CGIAR Challenge Program on
WATER & FOOD
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RESEARCH PROGRAM ON
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Forward-Looking Review of the CGIAR Challenge Program on Water and Food 2013-2014

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Foreword

With the publication of this final external review of the CGIAR Challenge Program on Water and Food comes another opportunity to look back on what was clearly for many an informative and transformative decade of work. CPWF's work has been at the forefront of CGIAR reform and change. It will certainly be recognized in the future within and beyond the CGIAR as a successful initiative that was ahead of its time in changing the paradigm of how agriculture and natural resource management research is carried out. The CGIAR as a whole, and its Research Program on Water, Land and Ecosystems in particular, now stand primed to see through this transition to people- and development-centered research. The task has been made clear; the challenge remains great. I encourage those who seek to be a part of this change to take the time to read the review that follows. Understanding the successes, shortcomings and lessons of CPWF can only serve to further illuminate the path ahead.

Alain Vidal
Director of the Challenge Program on Water and Food (2009-2014)

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Executive Summary

1. Scope of the review

The Challenge Program on Water and Food (CPWF) was a 10-year (January 1, 2004–December 31, 2013) investment by the CGIAR, conducted over two phases and aimed at an overarching goal of raising water productivity and improving food security while helping alleviate poverty, improve health, and attain environmental security. This review, undertaken between November 2013 and March 2014, was commissioned by CPWF to assess CPWF's achievements, but also to identify lessons to take forward by CGIAR Research Programs (CRPs) and other research and development stakeholders.

2. The objectives of CPWF

Over the course of its two phases the objectives of CPWF were progressively modified. However, these objectives retained a number of core features that defined CPWF as a pilot of a new research modality. These are used to frame this review.

Implementation strategy

- Explicit development framing of the overall objective of the program.
- Partnership and integrated research and development action as a key operational principle.

Research contributions

- Frontier-science that creates breakthroughs in understanding and practice of poverty reduction at the water and food interface.
- Breakthroughs in understanding how knowledge is produced, packaged and targeted at solving problems at the basin and field level.

Developmental outcomes and measures of sustainability

- Policy and institutional/ practice change among basin-level water and food stakeholders that will lead to poverty impact at scale.
- Capacity strengthened in research-for-development systems, including skills and relationships needed for collective research and development planning and action in the water and food arena.
- CPWF influences the global water and food agenda and its focus on using research to deliver impact.
- Lessons from CPWF contribute to the ongoing reform of the CGIAR and its transformation into a research-for-development organization.

3. Origins and history of CPWF

CPWF was one of four challenge programs established by the CGIAR in the early 2000s as an explicit attempt to pilot the refocusing of its agenda on delivering impact from research. Central to this refocusing was the recognition that this would require new patterns of partnership between CGIAR centers, national research organizations and development stakeholders.

CPWF's Phase I began on January 1, 2004 (although program negotiations, proposals, reviews and approvals started in 2002) and established a global research program around nine benchmark river basins. Following an external review in 2007 at the end of phase I, CPWF developed an implementation strategy — referred to as a research-for-development (R4D) approach — that focused on framing its research

with an analysis of impact pathways and a proactive engagement through dialogue and partnership with key stakeholders and change agents in these pathways. The transition to this approach took time to gain traction, but by 2009 CPWF was starting to implement a distinctive approach based around six Basin Development Challenges.

In parallel with the implementation of CPWF, the CGIAR reform process gathered pace and moved on from the challenge program model and started developing the mega project concept of cross-center research that culminated in the CRPs. CRP-5 on 'Water, Land and Ecosystems' (WLE) was launched in 2011. Some of the governance functions of CPWF were absorbed into WLE and consequent changes in funding arrangements led to substantial budget cuts in CPWF, with a number of activities being terminated or reduced in scope.

The period 2011 to 2013 entailed considerable tension between CPWF and WLE over the nature and value of an R4D approach. The timelines suggest that much of this tension arose because different actors held different views, each legitimized by the different program development and implementation processes that respective actors were involved in and which ran in parallel. CPWF struggled to articulate its R4D approach in terms that resonated with key CGIAR stakeholders. This, and mismatched timelines, weakened opportunities for learning lessons from CPWF.

4. Achievements

Implementation strategy

A core feature of CPWF's approach in Phase II was that it recognized that its route to impact at scale would be achieved by ensuring research outputs were developed in such a way as to bring about outcomes, which it defined as "changes in policy or practice". This led to an implementation strategy that, when viewed as a whole, represents a major innovation in the practice of R4D.

The combination of the different elements of CPWF's implementation strategy was entirely consistent with the program's original objective of piloting a new research modality that was both partnership-oriented and impact-orientated. Systems thinking, which underpins the different elements of the approach, is highly relevant to the complex systems nature of poverty reduction at the water and food interface. Piloting this systems-oriented research modality is also highly relevant to the wider CGIAR as it transforms into an R4D organization.

Research contributions

Over its two phases CPWF's research output has been considerable: over 300 journal articles, a similar number of book chapters, over 2000 data sets and a range of policy briefs and visual media. The diversity of publication and research output types addresses a range of different audiences and aids accessibility of research output. The review also notes that in addition to international public goods research outputs, CPWF has developed research products (particularly data sets) that have high regional significance and relevance.

The quality and relevance of CPWF's research outputs have been considerable. However, it is also noted that the research modality adopted, the significance of insights derived from this research and the adoption of these by development stakeholders (developmental outcomes) are inseparable and need to be judged holistically. This redefines what frontier science means in relation to poverty reduction on water and food, as it suggest research needs not only to be judged in terms of the novelty of the information and insights generated, but also by the utility of this to different stakeholders and the changes in their practices and interactions with other stakeholders as a result of participation in research endeavours.

CPWF has been innovative in exploring alternative reporting means that combine research process, research output and research outcome narratives. These include the forthcoming metasynthesis book, basin-level synthesis and outcome stories, and Most Significant Change exercises to capture unintended consequences and outcomes of the program implementation strategy. The review finds that the metasynthesis and the program-level syntheses that are derived from it are particularly valuable in: bringing together an analysis of the nature of the poverty-water-food interface; exploring intervention options and modalities; exploring the institutional, policy and political dimensions of this space, and; reflecting on the value of systems research approaches in development contexts that are non-linear and complex in nature.

There are a number of areas of research output that, in the opinion of the review team, place CPWF's work at the leading edge of global research.

Organized through its coordination and change projects and brought together in its metasynthesis, CPWF has developed one of the most comprehensive documentations and analysis of the R4D process to date. This will be an important benchmark in this area of enquiry for many years to come and is highly relevant to on-going policy and practice debates on the use of research for development.

Developmental outcomes and measures of sustainability

Policy and institutional practice changes in development stakeholders

There is significant evidence of research outputs and related activities leading to developmental outcomes. These outcome achievements are a direct result and inseparable from the R4D implementation strategy of CPWF. Not only has CPWF developed an operational strategy capable of delivering development outcomes, but it has also put in place appropriate knowledge management mechanisms to capture outcome narratives as part of a wider M&E system.

Impact on poor people

Despite good progress in moving research outputs to development outcomes, CPWF was unable to achieve impact at scale during its implementation. Reasons for this include (a) CPWF did not get into an effective implementation strategy until the second year of Phase II; and (b) the scope of activities was reduced half way through Phase II due to budget cuts. CPWF had limited success in attracting development financing that would have allowed it to collaborate in the implementation of interventions likely to deliver impact at scale. This undermines its impact, but also its ability to draw lessons about how impact at scale can be achieved. Considering the sunk investment in the research, engagements process and capacities developed and the outcomes achieved there is a good case for making further investments that will allow scaling up to be achieved and understood.

Contributions to capacity strengthening in water and food research for the development systems, water and food arena

CPWF has achieved considerable success in research capacity building. There are also a range of practices, relationships and attitudes that have resulted from the way CPWF was implemented. This represents a strengthened capacity of R4D systems on water and food at the basin-level. Not only has this built bridges between water and food silos, but it has also opened up spaces for research and development planning and action that did not exist before. As a result of CPWF, nascent communities of practice have been created in the basin programs with a shared philosophy about how research can be integrated into processes aimed at impact delivery. This is one of the key legacies of CPWF. These communities are fragile and need continued support if they are to sustain the achievements of CPWF and deliver impact at scale in the future.

Contributions to the global water and food agenda

CPWF has contributed to, but has not concluded on setting and evolving, an international agenda on water and food. A window of opportunity for the CGIAR to more fully engage in global agenda-setting exists in the post-2015 development goals discussions. Further synthesis of Phase II research findings (which have only recently matured) could make a valuable contribution to these debates.

5. Main findings and lessons

This review endorses CPWF's belief in the value of its approach (with some caveats). However, over and above the principles and processes involved in the R4D approach, the review believes that CPWF has made significant progress in illuminating the contours of a global R4D system on water and food. The program's experience suggests that there is potentially enormous impact value in organizing research as part of integrated research and development platforms at multiple scales (local, national, regional/basin, and global) with strong interconnections between these levels. There is a clear potential to bridge and create synergy between the immediate research and development challenges in regions, particularly the impact delivery challenge, and the long-term global water and food agenda. This is a major contribution to helping develop a shared understanding of what R4D success looks like. The review identifies 12 findings and lessons; four of the main ones are highlighted below;

- CPWF was a valuable pilot in R4D that warrants further experimentation.
- An explicit research focus on understanding impact delivery mechanisms in different contexts — and continuous reflection on the most appropriate role and organization of international research in these delivery mechanisms — proved valuable.
- Impact at scale requires the action and collaboration of others in implementation. This is still new territory for R4D, but is necessary if it is to generate lessons on how to deliver impact at scale.
- CPWF's experience highlights that there is a new role for international agricultural research organizations in facilitating and brokering a science-informed process of integrating research into development practice and planning at local to global scales.

The review also highlights some of the challenges that adopting an R4D approach presents. Critical among these are:

- Greater investments in non-research activities associated with partnership and engagement process — convening dialogue, relationship building, communication, etc.;
- Reframing frontier science to combine novelty, uptake processes and utility;
- New metrics of success that include systems capacity development achievements; and,
- Professional and institutional transformation to enable R4D.

Ways forward

This review believes that the experience and process of CPWF presents a number of opportunities for furthering the agenda of poverty reduction in the water and food arena. These are opportunities that are relevant to a range of stakeholders — WLE, other CRPs and the CGIAR, regional and international research organizations and development investors. Specific recommendations are framed around the following opportunities that emerge from CPWF.

- No need to relearn R4D-style implementation from scratch. Build on the operational lessons from CPWF, particularly about the diversity and quality of partnerships with development organizations.
- Complete the R4D experiment by engaging in development activities that go to scale. Needs new funding partnerships and modalities.

- Capitalize on CPWF's Phase II research findings and use them in regional and global agenda debates.
- Build on water and food R4D system's capacities in the basins and research and development trajectories that have been initiated.
- Use CPWF experiences to make R4D challenges, choices and roles explicit to researchers, donors, other CRPs and CGIAR governance (capacity building).
- Use the new vision of a global water and food R4D system to frame a stock taking of opportunities and a series of strategic conversations about the respective roles of CGIAR and other stakeholders, as well as the nature of both research and development investments needed to strengthen the capacity of the global system to deliver impact.

Acronyms

AAU	Addis Ababa University
ARARI	Amhara Regional Agricultural Research Institute
ARC	Agricultural Research Council of South Africa
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATA	Agricultural Transformation Agency
AU	African Union
AWM	Agricultural Water Management
BDC	Basin Development Challenge
BFP	Basin Focal Project
BRAC	Bangladesh Rural Advancement Committee (formerly)
CAADP	Comprehensive Africa Agriculture Development Programme
CAS	Complex Adaptive Systems
CGIAR	Consortium of International Agricultural Research Centers (formerly the Consultative Group on International Agricultural Research)
CEO	Chief Executive Officer
CIAT	International Center for Tropical Agriculture
CIDA	Canadian International Development Agency
CP	CGIAR Challenge Program
CPWF	CGIAR Challenge Program on Water and Food
CRP	CGIAR Research Program
CRS	Catholic Relief Services
CSIRO	Commonwealth Scientific and Industrial Research Organization
DAC	Development Assistance Committee of the OECD
EIAR	Ethiopian Institute of Agricultural Research
ER	External Review
EU	European Union
FANRPAN	Food Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agriculture Organization of the United Nations
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GWP-SA	Global Water Partnership, Southern Africa
HSAP	Hydropower Sustainability Assessment Protocol
ICEM	International Center for Environmental Management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
IWMI	International Water Management Institute
KCL	King's College London
LBDC	Limpopo Basin Development Challenge
LIMCOM	Limpopo Water Commission
LWP	Livestock Water Productivity
M&E	Monitoring and Evaluation
MBDC	Mekong Basin Development Challenge

MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MoFA	Ministry of Foreign Affairs
MoWE	Ministry of Water, Irrigation and Energy
MSC	Most Significant Change
NBDC	Nile Basin Development Challenge
NBI	Nile Basin Initiative
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NRM	Natural Resource Management
ODI	Overseas Development Institute
OECD	Organisation for Economic Cooperation and Development
OLM	Outcome Logic Models
ORARI	Oromia Region Agricultural Research Institute
PIPA	Participatory Impact Pathway Analysis
R4D	Research for Development
REC	Regional Economic Community
RIPPLE	Research-inspired Policy and Practice Learning in Ethiopia and the Nile region
RWM	Rain Water Management
SADAC	Southern Africa Development Community
SADC	Southern African Development Committee
SC	Steering Committee
SEI	Stockholm Environment Institute
SLM	Sustainable Land Management
SSA	Sub Saharan Africa
TAGMI	Targeting AGwater Management Interventions
ToC	Theory of Change
VBA	Volta Basin Authority
WB	World Bank
WLE	Water Land and Ecosystems
WLRC	Water and Land Resource Center
WRC	Water Resources Commission
WSSD	World Summit on Sustainable Development

1. Introduction

1.1 Scope of the Review

This report presents the finding of a forward-looking external review of the Challenge Program on Water and Food (CPWF). CPWF was a 10-year (2004–2013) investment by the CGIAR, aimed at an overarching goal of raising water productivity and improving food security while helping alleviate poverty, improve health, and attain environmental security. The program was premised on its ability to contribute to this overarching goal by: (i) Undertaking and supporting research that has direct impact on poor people by adopting an approach that brings about changes in relevant technological, institutional and policy domains; (ii) Framing a portfolio of research activities in a way that allows key findings to help set the international research and development agenda in the water and food arena; and, (iii) In common with other CGIAR challenge programs, informing the wider CGIAR and other research and development stakeholders on ways to deploy research so that it is more likely to contribute to favourable development outcomes.

The program was divided into two distinct 5-year phases. Over its lifetime CPWF's specific objectives and modus operandi underwent a number of changes as it came to grips with the challenge of contributing effectively to its ambitious goal. Most notably, in its second phase CPWF developed a series of institutional innovations in the way it conducted its research. These innovations focused on framing its research with an analysis of impact pathways and a proactive engagement through dialogue and partnership with key stakeholders and change agents in these pathways. CPWF referred to this as a "research for development (R4D)" approach. This approach has been controversial. It has challenged received wisdom on the organization of international agricultural research, the nature and quality of research outputs arising from such a program, the appropriate balance of research and development-like activities, the type and significance of outcomes achieved and the costs involved.

This review, undertaken between November 2013 and March 2014 during the final months of CPWF, was commissioned by CPWF as an explicit attempt to assess the achievements of CPWF, but also to identify lessons to take forward in substance and process terms under the CGIAR Research Program on Water, Land and Ecosystems (WLE) and other CRPs and by other research and development stakeholders.

1.2 Review Objectives

The focus of this review is three-fold (broadly following OECD DAC development evaluation criteria[1]) (Terms of Reference in Annex 1):

- To provide an independent assessment of CPWF research ***outputs*** (research products), related ***outcomes*** (changes in decision-maker policy or practice influenced by outputs), the ***sustainability*** of these outcomes after program closure, and nascent ***impacts*** (consequences of outcomes/ decisions for livelihoods, food security and other development objectives) along with the ***relevance***, scale, and targeting of the program.

- To explore the ***effectiveness*** of the program, particularly of the R4D approach in achieving these outputs and outcomes and drawing lessons for future program design and, more generally, for the use of agricultural research in complex development domains.

[1] See http://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm

- To explore and ***draw lessons*** about the effectiveness of the challenge program model and highlight what would be appropriate to take forward in substance and process terms under WLE (or other CRPs) as the CGIAR reform process unfolds. Particular attention should be placed on the effectiveness of the coordination elements of the program in each of the basins.

1.3 Review Guiding Questions

Assessing outputs

Assess CPWF research outputs as a whole with regard to:

- Credibility (scientific quality),
- Relevance (to CPWF program objectives or basin development challenges),
- Coverage (presence or absence of major gaps, given objectives),
- Coherence (complementarity, mutually reinforcing), and
- Accessibility (publications, policy briefs, summaries of research outputs and outcomes for different audiences, use of social media).

Assessing outcomes and the output – outcome links

Within an R4D approach, CPWF claims to use engagement processes (platforms, fora, dialogues, negotiation, partnerships, links with decision-makers) to translate outputs to outcomes (desired changes in policy or practice):

- Have CPWF research outputs been used in or are central to engagement processes?
- Have CPWF engagement processes resulted in desired outcomes?
- Are these outcomes likely to be sustainable?
- How effective has CPWF been in translating outputs to outcomes?
- Has the R4D approach been more effective than alternative approaches in developing outputs and translating them to outcomes?

Lessons

- What are the key lessons from CPWF in the use of agricultural research in complex development domains?
- What lessons does the CPWF experience in R4D provide to the CGIAR system?
- What CPWF lessons need to be taken forward in substance and process terms under WLE or other CRPs?
- How should CPWF lessons be best utilized?

1.4 Approach and Methods

The review is based on a combination of:

- Desk review of CPWF key reports,
- Interviews and consultation with CPWF basin leaders and management team,
- Interviews with CPWF partners and stakeholders, and
- Attendance at significant CPWF events.

The approach of the review was inclusive and participatory, making explicit use of the CPWF basin leaders, management team, partners and stakeholders in the development and validation of review findings and discussion of recommendations.

Key events in the review process included:

- An initial briefing and consultation with the management team.

- Visit to the Nile basin in Ethiopia, including field visits, attending a "share fair" to discuss basin messages, attending a "conversation dinner" with decision-makers and interviews with research and development partners and stakeholders.
- Visit to the Mekong basin to attend the regional Mekong Forum on Water, Food and Energy. This provided an opportunity to see numerous presentations on CPWF's work and allowed the review team to interview a wide range of partners and stakeholders.
- Visit to the Volta basin to meet with the Basin Leader.
- Visit to the Limpopo basin. This included field visits and interviews with partners and stakeholders. During this visit a meeting was held with all basin leaders to discuss the review's findings and its implications.
- Presentation and discussion of a summary of review findings at the Steering Committee meeting of WLE.
- Meeting, towards the end of the review process, with basin leaders, the management team and the WLE director in order to enable a collective conversation about the emerging review results.

The review team was made up of the following expertise:

- **Andy Hall, Team leader:** A researcher and advisor on agricultural innovation systems and R4D, with expertise in the evaluation of international agricultural research and capacity building programs.
- **Andy Bullock, Water and food specialist**: A researcher, advisor and practitioner with specific experience of the range of research, practice and policy issues at the water and food interface.
- **Barbara Adolph, R4D and livelihoods specialist:** A researcher with specific expertise in the design and implementation of research programs that seek to use research for developmental purposes. Wide experience in the CGIAR and other international research programs exploring the agriculture, poverty and environment interface.

Limitations of the Review

The review was not able to make visits to the Ganges basin and Andes system of basins due to the limitations of the scope of the review (time allocations). However, all the basin leaders were present during the Limpopo basin visit and the review team had time to interact with them. The team leader had previously visited the Andes during an earlier assignment. CPWF has produced a considerable amount of documentation, including research outputs. The review team was not able to fully review all of this material due to time constraints.

However, CPWF has produced a number of excellent synthesis documents that the review team has made use of.

The review was also not able to interview some key people about the program, notably Boru Douthwaite, but also Jonathan Woolley, the first CPWF director.

The review has not looked at the financial aspects of the program.

2. What Did CPWF Set Out to Deliver?

The Challenge Program on Water and Food (CPWF) was a 10-year investment in water and food under the CGIAR, commencing on January 1, 2004 and closing on December 31, 2013. The program was conducted in two phases.

Phase I ran over an approximate 5-year period from January 1, 2004 until December 31, 2008. During Phase I CPWF stated its objectives as follows:

Development objective

To increase the productivity of water for food and livelihoods in a manner that is environmentally sustainable and socially acceptable.

Intermediate objective

To maintain the level of global diversions of water to agriculture at the level of the year 2000, while increasing food production to achieve internationally adopted targets for decreasing malnourishment and rural poverty by the year 2015, particularly in rural and peri-urban areas in river basins with low average incomes and high physical, economic or environmental water scarcity or water stress, — with a specific focus on low-income groups within these areas.

Immediate objectives

- **Food security for all at the household level.**
- **Poverty alleviation** — through increased sustainable livelihoods in rural and peri-urban areas.
- **Improved health** — through better nutrition, lower agriculture-related pollution and reduced water-related diseases.
- **Environmental security** — through improved water quality as well as the maintenance of water-related ecosystem services, including biodiversity.

The implementation of Phase I had two key organising devices. The first took the form of nine benchmark water basins.

The second was the establishment of five principal themes, with nominated lead institutions from the CGIAR, namely:

- Improve crop water productivity (IRRI)
- Multiple uses of upper catchments (CIAT)
- Aquatic ecosystems and fisheries (WorldFish)
- Integrated basin water management systems (IWMI)
- The global and national food and water system (IFPRI)

CPWF was subject to an External Review (CGIAR Science Council, 2008) in 2007 (referred to throughout this review as ER2007), which made substantial recommendations aimed at better aligning the program with its original objectives.

Planning for Phase II of CPWF began during Phase I, with the second phase running from 2009-2013. Priority setting for this phase continued during 2009, with significant re-orientations in response to ER2007.

In 2008, CPWF underwent a comprehensive priority-setting process that utilised results from Phase I research, including the 10 Basin Focal Projects (BFPs), as well as advice from the mid-term review, the

Science Council and colleagues at IWMI. This resulted in a modified set of objectives for Phase II that CPWF felt were more achievable within the program time-frame, as well as more feasible to measure. These were as follows:

- To use water and food productivity research to generate practical knowledge that will yield tangible development outcomes for the poor.
- To ensure that research in complementary sectors (e.g., agriculture and water) is better integrated to improve the relevance and adoptability of scientific research, and to focus research solutions in ways that will better achieve developmental impact.
- To foster a more effective and integrated process of collaboration in water and food research among CG centers, and between the centers and other research partners.
- To improve the partnerships between the research community and development organizations (including policy-makers and NGOs) over issues of food and water productivity.

The implementation of these objectives in Phase II led to three major changes. First, Phase II was re-oriented to contribute to priority Basin Development Challenges, guided by an overall programmatic focus on the rain-fed sector and identified through consultation. See Table 1 for details.

Table 1. The CPWF Basin Challenges

River Basin	Basin Development Challenge
Andes System of Basins	To increase water productivity and reduce water-related conflict through the establishment of equitable benefit-sharing mechanisms
Ganges	To reduce poverty and strengthen livelihood resilience through improved water governance and management in coastal areas of the Ganges basin
Limpopo	To improve smallholder productivity and livelihoods and reduce livelihood risk through integrated water resource management
Mekong	To reduce poverty and foster development by optimizing the use of water in reservoirs
Nile	To strengthen rural livelihoods and their resilience through a landscape approach to rainwater management
Volta	To strengthen integrated management of rainwater and small reservoirs so that they can be used equitably and for multiple purposes

The second major change was the creation of thematic working groups as the principal way of organizing crosscutting research and messaging. These were as follows:

- Resilience
- Global drivers of change
- Learning to innovate
- Modelling and spatial analysis

The third major change was an explicit shift to an implementation approach that the program referred to as R4D. There were many dimensions to CPWF's R4D implementation approach (which are discussed in detail in subsequent sections of this review). R4D is understood in this context to be a

mode of research that seeks to make explicit the links to development processes by engaging directly with stakeholders in impact pathways — where key outcomes sought from research and other program activities are policy and practice changes (by these stakeholders) and where this is achieved by applying an overriding principle of enabling systemic innovation in the water and food arena (Hall et al., 2014; Ison et al., 2014; Harrington and Fisher, 2014).

An analysis of CPWF documentation across both phases — including proposals and medium-term plans — reveals that over the course of its two phases the objectives of CPWF were progressively modified. However, the review notes that these objectives retained a number of core features that defined CPWF as a pilot of a new research modality. This review finds that the interlinked objectives outlined below are valid for a research-for-development pilot program and are used in the remainder of this review to frame a discussion of CPWF's achievements and to draw lessons from. These are as follows:

Implementation strategy

- Explicit development framing of the overall objective of the program.
  "To use water and food productivity research to generate practical knowledge that will yield tangible development outcomes for the poor"
- Partnership and integrated research and development action as a key operational principle.
  "To ensure that research in complementary sectors (e.g., agriculture and water) is better integrated to improve the relevance and adoptability of scientific research, and to focus research solutions in ways that will better achieve developmental impact."
  "To foster a more effective and integrated process of collaboration in water and food research among CGIAR centers, and between centers and other research partners."
  "To improve the partnerships between the research community and development organizations (including policy-makers and NGOs) over issues of food and water productivity."

Research contributions

- Frontier-science that creates breakthroughs in understanding and practice of poverty reduction at the water and food interface.
- Breakthroughs in understanding how knowledge is produced, packaged and targeted at solving problems at the basin and field level.

Developmental outcomes and measures of sustainability

- Policy and institutional/ practice change among basin-level water and food stakeholders that will lead to poverty impact at scale.
- Capacity strengthened in research-for-development systems, including skills and relationships needed for collective research and development planning and action in the water and food arena.
- CPWF influences the global water and food agenda and its focus on using research to deliver impact.
- Lessons from CPWF contribute to the ongoing reform of CGIAR and its transformation into a research-for-development organisation.

These features are used to frame the assessment of the performance of CPWF that follows.

3. The CPWF Timeline in Relation to the CGIAR Reform Process

Before discussing what CPWF achieved it is useful to set out the history and timeline of CPWF in the context of the CGIAR reform process. This timeline helps highlight the point that what was taking place in CPWF was not happening in isolation from wider changes in the CGIAR. It also reveals that CPWF's ability to contribute to this reform process was challenged by, among other things, mis-matches in this timeline.

CPWF was one of four challenge programs established by the CGIAR in the early 2000s as an explicit attempt to pilot the refocusing of its agenda on delivering impact from research. Central to this refocusing was the recognition that it would require new combinations of research and other expertise aimed at complex development problems and that this, in turn, would require new patterns of partnership between CGIAR centers, national research organizations and development stakeholders. Although the term R4D was not used at the time, the intent of the challenge programs and the CGIAR reform process driving them resonates very strongly with what is now understood by this term.

As mentioned previously in this report, CPWF was divided into two distinct 5-year phases. Phase I established a global research program around nine benchmark river basins. It established a range of partnerships beyond existing CGIAR research practice at the time, but the ER2007 felt that it could have gone further in diversifying its partnership base. Following an external review at the end of Phase I, CPWF developed an implementation strategy focused on framing its research with an analysis of impact pathways and a proactive engagement through dialogue and partnership with key stakeholders and change agents in these pathways. CPWF referred to this as a research-for-development (R4D) approach. The transition to this approach took time to gain traction, but by 2009 CPWF was implementing a distinctive approach based around six basin development challenges and was engaging in a wide range of partnering, dialogue and engagement activities.

In parallel with the implementation of CPWF, the CGIAR reform process gathered pace. By the beginning of CPWF's Phase II the CGIAR had already moved on from the challenge program model and had started developing the mega project concept of cross-center research. In 2009, building on IWMI's 2007 Comprehensive Assessment of Water and Food, a mega program around water and food began to take shape. This went through a series of different formulations that culminated in the launch of the CRP on Water Land and Ecosystems (WLE) in 2011. Some of the governance functions of CPWF were absorbed into WLE and consequent changes in funding arrangements led to substantial budget cuts in CPWF, with a number of activities being terminated or reduced in scope.

This review observes that the period 2011 to 2013 entailed considerable tension between CPWF and WLE over the nature and value of an R4D approach. The timelines suggest that much of this tension arose because different actors within the same system held different views. Each of these views was legitimized by the different program development and implementation processes that respective actors were involved in and which ran in parallel. The review observes that neither the implementation of CPWF itself over both of its two Phases, nor its transition to the CRPs, have benefited from a clear vision that is either shared or explicit. Part of this problem lay in the difficulty that CPWF had in articulating its R4D approach in terms that resonated with key CGIAR stakeholders and their objectives and imperatives. This, together with the parallel dynamic of the CP and CRP processes has weakened opportunities for learning lessons from CPWF.

3.1 Relevance of R4D as an implementation approach

A key feature of the implementation approach adopted by CPWF was its adoption of an R4D approach. The history of CPWF discussed earlier explains the way that the adoption of this approach began towards the end of Phase I and was progressively developed in Phase II of the program. To understand the relevance of R4D to the broader aims of CPWF it is necessary to explore what is understood by R4D-style research.

CPWF made strenuous efforts to articulate its approach in its metasynthesis (Harrington and Fisher, 2014) and this review believes this is an important contribution to debate and practice on these issues. However, there has been considerable ambiguity about what R4D actually means — both in the international agricultural research community, more generally, but also within CPWF during its early years. Recent reviews of relevant literature on R4D (Hall et al., 2012 and Ison et al 2014) suggest that various interpretations of R4D include: an ambition to achieve development results; the adoption of particular tools (most notably, innovation platforms); a mode of research and development practice that is process-driven and which employs monitoring and learning arrangements that support adaptive managements; an approach that is interactive and integrative and relies on embedding research in a range of partnerships; and a modality of research and development practice that responds to the systems nature of the innovation and change process.

While it is almost impossible to be definitive about the precise operational features of R4D research practice, three key principles of working seem to be common.

- Firstly, it is a modality of research that is firmly aimed at delivery of development impact at different (but plausible) scales and time frames.
- Secondly, it is a modality of research that is adapted to the systemic nature of the change, innovation and development process — multiple players; multiple scales; multiple interactions; with non-linear relationships between inputs and outputs; the critical importance of institutional, policy and political settings in shaping the functioning of the system and its ability to deliver change, innovation and impact in response to an ever-changing environment (people, markets, climate, policy and politics).
- Thirdly, it does not give primacy to any particular mode of research (basic, adaptive, communicative, demand-driven, supply-driven, etc.) or development practice (public-led, private-led, top down, bottom up, etc.). Instead, it is about assembling the tools, resources, organizations and modalities that are appropriate to supporting, at a particular moment in time, a systemic engagement with development opportunities and challenges being tackled.

This, of course, means that there can be multiple operational manifestations of R4D-style research that emerge from the historical origins of the organizations and the nature of the development opportunities and challenges at hand. One of these manifestations, as we shall see, is that of CPWF.

Understanding R4D in this way leads this review to find that CPWF's adoption of an R4D approach as its basic principle was highly relevant in two respects. Firstly, the thematic focus of poverty reduction associated with water and food was a typical complex systems development arena. CPWF referred to this in the language of a "wicked problem", a development challenge at the intersect of multiple and often conflicting stakeholder agendas in a dynamic arena with intersecting bio-physical, climatic, market, policy and political elements. A shift to an R4D approach very early in Phase II that was both outcome-focused and oriented towards a systems engagement was, therefore, highly relevant to this type of "wicked problem".

Secondly, CPWF's shift to an R4D approach was highly relevant to the overarching agenda of influencing the way the CGIAR research model was evolving. As has been discussed earlier, although CPWF emerged in the early 2000s era of CGIAR change and reform, this process is ongoing and has progressively adopted a greater systems understanding of the development challenge and the role of international research in it. This review believes that this change process implies a reframing of the role and organization of international agricultural research as part of a global research for development community or system. CPWF's shift to an R4D approach was a highly relevant experiment and learning exercise in exploring how outcome-facing research could be located, organized and practiced in this wider global R4D space. In other words CPWF was a pilot in how the CGIAR could reframe its research, and as a pilot it is as relevant today as it was in 2002 at its inception.

The question for this review is how did CPWF translate its shift to an R4D approach into an implementation strategy that was oriented towards a system engagement with the poverty challenge at the water and food interface?

4. The R4D Implementation Strategy

The review observes that CPWF's progress towards operationalizing an effective R4D-style research program was slow to start and only really gained traction in Phase II. A core feature of CPWF's approach was that it recognized that its route to impact at scale would only be achieved by ensuring research outputs were developed in such a way as to bring about outcomes, which it defined as "changes in policy or practice". The program then put in place a number of activities and strategies to address this. This review believes that this led to an implementation strategy that, when viewed as a whole, represents a major innovation in the practice of R4D. The following are key features of CPWF's R4D approach:

- The organization of research around basin development challenges with a strong poverty reduction focus. This opened opportunities for wider partnerships and better alignment with the water and food priorities of national and regional stakeholders. (See Box 1.)
- Research collaboration with other CGIAR centers, notably IWMI and ILRI in the Nile basin, ICRISAT in the Limpopo basin, WorldFish in the Mekong basin, ILRI in the Volta basin, IRRI in the Ganges basin, IFPRI on water governance and CIAT in the Andes. IWMI was also present in each of the six basins, leading at least one project in four of the basins.
- Research collaboration with international advanced research institutes, notably the Stockholm Environment Institute in the Volta and Limpopo basins, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia in the Mekong basin, as well as the Overseas Development Institute (ODI) and King's College London (KCL).
- Collaboration with regional development organizations. For example, CONDESAN, a regional research and development organization, performed the basin coordination role in the Andes. In the Limpopo this role was performed by FANRPAN, a regional policy research and communication organization. In other basins development organizations became key project partners.
- Strong emphasis on promoting engagement with basin-level stakeholders at the policy and operational levels to ensure better research framing, ownership and uptake. This not only helped align program activities with development needs, but also with market, policy and political dynamics in each of the basins.
- A dedicated coordination and change research program in each basin to research and support the impact delivery process.
- The use of interactive innovation platforms (spaces for research and development collective action and learning) as a research implementation vehicle at local levels and as a stakeholder convening and dialogue vehicle in the form of regional and global water and food forum events.
- An M&E system that used impact pathway analysis to help identify key stakeholders to engage with in these pathways and to identify and track institutional and policy changes needed to progress in these pathways.
- A strong focus on knowledge management and learning with a strong emphasis on creating opportunities within the program for reflection on the effectiveness of the implementation approach being followed.
- The use of thematic working groups and other devices, including three international forums on water and food, to share information across basins in order to develop globally relevant messages.

- Management structure and governance arrangements to support a decentralized, basin-focused mode of implementation.
- The selection and support of basin leaders who subscribed to the R4D ethos and the expansion of the range of skills in the management team to include development expertise, knowledge management, communication and innovation and impact pathway analysis. R4D skills of the basin leaders were further strengthened by the establishment of "peer assist" exercises — a series of workshops that allowed basin leaders to present findings, critique each other's work and learn from each other.

This review recognises that key operational elements of CPWF's R4D implementation emerged progressively during Phase II. It also recognises that principles that informed these were arrived at by trial and error during the process of implementation and in the subsequent analysis during the preparation of the metasynthesis publication of Harrington and Fisher (2014). In other words the implementation strategy was an output of the program in its own right. A subsequent section is devoted to a more detailed analysis of the principles and practice of R4D that CPWF developed.

Box 1: Shifting from Benchmark Basins to Basin Development Challenges

The reframing of basin benchmark sites as basin development challenges signalled a shift from organizing research that would feed into global messages to one that also responded to development challenges identified by stakeholders at the basin level. This shift was coupled with a degree of autonomy and management responsibilities in research commissioning and planning activities – for example, the basin coordination function shifted to a basin leader function. This review observes that this shift led to some valuable changes in the implementation of research. For example, it shifted from research themes leading the research agenda, to the basin taking a lead and aligning research with development challenges. This also supported a shift to topic working groups; it resulted in a more prominent role for local research and development organizations; better aligned research priorities with local stakeholders; drew in a set of international research partners beyond the CGIAR as a result of competitive bidding; and, in cases where basin leaders were from IWMI, helped them grow in a value system building role of facilitating and brokering research and other partnerships in the R4D space.

The review also observes that the degree of autonomy given to the basins allowed them to evolve in different ways that added to the richness of the R4D experiment. This difference resulted from the different basin contexts and the different organizational homes of the basin leaders.

The basin challenge approach also helped focus on poverty reduction as a guiding principle. Not only did projects address local priorities, but this also allowed the research to be directly targeted towards poor households.

The review also finds, however, that there were gaps in the implementation strategy. This arose from both insufficient attention as well as changes in funding arrangements towards the end of the program and the inevitable cutting of some activities that accompanied this. These gaps include:

- Formal analysis of the architecture, policy and political dynamic of regional and global level water and food contexts was weak or absent. This was planned in Phase II, but was a casualty of the transition to WLE and the funding constraints this caused. This deprived the program of a road map of the regional and global system into which they sought to contribute.
- The slow start of projects and budget cuts towards the end meant that the program was not able to pursue any of its activities to the point where it was able to demonstrate impact at scale (this is discussed in detail in later sections). Not only did this undermine CPWF's development contribution, but it also undermined its ability to demonstrate how R4D could address the delivery challenge of achieving impact.
- The management team, after doing the heavy lifting of reorienting the program in Phase II, did not revisit its role and shift attention to engagement and influence in the global water and food arena and the CGIAR reform process. In its defence, at the point of transition, budget cuts pushed the management team into a fire-fighting mode of operation. This took up most of the management team's attention and meant that it was not able to defuse tension around the transition from CPWF to WLE and contribute as positively as it may otherwise have done to the transition process.

5. Program Arrangements for Contributing to Global Water and Food Debates

At the time of its design, CPWF was envisaged as becoming the primary international effort in setting and evolving the research agenda related to water and food — as significant an actor as the Intergovernmental Panel on Climate Change (IPCC). It was hoped that CPWF would influence the demand for knowledge and secure the financial alignment of others, including the budget allocations of research funding organizations.

CPWF organized its work in a number of ways to develop generic messages aimed towards higher-level global debates. These included the following:

Phase I established five principal themes, with nominated lead institutions, namely:

- Improve crop water productivity (IRRI)
- Multiple uses of upper catchments (CIAT)
- Aquatic ecosystems and fisheries (WorldFish)
- Integrated basin water management systems (IWMI)
- The global and national food and water system (IFPRI)

However, these theme groups that were intended to consolidate and bring coherence across the benchmark basins did not gain traction in the way they were initially intended.

In 2008, CPWF generated synthesis topic notes on four topics, namely:

- 'Improving rainwater productivity'
- 'Multiple-use water systems'
- 'Water benefits sharing for poverty alleviation and conflict management'
- 'Global drivers and processes of change'

In the same year, five policy briefs were published, consolidating findings from Phase I, namely:

- Food and Water Security under Global Change
- Managing water through livestock in the Nile Basin
- Water, people and food in the Mekong River Basin
- People, livelihoods and Multiple Use Water Systems
- How water and agriculture support livelihoods in the Volta

CPWF further documented project legacies in 2010-2011 for around 15 projects.

Under Phase 2, CPWF established four topic working groups, namely:

- Resilience
- Global drivers of change
- Learning to innovate
- Modelling and spatial analysis

CPWF's forthcoming metasynthesis (Harrington and Fisher, 2014)[2] has reported against five output clusters:

- Policy change
- Community resource management

[2] The External Review team had access to the manuscript of the book that was submitted to the publisher.

- Negotiations about resource use
- Development investment
- Research priorities

This review finds that CPWF progressively developed valuable ways of organising its global messaging. The four topic working groups established in Phase II were particularly valuable as these emerged as cross-basin communities of practice aimed at generating debate about significant findings at the program level. Unfortunately, these topic working groups were curtailed during budget cuts associated with the CPWF's merger with WLE. This was symptomatic of a wider problem of chosen themes or topics not getting enough time to mature into robust bodies of evidence. The global water and food forums were also cut for budget reasons and this curtailed a promising start the program had made on creating a research-informed global community of practice on delivery impact in the water and food arena.

6. Research Contributions

Over its two phases, CPWF's research output has been considerable. This includes over 300 journal articles, a similar number of book chapters, over 2000 data sets and a range of policy briefs and visual media (see Table 2 for details). This review finds that the diversity of publication and research output types appropriately addresses a range of different audiences and contributes effectively to the accessibility of research output. The review also notes that in addition to international public goods research outputs, CPWF has developed research products (particularly data sets) that have high regional significance and relevance. For example, CPWF has developed poverty mapping databases as part of modelling exercises in the Volta and Limpopo basins, which have been highly appreciated by policy implementation agencies and stakeholders in the regions.

The review also acknowledges that the publications reported in Table 2 below underreport CPWF's achievements in Phase II, as at the time of this review information was yet to be fully collated and synthesis, review and publication lag times mean that many publications are still in the pipeline.

Table 2. CPWF Research Outputs

Phase 1 outputs	ca. 1986
Book chapters / proceedings articles / books / monographs	287
Magazine articles, newsletters	25
Conference presentations / papers	205
Datasets (primary, processed, secondary)	1999
Journal articles	296
Policy & research briefs	39
Posters	53
Abstracts	111
Reviews; surveys; technical bulletins / notes; toolkits; (technical) manuals / handbooks; working, discussion or resource papers; brochure; case studies	215
Project, technical, other reports (meeting, seminar, special, workshop, resource)	151
Research reports	23
Online articles / presentations, Websites	10
Student theses (BSc, MSc, PhD)	178
Video / DVD	13

Phase 2 outputs	ca. 942
Books / book chapters	46
Articles for media or news	7
Conference & seminar papers	111
Data & info outputs, incl. datasets & databases	55
Journal articles	69
Policy briefs, briefing papers	44
Posters	72
PowerPoint presentations	70
Reference materials	34
Reports	58
Research reports	176
Digital media outputs, incl. websites, blogs, wikis	78
Student theses	56
Videos	18

Source: Data collated by CPWF

Overall the review finds that the quality and relevance of CPWF's research outputs have been considerable. However, the review also observes that the research modality adopted, the significance of insights derived from this research and the adoption of these by development stakeholders (developmental outcomes) are inseparable and need to be judged holistically. This redefines what frontier science means in relation to poverty reduction on water and food, as it suggests that research needs not only to be judged in terms of the novelty of the information and insights generated, but also by the utility of this to different stakeholders and the changes in their practices and interactions with other stakeholders as a result of participation in research endeavours.

The review recognizes that CPWF has struggled to find ways to report its results in conventional terms and has been innovative in exploring alternative reporting means that combine research process, research output and development outcome narratives. These include the metasynthesis book (Harrington and Fisher, 2014), basin-level synthesis and outcome stories, and Most Significant Change exercises to capture intended and unintended consequences and outcomes of the program implementation strategy. The review finds that the metasynthesis and the program-level syntheses that are derived from it are particularly valuable in: bringing together an analysis of the nature of the poverty-water-food interface; exploring intervention options and modalities in this space; exploring the institutional, policy and political dimensions of this space, and; reflecting on the value of systems research approaches in development contexts that are non-linear and complex in nature. The review finds that this type of analysis and synthesis is a significant advance towards a multidisciplinary mode of research that contemporary thinking suggests is needed in order to engage productively with development complexity.

The review also finds that the R4D approach allowed CPWF to explore dimensions of the food and water development challenge in ways that would not have been possible through conventional research modalities. In particular, CPWF, through its collaboration with development partners, has been able to explore research questions that sit at the interface of household, ecological, market and institutional issues related to policy and program implementation. This has also helped strengthen research relevance at the basin-level and has led to significant uptake of research findings. There are also a number of areas of research output that, in the opinion of the review team, place CPWF's work at the leading edge of global research. Summaries of notable illustrative examples are provided below. More detailed narratives of the key research achievement of each basin are provided in Annex 4.

- **Water-food-energy nexus.** In the Mekong CPWF is among the pioneers of practical research and evidence in spearheading the water:food:energy nexus. This has high relevance elsewhere as the post-2015 agenda shifts increasingly towards energy and agriculture developments.

- **Success factors in agricultural water management.** The Limpopo and Volta basins have begun to dismantle a principal challenge within African agricultural development by consolidating evidence on the persistent failure and low sustainability of many past interventions in agricultural water management. The major emerging message is that it is rarely the technology that is at the root of low sustainability — technologies do work. Instead, at play is a wider set of factors determining success, including community buy-in and adoption, financing within household budgets, incentives, institutions, and policy.

- **New patterns of evidence-based collective action for polder development.** In the Ganges CPWF has worked with a range of public agencies related to both agriculture and water development to create a better enabling environment for the scaling-up of trial results on polder development. Collectively, the evidence-based science that CPWF conducted, which takes into account local livelihood practices, has built up essential political and institutional capital. This foundation has given CPWF partners the legitimacy and convening power within the polder

setting to begin to negotiate and influence vital changes in sluice gate operation, which will be vital to the freshwater regime of the polders as the Delta Plan emerges as a critical basin-wide policy and operational instrument. This has a scale-out potential in the polder area, which is home to approximately 40 million people.

- **Hydrological /social data sets to parameterize basin modelling.** In the Ethiopian Highlands within the Nile basin, newly installed hydro-meteorological instrumentation has been established in transects within three so-called 'learning landscapes'. This has yielded core data to parameterize the basin-wide integrating SWAT model, being used to simulate the hydrological and sediment implications of different land management practices within the Ethiopian Upper Blue Nile basin. Without such local data, and understanding of the different fluxes, such models have to otherwise rely on their model calibration using known parameter ranges from the continental United States, where landscape conditions are very different. Ultimately, without acquisition of local hydro-meteorological information, the model simulations would have yielded unrealistic results in an upland Ethiopian environment. With such acquisition, the prospects are increased of the policies around land management, governance and livelihood interactions having been informed by more realistic projections.

- **New policy pathways to benefit sharing.** CPWF partners in the Andes have made a major and leading international contribution to the advancement of benefit sharing mechanisms at a significant spatial scale, bringing a necessary critical mass of exploration internationally and well-beyond the previous pattern of atomized and local explorations on the topic. In doing so, the CPWF partners have adopted influential breakthrough paradigms, having detected that a number of recently 'mainstream' science and policy strands were not yielding the evidence-base to move forward. Notably a review of 40 case studies of local Payment for Environmental Services studies revealed that only one had yielded tangible implementable actions, leading the Andes Basin team to become more assertive around the evidence from 'established' thinking of forests yielding more water in all cases and wetlands performing dominantly positively hydrological functions in respect of the volumes and patterns of downstream river flows. This paradigm shift towards non-mainstream local evidence away from the Phase I approach based on the mainstream generalities opened up opportunities under Phase II to introduce stronger hydrological literacy into negotiations around integrated (upstream: downstream, urban: rural, etc.) systems connecting water as a natural resource and the social and economic benefits of water.

- **Revisiting the importance of water productivity.** At its launch CPWF focused on increased water productivity. One of CPWF's principal contributions on water productivity at the global synthesis level has been to "revisit the concept of water productivity and discuss its utility as we found in applying it during the CPWF", concluding "that it is a useful measure, but needs to be applied with caution". CPWF concludes that water productivity is not the critically important factor that it was assumed to be when the program was initiated.

- **Unique research outputs on R4D practice.** The research outputs CPWF has delivered on the R4D process developed through its efforts to rigorously investigate impact delivery mechanisms and is at the frontier of global practice and derived thinking on R4D. Organized through its coordination and change projects and brought together in its metasynthesis (Harrington and Fisher, 2014), CPWF has developed one of the most comprehensive documentations and analysis of the R4D process to date. The metasynthesis will be an important benchmark in this area of enquiry for many years to come and is highly relevant to ongoing policy and practice debates on the use of research for development.

6.1 R4D Principles, Approaches and Tools developed and applied by CPWF

CPWF applied, adapted and fine-tuned elements of an R4D approach at the project, basin and program level throughout its lifespan. This review believes this has been a major output of the program as well as a key source of lessons and it, therefore, warrants elaboration in this report. The review recognises that it was not until the writing of the soon-to-be-published metasynthesis (Harrington and Fisher, 2014; Chapter 3: Harnessing research for development to tackle 'wicked problems') that the R4D approach used by CPWF was conceptualised and written up across projects and basins. There remain a range of interesting 'R4D stories' to tell that can inform debates on the usefulness of R4D to achieve impact.

The metasynthesis (Harrington and Fisher, 2014) identified eight R4D principles applied by CPWF, and provides a narrative explaining the role and mechanisms for each:

- Theory of change
- Knowledge management
- Partnerships and networking
- Research on R4D
- Policy and engagement
- Adaptive management
- Gender and diversity
- Capacity development

This review adapted these categories to group some and include additional principles, based on discussions with basin and project leaders, management team members, document review and stakeholder discussions (see Box 2). These principles reflect the review's assessment of the drivers behind some of the changes that CPWF brought about at different levels. These overlap with the principles identified in the meta-synthesis, but go beyond those that CPWF applied to include principles emerging from program implementation.

The review recognises that the extent to which these principles were adhered to varied across projects and basins — as is to be expected as each was implemented under different operating conditions and development contexts. It is also noted that principles related to inclusiveness and equity were not strongly articulated in discussions with CPWF stakeholders. Also missing from these principles — or at least not explicitly articulated — is the role of research and research actors in enabling processes of partnering, engagement and meaningful dialogue. Perhaps CPWF doesn't highlight this because it plays the role of a research actor in the processes it describes. However, the review observes that CPWF was able to play a role as a legitimate convener of engagement processes because of the credibility of the research information and expertise it brought to bear. In this sense, the processes, which CPWF put in place, were research-informed (rather than necessarily research-led) and this represents an important principle of mobilizing and using research within the development framing of R4D. In the same way it is important to recognise a legitimate role for research within R4D, albeit a different one from conventional research modalities.

These caveats notwithstanding, there is strong evidence that these principles, when combined, can significantly enhance the development of relevant outputs leading to outcomes.

These principles are mutually re-enforcing — for example, incentive systems and partnerships contributing to capacity development, partnerships supporting reflection and learning, a longer time-frame enabling reflection and learning to feed back into program implementation, and continuous reflection and learning enabling a more effective way of operating that builds on the experience gained.

Box 2: R4D Principles of CPWF

1. **Enable 'emergence'**: Operating on a sufficiently long-term time frame to enable changes to have an accumulative effect over time.
2. **Engagement and partnerships with a development focus**: Working with relevant and legitimate actors at all levels towards a common goal or outcome, aligning to and focusing research on the demands and needs at local, regional and global level.
3. **Incentivizing through devolution of power and resources:** Supporting, motivating and incentivizing those involved – including program and project staff, partners and wider stakeholders.
4. **Capacity development**: Beyond training of individual researchers, this involves strengthening the capacity of institutions to innovate and adapt, as well as to provide an enabling environment for innovation to continue.
5. **Continuous reflection and learning, supported by knowledge management and communication**: Implementing learning systems and adaptive management for reflection, to adapt to changing circumstances whilst retaining a clear goal / objective.

Source: The review's re-articulation of CPWF's principles, building on those in the metasynthesis (Harrington and Fisher, 2014)

They resonate with what the metasynthesis calls "cornerstones": understanding systemic change, network weaving to foster emergence, program evaluation and building the capacity to work differently.

The R4D principles implicitly guided the development, adaptation and fine-tuning of a wide range of R4D approaches, mechanisms and tools, which are documented in the CPWF body of literature, but had not been pulled together at the program level before the forthcoming metasynthesis. Taken individually, these mechanisms are not new to the vast majority of agricultural research and development initiatives, but taken together they constitute a strong body of R4D that has enabled CPWF outcomes to emerge and be taken forward. As with the principles, different mechanisms and tools reinforce each other, with each project and basin development challenge applying a different mix of tools to address the specific context in which it operates. Clearly some mechanisms worked better than others in specific circumstances, and one of the strengths of the program was the relative flexibility to experiment with different approaches.

Enabling emergence

No CPWF intervention had a 'point zero' in real terms — in all cases, the program intervened in geographies and thematic areas where others (including previous CGIAR research) had already taken action, where some knowledge had been generated, and where stakeholders were engaged in one way or another. Some of the most successful projects used CPWF strategically to continue their trajectory towards wider development objectives (such as increasing incomes and food security, or reducing poverty).

A key aspect here is sequencing — how CPWF interventions built on previous work, using existing networks and expanding them, making use of capacities and alliances developed earlier, and in turn creating the foundations (through investments in relationships, knowledge creation and capacities) for future outcomes and impacts. This framing of CPWF is in stark contrast to a perception of R4D initiatives as distinct, independent pieces of work that have clearly attributable outcomes and impacts.

This creative development of synergies with other (past or ongoing) research components was facilitated by a decentralised decision-making system that enabled the basin development challenges to design projects that fit with local, national and regional contexts (see also point 3 on devolution).

Arguably this is not a 'new' practice, as research initiatives generally build on previous work. The difference in CPWF was that it enabled pursuing R4D questions that were outside the 'radar' and mind-set of CGIAR by giving a stronger voice in research priority setting to development actors (for example farmers, local government, extension services, regional policy networks, etc.) — see also point 2 on engagement.

Box 3: How Emergence Supported Outcomes in Zimbabwe

An example for this is the goat work in Zimbabwe, led by ICRISAT in Bulawayo. CPWF-funded work built on an earlier re-orientation of ICRISAT's research in Southern Matabeleland from 'pushing' sorghum development to one of supporting goat production and marketing through improved sales systems and fodder development. This change in thinking and subsequent (research) practice was the result of a number of reinforcing events and activities, including listening to farmers about their priorities and the opportunities they see to improve income.

CPWF was able to build on this emerging change in paradigm by providing resources to undertake a number of specific research activities focusing on fodder production and marketing. In doing this it made use of capacities developed by earlier projects and programs, whilst in turn developing capacities that would benefit subsequent research and development initiatives. The program was also able to build on a well-developed network of actors, relationships of trust and respect, and a very good understanding of the mandates, priorities and strengths of these actors.

Source: Discussions with Andre F. van Rooyen, ICRISAT Bulawayo, February 2014

Engagement and partnerships with a development focus

Possibly the most significant R4D mechanism for CPWF was the quality of partnerships and engagement. The projects and BDCs actively sought out partners who had a mandate for and stake in developmental outcomes at different levels. Often this involved a careful 'mapping' of the mandates, interests and legitimacies of different organizations and actors. Partnerships were developed between CGIAR centers, between centers and other research actors, and (perhaps most importantly) between research and development actors at different levels.

A wide range of mechanisms for engagement and partnerships were adapted and used in the program, including the following:

- Mapping mandates of and engaging with regional and continental actors (e.g., RECs – Regional Economic Communities in Africa) with the aim of understanding and contributing to their development agenda, and to get ownership from them for updates or research outputs
- Based on an understanding of the mandates and objectives of these actors, adapting the research agenda to support the achievement of these objectives.
- Where feasible, making use of / working through existing networks and mandates of partner organizations to leverage demand rather than creating new structures and processes.
- Bi-annual program-level multi-stakeholder fora, with Policy and Practice Panels that included key development actors (e.g., FAO, IFAD, WB)

- Basin-level events (leading up to program-level fora by providing a regional platform first)
- Participation of CPWF project staff in key national and regional events (and prioritising these to the extent that they became fixed milestones in project and program work plans)
- Developing and supporting networks, multi-actor partnerships or multi-stakeholder platforms with a voice in decision-making about project and program priorities (e.g., innovation platforms that identify priority challenges and opportunities)
- Using participatory approaches and facilitation to engage with farmers and other local-level actors to ensure that their voice is heard and they can influence decisions (e.g., about research priorities).

An underlying logic behind these processes was the conviction — shared by most CPWF researchers and partners — that research should contribute to solving developmental challenges, and that these challenges are better understood and prioritised by legitimate development actors (rather than by researcher-facilitated ad-hoc exercises, for example). This way of operating requires that researchers accept the authority of other actors and see themselves as contributors rather than drivers of the R4D agenda — something that contradicts at times the culture of many research organizations, including parts of the CGIAR.

It also requires a re-thinking of the development process itself, and an internalisation of the concept of complex systems (and implications of this for the definition of outcome measures).

While engaging with the 'right' (relevant, legitimate) entities is of vital importance, what matters even more is what the engagement is about and how it is carried out. Bringing stakeholders on board only when decisions on research priorities, outputs and activities have already been made is counterproductive — confident development actors may well be alienated by this. A key success factor for CPWF was to engage with development actors early on in the R4D process: to jointly undertake analysis; weigh up different strategies; and, agree on priorities, entry points and specific activities. This enabled focusing on thematic areas and interventions that were most likely to contribute to developmental impact — an explicit objective of the program.

Similarly, the 'how' is important when building alliances and developing a joint agenda. Developing trust and mutual respect, accepting criticism, and being a reliable and honest broker between competing factions can all contribute to more effective and long-lasting relationships. Investing in these relationships will pay dividends in the long-term, which is why this review uses the term 'sunk investment' to describe the capacities, relationships and networks built by the program.

Where projects and programs were seeking to influence development actors and policy makers, engaging with them early on in the research process was essential to increase credibility and likely uptake of research outputs.

Box 4: Working with Regional Networks

CPWF developed effective and sustainable partnerships with key networks, including, for example, FANRPAN in Southern Africa and the Volta Basin Authority in West Africa. The nature of these partnerships varied, depending on the capacity, mandate and interests of partners. Depending on these, the program either supported the development of the networks'/ organizations' capacity (as in the case of the VBA) or benefited from the networks' capacity and legitimacy (the case of FANRPAN).

However, there are tensions between the necessity of investing in long-term, equitable partnerships that build on trust and respect, and the need to deliver tangible and measureable outcomes within a project timeframe. CPWF stresses the importance of process (to engage with partners, etc.) as being key to the development of relevant research agendas and, ultimately, research uptake and use. Yet process orientation can result in longer projects with less tangible outcome in the short-term, which is harder to justify in the current funding environment with the focus on value for money.

Similarly, partnerships are critical and need to be equitable and empowered to be effective, involving partners from the start in priority setting and subsequent implementation. Yet the responsibility for delivery lies with the CGIAR, and a clear framing of research questions by CGIAR centers from the start has been a key requirement of funders and CGIAR governance arrangements..

In addition to longer-term time horizons and secure funding for effective partnerships and engagement, funding mechanisms and management systems need to be sufficiently flexible to allow joint development of priorities and research design with partners. A phased approach for programs — with a periodic stock taking of the engagement process and articulation of emerging research questions — or using an even longer inception phase than CPWF Phase II (one year) might be able to address this.

Incentivizing through devolution of power and resources

A key feature of the CPWF approach has been the focus on supporting and investing in people and organizations at all levels, and incentivizing them by giving them responsibilities and the resources needed to fulfil these. Specifically, the following approaches have been used:

- Decentralization of decision-making (on some aspects) from program to basin, and basin to project. While this principle of subsidiarity was at first contested in the CPWF governance structure, its adoption did motivate those in charge, to the extent that they invested significant amounts of time and energy into the program even after the funding cuts.
- Appropriate program-level governance mechanisms, including an independent board and some level of control over the budget.
- Project leadership by non-CGIAR partners, and basin leadership integrated with key regional bodies (Volta Basin Authority, FANRPAN, CONDESAN) — indicating important leadership roles outside the CGIAR.
- Staffing — having a critical mass of the 'right' people (who are committed to development outcomes, can work in a team, are willing to listen to development actors, have the capacity and skills to use participatory tools and processes, etc.). Specifically, there is a need to ensure that there is a sufficient number of R4D and gender specialists to drive research towards an R4D 'mode'.

However, CPWF was not able to influence the performance assessment and incentive systems for CGIAR scientists, which is still largely focused on the publication of peer reviewed articles in high impact journals with a specific definition of 'quality of science'. A large proportion of highly relevant outputs and learning from CPWF was not suitable for publication in such journals, and was more appropriately packaged into policy briefs or other targeted communication products for specific development audiences.

Capacity development

Building the capacity of individuals and organizations was an important achievement of CPWF. This included:

- Developing champions in key organizations
- Training of researchers and facilitators
- Supporting organizational change through engagement and shared learning

In many cases the program built on capacities developed earlier, either by CGIAR-led programs and projects or through investments of others. In turn, the investments of CPWF will bear fruit far beyond the lifespan of the program.

Continuous reflection and learning supported by knowledge management and communication

A key feature of CPWF was the adaptive management system used, based on continuous reflection and learning, and supported by tools and processes to capture, formalise and share learning. These include:

- The coordination and change projects, which galvanised the learning between the basin level projects and provided the link to program-level learning
- M&E systems, including PIPA (Participatory Impact Pathways Analysis), OLMs (Outcome Logic Models) and MSC (Most Significant Change) stories
- Reflection meetings / study meetings (with a ring-fenced / dedicated budget)
- A wide range of communication and learning products — including publications, videos, toolkits, etc.
- A series of three International Forums on Water and Food, which were key mechanisms for building a programmatic community, global sharing and cross-basin learning. These were started in Phase I and continued in Phase II
- Thematic working groups for cross-basin learning, to build up the evidence base. However, these groups never really took off as their start coincided with the funding cuts in early 2012 — around a 40% reduction in the budget, with the greatest cuts to the central program budget in order to protect the basin programs
- Communities of practice at different levels for exchange and learning

There are a number of systemic mechanisms in conventional research commissioning and implementation that work against most of the R4D principles and practices described above. These include the following:

- Funders' demands for a clearly defined research proposal that specifies not only expected impacts and outcomes, but also specific outputs and activities
- A bias, in the CGIAR, towards a certain interpretation of science that emphasizes 'technological solutions' as a means of achieving developmental impact, vs. a broader interpretation that explicitly acknowledges the science behind research uptake and impact in a developmental context
- Power and control associated with hierarchies, budgets and lower status of social sciences

Because R4D principles are contested, they have not necessarily been fully applied to all of CPWF's work, despite evidence that they provide a solid base for impact-oriented R4D. Again and again the program had to justify choices made and convince sceptics of the benefits of working in a different way.

In summary, a key message from the analysis undertaken by this review (and indeed by CPWF itself) is that these principles are mutually re-enforcing. Taken individually, these mechanisms are not new to the vast majority of agricultural research and development initiatives, but taken together they constitute a strong body of practice that has enabled CPWF outcomes to emerge and be taken forward. (Mechanisms that enabled CPWF's R4D approach to support outcomes and impact are discussed in greater detail in Annex 5.)

The review concludes that CPWF's progressive development and operationalization of these principles resulted in a highly effective implementation strategy and that this implementation strategy was entirely consistent with the program's original objective of piloting a new research modality that was both partnership-oriented and impact-orientated.

7. Developmental Outcomes and Measures of Sustainability

7.1 Policy and institutional practice changes in development stakeholders

CPWF defined outcomes as "changes in policy or practice" (Harrington and Fisher, 2014 chapter 9). Outcomes are the result of research outputs being used or applied by target groups (for e.g., decision-makers at different levels). The resulting change in practice, behaviour or knowledge can then lead to impact — such as reduction in poverty or the development of sustainable livelihoods. CPWF used theory of change and outcome logic models to conceptualise the pathway from research activities to outputs, outcomes and ultimately impact.

A key question for this was whether there are direct or indirect linkages between the R4D approaches used and the outcomes achieved by the program at different levels. In the CPWF case outcomes referred to changes to the Complex Adaptive Systems (CAS) that constitute the Food-Water-Poverty nexus. There is no one-directional cause-effect relationship that attributes a change to a specific intervention, as complex systems constantly respond to a multitude of external and internal drivers of change. Rather, such an analysis has to be based on the identification of plausible narratives that explain how the approach used enabled and facilitated changes in knowledge, capacity and behaviour of key actors.

This review finds that there is significant evidence of research outputs and related activities leading to developmental outcomes. Evidence for this is found in the outcome narratives that CPWF has spent considerable effort developing. These outcomes (at the project basin and program-level) are extremely well documented by CPWF in the metasynthesis (Harrington and Fisher, 2014) and in the Most Significant Change narratives developed by the program, as well as project and basin reports. The knowledge management and M&E systems during the second phase of the program specifically focused on the compilation and analysis of outcome narratives and case studies, although the compilation and analysis of these stories was affected by the budget cuts in 2012.

Two illustrative outcome examples from the many documented by CPWF are:

- **Institutional changes in goat value chains in Zimbabwe:** The merits of the value-chain approach are now beginning to be transferred by the CPWF partners — including the local Rural District Council and the Umzingwane Catchment Council (with whom CPWF has evolved key linkages under L4) — to 1960s-constructed, medium-scale state irrigation schemes that used to be oriented towards maize under national food security objectives, and have accordingly suffered the recurring build-fail-rehabilitate cycle of such schemes. With such interventions by CPWF — and the highly significant paradigm shifts that the partners have adopted — the modalities of this work are of high relevance to farming households, particularly in the Zimbabwe part of the Limpopo, which is seeing recent and constant changes in farming systems, as well as elsewhere.

- **Changes in practice of a large Chinese hydropower company:** The development of a new Hydropower Sustainability Assessment Protocol (HSAP) was led by the International Hydropower Association, supported by an accompanying dialogue forum, culminating in a five-volume Protocol relating to new hydropower installations, with possibilities for retrofitting to existing installations. CPWF and its M-POWER partners were invited to comment on an early draft of the HSAP, evaluating its applicability and synthesis of technical and legal dimensions and redressing a critical gap in civil society dialogue. The CPWF/M-POWER engagement addressed issues of 'prior informed consent', transparency and the previous neglect of gender

within the protocol. This led to the refinement of key aspects of HSAP, for example the development of standalone guidelines on gender justice in hydropower. Significantly, as a result of the partnership arrangements under the CPWF, a large hydropower company in China has agreed to trial the revised HSAP on two large dams in the Upper Mekong.

In summary, not only has CPWF developed an operational strategy capable of delivering development outcomes, but it has also put in place appropriate knowledge management mechanisms to capture outcome narratives as part of a wider M&E system.

7.2 Impact on poor people

The achievement of pro-poor impact is at the root of the overall philosophy of CPWF and underpins its Theory of Change. The attainment of pro-poor impact has been used by CPWF as a cross-project unifier, adding programmatic value over and above the contribution of individual projects.

At the outset, CPWF set its Development Objective to significantly increase the productivity of water used for agriculture, enabling more food to be produced with the same amount of water that is used in agriculture today (i.e., at the 2002 level), as populations expand over the coming 20 years. This overarching Development Objective was coupled with Intermediate Objectives and Immediate Objectives — these remained largely unchanged during CPWF's transition from Phase I to Phase II. CPWF's progress towards these objectives over its duration was to be measured against household food security, poverty reduction, improved health and environmental security. The program's pro-poor approach was to be backed by the identification of strategic poverty-reducing interventions, assessments of impact on poor people, comparative advantage of pro-poor institutions and by the creation of an enabling environment for poor people to benefit from improved water productivity.

Early signals from CPWF were in line with this impact culture, with the 2003 Annual Report (CPWF, 2004) citing numerous examples of prospects for CPWF's practical impact on the poor, including *aus* (dry) season rice at Batiaghata in Bangladesh, sluice operation benefits to drought period crop cultivation in Bac Lieu, Vietnam, benefits to women farmers of newly constructed domestic rainwater reservoirs at pilot sites in Ghana, supplemental irrigation and nutrient management in Iran, and improved germplasm-based production in India.

Phase I impact assessments, published in 2009, consolidated a series of most significant change stories (Leon, C. de et al., 2009), the results of the extrapolation domain analysis (Rubiano and Soto, 2009) and guidance on the improvement of targeting of interventions (Rubiano and Garcia, 2009). Supported by the evolution of CPWF's program outcome pathways under the outcome logic model, and by impact pathways, CPWF published further impact assessments in 2011 on aerobic rice (Templeton and Bayot, 2011), citizen participation (Córdoba and White, 2011), the water:land interface (McDonald, 2011) and improving the resilience of small farm households (Woolley and Douthwaite, 2011).

This review finds that within each of the Phase II Basin Development Challenges, direct interventions aimed at pro-poor impact among households had been pursued in relation to livestock fodder in the Ethiopian Highlands, reservoir draw-down farming in Vietnam, goat value chain development in Zimbabwe and polder productivity in the polders of the lower Ganges. Having established the necessary innovation platforms and having achieved impacts for households within the initial trials, the aspired scaling-up processes under CPWF were curtailed at the cessation of funding by 2013. As a result, to date large-scale impacts on poor people have not been achieved. There is evidence that the outcomes CPWF has achieved could lead to considerable impact at a regional level in the future, particularly in cases where research findings and research-based protocols have been adopted by public and private development agencies, as discussed above.

The review also notes that there were a number of reasons why CPWF was unable to achieve impact at scale during its implementation. The program did not get into an effective implementation strategy until the second year of Phase II, during which the scope of activities was reduced due to budget cuts.

However, there are other cases where further investments will need to be made. For example, in Ethiopia CPWF has made good progress in developing a set of basin messages that could inform the design and implementation of natural resource management-orientated interventions. However, further work will be needed to fully embed these messages into the practices of key development investors. In the Limpopo development agencies and investors commented that while the research of CPWF had been highly appreciated, there was still a need to package this information in ways that could be directly used in investment choice and design. Development stakeholders in other regions also echoed this need for information packaging.

The review observes that CPWF had limited success in attracting development financing that would have allowed it to collaborate in the implementation of interventions likely to deliver impact at scale. A notable exception to this was in the Mekong, where co-financing with Australian development assistance had allowed CPWF to collaborate in a larger effort to strengthen water governance issues in the Mekong region. The scope and scale of this wider development intervention may provide the opportunity for CPWF to contribute to impact at scale in the future, although these have not been achieved to date. It has also been pointed out to the review that CPWF was prevented from attracting development financing because of prevailing institutional arrangements in IWMI and the CGIAR more generally at this time. In particular, concerns were raised that fund-raising by CPWF would compete with IMWI and the emerging WLE CRP.

In summary, CPWF did not reach the point where it was piloting delivery mechanisms to achieve impact at scale. This undermines its impact, but also its ability to draw lessons about how impact at scale can be achieved. Considering the sunk investment in research, engagements processes and the capacities developed and the outcomes achieved, there is a good case for making further investments that will allow scaling to be achieved and understood. The review observes that each basin has examples of outcome achievements that show potential for further investment — these opportunities have been articulated in key basin messages developed and published by CPWF (Fisher and Cook, 2012). It is vital that these promising direct household-level interventions are supported — within the innovation platforms that have been critical to the creation of these household benefits — to proceed through their scaling stages.

7.3 Contributions to capacity strengthening in research for development systems, including research and other skills and relationships needed for collective research and development planning and action in the water and food arena

The review finds that CPWF has achieved considerable success in research capacity building. This has been achieved as a result of the targeted support of young regional scientists in projects, through training and mentoring. In the Mekong CPWF has partnered with a regional organization (M-POWER) that targets research capacity building on water governance.

The review also observes that there are a range of practices, relationships and attitudes that have resulted from the way CPWF was implemented. According to the review, this represents a strengthened capacity of R4D systems on water and food at the basin-level. For example, the Agricultural Research Council of South Africa is now working with the Department of Water Affairs. In Peru the Ministry of Environment routinely involves researchers in the design of benefit sharing mechanisms. In the Mekong Chinese stakeholders have been brought into dialogue and relationships have been set up on water, food and power issues. In the Limpopo functional relationships have been established between the Limpopo

Water Commission (LIMCOM), Southern Africa Development Community (SADAC) and other national and regional water and food stakeholders. Not only has this built bridges between water and food silos, but it has also opened up spaces for research and development planning and action that did not exist before.

The review considers this to be evidence that, as a result of CPWF, nascent communities of practice have been created in the basin programs with a shared philosophy about how research can be integrated into processes aimed at impact delivery. These communities are fragile and need continued support if they are to sustain the achievements of CPWF and deliver impact at scale in the future. These communities include researchers that have been involved in the CPWF process and who tell the review that they have learned immensely from this experience. They also include regional bodies such as FANRPAN and Global Water Partnership (GWP), who recognize the dynamic that has been created through a stronger water and food community and express a desire for a "frank conversation" with the CGIAR about how, as an international research organization, it can best contribute to these communities in the future.

The review believes that one of the key legacies of CPWF is the process and collective capacity it has catalysed in the basins and this represents an opportunity for others who wish to pursue poverty reduction around water and food.

It is also worth noting that CPWF made considerable efforts to develop the capacity of its own staff to work in an R4D modality. A key capacity building innovation was the establishment of a "peer assist" mechanism. This involved a series of workshops where the basin leaders presented the experiences of work in their basins, critiqued each other's work, and shared lessons on what was working and what was not. This internal reflection process allowed CPWF staff to progressively develop the professional skills to work in the R4D modality that they aspired to. This not only leaves behind a skill base in working in this way, but it also holds lessons about how reflective learning and change can be organized to build the capacity of staff working on R4D programs.

7.4 Contributions to the global water and food agenda

At its design, CPWF was envisaged as becoming the primary international effort in setting and evolving the research agenda related to water and food in ways that would influence the demand for knowledge and secure the financial alignment of others, including the budget allocations of research funding organizations. Such global vision has not been attained, and indeed, the global impact ambition was reined in by ER2007 (CGIAR Science Council, 2008). The review also notes that while the global influence of CPWF has been a gap, staffing cuts in the management team at a time when the program was only just starting to marshal credible global messages was a significant limitation. Nevertheless, this review offers the following observations:

- The launch of the CPWF was conjunctive with the Comprehensive Assessment and the multi-stakeholder Dialogue on Water and Food, both having significant drive from within the CG-system. While this offered prospects for synergy, at the same time congested space was created, with different timelines for announcing their agenda setting intentions, with the Comprehensive Assessment being the earliest entrant.
- During the lifetime of the CPWF, other major actors have sought to influence the global agenda, including the World Bank's re-engagement in Agricultural Water Management (AWM), and the Collaborative Assessment of AWM in Sub Saharan Africa, while during Phase I the AU/NEPAD CAADP rose in prominence with its Pillar I on 'Land and Water' followed by national and regional CAADP Compacts, and increasing prominence of water for poverty-reducing economic growth within National Growth and Poverty Reduction Strategies, and the series of regional position papers informing the series of World Water Forums.

- At its launch CPWF focused on increased water productivity. In response to the then-recent World Summit on Sustainable Development (WSSD) target on *"Increased food production, to achieve targets for decreasing malnourishment and rural poverty, without increasing global diversions of water to agriculture over the 2000 level"*, the *"CGIAR takes on the challenge of increasing water productivity in food production through the CGIAR CPWF"*. Water productivity has been a central paradigm of the CGIAR's engagement at the interface of agriculture and water, notably of the Comprehensive Assessment. One of the CPWF's principal contributions on water productivity at the global synthesis level has been to "revisit the concept of water productivity and discuss its utility as we found in applying it during the CPWF", concluding "that it is a useful measure, but needs to be applied with caution". The CPWF concludes that water productivity is not the critically important factor that it was assumed to be when the CPWF was initiated. The CPWF's association with the WSSD target does not figure prominently after the original proposal.
- Instead, the CPWF 'headline' feed for the global agenda on water and food is that addressing water scarcity is a means of helping achieve broader development goals, including reducing poverty, rather than an end in itself.
- A mid-term message from the CPWF had been that there was sufficient water globally to meet growing food needs, and the principal challenge was one of management. This message stemmed from the CPWF's Basin Focal Project Book (Fisher and Cook, 2012) that reported the baseline and poverty linkages in benchmark basins, and consolidated information on water availability, climate change, productivity, resilience, water and development and water and poverty. Cross-basin analysis drew the significant conclusion that "despite all of the pressures facing our basins today, there are relatively straightforward opportunities to satisfy our development needs and alleviate poverty for millions of people without exhausting our most precious natural resource" (Fisher and Cook, 2012). This messaging formed part of an extensive media campaign by CPWF as it set out to counter the widespread notions of pervasive water scarcity and the dominant focus on efficiencies within existing production systems. While the CPWF message and campaign mirrored the already established perspective on water availability of a number of African National Growth and Poverty Reduction Strategies and of the Comprehensive African Agricultural Development Programme (CAADP) that foresaw sustainable exploitation of an abundant and under-developed resource, the program was also being conducted during a period of massive global investment in climate change adaptation to overcome water scarcity. The final framing within the CPWF Metasynthesis (Chapter 2) (Harrington and Fisher, 2014) provides a mature framing of scarcity amid abundance. While this framing is clearly in line with the CGIAR's long-term response to the environmental pressures on soil and water created by the radical changes in farming systems during the Asian Green Revolution, the messages are less clear on the African political direction to exploit an underdeveloped water resource for poverty reduction, and the longer-term driver of an African population that is set to reach 4.2 billion by 2100, a more than five-fold increase.
- The ER 2007 (CGIAR Science Council, 2008) encouraged a stronger engagement with the water sector, and this has led to a much stronger engagement with the integrated water management agenda, with agricultural water framed amid other competing uses and multiple use opportunities. With a deliberate focus on the rain-fed sector under the Basin Development Challenges of Phase II, the core agricultural water management agenda — around agri-businesses, value chains, virtuous financing cycles, investment domains, particularly in the small, medium and large-scale irrigation sectors — as encapsulated in the core agenda of other actors has not attracted the same level of programmatic attention, although parts of this 'core business' agenda have undoubtedly been furthered within rain-fed settings within some individual projects.

- CPWF has made efforts to connect water, food and poverty, globally, and at the basin level. However, the final compilations of poverty-related material leave some significant gaps in the conceptual framing of CPWF's original intentions to contribute to household food security, poverty reduction, improved health, and environmental security. Where agricultural water has been frequently cited as using 80-90% of global water withdrawals, it is suggested that an opportunity has been lost to market positive advocacy messages on agricultural water's contributions to pathways out of poverty — past and future.

In summary, this review finds that CPWF has contributed to, but has not concluded on setting and evolving an international agenda on water and food. The reduction of the profile of the water productivity issue carries implications for the advocacy of the CGIAR around water productivity. The emergence of a wider set of contributions to the global water and food agenda by other prominent actors has created current space for a reformulation of the water and food agenda through a multi-partner effort, that merges both core AWM business and wider natural resources issues, but in a way that, critically, will reflect significant regional and continental differences. That reformulation would, it is suggested, be most effective if framed to advance agricultural water's different contributions to pathways out of poverty, and is justified by increasing political attention to agriculture and the emerging post-2015 agenda, which envisages an expansion of irrigation. Further synthesis of Phase II research findings (which have only recently matured) could make a valuable contribution to these global debates.

7.6 Contribution of CPWF to the ongoing reform of the CGIAR and its transformation into a research-for-development organization

The review observes significant frustration within CPWF over the perception that its experiences have not been more influential in shaping the ongoing reform process of the CGIAR, particularly the development of the CRPs. As noted earlier the parallel implementation of the CPs and the development of the CRPs have been partly to blame. In reality it is only relatively recently that CPWF has been able to arrive at a synthesis and articulation of its R4D approach and its value. This review endorses CPWF's belief in the value of its approach (with some caveats mentioned below). However, over and above the principles and processes involved in the R4D approach, the review believes that CPWF has made significant progress in illuminating the contours of a global R4D system on water and food (this is elaborated in further detail in the 'ways forward' section). This is a major contribution to helping develop a shared understanding of what R4D success looks like.

CPWF's experience suggests that there is potentially enormous impact value in organizing research as part of integrated research and development platforms at multiple scales (local, national, regional/basin, and global) with strong interconnections between these levels. CPWF was more successful at supporting platforms at the local and regional level. However, there was a clear (but only partially fulfilled) potential to bridge and create synergy between the immediate research and development challenges in regions, particularly the impact delivery challenge, and the long-term global water and food agenda. The review believes that a research modality of this sort represents frontier science for systems domains such as water and food. A catalytic, science-informed role that helps strengthen the functioning of a global R4D system is a space that CGIAR's centers could and should occupy. It does, however, imply that the CGIAR should continue a path of transformation from centers of research excellence to facilitators and practitioners of global research-for-development excellence. (Lessons for the CGIAR and international agricultural research and development are elaborated further in the findings and lessons section).

8. Main Findings, Lessons and Challenges

8.1 Main findings and lessons

1. CPWF was a valuable pilot in R4D that warrants further experimentation. The review broadly endorses the lessons CPWF has developed about its use of the R4D approach and the value of this implementation strategy as a way of achieving development outcomes. The achievements of CPWF as an R4D pilot are sufficient to warrant further experimentation and development of this new paradigm of research in successor programs in the CGIAR. The approach is particularly relevant for research dealing with systems-based development challenges such as water and food.

2. Contributing to poverty reduction at the water and food interface needs systems-oriented research modalities. The CPWF experience suggests that one can better explore challenges at the water and food interface by adopting a systems-oriented research modality that recognizes that, beyond bio-physical factors, there is a complex interplay of social, economic, policy, institutional and political factors. This has implications for the disciplinary mix of research teams and this, in turn, shapes patterns of research partnerships needed to perform research activities. It also implies stronger situational assessment of organizational architectures, networks, stakeholder analysis, policy and political dynamics. CPWF made good progress in explicitly investigating stakeholder arrangements in impact pathways and this paid dividends in subsequent partnership and engagement strategies. CPWF gave less attention to the global landscape of water and food initiatives, but this is clearly an arena that deserves similar attention in future R4D programs.

3. Developmental framing of water and food challenges, organized at a basin level, sharpens impact focus and improves opportunities for alliances that lead to outcomes. CPWF's shift in framing the problem as a basin development challenge was critical in the progress it achieved in taking research outputs to development outcomes as it allowed the program to engage directly in the development agendas of local stakeholders. This helped build ownership of the program among stakeholders and aided uptake of research. This change in CPWF's strategy required a degree of decentralization of the program and necessitated much greater sharing of resources with local research and development organizations. This, in turn, also delivered dividends. It led to distinctive basin approaches that were adapted to the water and food stakeholder architectures and political dynamics in each region. It also helped build research and related capacities in local organizations, which has strengthened the program's sustainability.

4. Combining different research and research-informed activities proves valuable in the long-run. Stakeholders have adopted findings from original pieces of CPWF research. However, CPWF also had considerable success in taking existing research findings, often in the form of implementation protocols, and working with development stakeholders to adapt these to local situations. Other instances involved combining existing data sets and making these accessible to all stakeholders. One overwhelming piece of feedback from development stakeholders was the need for more efforts in packaging research results in ways that they could be of value in investment choice, planning and implementation. This underlines the value of combining different research and research-informed activities (for example, research into use activities) within an R4D program.

5. Research can be highly relevant to local stakeholders even if not globally new. In some basins research findings turned out to be surprisingly valuable to stakeholders, despite not being globally significant. For instance, poverty mapping databases provided information that had not previously been available in the region. In other cases CPWF needed to undertake collaborative research (around participatory processes, for example) with stakeholders in order to get their buy-in into process lessons

that are already mainstreamed in the global arena. This adaptation of research in a local landscape has achieved both buy-in (ownership and empowerment) as well as development outcomes — sustainability and potential for scaling up.

6. Building on existing research and development trajectories is more effective than starting from scratch. No CPWF intervention had a 'point zero' in real terms — in all cases, the program intervened in geographies and thematic areas where others (including previous CGIAR research) had already taken action, where some knowledge had been generated, and where stakeholders were engaged in one way or another. Some of the most successful projects used CPWF strategically to continue their trajectory towards wider development objectives (such as increasing incomes and food security, or reducing poverty). This also highlights the value of local organizations taking the lead in activities.

7. Investing in engagement activities helps build broad alliances and a critical mass of partners that are needed for research uptake and impact. CPWF, in addition to investing in research, invested considerable resources in engagement and process activities designed to build relationships with and between stakeholders in the water and food arena. This research-informed process of engagement proved valuable in helping identify relevant research questions, establishing partnerships to execute the research process, developing buy-in into research findings and building alliances with development organizations that could use CPWF's findings in intervention planning and implementation. These engagement processes need to be backed up by a set of program principles and skill sets related to the quality of partnerships, transparency, participatory ethos and openness to resource sharing. It also requires customized M&E arrangements that can track network development and behavioural changes in these networks.

8. R4D system capacities need to be a key program outcome. CPWF has created a nascent community of practice in its basin programs that is starting to have a shared philosophy about how research can be integrated into processes aimed at delivery impact and development. This is founded on skills, relationships and practices that result directly from the efforts of CPWF. Its value is that it represents a collaborative, systems capacity to effect change in the water and food arena. The emergence of such systems capacities needs to be recognized as a metric of success of an R4D program. The challenge for successor programs is to build on this capacity and continue its development into a global community of practice on delivering impact in the water and food arena.

9. There is a need to achieve a balance between regional and global water and food focus. CPWF achieved considerable success in shaping the water and food development agenda at the basin level. It was less successful in influencing the global water and food debate, particularly in terms of inserting an impact delivery message into its agenda, which may have led to longer-term and wider-scale impacts. Achieving a better balance between regional and global foci — and better bridging these so that regional experiences and agendas could influence the global agenda (and vice versa) — would have strengthened the impact of the program. However, opportunities still exist for re-engaging in the global water and food agenda in the post-2015 discussions.

10. An explicit research focus on understanding impact delivery mechanisms in different contexts, and continuous reflection on the most appropriate role and organization of international research in these delivery mechanisms, proved valuable. CPWF made explicit efforts to research the R4D process that it was experimenting with and this has been among its key intellectual achievements, with great inherent value to international agricultural research. This reiterates the worth of all agricultural research programs that dedicate specific efforts to understanding impact delivery mechanisms and continuously reflect on the most appropriate role and organization of international research in these delivery mechanisms.

11. Impact at scale requires the action and collaboration of others in implementation and this is still new territory for R4D. In the water and food arena impacts at scale will only arise directly through the actions of public and private stakeholders and development planners, investors and implementers (at regional and global levels). CPWF succeeded in changing the practice and policies of many stakeholders. However, it did not enter a mode of operation where it worked with development stakeholders in interventions delivering impact at scale. This is not to underplay the importance of its influencing role and achievements. However, it suggests that there is a mode of research that requires R4D programs playing an advisory and analytical role in major development interventions. Alternatively, it suggests the need to find governance mechanisms to allow R4D programs to attract development financing for interventions implemented by the program or its partners. Only then can R4D truly generate lessons on how to deliver impact at scale.

12. A new role for international agricultural research organizations. Many of the above findings suggest that some thought needs to be given to the role of CGIAR centers in R4D programs. The picture that emerges from the review of CPWF is one where the key role of CGIAR programs is chiefly concerned with facilitating and brokering a science-informed process of integrating research into development practice and planning — albeit better done at the regional than global level. It could be argued that this is a role of developing the capacity of systems to better use research resources — irrespective of whether these resources are located in local or global arenas. As a mode of operation, the CPWF experience seems to suggest that such an approach has great promise for progressing towards impact. This is not to diminish the value of research undertaken by CGIAR scientists. Rather, it is about a changing emphasis from planning and leading research, to supporting the planning and execution of research by others and contributing specific complementary research expertise and other expertise. This is a view that is shared by a number of policy-level regional stakeholders who continue to recognize the unique contributions international research organizations can make, but feel that the most appropriate role of the CGIAR centers needs to be clarified.

8.2 Challenges and choices for progressing R4D in international agricultural research

The review feels it is important to highlight some of the challenges that adopting an R4D approach presents. The approach has implications and choices have to be made by those who wish to follow the R4D route. These include:

1. Investments in non-research activities. The partnership and engagement process involves significant investment in non-research activities — convening dialogue, relationship building, communication, etc. Evidence from CPWF suggests that these activities have created the necessary conditions for conducting novel research at the water and food interface and have led to development outcomes. There is, nevertheless, a large non-research cost in this approach.

2. Greater sharing of resources with partners. Engaging in a more wide-ranging set of partnerships has implications for resource allocations. Inevitably this means that non-CGIAR partners need to be allocated a substantial proportion of the budget. Evidence from CPWF suggests that this pays dividends in terms of relationship building, capacity development, accessing a diversity of research and development expertise and empowering regional stakeholders.

3. Maintaining research agenda coherence in stakeholder-driven research. Partnering with regional stakeholders and empowering them to set research and development priorities decentralizes the research agenda, increases focus on immediate development needs and presents challenges in focusing on global long-term research objectives. CPWF's experience suggests that a basin-driven research agenda

strengthens stakeholder buy-in and uptake. It also suggests that programs need to play a stronger role in synthesis across basins and a stronger bridging role between basin-level and global-level research and development agendas.

4. Systems-driven lines of research enquiry. A systems research perspective on water and food issues can lead to lines of enquiry and entry points that fall outside program and organizational mandates — for example, energy in the Mekong or goat value chains in the Limpopo. Similarly, research and development trajectories can logically progress into unexpected lines of enquiry and activity. CPWF's experiences suggest that adaptive management, which allows this to happen, can be critical in achieving development outcomes. It is, however, important to be aware of these unexpected directions and to be comfortable with the consequences of these, especially when they are at odds with program and organizational mandates and imperatives.

5. Reframing frontier science. One of the key challenges of R4D that emerges from CPWF is that it challenges existing notions of frontier science and research excellence. In particular, it elevates the value of information utility and uptake to the same level as information novelty (from research), with the process of achieving uptake being inseparable from the research itself. The experience of CPWF suggests that this is a valuable way to organize research, but also that it presents challenges for conventional research performance frameworks and metrics.

6. Metrics of success. A key challenge with R4D concerns performance metrics. The experience of CPWF suggests that one of its major contributions has been in the development of the capacity of water and food R4D systems at the basin-level. This is both a contributory factor in the success of achieving development outcomes, but it has also been an outcome in its own right. Reporting this achievement in a convincing and succinct way remains a challenge. It is, however, a challenge that R4D organizations will need to address and incorporate into existing performance frameworks. Development impacts will also still need to be reported, but these will need to be portrayed in a much more distributed fashion, reflecting the collective mechanisms needed to achieve them despite funding imperatives that stake claims on success.

7. An integrated suite of tools and principles. The R4D approach of CPWF involves a wide-ranging suite of principles and tools (some new, some more familiar). Evidence from CPWF suggests that principles and tools cannot be cherry picked. The power of these lies in their integrated whole.

8. Professional and institutional transformation. The experience of CPWF suggests that successful R4D is contingent on people and their enabling environment in programs. Give the wrong people the right tools and R4D will fail. Get the right people and the wrong program enabling environment and R4D will fail. The challenge for implementing R4D is that it does require professional and institutional transformation to make it work and this does not seem to be widely understood as a necessary starting condition. This will require new skills, but also new attitudes. CPWF invested considerable time and effort into establishing an on-going process of capacity building for its staff and helped them continuously develop and improve their R4D skills through reflective learning (the peer assist process).

9. Ways Forward: Recommendations

9.1 A vision for moving forward

This review believes that the experience and process of CPWF presents a number of opportunities for furthering the agenda of poverty reduction in the water and food arena. These opportunities arise from the "sunk investment" made by CPWF in research and development outcomes, partnerships and capacity building, and are relevant to a range of stakeholders — WLE, other CRPs, regional and international research organizations and development investors.

In generic terms these opportunities include:

- There is no need to relearn R4D style program implementation from scratch. It is possible to build on the operational lessons from CPWF, particularly the importance of the diversity and quality of partnerships with development organizations for delivering outcomes and impact.
- Complete the R4D experiment by engaging in development activities that go to scale. This needs new funding partnerships and modalities.
- Capitalize on Phase II research findings that are yet to mature and use them in regional and global agenda debates.
- Build on water and food R4D systems capacities (skills, networks and alliances) in the basins and research and development trajectories that have been initiated.
- Use CPWF experiences to make R4D challenges and choices explicit to researchers, donors, other CRPs and CGIAR governance (capacity building).
- Undertake a stocktaking of opportunities, with a strategic conversation about the respective roles of CGIAR and other stakeholders, and the nature of both research and development investments needed to strengthen the capacity of the global system to deliver impact.
- Build on lessons about how the professional transformation of program staff needed for R4D implementation can be supported.

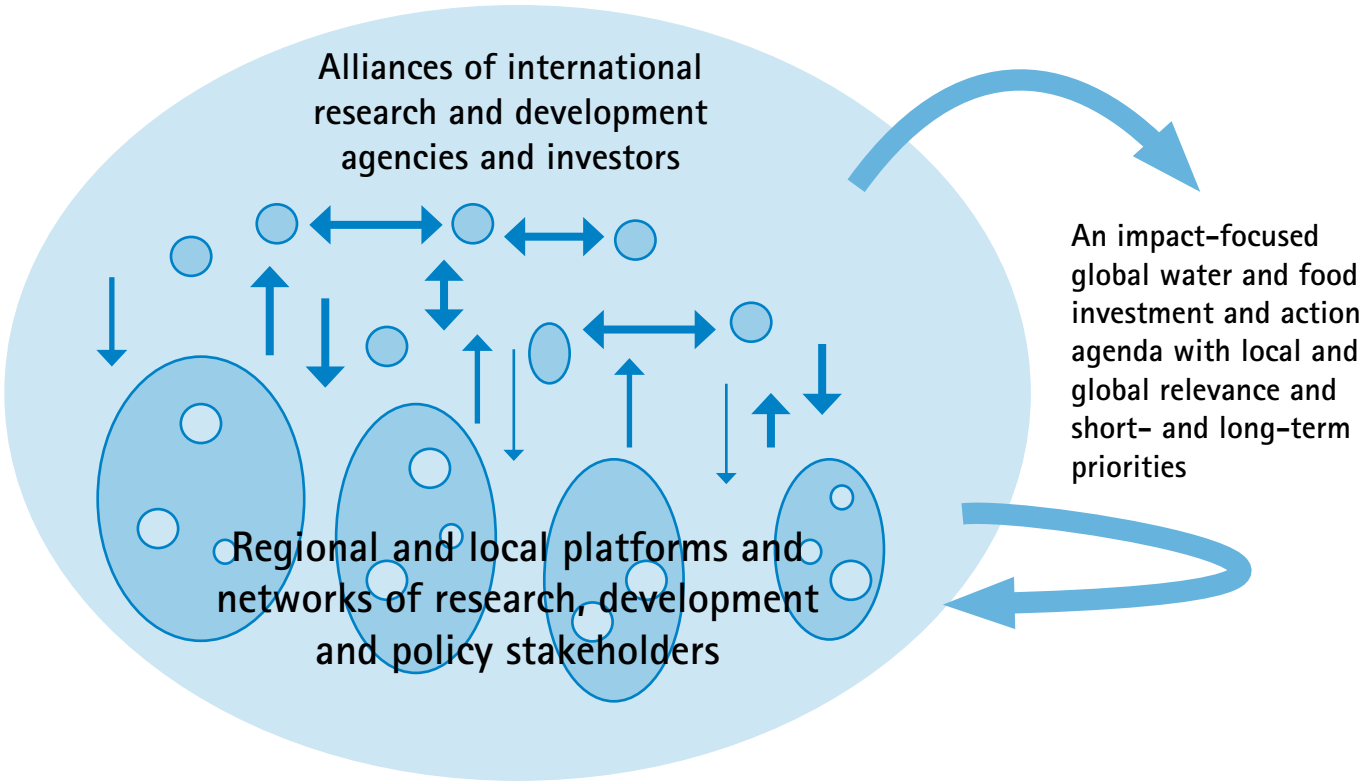
However, this review also notes that these opportunities need to be understood through the vision of success in the water and food domain that emerges from CPWF's progressive development of R4D thinking and practice. This is a vision of an effective global R4D system on water and food. CPWF's own documentation of its experience has elaborated the underlying conceptualizations of the nature of "wicked problems" such as poverty reduction in the water and food domain and the need to engage with these as complex system phenomena. It has also demonstrated the value of embedding research in development planning and action at local to global scales. This review has noted that linking local and regional efforts and priorities with the global water and food debate was an unfinished task in CPWF. CPWF, nevertheless, recognised the critical importance of this task in building coherence across a global system of research, development and other stakeholders.

In order to frame its recommendations for ways forwards this review has to elaborate this vision and endorse its relevance for progressing R4D as a mechanism to drive poverty reduction in the water and food domain (see Box 5 and Figure 1).

Box 5: A Vision of a Global R4D System on Water and Food

A global R4D system on water and food comprises a global coalition of research organizations, development investors and public and private sector stakeholders who collectively deliver impact in the water and food domain in response to local-to-global and immediate-to-long-term agendas through a process of pooling knowledge and other resources and integrating research with development planning and practice. The system has strong feedback loops so that local and immediate agendas inform global and long-term agendas and vice versa. These feedback loops also drive a continuous search for and refinement of ways of organizing impact delivery that are appropriate to the changing food and water agendas of stakeholders at different levels of the system. In practice a global R4D system will resemble a nested and interlinked set of innovation platforms that host the interactive processes needed to drive a continuous process of innovation and impact. The system values different sorts of research-related endeavours, from basic research through to communication of research results. It recognizes that research resources exist in both local and global arenas and each arena has distinctive comparative advantages in responding to different elements of the local-to-global food and water impact agenda. This is a new paradigm of research that embeds research in the efforts to deliver impact and combines the power of responsive, demand-led research with the power of opportunities arising from advances in the global scientific knowledge frontier.

Figure 1. A global R4D system on water and food



This vision is contestable. However, it fills the gaps in articulating an explicit conceptualization of the role CPWF-like interventions have at local to global scales. This review believes that the absence of such a vision has been a major bottleneck in conducting constructive conversations about the value of CPWF's approach and the nature of achievements that can be built upon. This vision of a global R4D system helps identify: opportunities from sunk investments in research, development outcomes and capacity building; the nature of both research and development investments needed to strengthen the capacity of the global system to deliver impact; and critical stakeholders (including donors) that need to engage together to clarify the respective roles they should perform within this wider system.

This review is not suggesting that WLE as CPWF's successor could or should take on the responsibility for the whole research and development agenda of the global system envisaged here. Rather, it suggests that this vision provides a lens to undertake a stocktaking of current sunk investments and as well as a framing for the strategic conversations that are needed so that domain stakeholders can take advantage of the opportunities that arise from the CPWF experience. WLE, as a successor to CPWF, is probably best placed to use this vision of a global R4D system on water and food to organize this stocktaking and orchestrate these strategic conversations. This process may lead to actionable implications for WLE and it would help avoid the costly reinvention of the lessons and approaches that emerge from CPWF. However, it is anticipated that this process will also be catalytic in advancing a more impact-oriented global water agenda that a range of regional and international stakeholders will both own and need to act on.

9.2 Recommendations for advancing lessons and opportunities arising from CPWF

While the previous section presents a vision and process for taking forward the lessons and opportunities arising from CPWF, the review is also mandated to suggest some concrete actions for WLE, the CGIAR and other CRPs and water and food domain stakeholders more generally. This review recognises that it cannot be prescriptive, and that uptake of recommendations made will be determined by a wider set of considerations beyond the scope of this review. However, enough direction is given to allow different audiences to consider practical courses of action that could be followed. In relation to specific recommendations for WLE, this review has focused on CPWF and has not reviewed WLE and its current and future plans. This limits the degree of precision to which recommendations can be made.

In presenting these options the review has taken into consideration:

- Making the most of the opportunities arising from CPWF's legacy as it transits into WLE, recognising that there are both short- and long-term dimensions associated with WLE's progression from its own Phase I to Phase II.
- Leveraging lessons and capacities in other CRPs, particularly the systems-oriented CRPs in the CGIAR as it progresses its own transformation process more generally.
- Implications for development investors and other sector stakeholders.

Opportunities for WLE

Build on CPWF's progressive learning-driven development of R4D.

This review endorses CPWF's R4D approach, but recognises that it emerged from practice over many years in the specific context of CPWF. Nevertheless, WLE is likely to face many of the same challenges as CPWF as it evolves its own R4D approach in response to demands for impact and wider partnerships, the systems nature of its problem domain and the inherent tensions between short-term

development needs and long-term strategic direction informed by science. It is not suggested that CPWF's R4D approach can or should be transferred wholesale to WLE. In fact, this would miss the central idea of R4D as an approach continuously "in the making". CPWF has certainly demonstrated the effectiveness of a number of core principles related to explicit development framing of research, and research-informed processes of partnership, engagement, subsidiary, knowledge management and communication (described in section 6). However, what also seems to have been key is the way that the application of these principles was wrapped in a set of monitoring, evaluation and learning arrangements. This not only helped fine-tune the application of these principles, but was also a key means by which CPWF staff built their own capacity to work in this way. This modality of professional transformation will be equally important in WLE as it starts to develop its own manifestation of R4D. The experience of CPWF suggests this will require strong leadership to support a culture of reflection and learning as well as investment in specific mechanisms such as the "peer assist" techniques. In the same spirit, WLE should consider organizing formal reflection in the form of a facilitated workshop to help learn lessons from CPWF, drawing on key staff from the program.

Build on CPWF sunk investment in people, capacities and networks in the basins to strengthen the enabling environment for impact.

One of the striking legacies of CPWF is what this review has referred to as "nascent communities of practice" in the basins. These are the networks of research and development stakeholders that have started to collectively develop a shared approach to poverty reduction in the water and food domain. CPWF has built considerable goodwill as well as relationships and skills in these stakeholder communities. This represents a collective regional capacity that can be built on. Yet, this capacity remains fragile. WLE has the opportunity to capitalise on this collective capacity and strengthen it further. It is worth bearing in mind that it will be the actions of this group of stakeholders that will orchestrate impact both at the household level as well as in the policy environment. Continued investments and consultation with these nascent communities of practice, perhaps by using these as a key implementation vehicle for WLE, would strengthen the enabling environment for impact and contribute to the delivery of impact results. Developing explicit plans on how to engage and strengthen these communities of practice would be one way of progressing this agenda.

Invest in CPWF activities that have the potential to go to scale.

The review noted that while CPWF had piloted a number of community-level interventions that had the potential to go to scale, these were not progressed beyond pilots and impact at scale was not achieved. For example, livestock fodder in Ethiopia, rainwater harvesting and livestock value chains in Zimbabwe, livelihood opportunities around revised dam operations in Mekong, etc. If WLE adopted these pilots into their work plans, and developed appropriate scaling and partnering strategies around these, impact at scale could be achieved early in the program cycle. The value of these scaling up activities is not only the impact these deliver, but also the opportunity they present to learn about the process of going to scale. This last point has been a key omission in CPWF's development and assessment of R4D and would add value to the CPWF experience. Detailed articulations of these opportunities are presented in the CPWF basin messages documentation (Fisher and Cook, 2012) and these should be a key point for reference for WLE.

Re-instatement of development-oriented topic working groups.

The review noted that one of the more promising initiatives of CPWF that was cut short was the topic working groups. These not only have the potential to link researchers and others within a program across regions, but they also have the potential to link to external research and development stakeholders. The WLE Research Coordinator could draw on these, and frame and 'locate' WLE programmatically within the evolving post-2015 development framework.

Plan for impact at scale during the life of the program.

CPWF was initially designed to be a three-phase, 15-year program. When the program undertook planning for an outcomes-focused Phase II it did so with a Phase III in mind, during which the program expected to focus on achieving outcomes at scale. With the creation of the CGIAR Research Programs, CPWF's plans for a third phase were extinguished and the program struggled to demonstrate impact at scale within its shortened timeframe.

This led to a legacy of interrupted scaling pilots and relatively modest levels of household-level impact. WLE might consider revisiting the impact targets it wishes to achieve during its own program term (10 years) and identify early on the development partners it will need to work with if these targets are to be met. CPWF also found that outcomes (policy, institutional and other behavioural changes) were key intermediary deliverables on the pathway to impact at scale in complex systems arenas such as water and food. Negotiating the importance of these sorts of deliverables with funders of research at the outset may help forestall accountability tensions later on.

Invest in CPWF's unfinished messages.

CPWF has synthesised much of its research in its forthcoming metasynthesis book (Harrington and Fisher, 2014). However, this has not captured more recent research completed up to the end of the program in March 2014. An opportunity exists to incorporate these more recently matured research outputs into basin and program-level messages. WLE could consider ways of making the most of these research findings — perhaps by supporting activities that would allow existing lines of research to be brought to a logical conclusion and synthesising higher-order global messages from this work.

Understanding regional policy settings.

CPWF's analysis of regional water and food policy settings was relatively weak. This hampered its ability to exploit national and regional policy directions and dynamics and the implications and opportunities these hold for priorities, collaboration and impact. WLE could consider giving a stronger focus in its regional focal areas to understanding policy contexts and dynamics (e.g., National Visions, National Growth and Poverty Reduction Strategies, Compacts, AgSWAPS, Basin Plans and also non food:water policies such as those around trade, gender, decentralisation, etc). This would help make explicit political directions and opportunities, including the policy instruments most likely to be significant in the enabling environment in their distinctive post-2015 settings. While this could be achieved by policy scoping studies, it would be more useful to combine this with policy dialogue events to strengthen engagement with key policy stakeholders. WLE has the legitimacy to convene these dialogues.

Hosting the collaborative development of an impact-oriented Agricultural Water Management/ Water and Food narrative.

One of the weaknesses of CPWF was the extent to which it was able to influence the global debates around water and food. Partially, this was because these debates had taken place in a congested space of overlapping initiatives. WLE might consider hosting a collaborative assessment of the emerging narrative around agricultural water management and water and food, framed within post-2015 development objectives. This would need to take account of significant inter- and intra-continental differences and political drivers. It would also be an opportunity to highlight so-called 'unconventional messages', where a program's findings might be considered to be running contrary to prevailing mainstream thinking; for example, following CPWF's lead in challenging the water scarcity/ use efficiency argument. This may be an event, backed by and targeting the main financing and advocacy institutions in the water and food domain.

Options for the CRPs and CGIAR

R4D capacity building in the CRPs and the CGIAR

The ongoing reform and transformation process in the CGIAR centered around the CRPs mirrors the transition to R4D that CPWF has piloted. The documentation that CPWF has developed on R4D and the expertise its staff embodies is an extremely valuable resource to systems CRPs and the CGIAR in general. The vision of a global R4D system that emerges from CPWF could make a valuable contribution to framing capacity building and future partnering strategies. However, the experience of CPWF also reveals the scope of the R4D capacity building task — it involves new tools, new professional skills and mind sets, new organizational structures, new institutional arrangements related to measures of professional performance, research excellence and evaluative frameworks more generally, and partnerships, networks and alliances and the institutional setting to support and make these meaningful.

A major conclusion from CPWF is, therefore, that not only is the capacity building task large in scope, but also that training of researchers in R4D tools is only one element of the task of professional, organizational and institutional transformation needed to make R4D a reality. It needs progressive systemic change across all levels of the operation and governance of the CGIAR and its CRPs. Furthermore, there is no blueprint for what this transformed capacity should look like — although many of the principles emerging from CPWF point to indicative practices. Instead, as the experience of CPWF and many other commentators on capacity building in the CGIAR have pointed out (Horton and Mackay, 2003), the key task is to legitimize and institutionalize the process of continuous reflection that drives incremental institutional learning and change. Again, as the experience of CPWF and the global experience on capacity building has shown (Horton, 2012) this needs strong leadership and commitment, coupled with the development of a reflexive culture of openness and adapting research practice to better address the challenge of improving the contribution of research to development.

A review of this type can never prescribe precisely how the CGIAR should approach the structuring of this capacity building process. However, as a starting point reflective learning could be targeted on four interrelated areas of capacity building associated with a shift to R4D:

- **What works and what doesn't work:** Critical analysis and reflection on tools, approaches and professional attitudes within and across the CRPs and the identification of training and staffing priorities
- **Organisational and institutional challenges of R4D in CGIAR:** Critical analysis and reflection of the implications of existing arrangements for a shift to R4D
- **Renewing partnerships:** Strategic conversations with regional research and development stakeholders about the appropriate roles and responsibilities of the CGIAR in a global R4D system
- **Re-visioning:** Goals and objectives of a reforming CGIAR

Options for systems-oriented CRPs and development delivery agencies

A forum on delivery/bottlenecks to impact

A clear message from the CPWF experience is that the question of how to move from research outputs through outcome to the delivery of impacts is a topic that is poorly understood and is one of the key challenges that R4D needs to unlock. This is an issue that is likely to be generic across all of the systems-oriented CRPs. Development agencies and investors who operate in the delivery space also face this same delivery challenge. Creating a global forum that brought together the CRPs and the wide range of delivery actors to make explicit their principal delivery and uptake challenges within the water and food

agenda would help identify opportunities to unlock these challenges. CPWF's messages on performance factors beyond technologies would make a valuable contribution to a forum of this sort. The vision of a global R4D system that emerges from CPWF's experience could provide a useful framing for the deliberations of this forum. The CRPs may wish to consider hosting such a forum in partnership with a development delivery agency such as IFAD. This would be one way of supporting the capacity building agenda discussed above.

Annex 1

Forward-looking review of CPWF: Terms of Reference

Background

The Challenge Program on Water and Food (CPWF) has been a 10-year investment by the CGIAR aimed at raising water productivity and improving food security while helping alleviate poverty, improve health, and attain environmental security.

These are all issues that sit at the complex interface of water and food research, practice and policies. The CPWF sought to address these issues through a new quality of partnerships among International Centers, advanced research institutes (ARIs), national research and extension systems (NARES), the NGO community and other partners, and through a cross-scale INRM approach that links field and farming systems to catchments, basins, and regional and international scales (CPWF, 2002).

A further aim of CPWF was to inform the wider CGIAR on ways to deploy research so that it is more likely to contribute to favourable development outcomes. It is anticipated that a forward looking review of the CPWF should identify its contributions and highlight what would be appropriate to take forward in substance and process terms under WLE (or other CRPs).

On the principal issues of water scarcity and water productivity, the CPWF concluded during the course of its work program that the planet does, in fact, have enough fresh water to meet the full range of needs for people and ecosystems for the foreseeable future, but that social and environmental equity will only be achieved through careful and creative management of water resources — how and by whom water is managed (Fisher and Cook, 2012). It was at this point that the CPWF expanded its relatively narrow focus on water productivity to more directly address water-related development challenges.

The program has generated evidence that suggests that its research and associated activities have led to tangible outcomes that impinge on water management and food security. In addition, in its second phase the CPWF has developed a series of institutional innovations in the way it conducts its research. These innovations focused on framing its research with an analysis of impact pathways and a proactive engagement through dialogue and partnership with key stakeholders and change agents in these pathways. CPWF refers to this as a research for development (R4D) approach. The program has generated evidence that suggests that R4D has allowed it to achieve tangible outcomes that would not otherwise have resulted from conventionally framed research.

Review objectives

The focus of this review is three-fold (with some adjustments in terminology, these broadly follow OECD DAC development evaluation criteria [3]).

1. To provide an independent assessment of CPWF research *outputs* (research products), related *outcomes* (changes in decision-maker policy or practice influenced by outputs), the *sustainability* of these outcomes after program closure, and nascent *impacts* (consequences of outcomes/ decisions for livelihoods, food security and other development objectives) along with the *relevance*, scale, and targeting (men/women/different groups) of the program.
2. To explore the *effectiveness* of the program and particularly of the R4D approach in achieving these outputs and outcomes and drawing lessons for future program design and more generally for the use of agricultural research in complex development domains.

[3] See http://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm

3. To explore and *draw lessons* about the effectiveness of the Challenge Program model and highlight what would be appropriate to take forward in substance and process terms under WLE (or other CRPs) as the CGIAR reform process unfolds. Particular attention should be placed on the effectiveness of the coordination elements of the program in each of the basins.

Suggested review guiding questions

One way to structure the guiding questions for the review is through what has been termed "Outcome Harvesting" [4]. Outcome Harvesting is like forensic science in that it applies a broad spectrum of techniques to yield evidence-based answers to the following questions:

- What happened?
- Who did it (or contributed to it)?
- How do we know this? Is there corroborating evidence?
- Why is this important? What do we do with what we found out?

Answers to these questions provide important information about the contributions made by a specific programme toward a given outcome or outcomes. Combining this with the focus on relevance, sustainability, effectiveness and influence provides the following questions.

Each question should look at what has been done, where the evidence lies and, as a result, what can be learned (and who the learning is for). The questions are linked and will require a process of collective analysis and validation towards the end of the review process.

Assessing outputs

Assess CPWF research outputs as a whole with regard to:

- Credibility (scientific quality),
- Relevance (to CPWF program objectives or basin development challenges),
- Coverage (presence or absence of major gaps given objectives),
- Coherence (complementarity, mutually reinforcing),
- Accessibility (publications, policy briefs, summaries of research outputs and outcomes for different audiences, use of social media).

Assessing outcomes and the output–outcome links

Within an R4D approach, CPWF claims to use engagement processes (platforms, fora, dialogues, negotiation, partnerships, links with decision-makers) to translate outputs to outcomes (desired changes in policy or practice):

- Have CPWF research outputs been used in or central to engagement processes?
- Have CPWF engagement processes resulted in desired outcomes?
- Are these outcomes likely to be sustainable?
- How effective has the CPWF been in translating outputs to outcomes?
- Has the R4D approach been more effective than alternative approaches in developing outputs and translating them to outcomes?

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[4] Ricardo Wilson-Grau Heather Britt, Outcome Harvesting, May 2012, Ford Foundation.
"Unlike some evaluation methods, Outcome Harvesting does not measure progress towards predetermined outcomes or objectives, but rather collects evidence of what has been achieved, and works backward to determine whether and how the project or intervention contributed to the change. Information is collected, or harvested, from the individual or organization whose actions influenced the outcome(s) to answer specific, useable questions. The harvested information goes through a winnowing process during which it is validated or substantiated by comparing it to information collected from knowledgeable, independent sources. The substantiated information is then analyzed and interpreted at the level of individual outcomes or groups of outcomes that contribute to mission, goals or strategies and the resultant outcome descriptions are used to answer the questions that were initially posed."

Lessons

- What are the key lessons from CPWF in the use of agricultural research in complex development domains?
- What lessons does the CPWF experience in R4D provide to the CGIAR system?
- What CPWF lessons should be taken forward in substance and process terms under WLE or other CRPs?
- How should CPWF lessons be best utilized?

Process

A small team of complementary experts to undertake the review over a period of four months, capitalizing on the final months of CPWF operations (and research team configuration) and in early 2014 undertaking analysis and drawing conclusions for dissemination.

Methodology

The review process will require a participative, flexible and iterative approach with a readiness from the review team to regularly communicate with each other and with CPWF, ensuring a learning and reflective process.

The review team will need to consider all six CPWF basin programs though they may wish to focus on specific aspects within a basin in order to highlight some issues.

Review to combine:

- Desk review of CPWF key reports (much already collated through process of the metasynthesis book, basin final messages, institutional histories, and others),
- Interviews with CPWF key actors – both those contracted to the program and those affected by R4D,
- Attendance at significant CPWF events, particularly final basin-level stakeholder meetings, and
- An inclusive validation process, including explicit use of feedback loops and reflection between the review team and the CPWF community.

Key expertise required

1. Team leader: An evaluation and impact assessment specialist with specific experience in the evaluation of international agricultural research and capacity building programs.
2. Water and food specialist: A researcher or practitioner with specific experience of the range of research, practice and policy issues at the water and food interface.
3. R4D specialist: A researcher or practitioner with specific expertise in the design and implementation of research programs that seek to use research for developmental purposes. Familiarity with the CGIAR and issues related to institutional learning and change.

Reference list (to share with Review team) or Bibliography

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Annex 2

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Annex 4

Research Outputs and Uptake in the Basins

River basins have provided a principal unit of coherence for CPWF, initially through nine 'Benchmark Basins' under Phase I, and subsequently under a targeted set of six basins under Phase 2 — the Nile, Volta and Limpopo in Africa, the Andes, the Ganges and the Mekong.

Phase I conducted and reported on basin-level assessments (BFP Book, 2009), reporting the baseline and poverty linkages in benchmark basins, and consolidated information on water availability, climate change, productivity, resilience, water and development and water and poverty.

Phase II was oriented at the outset to contribute to priority Basin Development Challenges, further guided by an overall programmatic focus on the rain-fed sector, identified through consultation as:

River Basin	Basin Development Challenge
Ganges	To reduce poverty and strengthen livelihood resilience through improved water governance and management in coastal areas of the Ganges basin
Limpopo	To improve smallholder productivity and livelihoods and reduce livelihood risk through integrated water resource management
Mekong	To reduce poverty and foster development by optimizing the use of water in reservoirs
Nile	To strengthen rural livelihoods and their resilience through a landscape approach to rainwater management
Volta	To strengthen integrated management of rainwater and small reservoirs so that they can be used equitably and for multiple purposes
Andes System of Basins	To increase water productivity and reduce water-related conflict through the establishment of equitable benefit-sharing mechanisms

Within each basin, Phase II was progressed typically through five mutually supporting projects, of which one was a basin coordination and management Project.

Highlights of research outputs and uptake in the six basins are as follows:

Mekong: With a portfolio of 20 projects, Phase II identified practical benefits to food and livelihoods from changes in the management of the basins' installed hydropower storage capacity, while simultaneously progressing water governance, social engagement and capacity development in conjunction with M-POWER, a regional network of national stakeholders aimed at capacity building of young regional scientists. Collectively, the science, research and engagement interventions within the Mekong have ensured that evidence-based knowledge is available and is being adopted amid the highly contested dialogues around hydropower in the region. CPWF is, in the opinion of the review, among, and probably in the lead of practical research and evidence that is spearheading this water:food:energy

nexus. This has high relevance elsewhere as the post-2015 agenda shifts increasingly towards energy and agriculture developments.

Limpopo: Phase II has contributed the application of a consistent basin-wide poverty and food insecurity mapping tool (L1), a database of small-scale water infrastructure (with common definitions) (L2), livestock (goat) watering and value chains (L3), local water governance (L4) with L5 building strong connections with regional political (SADC) and water management (Limpopo Basin Commission) entities, ensuring CPWF actions have been progressed within the regional IWRM paradigm. The Limpopo Basin Development Challenge has been the most successful within the CPWF in introducing and maintaining a 'full-basin' approach, with engagement in all four of the basin's riparian countries. The Limpopo has also revealed to this Review the strongest mutuality of its several projects at the local level.

Volta: Phase II has contributed a probability-based tool for predicting the likely success of small-scale water management interventions amid social, economic and environmental factors (V1), created an innovation platform that has improved farmers' access to inputs and skills (V2), explored alternatives for multiple water use in combined rain-fed and small dam production systems to yield improved livelihoods (V3) and progressed multi-level stakeholder participation and local water committee engagement (V4). Coordination and management under V5 has progressed connections with local stakeholders and coordination within the Volta Basin Authority.

Cross-basin: The Limpopo and Volta basins have, through significant cross-regional interactions, begun to dismantle a principal challenge within African agricultural development — namely by consolidating evidence on the persistent failure and low sustainability of many past interventions in agricultural water management. The major emerging message is that it is rarely the technology that is at the root of low sustainability — technologies do work, but success is also determined by a wider set of factors around community buy-in and adoption, financing within household budgets, incentives, institutions, and policy. This message, which has emerged from evidence-based analyses of more than 1,500 cases of rain-fed interventions within the Limpopo, nearly 500 cases of small water infrastructure and similar numbers in Volta, resonates strongly with the findings by some of the major donors who have supported African governments in their small-holder farmer investments over the past decades. In response, and notably in the Volta, the CPWF partners have developed the TAGMI decision support system, based on Bayesian logic, that informs of the main success and failure factors at the district level that will impinge upon the probability of uptake and sustainability of different water interventions in the basin, notably for small pump irrigation, small reservoirs and soil and water conservation, linking agricultural water to crop yield indicators, and increasingly to household poverty exit strategies.

Nile: Projects under Phase II consolidated information on past and ongoing activities on rainwater management systems (N1), established a simulation model for the hydrological and sediment impacts of different land-management intervention scenarios in the Upper Blue Nile (N2), and N4 has established community-based monitoring of local hydrology. Under N3, ILRI has established an innovation platform that has trialled improved livestock fodder production and marketing in the Ethiopian Highlands. N5, the overall management and coordination project, has built connectivity with national platforms for Sustainable Land Management within Ethiopia and issued high-level messages on a new Integrated Rainwater Management Paradigm. The importance of core hydrological observations and data has also been substantiated in the Ethiopian Highlands within the Nile Basin, where newly installed hydro-meteorological instrumentation has been established in transects within three so-called 'learning landscapes' at Jelldu, Fogera and Diga. These are essential investments by CPWF that are continuing to yield the core data to parameterise the basin-wide integrating SWAT model, being

used to simulate the hydrological and sediment implications of different land management practices within the Ethiopian Upper Blue Nile basin. Without such local data, and understanding of the different fluxes, such models have to otherwise rely on their model calibration using known parameter ranges from the continental United States, where landscape conditions are very different. Ultimately, without acquisition of local hydro-meteorological information, the model simulations would have yielded unrealistic results in an upland Ethiopian environment. With such acquisition, the prospects are increased of the policies around land management, governance and livelihood interactions having been informed by more realistic projections.

Ganges: With the primary focus of Phase II on opportunities in the mixed freshwater and saline environment of the coastal areas, G1 has mapped cropping systems and farming potentials within the existing polders, conducted on-farm trials on stress-tolerant rice varieties in locations with different salinity in Bangladesh and West Bengal, India (G2) progressed local-scale water governance to tackle conflict resolution over freshwater and saline water within the polder system (G3), and generated scenarios that illustrate the sufficiency of water (amid external pressures) to support to extend production to between one and three cropping seasons (G4). G5 has established strong connections with the Bangladesh Agricultural Research Council to create a better enabling environment for the scaling-up of trial results. Collectively, the evidence-based science within local livelihood practices conducted by CPWF has built up essential political and institutional capital. This foundation has given the CPWF partners the legitimacy and a degree of convening power within the polder setting to begin to negotiate and influence the vital changes in sluice gate operation that will be vital to the freshwater regime of the polders, as the Delta Plan emerges as a critical basin-wide policy and operational instrument. Working within the polder area, which is home to approximately 40 million people within an area of approximately 50,000 square kilometers, it is the assessment of this review that the CPWF partners have demonstrably brought scientific-based evidence, and the accompanying engagement process into tangible advances in opportunities for food security within the distinctive characteristics of the Ganges polders.

Andes: Through the Basin Development Challenge, the CPWF partners in the Andes have made a major and leading international contribution to the advancement of benefit-sharing mechanisms at a significant spatial scale, bringing a necessary critical mass of exploration internationally and well-beyond the previous pattern of atomized and local explorations on the topic. In doing so, the CPWF partners have adopted influential breakthrough paradigms, having detected that a number of recently 'mainstream' science and policy strands were not yielding the evidence-base to move forward. Notably a review of 40 case studies of local Payment for Environmental Services studies was analyzed to reveal that only one had yielded tangible implementable actions, leading the Andes team to become more assertive around the evidence from 'established' thinking of forests yielding more water in all cases and wetlands performing dominantly positively hydrological functions in respect of the volumes and patterns of downstream river flows. This paradigm shift towards non-mainstream local evidence away from the Phase I approach based on the mainstream generalities opened up opportunities under Phase II to introduce stronger hydrological literacy into negotiations around integrated (upstream: downstream, urban: rural, etc.) systems connecting water as a natural resource and the social and economic benefits of water. While this paradigm shift has so far been of insufficient duration to have removed all uncertainties, its major shift in scientific perspective and the introduction of a 'second-level negotiation support system' has begun to reduce power imbalances between and among stakeholders, including decision-makers within the policy domain, with strong prospects that more informed decisions will flow in the future than if the recently established hegemonies around ecosystem services had been clung to and remained unchallenged.

Annex 5

Mechanisms that enabled R4D to support outcomes and impact

The review observes that there are principally two main 'tangible' mechanisms that enabled CPWF's R4D framing and approaches to lead to and support outcomes and impacts at different levels.

Identifying and addressing relevant research questions

A key mechanism linking R4D to impact is around the relevance of the research questions and entry points. There are numerous examples in CPWF where engagement with key actors (including farmers and other rural people) — combined with their capacity to articulate their vision and the pathways to get there, and an ability and willingness from the side of the researchers to learn from and buy into this vision — has resulted in a more relevant research question, leading to more relevant outcomes and ultimately impact.

Examples include:

- The first CPWF International Forum on Water and Food questioned the relevance of water productivity as the main focal point of CPWF. This led to a re-framing of the program objectives and research priorities
- Farmer feedback to a survey undertaken by ICRISAT Bulawayo resulted in a re-framing of research priorities, away from crop focus towards an integrated crop-livestock system with market integration.

The different approaches used by the program to increase and enhance stakeholder participation (including the use of participatory methods and tools) contribute to this mechanism by providing the crucial link between the perspectives of researchers and other actors, including farmers.

Creating broad alliances and a critical mass for uptake

Researchers alone are not able to bring about the systemic changes needed (at policy, investment and operationalization level) to achieve impact. Building partnerships and alliances provides the basis from which change at scale can happen, ideally in a sustainable manner that will continue beyond the end of a particular intervention or investment. Again for this to be effective, it is essential that partnerships are developed over time and share the vision and objectives of the program, so that that there is a clear motivation for uptake.

Thus another key mechanism of the program was to work through partnerships, networks and alliances in order to ensure buy-in and uptake of jointly developed research outputs.

Examples include:

- Andes: Having a researcher located in the Ministry of Environment in Peru meant that projects could better engage with decision-makers in the design and implementation of new policy tools on benefit sharing.
- Zimbabwe: Bringing on board district development officers in project implementation enabled them to play a pro-active role in furthering the development trajectory that the project was piloting.

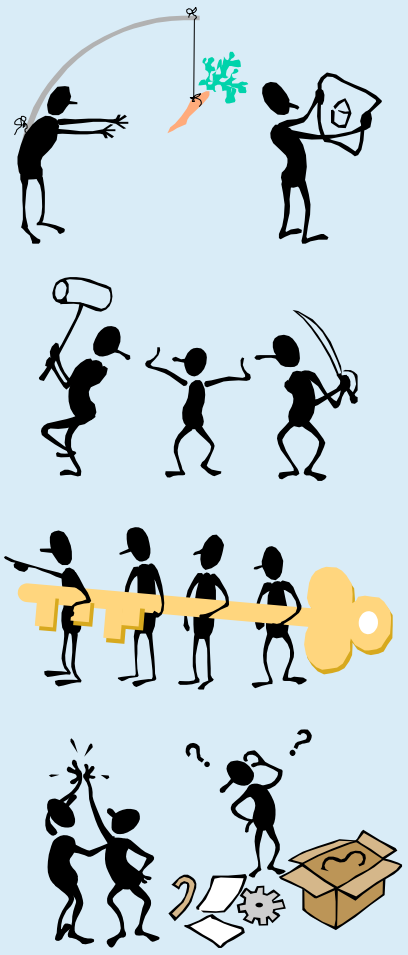
Figure 2 illustrates the way that approaches that both help develop better research questions and build broad alliances form a critical part of the program logic that underpinned CPWF's achievement of outcomes. The six mini case studies that follow illustrate how these different elements of CPWF's approach support the achievement of outcomes.

Figure 2. How R4D Principles, Tools and Mechanisms support Development Outcomes

R4D principles

1. Enable 'emergence'
2. Engagement and partnerships with a development focus
3. Incentivising through devolution of power and resources
4. Capacity development
5. Continuous reflection and learning, supported by knowledge management and communication

R4D tools, approaches and methods



R4D mechanisms

Identifying and addressing development **relevant** research questions

Creating broad alliances and a critical mass for **uptake**

Project / programme outputs

Data, information, models, tools, guidelines (scientific and other), publications, multi-media products, stories, events, platforms, etc.

Development outcome

Changes in knowledge, know-how, behaviour and capacities of system components

Changes in system functioning and performance

Enabling environment

Leadership Appropriate decentralisation of control over resources Longer funding horizons Poltical will
Good governance Transparency and accountability Supporting management structures, systems and processes / adaptive management

Case studies

1. *Limpopo (Southern Zimbabwe):*
   - ***Outcome: From sorghum to goats production and marketing: Changes in farmer, market and consumer behaviour***
     - Complex system thinking underpinning project interventions.
     - Working with local government (moved from "passive" beneficiaries to "active" partner – Ronnie Sibanda, CEO of Gwanda Rural District Council)
     - Change in research question / paradigm: Crops to livestock (despite ICRISAT crop focus)
     - Partnerships (agritex, district development officer) and innovation platforms
     - Leveraging support from others (sale pens built by PLAN / CARE)
     - Changes to re-stocking policy (import feed and water rather than import cattle)

   - ***Basin-level outcome: Improved capacity for regional water and food planning***
     - Lead agency FANRPAN, non-CGIAR – regional network, strong legitimacy, sustainability
     - Strengthening demand side of research – by making policy makers aware of what research can offer, but also be critical assessors of research programs (e.g. SADC representatives endorsing the integrated approach used by the LBDC for any future research investment in the region ; LIMCOM demanding that they work in all four Limpopo basin countries)

2. *Nile*
   - ***Outcome: Link local lessons to national intervention planning and design. Scaling up participatory catchment development***
     - Participatory approaches (e.g. participatory video) to empower groups such as the rural poor and women) to articulate their visions and priorities
     - Working with Woreda level stakeholders to develop capacity and assure legitimacy; improve relationship between Woreda officials and communities (mutual respect, etc.) through engagement process / participatory tools.
     - Local innovation fund to provide seed funds for individuals / communities to experiment with new technologies
     - National level: Align CPWF initiated platform with national level processes, use 8 key messages from CPWF as an engagement tool with national level decision makers and donors

3. *Mekong*
   - ***Outcome: Influencing public and private hydropower investments***
     - Create a neutral, safe dialogue space for interaction (Naga house). Project as a broker who facilitates interactions (and picks up the associated transaction costs)
     - Move from mono- to multistakeholder platforms to develop trust and understanding
     - Work with private sector investors (Chinese hydropower firms)
     - Influencing ministries (one ministry changed its operational procedures)

4. *Volta*
   - ***Outcome: Strengthen national and regional capacity***
     - Work with existing organizations (CLE – Comité Local de l'Eau) to improve governance mechanisms, develop capacity, improve systems and processes)
     - Embedding basin leader / V5 leader with Volta Basin Authority (= regional policy engagement, capacity development, etc.)
     - Work with local / national NGOs as an uptake pathway

5. *Andes (Peru)*
   - ***Outcome: Strengthen poverty relevance of intervention planning and implementation***
     - Ministry of Environment now uses an analysis of poor farmers' livelihoods in their design of benefit sharing mechanisms

6. *Ganges*
   - ***Outcome: New modes of collective planning and implementation***
     - Line departments for water and fisheries starting working together in Bangladesh; water board is responding to the needs of poor people (documented in the metasynthesis, chapter 8)
     - Started engaging with and influencing a major World Bank investment on polder rehabilitation (outcome to impact)
     - Developing and working with champions in key national organisations (Saheer Haque, Institute for Water Modelling – IWM)
     - Working with BRAC – who established an agricultural cell within their development area. CPWF staff is developing their capacity.

About CPWF

The CGIAR Challenge Program on Water and Food (CPWF) was a comprehensive, global research program that ran from 2002 to 2013. CPWF's goal was to increase the resilience of social and ecological systems through better water management for food production (crops, fisheries and livestock). In order to do so, the program carried out an innovative research and development approach that brought together a broad range of scientists, development specialists, policy makers and communities, in six river basins, to address the challenges of food security, poverty and water scarcity.

CPWF was integrated into the CGIAR Research Program on Water, Land and Ecosystems (WLE). WLE combines the resources of 11 CGIAR centers and numerous international, regional and national partners to provide a cohesive approach to natural resource management research. The program goal is to reduce poverty and improve food security through the development of agriculture within nature. This program is led by the International Water Management Institute (IWMI).

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