



Advisory
Services



CGIAR Research Program 2020 Reviews: Water, Land and Ecosystems (WLE)

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CGIAR Research Program 2020
Reviews: Water, Land and
Ecosystems (WLE)

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CAS Disclaimer

By design, the CGIAR Results Dashboard was a key source of data for the 2020 CRP Reviews. During the pilot phase of the CRP Reviews, issues with interoperability and resulting data quality between the management information systems (CLARISA and the Dashboard) and extracts from CRP systems (MARLO and MEL) were discovered. For harmonization, CAS engaged with the MARLO team and the CRP MEL focal points to conduct data cleaning and pre-analysis for CRP review teams. This exercise revealed the limitations of CGIAR's reporting/repository systems for evaluation purposes; these limitations were mostly due to changing reporting requirements and discrepancies in whether CRPs adopted MARLO or MEL systems. Moreover, in the case of peer-reviewed journal articles, the protocol used by the CRP review teams to identify relevant publications differed from the guidance applied by CRPs (the CRP review teams' bibliometric analysis used only publications indexed by International Scientific Indexing [ISI], available through Web of Science). Therefore, CAS acknowledges discrepancies between the CGIAR Results Dashboard, and the data provided to the Review teams for their analysis, which should not be seen as a factor having influenced the analysis by the CRP review teams.

Contents

Executive Summary	1
Background and Context.....	1
Purpose and Scope of the CRP 2020 review.....	1
Approach and Methodology	1
Key Findings and Conclusions.....	1
Quality of Science	1
Effectiveness	2
Future Orientation	2
Recommendations	2
Recommendations for the CRP	2
Recommendations for the CGIAR System	3
1 Background to the CRP 2020 Review	4
1.1 Purpose and Target Audience of the Review.....	4
1.2 Overview of the CRP and Its Context in Research for Development	4
1.3 Scope of the Review and Review Questions	6
1.4 Approach, Methods, and Limitations	6
1.5 Management and Quality Assurance	7
2 Findings.....	8
2.1 Quality of Science	8
2.1.1 Quality of Research Inputs	8
2.1.1.1 Skilled Staff	8
2.1.1.2 Funding.....	9
2.1.1.3 Infrastructure.....	10
2.1.2 Quality of Process (including Partnerships)	10
2.1.3 Quality of Outputs.....	12
2.2 Effectiveness	15
2.2.1 Achievement of Planned Outputs and Outcomes.....	15
2.2.1.1 WLE Milestones	16
2.2.1.2 WLE Innovations.....	16
2.2.1.3 WLE Policies.....	17
2.2.1.4 Flagships	17
2.2.2 Demonstrated Importance of Outcomes (Deep Dive on Selected OICR(s)).....	19
2.2.3 CRP Management and Governance	20
2.2.4 Progress along ToC (WLE and Flagships)	22
2.2.4.1 Use of ToCs in WLE	22
2.2.4.2 Progress along the ToC Pathways.....	22
2.3 Future Orientation	24
2.4 Cross-Cutting Issues	25
2.4.1 Capacity Development.....	25
2.4.2 Climate Change	25
2.4.3 Gender	26
2.4.4 Youth	26

3	Conclusions and Recommendations	27
3.1	Conclusions: Quality of Science.....	27
3.1.1	Quality of Research Inputs	27
3.1.2	Quality of Process (including Partnerships)	27
3.1.3	Quality of Outputs.....	28
3.2	Conclusions: Effectiveness.....	28
3.2.1	Achievement of Planned Outputs and Outcomes.....	28
3.2.2	Demonstrated Importance of Outcomes	28
3.2.3	CRP Management and Governance	29
3.3	Progress along ToC (WLE and Flagships)	29
3.4	Future Orientation	29
3.5	Cross-Cutting Issues	29
3.6	WLE Recommendations.....	30
3.7	CGIAR System-Level Recommendations	30
4	Lessons Learned	32
5	References.....	33
6	Annexes.....	34

Find the Annexes and Brief here:

[CRP 2020 Review: WLE | CAS | CGIAR Advisory Services](#)

List of Tables

Table 1. WLE flagship programs	5
Table 2. WLE publications in the CGSPACE database.....	13
Table 3. Characteristics of WLE OICRs selected for review deep dives	19

List of Figures

Figure 1. Schematic of WLE showing FPs and clusters of activity	5
Figure 2. Gender balance (2016) within WLE participating Centers	9
Figure 3. Annual funding of WLE flagships, 2017–19 (thousands of US\$)	10
Figure 4. Top WLE funding sources, 2019.....	10
Figure 5. Types of WLE partnerships measured by number of collaborations	11
Figure 6. Number of citations of WLE papers (bibliometrics database).....	12
Figure 7. Journal impact factors of 15 most popular journals for WLE authors	13
Figure 8. Combined WLE outputs of journal articles and outreach materials, 2017–19	14
Figure 9. Geographic focus of WLE publications.....	14
Figure 10. Countries where WLE publications are downloaded.....	14
Figure 11. Frequency of top 15 keywords in WLE publications, 2017–19	15
Figure 12. Outcomes, sectors, and drivers addressed in WLE reports and articles, 2017–19	15
Figure 13. Status of delivery of milestones by FP, 2017–19	16

Table of Acronyms

A4NH	Agriculture for Nutrition and Health CRP
ACIAR	Australian Center for International Agricultural Research
ADB	Asian Development Bank
AfDB	African Development Bank Group
AFS	agri-food system
AfSIS	Africa Soil Information Service
ARI	advanced research institution
Bioversity	Bioversity International
BMGF	Bill and Melinda Gates Foundation
BMU	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (Germany)
BMZ	Bundesministerium für wirtschaftliche Zusammen-arbeit und Entwicklung (Germany)
CA	conservation agriculture
CapDev	capacity development
CAS	CGIAR Advisory Services Secretariat
CBO	community-based organization
CCAFS	Climate Change, Agriculture and Food Security CRP
CCI	cross-cutting issue
CIAT	International Center for Tropical Agriculture
CoSAI	Commission on Sustainable Agricultural Intensification Commission
CoA	cluster of activity
CBD	Convention on Biological Diversity
CRP	CGIAR Research Program
CRRI	Common Results Reporting Indicator
CRS	Catholic Relief Services
CSA	climate-smart agriculture
DFID	Department for International Development (United Kingdom)
DGIS	Ministry of Foreign Affairs of Netherlands
EAT	EAT–Lancet Commission on Food, Planet, Health
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FGD	focus group discussion
FP	flagship program
FTE	full-time equivalent (staff year)
GID	Gender and Inclusive Development
GILIT	Gender in Irrigation and Learning Improvement Tool
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GLOCOLAN	Global Soil Laboratory Network
GPG	global public good
GCDM	Global Soil Data Manager
H	Hirsh index
IA	impact assessment
ICARDA	International Center for Agricultural Research in Dry Areas
ICRAF	World Agroforestry Center
ICRP	Integrating CRP

IDO	Intermediate Development Outcome
IF	impact factor
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IP	impact pathway
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPG	international public good
IRB	Institutional Review Board
iSDA	Innovative Solutions for Decision Agriculture
ISI	International Scientific Index
ISC	Independent Steering Committee
ISPC	Independent Science and Partnership Council
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
JCR	journal citation report
LWS	Land and Water Solutions for Sustainable Intensification (WLE flagship)
MARLO	Managing Agricultural Research for Learning and Outcomes
MC	Management Committee
MEA	multilateral environmental agreement
MEL	monitoring, evaluation, and learning
NARES	national agricultural research and extension system
NARS	national agricultural research system
NGO	nongovernmental organization
NRM	natural resources management
OA	open access
OICR	Outcome Impact Case Report
PIM	Policies, Institutions and Markets CRP
PMU	Program Management Unit
POWB	plan of work and budget
PPA	Program Participant Agreement
Q	journal quartile
QoR4D	Quality of Research for Development
QoS	quality of science
RDL	Restoring Degraded Landscapes (WLE flagship)
RUL	Rural-Urban Linkages (WLE flagship)
SADMS	South Asia Drought Monitoring System
SDG	Sustainable Development Goal
SIDA	Swedish International Development Cooperation
SLO	System-Level Outcome
SRF	Strategy and Results Framework
ToC	theory of change
ToR	terms of reference
UNFCCC	United Nations Framework Convention on Climate Change

UNCCD	United Nations Convention to Combat Desertification
USAID	United States Agency for International Development
VCR	Managing Resource Variability, Risks and Competing Uses for Increased Resilience (WLE flagship)
W1, W2, W3	Funding Windows 1, 2, and 3
WLE	Water, Land and Ecosystems CRP

Executive Summary

Background and Context

The Water Land and Ecosystems (WLE) CGIAR Research Program (CRP) is one of four cross-cutting Global Integrating Programs within the CGIAR portfolio. WLE's mission is *to provide the evidence base and solutions to help decision-makers scale up sustainable water, land, and ecosystem management innovations and investments in agricultural landscapes that reduce risks and increase the resilience of women and men in developing countries*. The program has focused on a subset of globally critical challenges that were identified based on a set of criteria including addressing the CGIAR "Grand Challenges."

Purpose and Scope of the CRP 2020 review

This review focuses on the work of the WLE CRP during the period 2017–19. The review questions are as follows:

1. Quality of science: To what extent does the CRP deliver quality of science, based on its work from 2017 through 2019?
2. Effectiveness: What outputs and outcomes have been achieved, and what is the importance of those identified results?
3. Future orientation: To what extent is the CRP positioned to be effective in the future, seen from the perspectives of scientists and of the end users of agricultural research?

Approach and Methodology

The review focused on two of the six CGIAR evaluation criteria: quality of science and effectiveness. Key sources of data were WLE program documentation and management data; bibliometric data on 257 scientific journal articles; and other publications and communications outputs. Findings were triangulated through semi-structured interviews of 34 people (17 female, 17 male) including the extended WLE team, the independent steering committee, donors, and partners. Three OICRs were selected for deep dives. The review does not extend to the level of individual projects falling under the umbrella of WLE but delivered through participating Centers and partners and was further limited by the short timeframe under consideration.

Key Findings and Conclusions

Quality of Science

WLE staff are experts in their fields, with leaders who are exceptionally good at fostering collaboration. The top 25 publishing researchers have a median H index of 15, with scores ranging from 4 to 35. WLE publication output is, however, driven by 5% of authors, including many flagship program (FP) leaders, who publish three or more WLE-attributed papers per year. Of the 25 most productive authors in International Scientific Index (ISI) journals, only two are women, which may resonate with the apparent imbalanced gender ratios in many WLE-affiliated research Centers, last assessed in 2016. There is furthermore a strong bias among full-time staff toward qualifications in biophysical disciplines (soil science, hydrology, ecology, and engineering).

Although WLE's W1 and W2 funding is considerably lower than that of most other CRPs, scientific output is remarkably high given these constraints. W1/W2 funding was constant between 2017 and 2018, and W1/W2 WLE funding to FPs constituted about 20% of their overall funding. W1/W2 funding has remained almost constant between US\$7.3 million and US\$7.8 million, while W3/bilateral funding has fluctuated between about US\$23 million and US\$26 million. Research infrastructure appears to be adequate, and yet the financial sustainability of important public good infrastructure deserves special attention. Long-term trials using people's fields present an ethical dilemma when funding cycles end prematurely. Digital infrastructure (websites, the THRIVE blog, and online databases) is excellent.

Partnerships are crucial to WLE's success. All partners are treated fairly, with transparent systems and processes, clear ethical guidelines, and equitable sharing of funds. WLE authors publish with an average of six coauthors. Trust was frequently mentioned as a crucial element of sustainable partnerships.

Journal impact factors (IFs) where WLE-affiliated authors publish and Altmetric scores are relatively high, with a median IF of 4.2 and Altmetric scores exceeding 20 in 40 publications. And yet citation rates, with a median of three per publication, are unexpectedly low: only 16% were cited 10 times or more. WLE publications in the CGSPACE database focus on Sustainable Development Goal (SDG)-related topics in Africa and Asia, yet are mostly downloaded by readers from developed countries—particularly the United States, China, France, and Germany. WLE’s research seems to expand its reach via briefs and reports, not peer-reviewed publications. Publications about methods and innovations in the CGSPACE database were particularly well received and were accessed more than 23,000 times since 2017.

Effectiveness

The WLE set out an ambitious program in line with its mission. It has been able to deliver on 90% of its 2017–19 milestones, and there are good prospects for delivery of the seven milestones carried into 2020. The 32 WLE innovations are solution oriented and represent an important bridge from science to the practice-oriented WLE targets and CGIAR sub-Intermediate Development Outcomes (IDOs). The 20 WLE policies include strategic outcomes at the national level. The four policies at global level include uptake of WLE science in multilateral environmental agreements (MEAs) and in SDG reporting, with potentially far-reaching implications for national practice and reporting.

The Outcome Impact Case Report (OICR) deep dives illustrate how WLE can (1) drive progress from outputs to local-level outcomes and impact; (2) develop, test, and pilot convincing and innovative solutions that attract further investment for scaling up; and (3) and develop and sustain services and facilities that can support large-scale improvement in practices benefiting people and the environment. Such results require continuity in efforts, partnerships, and vision over an extended period.

WLE interventions are complex, and the pathway from inception to output, and eventually outcome, is extended and often iterative in nature. WLE provides good examples of progress along the impact pathways identified in its theory of change, with WLE’s role including that of innovator and thought leader.

The WLE management and coordination arrangement operates in a transparent manner and has fostered a collegiate approach. The review found that WLE has used its limited resources in an effective and catalytic manner to engage with other Centers and CRPs. However, its agility in this area was constrained by the funding formula agreed upon when WLE was approved. Work in countries with an established CGIAR presence has benefited from the track record of collaboration with national partners and in-depth knowledge of issues and context.

Climate and the related themes of resilience and adaptive capacity are strongly represented in the WLE results framework, and the program is making significant contributions. WLE contributions to individual, community, and institutional capacity development (CapDev) are not well captured in current reporting, which emphasizes formal training. The development of systems thinking in senior scientists in collaborating Centers will be an important WLE legacy. Gender is considered in project approaches, gender-dedicated research, and outputs such as toolkits, with an emphasis on drivers of change and on equitable benefits. Youth has received less focus than other cross-cutting issues and is currently considered one of many dimensions of inclusion.

Future Orientation

WLE’s experiences and achievements in applying integrated systems approaches to real-world development challenges through leveraging multi-scale partnerships represents a significant opportunity for One CGIAR. WLE’s achievements provide an important reference point for One CGIAR for transdisciplinary work at the interface of livelihoods, landscape resilience, and food and water security.

Recommendations

Recommendations for the CRP

1. Showcase the role of WLE and of CGIAR as thought leaders and providers of integrated solutions through participation in relevant global events.
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.

3. Synthesize and analyze WLE results and learning at the outcome level, including with reference the WLE theory of action, to serve as a documented program legacy.
4. Undertake strategic reviews of i) WLE's externally oriented capacity development work to identify lessons and potential gaps, including in the context of upscaling and exiting from interventions; and ii) partnership engagement and strategies to identify lessons, and potential gaps or opportunities including in the context of upscaling and exiting from individual interventions.
5. Undertake an appraisal of WLE projects and expertise to better define WLE's capacities, strengths, opportunities, and possible gaps in contributing to One CGIAR global challenges.

Recommendations for the CGIAR System

Integration

1. Continue to support integrated approaches on water, land, and environment in the context of the SDGs and build a System-wide understanding of the need to transform agricultural practices to maintain ecosystem services and ensure that contributions to improved livelihoods and well-being are sustainable.
2. Develop appropriate incentives to encourage researchers and Centers, including agri-food system (AFS) Centers, to engage in interdisciplinary and systems research, while recognizing that an expectation of financial incentives to collaborate may be counterproductive and that willingness to collaborate needs to be based on a shared vision.
3. Develop guidance for integration of social sciences into action research projects with a view to developing an understanding of factors required for sustaining solutions.

Places

4. Identify a handful of place-based programs in priority river basins, city regions, or transboundary landscapes where the triple challenge of producing food sustainably, enhancing human well-being, and conserving ecosystem services can be addressed.
5. Strengthen country coordination structures as a means for all CG Centers/CRPs to explore integrated solutions at local, landscape, and relevant subnational or national scales while ensuring coherent engagement with national stakeholders.
6. Develop a suite of practical guidelines to promote engagement of local partners (nongovernmental organizations, national agricultural research systems, national agricultural research and extension systems) and local communities as collaborators in project design and implementation across CGIAR.

People and Assets

7. Develop a capacity development strategy for junior and emerging scientists in CGIAR.
8. Develop an asset management strategy for CGIAR services, facilities, and platforms that provide for large-scale uptake of solutions.

1 Background to the CRP 2020 Review

1.1 Purpose and Target Audience of the Review

The purpose of the review is to assess the extent to which the Water, Land and Ecosystems CGIAR Research Program (WLE) is delivering quality of science and demonstrating effectiveness in relation to its theory of change. The objectives are to:

- Fulfill CGIAR's obligations around accountability regarding the use of public funds and donor support for international agricultural research
- Assess the effectiveness and evolution of WLE's work as a CRP in 2017–21
- Provide an opportunity to generate insights about WLE's research contexts and programs of work, including lessons for future CGIAR research modalities.

The primary user for the review is the CGIAR System Council, with additional potential insights for the WLE program management and the wider WLE team in the partnering CGIAR Centers. The findings, conclusions, and recommendations may be of use in refining the CRP's 2021 program of work and budget (POWB) or in drawing lessons to inform future research modalities. Lessons from the review may inform the One CGIAR transition in 2022.

1.2 Overview of the CRP and Its Context in Research for Development

WLE is one of four cross-cutting Integrating CGIAR Research Programs (ICRPs). WLE's vision, as set out in its July 2016 Proposal for the period 2017–22,¹ is of a world in which agriculture thrives within the vibrant ecosystems that support it while delivering enduring prosperity for farming communities. WLE's mission is *to provide the evidence base and solutions to help decision-makers scale up sustainable water, land, and ecosystem management innovations and investments in agricultural landscapes that reduce risks and increase the resilience of women and men in developing countries*. It set out to achieve this through a focus on increasing productivity and identifying synergies and managing trade-offs among sectors.

The 2017–22 program was the second phase of the CRP and continued the work of the earlier phase that ran from 2012 to 2016. WLE is led by the International Water Management Institute (IWMI) and delivered in association with six CGIAR Centers (Bioversity, the International Center for Tropical Agriculture [CIAT], the International Center for Agricultural Research in Dry Areas [ICARDA], the International Crops Research Institute for the Semi-Arid Tropics [ICRISAT], the International Food Policy Research Institute [IFPRI], and World Agroforestry Center), and two partners (the Food and Agriculture Organization of the United Nations [FAO] and the Global Partnership on Sustainable Urban Agriculture and Food Systems [RUAF]). The Center for International Forestry Research [CIFOR], the International Potato Center [CIP], the International Livestock Research Institute [ILRI], and WorldFish were part of the original proposed partnership, but only WorldFish has played a role in the program. The duration of the program was subsequently reduced from six years to five years.

Given the broad scope of WLE, the program has focused on a subset of globally critical challenges that were identified based on a set of criteria that includes addressing the CGIAR "Grand Challenges"; adding value to other CRPs and having clear synergies with them; building on previous accomplishments and WLE's comparative advantage; having potential to contribute to social and economic equality; and addressing emerging critical natural resource management (NRM) issues that are not being addressed. Phase 2 of WLE was designed to contribute directly to achieving CGIAR System-Level Outcome (SLO) 3, "improving natural resource systems and ecosystem services," and to a lesser extent SLO1 on reducing poverty and SLO2 on health and nutrition benefits.

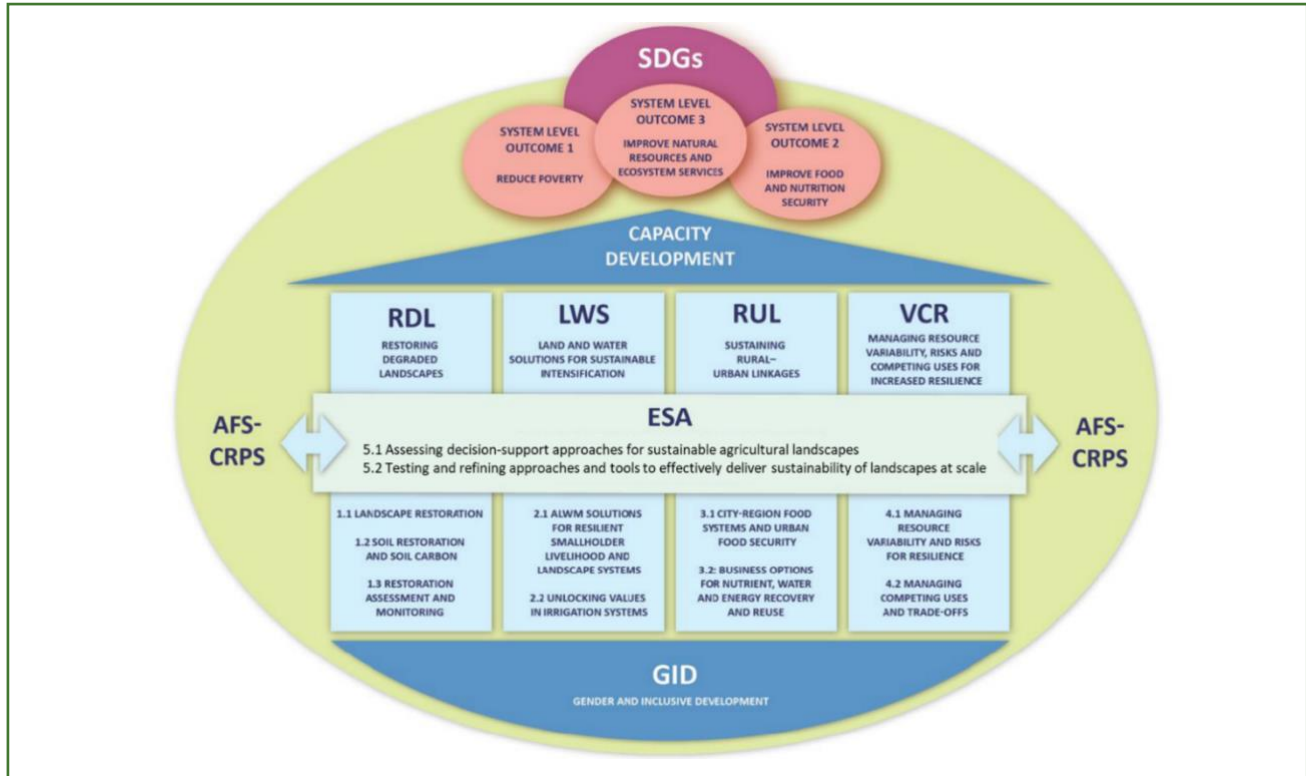
Research activities are carried out through five flagship programs (FPs), described in the full narrative proposal for the CRP,² that serve as umbrellas for projects and other initiatives (Figure 1 and Table 1).

¹ CGIAR Research Program on Water, Land and Ecosystems - Sustainable solutions for people and societies. Full Proposal 2017-2022 Updated July 31, 2016.

² A revised proposal for FP5 was prepared in 2017.

Each of the FPs has worked with, and been supported by, the core theme, Gender and Inclusive Development (GID). The WLE portfolio of projects (in the 2020 planning cycle) spans 66 countries, with a highly uneven geographic distribution of the 127 projects. Some projects cover more than one country.

Figure 1. Schematic of WLE showing FPs and clusters of activity



Source: WLE 2016 project document, with ESA modified based on 2017 Addendum.

Table 1. WLE flagship programs

Flagship	Description (funding for 2017–19)
FP1–Restoring Degraded Landscapes (RDL)	RDL finds solutions for restoring agricultural lands that have been mismanaged or overexploited, and measures that will reduce degradation (W1/W2: US\$5,433,000; W3/bilateral: US\$27,644,000).
FP2–Land and Water Solutions for Sustainable Intensification (LWS)	LWS provides research evidence on processes and opportunities for adoption of sustainable agricultural land and water management solutions at scale (W1/W2: US\$4,939,000; W3/bilateral: US\$27,515,000).
FP3–Rural-Urban Linkages (RUL)	RUL assesses the performance of urban and peri-urban agriculture within the city region food systems, while identifying innovative ways to turn urban waste challenges into new strategies and business opportunities (W1/W2: US\$2,898,000; W3/bilateral: US\$6,393,000).
FP4–Managing Resource Variability, Risks, and Competing Uses for Increased Resilience (VCR)	VCR aims to reduce risks and losses that farming communities suffer from water-related disasters, and to find better ways of maximizing the opportunities that competing uses of land, energy, and water can provide (W1/W2: US\$4,308,000; W3/bilateral: US\$6,730,000).
FP5–Enhancing Sustainability across Agricultural Systems (ESA)	ESA supports the design and development of socially inclusive decisions and investments for more sustainable agricultural landscapes by developing user-friendly approaches and tools to assess and manage scale effects of agricultural interventions on selected Sustainable Development Goal (SDG) targets (W1/W2: US\$1,149,000; W3/bilateral: US\$6,481,000).

WLE is guided by (1) an Independent Steering Committee (ISC) responsible for providing scientific direction and strategic oversight and formulating recommendations on priorities, work plans, and budgets for consideration and approval by the Lead Center Board and (2) a management committee (MC) responsible for reviewing WLE planning and monitoring processes, ensuring effective and strategic results-based management, making decisions on partnership and resource allocation, and committing to and actively mobilizing strategic funding for research projects under WLE.

Day-to-day coordination and administration are provided by a small Program Management Unit (PMU), that is also responsible for engagement with other global and regional programs and internal and external communications. The PMU is hosted by IWMI and led by a program director who chairs the MC and has oversight for the entire program.

WLE is among the smallest of the 12 CRPs, with a WI/W2 budget of US\$9.029 million in 2020. WLE also receives considerably less funding than the other three integrating CRPs: CCAFS, with more than US\$19 million, and A4NH receive twice as much as WLE, while PIM receives \$4.5 million more than WLE.

1.3 Scope of the Review and Review Questions

The CRP 2020 review focuses on two of the six evaluation criteria as defined in the CGIAR evaluation framework: quality of science (consisting of scientific credibility and legitimacy, which are two of the four elements constituting the Quality of Research for Development Framework [Qo4RD]) and effectiveness, which provides a basis to estimate CRP potential over time and according to resources and organization management. Guided by the terms of reference (ToR) (Annex 1), this review focuses on WLE and its five FPs (2017–19).

The review focuses on two of the six evaluation criteria defined in the CGIAR evaluation framework: quality of science and effectiveness. The review questions are as follows:

1. Quality of science: To what extent does WLE deliver quality of science, based on its work from 2017 through 2019?
2. Effectiveness: What outputs and outcomes have been achieved, and what is the importance of those identified results?
3. Future orientation: To what extent is WLE positioned to be effective in the future, seen from the perspectives of scientists and of the end users of agricultural research (such as policymakers, practitioners, and market actors)?

1.4 Approach, Methods, and Limitations

The team has reviewed qualitative and quantitative data from the following sources: (1) CGIAR Managing Agricultural Research for Learning and Outcomes (MARLO) and dashboard data pre-analyzed and pre-summarized by CAS Secretariat, including on publications, outcomes, milestones, innovations, and other metrics; and (2) documentation related to governance and management, including operational and financial planning and reporting, and minutes and extracts from meetings of the ISC and the MC. A bibliographic database of 257 peer-reviewed publications provided by CAS, a searchable database of reports (CGSPACE), the Mendeley literature database and web-based resources such as the CGIAR Thrive blog, and internal datasets such as IFPRI's Agricultural Science and Technology Indicators (ASTI) data were used for empirical analysis of quality of science. The quality of science elements adopted in this evaluation are well aligned with the science credibility and legitimacy elements CGIAR's Qo4RD framework. Further details on the methodology and documentation are provided in Annexes 2 and 3.

Progress has been assessed along the WLE results frameworks and theory of change, including cross-cutting dimensions. Impact pathways were reviewed through three case studies spanning five published OICRs and their associated publications. Findings were triangulated through semi-structured interviews, including 24 individual and group interviews, reaching 34 people (Annex 4).

The limitations are as follows:

- The review is desk based, using a set of documents and CGIAR dashboard data pre-analyzed by CAS and by the CRP covering the period 2017–19, supplemented by interviews and data in the public domain, as described above.
- The review does not extend to the level of individual projects falling under the umbrella of WLE but delivered through participating Centers and partners.
- The review has taken only a limited perspective on CGIAR institutional arrangements.

- The period covered by the review (2017–19) is short relative to the time frame for bringing about change in often complex and multidimensional environmental interventions addressed by the WLE.

1.5 Management and Quality Assurance

The CAS Secretariat managed the review, providing oversight through regular check-ins and standardized quality assurance. The preliminary findings and draft report were shared with the peer reviewer, CAS Secretariat, and WLE program for feedback and factual corrections. The review team was composed of Dr. Sarah Humphrey, senior evaluation expert and team leader, who led on effectiveness, cross-cutting issues, and development of recommendations, and Dr. Christo Fabricius, senior subject matter expert with experience in social-ecological resilience, sustainable livelihoods, and ecosystem services, who led on quality of science and future orientation.

2 Findings

2.1 Quality of Science

Quality of science (QoS) is evaluated in terms of (1) research inputs, (2) research processes, and (3) research outputs.

2.1.1 Quality of Research Inputs

2.1.1.1 Skilled Staff

WLE researchers have deep skills within their areas of expertise, and FP leaders are exceptionally adept at cross-disciplinary integration. WLE has access to almost 6,000 experts in 10 Tier 1 and 2 partner Centers (Annex 7, Figure 1).

CGIAR is an applied research organization. In addition to the production of publications and physical outputs, the relevance, scientific credibility, and effectiveness of CGIAR scientists are also evaluated against the scale of activities they are involved in and the resources they can mobilize, their influence on policy and practice, their mentorship of junior staff, and the partnerships they mobilize (QoR4D framework). Scientific credibility in the form of publication outputs, H indices, and citation rates is, however, a crucially important yardstick.

The top 25 authors of peer-reviewed publications are well recognized, globally. The median H index of the top 25 authors is 16.5, with scores ranging from 4 to 33. Some tend to publish in high-impact journals (i.e., with impact factors > 5) but are seldom lead authors of high-impact publications. FP leaders and project leaders are generally among WLE's most accomplished and recognized scientists (in terms of publication records and H indices), leading by example.

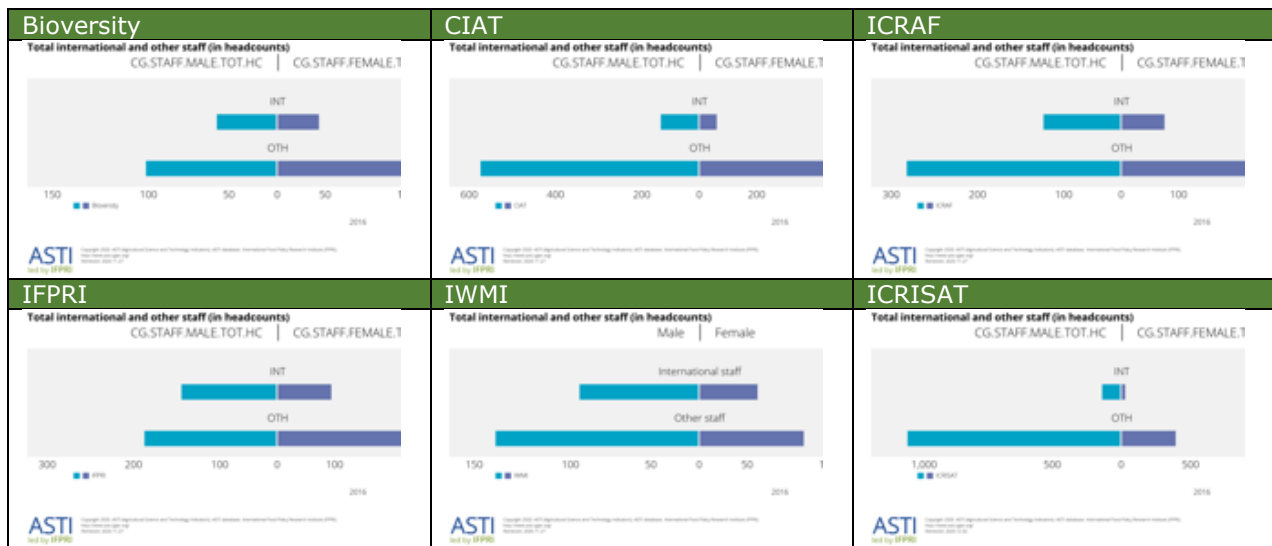
While a wide range of WLE-affiliated researchers (1,407 according to the bibliometric database provided by CAS) publish their work, WLE publication output is driven by the 5% of authors who are involved in three papers or more per year. WLE's 1,407 affiliated authors are involved in a median of one paper per researcher published under WLE over the 2017–19 period, with numbers ranging from 1 to 14 papers. Only 77 (5%) of authors have been involved in three or more papers over a three-year period published under WLE (i.e., one [unfractionalized] paper or more per year), and it is unclear how many authors never publish under WLE.

When fractionalized to account for the number of coauthors, the median per capita publication rate is 0.14 WLE-attributed publication units per WLE-affiliated author over a three-year period, with values ranging from 3.1 to 0.01.

Analysis of the CGSPACE literature database, which may not contain a comprehensive record, reveals that many WLE authors who were not among the top 25 in the bibliographic database have been prolific publishers of grey literature, producing up to 38 reports in a single year (see Annex for detailed information). Some authors with very high H indices who publish mainly books and reports (e.g., Drechsel) do not appear among the top 25 peer-reviewed publishers, and upcoming young scientists may be disadvantaged by the conventional methods of evaluating research impact using H indices. Bibliometric data (i.e., of International Scientific Index [ISI] publications) masks some of WLE's most competent and globally recognized authors who are prolific publishers of widely read reports and books available in the public domain.

Authors from developing countries are well represented among the top 25, but women are less well represented than men: only 2 of the top 10 publishers are women (Ringler, the most productive WLE author, and Schmitter). These two women published 14 and 8 papers respectively. Dr. Ringler not only published 14 times more papers than the median and 4 times more than the top 5%, but also collaborates exceptionally widely. While the gender balance within Centers appears to be skewed toward males in most participating Centers except Bioversity and IFPRI (Figure 2), there is little reference to capacity development of young WLE researchers in annual reports (ARs) and on websites. While much may have changed since 2016, more recent data were not accessible during the review period.

Figure 2. Gender balance (2016) within WLE participating Centers



Source: IFPRI ASTI database.

Note: Dark blue = female staff.

According to the bibliometric database, authors are based (in order of frequency) in the United States, Germany, Ethiopia, Kenya, South Africa, Australia, India, France, Sri Lanka, and the United Kingdom. Authors who received the highest citations per article were (in order of frequency) from Switzerland, Sweden, Zimbabwe, Canada, the United States, China, Pakistan, South Korea, Malaysia, and Saudi Arabia.

Research staff are well qualified, and most researchers have PhD degrees. There is, however, a strong bias among full-time staff toward qualifications in biophysical disciplines (soil science, hydrology, ecology, and engineering) at the expense of qualifications in economics and social sciences. A random selection of the profiles of 30 FP and project leaders indicates the following distribution of qualifications among senior researchers: biophysical scientists: 22/30 = 74% (dominated by soil scientists, ecologists, agricultural scientists, engineers, hydrologists); social scientists: 4/30 = 13%; economists: 4/30 = 13%. These shortcomings are to some extent compensated for through collaboration with other CGIAR Centers and external partners, such as business schools, the private sector, and nongovernmental organizations (NGOs).

2.1.1.2 Funding

Although WLE’s W1 and W2 funding is considerably lower than that of other CRPs owing to its relatively new arrival and low funding baseline at the beginning of Phase 2, WLE’s scientific output is remarkably high given its comparative funding disadvantage. The most important constraint is related to the timing and predictability of W1 and W2 funding rather than the amount. W1/W2 funding was constant between 2017 and 2018, and the proportion of W1/W2 WLE funding to FPs was in the order of 20% of their overall funding each year. There are exceptions: W1/W2 funding to FP4 exceeded its W3/bilateral funding in 2017 while the latter grew rapidly in 2018. W3/bilateral funding associated with FP5 has declined over the three years, and WI/W2 funding exceeded this in 2019 (Figure 3). This was mainly due to FP5’s strategy of supporting projects and activities in other flagships, CRPs, and partner organizations. In 2019 WLE’s income was US\$30.44 million (W1/W2 = US\$7.78 million; W3 = US\$3.78 million; bilateral = US\$18.88 million). The biggest funding source (Figure 4) was the CGIAR Trust Fund (US\$7.78 million), followed by the United States (US\$3.64 million), Germany (US\$2.92 million), IFAD (US\$1.84 million), and the European Commission (US\$1.02 million). Annex 7 contains 2020 budgeted income.

Figure 3. Annual funding of WLE flagships, 2017–19 (thousands of US\$)

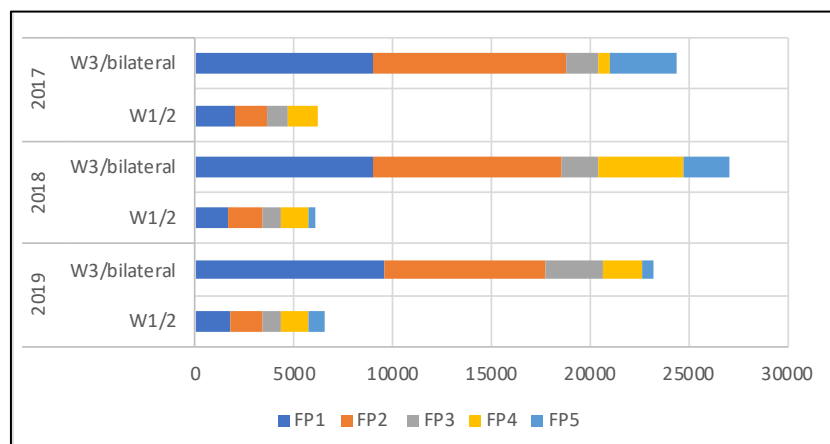
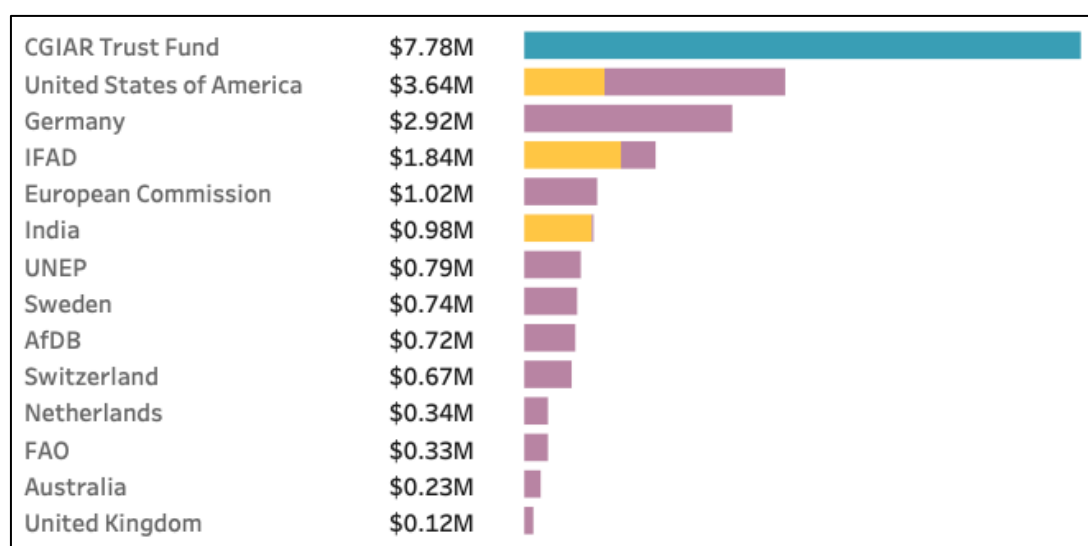


Figure 4. Top WLE funding sources, 2019



2.1.1.3 Infrastructure

Research infrastructure appears to be adequate. Infrastructure such as soil-testing laboratories and field trials is established in collaboration with partners and governments. Infrastructure adequacy was seldom discussed in interviews, despite being raised as a discussion topic, with one exception: soil spectroscopy, discussed in more detail in the deep dive into the OICR (see Annex).

With the exception of some long-term trials, most of WLE’s research and innovations do not, however, rely on fixed physical infrastructure as most innovations happen in the field. This reliance on real-life experiments presents an ethical dilemma to many programs, with questions being raised about the fairness of using people’s fields for long-term experiments, as trials are ended when funding runs out. Information about research infrastructure (as defined in the ToRs) is not readily available in annual reports or databases and had to be inferred from interviews, focus group discussions, and subjective assessment of available digital infrastructure. Digital infrastructure, which is exceptionally well developed in the form of websites and online databases, is a key strength in WLE. This ensures adequate and transparent monitoring of resource allocation, progress, and outputs.

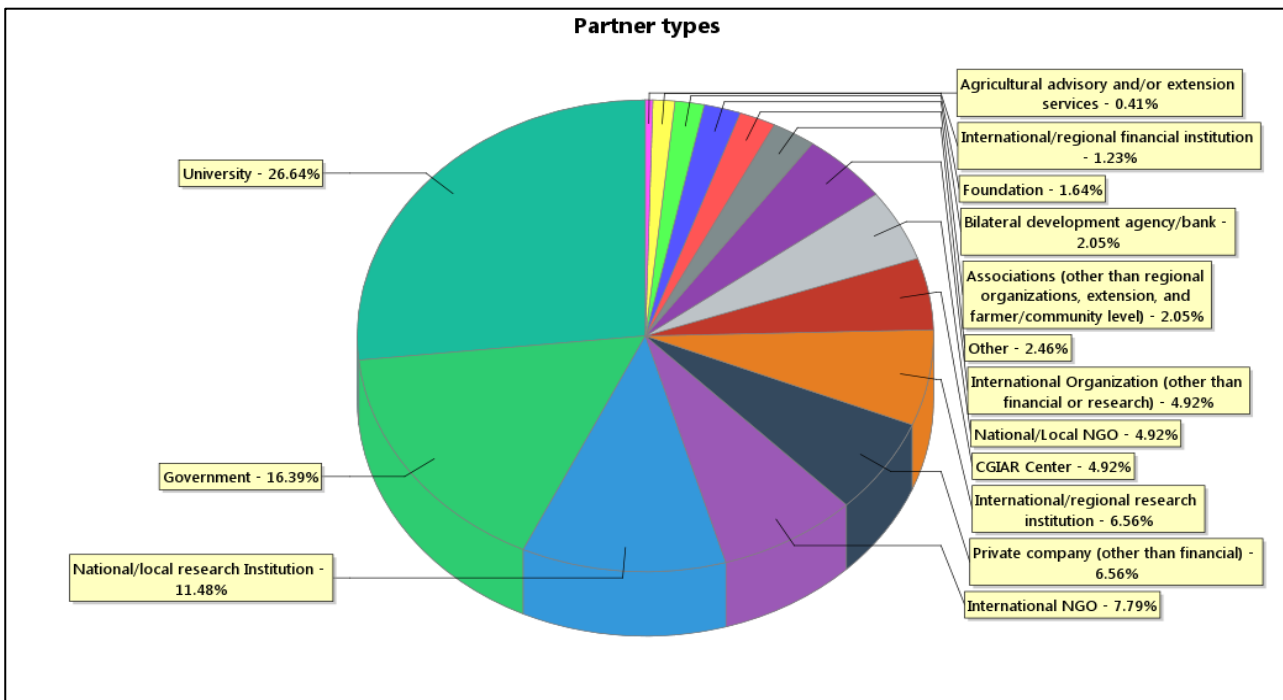
2.1.2 Quality of Process (including Partnerships)

Partnerships are crucial to WLE’s success, and the vast majority of publications are coauthored with external partners. WLE cooperates with more than 250 external partners to promote adoption and scaling up of solutions. WLE’s partners assist it with not only research and capacity development but also delivery and mainstreaming of research findings into national policies and strategies (Figure 5). Donors

and research partners have commented that this connectedness with policy and implementation agencies in government and national NGOs is one of the greatest advantages of collaborating with WLE and its CGIAR partner Centers and flagship programs (see OICR analysis).

As indicated by the number of coauthors from different institutions, WLE researchers seem to treat research partners fairly and equitably. There is an average of 7 coauthors per document in the bibliometrics database of 257 papers, and only 3 single-authored documents. The top five Altmetrics papers analyzed in more detail (Annex 7) have 4, 11, 17, >80, and 28 authors, respectively – most of them led by authors external to WLE. The exception is the two Special Issues in international journals focusing on the 'TISA' (Transforming Irrigation in Southern Africa) project, where ICRISAT staff (Van Rooyen and Moyo) have led three papers each, with more being published in 2020.

Figure 5. Types of WLE partnerships measured by number of collaborations



Trust is widely recognized and frequently mentioned in key informant interviews as a crucial element of functional partnerships and actively promoted, without any mention of conflicts of interest during interviews. In most instances trust has resulted from multiyear collaborations and personal relationships, leading to tangible delivery. Funding is shared with research partners, and they receive ample credit in WLE media releases and reports. It did, however, become clear during focus group discussions that historically uncertainties around W1/W2 funding could have challenged the sustainability of relationships. Some WLE researchers from developing countries have commented that their association with CGIAR has helped them to be assertive when negotiating for fair sharing of intellectual benefits of research when collaborating with external partners from developed countries. Where WLE researchers were brought in by external partners, as was the case with ICRISAT’s Innovation Platforms work in Zimbabwe, WLE researchers have made important conceptual contributions.

WLE is guided by CGIAR’s ethics principles of dignity and respect, commitment to sustainability, excellence, and partnerships. IWMI has an ethics policy that sets out the ethical principles underpinning all research activities conducted by IWMI; defines the responsibilities of IWMI and IWMI’s researchers and staff in view of research ethics; provides guidance on the application of those principles, by defining standards that researchers and staff involved in IWMI projects and activities will adhere to; and defines scientific (mis)conduct and related mechanisms. Institutional Review Boards (IRBs) became operational in January 2020 and have the mandate to approve or cancel research activities involving human subjects, including those managed or conducted by WLE. Since becoming operational, IRBs have reviewed every new W1/W2 and bilateral proposal mapped to WLE (P. Drechsel, pers. comm.).

WLE is gradually implementing CGIAR’s open access policy. In 2018, 54% of papers were open access and 40% were ISI indexed (WLE AR 2018). In 2019, open access increased to 62% of papers and 92% ISI indexed (WLE AR 2019)—a promising trend. This result aligns with similar measures in the

bibliometrics database. Many reports are available online via the CGSPACE database and are easy to locate, search for, and access.

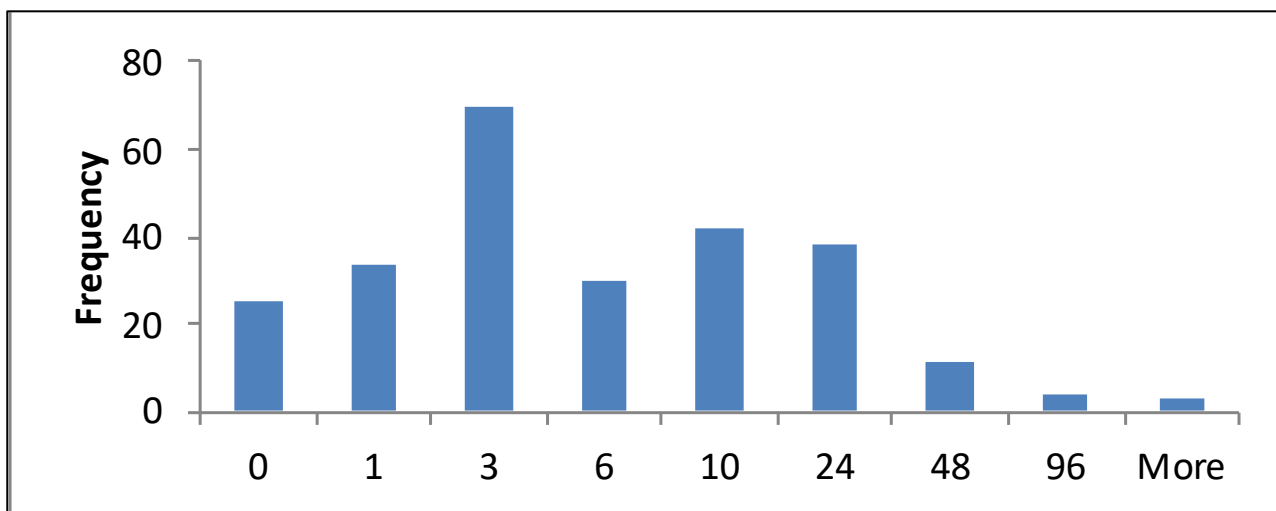
WLE adds value to the research conducted by Centers by contributing to strategic research design, using incentive funds to promote integration, and engaging in regular and transparent monitoring and evaluation and milestone tracking. Several interviewees commented on the valuable contributions of the PMU to facilitate self-monitoring and reporting, which they said adds value and focuses their activities and strategies. According to FP leads, WLE’s processes and criteria for allocating W1/W2 funding are transparent and fair, with clear guiding principles.

2.1.3 Quality of Outputs

Three sources of data were used for assessing quality of outputs: the CGIAR CGSPACE database (<https://cgspace.cgiar.org>); the bibliometrics data pre-analyzed by CAS; and a Mendeley database, also provided by CAS.

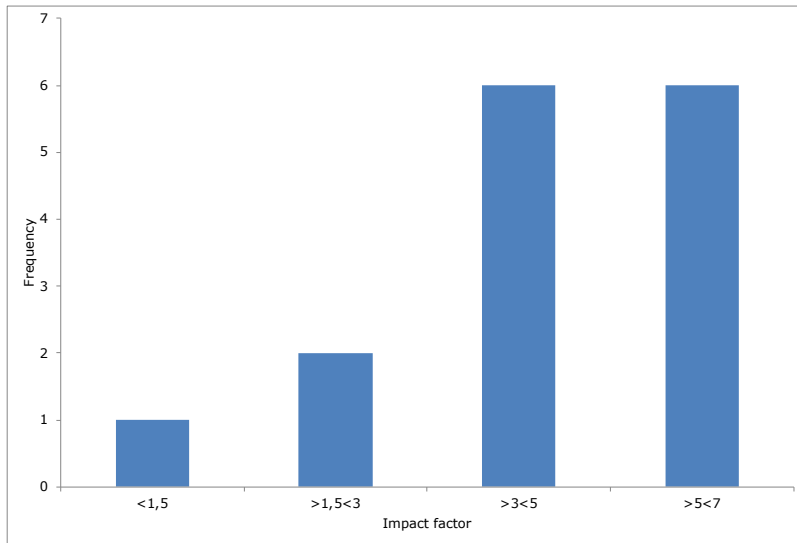
The mean citation rate of 9.4 of the 257 papers in the bibliography database was highly skewed by two papers that received more than 200 citations. The median citation rate was 3 per paper; 24 papers were never cited, and 26 papers were cited only once (Figure 6). Most of the articles (83%) were based on primary data, but the 32 review articles received above-average numbers of citations. Of the 257 papers, 16% were cited 10 times or more, and 46% 5 times or more. Papers that were never cited were either published very recently (2019) or in obscure journals. A wide range of journals (139 in total) were used for publication. *Sustainability*, a journal with a mediocre ranking (120 out of 250 in its category) that has been criticized by some academics for questionable editorial practices (see general discussion in the journal *Nature* and specific discussions on Twitter), is the most frequently chosen journal for WLE publications.

Figure 6. Number of citations of WLE papers (bibliometrics database)



Impact factors of journals where WLE authors publish are high, ranging from 6.55 to 1.09 among the 15 most popular journals, with a median of 4.2 (Figure 7). In addition, four papers published in *Nature* (IF = 43) and *Nature Ecology and Evolution* (IF = 12.5) and two in *Science* (IF = 42) are not among those by the top 25 authors but have very high Altmetric scores and are referred to in policy documents.

Figure 7. Journal impact factors of 15 most popular journals for WLE authors



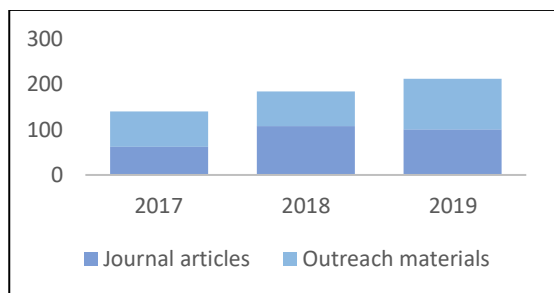
Altmetric scores among the top 25 WLE papers in the bibliometric database are relatively high—among the top 10% for articles in their field. Eight ISI-indexed papers have Altmetric scores exceeding 100. Most of these were among the top 10 most-cited papers, and all were cited more than 10 times. High Altmetric scores were due to high numbers of Twitter mentions and inquiries via Mendeley. Articles for deeper analysis were selected based on (1) their citations, (2) journal rankings, (3) their Altmetric scores, and (4) their relevance to the selected OICRs (Annex 7).

Looking at the more comprehensive collection of internal reports and journal papers in the CGSPACE database, a richer picture emerges: outreach materials outnumber journal articles, raising the total WLE outputs from 257 to 669 (threefold, Table 2). The database also provides evidence of a rapid rise in WLE outputs since 2017 (Figure 8). Data from CGSPACE demonstrate that the most popular publications (as reflected by downloads) are grey literature, particularly handbooks, guidelines, and methodologies, which are difficult (and slow) to get published in the peer-reviewed literature. Eleven of the top 20 downloaded publications are about methods and innovations. These 11 publications have been downloaded more than 17,000 times, with more than 23,000 interactions (i.e., views and downloads). To put this in perspective, the most-cited WLE peer-reviewed publication, cited 330 times in three years, has been read <1,700 times (<https://doi.org/10.1016/j.soilbio.2018.01.030>).

Table 2. WLE publications in the CGSPACE database

	2017	2018	2019
Journal articles	62	108	101
Book chapters	8	109	13
Outreach materials	79	77	112
Total	149	294	226

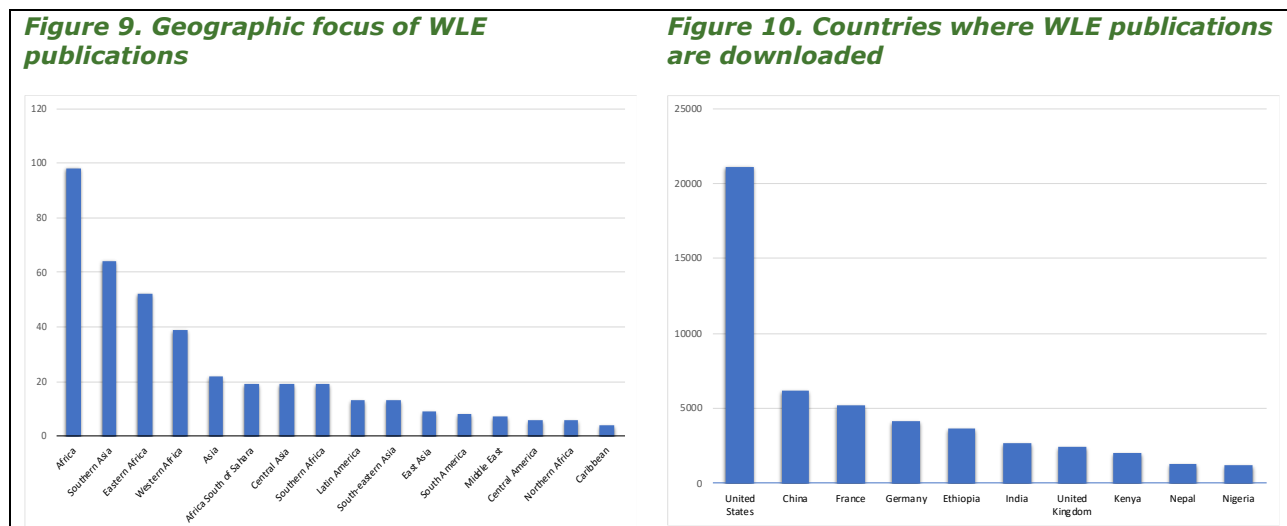
Figure 8. Combined WLE outputs of journal articles and outreach materials, 2017–19



Source: CGSPACE database.

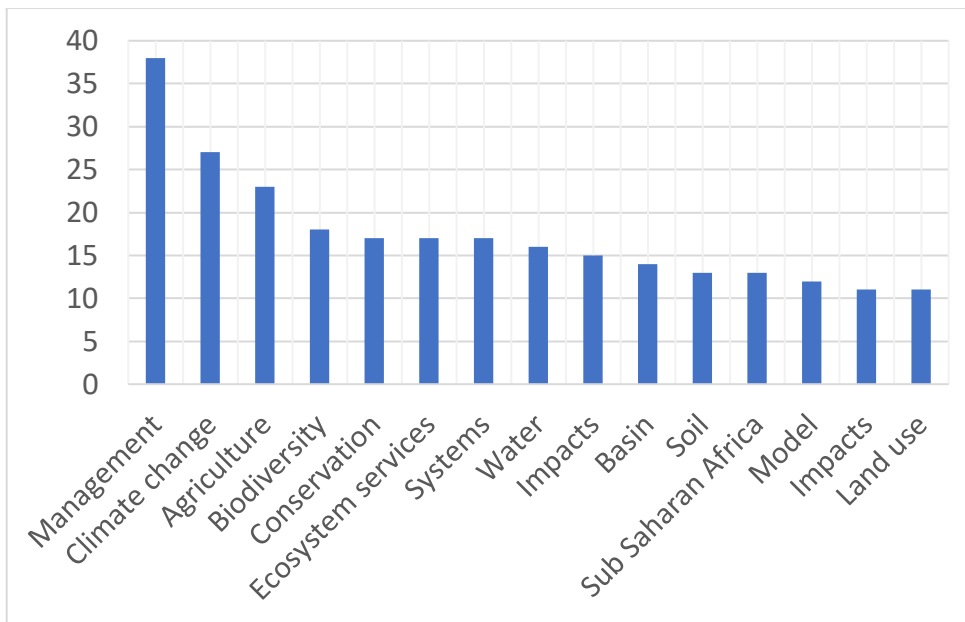
Top downloads and reads of the total range of outputs shows that reports are more popular than peer-reviewed papers; only 2 of the top 20 downloads are peer-reviewed papers. The most-downloaded papers are graphically presented in Annex 7.

Most of these publications are about Africa and South Asia, with a smaller number about Latin and Central America and the Caribbean (Figure 9 and word cloud in Annex 7). But most of the downloads are from the United States and Europe, where researchers and scholars are concentrated (Figure 10).



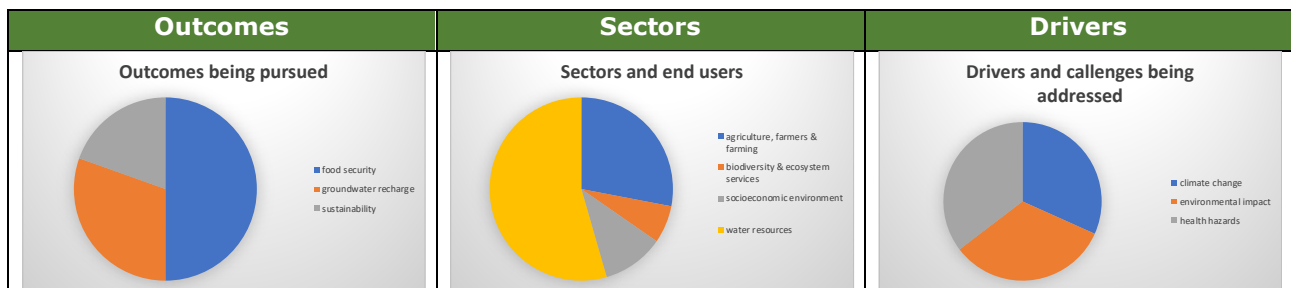
A look at the representation of keywords in reports and publications (Figure 11) shows that most of the keywords relate to management, climate change, agriculture, and biodiversity—WLE’s core business. Most of the outcomes being pursued in these publications relate to food security, are aimed at farmers and water users, and focus on the drivers climate change, environmental impacts, and health hazards—linked to the SDGs (Figure 12). These publication topics resonate well with the words used in project titles, obtained from the projects database. A word cloud of keywords is graphically presented in Annex 7.2.

Figure 11. Frequency of top 15 keywords in WLE publications, 2017–19



Source: CGSPACE database.

Figure 12. Outcomes, sectors, and drivers addressed in WLE reports and articles, 2017–19



Source: CGSPACE database.

2.2 Effectiveness

This section looks at the extent to which WLE’s planned outcomes and outputs had been achieved by 2019 (2.2.1), reflects on three in-depth studies of WLE OICRs (2.2.2), considers how management and governance arrangements have supported effectiveness (2.3), and looks at progress along the WLE theory of change (2.2.4). Background data are provided in Annex 7.

2.2.1 Achievement of Planned Outputs and Outcomes

The WLE results framework is structured around a series of two to three CoAs per flagship—each associated with an outcome statement, one or more targets (which are considered aspirational), and a series of annual milestones. In line with CGIAR reporting requirements, WLE does not report systematically at the level of the outcomes and related targets, though progress is reflected in the narrative sections of annual reports.³ The review of effectiveness is based on reporting against milestones, using CGIAR Dashboard data pre-analyzed by CAS, supplemented by information in annual reports, including information on risk. Further information on effectiveness is derived from reporting on policies and innovations as well as OICRs (section 2.2.2).

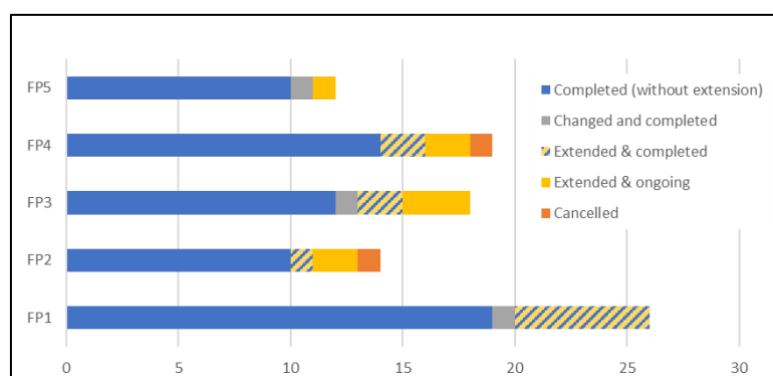
³ The 2019 annual report introduced sub-IDO indicators at the output or immediate outcome level, but these do not include targets and are not currently used for reporting. WLE targets were also adjusted to a measurable level.

2.2.1.1 WLE Milestones

A first set of WLE milestones was included in an annex to the program proposal document (July 2016). The set of milestones has been substantially expanded, and individual milestones have been updated each year during development of the POWB. Progress is reported in annual reports. The formulation of milestones has improved since 2017, when a large number of rather open milestones were introduced. The 2018 and 2019 milestones are specific, measurable, achievable, realistic, and timebound in the sense that they are established for a one-year reporting timeframe. The milestones increasingly capture contributions from more than one project supported through multiple funding sources. Most WLE milestones are at the output level, within the sphere of control of the FPs. A few WLE milestones are at the outcome level (notably FP3).

WLE has 11 clusters of activity and outcomes spanning the five FPs.⁴ It sets two or three milestones per outcome per year. Overall WLE has completed 79 of its 89 milestones (90%). Two milestones were canceled, and eight are ongoing. Individual FPs have completed between 11 and 26 milestones, with the lower number for FP5, which started only in 2018. Nineteen milestones were extended (counting only those that reported in the following year for 2017 and 2018); this represents 24% of milestones at the WLE level. The proportion is similar (21–23%) for FP1, FP2, and FP4, higher (28%) for FP3, and lower (8%) for FP5. Three milestones were changed (Figure 13).

Figure 13. Status of delivery of milestones by FP, 2017–19



Reporting indicates that delays in milestone delivery may result from delays in a single project activity. Other milestone delays have occurred when the final step in delivery is beyond the sphere of control of the FP (e.g., a final publication). These milestones are sometimes categorized as extended in annual reporting but are not taken up in the following year's POWB or classified as extended in MARLO.⁵ Several 2017 milestone extensions were due to their not being clearly timebound to one year.

The risk analysis for milestone delivery initiated in 2018 at the CGIAR level has provided limited insights; it is not possible to determine whether any of the standardized categories of risk are of greater concern owing to gaps in the risk profiling. Nine of the extended and changed milestones were identified as low risk. The most frequently mentioned risk for extended milestones is "inherent risk in unknown cutting-edge research or science" (four cases). Milestone reporting does not always support the anticipated risk as having been the source of delay.

2.2.1.2 WLE Innovations

CGIAR defines innovations as "new or significantly improved outputs or groups of outputs—including management practices, knowledge or technologies." WLE has not established targets for innovations, and from a reporting and accountability perspective these are anecdotal in nature. The WLE FPs reported 32 innovations in MARLO and the CGIAR Dashboard between 2017 and 2019, of which 16 occurred in 2019. There is limited evidence for the 9 innovations reported in 2017, and these are not considered representative. The WLE partner was the sole contributor on 2 innovations, lead on 4, and partial contributor on 9 (data are incomplete and not provided in 2017) (Annex 7.2).

⁴ There has been no reported delivery on the set of "uplift" outcomes established for each FP, which were contingent on mobilization of additional funding.

⁵ For 2017 milestones this is because MARLO did not incorporate a function to extend milestones from 2017 into 2018.

Most innovations fall into two categories: (1) production systems and management practices and (2) research and communication methodologies and tools (each 42% of total). Seven of the innovations are global in scope; 7, regional; 1, multinational; and the remainder, national. Four countries have had multiple innovations: Kenya (4), Ethiopia (3), Myanmar (Burma) (3), and Cuba (2).

Twenty of the WLE innovations are at stages 1 and 2, 11 are at stage 3, and just one is at stage 4. There are not yet any examples of progression through stages in follow-on innovation reports. The innovations are solution oriented and represent an important bridge from science to the practice-oriented WLE targets and CGIAR sub-IDOs. Some but not all identify an uptake partner in the title; this aspect is more fully explored in the three innovations that are further reported as OICRs.

2.2.1.3 WLE Policies

CGIAR defines policies as “policies, legal instruments, investments or curriculum modified in design or implementation, informed by CGIAR research.” WLE has not established targets for policies, and from a reporting and accountability perspective these are anecdotal in nature. WLE recorded 20 policies in MARLO between 2017 and 2019, with the greatest number (7) contributed by FP4 (Annex 7.2).

Nineteen policies are categorized as “policy or strategy” and one as “budget or investment.” All but one policy⁶ target the public sector. Eight policies are at level 1, two at level 2, and none at level 3. There are not yet any sequences of policies on the CGIAR Dashboard that demonstrate further developments. Four of the WLE policies are global, of which two are linked to multilateral environmental agreements (MEAs), one to SDG reporting, and one to investment. Of the national policies, Ethiopia (4) and India (4) feature more than one policy.

2.2.1.4 Flagships

Flagship 1: Restoring Degraded Landscapes (RDL)

FP1 focused on support to the implementation of equitable landscape and soil restoration strategies and concomitant monitoring, evaluation, and learning (MEL) systems. At the output level, FP has delivered 28 milestones in three CoAs toward three FP outcomes. Six milestones were extended, while nevertheless reporting progress in the year they first reported.

Out of 11 innovations reported by FP1, five related to production systems and management practices and four related to research and communication methodologies and tools, echoing the orientation of its three outputs. At the outcome level, the flagship has reported three policy results at the national level, of which two were in Ethiopia; one at the global level; and six OICRs, including one addressing uptake of WLE findings at the policy level in Ethiopia, jointly developed with FP2.

Highlights include the development and expanded use of soil spectral technology in Africa and beyond, described in three successive OICRs. The FP contributed to the Africa Soil Information Service (AfSIS) and to development of high-resolution soil maps that have help shaped large-scale investments in soil restoration in Africa (Outcome 2.2) and the establishment of a soil spectroscopy network through the Global Soil Laboratory Network (GLOSOLAN) (Outcome 2.3). WLE’s recommendations on soil carbon sequestration were adopted by the 197 parties of the United Nations Conference on Combating Desertification (UNCCD). FP1’s Global Soil Data Manager (GSDM) application was recognized by the Royal Swedish Academy of Engineering Sciences in 2019 as a top 60 innovative idea (Outcome 1.1).

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

FP2 had the objective of delivering science into practice to help unlock the potential value of more resilient farming systems. The flagship has delivered 11 milestones toward two flagship outcomes, of which one was extended in 2017. Delivery is continuing on two further milestones that were extended in 2019—in one case to complete a special edition of a journal, in the second to extend the testing period for farm-level tools. Five of the eight innovations are related to production systems and management practices, two to biophysical research, and one to social science (the only WLE innovation categorized as such). At the outcome level, the flagship has reported seven policy results at the national level and six OICRs, one jointly developed with FP1.

FP2 has focused on agricultural land and water management (ALWM) solutions and investment options, with highlights including innovative work on solar irrigation in India being replicated in neighboring countries (Outcome 2.1) and development of a suite of irrigation scheme performance tools (Outcome

⁶ Data are for 2018 and 2019.

2.2). The flagship has worked on strengthening local governance including water user associations in Myanmar and elsewhere and agriculture innovation platforms in Zimbabwe.

Flagship 3: Rural-Urban Linkages (RUL)

FP3 focused on contributing to urban food security and reducing the environmental impact of urbanization through the implementation of urban waste and water resource recovery and reuse business models. FP3 has completed 15 milestones toward two flagship outcomes, including two that were extended in 2017. Delivery is continuing on three 2019 extended milestones, in two cases reflecting delays associated with the external operating environment that had been identified as presenting a medium-level risk. Among five innovations reported by FP3, four are research and communication methodologies and tools and one relates to production systems and management practices.

At the outcome level, the flagship has delivered two policies at the national and subnational levels, both described in OICRs. Several FP3 milestones are at the outcome level in that they require action by cities that falls beyond the immediate control of the CGIAR partners. These were achievable in view of longstanding relationships with city authorities and the RUAF Global Partnership, which was IWMI's long-term partner and FP co-leader in this initiative. The methodology for assessing city region food systems for urban climate resilience has been field tested in five cities, and the gender indicator framework has been tested in three, with findings shared through the Milan Urban Food Policy Pact group of 200 cities (Outcome 3.1). Training materials on resource recovery and reuse have been taken up in postgraduate training by seven universities and business schools (Outcome 3.2), and a compendium of good practices is being completed with FAO.

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

FP4 focused on reducing risks and losses to agriculture from floods and droughts and natural resource use trade-offs. It has delivered 16 milestones toward two flagship outcomes, of which two were extended. Two further milestones are ongoing, having been extended in 2018 and 2019, one in view of the inherent risk in unknown cutting-edge research or science (and delays in publication) and a second to allow technological advances to be incorporated into diagnostic and planning tools. The flagship has reported three innovations related to research and communication methodologies and tools.

FP4 has reported seven policy results, five at the national level, of which two have been in India, and two at the global level. It has reported five OICRs. Highlights include the development of an award-winning mobile phone application called AgRISE (with CCAFS), which combines satellite and climate data with field data to deliver a crop health card in support of a national agricultural insurance scheme that could reach over half of Indian farmers within the next two to three years (Outcome 4.1). The FP has developed and applied tools to address trade-offs across competing water-energy-food needs, with work on environmental flows taken up by the United Nations for country reporting against SDG 6.4.2, which is related to water stress.

Flagship 5: Enhancing Sustainability across Agricultural Systems (ESA)

FP5 focused on identifying and testing ways to promote sustainable intensification at scale with partners. The FP was redesigned in 2017, and, while related projects continued to be delivered in 2017, the flagship was fully active for two of the three years covered by this review. FP5 has delivered 11 milestones toward two flagship outcomes and one further milestone that was to be completed in 2020. It has delivered four innovations, two related to research and communication methodologies and tools and one related to production systems and management practices.

While FP5 has not reported any policies, the two FP5 OICRs address contributions to the global policy agenda, including notably influencing the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to focus on critical interdependencies of biodiverse ecosystems and food production (Outcome 5.2). Another strategic highlight is the establishment in 2019 of the Sustainable Agricultural Intensification Commission (CoSAI), which is exploring policy approaches to manage trade-offs in smallholder agricultural landscapes between environmental sustainability, healthy diets, and livelihoods (Outcome 2.1). Other flagships have reported benefiting from the business know-how of FP5 and its ability to work with trade-offs. Other FPs are contributing to implementation of the FP5 survey to investigate how to better support decisions for more sustainable agriculture and natural resource management.

2.2.2 Demonstrated Importance of Outcomes (Deep Dive on Selected OICR(s))

The review conducted deep dives of three WLE initiatives that have developed OICRs (Annex 8), including one initiative that has prepared three OICRs describing developments over a period of three years (Table 3). The reviewed OICRs are supported by evidence and show good congruence with the WLE ToC. They demonstrate the potential for WLE to move from outcomes to impact at local to large district scales and showcase innovations and services with potential broader uptake through replication or scaling up with relevant partner support.

Table 3. Characteristics of WLE OICRs selected for review deep dives

OICR	2205: Evidence-based soils agronomy for raising crop production 2297: Soil-plant spectral technology guiding soil fertility investments in Africa 3337: Soil spectral technology being scaled up from Africa to global use	3362: Smart water management tools and Innovation Platforms in small-scale Zimbabwean irrigation schemes	2796: Making the leap from drought monitoring to managing agricultural drought risks in India
Year (level of maturity)	2017, 2018, and 2019 (all level 2)	2019 (level 2)	2018 (level 1)
Timing	WLE/ICRAF has supported work on soil spectroscopy since 2012	WLE/ICRISAT initiated work on innovation platforms in 2012; ACIAR supported TISA Project from 2013	WLE/CCAFS/IWMI launched the South Asia Drought Monitoring System (SADMS) in 2014
Partners	International and national research organizations and facilities/data platforms, private sector, development partners, international research funding body	International research partners, government	National research funding body, government, donors
Innovation/policy (MARLO)	Portable and inexpensive soil-plant spectral diagnostic tools for rapid and low-cost analysis of soil properties and plant nutrients	Agricultural Innovation Platform to address structural impediments to securing benefits of small-scale irrigation systems	Use of SADMS to provide real-time data to support contingency planning and target relief efforts
Scaling	Seventeen African countries were using spectral analysis technology in 2018. The 2019 OICR provides evidence of growing international, development agency, and private sector interest.	The approach was scaled up in a second phase to 30 more irrigation schemes, covering 757 ha.	The World Bank and other donors have adopted the approach for use in other countries, including the Next Generation Drought Index Project.
Catalytic results	Availability of improved high-resolution soil maps for Africa. FAO-led Global Soil Laboratory Network (GLOSOLAN) to develop a global soil mid-infrared spectral library and prediction service	Understanding of the role of capacitating local actors to secure long term use of tools for climate smart agriculture/sustainable intensification	Proof of concept of how the SADMS can support disaster risk reduction at different scales

Timing: The deep dives reveal how timeframes from inception to outputs and eventually outcomes exceed a typical project duration and in many cases the CRP phase duration. The OICRs build on a foundation of research and related products and services developed during Phase 1 of the WLE and, in some cases, a legacy of earlier work by Centers or individual researchers. A wider review of timelines for the 20 WLE OICRs found that 8 of the OICRs build on work that was referenced in the 2016 WLE annual report produced at the end of Phase I. The reported results have their origins in WLE work starting from two to seven years before the OICR publication, and two OICRs refer to IMWI work on environmental flows from as early as 2008. Work is continuing in all three deep dive cases.

A 2019 FP4 OICR traces the work on experimental games from proof-of-concept in 2013/2014 to piloting in 20 communities; scaling with a national partner to 200 communities and – in parallel – testing in different settings; to the award in 2019 of a major grant to scale the work to over 200,000 households.

Partnerships: The 20 OICRs identify 78 external partners of which the most frequently mentioned are academic and research partners (15 OICRs), government (14), bilateral and donor governments (11), development organizations (8), and foundations and financial institutions (5) (Annex 7.2). Just two OICRs identify national agricultural research systems (NARSs) or national agricultural research and extension systems (NARESSs) as partners, three identify the private sector, and one CBOs and farmers groups. The partners identified in MARLO are typically partners that were formally engaged in related project activities including donors, research organizations, service providers, and other collaborators. The deep dives reveal active involvement of a far wider set of stakeholders and anticipated engagement of further partners during follow-on work. The number and diversity of partners increased over the lifetime of the soil spectral initiative as the scope of work expanded, with the private sector and development organizations becoming involved as the work progressed. Researchers reported similar engagement for further development of South Asia Drought Monitoring System (SADMS) services and for scaling and replication of solutions.

ICRISAT's long-term local presence in Zimbabwe, the local knowledge of team members, and their access to policymakers and officials in the Ministry of Lands made it a valued partner for the international project consortium and was associated with stronger results than in other participating countries.

Innovations and Service Provision: All three deep-dive OICRs are associated with WLE innovations, with one of these dating from phase 1 (SADMS) and now considered to be at innovation level 4 (demonstrated uptake by next users). Two are associated with a facility or service with potential for far-reaching contributions to the CGIAR SLOs (or more broadly, to the SDGs). The three OICRs are tackling the challenge of sustaining benefits in different ways, working with traditional and new research and uptake partners, and developing skill sets that are far removed from the science at the heart of the intervention.

- The soil spectral team worked with a commercial partner to develop a hand-held and affordable spectrometer and adapt this for use in different conditions (for example, high humidity). Quality control is currently assured by national AfSIS laboratories in five countries, and ultimately by the ICRAF AfSIS lab. ICRAF does not receive core funding to maintain the laboratory, which is supported by cost recovery from relevant projects and, to a limited extent, by provision of services. Bilateral donors are typically reluctant to support core infrastructure through project grants.
- The “Making the Leap” OICR is underpinned by the SADMS maintained by IMWI since 2014. The team is providing direct access to the system by mirroring it in partner institutions and is exploring use of a trademark and provision of remote upgrades. It has obtained in-kind support from information technology and service providers to facilitate maintenance of the system and data sharing. However, there is not yet an alternative institutional structure to oversee and maintain the service.
- The Zimbabwe water management project is exploring issues related to maintenance costs of services by taking a value chain perspective to consider how farmers can realize the value of productivity gains, so that they reinvest in improved small-scale irrigation. The innovation platforms are an exemplary approach to engaging next users in developing solutions.

2.2.3 CRP Management and Governance

WLE Leadership: The WLE leadership has built trust and a collegial approach through transparency in a context where competition for funding could be detrimental and incentives to collaborate are limited. Each of the FPs is co-led by senior scientists from two of seven participating Centers, with the host institution (IWMI) represented in the leadership of four of the five FPs. The WLE FP leaders, despite only working part time for the CRP, demonstrated a strong sense of belonging to the CRP. Lessons are shared among FP leaders and Centers, who have a sound understanding of the complementarity of their activities. They have collaborated on CRP-wide activities, such as the piloting of an FP5 survey to decision-makers on what works in decision support for landscape management. There are also good examples of collaboration between FPs, as evidenced in joint policy outcomes and OICRs and in FP1, FP4, and FP5 support to an IWMI-led trade-off modeling initiative.

The program is supported by a small PMU (12 females, 1 male) whose role in overall program direction as well as planning, monitoring evaluation and learning, communications, and gender and youth is strongly appreciated by FP leaders. The WLE Management Committee (7 females, 5 males) of FP leaders and senior PMU staff is involved in annual reporting and in planning.

Independent Steering Committee: The WLE is governed by an Independent Steering Committee with members (4 females including one ex officio, 2 males) providing guidance based on their institutional roles and individual experience. There has been continuity in membership, with some members covering the transition from WLE Phase I to Phase II. The ISC is well briefed and provides substantive and timely advice. The ISC members have complementary skills, including a deep understanding of the CGIAR System, that allows the ISC to engage with other System governance bodies as well as provide perspectives on global context for WLE and scientific know-how.

WLE Budget, Portfolio Development, and Center Collaboration: WLE is the smallest of the four global integrating programs, with a budgetary allocation of approximately 5% of System-wide W1 and W2 funding. WLE is expected to use its limited resources in a catalytic manner to build its portfolio and engage with other Centers and CRPs. The W1/W2 funding identified for WLE at the outset of Phase I was 19% of its projected budget (US\$350 million over six years). WLE undertook to provide a 1:4 match to funding associated with activities mapped to WLE by each of the participating Centers and has developed a transparent process for screening proposed contributions (i.e., mapped grants through W3/bilateral projects) to the CRP. Collaboration with other Centers is formalized through program participant agreements (PPAs) linked to deliverables.

WLE uses W1/W2 funds at PMU level to provide the coordination “glue” for the program, including support on MEL, communications, and gender and inclusion. Interviews with FP leaders indicated that W1/W2 funds add value to Center contributions by providing seed funding for new initiatives, supplementing activities of existing (W3/bilaterally funded) projects, including notably input from senior scientists, and in some cases serving as leverage (cofinancing). WLE has been able to use a limited amount of additional funding for cross-program activities (including through FP5) and in one year supported new activities proposed by FP leaders. However, the overall arrangement of funds being tied to mapped contributions has constrained WLE’s potential to operate in as strategic or agile a fashion as larger CRPs.

Despite good collaboration with its Tier 1 partners, the potential of WLE as a global integrating program to integrate WLE themes across the CGIAR Centers and CRPs has not been fully realized—a situation that can be traced to the rather cautious reception of the program by the ISPC Board in view of its innovative nature and systems approach. At a practical level, an FP4 2017 milestone to develop work plans with selected agrifood system CRPs to support ex ante analyses of water variability was canceled, while an FP5 milestone related to work plans for partnerships in different farming systems was scaled back in view of resource limitations. The limited overall funding to WLE stifled opportunities to support more creative, higher-risk, cross-Center work as priority was given to core results.

Examples of successful cross-program collaboration include a good working relationship with the Fish CRP, where WLE’s systems integration perspective and link to policy processes is strongly appreciated. WLE has collaborated with CCAFS on different aspects of climate-smart agriculture (e.g., solar irrigation), with A4NH on nutrition-sensitive landscapes and holistic metrics, and with PIM on an experimental games approach to improve local groundwater governance. However, management meeting notes indicate that the relationship with other CRPs has sometimes been characterized as competitive rather than collaborative since research projects in collaborating Centers are typically mapped onto just one CRP.

Adaptive Management: The Management Committee is involved in identifying and screening Center contributions to WLE and in developing the annual program of work and budget. The annual revision of milestones provides a practical adaptive management tool and has been undertaken in a rigorous manner, accompanied by increasing attention to the quality of contributions by projects. The otherwise positive evolution of milestones, together with the absence of systematic reporting targets, has presented a challenge in terms of establishing a benchmark for measuring effectiveness.

Country Coordination: WLE has a strong concentration of activities in certain countries, notably India and Ethiopia, where it has benefited from its track record of collaboration with national partners and been able to demonstrate results at local to national scales, with collaboration among Centers and flagships. WLE has also generated significant experience with different and sometimes complementary interventions at landscape or basin scales in different settings. WLE external partners have highlighted country presence and know-how as a key asset for effective delivery at the country level. However, the outcome evaluation of WLE’s portfolio of work in Ethiopia points to the need for stronger site integration and identified competition for funding among the WLE partners operating in the country.

2.2.4 Progress along ToC (WLE and Flagships)

2.2.4.1 Use of ToCs in WLE

The WLE and FP ToCs are presented as an expanded narrative account of their results frameworks (comprising outcomes, 2022 targets, and IDO alignment) enriched by an explanation of strategies and assumptions. Each ToC is illustrated by a set of rather generic impact pathways describing how the program will actively engage (e.g., inform, influence, capacitate) different categories of uptake partners.

FP leaders have reported that there is little if any consideration of the ToC on a day-to-day basis (except for FP5) but that the process of developing the ToC was valuable in placing a focus on the ways in which research can support development. WLE started to develop a new “theory of action” in 2018, a useful learning process that has encouraged reflection and learning at the program level. FP leaders reported that many individual projects now include their own ToCs, and all projects are now expected to report the relevance and availability of research results to next users.

The ToC emphasis on uptake partners represents a useful entry point for future effectiveness, creating a bridge from science to influence on policy, practice, and investment. The approach reflects a lesson from Phase I, where the final report noted, “Most of WLE’s achievements result from a long-term engagement with multiple partners along the impact pathway, including immediate clients, and in-depth research that involves thinking laterally across sectors and/or disciplines” (2016 annual report, p. 3). Uptake partners are mentioned or implicit (e.g., in wording such as “inform investment”) in the formulation of approximately two-thirds of WLE milestones.

The WLE results framework has been repeatedly amended, particularly at the level of future annual milestones, while retaining the overall structure set out in the program document. The 2020 realignment of WLE outcomes with cross-cutting IDOs, notably “capacity development” and “policies and institutions,” appears to mark a shift in strategic thinking toward intermediate outcomes (capacitating and enabling change processes) as a step toward delivering impacts.

2.2.4.2 Progress along the ToC Pathways

WLE⁷ interventions are extremely diverse in nature, with most having a clear solutions orientation that lends itself to development of a ToC. The WLE role may be as project leader or as a contributor to a larger project or initiative.⁸

The most immediate examples of demonstrated progress along a ToC to outcomes and impact (improved livelihoods and/or environmental status) are the proof-of-concept and piloting stages of action research projects. These impacts are at local scale and result from interventions largely within the sphere of control of WLE. Several WLE OICRs are concerned with the scaling up of successful piloted actions, with the WLE role sometimes shifting from that of project manager to research or technical partner. Most WLE interventions take place in complex arenas over extended timeframes and the potential for progression along a results chain is often beyond WLE’s sphere of control. WLE has not been able to invest in a systematic approach to monitoring the progress and further development of policies or other outcomes. It has not yet reported any contributions to SLOs, representing the CGIAR impact level, on the CGIAR Dashboard. Similarly, it has not compiled data on 2017–19 contributions to the WLE targets, CGIAR IDOs, and sub-IDOs.

The most-mentioned uptake partners in the WLE and FP ToCs are (1) policymakers, (2) investors including development banks, (3) global dialogue stakeholders, and (4) NARs, NAREs, NGOs, and community-based organizations (CBOs). Three FPs identified the CGIAR agrifood system CRPs or their national partners as uptake partners, two mentioned international organizations involved in food and agriculture, and one mentioned business schools and the private sector. The OICRs, policies, and innovations provide examples of how WLE is able to extend influence along these impact pathways. The OICR deep dives illustrate the value of pursuing multiple uptake pathways and combining tools, methods, services, and policy.

Sixteen of the 20 WLE policies are at the national or subnational level, targeting the public sector, and at level 1 (research taken up by next user) or level 2 (policy or law enacted). Examples of influence at this

⁷ WLE refers in this section to WLE institutional partners (CGIAR Centers and RUAF).

⁸ It was beyond the scope of the review to look at individual projects. Examples in this section are based on information in OICRs, reported innovations and policies, and annual reports. The 2019 WLE outcome evaluations provide further examples of progress along impact pathways in Ghana, Sri Lanka, and Ethiopia and at the international level.

level include broad contributions to sector-level policy (Uzbekistan agricultural development strategy, national sanitation policy of Sri Lanka, municipal food security policy for Cali, Colombia), integration of tools and methods into policy (e.g., policy recommendations on managed aquifer recharge taken up as an agricultural extension tool in Vietnam, inclusion of soil fertility measures in the Ethiopian soil strategy) and more systemic approaches to address barriers to uptake (e.g., Ethiopian policy to make all water technologies tax exempt, adoption of the Government of Ethiopia's soil and agronomic data-sharing policy). A similar example related to the public sector budget or investment is the arrangement for surplus power buyback from solar irrigation in India. Further results depend on the extent to which these policies are implemented; some have transformative potential in terms of changing not just what is done but how things are done at national level. Government agencies are an implementation partner in 75% of OICRs providing potential for longer-term influence at least the scale of the project though formal and informal capacity development—particularly where the work is demand driven.

Two policies target investment banks. One policy describes how a donor took up WLE lessons on gender (see section 4). The WLE OICRs provide many further examples of how WLE is influencing or informing the actions of investment banks and other development partners at local to multicountry scales. For example, improved soil maps developed in collaboration with the WLE/ICRAF Partner World Soil Information organization are being used by development agencies to guide land management decisions at scale, such as fertilizer recommendations for West Africa. Approaches and information systems such as SADMS have attracted similar interest from donors. While WLE can clearly be seen to have contributed in a catalytic manner to such changes, they do not reach the attribution or documentation standard required to be classified as WLE policies, and it is not feasible to track and report on impact. The OICR deep dives provided examples of how WLE partners are moving facilities and services to the level of internal organizations such as FAO. For example, WLE is leading a new initiative of the FAO-led Global Soil Laboratory Network (GLOSOLAN) to develop a global soil mid-infrared spectral library and prediction service as a free resource (international public good) to interested countries.

The second WLE policy targeting investment banks is WLE/IFPRI research that feeds into World Bank Guidance on irrigation-nutrition linkages. This work is global and can be expected to influence and inform relevant World Bank investments over an extended period. Three further WLE policies are normative in nature, with the additional impetus of being taken up as recommendations or required as standards and norms through MEAs (United Nations Framework Convention on Climate Change [UNFCCC], United Nations Convention to Combat Desertification [UNCCD]) and processes. The adoption of the WLE-supported methodology for monitoring environmental water flows into Sustainable Development Goal 6.4.2 is a particularly powerful example since the custodian agency for the indicator will follow up national reporting. There is evidence of WLE engaging with other MEAs such as Ramsar, through long-term engagement with its Scientific and Technical Review Panel—a less tangible influence that may lead over time to policy outcomes.

WLE is a thought leader in global dialogues including IPBES and the EAT–Lancet Commission. The establishment of CoSAI will contribute to raising the profile of WLE in thought leadership and, importantly, show how CGIAR is bringing the experience and voice of the global South to the forefront.

While not often identified as partners, evidence of engagement of national organizations (NARS, NARES, CBOs) as next users and sometimes as custodians of knowledge is clear in the WLE OICRs, sampled project reports, and annual reports. For example, AfSIS helped develop state-of-the-art soil information systems in five countries. The OICRs and outcome evaluations include examples of local and international NGOs and development agencies taking up WLE methods and tools in projects.

Assumptions for progress on related impact pathways are relevant and coherent, reflecting CGIAR's QoR4D approach. These conditions could be better met by more systematic and earlier involvement of next users at the project design phases so that project assumptions related to uptake become drivers. Beyond the intervention level, there is scope to leverage far greater uptake of WLE methods and tools through NGOs and technical development agencies, including in conjunction with knowledge brokers with extensive networks including the mainstream media; organizations such as the International Institute for Environment and Development (IIED), the International Institute for Sustainable Development (IISD), and the International Union for the Conservation of Nature (IUCN); and development agencies such as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), which is a WLE partner in Ethiopia.

Finally, WLE successfully worked with business schools and universities to integrate resource recovery and reuse concepts into business development curricula. ICRAF has provided advisory services to private companies deploying spectral technology in 22 countries but has ongoing concerns about quality assurance and continued funding of research infrastructure.

2.3 Future Orientation

WLE's scientists and partners have the scientific legitimacy, track record, alliances, and practical decision support tools to play a leading role in helping the global community to insert an ecosystems-based approach into SDG strategies and action plans. WLE's ethos—that equitable development can be achieved only by using the Earth's ecosystem services such as healthy soil, clean water, and climate regulation more sustainably—is well aligned with current global awareness and global sustainable development trends. WLE and its internal and external partners have demonstrated that it can (1) drive progress from outputs to local-level outcomes and impact and (2) engage with and influence global dialogues. Among WLE's greatest strengths are its practical orientation toward social-ecological resilience through integrating soils, water, ecosystem resilience, and livelihoods and producing practically useful field-tested tools to implement recommendations and good practices. There is potential to further develop and expand practical solutions to global challenges, grounded in quality science and adapted to local contexts. Such results demand continuity in inputs, efforts, partnerships, and vision over an extended period, as well as patience associated with long-term perspectives.

WLE and its internal and external partners have demonstrated the value of interdisciplinary research and cross-Center collaboration. The WLE emphasis on uptake partners, echoed in the formulation of impact pathways and milestones and evident in policies, innovations, and OICRs, is a sound foundation for research for development—especially when integrated with citizen's science. WLE's potential as a global integrating program that addresses the triple goals of environmental sustainability, food security, and improved human well-being was hindered by apparently insufficient financial incentives (or imperatives) to collaborate and lack of investment in a grand vision. A more radical approach may be needed to achieve more functional integration in the context of One CGIAR.

WLE's experiences and achievements in applying integrated systems approaches to real-world development challenges through leveraging multiscale partnerships represents a significant opportunity for One CGIAR. WLE is in a unique position—as an exceptional integrated systems program that also has demonstrated practical, field-tested tools and applications—to advance the vision of One CGIAR. WLE's achievements provide an important reference point for CGIAR for transdisciplinary work at the interface of livelihoods, landscape resilience, and food and water security. WLE may therefore want to consider playing a stronger strategic thought leadership role within CGIAR as well as externally in global processes such as the IPBES Nexus Assessment, World Food Summit, EAT Forum, global agricultural intensification debates, and other emerging transformative movements. WLE has an important future role to play in helping governments achieve targets from the Convention on Biological Diversity (CBD) and the UN Climate Change Convention (COP 26) and in advancing the goals of the UNFCCC, the UN Forum on Sustainability Standards (UNFSS), and the UNCCD, in the context of the SDGs.

Progression along impact pathways is a long-term process with iterative loops. OICRs have demonstrated that the best results occur where multiple impact or uptake pathways are pursued. This process requires continuity of effort and vision over an extended period. It also requires time and adaptability to co-produce knowledge by nurturing existing and exploring new alliances and trusted partnerships. This iterative process of knowledge sharing, learning, field testing, and reinvention does not always align with CGIAR's year-on-year approach to resource allocation and short time horizons. The timeframes of resource allocation and program evaluation need to be considerably extended for a program such as WLE to achieve its full potential.

As one of the smallest CRPs in financial terms, WLE has successfully engaged several CGIAR Centers in its FPs in collaborative research. However, despite its broad mandate, efforts to engage Centers in collaborative work did not achieve their true potential. This was largely due to a comparatively weak financial resource base and lack of demonstrable high-level commitment to the WLE vision. There is still time to gain momentum in programs such as FP5 that are closely aligned with the OneCGIAR vision. This will, however, necessitate a more tangible high-level commitment, accompanied by further injections of seed funding, to support the goals of agricultural sustainability and sustainable intensification of food systems.

2.4 Cross-Cutting Issues

The WLE project document anticipated contributions to the cross-cutting issues (CCIs)⁹ in the CGIAR strategic results framework in its narrative as well as in its FP results framework. Four FPs included contributions to CCI sub-IDOs spanning all four CCIs. Six of the 11 CoAs in the April 2020 WLE Strategy and Results Framework (SRF) are aligned with five CCI IDOs spanning climate change, policies and institutions, and capacity development.

2.4.1 Capacity Development

The WLE project document anticipates developing and strengthening the capacity of partners to engage in research processes and to effectively use research at multiple scales. CapDev is at the apex of the WLE structure, bridging research results and contributions to the IDOs, SLOs, and ultimately to SDGs. Approaches identified by each of the FPs span institutional strengthening and organizational development, development of learning materials and approaches, and needs assessments and research on CapDev, with reference to gender-sensitive approaches and development of future research leaders.

CapDev is the most frequently referenced CCI in OICRs, with 5 of the 20 OICRs (25%) identifying CapDev as a principal issue and 8 (40%) identifying it as a significant issue. Two OICRs are aligned with CCI/CapDev IDOs. Twenty WLE milestones fall under the two WLE CoAs and outcomes aligned with the CapDev CCI of increased capacity for innovations in partner research organizations (Outcomes 3.2 and 5.1). A further 16 milestones fall under the related “policies and institutions” CCI concerned with creating an enabling environment. Many more milestones refer to different aspects of CapDev, from formal training and production of knowledge materials and decision support tools to community organization. The CGIAR Dashboard provides data on short- and long-term training (including PhDs) as the only element of CapDev reported by CRPs. WLE reached 14,671 trainees from 2017 to 2019, of whom 30% were women.

Justifications of OICR contributions tend to refer to formal training of target groups and individuals (MScs and PhDs), with a just few cases referring more broadly to community capacity or institutional development. FP2’s work on small-scale irrigation in Zimbabwe is a good example of a more systematic approach to CapDev and empowerment, where innovation platforms are bringing stakeholders together to identify and tackle constraints to sustaining the benefits of small-scale irrigation.

FP5 is rolling out a survey developed in 2019 to identify gaps in capacity to use evidence and to determine the demand for decision support tools.

2.4.2 Climate Change

Two of WLE’s CoAs have been identified as contributing primarily to the climate change CCI: FP1 work on soil restoration contributes to the CCI sub-IDO on reduced net greenhouse gas emissions, and FP4 work on managing resource variability and risks for resilience contributes to the CCI sub-IDO on capacity to deal with climatic risks and extremes. Climate and the related themes of resilience and adaptive capacity are also represented in the contribution to the WLE climate-related SRF IDOs. FP1 contributes to the SRF IDO related to climate through the sub-IDO on smallholder risk, while FP1 and FP5 contribute to the SRF sub-IDO 3.3.1 on increased resilience of agroecosystems and communities. The five concerned CoAs account for 43% (38 of 89) WLE’s 2017–19 milestones, representing a substantial contribution to the broadly defined domain of climate-smart agriculture.

Four of 20 OICRs (20%) identified climate change as a principal issue, and 7 (35%) identified it as a significant issue, featured most prominently under FP2 (LWS) and FP4 (VCR). Five OICRs are aligned with CCI/climate IDOs, and four refer to collaboration with CCAFS, of which two (India solar irrigation, SADMS) are associated with policies.

“Climate change” is the second most frequently used publication keyword, after “management,” in the bibliometrics database and is used 27 times. With 48 entries in the WLE Thrive blog, climate change is the second most frequently addressed blog topic. “Climate change” is a keyword in 26 publications listed in the CGSPACE database, compared with the 140 publications mentioning “water” as a keyword.

⁹ These issues are climate change, gender and youth, policies and institutions, and capacity development.

2.4.3 Gender

Gender-inclusive development was defined as a foundation and cross-cutting issue for the WLE program, and gender was identified as a cross-cutting issue for all five FPs in the WLE project document. None of the WLE CoAs was identified as contributing primarily to the gender CCI. Gender became more prominent at the milestone level in 2018 and is represented in 10 milestones. WLE aims to transition from women-inclusive to gender-transformative approaches—i.e., enabling structural changes and addressing institutional and systemic barriers to change at scale.

One OICR identified gender (5% of all OICRs) as a principal issue, and three (15%) identified it as a significant issue. One OICR describes how a WLE finding that women were excluded from water management training in Tajikistan despite their growing role in water management as men migrate away was taken up in a major U.S. Agency for International Development (USAID) investment project that has put a focus on training women farmers.

WLE has had dedicated full- or part-time staff working on gender and inclusion throughout the period covered by the review, with three changes in staffing. The latest appointee (at 50% full-time equivalent) has brought stability to the role and is working actively with each FP to promote a gender-transformative approach that looks at systemic barriers to women's participation as well as at wider inclusion issues (including youth). WLE is contributing to System-wide consideration of and learning on gender issues including through the CGIAR Platform on Gender.

WLE produced a brief on gender-equitable pathways to intensifying agriculture sustainably (WLE, 2018). The brief presents the following recommendations: Invest in studying gender contexts, barriers, and opportunities when designing and implementing sustainable agricultural intensification in order to secure more gender equitable solutions. Use systematic participatory methodologies (e.g., WLE's Gender in Irrigation Learning and Improvement Tool, GILIT) to better understand gender differences, and adjust designs accordingly. In societies with very restrictive norms and weak government commitment or capacity, identify those areas that are already within women's' ability to engage and work with these areas to improve their productivity and benefits. The GILIT can be used to enable gender equity in irrigation projects and schemes (Lefore et al., 2017). As a collaborative learning tool, it supports the design of new irrigation schemes, and enhances existing ones, in ways that ensure improved gender equity.

WLE commissioned reviews of its gender work in 2020. The reviews provide numerous examples of gender being considered in project approaches, gender-dedicated research, and outputs such as toolkits, with an emphasis on drivers of change and on equitable benefits. Consideration of gender varied among FPs and was less evident in technical outputs.

2.4.4 Youth

Youth has received a lower profile than the other cross-cutting issues. Just one of the 20 OICRs mentioned youth as a significant issue (FP3), where the related project aimed to involve youth in encouraging waste reduction practices, and none mentioned youth as a principal issue. Youth is viewed by the WLE PMU as an aspect of inclusion. The WLE 2019 annual report noted that work in this area is confounded by governments' and international organizations' varying definitions of youth, plus the fact that there are few data in this area. Furthermore, researchers noted, work with minors¹⁰ can be more demanding with respect to ethical approvals. Nevertheless, annual reports reflect consideration of youth as a distinct target group for CapDev and in studies related to employment opportunities and migration.

¹⁰ The UN defines youth as persons between the ages of 15 and 24 while recognizing that some states may use different definitions (e.g., 18–30).

3 Conclusions and Recommendations

3.1 Conclusions: Quality of Science

3.1.1 Quality of Research Inputs

WLE researchers have deep skills within their areas of expertise, FP leaders are exceptionally adept at cross-disciplinary integration, and WLE flagship programs are a model for interinstitutional collaboration, both within CGIAR and externally. The cornerstones of this model are trusted partnerships, co-created solutions, and practical validation in real-life solutions. All of this is underpinned by relevant, high-quality research.

WLE funding is significantly lower than that of most other CRPs, and yet the science output has been remarkable given this constraint. The most important constraint to science is related to the timing and predictability of W1 and W2 funding. The relatively weak financial support received by the CRP has been an important obstacle to its making the most of its broad and visionary mandate.

While the full complement of research infrastructure contributed by participating CGIAR Centers and partners appears to be adequate in most instances without influencing QoS, the continued functioning of globally significant laboratories such as the soil spectral analysis lab is essential. The data and science generated by these laboratories should be seen as international public goods, with a crucial role in closing the yield gap and generating environmental outcomes in agriculture.

To evaluate researchers' performance, CGIAR may want to consider developing an integrated framework consisting of number of publications (both peer reviewed and not), number of collaborating authors (more is better), Altmetric scores, downloads from CGIAR websites, and impact of research on the SDGs, in addition to number of years as an active researcher.

WLE may want to consider

- Developing internal capacity, providing incentive funds for pairing emerging researchers with established researchers in projects and publications
- Focusing on internal capacity development such as writing workshops and transdisciplinary research with an emphasis on young and women researchers
- Finding ways to provide greater certainty in year-to-year allocation of W1/W2 funds to support lasting partnerships
- Promoting systematic integration of social science in WLE's strategic planning, research prioritization, and execution, and recruiting staff with a greater diversity of qualifications, particularly in social and economic sciences, by allocating funds for strategic internships with a focus on emerging female researchers from developing countries
- Providing incentive funds, awards, and recognition for productive emerging researchers using additional criteria, such as number of reports and annual downloads, in addition to H index and number of peer-reviewed publications
- Providing a list of highly preferred and appropriate journals to WLE researchers, coupled with recognition when manuscripts are accepted for publication in these journals.

3.1.2 Quality of Process (including Partnerships)

Partnerships are crucial to WLE's success, and the vast majority of publications are coauthored with external partners. Trust is recognized as a crucial element of functional partnerships and actively promoted, and partnerships appear to be highly equitable with a strong commitment to gender and cultural equality. The processes and criteria for allocating funds appear to be equitable, fair, and transparent. WLE may want to consider

- Securing bridging funds to span periods of funding uncertainty in important partnership projects
- Advocating for the formalization of human research ethics approval systems and processes in projects funded or co-funded by WLE, beyond tabling proposals at Centers' Institutional Review Boards (an important step in the right direction).

3.1.3 Quality of Outputs

WLE's science outputs increased from 2017 to 2019. While acknowledging that CRP science outputs go beyond journal articles, it is nevertheless of concern (1) that the median ISI publication output mapped to WLE listed in the bibliometrics database is one peer-reviewed paper per author (which includes part-time researchers and external collaborators) in a three-year cycle; (2) that only 5% of listed researchers have been involved in three or more WLE-attributed publications from 2017 to 2020; and (3) that 1,200 of the 1,406 researchers listed in the bibliometrics database have been involved in only one paper mapped to WLE. A more promising picture may emerge if the output by only full-time employees, across all CGIAR Centers, including no-ISI publications, is included in the analysis. While journal impact factors are relatively high, the median citation rate of three citations per paper leaves room for improvement. Reports, particularly those on methods, inventories, and guidelines, appear to be more popular among readers than peer-reviewed papers. Many reports are downloaded thousands of times, compared with a few hundred reads and a handful of citations for peer-reviewed papers. WLE's impact appears to be more through high-quality scientific reports and briefs than through peer-reviewed journal articles.

WLE may want to consider

- Providing capacity development programs, incentives, and awards for emerging researchers who are publishing fewer than three papers in a three-year cycle; an increase of one paper every three years among the majority of researchers who infrequently publish could double WLE's publication outputs
- Spearheading the development of guidelines for appropriate publication venues and channels of research outputs, including journals with poor reputations that should not be considered
- Providing assistance with translation of journal papers into policy and practice briefs or guidelines for easy access and readability via the GCSPACE database
- Creating wider awareness of easily available, high-quality WLE reports on cutting-edge topics in the CGSPACE database.

3.2 Conclusions: Effectiveness

3.2.1 Achievement of Planned Outputs and Outcomes

The WLE set out an ambitious program in line with its mission to provide the evidence base and solutions to help decision-makers scale up sustainable water, land, and ecosystem management innovations as well as its mandate as a global integrating program. WLE has been able to deliver on 90% of its 2017–19 milestones, and there are good prospects for delivery of the milestones carried into 2020. The WLE milestones are largely at output level and describe relevant and meaningful contributions toward the 11 WLE outcomes. Milestones have increasingly included contributions from more than one project, suggesting that the milestones are capturing the work of a larger part of the WLE-mapped portfolio.

WLE has not established any targets for innovations and policies, but WLE researchers are encouraged to record results. The 32 WLE innovations (management practices, knowledge, or technologies) are solution oriented and represent an important bridge from science to the practice-oriented WLE targets and CGIAR sub-IDOs. Most of the 20 WLE policies (policies, legal instruments, investments, or improved curriculum) are at national or subnational levels. The four WLE policies at the global level include uptake of WLE science in MEAs (UNCCD and UNFCCC) and in SDG reporting, with potentially far-reaching implications for national practice and reporting. WLE has also contributed as a thought leader to the work of IPBES and the EAT–Lancet Commission, although this work was not recorded as related to policies.

3.2.2 Demonstrated Importance of Outcomes

The OICR deep dives illustrate how WLE can (1) drive progress from outputs to local-level outcomes and impact; (2) develop, test, and pilot convincing and innovative solutions that attract further investment for scaling up; and (3) and develop and sustain services and facilities that can support large-scale improvement in practices benefiting people and the environment. Such results require continuity in effort, partnerships, and vision over an extended period.

The OICRs have provided insights and lessons related to timing, innovations and service provision, expansion of partnerships, and exit strategies and sustaining benefits. They have highlighted that moving from outputs to outcomes and impacts at scale requires a skill set and type of engagement quite different from what is demanded by research and innovation. The WLE OICRs show poor representation of national

research organizations, NGOs, and CBOs as formal partners of WLE research projects, suggesting a need for greater attention to engaging rather than substituting for research institutions in donor-supported projects.

3.2.3 CRP Management and Governance

The WLE management and coordination arrangement operates in a transparent manner and has fostered a collegial approach, with senior staff from seven participating Centers and partners providing a leadership role in the design and delivery of the FPs and playing an active role in the management committee. The review found that WLE has used its limited resources in an effective and catalytic manner to engage with other Centers and CRPs. However, its agility in this area was constrained by the funding formula agreed when WLE was approved, which ties WLE support to (but also incentivizes) project-based contributions by participating Centers.

The annual revision of milestones provides an important management tool and has been undertaken in a rigorous manner with increasing attention to the quality of contributions by projects. It would be desirable to separate the dual role of milestones as an operational tool for compiling and reporting on annual contributions to WLE and as a measure of effectiveness and accountability at the program level. The reviewers recognize the difficulty in establishing meaningful targets for the WLE in view of its diverse and sometimes complex interventions.

Work in countries with an established CGIAR presence has benefited from the track record of collaboration with national partners and in-depth knowledge of issues and context. There is potential to develop more integrated approaches to working at scale in such settings, including through the appointment of country coordinators or offices that could serve multiple Centers and CRPs.

3.3 Progress along ToC (WLE and Flagships)

Program managers value the WLE ToCs and impact pathways as a framework for advancing thinking about program interventions and informing project design. The streamlined WLE SRF reflects a growing understanding of how WLE can support effectiveness by building a bridge between research and policy and practice, in the context of development.

The ToC places emphasis on uptake partners building on lessons from WLE phase I, and this is evident in the formulation and delivery of milestones. The WLE provides good examples of progress along all these pathways, with WLE's role varying from that of innovator to thought leader. WLE has proven its ability to influence global norms with potential far-reaching impact.

WLE interventions are complex, and the pathway from inception to output, and eventually outcome, is extended and often iterative in nature. This has implications for longer-term resource planning. There is scope to change some of the ToC assumptions related to uptake into drivers by engaging next users such as farmers and CBOs at the design stage of projects to ensure relevance and credibility, in line with the CGIAR QoR4D approach.

3.4 Future Orientation

WLE's experiences and achievements in applying integrated systems approaches to real-world development challenges through leveraging multiscale partnerships represent a significant opportunity for One CGIAR. WLE is in a unique position—as an exceptional integrated systems program that has demonstrated practical, field-tested tools and applications—to advance the vision of One CGIAR. WLE's achievements provide an important reference point for One CGIAR for transdisciplinary work at the interface of livelihoods, ecosystem services, landscape resilience, and food and water security. WLE is well positioned to play a future strategic thought leadership role within CGIAR as well as externally in relevant global dialogues.

3.5 Cross-Cutting Issues

Climate and the related themes of resilience and adaptive capacity are strongly represented in the WLE results framework, and the program is making significant contributions in this area. WLE contributions to different aspects of capacity development (individual, community, institutional) extend well beyond the formal training reported on the CGIAR Dashboard but are not well captured in current reporting. Regarding internal CapDev, the development of systems thinking in senior scientists in collaborating Centers will be an important WLE legacy.

WLE's review of gender contributions across the FPs provides evidence of gender being considered in project approaches, gender-dedicated research, and outputs such as toolkits, with an emphasis on drivers of change and on equitable benefits. Looking ahead, WLE is contributing to more comprehensive thinking about gender and inclusion at the program level and beyond. Youth has been addressed in WLE work related to employment opportunities and migration but has received less focus than other cross-cutting issues and is currently considered one of many dimensions of inclusion.

3.6 WLE Recommendations

In formulating these recommendations, the reviewers note that WLE is approaching its final year of operations and that the development of the program of work and budget for 2021 has already been completed. The emphasis here is on consolidating learning and helping to position CGIAR as a future thought leader and global resource in addressing complex, integrated global challenges in agriculture. Recommendations for WLE are as follows:

1. Showcase the role of WLE and of CGIAR as thought leaders and providers of integrated solutions through participation in relevant global events, including the 2021 UN Food Systems Summit, the IPBES Nexus Assessment, and the UN Climate Summit (COP 26), working in collaboration with other CRPs (CCAFS, PIM, A4NH) as appropriate.
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.
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.
4. Undertake a strategic review of i) WLE's externally oriented capacity development work with a view to identifying lessons and potential gaps, including in the context of strategies for upscaling and/or exiting from individual interventions; and ii) WLE's partnership engagement and strategies with a view to identifying lessons and potential gaps or opportunities, including in the context of strategies for upscaling and/or exiting from individual interventions, in preparation of the transition to One CGIAR. Consideration should be given to (1) engagement of next users in project design, and (2) collaboration with partners who can help to magnify WLE learning, including knowledge brokers with extensive networks such as IUCN.
5. Undertake an appraisal of WLE projects and expertise to better define WLE's capacities, strengths, opportunities, and possible gaps in contributing to One CGIAR global challenges.

3.7 CGIAR System-Level Recommendations

Integration

1. Continue to support integrated approaches on water, land, and environment in the context of the SDGs, and build a System-wide understanding of the need to transform agricultural practices to maintain ecosystem services and ensure that contributions to improved livelihoods and well-being are sustainable.
2. Develop appropriate incentives to encourage researchers and Centers, including agrifood system Centers, to engage in interdisciplinary and systems research, while recognizing that an expectation of financial incentives to collaborate may be counterproductive and that willingness to collaborate needs to be based on a shared vision.
3. Develop guidance for integration of social sciences into action research projects with a view to developing an understanding of factors required for sustaining solutions.

Places

4. Identify a handful of place-based programs in priority river basins, city regions, or transboundary landscapes where the triple challenge of achieving sustainable food production, enhancing human well-being, and conserving ecosystem services can be addressed. This may comprise an integrated, transdisciplinary, and multiscale approach, drawing on WLE's key strengths: co-creating integrated, field-tested solutions at local, landscape, and national scales with local implementation partners.
5. Strengthen country coordination structures as a facility for all CG Centers/CRPs to explore integrated solutions at local, landscape, and relevant subnational or national scales while ensuring coherent engagement with national stakeholders.
6. Develop a suite of practical and ethical guidelines to promote engagement across CGIAR of local partners (NGOs, NARSs/NARESs) and local communities as collaborators in project design and implementation.

People and Assets

7. Develop a capacity development strategy for junior and emerging scientists in CGIAR. This may, for example, include assessing the feasibility of capacity development grants for emerging and women researchers from developing countries; launching a program to develop the scientific writing capacity of emerging researchers who publish fewer than two papers in a three-year cycle; and issuing diversification grants to recruit young, female, and developing-country interns with complementary skills and qualifications.
8. Develop an asset management strategy for CGIAR services, facilities, and platforms to provide for large-scale uptake of solutions, including establishing the conditions for and limits of W1 investment in such facilities (e.g., infrastructure facilities such as the ICRAF soil lab or information facilities such as SADMS).

4 Lessons Learned

Lessons from the WLE CRP review that have not been the subject of recommendations include the following:

1. It is important to recognize the extended timeframes needed to achieve outcomes in complex interventions, which often extend beyond the timeframes of individual projects or even a CRP phase.
2. It is difficult to establish meaningful indicators and targets at the program level for large and complex programs such as WLE.
3. The skill sets required for successful development, scaling up, and outreach differ from research skill sets and, in some cases, may be best accessed through partnerships.

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6 Annexes

Find the Annexes and Brief here:

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