE/IWMI designed an intervention that captures youth aspirations, their choice of work and their awareness of programs and policies targeting them through local radio programs such as Radio Sagarmatha, as well as policymakers' perceptions regarding youth migration (including reverse migration owing to COVID-19).

WLE will produce findings addressing the direction of the program's work in 2021.

Despite the focus on intersectional gender inequalities, there is very little data and research on youth. On the

one hand, a key challenge is in defining "youth": definitions and interventions vary widely because of diverse viewpoints. Where there is a focus on youth, the tendency is to "present an imagery of a homogenous category of youth migrating from rural to urban locations and livelihoods".

WLE/FISH/IWMI-led research in Myanmar is providing evidence, to be published in 2021, on how livelihood aspirations, opportunities and challenges for youth are based on historical and structural inequalities in the food system and deep-rooted gendered norms and identities.

1.3.3 Capacity Development

WLE invests to help people use its growing suite of tools and inform investors and stakeholders on findings. Table 7 quantifies male and female trainees but does not communicate the full range of training. For example, WLE provided training to 5,677 people in 2020, including:

New tools

- RDL/ICRAF trained 58 people from Asia and Africa on infrared spectroscopy, X-ray spectrometer techniques, data analysis and soil processing; and co-organized a soil spectroscopy webinar for some 850 people from 28 countries.
- RDL/Alliance trained 120 Ethiopians on web portal use and data management and 40 people on data standardization.
- VCR/IWMI trained professionals on tools such as water accounting, index-based flood insurance, SADMS and energy modeling; and contributed to a course on IWMI's Global Environmental Flow Information System.
- ESA/Alliance equipped over 160 researchers and decision makers from 51 organizations to use new tools for assessing ecosystem services, synergies and tradeoffs in sustainable agriculture.

Skills to implement new practices and policies

RUL/IWMI implemented or supported training on resource recovery and reuse (RRR), including:

- In Sri Lanka, 186 representatives from restaurants, supermarkets, schools and universities were trained in food waste reduction; 200 representatives from compost users and producers were trained in new compost standards.
- India's WASH Institute will train nearly 5,000 people on WLE RRR business models (OICR).
- WLE/IWMI trained over 70 Ghanaian public- and private-sector representatives in fecal sludge management; and supported training for 11 Bangladeshi cities in advanced fecal sludge and solid waste management.

Information exchange

- In 2020, VCR supported the Global Framework on Water Scarcity in Agriculture's three-day information exchange and capacity building event on water-nutrition linkages; this was followed by other online events, at Stockholm World Water Week and at the Borlaug Dialogue.

1.3.4 Climate Change

The entire thrust of WLE's program focuses on building resilience to climate change impacts. Some key achievements in 2020 include:

Climate information and disaster management services

- SADMS provided real-time drought severity data to Indian states to inform contingency plans. Its framework is being scaled out to other Asian and African countries (OICR).
- The African Group of Negotiators Experts Support (AGNES) requested a background paper on the socio-economic and food security aspects of climate change in Africa.

Climate-smart land and water management practices

- In Jordan, LWS/ICARDA demonstrated how soil and water enhancements potentially bridge erratic rainfall and droughts, leading to increased government investments (OICR).
- An external review showed that WLE is making significant contributions to Ethiopian sustainable land and water management, critical for adapting to climate change.
- Climate mitigation and adaptation are integrated into ESA tools, including analyzing forest restoration options; a gendered approach to ecosystems services analysis; and farm-design analysis of nutrition-income tradeoffs.

Trees and crops for adaptation to climate change

- In Ethiopia, RDL/ICRAF evaluated land suitability and potential climate change impacts on alfalfa production and the effects of forest composition and disturbance on soil carbon stocks in an Afromontane forest.
- RDL/ICRAF and CCAFS co-developed evidence on the mitigation benefits of tree expansion on rangeland in Colombia (paper, blog). An RDL/Alliance-led secretariat for Colombia's zero-deforestation dairy value chain agreement got the two major dairy-producing firms to sign the agreement (OICR).
- RDL/Alliance started working on reconciling agriculture, forestry and land-use emissions from different data sources to provide insights on how to improve national greenhouse gas reporting to the UNFCCC.

Climate-resilient urban food systems

- FAO/RUAF/IWMI collaborated on the Building Climate Resilient City Region Food Systems initiative. Methodological guidelines (also here and here) developed include climate change and pandemic vulnerability assessments.

2. Effectiveness and Efficiency

2.1 Management and Governance

2020 was largely stable in terms of management and governance, following structural changes the previous year. Leigh Ann Winowiecki took on co-leadership of FP1 following Keith Shepherd's retirement, and Adam Hunt left his role as WLE Head of Communications. With only 1.5 years of the program remaining, it would not have been possible to hire a replacement full-time staff. Instead, WLE's communications work has been outsourced to Scriptoria, a consulting company. Mark Smith, as IWMI's new Director General, replaced Claudia Sadoff on the WLE Independent Steering Committee (ISC) after she left IWMI to join the CGIAR Executive Management Team.

Meetings of the Management Committee (MC) and ISC were virtual throughout 2020, due to COVID-19-related restrictions on travel. To an extent this was a success, with WLE still able to operate and make

decisions, using a format of more frequent, shorter meetings. Reduced travel also resulted in cost savings. It was not possible to maintain engagement for longer periods, however, so there were limitations to discussing science in depth and exchanging detailed ideas.

The Program Management Unit (PMU) was able to adjust to virtual working easily; while some members are based with IWMI in Sri Lanka, others are located in different countries and there was already a culture of remote working. Regular meetings and engagement were maintained.

In the latter half of the year, WLE began to plan in more detail for the end of the current phase, starting to develop plans for knowledge management, synthesis, archiving and so on, as well as considering the future of WLE staff. This will be a focus of the PMU for the year ahead.

The participation of women in the management of WLE remained good, with the ISC, MC and PMU composed of 64% women.

2.2 Partnerships

2.2.1 Highlights of External Partnerships

WLE partners with many institutions that add value to its research or support uptake of its innovations (Table 8): farmer organizations, universities, government institutions, private firms, international development agencies, NGOs, advocacy organizations and UN agencies. Among important partnerships in 2020:

- WLE is supporting preparations for the UN Food Systems Summit (UNFSS) in partnership with the World Wide Fund for Nature, Johns Hopkins University and the Global Alliance for Improved Nutrition; a WLE scientist is seconded to UNFSS.
- WLE/ESA is collaborating with the UK Foreign, Commonwealth & Development Office for COP26 on Transforming Agricultural Innovation for People, Nature and Climate.
- VCR/IWMI chairs the Technical Advisory Committee of the World Water Quality Alliance. Partners include the UN Environment Programme, Germany's Federal Institute for Geosciences and Natural Resources, FAO, the International Water Association and the International Institute for Applied Systems Analysis.
- VCR/IWMI contributes to sustainable water futures in sub-Saharan Africa. Partners include the US Geological Service and Army Corps of Engineers, the World Bank, Conservation International, the International Union for the Conservation of Nature and the University of Arizona.
- RUL collaborates with FAO developing national action plans for food waste reduction and urban resilience, and India's WASH Institute on fecal sludge management training modules (OICR).
- LWS and the Global Water Partnership prepared a perspectives paper on new approaches to water storage.
- LWS also collaborates with numerous partners to understand the barriers to inclusive, sustainable scaling of solar irrigation in Africa and Asia, including CCAFS, GIZ, private firms and the South and Southeast Asia Regional Innovation Hub of Water and Energy for Food.
- RDL has a strong partnership with the UN Convention to Combat Desertification. It is contributing to the Global Land Outlook and on the expert panel of the Group on Earth Observations for Land Degradation Neutrality.

2.2.2 Cross-CGIAR Partnerships

WLE'S longstanding partnership with CCAFS continued in 2020, complemented by collaboration with FISH, RICE, PIM, RTB, FTA and A4HN. Highlights include:

- WLE collaborated with CCAFS on implementing Climate Smart Agriculture practices and technologies to reduce degradation in selected sites of Ethiopia, and with ILRI under the Africa RISING program on implementation of restoration and sustainable management options at Ethiopian learning sites.
- WLE and CCAFS co-developed evidence on the mitigation benefits from tree expansion on rangeland in Colombia (paper, blog).
- WLE intensified collaboration with CCAFS, the Indian Council of Agricultural Research (ICAR), the Borlaug Institute for South Asia (BISA) and an insurance partner (Reliance General Insurance Company Limited) on bundling seed systems, index-based flood insurance and climate information (Bundled solutions of index insurance with climate information and seed systems to manage agricultural risks).
- FISH/WorldFish continued to collaborate closely with WLE/IWMI on integrating fisheries in irrigation systems, and RICE/IRRI on rice-fish systems.
- PIM and WLE/IFPRI continued their collaboration on scaling up groundwater governance. Social learning games were rolled out in a series of Indian districts in 2020 where COVID-19 risks were low.
- Collaboration with A4NH was strengthened through joint work on the Agrobiodiversity Index to leverage and connect to the nutritional and environmental benefits of agrobiodiversity (OICR).
- A new initiative developed with CCAFS and FTA on agro-ecological transitions was selected for funding by the EU and IFAD.
- ESA led development of a cross-CGIAR framework for knowledge brokering with the Alliance, ICRAF, IFPRI and other partners.
- Finally, three CGIAR Centers (IWMI, IFPRI and ICARDA) and representatives from governments, international organizations, development finance institutions, NGOs, academia and practitioners contributed to a Global Framework on Water Scarcity in Agriculture (WASAG) White Paper, "Can water productivity improvements save us from global water scarcity?" (in press at FAO).

2.3 Intellectual Assets

N/A

2.4 Monitoring, Evaluation, Learning and Impact Assessment (MELIA)

In 2020, WLE had ambitious plans to add to its growing list of complexity-aware outcome evaluations. Three CRP-commissioned evaluations were planned; however, two were abandoned due to COVID-19. The remaining evaluation, on Climate-Smart Research on Solar-Powered Irrigation in India, produced four recommendations, of which three were accepted in full; the fourth recommendation was directed towards CGIAR at large and went beyond the limited scope of the CRP. Of note, the evaluation included a robust simulation model used to project potential benefits up to 2040. Ultimately, the Solar-Powered Irrigation evaluation confirmed that the program is achieving significant outcomes with potential for large-scale impacts.

WLE also hosted a CAS-commissioned CRP review. The review assessed the extent to which the second phase of the CRP delivered quality of science and demonstrated effectiveness in relation to the CRP's theory of change from 2017–2019. Overall, the review was very positive about WLE's effectiveness and quality of science. The review also made a strong argument for the future orientation of WLE's research activities,

noting that "WLE's achievements provide an important reference point for the One CGIAR for transdisciplinary work at the interface of livelihoods, landscape resilience and food and water security".

2.5 Efficiency

As a cross-cutting program, WLE encourages efficiency and development impact through combined efforts, collaborating with CGIAR Centers and CRPs on specific natural resource management and sustainable agricultural intensification (SAI) issues. In 2020, WLE supported a new multi-partner synthetic initiative, bringing together knowledge and capacity in improving agricultural water use to make this work more accessible for policy and decision making. WLE continued to support similar collective projects, such as the partnership with FISH and RICE in Southeast Asia to understand how integrating water, rice and fisheries management can achieve productivity gains and enhanced resilience for farmers; and CoSAI, which brings together research on SAI solutions from inside and outside CGIAR, for greater efficiency in analyzing and promoting evidence.

An unintended efficiency gain in 2020 was the reduction in travel, allowing for some researchers to spend more time on reflection and writing, as well as new models of partnership with local providers and reduced expenditure.

In management, the previous year's investment in developing a three-year budget and portfolio (2019–2021) reduced some of the transaction costs in planning for 2020. WLE continues to use the MARLO platform for planning and reporting, allowing the management team to monitor commitments and progress, and ensuring a single location for program-level data. MARLO has the potential for significant efficiency gains, for example with a Business Intelligence module to extract and analyze data from MARLO, and with future streamlining of the various fields, as at present the requirements for planning and reporting are heavy.

2.6 Management of Risks to your CRP

Following IWMI's Risk Management framework, WLE monitors four categories of risk: research and science risks; financial risks; infrastructure and capability risks; and reputational risks. WLE's management reviews the register twice a year, identifying appropriate mitigation actions. Of 18 risks identified in 2020, four were inherently high-risk:

- **Financial risk** of potential W1/W2 funding cuts due in part to effects of COVID-19 on donor economies. Mitigation measures including scenario-planning to be applied to different funding levels, and establishment of a process to apply funding reductions to enable high-performing initiatives to continue.
- **Reputational risk** around the outcome of the independent light touch review. The WLE team ensured that appropriate resources were assigned to assemble requested documentation and to facilitate the evaluation.
- **Infrastructure/capability risk** around perceived job insecurity post-2021, which could lead to program staff seeking alternative employment. This was a residual high risk, given the continued uncertainty of the future structure and funding arrangements.
- **Research/science risk** to the future of sustainability and agriculture work within CGIAR beyond 2021. To mitigate this risk, WLE continued to engage on, and raise the profile of, natural resource management across CGIAR, including through CoSAI and communications campaigns.

Due to cancellation of travel, events and fieldwork because of COVID-19, the dual risks of under-expenditure compared to planned budgets and inability to deliver planned outputs became more significant during 2020. WLE researchers were asked to plan alternative methods of delivery, as far as possible, and expenditures were closely monitored. Monitoring these risks will also be a focus for 2021.

2.7 Use of W1-2 Funding

W1/W2 was 27% of total 2020 expenditure. W1/W2 supports several areas, illustrated by examples in Table 12:

- *Discovery* – testing new concepts, e.g. FP5 research on synergies and tradeoffs analysis, integrated landscape and agrobiodiversity approaches and decision analysis.
- *Tailoring knowledge for delivery* – translating research into investable processes or products, e.g. Kenyan dashboard on land degradation, soil health and land restoration.
- *Influencing and stimulating dialogue* through engagement in multiple policy and research fora, e.g. working with FCDO to develop the climate and nature campaign for UNFCCC COP26.
- *Policy engagement* – feeding WLE/IWMI research into policy processes, e.g. the new irrigation decree on water-efficient technologies in Uzbekistan.
- *Training*, e.g. bringing specific resource recovery and reuse techniques to practitioners in Ghana, India and Sri Lanka.
- *Scaling* tools and approaches, e.g. building private sector partnerships to overcome systemic barriers in scaling solar-based irrigation.

W1/W2 also leveraged funding, for example through the award of three GENDER Platform grants, and by providing co-funding for initiatives with bilateral donor support, such as the development of disaster risk management tools in South Asia and Africa.

CoSAI invested in, inter alia, a landscape analysis on food, agriculture and environment; an estimation of investment in innovations; and an African Green Revolution Forum (AGRF) Dialogue on feeding cities and growing Africa. WLE also launched Water4Ag to bring research on enhancing water productivity and establishing an integrated water storage agenda into international policy discussions; and new research to set up integrated assessment models for selected river basins, facilitating and strengthening scenario development across scales.

3. Financial Summary

The total expenditure of WLE in 2020 was USD 32.7 million. This comprised USD 9 million in W1 & W2 funds, and USD 23.6 million in W3, Bilateral and Center funds.

The expenditure budget included in WLE's 2020 Plan of Work and Budget (POWB) was USD 32.5 million, of which USD 10.8 million was W1 & W2 funding.

The W3, Bilateral and Center funds budget included in the WLE 2020 POWB was USD 21.7 million. As predicted in the POWB, as further data was gathered on expected bilateral grants early in 2020, the W3, Bilateral and Center funds budget was also revised upwards to USD 33.7 million; this figure is reflected in Table 13.

The expenditure for both W1 & W2 and for W3, Bilateral and Center funding was lower than the revised 2020 budget presented in Table 13, largely due to constraints caused by COVID-19. With most travel and events cancelled, some projects were able to deliver on their commitments via alternative methods (virtual events, research by phone, etc.) that were often lower in cost, while other outputs were adjusted or postponed.

The bilateral expenditure recorded is that which is directly received, used and accounted for in the financial reports of our partners. Many WLE partners have successfully leveraged bilateral funding via co-investment by project partners; such funding is not accounted for in CGIAR accounting or in Table 13.

Part B. TABLES

Table 1: Evidence on Progress towards SLO targets (Sphere of Interest)

SLO Target (2022)	Brief summary of new evidence of CGIAR contribution	Expected additional contribution before end of 2022	Geographical scope (with location)
SLO1: Reduce Poverty			
1.1. ADOPTION: 100 million more farm households have adopted improved varieties, breeds, trees and/or management practices	No new evidence in 2020		
1.2. EXIT POVERTY: 30 million people, of which 50% are women, assisted to exit poverty	No new evidence in 2020		
SLO2: Improve Food and Nutrition Security for Health			
2.1. YIELD INCREASE: Improve the rate of yield increase for major food staples from current <1% to 1.2–1.5% per year	No new evidence in 2020		
2.2. MINIMUM DIETARY REQUIREMENTS: 30 million more people, of which 50% are women, meeting minimum dietary energy requirements	No new evidence in 2020		
2.3. MICRONUTRIENT DEFICIENCIES: 150 million more people, of which 50% are women, without deficiencies in one or more essential micronutrients	No new evidence in 2020		
2.4. WOMEN'S NUTRITION 10% reduction in women of reproductive age who are consuming less than the adequate number of food groups	No new evidence in 2020		
SLO3: Improve Natural Resources and Ecosystem Services			

3.1. WATER AND NUTRIENT EFFICIENCY: 5% increase in water and nutrient efficiency in agro-ecosystems	No new evidence in 2020		
3.2. REDUCED GREENHOUSE GAS EMISSION: Reduction in agriculturally-related greenhouse gas emissions by 5%	No new evidence in 2020		
3.3. ECOSYSTEM RESTORED: 55 million hectares degraded land area restored	No new evidence in 2020		
3.4. PREVENTION OF DEFORESTATION: 2.5 million hectares forest saved from deforestation	No new evidence in 2020		

Table 2: Condensed list of policy contributions in this reporting year (Sphere of Influence)

Title of policy, legal instrument, investment or curriculum to which CGIAR contributed	**Description** of policy, legal instrument, investment or curriculum to which CGIAR contributed	Level of maturity	Link to **sub-IDOs**	CGIAR cross-cutting marker score				Link to **OICR** (obligatory if Level of Maturity is 2 or 3) or link to **evidence** (e.g. PDF generated from MIS)
				Gender	Youth	Cap Dev	Climate Change	
Ethiopia adopts WLE/IWMI suggestions on valuing multiple uses of water in its new water policy	WLE/IWMI worked with the Ministries of Agriculture and of Water, Irrigation and Electricity to contribute to policy review processes, leading to a new draft policy document on irrigation.	1	Conducive agricultural policy environment	0	0	0	1	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3950&cycle=Reporting&year=2020
Uzbekistan Presidential Resolutions #5742 and	There has been a shift in subsidies from energy to water-saving technologies in lift irrigated areas.	2	Agricultural systems diversified and intensified in ways that protect soils	1	1	1	1	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3959&cycle

#4919 shift subsidies from energy to water saving in lift irrigation schemes			and water					=Reporting&year=2020
The European Union is proposing that 10% of natural and semi-natural habitats in agricultural landscapes be conserved	Agricultural landscape biodiversity targets were included in the European Union Biodiversity Strategy for 2030, reflecting the ambition of the Convention on Biological Diversity	1	Increased resilience of agro-ecosystems and communities, especially those including smallholders	0	0	1	1	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=4045&cycle=Reporting&year=2020

Table 3: List of Outcome/Impact Case Reports from this reporting year (Sphere of Influence)

Title of Outcome/Impact Case Report (OICR)	**Link to full OICR**	**Maturity level** 1, 2, 3
Nationwide scaling out and international adoption of "Agua de Honduras", a platform developed by WLE/Alliance to improve water management investment decisions	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3946&cycle=Reporting&year=2020	2
New approach to water users' associations in pump-based irrigation schemes in Myanmar results in equitable water allocation and boosts production	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3949&cycle=Reporting&year=2020	1
WLE/IWMI research influenced Ethiopian water sector policy reform to recognize multiple water values and other up-to-date options, benefitting irrigators, domestic and industrial users, and environment	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3950&cycle=Reporting&year=2020	2
Solar suitability tool and maps developed by WLE/IWMI now used by private sector actors to expand solar pump supply chains across sub-Saharan Africa	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=2896&cycle=Reporting&year=2020	1
WLE/IWMI research findings on water and energy use in lift irrigated areas have impacted water policies in Uzbekistan, potentially applicable to over two million hectares	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3959&cycle=Reporting&year=2020	2

WLE/IWMI business models research at the sanitation-agriculture interface used in pan-Indian training program which will target over 5,000 officials in the next two years	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3947&cycle=Reporting&year=2020	1
WLE/CCAFS/IWMI support South Asia and sub-Saharan Africa to make the leap from drought monitoring to managing agricultural drought risks	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=2899&cycle=Reporting&year=2020	2
WLE/Alliance-supported data sharing and big data applications being rolled out in Ethiopia to encourage the government's efforts to transform agriculture	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3948&cycle=Reporting&year=2020	1
Eight thousand Uzbekistan farmers cultivating 360,000 hectares are using water-accounting tools to improve water distribution making further expansion a national priority for 2020-2030	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3900&cycle=Reporting&year=2020	2
WLE/Alliance leadership of a multi-stakeholder platform secretariat prompted dairy giants to join the zero-deforestation movement in Colombia	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=3960&cycle=Reporting&year=2020	1
At least six private sector partners use WLE/A4NH/Alliance's Agrobiodiversity Index products to guide more holistic decision-making	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=4010&cycle=Reporting&year=2020	1
The European Union includes agricultural landscape biodiversity targets in its Green Deal strategies and in preparation for the Convention on Biological Diversity	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=4045&cycle=Reporting&year=2020	1
Wheat Varietal Diversification Increases Ethiopian Smallholders' Food Security for 50,000 to 75,000 farmers: Evidence from a WLE/Alliance-led Participatory Development Initiative	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=4083&cycle=Reporting&year=2020	3
Rehabilitation of dry agro-pastures through community-based mechanized micro water harvesting and flood-irrigation agriculture to benefit to 1,000 ha/ year in Jordan	https://marlo.cgiar.org/projects/WLE/studySummary.do?studyID=4081&cycle=Reporting&year=2020	1

Table 4: Condensed list of innovations by stage for this reporting year

Title of innovation with link (e.g. to MARLO).	Innovation Type	Stage of innovation	Geographic scope (with location)
2053 – Subsurface water retention membrane (SWRM)/ Soil Water Retention Technology (SWRT) to restore and use sustainably, lands with sandy soils (Flagship 1)	Production systems and management practices	2	Multi-national (Kenya, Zimbabwe)
2154 – Big data applications in Ethiopia to support agricultural transformation (Flagship 1)	Research and communication methodologies and tools	3	National (Ethiopia)
2111 – Expert System for Soil Nutrient Management developed for El Salvador (Flagship 1)	Research and communication methodologies and tools	1	Sub-national (El Salvador)
2112 – AGRI World Sources platform is a mapping application that uses public information on terrain, soil and climate to identify water sources for small-scale irrigation (Flagship 1)	Research and communication methodologies and tools	2	Regional (Central America) and under expansion to African countries
2155 – Respondent-driven method for mapping small agricultural plots using tablets and high-resolution imagery in Kenya (Flagship 1)	Research and communication methodologies and tools	3	Sub-national (Kenya)
2166 – Low-cost, multi-purpose handheld and next generation soil-plant sensors to drive quality through the agricultural value chain (Flagship 1)	Research and communication methodologies and tools	3	Global
2167 – Seeds for Needs, comprehensive package to promote selection of local varieties adapted to local conditions from national genebanks through farmers' use, using crowdsourcing and citizen science approaches (Flagship 1)	Production system and management practices, Research and communication methodologies and tools	4	National (Ethiopia, Uganda)
2051 – Framework for Small-Scale Irrigation and Women's Empowerment in Ghana (Flagship 2)	Social science	1	National (Ghana)
2052 – Application of the Net-Map tool to the diffusion of small-scale irrigation in Ghana and Ethiopia (Flagship 2)	Research and communication methodologies and tools	3	National (Ethiopia, Ghana)
2171 – Enabling environment tool for scaling water innovations (Flagship 2)	Research and communication methodologies	2	National (Nepal, Ghana,

	and tools		Ethiopia, Mali, Nigeria, Sudan, Uzbekistan)
2165 – Methodology for identifying suitable watersheds for rehabilitation in dryland areas (Flagship 2)	Production systems and management practices	2	Regional (Middle East)
2163 – Global and regional assessment of the potential of wastewater as a water, nutrient and energy source (Flagship 3)	Biophysical research	1	Global
2164 – Inclusion of lessons regarding the impact of COVID-19 and response actions in the Approach, Process and Methodology document for the City Region Food Systems (CRFS) program (Flagship 3)	Research and communication methodologies and tools	1	Global
2169 – Predictive, integrated hydrological and groundwater use model in South Asia (Flagship 4)	Research and communication methodologies and tools	1	Regional (South Asia)
2170 – Regional energy trading model for the Eastern Nile Region (Flagship 4)	Research and communication methodologies and tools	1	Regional (Eastern Nile)
2327 – Innovative Risk Management Solutions for Floods and Drought to support national strategies for Disaster Risk Reduction (Flagship 4)	Production systems and management practices	3	Multinational (Asia and Africa)
2054 – Agrobiodiversity Index for supporting public and private sector decision making on biodiversity in food systems, for healthy diets, sustainable production and conservation (Flagship 5)	Research and communication methodologies and tools	4	Global
2122 – Biodiversity integrity indicator and threshold of minimum 10–20% of land for conservation in agricultural landscapes (Flagship 5)	Research and communication methodologies and tools	4	Global
2156 – Food system environmental data layers compiled and adapted to further innovate the Food Systems Dashboard (Flagship 5)	Research and communication methodologies and tools	3	Global
2157 – Innovative Food Systems Solutions Portal and online interactive portal that hosts and connects groups around innovative food systems solutions for healthy diets and a healthy planet (Flagship 5)	Research and communication methodologies and tools	1	Global

2159 – Culturally Grounded Indicators of Resilience in Social-ecological Systems (Flagship 5)	Research and communication methodologies and tools	3	Global, National (Cuba, Ethiopia)
2160 – Protocol for systematic review on the impact of diversification on biodiversity (Flagship 5)	Research and communication methodologies and tools	1	Global
2168 – Cross-CGIAR knowledge brokering framework for integrated landscape management Flagship 5)	Research and communication methodologies and tools	3	Global
2161 – A practitioners' guide to applying The Nature Conservancy's Voice, Choice, and Action framework for community-based management of freshwater resources (Flagship 5)	Research and communication methodologies and tools	3	Global

Table 5: Summary of status of Planned Outcomes and Milestones (Sphere of Influence-Control)

FP	2021 Outcome	Mapped to Sub-IDO	Summary narrative on progress against each FP outcome this year	2020 Milestone	2020 milestones	Evidence for completed milestones	Links to evidence
F1	F1 Outcome: 1.1 Better informed landscape restoration policies, approaches and interventions [related WLE sub-IDO indicator: Number of countries in which governments, agencies and local stakeholders invest in research-based strategies and programs targeting adoption of restorative and preventative practices against land	Increased resilience of agro-ecosystems and communities, especially those including smallholders	The Restoring Degraded Lands (RDL) Flagship produced information platforms for supporting the use of land, soil and water management for landscape restoration and sustainable use in Central America, El Salvador and Ethiopia. RDL is advancing towards the identification of	2020 – Stakeholder capacities and information platforms are developed, leading to more feasible, gender-responsive and locally-led restoration projects in productive landscapes in at least two countries (Ethiopia, Peru)	Complete	Peru: Zero-deforestation strategies agreed among the cacao and oil palm value chain actors. (1, 2) El Salvador: Soil erosion monitoring manuals developed for training partners on monitoring erosion; Expert System for Soil Nutrient Management to assist restoration. An information platform developed to inform water management. (3–5) Ethiopia: Developed a framework to assist selecting restoration options. Developed information to support decision makers in selecting the appropriate site for building a drinking water dam and on providing landscape management options to reduce siltation. Supported government on tackling water hyacinth in Lake Tana. (6–8) Global studies inform dialogues on contribution of the agro-	(1) Moving towards a deforestation-free cacao and chocolate value chain with low greenhouse gas emissions https://hdl.handle.net/10568/110541 (2) Moving towards a palm oil value chain that contributes to the conservation of forests and a reduction in greenhouse gas emissions https://hdl.handle.net/10568/110537 (3) Site-specific recommendations for nutrient management for maize in the Agua Caliente sub-basin, Ahuachapán - El Salvador https://arcg.is/04fTyG; and two manuals for soil erosion monitoring (4) AGRI World Sources platform https://agri-worldsources.com/

	degradation]		business models to address drivers of deforestation in the Peruvian Amazon, and to implement restoration action in districts of Tanzania.			food sector in combating land degradation: Knowledge brokering framework for integrated landscape management. (9) Kenya, Zimbabwe: Research on effectiveness of subsurface water retention membranes for restoring sandy soils. (10) Consolidated current knowledge and evidence on soil health management and ecosystem services and soil micro-organisms long-term; tradeoff analysis of integrated soil fertility management across central and northern Tanzania. (11) The Global Soil Data Manager (reported in 2019) functionalities improved and use expanded; it gained 45 new users and 698 sessions of use in 2020. (12)	(5) OICR (6) Targeting SLM technologies across landscapes: a framework to facilitate matching SLM technologies with landscape conditions and generate evidence https://cgiar-my.sharepoint.com/:w:/g/personal/j_y_mutua_cgiar_org/ERtaRUICn7xHmznYc7VHTNsBJQR0hhD4P44fLCIgKEWxWg?rtime=z1Ti6c3Z2Eg (7) Ethiopia Government and Alliance partners to implement USD 32 million water project https://blog.ciat.cgiar.org/ethiopia-government-and-alliance-partners-to-implement-usd-32-million-water-project/ (8) Helping Lake Tana fight the water hyacinth menace https://blog.ciat.cgiar.org/helping-lake-tana-fight-the-water-hyacinth-menace/ (9) A knowledge brokering framework for integrated landscape management https://doi.org/10.3389/fsufs.2020.00013 (10) Reclaiming the lost glory of sandy soils in Kenya https://alliancebioversityciat.org/news_and_blogs/reclaiming-the-lost-glory-of-sandy-soils-in-kenya (11) The impact of interventions in the global land and agri-food sectors on Nature's Contributions to People and the UN Sustainable Development Goals https://doi.org/10.1111/gcb.15219 (12) Rethinking agro-food sector to combat land degradation and desertification https://doi.org/10.1007/978-3-319-71065-5_132-1
F1	F1 Outcome: 1.1 Better informed landscape restoration policies, approaches and interventions [related WLE sub-IDO indicator: Number of countries in which governments, agencies and local stakeholders invest in research-	Increased resilience of agro-ecosystems and communities, especially those including smallholders		2020 – Sustainable and socially inclusive models for landscape restoration and sustainable intensification are co-designed with private sector partners in at least two	Complete	Peru: Three business models agreed with three cacao and oil palm companies through a Memorandum of Understanding aimed at achieving zero deforestation. In 2021, this will be the basis for implementing investment cases. In 2020, it was decided to increase the number of business models in Peru to compensate for the lack of concrete private sector engagement for the business case. (1) Scoping review to ascertain the impact on small-scale producers of farmers' organization (FO) services in sub-Saharan Africa and India. RDL/IFPRI analyses indicated that information, infrastructure and logistical support can facilitate access to	(1) MoUs that include the business model canvas are available upon request and only for verification purposes. As these are legal documents, they are not accessible to the public. (2) A scoping review of the contributions of farmers' organizations to smallholder agriculture https://doi.org/10.1038/s43016-020-00164-x

	based strategies and programs targeting adoption of restorative and preventative practices against land degradation]			countries (Peru, Kenya)		markets and help integrate FOs into policy. Natural resource management should also be more widely incorporated in the services provided by FOs to mitigate risks associated with environmental degradation. (2)	
F1	F1 Outcome: 1.1 Better informed landscape restoration policies, approaches and interventions [related WLE sub-IDO indicator: Number of countries in which governments, agencies and local stakeholders invest in research-based strategies and programs targeting adoption of restorative and preventative practices against land degradation]	Increased resilience of agro-ecosystems and communities, especially those including smallholders		2020 – Capacity enhancement to improve gender equity in restoration initiatives in at least two countries (Cameroon and Peru)	Complete	RDL/Bioversity worked with partners in Peru and Ethiopia to share results from our studies from 12 communities and plan ways forward for enhancing gender equity in restoration. Partners included Association APPALAR/Pronaturaleza, Cacao Peru Alliance (Chazuta farmers), Pachamama Raymi Civil Association (Tayancani Community) and AIDER (Jose Ignacio Tavra community). Some of the resource materials used were factsheets tailored to the specific contexts and communities where partners work. In particular, the results have prompted partners to devise ways to enhance support to young cocoa farmers, to enhance inter-generational succession of cocoa farming. (1) The planned multi-stakeholder workshop to share research findings in Cameroon was cancelled due to COVID-19. RDL/IFPRI widely shared evidence on why gender matters for soil health and this has been shared to inform soil restoration efforts. (2) RDL advanced in integrating gender across the project portfolio as well as pursuing gender-focused projects. Led by an interdisciplinary team of scientists in close collaboration with partners, one such project examined gender in restoration discourses, policies and practices in Ethiopia to build partners' capacity to implement gender-focused interventions. (3–4)	(1) Factsheets on enhancing gender equity in restoration https://cgiar-my.sharepoint.com/:f:/g/personal/marlene_elias_cgiar_org/EgJJg0YEARRKvVmdOltdmn8B51oPmL8bzzwZEYKy0V8k3g (2) Why gender matters for soil health as part of sustainable food systems www.agrilinks.org/post/why-gender-matters-soil-health-part-sustainable-food-systems (3) MSc dissertation: Gender integration in climate change policy and adaptation practise in Ethiopia's agriculture sector https://cgiar.sharepoint.com/:b:/s/WLE/ETlQ-UCEBKFKqNLHDtpkSVEBP1IR0iuIOeksk-D5hcVLcg?e=WJSNfb (4) Semantics and words matter for analyzing gender and social inclusivity in development projects https://wle.cgiar.org/thrive/2020/07/24/semantics-and-words-matter-analyzing-gender-and-social-inclusivity-development
F1	F1 Outcome: 1.1 Better informed landscape restoration policies, approaches and interventions [related WLE sub-IDO indicator: Number of countries in which governments, agencies and local stakeholders invest in research-based strategies and programs targeting adoption of restorative	Increased resilience of agro-ecosystems and communities, especially those including smallholders		2020 – National and sub-national strategies for restoration are improved and deliver food security and livelihoods co-benefits, by the better use of local agrobiodiversity in at least three countries (Uganda, Nepal, Uzbekistan)	Complete	Worked on selecting crop and tree species in restoration projects and developed evidence to de-risk such investments and achieve targeted outcomes: - Global: Forest and woodland replacement patterns following drought-related mortality (1, 2) - Global: From Tree Planting to Tree Growing: Rethinking Ecosystem Restoration through Trees (3) - Ethiopia: Relationship between *Prosopis juliflora* invasion and livelihood diversification in the South Afar (4) - Ethiopia: Analyzed composition and density of soil seed banks of *Prosopis juliflora* in Afar region rangelands (5) Established zonal seed banks in Uzbekistan and networks of	(1) Forest and woodland replacement patterns following drought-related mortality https://doi.org/10.1073/pnas.2002314117 (2) More abundant tree species unlikely to return after droughts https://wle.cgiar.org/thrive/2020/11/21/more-abundant-tree-species-unlikely-return-after-droughts (3) From tree planting to tree growing: Rethinking ecosystem restoration through trees www.worldagroforestry.org/publication/tree-planting-tree-growing-rethinking-ecosystem-restoration-through-trees (4) Relationship between *Prosopis juliflora* invasion and livelihood diversification in the South Afar region, Northeast

	and preventative practices against land degradation]					seed producers in Bolivia to foster producing quality planting material, adapted to agro-ecological areas, increasing availability and accessibility of this material for restoring degraded environments. The Uzbek Government passed a resolution to promote agro-biodiversity at the community and national level. (6, 7) Demonstrated benefits of improving access and management of crop and fruit tree diversity to support incorporating local agrobiodiversity portfolios in restoration and rural livelihood strategies (Uganda, Nepal, Uzbekistan). (8)	Ethiopia https://doi.org/10.1016/j.regsus.2020.09.002 (5) Analysis of composition and density of soil seed banks of *Prosopis juliflora* in Afar region rangelands, Northeast Ethiopia https://doi.org/10.1016/j.rala.2020.10.005 (6) Measures for the restoration of endangered local varieties of agricultural crops have been approved https://kun.uz/news/2020/09/07/qishloq-xojaligi-ekinlarining-yoqolib-ketish-xavfi-ostida-bolgan-mahalliy-navlarini-qayta-tiklash-choralari-tasdiqlandi (7) Local seed production: How is the industry supported? www.norma.uz/qonunchilikda_yangi/original_urugchilik_ushbu_soha_qanday_qullab-quvvatlanadi (8) Good practices for agrobiodiversity management https://hdl.handle.net/10568/109625
F1	F1 Outcome: 1.2 Policies, strategies, and interventions investing in practices that rehabilitate or protect soil fertility and soil carbon [related WLE sub-IDO indicator: Number of countries where climate financing, national strategies and programs invest in research-based practices to build soil fertility and soil carbon, providing food security, adaptation and mitigation benefits]	Reduced net greenhouse gas emissions from agriculture, forests and other forms of land-use (Mitigation and adaptation achieved)	The Restoring Degraded Lands (RDL) Flagship analyzes the success and failure factors of restoration actions implemented on the ground by RDL in Ethiopia and Colombia. This provides lessons to be linked with policy and incentives required for scaling up these options. Also, RDL is assessing the effect of different land use options in reducing erosion and water runoff. As a strategy to accelerate diffusion and uptake of soil fertility recommendations to reduce soil degradation, RDL is	2020 – Policymakers better understand the success and failure factors of restoration efforts, leading to more effective, evidence-driven land restoration projects in Colombia and Ethiopia	Complete	Colombia: Adoption study of silvopastoral systems for restoring degraded lands in the Amazon conducted. (1) Ethiopia: Key factors for success of WLE's restoration efforts in Ethiopia and lessons learned identified using the experience capitalization method. This will be used in dialogues with the Ethiopian government regarding restoration investments. (2) Ethiopia: Detailed analysis of soil organic carbon sequestration potential from land management options conducted and results translated into a report for policy and decision makers. The results are instrumental to plan targeting of interventions across scale. (3) Ethiopia: Impacts of different land uses and soil and water conservation options assessed for their impact in reducing erosion in the Central Highlands of Ethiopia. (4) Global: RDL/ICRAF served on the expert panel in the Group on Earth Observations for Land Degradation Neutrality competition to build a land use planning tool to support achieving land degradation neutrality. (5) RDL/CIAT contributed to policy dialogues through a UN Climate Change contribution on nutrient and manure management and a brief on non-responsiveness of soils in sub-Saharan Africa. (6)	(1) Survey data and report (not public yet; under approval from the editorial team) https://cgiar-my.sharepoint.com/:b:/g/personal/m_quintero_cgiar_org/EWXRaAblY3BCgaom_CNOm1EBD-abUQZQY2SgkPI_ZzHUYw (2) Experience capitalization of Gudoberet-Adisgie and Jewe landscape restoration process in Ethiopia https://cgiar-my.sharepoint.com/:w:/g/personal/m_quintero_cgiar_org/EbWaNS9QJhpDm6DnAMsl7WwBYVnXlmNT5uZSWUBoF5c7gA (3) Soil organic carbon dynamics along chrono-sequence land-use systems in the highlands of Ethiopia https://doi.org/10.1016/j.agee.2020.106997 (4) Assessing the impacts of different land uses and soil and water conservation interventions on runoff and sediment yield at different scales in the central highlands of Ethiopia https://doi.org/10.1017/S1742170520000010 (5) UNCCD Podcast EP1: Ermias Betemariam https://soundcloud.com/unccd/unccdpodcastep1 (6) Addressing the non-responsiveness of crops to fertilizers under some soils in sub-Saharan Africa www.slu.se/globalassets/ew/org/andra-enh/uadm/global/agrifose/phase-1/outputs/briefs/agrifose2030-brief-addressing-the-non-responsiveness.pdf

F1	F1 Outcome: 1.2 Policies, strategies, and interventions investing in practices that rehabilitate or protect soil fertility and soil carbon [related WLE sub-IDO indicator: Number of countries where climate financing, national strategies and programs invest in research-based practices to build soil fertility and soil carbon, providing food security, adaptation and mitigation benefits]	Reduced net greenhouse gas emissions from agriculture, forests and other forms of land-use (Mitigation and adaptation achieved)	developing the use of big data analytics and digital tools to create nutrient management digital tools.	2020 – Tool developed and utilized by Ethiopian Ministry of Agriculture for "sound" fertilizer recommendation using big data analytics to make informed decisions on integrated soil fertility management in degraded landscapes	Complete	Prototype of the crop response to fertilizer application prediction tool developed using big data analytics and presented for feedback at a national workshop of the Coalition of the Willing for Soil and Agronomy Data Sharing. This tool is part of the efforts of the Coalition for improving access to and accelerating applicability of soils and agronomy data in soil management activities in landscapes. For example, it is being used to refine local fertilizer recommendations. (1)	(1) Workshop keynote: Brief update on data analysis https://youtu.be/LvOxl3p7Tdg
F1	F1 Outcome: 1.3 Strengthen approaches to the monitoring and evaluation of land restoration and the assessment of land degradation risks [related WLE sub-IDO indicator: Number of countries that adopt and have trained staff in land restoration surveillance, planning and verification frameworks]	Increased capacity of partner organizations, as evidenced by rate of investments in agricultural research	Makueni County of Kenya has benefited from having data in a range of sectors more accessible to allow enhanced decision making for planning land management interventions. Rwanda, Kenya, India, Côte d'Ivoire, China, Soils4Africa project, Excellence in Agronomy (EiA) benefited from the capacity development trainings on soil spectroscopy. Contributed to the development of low-cost, multi-purpose handheld and next generation soil-plant sensors to drive	2020 – Incorporation of up-to-date and accurate spatial assessments at relevant scales into decision dashboards for enhanced engagement with evidence around land degradation, soil health and land restoration in Kenya	Complete	RDL/ICRAF co-designed an open-source resource dashboard with Kenya's Makueni County stakeholders to improve market access, agricultural productivity, land restoration and improved nutrition initiatives. (1) Another key activity in a workshop hosted in Makueni County was to use a "data wall" to allow participants to interact with existing datasets, including maps. (2) Produced a respondent-driven method for mapping small agricultural plots using tablets and high-resolution imagery. (3) RDL/CIAT designed a dashboard for visualizing simulated impacts of different agricultural management practices on soil organic carbon, yield and Nitrogen loss in Kenya and Ethiopia. It will be launched in 2021. (4) Generated evidence on: soil and farm management effects on yield and nutrient concentrations, East Africa; (5) nutrient analysis in agricultural organic amendments using machine learning; (6) evidence-based investment selection under climatic and socio-political risk using Bayesian networks. (7)	(1) Combat land degradation in Makueni County http://landscapeportal.org/documents/2980 (2) New resource hub will offer evidence-based solutions for land restoration https://forestsnews.cifor.org/64278/new-resource-hub-will-offer-evidence-based-solutions-for-land-restoration?fnl=en (3) A respondent-driven method for mapping small agricultural plots using tablets and high resolution imagery https://doi.org/10.1002/jid.3475 (4) Leveraging local knowledge to map and link agricultural plots to farmer practices www.ifpri.org/blog/leveraging-local-knowledge-map-and-link-agricultural-plots-farmer-practices (5) Soil and farm management effects on yield and nutrient concentrations https://doi.org/10.1016/j.scitotenv.2020.137078 (6) Comprehensive nutrient analysis in agricultural organic amendments through non-destructive assays using machine learning https://doi.org/10.1371/journal.pone.0242821 (7) Evidence-based investment selection: Prioritizing agricultural development investments under climatic and socio-political risk using Bayesian networks https://doi.org/10.1371/journal.pone.0234213

			quality through the agricultural value chain.				
F1	F1 Outcome: 1.3 Strengthen approaches to the monitoring and evaluation of land restoration and the assessment of land degradation risks [related WLE sub-IDO indicator: Number of countries that adopt and have trained staff in land restoration surveillance, planning and verification frameworks]	Increased capacity of partner organizations, as evidenced by rate of investments in agricultural research		2020 – WLE monitoring, evaluation, learning and impact assessment (MELIA) framework and methods, which explicitly consider changes in gender equality and social inclusion, piloted in the context of the Promise of the Commons initiative in at least one state in India	Extended	Data collection in India had to be postponed due to COVID-19, resulting in this milestone being extended. Advanced on RDL MELIA Framework Piloting Report, impact assessment, and an integrated framework and methods for monitoring, evaluating, and enhancing the effectiveness of initiatives to restore degraded land. (1–3) Undertook a mobile survey as an interim measure to assess whether FES's restoration model is promoting resilience to large covariate shocks to COVID-19. A paper has been submitted to a journal for publication. Ganges: A web portal was developed by RDL/IFPRI for dissemination of the products from a project. This web-based application was developed mainly to provide stakeholders and the public with visualization and downloading of project products derived from satellite images and model-derived geospatial information data. The web application is hosted on a server at the Center for Spatial Information Science and Systems (CSISS), George Mason University, United States. (4)	(1) Evaluating the restoration of the commons: A quasi-experimental impact assessment of a large-scale land restoration initiative in India founded on the tenets of local collective action and property rights https://cgiar.sharepoint.com/:b:/s/WLE/Efb7nVX-m4dCq43TiH-GgSsBHBh6TiZxDrpIlivpm0dhoQ (2) Can restoration of the commons foster resilience? Comparing COVID-19 induced livelihood impacts and coping strategies among villages targeted and not targeted by a large scale common land restoration initiative in three Indian states https://cgiar.sharepoint.com/:b:/s/WLE/EapobodqbGhEtbNc16efIF0BXsqQXifRsJoBlH93Ag5tjw (3) Integrated framework and methods for monitoring, evaluating, and enhancing the effectiveness of initiatives restoring degraded land: Evaluating the impact of the Promise of Commons Initiative in India https://cgiar.sharepoint.com/:b:/s/WLE/EeDHQI9jf3FErrFxVBVF0IEBYfwAvVXOoi_KpbbSED-9_w (4) Ganges River Basin Land Use and Land Cover Portal http://cloud.csiss.gmu.edu/ganges-lulc/
F1	F1 Outcome: 1.3 Strengthen approaches to the monitoring and evaluation of land restoration and the assessment of land degradation risks [related WLE sub-IDO indicator: Number of countries that adopt and have trained staff in land restoration surveillance, planning and verification frameworks]	Increased capacity of partner organizations, as evidenced by rate of investments in agricultural research		2020 – Capacity to use soil-plant spectral technology to assess soil health and target soil and crop management recommendations developed in at least five additional countries in Africa (Guinea, The Gambia, Mali, Niger, Senegal, Sierra Leone), Asia (China, India, Vietnam), and Latin America	Complete	Development of low-cost, multi-purpose handheld and next generation soil-plant sensors to drive quality through the agricultural value chain by bringing affordable soil testing to smallholder farmers in sub-Saharan Africa and capacity development. RDL/ICRAF in collaboration with Innovative Solutions in Decision Agriculture published a 30m resolution soil properties map of Africa. ICRAF contributed soil spectral and chemical analytical data and spectral prediction models. (1) ICRAF continued to develop open-source spectroscopy software for quality control, calibration and prediction of soil and plant properties from mid-infrared spectra. (2) RDL/ICRAF contributed to the development of a new global soil spectroscopy initiative under the Global Soil Laboratory Network (GLOSOLAN) under the umbrella of the Global Soil Partnership hosted by FAO. (3)	(1) Soil map of Africa www.isda-africa.com/isdasoil/ (2) SpecWeb App https://andrewsila.shinyapps.io/specweb/ (3) Global Soil Partnership: Dry chemistry (spectroscopy) www.fao.org/global-soil-partnership/glosolan/soil-analysis/dry-chemistry-spectroscopy/regional-champions-on-soil-spectroscopy/cifor-icraf-kenya/en (4) Data: Mid-Infrared Spectra (MIRS) from ICRAF Soil and Plant Spectroscopy Laboratory https://data.worldagroforestry.org/dataset.xhtml?persistentId=doi:10.34725/DVN/QXCWP1 (5) Comprehensive nutrient analysis in agricultural organic amendments through non-destructive assays using machine learning https://doi.org/10.1371/journal.pone.0242821

				(Haiti), and farm soil testing services extended to farmers through private sector partnerships in Kenya and Ghana.		Capacity was scaled to leverage soil-plant spectral technology to assess soil health and target soil and crop management recommendations in Côte d'Ivoire, Rwanda, India and China. ICRAF published its spectral libraries using FAIR data principles. A paper was published using the database. (4, 5)	
F2	F2 Outcome: 2.1 Policy and practice informed by more effective agricultural land and water management solutions and investment options [related WLE sub-IDO indicator: Number of countries in which AWLM solutions have been adopted into policy, practice and/or investment]	Reduced smallholders' production risk	The Flagship on Land and Water Solutions (LWS) for Sustainable Intensification has been collaborating with six countries in Africa and South Asia to support implementation of innovative agriculture, land and water management (ALWM) solutions through private sector collaboration and piloting business models. This includes facilitation of multi-stakeholder dialogues including the private sector, informing and influencing policies and scaling out watershed innovations. Various outreach activities with a range of stakeholders have led to uptake by the public and private sector.	2020 – Three to five sustainable business models for Agriculture, Land and Water Management (ALWM) solutions piloted with the private sector in at least three countries (India, Ethiopia, Ghana, Pakistan, Nepal, Bangladesh).	Complete	Established national multi-stakeholder dialogues to support farmer-led irrigation (FLI) development and brought in the 2030 Water Resources Group (WRG) of the World Bank to the Agricultural Water Management taskforce in Ethiopia to support scaling activities. (1, 2) Influenced the following policies in Ethiopia: agricultural reforms and contribution to the draft smallholders/small-scale irrigation policy; national water corridor development plan undertaken by the Ministry of Water, Irrigation and Energy; and PES policy. (3) Business models including financing modalities were tested in Ghana and Ethiopia. (4, 5) Four innovation grants were issued (Bangladesh, India, Nepal and Pakistan) to test innovative bundle solutions for solar irrigation. (6) Solar irrigation potential assessment and management tools and suitability mapping guide stakeholders (e.g. public and private sector, farmers, investors) in solar irrigation development (7–13, 14, 15) including gender and inclusion aspects, (16) and policy guidance have been identified. (17–30) Many outreach activities (webinars, online workshops) were implemented across different geographies.	(1) More than money: Stakeholders look beyond financing to expand farmer-led irrigation www.agrilinks.org/post/more-money-stakeholders-look-beyond-financing-expand-farmer-led-irrigation (2) Multi-stakeholder dialogue space on farmer-led irrigation development in Ghana: an instrument driving systemic change with private sector initiatives www.km4djournal.org/index.php/km4dj/article/view/489 (3) OICR (4) Solar business model report for Ghana (publication forthcoming August 2021) (5) How connecting innovators and implementers can catalyze solar irrigation scaling in Ghana www.agrilinks.org/post/how-connecting-innovators-and-implementers-can-catalyze-solar-irrigation-scaling-ghana (6) Innovation Fund Awardees https://solar.iwmi.org/innovation-fund-awardees/ (7) Potential for Solar Photovoltaic Based Irrigation map http://sip.africa.iwmi.org/ (8) Solar Powered Irrigation Systems (SPIS) Toolbox: Safeguard Water https://energypedia.info/wiki/SPIS_Safeguard_Water (9) SPIS Toolbox: Adjust Planning and Operation https://energypedia.info/wiki/SPIS_Toolbox_-_Adjust_Planning_and_Operation (10) SPIS Toolbox: Market https://energypedia.info/wiki/SPIS_Market (11) SPIS Toolbox: Sustainable Energy for Pumping and Irrigation

							https://energypedia.info/wiki/Sustainable_Energy_for_Pumping_and_Irrigation#Solar_Irrigation_Potential_.28SIP.29_Tool (12) SPIS Toolbox: Climate-Smart Agrifood Systems: Tools & Software https://energypedia.info/wiki/Climate-Smart_Agrifood_Systems:_Tools_%26_Software#Pumping_and_Irrigation (13) Water and Energy for Food (WE4F) Portal https://energypedia.info/wiki/Portal:Water_and_Energy_for_Food (14) Who benefits from farmer-led irrigation expansion in Ethiopia? https://hdl.handle.net/10568/110356 (15) Data-driven 'water and agriculture' planning: The big picture www.indiawaterportal.org/articles/data-driven-water-and-agriculture-planning-big-picture (16) Identified the gender gap in credit scoring to enhance women's access to PAYGO systems (Ghana) (Non-disclosure agreement with private sector but report available upon request) (17) Co-identification of value chain-based pathway for scaling of irrigation technologies and services: Cases in Basona Worana and Lemo woredas in Ethiopia https://hdl.handle.net/10568/110592 (18) Catalyzing farmers' irrigation investments: Recommendations to scale sustainable rural transformation https://waterforfood.nebraska.edu/-/media/projects/dwfi/resource-documents/reports-and-working-papers/catalyzing-farmers-irrigation-investments.pdf (19) Accelerating irrigation expansion in sub-Saharan Africa: Policy lessons from the global revolution in farmer-led smallholder irrigation https://hdl.handle.net/10568/107949 (20) Farmer-led Irrigation Development (FLI) – Webinar Series www.iwmi.cgiar.org/events/farmer-led-irrigation-development-fli-webinar-series (21) Initial research highlights importance of irrigation for Ethiopian farmers during COVID-19 www.agrilinks.org/post/initial-research-highlights-importance-irrigation-ethiopian-farmers-during-covid-19 (22) Compendium on solar powered irrigation systems in

							India https://hdl.handle.net/10568/109736 (23) India's food system in the time of COVID-19 www.epw.in/journal/2020/15/commentary/indias-food-system-time-covid-19.html (24) Changing rainfall patterns in an era of climate change: A multiparameter spatiotemporal analysis of trends & impacts for India (under review) https://doi.org/10.21203/rs.3.rs-95659/v2 (25) Sustainability of groundwater through community-driven distributed recharge: An analysis of arguments for water scarce regions of semi-arid India https://doi.org/10.1016/j.ejrh.2020.100680 (26) Impact of irrigation on India's dairy economy https://doi.org/10.3390/agriculture10030053 (27) Carbon footprint of India's groundwater irrigation https://doi.org/10.1080/17583004.2020.1750265 (28) Can MGNREGA be a tool for post-COVID-19 rural recovery www.downtoearth.org.in/blog/economy/can-mgnrega-be-a-tool-for-post-covid-19-rural-recovery-72201 (29) Outcome evaluation of climate-smart research on solar-irrigation in India https://hdl.handle.net/10568/113398 (30) Outcome evaluation of climate-smart research on solar-irrigation in India: Simulation modeling https://hdl.handle.net/10568/113399
F2	F2 Outcome: 2.1 Policy and practice informed by more effective agricultural land and water management solutions and investment options [related WLE sub-IDO indicator: Number of countries in which AWLM solutions have been adopted into policy, practice and/or investment]	Reduced smallholders' production risk		2020 – Sustainable and inclusive agriculture, land and water management (ALWM) solutions for landscape/ watershed management are integrated in public sector investments in two countries (Ethiopia and India)	Complete	Several journal papers and viewpoints were published to stimulate the debate on integrating ALWM solutions in investments. (1, 2) An assessment method for in-situ water harvesting was developed. (3) In Ethiopia, India and elsewhere, several years of demonstrations, learning sites and stakeholder engagement around the concepts of integrated watershed management that support sustainable landscape management and are closely linked to livelihoods, including gender equity, have resulted in high impact changes in policy and investments by government. These were supported by science communication (special issues, high impact journal papers and popular press), stakeholder engagement and key partnerships. (3–19)	(1) Journal paper on overlapping decision spaces of ALWM solutions, in review at *The Lancet* (2) Gender transformative impacts from watershed interventions: Insights from a mixed-methods study in the Bundelkhand region of India http://oar.icrisat.org/11393/1/pdfviewer.pdf (3) Renovated water harvesting structures have immense potential for agricultural productivity, suggest research findings www.icrisat.org/renovated-water-harvesting-structures-have-immense-potential-for-agricultural-productivity (4) Revive havelis, India's ancient rain harvesting farms, to save big on money and resources www.icrisat.org/revive-

						Jordan: community-based rehabilitation of dry agro-pastures through mechanized micro water harvesting and flood-irrigation agriculture. (20)	havelis-indias-ancient-rain-harvesting-farms-to-save-big-on-money-and-resources (5) Watershed interventions provide groundwater access all year through https://wle.cgiar.org/news/watershed-interventions-provide-groundwater-access-all-year-through (6) Scaling out experiential games for better ground and surface water management across India https://wle.cgiar.org/news/scaling-out-experiential-games-better-ground-and-surface-water-management-across-india (7) Shaping policies on sustainable agriculture: Academicians and scientists talk to policy makers www.icrisat.org/shaping-policies-on-sustainable-agriculture-academicians-and-scientists-talk-to-policy-makers (8) Rehabilitation of degraded rangelands in Jordan: The effects of mechanized micro water harvesting on hill-slope scale soil water and vegetation dynamics https://hdl.handle.net/20.500.11766/12602 (9) Storing water: A new integrated approach for resilient development www.gwp.org/globalassets/global/toolbox/publications/perspective-papers/perspectives-paper-on-water-storage.pdf (10) Suitability of arid land rehabilitation technologies: Simulation of water harvesting based solutions in Middle Eastern agro-pastures www.researchgate.net/publication/345253442_Suitability_of_arid_land_rehabilitation_technologies_simulation_of_water_harvesting_based_solutions_in_Middle_Eastern_agro-pastures (11) Building climate resilience in degraded agricultural landscapes through water management: A case study of Bundelkhand region, Central India https://doi.org/10.1016/j.jhydrol.2020.125592 (12) An interdisciplinary framework for using archaeology, history and collective action to enhance India's agricultural resilience and sustainability https://doi.org/10.1088/1748-9326/aba780 (13) Contour bundling technology-evidence and experience in the semiarid region of southern Mali https://doi.org/10.1017/S1742170519000450

							(14) Viewpoint: Water, agriculture and poverty in an era of climate change: Why do we know so little? https://doi.org/10.1016/j.foodpol.2020.101905 (15) Changing agricultural landscapes in Ethiopia: Examining application of adaptive management approach https://doi.org/10.3390/su12218939 (16) Multicriteria decision-support system to assess the potential of exclosure-based conservation in Ethiopia https://doi.org/10.1017/S1742170520000034 (17) The response of water and nutrient dynamics and of crop yield to conservation agriculture in the Ethiopian highlands https://doi.org/10.3390/su12155989 (18) Establishing irrigation potential of a hillside aquifer in the African highlands https://doi.org/10.1002/hyp.13659 (19) Connecting hillslope and runoff generation processes in the Ethiopian highlands: The Ene-Chilala Watershed https://doi.org/10.2478/johh-2020-0015 (20) OICR
F2	F2 Outcome: 2.2 Improved management of new and revitalized medium to large scale irrigation schemes [related WLE sub-IDO indicator: Number of medium and large irrigation systems revitalized for increased sustainability and productivity]	Agricultural systems diversified and intensified in ways that protect soils and water	The Flagship on Land and Water Solutions (LWS) for Sustainable Intensification has revitalized irrigation schemes through supporting irrigation asset management and facilitating learning and innovation platforms (via online events). A Special Issue of *International Journal of Water Resources Development* was published. Management of irrigation schemes has improved through development and use of tools (e.g. SAMS4i, in-situ	2019 Extended – Consolidate transferring knowledge from tested WLE solutions on farm-level tools and management into demonstration in irrigated systems in two countries	Complete	Outreach and networking activities were used to share knowledge on WLE solutions for irrigation systems and generated interest in the professional community (policymakers and practitioners). (1–3) Technological innovation options for demand side water management and social implications (e.g. needs for behavioral change) were co-developed. (4) High-level policy reports on water productivity, integrated water storage and adaptive water management in the Nile Delta were developed and discussed with a wide range of stakeholders including national policy and decision makers, DFIs, academia and the private sector. (5, 6)	(1) Webinar: More crop per drop: Farmer-learning and the promise of improved water use in agriculture https://thewaterchannel.tv/thewaterblog/more-crop-per-drop-farmer-learning-and-the-promise-of-improved-water-use-in-agriculture (2) Research in action with IWMI: How the International Water Management Institute took the VIA to Ethiopia https://via.farm/stories_iwmi (3) Launch event: International Network of Service Providers for Irrigation Excellence (INSPIRE) www.iwmi.cgiar.org/events/launch-of-the-international-network-of-service-providers-for-irrigation-excellence-inspire (4) Increasing irrigation efficiency in Jordan: demand and supply side constraints and opportunities. Report prepared by the International Water Management Institute for Mercy Corps' "Water Innovation Technologies" Project https://hdl.handle.net/10568/107112 (5) A gendered analysis of shifts in adaptive water management in the Nile Delta of Egypt https://hdl.handle.net/20.500.11766/12861

			measurements), utilization of novel data sources (e.g. Earth Observation in WaPOR project, ground-truthing data) and the development of IT applications for a range of users. Water governance has been supported through water users' associations and outreach activities for Africa, Asia, and the Middle East and North Africa (MENA) region.				(6) WASAG Webinar: Water productivity improvements – A silver bullet for the climate crisis? www.fao.org/index.php?id=105077
F2	F2 Outcome: 2.2 Improved management of new and revitalized medium to large scale irrigation schemes [related WLE sub-IDO indicator: Number of medium and large irrigation systems revitalized for increased sustainability and productivity]	Agricultural systems diversified and intensified in ways that protect soils and water		2019 Extended – National policymakers, academics and key stakeholders gain access to improved evidence base on small-scale irrigation through the publication of Special Issue of *International Journal of Water Resources Development*	Complete	The Special Issue of the *International Journal of Water Resources Development* is now used to support dialogues with donors and policymakers in several countries. (1–3) In Zimbabwe, these published results led to other projects and NGOs using the tools and approaches. The original donor ACIAR funded a further scoping study to evaluate the potential for further work on the integration of irrigation, dryland farming and livestock to develop local food systems based on circular economy principles. ICRISAT used the special issue to introduce the project approach and impact to the coordinator of the large IFAD-funded Participatory Small-scale Irrigation Development Project (PASIDP) in Ethiopia. At their request, we introduced the concept to the IFAD representative in Ethiopia, Mawira Chitima. The aim is for ICRISAT to support the existing PASIDP and contribute to this program's next development phase.	(1) International Journal of Water Resources Development, Volume 36, Issue sup1: Transforming Small-Scale Irrigation in Southern Africa www.tandfonline.com/toc/cijw20/36/sup1?nav=tocList (2) Simple interventions embedded in a wider learning environment lead to big gains and systemic changes www.icrisat.org/simple-interventions-embedded-in-a-wider-learning-environment-lead-to-big-gains-and-systemic-changes/ (3) Far-reaching impact of technology and innovation: Saving time, boosting income and reducing household conflict in Zimbabwe and beyond www.icrisat.org/far-reaching-impact-of-technology-and-innovation-saving-time-boosting-income-and-reducing-household-conflict-in-zimbabwe-and-beyond
F2	F2 Outcome: 2.2 Improved management of new and revitalized medium to large scale irrigation schemes [related WLE sub-IDO indicator: Number of medium and large irrigation systems revitalized for increased sustainability and productivity]	Agricultural systems diversified and intensified in ways that protect soils and water		2020 – National governments combine on-farm and scheme performance tools to improve irrigation efficiency at scheme level in at least three countries (India, Zimbabwe, Ethiopia, Myanmar, Sri Lanka)	Complete	Use of remote sensing and field data allowed a detailed analysis and improved the performance of an irrigation scheme (Ethiopia). (1) Related data was used for the co-development of applications to assist farmers and other stakeholders in irrigation water management decisions for various crops in Lebanon and Egypt (FAO-WaPOR). (2–11) Investments in the Indus System River Basin (e.g. Khanpur Dam, Chashma Lift) and water monitoring are influenced via the Water Management for Enhanced Productivity (WMfEP) project, informing investments of more than USD 1 billion. (12) Various outreach activities helped to share results and support several countries. (13)	(1) More crop per drop: Farmer-learning and the promise of improved water use in agriculture https://thewaterchannel.tv/videos/june-18-2020-more-crop-per-drop-farmer-learning-and-the-promise-of-improved-water-use-in-agriculture (2) Stakeholder mapping and needs assessment – Lebanon www.fao.org/3/ca7502en/ca7502en.pdf (3) LARI-LEB app https://play.google.com/store/apps/details?id=com.moussawi7.lari&hl=en (4) Video: IRWI app – irrigation water information https://youtu.be/teaCWyG0PAA (5) Technical Report: Implementation of on-farm water management solutions to increase water productivity in Egypt. ICT-Phone Application "IRWI-اروي" for Water Management in Agriculture https://irwicrop.com/Technical-Report-IRWI.pdf (6) IRWI on App Store https://apps.apple.com/us/app/%D8%A7%D8%B1%D9%88%D9%8A-irwi/id1529743508 (7) IRWI on Google Play https://play.google.com/store/apps/details?id=brilliantthoug

							hts.irwi (8) IRWI on desktop https://irwicrop.com (9) IRWI-Phone app gives smallholders farmers opportunity to improve water productivity in Egypt www.fao.org/in-action/remote-sensing-for-water-productivity/news-and-events/news/news-details/en/c/1308366 (10) WaPOR, remote sensing for water productivity: Field level activities www.fao.org/in-action/remote-sensing-for-water-productivity/capacity-development/field-level-activities/en (11) Webinar: The role of information and communication technologies (ICT) in water conservation in agriculture management https://youtu.be/_tcKljRyKJU (12) Evidence for the influence of major investments in the Indus Basin (WrEMP project) are internal donor reports that can be shared on request (13) Webinar: Irrigation development and agricultural water management in Africa: Transitioning implementation for sustainable adaptation www.iwmi.cgiar.org/events/irrigation-development-and-agricultural-water-management-in-africa-transitioning-implementation-for-sustainable-adaptation
F2	F2 Outcome: 2.2 Improved management of new and revitalized medium to large scale irrigation schemes [related WLE sub-IDO indicator: Number of medium and large irrigation systems revitalized for increased sustainability and productivity]	Increased capacity of partner organizations, as evidenced by rate of investments in agricultural research		2020 – Recommendations and tools to support inclusive water governance are tested/ implemented by national governments in at least two countries (Myanmar, Zimbabwe)	Complete	Tools to support inclusive water governance were appreciated by many country representatives from Africa, Asia and MENA as well as other stakeholders and implemented in several countries (Myanmar, Zimbabwe, Tanzania, Uzbekistan, Sri Lanka, etc.). Global knowledge sharing events on FLI development, governance, GYI were appreciated by a range of stakeholders. (1) Integrated management of water and energy for food and agriculture and upscaling of technological advances ("smart monitoring stick") supported policy changes in Uzbekistan. (2, 3) Water user associations remained effective during the pandemic and supported resilience (Myanmar). (4, 5)	(1) Farmer-led Irrigation Development (FLI) – Webinar Series www.iwmi.cgiar.org/events/farmer-led-irrigation-development-fli-webinar-series (2) OICR (3) OICR (4) OICR (5) Success despite COVID: Hope from a water users association in central Myanmar www.iwmi.cgiar.org/2020/11/success-despite-covid-hope-from-a-water-users-association-in-central-myanmar
F3	F3 Outcome: 3.1 Improved capacity of urban stakeholders to implement evidence-based policies and practices in support of	Conducive agricultural policy environment	The milestones have been extended to 2021 and beyond: The assessment and capacity development activities were	2020 – Ten towns or cities create Urban Food Policies or Strategies with WLE facilitation,	Extended	In the cities of Antananarivo, Kigali, Colombo, Tamale and Melbourne, the action planning under City Region Food Systems (CRFS) continued but was delayed due to the inclusion of COVID-19 in the (to be revised) survey methodology (new indicators) as well as limited fieldwork. (1)	(1) City Region Food Systems to cope with COVID-19 and other pandemic emergencies www.fao.org/uploads/pics/City_Region_Food_Systems_to_cope_with_COVID19_and_other_pandemic_emergencies__12.05.2020.pdf

	urban food security and resilience. [related WLE sub-IDO indicator: Number of cities with increased capacity and evidence for stakeholders and policy makers to implement urban and peri-urban agriculture related policies, strategies and/or farming system innovations]		expanded, content-wise and in the number of cities, to cover pandemic-related resilience challenges. While this is laudable, the related changes in methodologies put the teams back to the starting line, resulting in significant delays in parallel with those affecting fieldwork during the pandemic.	leading to improved food security and resilience in urban areas		Meanwhile, in Quito, Lusaka, Kitwe, Medellin and Toronto, food action plans and/or food policy platforms are available. (2) Article on building resilience in city-region food systems published. (3) Special issue of *Urban Agriculture Magazine* on gender and urban agriculture published. (4) A wider set of cities informed and capacities built through MUFPP and CityFood Platforms. This forms part of the process of creating food policy or strategy. (5, 6)	(2) Sustainable city region food system contributes to enhance strength and resilience against pandemics and climate change www.fao.org/in-action/food-for-cities-programme/news/detail/en/c/1370320 (3) City region food systems: Building resilience to COVID-19 and other shocks https://doi.org/10.3390/su13031325 (4) A call for transformative actions on gender and inequality https://ruaf.org/news/urban-agriculture-magazine-issue-37-a-call-for-transformative-actions-on-gender-and-inequality (5) Milan Urban Food Policy Pact https://milanurbanfoodpolicypact.org (6) CITYFOOD network https://ruaf.org/news/cityfood/
F3	F3 Outcome: 3.1 Improved capacity of urban stakeholders to implement evidence-based policies and practices in support of urban food security and resilience [related WLE sub-IDO indicator: Number of cities with increased capacity and evidence for stakeholders and policy makers to implement urban and peri-urban agriculture related policies, strategies and/or farming system innovations]	Conducive agricultural policy environment		2020 – Recommendations for gender-sensitive Milan Urban Food Policy Pact (MUFPP) indicators provided to global MUFPP secretariat to inform its works across all 200 signatory cities	Extended	The Framework indicators, including those with a gender lens, were part of a virtual training (CDI FSUS course, October–November 2020, 30 participants). They will also be tabled at the MUFPP annual meeting that was postponed to 2021 due to COVID-19, but preparations for regional meetings (early 2021) were made. (1) So far, the gender-sensitive indicator framework has been tested in three cities: Nairobi, Quito and Antananarivo. These cities adapted or proposed new indicators, as it appeared difficult to apply the gender lens as originally proposed. A related report was published in UAM 37. (2, 3)	(1) Milan Urban Food Policy Pact monitoring framework: A practical handbook for implementation https://cgiar.sharepoint.com/:b:/s/WLE/Eazkcd-wM_VAsfmiwhN7zsUBuljK9h6Xdul3c1g6Qk_bSA (2) Urban Agriculture Magazine no. 37 – Gender in urban food systems https://ruaf.org/document/urban-agriculture-magazine-no-37-gender-in-urban-food-systems (3) Milan Urban Food Policy Pact https://milanurbanfoodpolicypact.org
F3	F3 Outcome: 3.1 Improved capacity of urban stakeholders to implement evidence-based policies and practices in support of urban food security and resilience [related WLE sub-IDO	Conducive agricultural policy environment		2019 Extended – Field tested methodology to assess and increase climate resilience in at least three city-region food systems	Extended	The Approach, Process and Methodology for the City Regional Food Systems (CRFS) Program was updated based on the impact of COVID-19 to include pandemic-related indicators. This delayed the testing of the methodology in the five cities involved in this program. (1–4)	(1) Building climate- and pandemic-resilient city region food systems through adapted production systems: Approach, process and methodology (draft) https://cgiar.sharepoint.com/:b:/s/WLE/EbQ2ySMKMaJFhgPdSRscntYBqtnhRePILeRfG8df1dpSuw (2) Strengthening city-region food systems during and beyond COVID-19 https://wle.cgiar.org/thrive/2020/04/08/strengthening-city-region-food-systems-during-and-beyond-covid-19

	indicator: Number of cities with increased capacity and evidence for stakeholders and policy makers to implement urban and peri-urban agriculture related policies, strategies and/or farming system innovations]						(3) Presentations on City Region Food Systems and COVID-19, from FAO COVID Seminar, June 2020, and USA Urban Food Systems Symposium, October 2020https://cgiar.sharepoint.com/:b:/s/WLE/EbKZUGKeZD9LhgS21V8f0s4BtgoNSSUvR_QJmrJ7N9rCIw?e=2dVY2x (4) City Region Food Systems at the MUFPP Africa Forum 2021 https://ruaf.org/news/city-region-food-systems-at-the-mufpp-africa-forum-2021/
F3	F3 Outcome: 3.1 Improved capacity of urban stakeholders to implement evidence-based policies and practices in support of urban food security and resilience [related WLE sub-IDO indicator: Number of cities with increased capacity and evidence for stakeholders and policy makers to implement urban and peri-urban agriculture related policies, strategies and/or farming system innovations]	Conducive agricultural policy environment		2019 Extended – Adoption of gender indicator recommendations into the Milan Urban Food Policy Pact (MUFPP) framework in four cities	Changed	This is a duplication; this milestone is the same as (or has been succeeded by) the one above.	See links above on the gender indicator.
F3	F3 Outcome: 3.2 Increased business capacities in nutrient, water and energy recovery from domestic and agro-industrial waste for intensified food crop production [related WLE sub-IDO indicator: Increased number of business schools, training courses and start-up trainees with RRR	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	Two milestones, on gender dynamics in resource recovery and reuse (RRR) and inclusive business models, revised water quality guidelines had to be extended. Three milestones were reached: guidelines for producing organic fertilizer, roll-out of	2019 Extended – Completion of analysis of gender dynamics in resource recovery and reuse and inclusive business models	Extended	Delivery D4166 was in POWB 2021 extended to 2021, as the main author left IWMI. Another staff member is now responsible for completing it.	

	business capacity]		RRR courses, and completing initiation of RRR public-private partnerships.				
F3	F3 Outcome: 3.2 Increased business capacities in nutrient, water and energy recovery from domestic and agro-industrial waste for intensified food crop production [related WLE sub-IDO indicator: Increased number of business schools, training courses and start-up trainees with RRR business capacity]	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities		2020 – In collaboration with Sri Lanka's regulatory agencies, guidelines for organic fertilizer production developed and 100 private sector producers and farmers trained in their use	Complete	The guidelines were released, and 200 participants attended the first of three awareness and training workshops. Due to COVID-19, the follow-up workshops remain delayed. (1–3)	(1) Standards for compost production and certification https://cgiar.sharepoint.com/:b:/s/WLE/EZ8itCaQXbFDtMr5CIdlNU4BFYiWLoTV2ZDgb925sJ9Aug (2) Workshop: Introducing organic fertilizer standards to Sri Lanka (not externally accessible) https://intranet.iwmi.org/introducing-organic-fertilizer-standards-to-sri-lanka.aspx (3) IWMI Twitter thread https://twitter.com/IWMI_/status/1214766876254973952
F3	F3 Outcome: 3.2 Increased business capacities in nutrient, water and energy recovery from domestic and agro-industrial waste for intensified food crop production [related WLE sub-IDO indicator: Increased number of business schools, training courses and start-up trainees with RRR business capacity]	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities		2020 – Roll-out of free resource reuse and recovery (RRR) online course available based on WLE research and publications	Complete	Uptake statistics and progress report on RRR training module interest and adoption by universities can be found on the MARLO link of P443. (1) The Indian WASH Institute is implementing RRR business training modules to nearly 5,000 professionals in 2021. (2)	(1) RRR curriculum uptake – 2020 progress report on university and online courses roll-out https://cgiar.sharepoint.com/:b:/s/WLE/ER-McczvYrNPiGGa5CkrCiAB-7g-i8sJO_TpELvC9POUcA (2) OICR
F3	F3 Outcome: 3.2 Increased business capacities in nutrient, water and energy recovery from domestic and agro-industrial waste for intensified food crop production [related WLE sub-IDO	Increased capacity for innovation in partner development organizations and in		2020 – Three new WLE-facilitated public–private partnerships (PPP) on waste use for resource recovery operating in Ghana supporting alternative	Complete	All four RRR plants have been initiated (2 x compost, 1 x fuel, 1 x fish). Three are using the same private partner in their public–private partnerships, Jekora Pvt. Ltd. (1–3)	(1) After the flush: How a project in Ghana is turning human waste into an economic resource www.iwmi.cgiar.org/2020/11/after-the-flush-how-a-project-in-ghana-is-turning-human-waste-into-an-economic-resource (2) The brown revolution: Plant food from toilet waste https://wle.cgiar.org/thrive/2020/02/25/brown-revolution-plant-food-toilet-waste (3) Construction of fertilizer factory commences in Somanya

	indicator: Increased number of business schools, training courses and start-up trainees with RRR business capacity]	poor and vulnerable communities		options for increased food and energy production			www.ghanaweb.com/GhanaHomePage/business/Construction-of-fertilizer-factory-commences-in-Somanya-776767
F3	F3 Outcome: 3.2 Increased business capacities in nutrient, water and energy recovery from domestic and agro-industrial waste for intensified food crop production [related WLE sub-IDO indicator: Increased number of business schools, training courses and start-up trainees with RRR business capacity]	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities		2020 – The Food and Agriculture Organization (FAO) adopts WLE revised water quality guidelines (starting with Central Asia)	Extended	The consultant who is coordinating all chapters of the Water Quality Guidelines had to be changed. This delayed the start of the process. The project is now on track with a six-month delay and should close mid-2021.	
F4	F4 Outcome: 4.1 Uptake of solutions to enhance resilience to extreme water variability at different levels [related WLE sub-IDO indicator: Number of countries in which stakeholders and policy makers implement approaches that increase water supply for agricultural production under conditions of water variability]	Enhanced capacity to deal with climatic risks and extremes (Mitigation and adaptation achieved)	We have continued the implementation of innovative approaches for mitigating climate-related shocks in Asia and Africa. This includes: i) scaling up of index-based flood insurance as one component of bundled measures in India and Bangladesh; ii) development of guidance on equity issues and uptake of weather insurance by marginalized women and men; and iii) extension of drought monitoring and planning to additional countries in Asia	2019 Extended – WLE diagnostic and planning tools (particularly software) developed for flood and drought mitigation across Asia (Sri Lanka, Myanmar, Vietnam, India) are used and supported by national/state governments and UN-SPIDER	Complete	Collaborating with CCAFS, government partners and insurance companies, the continued roll-out of index-based flood insurance in both India and Bangladesh has resulted in increasing numbers of beneficiaries, (1, 2) including casual laborers. (3) We continue to enhance the technical foundation underpinning the South Asia Drought Monitoring System (SADMS), (4–7) the utility of which was extended to Afghanistan and Southern Africa in 2020. We continue to work with the United Nations Office for Outer Space Affairs (UN-SPIDER), including through development of training materials (8) and modification of existing tools to assist with new hazards (e.g. locust swarms). (9)	(1) How hi-tech insurance is helping farmers survive floods www.iwmi.cgiar.org/success-stories/how-hi-tech-insurance-is-helping-farmers-survive-floods/ (2) Project completion report of index-based agriculture insurance in Haor area https://hdl.handle.net/10568/110023 (3) Casual labourers in Bangladesh to benefit from newly launched flood insurance scheme www.wfp.org/news/casual-labourers-bangladesh-benefit-newly-launched-flood-insurance-scheme (4) Do satellite surface soil moisture observations better retain information about crop-yield variability in drought conditions? https://doi.org/10.1029/2019WR025855 (5) South Asia Drought Monitoring System (SADMS) www.un-spider.org/sites/default/files/IWMI-South-Asia-Drought-Monitoring-System_1.pdf (6) Drought Bulletin www.iwmi.cgiar.org/resources/drought-monitoring-system/drought-bulletin (7) Climate and Food Security Monitoring Bulletins – Sri Lanka https://wle.cgiar.org/solutions/climate-and-food-

			(Nepal, Afghanistan) and Africa (commenced roll-out to 16 Southern African countries).				security-monitoring-bulletins-sri-lanka (8) MOOC: Geospatial Applications for Disaster Risk Management https://un-spider.org/news-and-events/events/mooc-geospatial-applications-disaster-risk-management (9) Space technology for locust early warning systems www.geospatialworld.net/blogs/space-technology-for-locust-early-warning-systems/
F4	F4 Outcome: 4.1 Uptake of solutions to enhance resilience to extreme water variability at different levels [related WLE sub-IDO indicator: Number of countries in which stakeholders and policy makers implement approaches that increase water supply for agricultural production under conditions of water variability]	Enhanced capacity to deal with climatic risks and extremes (Mitigation and adaptation achieved)		2020 – Tested WLE solutions for mitigation of, and adaptation to, flood and drought risks (including nature- based solutions, insurance, pre-event forecasting and post-event monitoring), where possible bundled with complementary solutions from other CRPs (e.g. fisheries and seed options) to enhance adaptive capacity and build resilience to multiple climate risks, further along the pathway to scaling in at least five countries (India, Myanmar, Nepal, Vietnam, Sri Lanka)	Complete	With CCAFS, the Indian Council of Agricultural Research and Weather Risk Management Services Pvt. Ltd., pilots have been conducted in which flood insurance products (see above) have been bundled with seeds and climate information services. (1) Throughout 2020 we continued an evaluation of equity issues associated with Weather Index Insurance in India and Bangladesh and developed recommendations on increasing inclusivity. (2–4) A guidance document is drafted and currently under review. Through trials in India (5–7) and a global analysis (8) we have continued to build the evidence base for the effectiveness and viability of managed aquifer recharge as an approach for mitigating the adverse effects of both floods and droughts.	(1) Bundling seeds, weather forecasts and insurance https://hdl.handle.net/10568/110276 (2) Challenges and potential solutions to social inclusion in an aggregator model to promote weather index insurance in Bangladesh https://hdl.handle.net/10568/110361 (3) Ex-post evaluation of the second pilot of the Index-Based Flood Insurance in Bihar, India: Reflections for upscale https://hdl.handle.net/10568/109893 (4) Amidst food system shocks, we must ensure weather index insurance reaches the most vulnerable https://wle.cgiar.org/thrive/2020/05/13/amidst-food-system-shocks-we-must-ensure-weather-index-insurance-reaches-most (5) Managing underground transfer of floods for irrigation: A case study from the Ramganga basin, India https://doi.org/10.1016/j.jhydrol.2019.124518 (6) Mitigating floods for managing droughts through aquifer storage: An examination of two complementary approaches https://hdl.handle.net/10986/33244 (7) Managed aquifer recharge of monsoon runoff using village ponds: Performance assessment of a pilot trial in the Ramganga Basin, India https://doi.org/10.3390/w12041028 (8) Underground transfer of floods for irrigation (UTFI): Exploring potential at the global scale https://doi.org/10.5337/2020.204
F4	F4 Outcome: 4.1 Uptake of solutions to enhance resilience to extreme water variability at different	Enhanced capacity to deal with climatic		2020 – Enhanced awareness and increased capacity within government,	Extended	Despite COVID-19, which required significant change in the planned work program, phase 1 data collection was completed for a gender analysis to ensure community-based wetlands management is socially inclusive in the Gulf of Mottama, Myanmar. A conceptual framework for inclusive wetlands	(1) An inclusive approach to wetlands governance: A conceptual framework https://cgiar.sharepoint.com/:b:/s/WLE/Ed2hDAioOpFIgdqZgOXcDY8BCTLsgtWloslv7W1VrIA7dw

	levels [related WLE sub-IDO indicator: Number of countries in which stakeholders and policy makers implement approaches that increase water supply for agricultural production under conditions of water variability]	risks and extremes (Mitigation and adaptation achieved)		NGOs and private sector (in India, Nepal, Bangladesh, Myanmar) to better manage gendered vulnerabilities in marginalized farming communities, associated with climate hazards and unequal access to resources		governance was developed. (1) In Nepal, the project "From vulnerability to resilience of those left behind" has continued to develop an understanding of the biophysical aspects of hazards but has yet to determine the socio-economic consequences, in particular for women and youth.	
F4	F4 Outcome: 4.2 Uptake of solutions and investment options better able to address tradeoffs across competing water-energy-food needs [related WLE sub-IDO indicator: Number of countries with demonstrable investment by donors, MDBs and Governments in landscape-based solutions to manage increased water variability]	More productive and equitable management of natural resources	In 2020 we continued with the implementation of water-energy-environment-food nexus tools in various river basins and countries of Asia and Africa. Despite COVID-19 limitations we contributed to global discussion, conducted capacity-building exercises and presented results in professional, university and policy settings.	2020 – At least one government (Ethiopia) in sub-Saharan Africa uses energy tools to inform national investment plans for electrification while also considering irrigation development plans	Completed	Energy modeling system in use by Ethiopian government presented by government staff at training session. (1) Synergies between energy access and irrigation in Ethiopia explained by researcher co-financed by WLE and other partners. (2, 3)	(1) Workshop: Capacity building on modeling the Ethiopian energy system https://youtu.be/KO6A0KSNRgs (2) Capturing the productive use dividend: Valuing the synergies between rural electrification and smallholder agriculture in Ethiopia https://rmi.org/insight/ethiopia-productive-use (3) How rural electrification is transforming Ethiopia's agriculture sector www.cnbcafrica.com/2020/how-rural-electrification-is-transforming-ethiopias-agriculture-sector
F4	F4 Outcome: 4.2 Uptake of solutions and investment options better able to address tradeoffs across competing water-energy-food needs [related WLE sub-IDO indicator: Number of countries with demonstrable	More productive and equitable management of natural resources		2020 – At least one multilateral agency (Asian Development Bank), one river basin organization (Mekong River Basin Commission) and two regional programs (Nile Equatorial Lakes	Completed	We built capacity in tools and approaches developed (water accounting, groundwater management), aligning outputs with decision-maker priorities such as at the World Bank, (1) ADB, (2) Governments of Kenya and Tanzania, (3) FAO, (4) Mekong River Commission (5) and Government of Vietnam. (6) We continue building capacity in the Niger Basin on water-energy-food linkages. (7) We supported AMCOW's Pan-Africa Groundwater Program (8–12) and established a pilot transboundary monitoring network with South Africa, Botswana, Zimbabwe, LIMCOM and SADC-	(1) Webinar for the World Bank: Water Accounting for Water Balance Assessments (not available online) (2) Webinar: Increasing agricultural production using water productivity www.un-ihe.org/webinar-increasing-agricultural-production-using-water-productivity (3) Transboundary water resource management in Kenya and Tanzania (Part 1: 15 participants, 7 of which female; Part 2: 20 participants, 9 of which female) (two reports but not available online)

	investment by donors, MDBs and Governments in landscape-based solutions to manage increased water variability]			Subsidiary Action Program and Southern African Development Community) invest in further development and capacity building of WLE approaches and tools (e.g. Water Accounting Framework, e-flows simulation, groundwater management) that facilitate greater understanding of inter-sectoral tradeoffs associated with different water management options		GMI. (13) We continued building knowledge on transboundary data-sharing opportunities/constraints. (14) An Inner Niger Delta project linking environmental flow requirements to livelihoods was completed (15) and is being extended in the Limpopo through a USAID-funded project. (16) We continued development of e-flows in SDG 6.4.2, including online training and FAO e-learning academy inputs. (17–19) We continued contributing to the global discourse on rural energy access for water and food security, including a T-20 brief for the G-20 on investments in energy to meet water and food security goals in sub-Saharan Africa (20) and a presentation at the Agricultural Chief Scientist meeting on WLE solutions. (21) We contributed to making the global case for inclusion of the environment in development planning. (22–25)	(4) Webinar for the FAO D-Group on WA/WP: Water accounting and water productivity to support irrigation investments (not available publicly online) (5) Water accounting for water use monitoring in the Mekong (with participants from Vietnam, Laos, Thailand and Cambodia) (not available online) (6) Introduction to groundwater management roles in addressing salinity intrusion and land subsidence in the Mekong Delta https://mekongsip.org/past-events/introduction-to-groundwater-management-roles-in-addressing-salinity-intrusion-and-land-subsidence-in-the-mekong-delta (7) Challenges and opportunities in the operationalization of the water-environment-energy-food (WE^2F) nexus: Case study of the Upper Niger Basin and the Inner Niger Delta, West Africa www.e3s-conferences.org/articles/e3sconf/abs/2020/43/e3sconf_i2cnp2020_02001/e3sconf_i2cnp2020_02001.html (8) AMCOW embraces groundwater in Africa through a new UK-funded networking project https://amcow-online.org/news/amcow-embraces-groundwater-in-africa-through-a-new-uk-funded-networking-project (9) A continental coalition is set in motion to support sustainable groundwater use across Africa www.iwmi.cgiar.org/2020/02/a-continental-coalition-is-set-in-motion-to-support-sustainable-groundwater-use-across-africa (10) AMCOW Pan African Groundwater Program (APAGroP): A new pan-African initiative promises to open peer-to-peer learning between national governments and increase groundwater data sharing and research collaboration [K4] https://upgro.org/2020/07/23/apagrop-k4 (11) African Ministers' Council on Water reaches out to co-develop and consolidate its pan-African groundwater program https://gripp.iwmi.org/2020/03/19/african-ministers-council-on-water-reaches-out-to-co-develop-and-consolidate-its-pan-african-groundwater-program

							(12) African Ministers' Council on Water embraces groundwater as a key resource for health and socioeconomic development in Africa through a UK-funded networking project https://gripp.iwmi.org/2020/07/01/african-ministers-council-on-water-embraces-groundwater-as-a-key-resource-for-health-and-socioeconomic-development-in-africa-through-a-uk-funded-networking-project (13) Piloting a transboundary groundwater network during a pandemic: The Tuli Karoo experience https://conjunctivecooperation.iwmi.org/2020/11/17/piloting-a-transboundary-groundwater-network-during-a-pandemic-the-tuli-karoo-experience/?utm_source=rss&utm_medium=rss&utm_campaign=piloting-a-transboundary-groundwater-network-during-a-pandemic-the-tuli-karoo-experience (14) The devil's in the details: Data exchange in transboundary waters www.tandfonline.com/doi/abs/10.1080/02508060.2020.1850026 (15) Sustainable floodplains: Linking e-flows to floodplain management, ecosystems, and livelihoods in the Sahel of North Africa www.researchgate.net/publication/347675849_Sustainable_Floodplains_Linking_E-Flows_to_Floodplain_Management_Ecosystems_and_Livelihoods_in_the_Sahel_of_North_Africa (16) Project profile – E-flows for the Limpopo River https://africa.iwmi.cgiar.org/show-projects/?C=1113 (17) SDG indicator 6.4.2 – Report on level of water stress www.fao.org/3/ca8358en/CA8358EN.pdf (18) SDG indicator 6.4.2 – Course on level of water stress https://elearning.fao.org/course/view.php?id=365 (19) FAO e-learning course on level of water stress indicator – SDG 6.4.2 www.fao.org/land-water/news-archive/news-detail/en/c/1257263/ (20) Enhanced water security and energy access: Key investments for sub-Saharan Africa https://t20saudiarabia.github.io/PolicyBriefs/T20_TF10_PB14

							.pdf (21) The water-energy-food nexus: From science to implementation www.macs-g20.org/fileadmin/macs/Annual_Meetings/2020_SaudiArabia/Documents/Activites/water__Energy__Food_Nexus/1.Session_1/1.7_Session_IFPRI_MACCS_WEF_Nexus_IFPRI.pdf (22) Improved water management is central to solving the water-energy-food trilemma in Lao PDR https://iahr.tandfonline.com/doi/full/10.1080/07900627.2020.1754175#.YDZHAzHiuM8 (23) Balancing services from built and natural assets via river basin trade-off analysis www.researchgate.net/publication/343335068_Balancing_services_from_built_and_natural_assets_via_river_basin_trade-off_analysis (24) Is green the new grey? If not, why not? www.watersciencepolicy.com/2020/05/22/is-green-the-new-grey-if-not-why-not/ (25) Evaluating the global state of ecosystems and natural resources: Within and beyond the SDGs www.mdpi.com/2071-1050/12/18/7381/htm
F5	F5 Outcome: 5.1 Policymakers have improved access to evidence, tools and expert advice to design and manage agriculture and natural resource interventions sustainably	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	The Flagship on Enhancing Sustainability Across Agricultural Systems (ESA) co-developed with partners and made available a cross-CGIAR knowledge brokering framework with an integrated landscape management toolbox. ESA contributed to the preparation of the Convention on Biological Diversity (CBD), for example through target-setting for	2020 – An interactive roadmap on WLE landscape decision-support tools is co-developed with decision makers from at least three countries (Ethiopia, Uganda, Rwanda) and is made available online	Complete	Through co-development processes with partners from at least five countries (Kenya, Ethiopia, Sri Lanka, Italy, UK), FP5 developed and made available online a knowledge brokering framework as a roadmap on WLE decision-support tools. (1) FP5 co-developed and made available: New decision-support tools including a gender-sensitive ecosystem services approach, (2) A practitioner's guide to applying TNC's Voice, Choice and Action framework, (3) A protocol on assessing the relationship between agricultural diversification and biodiversity, (4) and A review of integrated landscape approaches with lessons learned and recommendations. (5) FP5 also contributed to the advancement and uptake of the Agrobiodiversity Index (6) and the environmental dimension of the interactive Food Systems Dashboard, a tool to support food	(1) A knowledge brokering framework for integrated landscape management https://doi.org/10.3389/fsufs.2020.00013 (2) A gendered ecosystem services approach to identify novel and locally-relevant strategies for jointly improving food security, nutrition, and conservation in the Barotse Floodplain https://doi.org/10.1080/14735903.2020.1787618 (3) Community-based management of water resources: A practitioners' guide https://doi.org/10.2499/p15738coll2.133692 (4) The impact of diversified farming practices on terrestrial biodiversity outcomes and agricultural yield worldwide https://doi.org/10.3390/mps4010008 (5) Characterizing and evaluating integrated landscape initiatives https://doi.org/10.1016/j.oneear.2020.01.009

			biodiversity in agriculture, and to the preparations for the UN Food systems summit (UNFSS). CoSAI launched with 21 Commissioners from the Global South. Six functioning Working Groups were established addressing key challenges, through evidence-based research and open inquiry, to support innovation impact in sustainable agricultural innovation (SAI).			systems policies. (7) Due to COVID-19, the interactive feedback sessions with the country partners teams were limited and are scheduled as virtual meetings in 2021, which will further guide/upgrade the interactive interface of the roadmap and the tools.	(6) OICR (7) Food Systems Dashboard https://foodsystemsdashboard.org
F5	F5 Outcome: 5.1 Policymakers have improved access to evidence, tools and expert advice to design and manage agriculture and natural resource interventions sustainably	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities		2020 – WLE landscape decision support tools are demonstrated at two international events and adopted by key partners (national and local governments, Food and Land Use Coalition, WBCSD, IPBES, EAT, GEF, UNEP) to facilitate co-learning	Complete	FP5 tools and approaches were demonstrated and used at the Earth Commission workshop in preparation for the CBD, (1) and contributed to the development of the EU Farm to Fork and EU Biodiversity 2030 targets. (2) Tools and results were also presented at: The EAT Forum in preparation for the UNFSS, (3) At the EU Biodiversity @ Business platform (4) and At World Business Council on Sustainable Development meetings of One Planet Business for Biodiversity. (5) FP5 approaches were also taken up in the 2020 FABLE report (6) and in position papers in preparation for the CBD. (7)	(1) Set ambitious goals for biodiversity and sustainability https://science.sciencemag.org/content/370/6515/411.summary (2) OICR (3) EAT@Home side sessions https://eatforum.org/event/eat-home/side-sessions (4) Assessment of biodiversity measurement approaches for businesses and financial institutions: Update report 3 (ABDI part of this report) https://ec.europa.eu/environment/biodiversity/business/news/news-277_en.htm (5) Agroecological transitions for building resilient and inclusive agricultural and food systems (TRANSITIONS): Private sector incentives and investments – Grant design document https://cgiar-my.sharepoint.com/:w:/g/personal/r_remans_cgiar_org/EUVTvnz3a6pOtjgHVDaHCucBIWyI36QkPXXitVxqtAPPrA (6) 2020 report of the FABLE Consortium, Pathways to sustainable land-use and food systems http://pure.iiasa.ac.at/id/eprint/16896/1/2020%20FABLE%20Report_Full_High_Resolution.pdf (7) Including food systems, biodiversity, nutrition and health in the Post-2020 Global Biodiversity Framework, submission for the CBD www.cbd.int/api/v2013/documents/6CD5FB27-3475-1E09-291D-41C0F41B834C/attachments/ABI-2.pdf
F5	F5 Outcome: 5.1 Policymakers have improved access to evidence, tools and expert advice to design and manage agriculture and natural resource interventions sustainably	Increased capacity for innovation in partner development organizations and in		2020 – Commission on Sustainable Agricultural Intensification (CoSAI) launched with strong Southern engagement , and dialogues	Extended	**CoSAI launched**: There are now 21 Commissioners actively contributing to a variety of working groups, gathering evidence through commissioned studies and open inquiry to address the key challenges to enable a greater level of support for innovation at scale in sustainable agriculture intensification. (1–4) The first study was commissioned to provide a global baseline for investment. (5) CoSAI hosted a range of expert dialogues to design evidence gathering on the investment gap, principles and metrics, and approaches and instruments. (6)	(1) Renowned Global South experts join new commission on sustainable agricultural intensification https://wle.cgiar.org/cosai/news/press-release-renowned-global-south-experts-join-new-commission-sustainable-agricultural (2) Commissioners https://wle.cgiar.org/cosai/commissioners

		poor and vulnerable communities		conducted during at least two high-level events		**Strong Southern engagement** was achieved with all members of the Commission coming from the Global South, including Africa, the MENA region, Asia (in particular South Asia) and Latin America. The diversity of Commissioners also ensures representation from both the public and private sectors, as well as academia, advocacy bodies, financial institutions, policy think tanks, UN agencies, NARES and innovation platforms. (2) **Dialogues**: CoSAI engaged with the African Green Revolution Forum (AGRF) through a panel session focused on the critical importance of SAI to feed cities and grow Africa, (7) and developed a partnership with the COP26 Transforming Agricultural Innovation for People, Nature and Climate campaign. (8) Due to COVID-19, the Commissioners were not able to meet in person.	(3) CoSAI big questions https://wle.cgiar.org/cosai/cosai-big-questions (4) The context for CoSAI: A landscape analysis https://wle.cgiar.org/cosai/context-cosai (5) Innovation investment study https://wle.cgiar.org/cosai/innovation-investment-study (6) Investment gap study https://wle.cgiar.org/cosai/investment-gap (7) CoSAI roundtable at AGRF summit https://wle.cgiar.org/cosai/news/cosai-round-table-agrf-summit (8) Transforming Agricultural Innovation for People, Nature and Climate https://wle.cgiar.org/cosai/news/transforming-agricultural-innovation-people-nature-and-climate-4
F5	F5 Outcome: 5.2 Natural and agricultural resource interventions are more cost-effective by minimizing negative trade-offs that degrade landscapes	Increased capacity for innovations in partner research organizations Enhanced individual capacity in partner research organizations through training and exchange	Use of WLE tools in Ethiopia, Uganda, India and Zambia helped identify synergies and tradeoffs in agricultural and natural resource management programs. There is an increased interest in and use of WLE tools by private sector partners and in collaboration with A4NH to leverage synergies and minimize tradeoffs between food and nutrition, livelihoods and environmental sustainability. Insights from a survey among decision makers and researchers identified	2019 Extended – Completion of large-scale survey targeting key policymakers (e.g. in NGOs, national governments, development banks, etc.) to identify gaps in capacity to use evidence, and to determine demand for decision support tools	Complete	FP5 identified ways to better bridge decision making with evidence use through a large survey among decision makers and researchers. (1) The survey was widely distributed via email and online networks (e.g. Ag2Nut community, WBCSD newsletter, Bridge Network, Integrated Landscape Initiative Network). Key insights include: bridging science with policy is facilitated particularly through expert engagement in decision making, consolidating materials to avoid fragmentation of the evidence, and easily accessible online materials; the nature of the institution (public, private, non-profit, research) determines the way evidence is used for decision making more than if the individual is male or female. (1) A reflection piece was also developed on use of evidence under the pandemic. (2)	(1) Presentation and update on survey (in MARLO) https://cgiar.sharepoint.com/:p:/s/WLE/ET51vTEa0FVHsSBN3o7UHhIBETDVfXV5yBscb8GQDiaLfQ?rtime=pFSwZXUK2Ug (2) Earth Day 2020: Lessons for human survival from a pandemic and a global environment under stress www.ifpri.org/blog/earth-day-2020-lessons-human-survival-pandemic-and-global-environment-under-stress
F5	F5 Outcome: 5.2 Natural and agricultural resource interventions are more cost-effective	Increased capacity for innovatio		2020 – Researchers and decision makers from at least 10	Complete	FP5 contributions (modules on nutrition-sensitive landscapes and on agrobiodiversity) to global courses included: Wageningen University, (1)	(1) WUR and CGIAR working together to equip future researchers, managers and leaders to address challenges in multifunctional foodscapes https://wle.cgiar.org/thrive/2020/10/20/wur-and-cgiar-

	by minimizing negative trade-offs that degrade landscapes	ns in partner research organizations Enhanced individual capacity in partner research organizations through training and exchange	ways to bridge science and decision making. WLE with Wageningen University contributed to training of researchers and decision makers from some 10 institutions and 10 countries on systems approaches and using WLE tools.	institutions are trained on how to better bridge evidence and decision makers related to sustainable agricultural landscapes and natural resource management		The Graduate Institute of International and Development Studies (2) Individual trainings of researchers, (3) and Researchers and decision makers from > 10 institutions and > 10 countries were trained to use evidence and systems approaches to improve sustainable agricultural landscape management and food systems. An impact assessment of such earlier trainings shows that participants continue to use these approaches in their work and that this type of training is an effective mechanism to equip partners and enhance use. (4)	working-together-equip-future-researchers-managers-and-leaders (2) CGIAR and Graduate Institute training videos www.graduateinstitute.ch/research-centres/centre-international-environmental-studies/videos (3) Semantics and words matter for analyzing gender and social inclusivity in development projects https://wle.cgiar.org/thrive/2020/07/24/semantics-and-words-matter-analyzing-gender-and-social-inclusivity-development (4) Have ESR-sponsored training courses stimulated uptake of ecosystem service science? https://wle.cgiar.org/news/have-esr-sponsored-training-courses-stimulated-uptake-ecosystem-service-science
F5	F5 Outcome: 5.2 Natural and agricultural resource interventions are more cost-effective by minimizing negative trade-offs that degrade landscapes	-Increased capacity for innovations in partner research organizations -Enhanced individual capacity in partner research organizations through training and exchange		2020 – The use of WLE decision support tools in at least three agricultural or natural resource management programs, supports tradeoff and risk-return analysis and contributes to the identification and implementation of sustainable and inclusive options	Complete	In Ethiopia, with WeForest, probability estimates from Forest and Landscape Restoration experts were applied to account for uncertainties. The simulations showed that investments in assisted natural regeneration, enrichment planting, exclosure establishment and soil-water conservation structures all have a greater than 77% chance of positive returns. Viability of carbon markets and rate of deforestation emerged as critical knowledge gaps. (1) In Uganda, with the RTB CRP, dimensions of sustainability, with an explicit gender lens, were studied in the context of ongoing expansion of intensive, commercial mono-cropping of banana in southwestern Uganda, to better understand tradeoffs and synergies. Lessons learned and recommendations for diversification and more sustainable value chains helped guide an EU STEP-UP in the region. (2) In India, with the Indian Council for Agricultural Research, using landscape tools and adapting the Agrobiodiversity Index, an ambitious initiative was co-developed to integrate scenarios for healthy and sustainable diets and land use systems, working with local partners and farming families in the Godavari Basin. (3) In Zambia, with the Ministries of Agriculture and Health, a gendered ecosystem services approach was applied. It identified novel and locally relevant strategies for improving food security, nutrition and conservation in the Barotse Floodplain. (4)	(1) Stochastic simulation of restoration outcomes for a dry afromontane forest landscape in northern Ethiopia https://doi.org/10.1016/j.forpol.2021.102403 (2) Predictable patterns of unsustainable intensification (preprint) https://cgiar-my.sharepoint.com/:b:/g/personal/r_remans_cgiar_org/EQvoFZbzvqZDkVk_sUkeJ1IBU0Qc17YKWxiczOj73f8PEA (3) Agriculture in the Anthropocene: Can India's Godavari Basin show us the way? https://wle.cgiar.org/thrive/2019/12/02/agriculture-anthropocene-can-india%E2%80%99s-godavari-basin-show-us-way (4) A gendered ecosystem services approach to identify novel and locally-relevant strategies for jointly improving food security, nutrition, and conservation in the Barotse Floodplain https://doi.org/10.1080/14735903.2020.1787618

Table 6: Numbers of peer-reviewed publications from current reporting period (Sphere of Control)

	Number	Percent
Peer-reviewed publications	130	100%
Open Access	93	72%
ISI	105	81%

Table 7: Participants in CapDev Activities

Number of trainees	Female	Male
In short-term programs facilitated by CRP	1,920	2,995
In long-term programs facilitated by CRP	292	470
* PhDs	3	6

Table 8: Key External Partnerships

Lead FP	Brief description of partnership aims	List of key partners in partnership	Main area of partnership
1	Translating WLE/Alliance research findings and technical information on sustainable cacao and oil palm management, and more competitive value chains, into the design of investment models supporting zero-deforestation business models in Peru	Climate Focus	Delivery
1	Development of solutions to achieve a land degradation neutrality target (RDL/ICRAF is a member of the expert panel in the Group on Earth Observations and the Global Land Outlook Second Edition Steering Committee)	UNCCD – United Nations Convention to Combat Desertification	Policy
1	WLE/ICRAF is contributing to the soil spectroscopy initiative of the GLOSOLAN Global Soil Laboratory Network led by the Food and Agriculture Organization of the United Nations	GLOSOLAN – Global Soil Laboratory Network FAO – Food and Agriculture Organization of the United Nations	Research Delivery
1	Ethiopian Biodiversity Institute has been key in providing material and contributing to research activities, and is also responsible for the community seed bank in the country	EBI – Ethiopian Biodiversity Institute	Research Capacity Development
1	Rolling out WLE/Alliance-supported data sharing and big data applications in Ethiopia to support agricultural transformation	GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit ILRI – International Livestock Research Institute under Africa RISING (USAID-funded program) EIAR – Ethiopian Institute of Agricultural Research EARCS – Ethiopian Agricultural Research Council Secretariat Ethiopian Ministry of Agriculture CABI – Centre for Agriculture and Bioscience International European Union IFAD – International Fund for Agricultural Development CCAFS – CGIAR Research Program on Climate	Delivery Research

		Change, Agriculture and Food Security ICRISAT – International Crops Research Institute for the Semi-Arid Tropics	
1	Nationwide scaling out and international adoption of “Agua de Honduras”, a platform developed by WLE/Alliance to improve water management investment decisions	USAID – United States Agency for International Development Government of Honduras SDC – Swiss Agency for Development and Cooperation FAO – Food and Agriculture Organization of the United Nations CDB – Caribbean Development Bank	Delivery Policy
1,2	Support to UN Food Systems Summit Action Track 3 on Nature-Positive Production; preparing Summit Dialogues on Water and Food Systems in Southern Africa, Pakistan and Central Asia plus a Global Event	UNFSS – United Nations Food Systems Summit	Policy
2	Collaboration by policymakers across five East African countries to capture the benefits from upscaling local and regional land and water management practices and consider tradeoffs to the ecosystem	IIASA – International Institute for Applied Systems Analysis LVBC – Lake Victoria Basin Commission, (an institution of the EAC - East African Community)	Policy
2	Organization of workshop by WLE/ICARDA/IFPRI/IWMI “Can Water Productivity Improvements Save Us from Global Water Scarcity?” and drafting of a white paper (currently in press at FAO) that was discussed with many stakeholders	WASAG – Global Framework on Water Scarcity in Agriculture CIHEAM – International Center for Advanced Mediterranean Agronomic Studies University of Salamanca, Spain GWP – Global Water Partnership Australian National University Agroscope, Switzerland Daugherty Water for Food Global Institute at the	Policy

		University of Nebraska, USA IHE Delft Institute for Water Education FAO – Food and Agriculture Organization of the United Nations IFAD – International Fund for Agricultural Development	
2	Understanding barriers to inclusive and sustainable scaling of solar-based irrigation in Africa and Asia (with CCAFS – CGIAR Research Program on Climate Change, Agriculture and Food Security)	GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit Technoserve Futurepump Sunculture Pumptech PEGAfrica Ghampower Rensys Energy Saving Trust SolarWorks Hello Solar WE4F – Water and Energy for Food hubs in East and West Africa and South and Southeast OBJ (joint initiative of the German Federal Ministry for Economic Cooperation and Development, European Union, Netherlands Ministry of Foreign AffairsSwedish International Development Cooperation Agency and United States Agency for International Development)	Research Policy Capacity Development
2	Building on the CGIAR Inspire Challenge won in 2019 with innovative ways to analyze solar pump data (e.g. machine learning)	Futurepump	Research

2	Drafting of a policy-setting GWP Perspectives Paper, “Storing water: A new integrated approach for resilient development”	GWP – Global Water Partnership	Policy
2	Launch of the International Network of Service Providers for Irrigation Excellence (INSPIRE), a platform for knowledge exchange on service delivery between managers of irrigation and drainage systems, donors, research institutions, governments and others	INSPIRE – International Network of Service Providers for Irrigation Excellence ADB – Asian Development Bank FAO – Food and Agriculture Organization of the United Nations ICID – International Congress on Irrigation and Drainage (ICID) Interamerican Development Bank	Delivery
2	Joint development of a paper after UN Nutrition expressed interest in increased collaboration on water for improved nutrition	UNSCN – United Nations Standing Committee on Nutrition	Policy
2	Promoting a new approach to water user associations’ pump-based irrigation schemes, resulting in equitable water allocation and higher production	NEPS – National Engineering and Planning Services, Myanmar Welthungerhilfe UNOPS – United Nations Office for Professional Services ICRISAT – International Crops Research Institute for the Semi-Arid Tropics	Research Delivery
2	Influencing Ethiopian water sector policy reform with WLE/IWMI research to recognize multiple water values and other up-to-date options	UK Research and Innovation through Global Challenge Research Funded by Newcastle University European Union through SHARE – Supporting Horn of Africa Resilience project, led by Farm Africa GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit through irrigation benchmarking project in the Nile Basin co-implemented by IWMI and NBI – Nile Basin Initiative	Policy

2	Private sector actors' use of solar suitability tool and maps developed by WLE/IWMI to expand solar pump supply chains across sub-Saharan Africa	GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit through WE4F – Water and Energy for Food hub in East and West Africa Futurepump PUMPTECH PEG Africa SolarWorks TechnoServe/Sunculture	Delivery
2	Improving water policies in Uzbekistan with WLE/IWMI research findings on water and energy use in lift irrigated areas	USDA-ARS – United States Department of Agriculture Agricultural Research Service Ministry of Water Resources of Uzbekistan Uzgip Institute	Policy
3	Working towards national action plans for food waste reduction	FAO – Food and Agriculture Organization of the United Nations	Policy Capacity Development
3	Working towards increased urban resilience through strengthened city-region food systems	FAO – Food and Agriculture Organization of the United Nations	Policy Capacity Development
3	Public–private partnerships on resource recovery and reuse	Jekora Ventures Ltd.	Delivery
3	Strengthening refugees' natural resource management and livelihoods in East Africa	DRC – Danish Refugee Council	Delivery
3	WLE/RUAF is strengthening the Milan Urban Food Policy Pact indicator framework for investments in over 200 cities	MUFPP – Milan Urban Food Policy Pact secretariat, hosted by City of Milan	Policy
3	Using WLE/IWMI business model research at the sanitation–agriculture interface in a pan-Indian training program targeting the public, private and educational sectors	WASH – Water, Sanitation and Hygiene Institute, India	Capacity Development
4	VCR/IWMI along with WorldFish is a founding member of the Inland Fisheries Alliance, which promotes sustainable fisheries	Conservation International The Nature Conservancy	Policy

		WWF – World Wide Fund for Nature	
4	VCR/IWMI is a contributor to the Transformative Partnership Platform on Agroecology, which promotes the application of agro-ecological principles	CIRAD – French Agricultural Research Center for Development SDC – Swiss Agency for Development and Cooperation INTPA – European Commission Directorate-General for International Partnerships CRAI – French Commission for International Agricultural Research	Delivery
4	VCR/IWMI chairs the Technical Advisory Committee of the World Water Quality Alliance, which advocates for the central role of freshwater quality in achieving prosperity and sustainability	UNEP – United Nations Environment Programme BGR – Federal Institute for Geosciences and Natural Resources, Germany FAO – Food and Agriculture Organization of the United Nations IWA – International Water Association Deltares IIASA – International Institute for Applied Systems Analysis	Delivery
4	VCR/IWMI contributes to the Socio-Environmental Synthesis Centre project on planning for sustainable water futures in sub-Saharan Africa in the context of the Sustainable Development Goals	USGS – United States Geological Service Conservation International World Bank IUCN – International Union for the Conservation of Nature USACE – United States Army Corps of Engineers University of Arizona	Delivery
4	VCR/IFPRI supports Power for All's agriculture campaign to accelerate rural energy access in Africa towards water and food security; IFPRI provided data for its Uganda	Power for All	Delivery

	analysis and collaborated on outreach		
4	WLE/CCAFS/IWMI support South Asia and sub-Saharan Africa to make the leap from drought monitoring to managing agricultural drought risks	MAFF – Ministry of Agriculture, Forestry and Fisheries of Japan World Bank ICAR – Indian Council of Agricultural Research KSNDMC – Karnataka State Natural Disaster Monitoring Centre Tamil Nadu State Disaster Management Department (Government of Tamil Nadu) WRMS – Weather Risk Management Services Pvt. Ltd. DMC – Disaster Management Centre, Sri Lanka (Ministry of Irrigation and Water Resources and Disaster Management) WFP – World Food Programme AMD – Afghanistan Meteorological Department ANDMA – Afghanistan National Disaster Management Authority African Risk Capacity (an African Union agency) SADC – Southern African Development Community ZMD – Zambia Meteorological Department	Delivery Capacity Development
5	Developing joint training modules for youth, researchers and decision makers on socio-ecological systems approaches	Wageningen University	Capacity Development
5	Applying decision tools, building capacity and anticipating synergies, tradeoffs and risks in the WeForest programs	WeForest	Delivery
5	Contributing to the FABLE (Food, Agriculture, Biodiversity, Land-Use, and Energy) calculator and reports, working with the 20 FOLU (Food and Land-Use Coalition)-FABLE	FOLU-FABLE – Food, Agriculture, Biodiversity, Land-Use, and Energy Consortium of the Food and	Policy

	country teams	Land-Use Coalition	
5	Providing scientific support as a knowledge partner for key initiatives such as the OnePlanet Business for Biodiversity Initiative and the nature-positive agriculture program	WBCSD – World Business Council for Sustainable Development	Delivery Other: Private Sector Policy
5	WLE/Alliance contributes to the Food Systems Dashboard and to surfacing game-changing solutions for healthy diets and a healthy planet	GAIN – Global Alliance for Improved Nutrition Johns Hopkins University	Policy
5	Contributions from ESA and the Commission on Sustainable Agriculture Intensification to the Nature campaign related to sustainable intensification and the nexus between agriculture and biodiversity (with CCAFS – CGIAR Research Program on Climate Change, Agriculture and Food Security)	FCDO – Foreign, Commonwealth & Development Office, United Kingdom	Policy

Table 9: Internal Cross-CGIAR Collaborations

Brief description of the collaboration	Name(s) of collaborating CRP(s), Platform(s) or Center(s)	Value added
With ILRI, RDL/Alliance worked under the Africa RISING program in the joint implementation of restoration and sustainable management options at learning sites in Ethiopia.	ILRI	
RDL/Alliance worked together with CCAFS and with EU-IFAD support in the implementation of Climate Smart Agriculture practices and technologies that contribute to reduce degradation in selected sites of Ethiopia.	CCAFS	
Leveraged WLE/ICRAF/Alliance and CCAFS expertise to co-develop evidence on the mitigation benefits from tree expansion on rangeland in Colombia. A paper and a blog published.	CCAFS	
VCR intensified collaboration with CCAFS on index-based flood insurance and bundling with seed systems and climate information.	CCAFS	
VCR/IWMI continued to collaborate closely with WorldFish and the FISH CRP on integrating fisheries in irrigation systems, and with IRRI and the RICE CRP on rice-fish systems.	FISH CRP RICE CRP	

	WorldFish	
WLE/IFPRI collaboration with PIM on scaling up groundwater governance has continued, with social learning games rolled out in a series of districts in 2020 where COVID-19 risks were low.	PIM	
A cross-CGIAR framework for knowledge brokering was developed and made available. A case study in collaboration with the CGIAR program RTB in Uganda was completed (related paper submitted).	RTB	Understanding the bottlenecks for landscape approaches in agrifood systems programs and jointly developing an approach to help overcome those
Collaboration with A4NH was strengthened through joint work on the Agrobiodiversity Index to leverage and connect to the nutritional as well as environmental benefits of agrobiodiversity.	A4NH	Taking a food systems approach to better manage agrobiodiversity for healthy diets and sustainable production
A new initiative was developed with CCAFS, FTA and WLE/Alliance on agro-ecological transitions and selected for funding by the EU in collaboration with IFAD.	CCAFS FTA	Integrating climate dimensions more into agro-ecology and developing a cross-CGIAR team and initial topics to enable evidence-based agro-ecological transitions

Table 10: Monitoring, Evaluation, Learning and Impact Assessment (MELIA)

Studies/learning exercises planned for this year (from POWB)	Status	Type of study or activity	Description of activity / study	Links to MELIA publications
Outcome evaluation of climate-smart research on solar-powered irrigation in India conducted under the CGIAR Research Program on Water, Land and Ecosystems (WLE), CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the CGIAR System Management Office (SMO)	Completed	Qualitative outcome study	Outcome evaluation (with recommendations) and ex-ante modeling jointly funded by the CGIAR Research Program on Water, Land and Ecosystems (WLE), CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the CGIAR System Management Office (SMO).	Outcome evaluation of climate-smart research on solar-irrigation in India and Outcome evaluation of climate-smart research on solar-irrigation in India: Simulation modeling
CGIAR Research Program 2020 Reviews: Water, Land and Ecosystems	Completed	Qualitative outcome study	Commissioned by CGIAR Advisory Services, the review assessed the extent to which the second phase of the CRP delivered quality of science and demonstrated effectiveness in relation to the CRP's theory of change from 2017–2019.	CRP 2020 Review: WLE
Outcome evaluation: two/three further topics to be confirmed	Cancelled	Qualitative outcome study	Due to COVID-19-related travel restrictions, the remaining outcome evaluations were cancelled	NA
Annual WLE Reflection Workshop	Cancelled	Internal review	Due to COVID-19-related travel restrictions, the Reflection Workshop was cancelled	NA

Table 11: Update on actions taken in response to relevant evaluations

Name of the evaluation	Recommendation number	Text of recommendation	Status of response to this recommendation	Concrete actions taken for this recommendation	By whom (per action)	When (per action)	Link to evidence
Outcome evaluation of climate-smart research on solar-powered irrigation in India (SPaRC)	1	IWMI-Tata Water Policy Research Program (ITP) to continue to play a central role in the SPaRC outcome trajectory. Given the potential impact of SPaRC, and the huge return on research investment that this would bring, WLE/IWMI, CCAFS and the Tata Trust should continue to support ITP in playing a central role in the SPaRC outcome trajectory.	Ongoing	WLE will continue to support ITP to play a central role in the SPaRC outcome trajectory.	Flagship 2	2021	Link And Simulation modeling
Outcome evaluation of climate-smart research on solar-powered irrigation in India (SPaRC)	2	WLE and CCAFS to propose a synthesis across recent outcome evaluations as to how programmatic research has achieved impact at scale, to inform the move to One CGIAR.	Ongoing	WLE will commission a synthesis product on achieving impact at scale.	PMU	2021	Link And Simulation modeling
Outcome evaluation of climate-smart research on solar-powered irrigation in India (SPaRC)	3	WLE and CCAFS to support the handing over of the simulation model to ITP.	Ongoing	WLE will provide support to ITP for use of the simulation model.	PMU	2021	Link and Simulation modeling
CGIAR Research Program 2020 Reviews: Water, Land and Ecosystems	1	Showcase the role of WLE and of CGIAR as thought leaders and providers of integrated solutions through participation in relevant	Ongoing	WLE flagships will showcase innovations by participating in relevant global events.	All flagships	2021	Link

		global events, including the 2021 UN Food Systems Summit, the IPBES Nexus Assessment and the UN Climate Summit (COP26), working in collaboration with other CRPs (CCAFS, PIM, A4NH) as appropriate.					
CGIAR Research Program 2020 Reviews: Water, Land and Ecosystems	2	Lead the way within CGIAR on harnessing the capacity of underrepresented researchers (e.g. women, social scientists, young and emerging researchers), pioneering innovative research ethics procedures and promoting co-created transdisciplinary research that catalyzes systemic change.	Ongoing	WLE senior researchers will actively mentor junior staff and interns. Opportunities will be made available for junior staff to participate in conferences and proposal writing.	All flagships	2021	Link
CGIAR Research Program 2020 Reviews: Water, Land and Ecosystems	3	Synthesize and analyze WLE results and learning at the outcome level, including with reference to the WLE theory of action, to serve as a documented program legacy.	Ongoing	WLE Flagships and/or the PMU will commission a number of synthesis products in 2021. WLE Outcome/Impact Case Reports are produced each year specifically to synthesize outcome-level results and learning.	PMU	2021	Link

Table 12: Examples of W1/2 Use in this reporting period (2020)

Specific examples (including through set aside strategic research funds or partner funds)	Broad area of use of W1/2
WLE Program Level – Influencing and stimulating dialogue: The WLE Program Director and Head of CoSAI Secretariat, as part of the Steering Committee, contributed to the evidence base and strategy of the FCDO-led climate and nature campaign in the lead-up to UNFCCC COP26.	Policy
Gender – Discovery: WLE examined gender perspectives on water security by exploring an integrated water management approach for agriculture, livestock and human consumption.	Research
Gender – Stimulating investment: Following WLE work, the Gender4 team secured further funding from the CGIAR GENDER Platform for research in three areas: Stories from the sharp end of climate change; COVID-19 and Egypt's water crisis: generating evidence for gender-transformative innovations; The pandemic and women agribusiness in Asia from feminist perspectives.	Research
Gender: WLE completed an internal systematic analysis of gender and social inclusion research across Flagships and projects. Insights show a progressive shift in understanding gender – from a limited focus on gender as women, to understanding how gender inequalities intersect with poverty, age and other disparities across sectors, institutions and communities.	Research
Flagship 1 – Discovery: Development of approach and collation of evidence on simulating landscape restoration outcomes in Ethiopia	Research
Flagship 1 – Discovery: Incorporation of livestock economics expertise in the adoption study of silvo-pastoral systems in degraded lands of the Amazon (Colombia).	Research
Flagship 1 – Tailoring knowledge for delivery: Led by an interdisciplinary team of scientists in close collaboration with partners, a WLE project is examining gender in restoration discourses, policies and practices in Ethiopia. To date, the project has delivered a Master's Thesis, guide for practitioners and scientific literature review.	Policy
Flagship 1 – Tailoring knowledge for delivery: Dashboard for enhanced engagement with evidence around land degradation, soil health and land restoration in Kenya.	Capacity Development
Flagship 1 – Policy engagement: Using the Science-Policy Interface Platform of UNCCD to translate current WLE science into policy options.	Policy
Flagship 1 – Scaling: Development of low-cost, multi-purpose handheld and next generation soil-plant sensors to drive quality through the agricultural value chain (Global).	Delivery
Flagship 2 – Discovery: Understanding pumping behavior and groundwater levels using Internet of Things pump data. This research	Research

complemented work under the Big Data Challenge using Machine Learning.	
Flagship 2 – Discovery: Developed a global modeling-based suitability assessment tool for in-situ water harvesting based watershed management, which has the potential for future policy support.	Research
Flagship 2 – Influencing and stimulating dialogue: Webinar series on Farmer-led irrigation and agricultural water management at Stockholm World Water Week, African Union and International Network of Service Providers for Irrigation Excellence (INSPIRE).	Partnerships
Flagship 2 – Influencing and stimulating dialogue: New Water4Ag project launched to bring research on enhancing water productivity and establishing an integrated water storage agenda into international policy discussions, including UNFSS.	Policy
Flagship 2 – Influencing and stimulating dialogue: 2030 Water Resources Group joins multi-stakeholder dialogue as partner in Ethiopia.	Partnership
Flagship 2 – Influencing and stimulating dialogue: Scientific and policy workshop held with the Working Group on Water & Nutrition under the Global Framework of Water Scarcity in Agriculture.	Partnership
Flagship 2 – Policy engagement: New irrigation decree on water-efficient technologies in Uzbekistan.	Policy
Flagship 2 – Policy engagement: Establishment of national multi-stakeholder dialogue spaces in Ethiopia and Ghana, including with the private sector, to influence policy to support farmer-led irrigation development.	Policy
Flagship 2 – Policy and scaling: Solar suitability tool used to discuss barriers in irrigation supply chains in P4G-led workshop with government and private sector partners in Ethiopia.	Policy
Flagship 2 – Scaling: New private sector partnerships to overcome systemic barriers in scaling solar-based irrigation in Africa and Asia.	Partnerships
Flagship 2 – Stimulating investment and scaling: Establishment of a learning site for demonstrating integrated watershed management in Tanzania. This led to Biovision Foundation for Ecological Development funding a project for 2021–2023.	Delivery
Flagship 3 – Tailoring knowledge for delivery: A new global assessment of the potential benefits of resource recovery and reuse from wastewater received an Altmetric score of 89.	Research
Flagship 3 – Tailoring knowledge for delivery: The Approach, Process and Methodology document for the City Region Food Systems (CRFS) program was updated to include lessons on the impact of COVID-19 and response actions related to the vulnerability of CRFS. This has been implemented and tested in five cities.	Research
Flagship 3 – Tailoring knowledge for delivery: Lessons on the impact of COVID-19 and response actions related to the vulnerability of city-region	Delivery

food systems was published in *Sustainability* and different blogs.	
Flagship 3 – Influencing and stimulating dialogue: 12 articles on gender issues and transformations in urban food systems were published along with several blogs.	Other: Gender
Flagship 3 – Policy engagement: The Milan Urban Food Policy Pact Indicator Framework was updated to include lessons from three cities on Gender, Climate Change and Pandemics. A WLE-supported handbook including lessons on Gender has been drafted and is currently under revision by FAO.	Policy
Flagship 3 – Training: In Sri Lanka, 200 representatives from compost users and producers were trained in the new compost standards for compost derived from waste products.	Capacity development
Flagship 3 – Training: In Sri Lanka, 300 representatives from restaurants, catering, supermarkets, schools and universities were trained in food waste reduction.	Capacity development
Flagship 3 – Training: In India, the WASH Institute adopted WLE resource recovery and reuse business models in preparation for large scale roll-out of training for 5,000+ individuals in 2021.	Capacity development
Flagship 3 – Training: In Ghana, a WLE-facilitated waste-to-resource public–private partnership started operation, with 77 public and private sector representatives trained.	Delivery
Flagship 3 – Training: Materials on city-region food system process and tools (visioning, assessment, indicators, action planning) were updated with COVID-19 lessons. Teams in Antananarivo, Kigali, Colombo and Tamale began to implement this, and held stakeholder meetings to stimulate action planning. Lessons are being shared with other cities, including Melbourne.	Capacity Development
Flagship 3 – Scaling: Lessons from IWMI/WLE resource recovery and reuse work with public–private partnerships are being used to support city actors to develop business plans in four towns in Nepal (Bheriganga), Bangladesh (Satkhira, Barguna) and Uganda (Kalongo).	Delivery
Flagship 4 – Discovery: A project aimed at identifying and addressing the root causes of gender inequality in wetlands management has developed a conceptual framework and methodology to be implemented by Helvetas in the Gulf of Mottama, Myanmar.	Research
Flagship 4 – Discovery: Development and implementation of disaster risk management tools in South Asia and Africa. This work was co-funded by W1/2 and bilateral funding.	Research
Flagship 4 – Discovery and partnership: Collaboration with WorldFish and the FISH CRP on integrating fisheries in irrigation systems and with IRRI and the RICE CRP on rice-fish systems.	Partnerships

Flagship 4 – Tailoring knowledge for delivery: Support to national level roll-out of Sustainable Development Goals. This work was co-funded by W1/2 and bilateral funding.	Policy
Flagship 4 – Tailoring knowledge for delivery: Evaluation of index-based flood insurance impacts for the poor, landless and women; writing and publishing synthesis pieces related to important gender issues.	Other: Gender
Flagship 4 – Policy engagement: Engagement in global discourse on sustainable development including nature-based solutions, sustainable groundwater utilization and wise use of wetlands, via input to the Ramsar Scientific and Technical Review Panel.	Policy
Flagship 4 – Policy engagement: Background paper provided to the African Group of Negotiators on Climate Change.	Policy
Flagship 4 – Policy engagement: Groundwater information support provided to the African Ministers' Council on Water following their establishment of a Groundwater Desk.	Policy
Flagship 4 – Policy engagement: Collaboration with the African Union Commission on Irrigation's Role to Transform Food Systems in Africa.	Policy
Flagship 5 – Discovery: Estimating investment in innovation for sustainable agriculture intensification through a CoSAI-commissioned study.	Research
Flagship 5 – Discovery: Landscape analysis by CoSAI of 42 major global reports (2008–2020) on food, agriculture and the environment.	Pre-start up
Flagship 5 – Discovery: Development and implementation of integrated landscape and agrobiodiversity approaches adapted for Indian agricultural programs.	Research
Flagship 5 – Discovery: Application of decision analysis in Ethiopia to guide forest and land restoration efforts.	research
Flagship 5 – Discovery: Application of synergies and tradeoffs analysis along a banana intensification gradient in Western Uganda to guide RTB-related projects.	research
Flagship 5 – Discovery: Development and application of integrated assessment models that bridge models and decision support tools across scales, in order to facilitate and strengthen scenario development across scales.	research
Flagship 5 – Discovery and synthesis: A global meta-analysis on the impact of agricultural diversification on biodiversity and productivity, identifying synergies and tradeoffs between biodiversity outcomes and yield.	research
Flagship 5 – Tailoring knowledge for delivery: Developing a cross-CGIAR knowledge brokering framework for facilitating and applying integrated landscape management.	Delivery

Flagship 5 – Tailoring knowledge for delivery: Development, implementation and analysis of a survey among decision makers, practitioners and researchers to better bridge evidence and decision making in landscape management.	policy
Flagship 5 – Policy engagement: Hosting by CoSAI of the African Green Revolution Forum (AGRF) Dialogue on feeding the cities and growing Africa through innovations in sustainable agriculture intensification.	Policy
Flagship 5 – Training: Developing and integrating WLE materials and expertise into a series of capacity development efforts and trainings, with Wageningen University as a key partner.	Capacity Development
Program Monitoring Evaluation and Learning – Tailoring knowledge for delivery: A joint WLE/CCAFS/SMO outcome evaluation was completed on solar-powered irrigation in India.	Other MELIA
Program Communications: Policy engagement and influencing and stimulating dialogue through portfolio-level knowledge management and communications activities including content production (publications, briefs, blogs, etc.); interactive virtual events with donors, partners and researchers; outreach through op-eds in international media; and social media.	Other: Outreach
Program Communications – investment in social media, the website and Thrive resulted in: ▪ 258,803 visits to the WLE website ▪ 143,381 Thrive page views; 41,132 Content page views; 32,659 Solutions page views; 18,269 Research page views; 17,713 News page views; 9,174 CoSAI page views Social media followers ▪ 24,539 Twitter (9% increase from 2019) ▪ 13,634 Facebook (16% increase) ▪ 4,016 LinkedIn (982% increase) Social media impressions/reach ▪ 1,566,943 Twitter (14% decrease) ▪ 1,921,243 Facebook (18% increase) ▪ 114,766 LinkedIn (622% increase)	Other: Outreach
Program Management: Support to management and synthesis functions of all flagships. Extensive program support including Strategic Management and Partnerships; Planning and Reporting; Coordination and Administration; Communications and Knowledge Management; Monitoring, Evaluation and Learning; and Gender, Youth and Inclusivity.	Delivery

Table 13: CRP Financial Report

in USD millions

	Planned Budget 2020			Actual expenditure			Difference			Comments
	W1/W2	W3/ Bilateral/ Center	Total	W1/W2	W3/ Bilateral/ Center	Total	W1/W2	W3/ Bilateral/ Center	Total	
F1 - Restoring Degraded Landscapes (RDL)	2.1	9.8	11.9	1.7	6.3	8.0	0.4	3.5	3.9	
F2 - Land and Water Solutions for Sustainable Intensification (LWS)	2.0	14.4	16.4	1.9	11.3	13.2	0.1	3.1	3.2	
F3 - Sustaining Rural-Urban Linkages (RUL)	1.2	2.7	3.9	1.2	1.9	3.1	0	0.8	0.8	
F4 - Managing Resource Variability, Risks and Competing Uses for Increased Resilience (VCR)	1.9	4.9	6.8	1.8	3.1	4.9	0.1	1.8	1.9	
F5 - Enhancing Sustainability Across Agricultural Systems (ESA)	0.8	1.9	2.7	0.7	1.0	1.7	0.1	0.9	1	
FP5 Commission on Sustainable Agricultural Intensification (COSAI)	0.7	0	0.7	0.6	0	0.6	0.1	0	0.1	
Management & Support	1.6	0	1.6	1.2	0	1.2	0.4	0	0.4	
Strategic Initiatives	0.5	0	0.5	0	0	0	0.5	0	0.5	Funding now allocated for use in 2021
Total	**10.8**	**33.7**	**44.5**	**9.1**	**23.6**	**32.7**	**1.7**	**10.1**	**11.8**	

Source: Audited lead and participating Center financial reports.