

Making a difference in the lives of the poor Making a difference in the lives of the poor

CGIAR Research Program Aquatic Agricultural Systems Program Proposal



**Research
Program on
Aquatic
Agricultural
Systems**

About this document

The proposal for the CGIAR Research Program on Aquatic Agricultural Systems was prepared by the WorldFish Center, three other CGIAR Centers (Bioversity, IWMI and CIAT) and a number of global, regional and national partners during the course of 2010.

After reviews of the initial proposal, it was revised and re-submitted to the CGIAR Consortium Board who approved its submission to the CGIAR Fund Council. In July 2011, the Fund Council approved the proposal as one of the portfolio of CGIAR Research Programs to be implemented under the CGIAR Strategy and Results Framework. Implementation of the Program began in the third quarter of 2011 under the leadership of WorldFish, and with the participation of Bioversity, IWMI and a wide range of partners.

September 2011

Table of Contents

About this document	i
Table of Contents	ii
List of Figures	iv
List of Tables	v
List of Boxes	vi
List of Annexes	vii
Executive Summary	viii
1 Introduction.....	1
2 Program Goal and Objectives.....	2
3 Justification	3
3.1 The importance of Aquatic Agricultural Systems	3
3.2 Adding value through the CGIAR Research Program on Aquatic Agricultural Systems.....	5
4 Our Approach	8
4.1 Catalyzing change in Aquatic Agricultural Systems	8
4.2 Strengthening rights and reducing vulnerability	12
4.3 Social transformation and gender equity	13
4.4 Resilience in practice	13
4.5 A commitment to place and the people who live there.....	16
4.6 Working in partnership.....	17
4.7 Results-based management.....	17
5 Impact pathways.....	18
5.1 Linking objectives, outcomes and impacts.....	18
5.2 How we will achieve impact and do so at scale	18
6 Research Framework and Themes.....	27
6.1 Introduction	27
6.2 Research framework	27
6.3 Research priorities	29
6.4 Research themes	31
6.4.1 Theme 1: Sustainable increases in system productivity	31
6.4.2 Theme 2: Equitable access to markets.....	36
6.4.3 Theme 3. Social-ecological resilience and adaptive capacity	39
6.4.4 Theme 4. Gender equity.....	41
6.4.5 Theme 5. Policies and institutions to empower aquatic agricultural systems users.....	42
6.4.6 Theme 6. Knowledge sharing and learning	44
6.5 International public goods.....	46

7	Gender Strategy: A Transformative Approach to Gender Mainstreaming in Research and Development Interventions in Aquatic Agricultural Systems	48
7.1	Gendered processes of change in aquatic agricultural systems	48
7.2	Gender relations and roles in the pursuit of livelihoods	48
7.3	Gender disparities in asset poverty, social exclusion and vulnerability	49
7.4	Gendered well-being outcomes	49
7.5	Overall rationale of the gender strategy	50
7.6	Gender mainstreaming	51
7.7	Gender transformative action	52
8	Capacity Development	52
8.1	Demand-driven investments in capacity	53
8.2	Areas for investment	53
9	Partnership Strategy	54
9.1	Different levels of partner engagement	55
9.2	Partnerships at different geographical scales	56
9.3	Making partnerships work	61
9.4	Funding partnerships	61
10	Integration of CGIAR Centers and Synergies with Other CGIAR Research Program	62
11	Strategy for Knowledge Sharing and Learning	74
11.1	Introduction	74
11.2	Guiding principles	74
11.3	Target audiences	74
11.4	Approach	74
11.5	Making it happen	75
12	Delivering the Program in Focal Countries	76
12.1	Focusing on countries	76
12.2	Focusing on hubs	78
12.3	Partnership approach — scaling in focal countries	81
13	Monitoring, Evaluation and Impact Assessment	82
14	Timeframe	83
15	Governance and Management of the Program	84
16	Managing Risk	88
17	Budget	90
17.1	Program costs 2011-2013	90
17.2	Program costs 2014-2016	95
17.3	Funding scenarios: 2009 + 10%	97
17.4	Funding scenarios: -20%	98

List of Figures

Figure 1: CGIAR Strategy and Results Framework and Program goals and objectives.	2
Figure 2: Agricultural systems upon which the Program will focus	3
Figure 3: Theory of change for the Program.	11
Figure 4: Program commitments along the impact pathway by type of partnership	25
Figure 5: Program objectives, action research activities, and their impacts on drivers of poverty.	29
Figure 6: Responsibility in participatory market chain analysis shifts from researchers to users.	37
Figure 7: Zambian focal hubs in Luapula and the Upper Zambezi and Kafue Flats	79
Figure 8: The four stages of building impact at scale.	81
Figure 9: Proposed governance and management structure	87
Figure 10: Comparison of Program expenditure by major cost categories	94
Figure 11: Comparison of Program expenditure by research themes	94
Figure 12: Comparison of Program expenditure by country.....	95
Figure 13: Comparison of Program expenditure by CGIAR Centers and partners.....	95
Figure A 1: Program hubs in Bangladesh	125
Figure A 2: Map of poverty and vulnerability (red boundaries) in Bangladesh	126
Figure A 3: Map of Cambodia showing wetlands	130
Figure A 4: Poverty map and research hubs in Cambodia	132
Figure A 5: Poverty map and research hubs in the Philippines.....	136
Figure A 6: Program hubs in the Solomon Islands	142
Figure A 7: Poverty map and research hubs in Zambia	148
Figure A 8: RBM life-cycle approach	160

List of Tables

Table 1: Linking Impacts of the Program's Objectives to CGIAR Objectives	20
Table 2: Initial analysis of development challenges, hypotheses of change and key research questions for five hubs in Bangladesh	34
Table 3: Sample research questions under Theme 1	35
Table 4: Generating international public goods through research across countries and hubs ..	47
Table 5: Summary of engagement with some partners in the CGIAR Research Program on Aquatic Agricultural Systems in Bangladesh.....	57
Table 6: Skills and achievements of some global partners.....	60
Table 7: Potential contribution and current engagement of CGIAR Centers and Challenge Programs in the CGIAR Research Program on Aquatic Agricultural Systems	64
Table 8: Collaboration & linkages between the CGIAR Research Program on Aquatic Agricultural Systems and other CGIAR Research Programs and mechanisms for achieving effective integration	66
Table 9: Indicative list of categories of target audiences and the products and processes that may be used to build and sustain knowledge sharing and learning.....	76
Table 10: Rationale for initial country focus	77
Table 11: Three-year schedule for implementing the Program.....	83
Table 12: Preliminary analysis of the nine major risks identified for the CGIAR Research Program on Aquatic Agricultural Systems	89
Table 13a: Program budget 2011 by major cost categories vs research themes, coordination and governance & management	91
Table 13b: Program budget 2012 by major cost categories vs research themes, coordination and governance & management	91
Table 13c: Program budget 2013 by major cost categories vs research themes, coordination and governance & management	92
Table 14a: Program budget 2011 by major cost categories vs country, coordination and governance & management	92
Table 14b: Program budget 2012 by major cost categories vs country, coordination and governance & management	93
Table 14c: Program budget 2013 by major cost categories vs country, coordination and governance & management	93
Table 15: Program cost 2014 - 2016 (USD '000)	96

Table 16: Program Personnel resources 2011 – 2013.....	96
Table 17: Program Estimated trainings and workshops 2011-2013	97
Table 18: Program Estimated Capital and Other Equipment 2011 – 2013.....	97
Table 19: Initial funding scenario for the Program	98
Table 20: Funding scenario for the Program with a 20% budget cut to be updated	99
Table A 1: Summary of national consultations and engagement of partners and CGIAR Centers	100
Table A 2: Program hubs in Bangladesh	127
Table A 3: Partnerships through which the Program will work to have impact in Bangladesh	129
Table A 4: Program hubs in Cambodia	133
Table A 5: Partnerships through which the Program will work to have impact in Cambodia...	134
Table A 6: Program hubs in the Philippines	137
Table A 7: Partnerships through which the Program will work to have impact in the Philippines	139
Table A 8: Program hubs in Solomon Islands.....	143
Table A 9: Partnerships through which the Program will work to have impact in the Solomon Islands	144
Table A 10: Program hubs in Zambia	149
Table A 11: Partnerships through which the Program will work to have impact in Zambia	150

List of Boxes

Box 1: Measuring and addressing poverty	4
Box 2. Building on previous CGIAR engagement in Aquatic Agricultural Systems.....	6
Box 3: Action research: bridging research, practice and policy in the Program.....	9
Box 4: Beyond the rhetoric; resilience thinking shaping management reform	15
Box 5: Implementing Program in the Greater Khulna hub, Bangladesh.....	80

List of Annexes

Annex 1: Proposal Development	100
Annex 2: Gender Partnerships, Participatory Gender Tools for Out-Scaling, Gender Mainstreaming in Research Themes, Gender Strategy Monitoring and Evaluation	102
Annex 3: Initial Analysis of Development Challenges, Hypotheses of Change and Key Research Questions for Program Hubs in Bangladesh.....	110
Annex 4: Country Research Questions by Program Theme.....	117
Annex 5: Country Details.....	123
Annex 6: Selected Global Research Partnerships to be pursued through the Program.....	152
Annex 7: Contribution of CGIAR Centers to the Program	155
Annex 8: Using Results Based Framework for Monitoring, Evaluation and Impact Assessment	160
Annex 9: Letters of Support	162
Annex 10: References.....	185
Annex 11: List of Acronyms	190

Executive Summary

Over 700 million people depend on aquatic agricultural systems (AAS), and some 250 million live on less than US\$1.25 a day. Living in coastal zones and along river floodplains, these communities are not only poor, they are also vulnerable to multiple drivers of change, notably demographic trends, climate change, sea level rise, and increasingly frequent and severe extreme weather events. They live there despite their vulnerability because these are highly productive systems that provide multiple opportunities for growing or harvesting food and generating income.

Aquatic agricultural systems have long been on the agenda of the CGIAR, with investments made to improve crop yields, sustain wild fisheries, develop aquaculture and increase benefits from livestock. Yet only rarely has this research been well integrated to reflect the multiple choices faced by the women and men who live in these systems. Too often our investment has been targeted solely at component crops, fisheries, or other single dimensions of each system and so has failed to deliver its full benefits to the poor. As a result, stakeholders' integrated livelihoods have been marginalized by our agricultural research investments, and the opportunities they offer for reducing poverty have been missed.

The Program is designed to confront this weakness and change how the CGIAR engages with these systems. We will pursue a program of integrated research to identify key constraints faced by smallholder households, seek ways to overcome them, and pursue a research agenda to guide development investment along pathways to impact. We will bring together the combined knowledge of aquatic agricultural system users, governments and civil society organizations, integrating it with the capacities of the CGIAR and its partners. Together we will pursue improvements in system productivity, markets, resilience, gender equity, policies, and knowledge sharing.

A demand-driven and participatory gender approach lies at the core of the program. We will identify gender-equitable options to improve the lives of smallholder households. These options will embrace both old and new technologies that combine permutations of farming, fishing, aquaculture, livestock rearing and forestry with processing and trading of agricultural commodities, and with non-agricultural livelihoods. Our demand driven focus will help tailor these solutions to the specific needs of different households living in different environmental and socio-cultural conditions.

The Program will focus initially on three aquatic agricultural systems: (i) Asia's mega deltas, targeting Bangladesh and Cambodia; (ii) Asia-Pacific islands, targeting the Philippines and Solomons; and (iii) African freshwater systems, targeting first Zambia, then Uganda and Mali. In each of these systems, national consultations have identified focal hubs for our actions. In these hubs we will develop a commitment to "place" and build partnerships among fishers, farmers, traders, women's groups, private firms, local governments and other agents of change.

Through our partnerships approach and targeted investment, the Program seeks to improve the lives of 15 million poor and vulnerable people over the next 6 years. By further expanding and disseminating the learning derived from this effort, we expect to increase that number to 50 million by 2022. We will achieve these impacts at scale by focusing the CGIAR's combined strengths, and by building upon best practices in effective partnerships to engage the skills and capacities of national agricultural research systems, nongovernmental organizations, advanced research institutes, producer groups, the private sector and others. We will scale out more

widely by building on cross-program learning to develop and disseminate a suite of international public goods.

The budget for the Program is US\$59.4 million over the first 3 years, \$27.1 million of which has been identified in existing restricted grants together with projected increases, and \$12.3 million of which comes from existing core resources. A gap of \$20.0 million remains to be met. It is estimated that the investment of \$59.4 million in the Program will leverage impact through partner funding of approximately \$300 million over the 3-year period.

1 Introduction

For the poor and vulnerable rural communities who live along the world's major rivers and coasts, pathways out of poverty depend heavily on the productivity of aquatic agricultural systems (AAS).^a These integrated agricultural systems combine activities that harness the natural productivity of freshwater and coastal ecosystems to more intensive farming. An often complex and seasonally dynamic mix of annual and perennial crops, of livestock rearing and fisheries, supports the livelihoods of millions of people. Despite this productivity, however, the farming, fishing and herding communities who live in these systems are among the poorest and most vulnerable in their countries and regions. In these communities, women constitute a disproportionate share of the poor due to unequal gender relations and differential access to and control of resources.

The mandate of the CGIAR Research Program on Aquatic Agricultural Systems is to confront this paradox of high ecological productivity mingled with high prevalence of poverty, vulnerability and inequity among social groups. Its goal is to transform them into systems that realize their full development potential while remaining resilient as societies and environments change. We propose to do this by harnessing the strengths of the Consultative Group on International Agriculture Research (CGIAR) in agricultural research and combining them with the skills and capacities of national agricultural research systems (NARS), nongovernmental organizations (NGOs), the private sector, advanced research institutes (ARIs) and other partners, to pursue an innovative program of integrated agricultural research.

As in other integrated agricultural systems, effective engagement with poverty and vulnerability in aquatic agricultural systems requires us to put the poor and vulnerable at the core of our work. This requires our research to be rooted firmly in the development agenda and responsive to context-specific differences in threats and opportunities. The complexity and diversity of these systems mean there can be no single technical fix or blueprint solution to the challenges they face. Our research must therefore operate at many scales and across sectors and be informed by diagnoses of constraints and opportunities at multiple scales. It must pay particular attention to the household level, where socio-cultural norms, beliefs and attitudes underlie the persistence of gender inequity. Only by doing so will we achieve the transformational change the poor deserve.

Pursuing our work in this way will challenge the CGIAR to move beyond traditional circles and change the way we do much of our research. By emphasizing approaches that call for research *in* development — rather than research *and* development or research *for* development — we will pursue a conscious change in emphasis and mind set, one that can help the CGIAR to conceive and deliver our research differently. We therefore envisage the Program as an exemplary vehicle for implementing the fundamental changes in ways of working that the CGIAR reform process foreshadowed and the Global Conference on Agricultural Research for Development (GCARD) has endorsed.

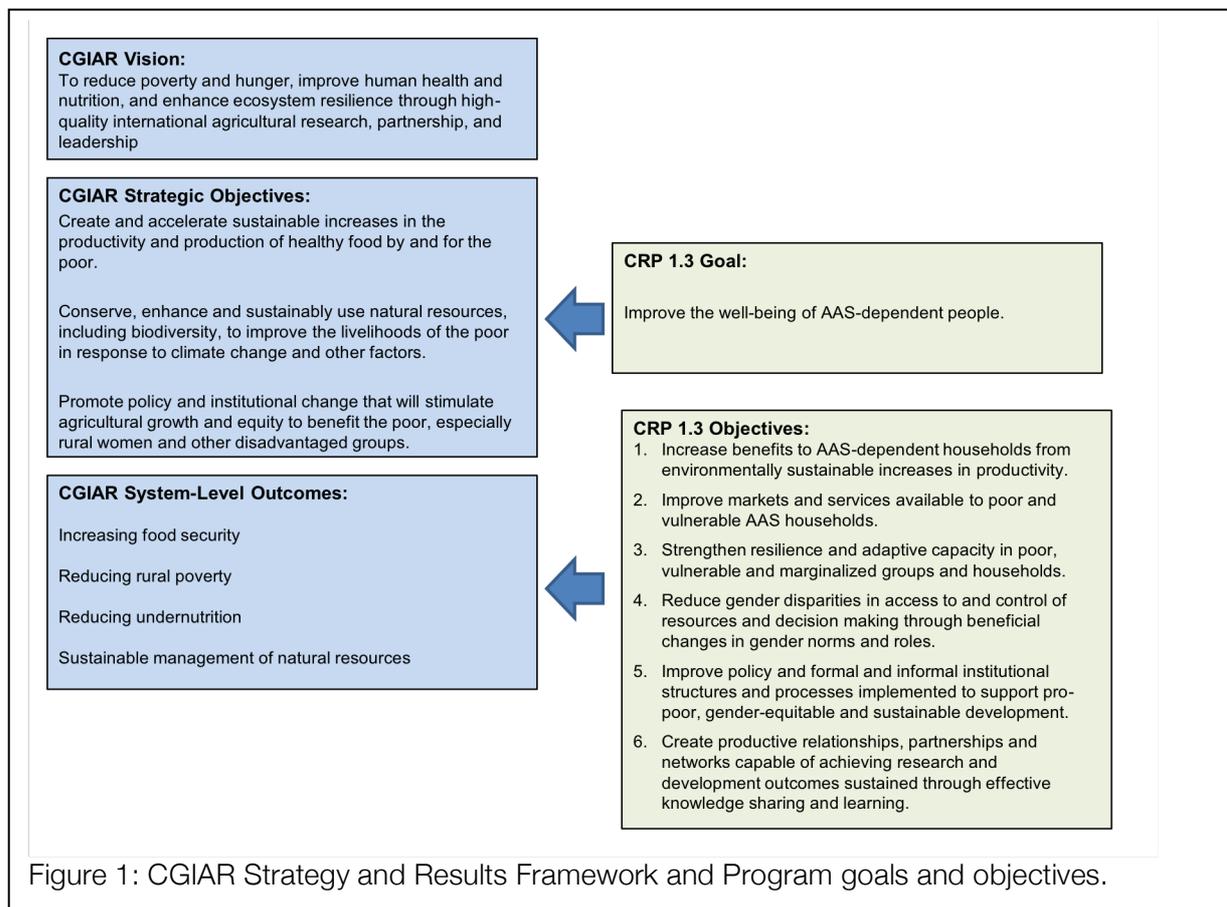
^a We define aquatic agricultural systems as systems in which the annual production dynamics of freshwater and/or saline or brackish coastal systems contribute significantly to total household income.

2 Program Goal and Objectives

The overall goal of the CGIAR Research Program on Aquatic Agricultural Systems is to improve the well-being of aquatic agricultural system-dependent peoples. We will do so by bringing to bear the strengths of the CGIAR in agricultural research together with those of our partners in research and development. The overarching objectives of the Program are:

- Increased benefits to aquatic agricultural system-dependent households from environmentally sustainable increases in productivity.
- Improved markets and services available to poor and vulnerable households in aquatic agricultural systems.
- Strengthened resilience and adaptive capacity in poor, vulnerable and marginalized groups and households.
- Reduced gender disparities in access to and control of resources and decision making through beneficial changes in gender norms and roles.
- Improved policy and formal and informal institutional structures and processes implemented to support pro-poor, gender-equitable and sustainable development.
- Productive relationships, partnerships and networks capable of achieving research and development outcomes sustained through effective knowledge sharing and learning.

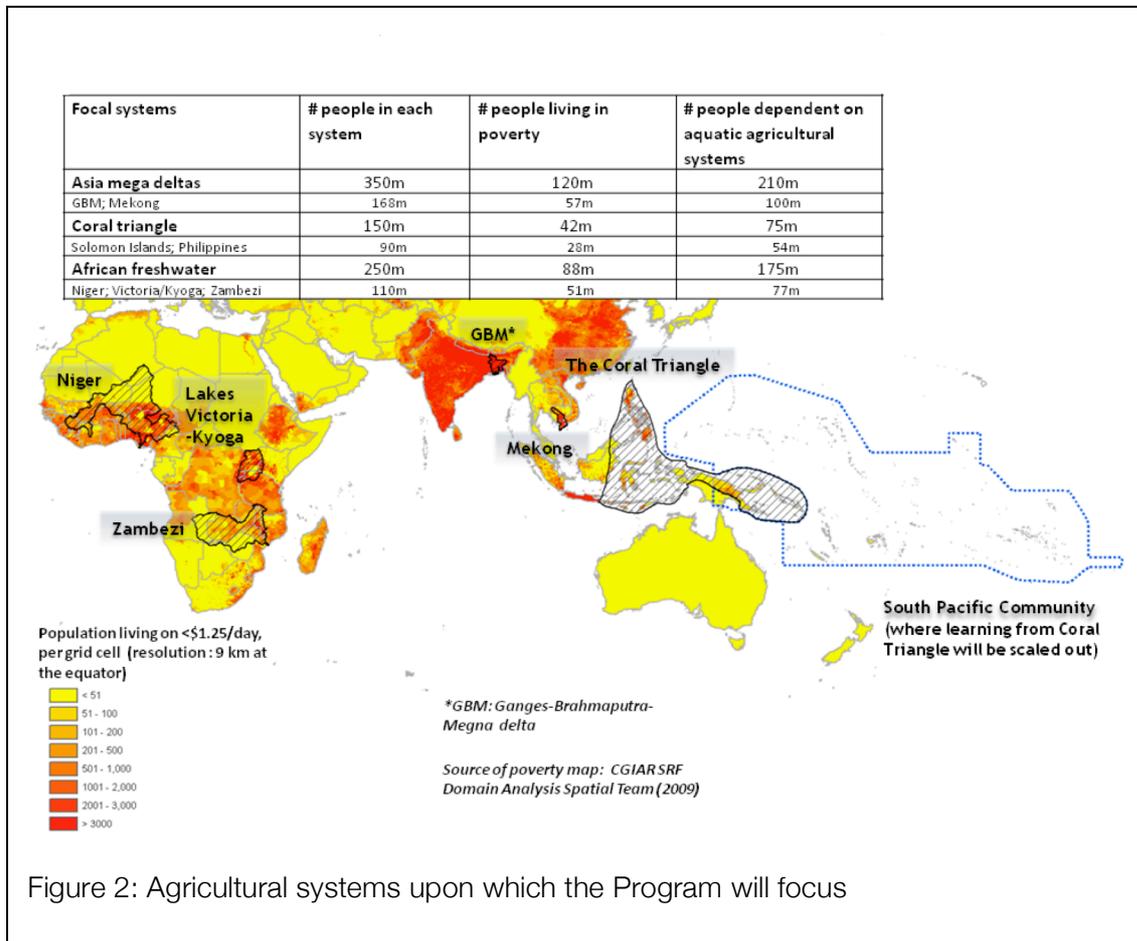
We will pursue these objectives by putting the poor and vulnerable at the center of the program. To achieve our objectives, we will use an approach that empowers communities and individuals to engage more effectively in their own development. The relationship between the program goal and objectives and the CGIAR Strategy and Results Framework (SRF) is summarized in Figure 1.



3 Justification

3.1 The importance of Aquatic Agricultural Systems

Many of the world’s poor rural households depend on aquatic agricultural systems for all or part of their livelihoods. Asia’s mega deltas are densely populated and support a mix of predominantly family-based farming and fishing. The Ganges-Brahmaputra-Megna system supports 160 million people in Bangladesh alone, 40% of whom live below the poverty line of US\$1.25 per day. In contrast, the islands of the Pacific and East Asia support much smaller populations, but a large portion of them are poor and depend on coastal resources as their primary sources of income. Solomon Islands, for example, has only 510,000 inhabitants, but with 75% of them relying on subsistence farming (mostly by women) and fishing (mostly by men), political and social stability depends on the well-being of the rural sector and the aquatic agricultural systems that predominate there. These systems are also important in Africa, where large floodplains and lakes, together with dispersed wetlands, play central roles in supporting diversified rural livelihood strategies, based on a mix of male, female and family-based farming and fishing systems. In Zambia, for example, aquatic systems cover 20% of the land surface and support 3 million people, or 25% of the population.



Taken together, Asia’s mega deltas, the small island systems of the Pacific and East Asia, and Africa’s inland waters, are home to 250 million of the world’s poor (Figure 2), and provide important opportunities for international efforts to reduce poverty and hunger. To realize this potential, development efforts will need to better at helping the people who live there meet the challenges they face. Population growth, urban expansion, increased demand for resources, and climate change are but four common challenges across these systems that combine with

profound issues of economic, social and institutional marginalization to drive poverty and vulnerability. Together these constraints have made AQUATIC AGRICULTURAL SYSTEMS profoundly challenging development arenas (Welcomme et al. 2010, Small & Nicholls 2003), and enhancing their contribution to rural development will require carefully designed investments. Well targeted research, coupled with much stronger linkages with development practice and policy, can help achieve this, and accelerate pathways out of poverty.

Box 1: Measuring and addressing poverty



Three key overlapping and reinforcing dimensions of poverty

To identify the poor in AAS and support them with the right types of development interventions, we must understand and take into account the complex multiple dimensions of poverty and their interrelationships, both causal and correlative. The figure above simplifies them, highlighting three key dimensions of poverty, for all of which the program will seek measurable improvements.

Income and asset poverty is when individuals and households do not have sufficient means to sustain a decent standard of living, as defined by national poverty lines, human development indices or their own metrics. Standardized measures are used in economic planning and targeting in social protection schemes, but local development activities may use more qualitative techniques to identify the poor, such as wealth ranking.

Vulnerability is the result of people's exposure to natural disasters and economic shocks, the sensitivity of their livelihood systems to these risks, and their capacity to use their assets and capabilities to cope and adapt. Two commonly used applications of this concept are in World Food Programme famine vulnerability mapping (World Food Programme 2007) and Intergovernmental Panel on Climate Change (IPCC) mapping of vulnerability to climate change.

Marginalization, or social exclusion, sees certain groups systematically disadvantaged because they are discriminated against on the basis of their ethnicity, race, religion, sexual orientation, caste, gender, age, education, class disability, HIV status, migrant status or where they live (Atkinson 1998, DFID 2005).

These conditions and processes, which are often strongly gendered, overlap and may reinforce one another, so that people who are socially excluded or marginalized may become income and asset poor, and asset poverty reduces capacity to adapt, making its victims more vulnerable to external shocks and adverse trends (Allison et al. in press).

The Program will take up this challenge through a program of research in development that addresses key constraints faced by smallholder households. Specifically, we will work with smallholders and small-scale producers and traders of system products to identify why they have been unable to rise out of poverty and work with them to design interventions that assist them in doing so. We will adopt an approach that reflects the multidimensional and strongly gendered nature of poverty and vulnerability in aquatic agricultural systems (Box 1).

In pursuing a research-in-development program to address these challenges, the diversity of aquatic agricultural systems gives rise to opportunities for learning and impact across a range of contexts, from seasonally-flooded plains in western Zambia and sparsely inhabited islands in the Solomon Archipelago to some of the most urbanized and intensively cultivated systems on the planet, such as the Mekong Delta and parts of the Ganges-Brahmaputra-Megna Delta. These systems also exhibit a range of social relations and gender roles and disparities, with relatively fewer gender inequities in development outcomes in the Philippines and Solomon Islands and wider disparities in Zambia and Bangladesh. The Program will learn from these diverse environments and distil a set of common principles and practices to address commonalities (see section 6.5 for a discussion of international public goods).

3.2 Adding value through the CGIAR Research Program on Aquatic Agricultural Systems

Aquatic agricultural systems have long been on the agenda of the CGIAR, and there is a substantial record of achievement (Box 2). Of particular importance has been the attention given to improving crop yields (especially of rice), sustaining wild fisheries and increasing production from aquaculture, and improving the development benefits from livestock production. Yet, only rarely have these efforts or those of the wider agricultural research and development community, been effectively integrated to reflect both the multiple opportunities and choices, and the multidimensional nature of poverty, faced by the women and men who live in these systems and the diversified livelihoods strategies they adopt. Too often these investments have been targeted solely at component crops, fisheries, or other single dimensions of each system and so have failed to deliver their full benefits to the people who depend on them. As a result, these integrated livelihoods have been marginalized by our agricultural research investments, and the opportunities they offer for reducing poverty have been missed.

The challenge of the Program is to pursue a research-in-development agenda that accelerates learning and brings together the combined knowledge of system users, government and civil society organizations working for development. The Program must integrate this knowledge with the capacities of the CGIAR and partner research organizations to harness the full development potential of aquatic agricultural systems. To do so, we will move beyond the inadequate and often conflicting sectoral approaches that have limited the impacts of agricultural research in the past. In their place, we will pursue integrated approaches that recognize the full complexity of these systems and so harness their multiple contributions to reducing poverty. We will link three strands of thinking in agricultural development: (i) farmer first and farmer participatory research and innovation systems; (ii) rural livelihoods approaches and related concepts such as farming systems research, agro-ecosystem analysis, institutional analysis and development; and (iii) resilience-based management.

We will learn from past investments in integrated natural resource management and innovation in other integrated systems, while targeting the current and emerging challenges faced by the poor and vulnerable in aquatic agricultural systems. For example integrated approaches to assessing options for farm improvement have been developed in other agricultural systems e.g. Giller et. al. 2010, and the 'best-fit' approach (Birner et al. 2006) to applying technology and

advice provides important insights that the program will draw upon. Similarly this Program will forge links with the CGIAR Research Program on Policies, Institutions and Markets and other Programs working in other agricultural systems, to draw on emerging lessons concerning macro-level policy reforms and innovations in institutions and governance for agricultural development that may be adapted for aquatic agricultural systems. Working in this way we will bring to bear the CGIAR's unique strengths in agricultural research with those of multiple partners to exploit synergies across systems and sectors.

By taking this direction, the Program will address not only the specific challenges of aquatic agricultural systems, but also the wider challenge of integrating research into development. A common criticism of agricultural research for development is that it has too often been supply-driven, focused on 'singular approaches' (Giller et al. 2010) and dissociated from a real understanding of the integrated lives and difficult choices that the poor have to make. To address this, the Program seeks to change the way that the CGIAR engages with these poor rural communities and the development processes that are designed to improve their livelihoods.

Box 2. Building on previous CGIAR engagement in Aquatic Agricultural Systems

Analysis of rural livelihood strategies, opportunities and constraints, with a focus on enabling diversification to reduce dependence on overexploited natural resources

Assessing the impact of new technologies and farming systems, such as improved rice, new fish breeds and integrated agriculture-aquaculture systems

Identifying ways to strengthen access to global markets for small-scale producers through product quality enhancement

Assessing the performance of community-based natural resource management systems with the aim of strengthening local systems of natural resource management and addressing the causes of institutional failures

Water productivity analysis to inform trade-offs between different potential uses of aquatic agricultural systems, such as for fisheries and conservation, intensive shrimp farming, or irrigated agriculture

Assessing social service provision and identifying ways of addressing social development issues in aquatic agricultural system-dependent communities, including education and literacy, and the performance of local government

Assessing vulnerability of aquatic agricultural systems to climate variability and change, assessing the costs of adaptation, and scaling up this research through national and global climate change policy engagement

Developing strategies for post-disaster response, particularly following the Indian Ocean tsunami in 2004 and Cyclone Sidr in Bangladesh in 2007

Political economy analysis of policy processes in aquaculture, fisheries, coastal and wetland land-use and biodiversity conservation

Broadly, our approach entails a change in primary focus from research that generates global public goods, followed by investment in dissemination and extension to help these technologies reach users, toward research that is embedded within ongoing processes of development and change. We call this research *in* development, rather than research *for* development. At present, much of the information generated by international research Centers can be used only by those actors that have the capability to absorb and utilize it. In other words, the information is free, but its use is not, making it unavailable to marginalized people. The CGIAR Program on Aquatic Agricultural Systems will seek to change this.

If we are to do this successfully, we will need to embrace and apply concepts such as farmer first, strengthening civil society, empowerment, and transformative development, as well as change the way we research agriculture and natural resource management. With partners ranging from development practitioners to development-studies research institutes, from crop, fisheries, and environmental scientists to human rights advocates, the research-in-development consortium we are developing encompasses some of the leading individuals and institutions in their field. We aim to draw on this breadth and depth of experience to work through ongoing processes of innovation, both autonomous and externally driven, to help secure productivity gains for the benefit of system users living in poverty.

Essentially, the comprehensive, diagnosis-based and transformative approach proposed for this Program responds to a need to address, in aquatic agricultural systems, what have been termed “fractal poverty traps” (Barrett & Swallow 2006). These are situations in which people are trapped in an unfavorable dynamic equilibrium by processes that exist simultaneously at multiple scales (micro, meso and/or macro) and are self-reinforcing through feedback effects. Our schematic diagram of the multiple dimensions of poverty (Box 1) provides a simplified view of such traps, seen from a household perspective and looking upward to larger scales of governance, production system and geography. Barrett and Swallow (2006) contend that small adjustments at any one of these levels — such as building some aspect of household assets (e.g. by improving access to education or health care), introducing new technologies, or investing in incremental improvements in democratic decentralization — are unlikely to move the system away from its dominant, stable dynamic equilibrium. In the case of many aquatic agricultural systems, that stable dynamic equilibrium is one where many poor and disenfranchised people living in highly productive environments produce (and often trade) goods of high value in global markets but are still unable to climb out of poverty. Governments, markets and communities are simultaneously weak in places characterized by fractal poverty traps. This is why we emphasize addressing the broad context at multiple scales, following a diagnosis of which parts of the trap are most difficult to escape, and which can best respond to intervention, to enable poor people to use the production technologies and other innovations that the CGIAR and its partners generate to transform their lives. We recognize that achieving these transformations at scale requires partnership with agencies and agents that are able to implement innovations that reach beyond local scales to influence governance at all levels.

4 Our Approach

Implementing research in development requires a distinctive commitment to people and place based on a holistic vision of the complex, iterative nature of the development process. Having the tools to sustain a prolonged effort to achieve results in this complex, challenging process is essential. In this section, we present selected innovative elements of our approach. We believe this approach is key to the overarching purpose of linking CGIAR research to users and accelerating its uptake and the achievement of impact.

4.1 Catalyzing change in Aquatic Agricultural Systems

The central hypothesis driving the approach of the Program is that the CGIAR can have greater impact on aquatic agricultural systems by moving beyond the linear production model that has dominated much agricultural research and embracing a more integrated, innovative view of how to achieve development in agricultural systems. We will do this through an action research and partnership-driven approach to development that moves far beyond the view of development as a purely technical process, as well as the persistent views of development as charity. We will embrace development as a human right, whose goal is to achieve improved well-being for those currently living in poverty and with hunger. Moving toward these goals and approaches, and building a CGIAR that is “fit for purpose” in the 21st century, is a core rationale of CGIAR reform and a central theme of the GCARD held in France in March 2010.

The action research approach (Box 3) we will take provides a platform upon which more traditional agricultural research for development still has an important contribution to make but will do so much more effectively because of stronger engagement with the development context that the Program will foster. We will achieve our goal by serving as a successful catalyst for innovation in aquatic agricultural systems that will build networks of information and influence.

Box 3: Action research: bridging research, practice and policy in the Program

Action research seeks to create participative research communities. It seeks to engage those who may otherwise be subjects of research or recipients of interventions as inquiring co-researchers. Action research does not start from a desire to change others “out there”; it starts from a wish to change *with* others (Reason & Bradbury 2008). The process involves systematic cycles of action and reflection: in action phases, co-researchers test practices and gather evidence. In reflection stages, they make sense of it together and plan further action. This closes the gap between knowing and doing. It can be used at multiple scales and for multiple purposes, such as helping political and social movements to develop their strategies and policies to be more effective, or helping farmers’ groups to identify and overcome constraints to accessing global value chains. At one end of the spectrum is research that engages farmers or others in a change process led by technical experts (technical action research) and, at the other end of the spectrum, poor, vulnerable and marginalized groups taking charge of the change process and the learning derived from it (emancipatory action research).

Examples of successful change brought about by action research include the following:

Partnership among farmers, NARS and ARIs to promote conservation farming strategies in semi-arid East Africa over the past 8 years were successful when farmers shifted the objectives of the research from a focus on minimum tillage (the researchers’ interest) to improved rainwater harvesting, which was their primary concern (Rockstrom et al. 2009).

Community-led initiatives to identify ways of reducing alcohol abuse among Maori communities in New Zealand identified strategies that were based on people’s own incentives and norms and generated social benefits beyond those intended, including improved attitudes and interaction with police (Moewaka Barnes 2000).

Decentralization through “empowered deliberative democracy” in the Indian states of West Bengal and Kerala in the 1990s tied discussion to action; achieved the participation of subordinated groups of women, the landless, sharecroppers and smallholder farmers; and were linked with redistributive policies that had pro-poor outcomes. The reforms helped to reduce landed elites’ abuse of political power while widening the political space within which the poor could participate, both within and beyond the formal institutions of state power (Hickey & Mohan 2005).

To enable the innovation system to build resilience and improve development benefits from AAS, we will explicitly commit to an action research approach that seeks to learn by doing. In our case, our co-researchers will be farmers, women fish traders, youth groups, local government officials, aid workers and others. Our action research aims to go beyond finding useful information to guide action. It aims to place the capacity for generating and using that knowledge in the hands of people who are trying to improve their lives. We will seek to use action research as a tool for emancipation and social change. If this approach works, it will have more lasting and transformative impact, as it works within local structures and processes and finds ways to challenge them, based on knowledge of what the real obstacles to change are in any given situation. This sharply contrasts with many project-based approaches, which provide temporary means to overcome or bypass constraints that reassert themselves when the external resources and structures of the project withdraw.

We recognize that full immersion into action research will require a major change in the way most CGIAR scientists work. It may also pose challenges to some of the ways in which program partners implement their projects. Accordingly, we will invest substantially in building capacity. We recognize that some activities may not need such a radical change in research approach. For example, developing and distributing an improved crop variety may not require emancipatory action research, but transforming gender relations probably will.

By focusing on the needs of farmers, fishers, local government officials, NGO workers, marginalized ethnic groups, and women, we will work to provide them with greater opportunities to innovate, thereby improving their means and incentives to increase agricultural productivity, sustain natural resources, access markets for goods and labor, and realize their rights and freedoms. Building the relationships, structure, capitals, capabilities and freedoms to allow this innovation system to flourish will be the key development activities of the program. Importantly, research will include documenting and analyzing the lessons learned from this new way of engaging research with development.

While our approach focuses on people and place we also recognize that external drivers, or macro-level processes, often determine the fate of these systems. We will analyze this broader vulnerability and its variability amongst systems. Our diagnoses will consider a full range of these macro processes including economic, environmental and political. Particular emphasis will be given to understanding how to reduce the vulnerability of aquatic agricultural systems to these factors, and build resilience of the poor who are most exposed to them.

To focus our approach on pathways of action that are likely to have impact, the program builds on our analysis of key constraints driving poverty and vulnerability in aquatic agricultural systems, and identifies a set of six corresponding hypotheses of change to frame our research agenda (Figure 3). These hypotheses comprise our preliminary theory of change (North 1996, Keystone Accountability 2009). This theory of change argues that releasing the productive potential of aquatic agricultural systems to benefit the poor will require aquatic agricultural systems users and their partners in development to generate innovations in farming, natural resource management, marketing, livelihood strategies and social institutions. The capacity and confidence to innovate will be greater if people are less poor and vulnerable, better fed, and better integrated into economic, social and political processes.

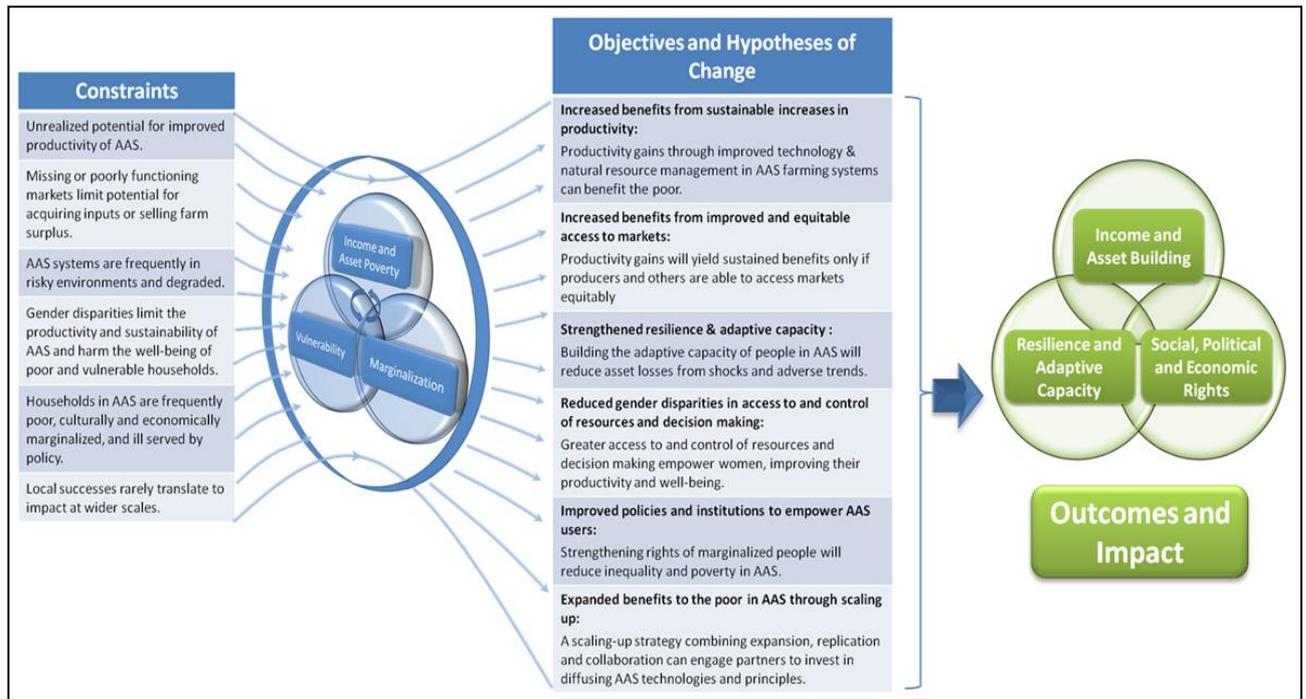


Figure 3: Theory of change for the Program.

The program recognizes a set of six broad constraints driving poverty and vulnerability in AAS. Looking at these constraints through the lens provided by our analysis of multi-dimensional poverty (income and asset poverty, vulnerability, marginalization), we identify six hypotheses describing possible pathways to remove these constraints. Each of these hypotheses in turn corresponds to one of the program's six objectives.

Our hypotheses suggest that productivity gains, improved natural resource management, improved access to markets, transformed gender relations, improved policies, impact at scale, and flourishing knowledge exchange and innovation systems will collectively effect significant poverty reductions in aquatic agricultural systems. By pursuing actions that address these hypotheses and achieve the corresponding program objectives we will achieve outcomes and impacts on the three dimensions of poverty through income and asset building, social, political and economic rights, and resilience and adaptive capacity (see also Table 1 for more detailed presentation of this pathway). However the relative importance of these processes in any given context can be determined only through careful diagnosis and some contexts may not require addressing all of them. Diagnosis and sequenced interventions are therefore critical underlying principles of this program, as they are in much contemporary development practice at both micro and macro scales (Rodrik 2006, Ostrom 2007, Collier 2008). We will focus in each location on the appropriate combination of research activities that best addresses the key constraints and opportunities faced by system households. In some the primary focus will be on developing new technologies to better harness the productive potential of the aquatic agricultural systems, while in others the focus may be on strengthened community participation as a means to assert rights and reduce exposure to risk.

To test our hypothesized theory of change that will bring about improved wellbeing for the poor and vulnerable, we need baseline data that move away from amorphous notions of poverty and vulnerability. Poverty is a condition of deprivation while vulnerability is a predictive chance of being affected by risks, shocks and hazards. In our baseline assessments, we will therefore use a framework (Hulme et al. 2001; Moore 2001) that differentiates groups and households into categories of the chronic and transient poor, as well as the non-poor. These categories will be

delineated by generating sets of indicators defining income and asset poverty, marginalization and vulnerability. Chronic poverty, for example, is associated with low income and assets, as well as marginalization from institutional structures and processes. Transient poverty, on the other hand, is linked more with vulnerability to risk and capacity for resilience. Interventions then can be targeted to meet the specific needs of different households. A set of multi-dimensional indicators will be formulated and used to analyze whether project interventions have moved participants over the thresholds of poverty and vulnerability. Moreover, the extent to which improvements in assets, capabilities and quality of life meet the aspirations for change by participants will be analyzed by using a wellbeing framework (McGregor 2007, McGregor et al. forthcoming), which focuses equally on the material (basic needs and economic aspects), social (relations among people, networks) and psychological/cultural (perceptions of satisfaction and aspirations) dimensions of benefits.

4.2 Strengthening rights and reducing vulnerability

Improving agricultural productivity or strengthening fishing rights can provide a route out of poverty if aquatic agricultural systems users' poverty and vulnerability are caused mainly by material constraints, such as low resource productivity. Increasing crop and fishery productivity cannot, however, inoculate a fishing or farming family against high incidence of malaria and HIV/AIDS, the depredations of rent-seeking officials, theft of livestock or fishing gear, unsafe working conditions, or forced eviction from their home. Yet this is the vulnerability context faced by many who live in aquatic agricultural systems (Allison 2005, Mills et al. 2009). People may also lack the power, education and cohesive social institutions to be aware of their rights, able to self-organize and articulate their demands, to negotiate with government officials, or carry out their responsibilities (Allison et al. 2011). The CGIAR Research Program on Aquatic Agricultural Systems recognizes this wider context of development and rights, in which agricultural research seeks to have impact, and will build program linkages with other development actors to address it. Similarly, aquatic agricultural systems users are vulnerable to macro environmental drivers such as floodplain modification, the damming of rivers, displacement by large-scale commercial aquaculture, tourism and other coastal development, and pollution (Welcomme et al. 2010, Hall, 2011). Local systems allocating land and water rights can confront and prevent some of these threats, but not all, notably pollution and upstream modifications in river basins.

Where smallholder farmers' and fishers' interests are historically unrepresented or overridden by competing claims, smallholders have no incentive to invest in managing their local land and water resources to optimize future yields. Effective approaches to poverty reduction thus often require investments in social protection and infrastructure that mitigate constraints on poor members of households engaging in production. The program will therefore embrace a holistic approach to poverty reduction, informed by the effective diagnosis of target households, including the understanding that households are gendered and do not necessarily act in a unitary manner. It will build real partnerships with governments, NGOs and other agencies that engage in social protection schemes and other interventions that mitigate constraints faced by different categories of the poor. This will significantly increase the chances that CGIAR investments in agriculture development will yield the impacts intended.

This approach to reducing vulnerability will require the program to consider the effects of other macro factors, such as economic changes and policies, on system users. The diagnostic approach of the program will identify these issues, and the research agenda developed will, where appropriate, be designed to identify and understand ways through which vulnerability to macro trends can be mitigated. This may include some of the social protection measures discussed above but may also include investments that strengthen household capacity to diversify their livelihoods away from vulnerability to these external factors. One of the strengths

that the CGIAR brings to this work is the ability to pursue this locally focused diagnosis while also drawing on the broader perspective that wider CGIAR analysis of policy and economic issues provides. The Program will develop close linkages with the CGIAR Research Program on Policies, Institutions and Markets to ensure that we can draw upon this work to best effect, including through annual program review.

4.3 Social transformation and gender equity

We will pursue a gender approach that is demand-driven and participatory. It will be centered on identifying gender-equitable options to maintain or change current household livelihood portfolios, based on an integrated approach to increasing productivity while maintaining the sustainability of aquatic agricultural systems. This approach will encompass new methods and technologies that combine permutations of farming, fishing, aquaculture, livestock rearing and forestry with non-agricultural livelihoods. It will offer a demand-driven suite of options best suited for women and men according to their category of household, and adapted to local environmental and socio-cultural conditions. The approach aspires to effectively combine productivity increases with actions that redress gender disparity in asset poverty, social exclusion and vulnerability. It focuses on such outcomes as the improved distribution of food and quality nutrition within households, heightened capacity and skills, changes in workload and greater political representation, as much as it does on improved incomes.

The program will incorporate rigorous gender analysis to understand the relationships among changes in aquatic systems; their impacts on agricultural and fishery production; and persistent poverty, social exclusion and vulnerability. This analysis will be based on consultations with both female and male stakeholders from different social groups, and the collection of gender and age-disaggregated data. Household and community data collection and analysis will attempt to bridge the gap between global indicators of poverty, social exclusion and vulnerability based on outsiders' perspectives and locally relevant indicators based on insiders' perspectives. We will use a comprehensive Gender Analytical Matrix (Annex 2a) developed by the WorldFish Center and that is appropriate to aquatic agricultural systems. This builds on the social relations approach (Kabeer 1996, 2001) to generate a gendered well-being framework (informed by McGregor 2007) that encompasses a multidimensional, dynamic perspective of poverty, as well as an often-overlooked cognitive dimension that incorporates differential aspirations of men, women and their younger counterparts.

4.4 Resilience in practice

The CGIAR has begun to explore the value of using resilience perspectives to guide its own research aims and processes (Walker et al. 2010).^b The Program will build on recent work by some partners that seeks to put resilience concepts into practice (Box 4). Important components of resilience theory that guide the practical emphasis in this program are as follows:

Self-organization. The capacity of people and institutions to organize and reorganize as they adapt to change and surprises is critical to building resilience (Berkes & Seixas 2005, Mahon et al. 2008) and parallels strongly the set of ideas around recognizing rights and empowerment as means to achieve development outcomes (Hickey & Mohan 2004). The Program will improve the self-organizing capacity of system users and their governing institutions through processes that characterize the program's approach (e.g., participatory diagnosis, action research,

^b A widely cited definition of resilience in a socio-ecological system is "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks." (Walker et al. 2008)

capacity development and knowledge sharing) and through its thematic activities (e.g., building capacity to adapt to climate variability and change, improving access to health services to combat waterborne disease in aquatic agricultural system communities, increasing adoption of improved feeding and care practices in women and children, strengthening community-based market cooperatives and organizations that manage natural resources, and gender mainstreaming).

Transformation. Resilience thinking recognizes that maintaining desired system functions such as food production in the face of change may require transforming other elements of linked socio-ecological systems. In aquatic agricultural systems, the ecological system is sometimes transformed to maintain social resilience (e.g., flood control civil engineering alters the ecology of floodplains but can enhance the security of people who live and work on them). Likewise, greater benefits from aquatic agricultural systems can be achieved in some circumstances through social transformation — for example, through transformational change in gender relations in places where men exclude women from economic, social and political opportunities. Another example is where reforming property rights can address long-standing conflict or injustice over access to land and water. In both cases, major shifts in social norms and policies can transform the lives of marginalized and vulnerable groups of people.

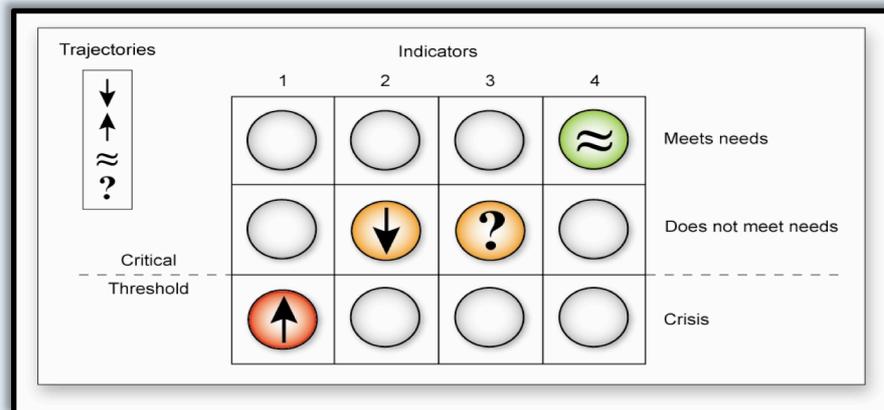
Transformation poses both practical and ethical questions. Practically, transformation often requires confrontation or negotiation with entrenched structures of power (e.g., Cornwall 2004). Ethically, trade-offs are often needed among competing values (Olsson et al. 2008, Van der Brugge & Van Raak 2007, Kristjanson et al. 2009). To paraphrase Walker et al. (2010): (i) Who decides when to enhance resilience by incremental change and when to transform? (ii) If a aquatic agricultural system is to be transformed, who decides what the changes will be? (iii) As transformation will favor some people over others, who will lose and who will win? (iv) Do research organizations have a legitimate role in this process? (v) The transformation process may be chaotic and unpredictable, throwing up new actors and causing unexpected ecological phase shifts. The Program will foster dialogue on these issues to initiate transformations toward more productive, equitable and resilient aquatic agricultural systems.

Box 4: Beyond the rhetoric; resilience thinking shaping management reform

For resilience thinking to have impact on the ground it must catalyze the development of innovative management paradigms that meet the challenges of transforming and sustaining complex systems characterized by uncertainty and nonlinear change. In the data-poor context of ASS in developing countries, it is equally critical that new methods abandon the heavy data requirements that characterize classical natural resource management and look instead for ways to feed existing, often local, knowledge into management systems that are primed to learn.

Resilience thinking promotes a broad conceptualization of the system being managed, one that incorporates the natural system, people and livelihoods, institutions and governance, and external drivers. This fosters engaging a broader set of stakeholders, recognizing influences from outside the system that may overrun internal management actions, and developing socially relevant indicators for monitoring the state and trajectory of the system.

Shared learning from pilot trials is unveiling a set of tools and processes to support implementation. One such tool, the indicator dashboard (figure below), provides a simple visual aid for moving from community-based diagnosis to the development of management indicators that are based on the ability of the system to meet community needs. It specifies monitoring at a resolution that is appropriate for community-based systems and can feed directly into the learning processes.



The indicator dashboard shows the possible states (meets needs, does not meet needs, crisis), trajectories (better, worse, unknown, same) and thresholds (good to bad, bad to crisis) that characterize indicators identified by stakeholders.

This diagnostic tool was used to develop a management plan for the bêche-de-mer (sea cucumber) fishery in the village of Kia on Santa Isabel Island in Solomon Islands. The participatory diagnosis identified the provision of cash to pay boarding school fees as a critical social outcome of a healthy bêche-de-mer fishery. Along with classical resource indicators (e.g., the number of sea cucumbers encountered on a standard transect) a selected indicator of management effectiveness was the number of students being sent home from boarding school for nonpayment of fees. The diagnosis recognized that cash from the bêche-de-mer fishery had caused villagers to abandon their vegetable gardens in favor of purchasing basic food requirements. When the government enforced the closure of the fishery in response to resource depletion, the lack of functional gardens and gardening skills compounded the impact of reduced income on households. A management intervention of promoting garden cultivation and an indicator based on the number of productive gardens in the village were included in the management plan. At the instigation of villagers, this management plan was later expanded to cover all marine resources, showing the community's strong buy-in and ownership of the plan.

4.5 A commitment to place and the people who live there

At the global scale, the CGIAR Research Program on Aquatic Agricultural Systems will focus on three contrasting aquatic agricultural systems: (i) Asian mega deltas, with initial focus on the Ganges-Brahmaputra-Megna and lower Mekong; (ii) Asia-Pacific islands, with initial focus on coastal systems in Solomon Islands and the Philippines; and (iii) African freshwater systems, with initial focus on the Zambezi Basin in Zambia, Lake Victoria waters in Uganda, and the Niger Basin in Mali. Within each of these systems, focal countries have been identified, and national consultations have agreed on focal hubs for our actions. In focusing on these systems, we have sought to respond to the priorities of regional bodies — notably the Comprehensive Africa Agriculture Development Programme (CAADP) coordinated by the New Partnership for Africa's Development (NEPAD),^c the Forum for Agricultural Research in Africa (FARA), the Asia Pacific Association of Agricultural Research Institutions (APAARI) and the Secretariat of the Pacific Community (SPC)^d — and target our efforts where large numbers of the poor, or a large proportion of the poor, depend on aquatic agricultural systems, and where our work in the selected systems and countries provides substantial opportunity to scale out regionally and globally.

Our overall approach is to develop a commitment to “place.” Long-term commitment to places and relationships helps to establish the trust and cooperation necessary to implement an action-research approach. In these places, we develop partnerships among fishers, farmers, traders, women’s groups, private firms, local governments, and other agents of change. We will work with them through our global research themes of sustainable increases in system productivity, equitable access to markets, socio-ecological resilience and adaptive capacity, gender equity, and policies and institutions to empower system users, and knowledge sharing and learning, with the emphasis varying according to local needs. Our aim is to build a community network of learners in each aquatic agricultural system that will share knowledge and scale out practices by developing its own capacity for accessing resources, its own marketable expertise in effecting change and its own links to higher-level policy. The CGIAR and our partners in government and civil society will work together to build the necessary capabilities and networks, reflecting the strengthening role of the CGIAR as a bridging organization (Ekbior 2009).

Focal countries and hubs face a great range of development challenges and opportunities. The Program will therefore seek to recognize and embrace this diversity in its work. We will explicitly identify target communities along a continuum, from areas of severe and endemic poverty, high vulnerability, and limited options, to those with less acute poverty, reduced vulnerability and a clearer set of development options. By working in these areas with differing development challenges, the Program will guide investments across a wide spectrum of contexts. We will, however, focus our greatest effort in those areas where first analysis suggests that the potential for alleviating poverty is highest. Section 6.3 provides more details of our approach to identifying research priorities.

In pursuing our focus on place, we will put people’s social and economic activities at the center of our analysis and development planning. We acknowledge that attempts to increase agricultural productivity or improve natural resource governance in support of the poor require us to understand people’s circumstances and work fundamentally with women and men, rather than using entry points related to particular technologies or sectors. This allows us to take a

^c As articulated in the CAADP companion document *Integrating livestock, forestry and fisheries subsectors into CAADP* (FAO 2006).

^d As articulated in the GCARD consultation.

view of the options for management and development intervention that transcend traditional sectoral boundaries such as fisheries, agriculture, pastoralism, wage labor or small enterprise, and that incorporate overarching issues that affect all people, irrespective of occupation, such as good nutrition and health, access to social services (e.g. health care, education and social security), financial services (savings, loans and insurance), political representation and judicial services. In applying this approach, we will conduct early participatory diagnoses or situation analyses in each hub (Rodrik 2006, Andrew et al. 2007, Ostrom 2007).

By developing our engagement in each country and hub through dialogue with other development partners, the Program will pioneer new ways of working with, and adding value to, investments made through others. This explicit engagement with the complex institutional environment within which rural development takes place will greatly improve the targeting of CGIAR research, expand opportunities for scaling out and strengthen impact.

4.6 Working in partnership

The CGIAR Research Program on Aquatic Agricultural Systems recognizes that many other development actors are engaged in the areas where we will focus, and that they together will invest substantially larger sums on reducing poverty there. In this context, the CGIAR needs to focus explicitly on where its own investments can complement and add value to these larger programs and so leverage greater impact for the poor. Involving partners with gender sensitivity and commitment, and linking up with organizations with gender expertise, will be integral to this partnership strategy. To achieve this, we propose establishing coalitions of partners working in these areas in each country, allowing the specific development context in each to determine the precise form and operating arrangements there. First steps toward establishing such a coalition have been taken in focal countries as part of scoping the current proposal. The program's partnership strategy is detailed in section 9, as are governance and management arrangements in section 15.

4.7 Results-based management

We believe that the CGIAR Research Program on Aquatic Agricultural Systems is an ambitious but realistic program. Achieving its ambitions will, however, require high-quality management delivering high-quality performance. To this end, we will adopt results-based project management. This focuses on four key components:

- appropriate strategic planning that defines clear and measureable results and indicators;
- effective monitoring and evaluation (M&E) that measures and assesses progress toward results using agreed indicators;
- reporting internally and externally on this progress; and
- using information from M&E to learn lessons and make decisions.

In pursuing this approach, we will work not only to improve efficiency and effectiveness through organizational learning, but also fulfill our obligations to the CGIAR and other stakeholders through performance reporting. As part of this work, we will focus on effectively involving stakeholders throughout the management lifecycle, including in defining realistic expected results, assessing risk, monitoring progress, reporting on performance and integrating lessons learned into management decisions. An effective system of results-based M&E is fundamental to results-based management. We describe the program's approach to M&E and impact assessment in section 13.

5 Impact pathways

5.1 Linking objectives, outcomes and impacts

The CGIAR Strategy and Results Framework highlights the need for a shift in emphasis from understanding the impact of particular technologies on the incomes of the rural poor to understanding the complex of factors required to significantly reduce rural poverty rates. This requires a shift in focus from ex-post impact assessment to understanding the pathways out of poverty. The Program has been developed with this holistic focus, establishing six research themes that provide a framework for research. Our recognition of the multiple dimensions of poverty and our commitment to people and place gives space to tailor these generic themes to the specific countries and hubs in which we will work. We will do this through gendered participatory diagnoses and ex-ante assessments that will be used to initiate the program in each country and hub. As described in detail in section 6.3, participatory diagnoses and ex-ante assessments will be used to identify key development challenges in each hub and agree on a theory of change and a research agenda. This process will help identify indicators of impact that will be used to assess program performance.

Figure 3 summarize the logical pathway from our key hypotheses (focused on constraints) to our program objectives and our research activities and the possible solutions they provide. Taking information from those figures, we show in Table 1 how these constraints and their theory of change have driven our selection of program objectives. We describe some impact indicators for each objective link to CGIAR system-level objectives as set out in the CGIAR Strategy and Results Framework. In the following section, we describe how the program will work to achieve the impacts we seek.

5.2 How we will achieve impact and do so at scale

The CGIAR Research Program on Aquatic Agricultural Systems will achieve impact at multiple scales. It will do so through three related pathways that reflect distinct strategies of partnership and knowledge sharing and learning. The first pathway will be the significant but localized benefits achieved through our direct engagement with partners in specific research sites in selected program hubs. The second is the more extensive achievement of benefits through the learning alliances and impact networks that the program will develop in these hubs. We will link closely with partners working in these hubs with the express intention of expanding the program's learning and impact through their own projects and networks. The third pathway is the more widespread and larger reduction in poverty that can be achieved by expanding the program networks nationally, regionally and globally, as well as by working through these networks to foster the dissemination and wider adoption of the learning, methods and technologies harnessed through the Program. To achieve this, we will foster the development of national learning alliances for aquatic agricultural systems in focal countries, and work with partners internationally to build a global coalition for knowledge sharing and learning in aquatic agricultural systems. These pathways and the hubs are the cornerstones of our strategy for scaling up.

Achieving impact at scale along these three pathways will require careful investment in a range of research, partnerships, and knowledge-sharing and learning activities designed to facilitate the processes required to translate outputs into outcomes and outcomes into impacts. Each pathway will use specifically tailored knowledge-sharing and learning strategies to foster ownership and inclusion and raise awareness and understanding of program outcomes, encouraging positive perceptions of them and their adoption and institutionalization. In pursuing these pathways, the program recognizes the importance of both vertical scaling (institutionalization through policy, political, legal and other types of system change) and

horizontal scaling (achieved through expansion, replication and collaboration). Our research is designed to build on evidence to stimulate the policy and other systematic changes required for vertical scaling, and our partnership strategy provides the means to do this through replication and collaboration.

Table 1: Linking Impacts of the Program's Objectives to CGIAR Objectives

Constraints in Aquatic Agricultural Systems (AAS)	Hypothesis of Change to Relieve Constraint	Program Objective (Statement of Outcome)	Sample Indicators		CGIAR System-Level Objectives
			Outcomes	Impacts	
Potential for improved AAS productivity is unrealized.	Productivity gains through improved technology & natural resource management in AAS farming systems can benefit the poor.	1. Increased benefits to AAS-dependent households from environmentally sustainable increases in productivity.	<p>Increased dissemination and uptake of improved technologies</p> <p>High adoption rates of new practices and technologies among men and women</p> <p>Reduced gender gap in technology adoption rates</p> <p>Natural resources in AAS sustainably managed</p>	<p>Improved rural incomes and well-being in AAS-dependent households</p> <p>Equitable sharing by men and women</p> <p>Increased share for the poorest and most vulnerable</p> <p>Decreased poverty (measured by national indexes)</p> <p>Increase in human development index</p> <p>Improved nutritional status and food security</p> <p>Reduced percentage of children underweight</p> <p>Reduced gender gap in nutritional status</p> <p>Reduced gender gap in per capita food availability</p> <p>Larger percentage increase in food availability for households with high undernutrition</p> <p>Increased diet diversity at household and individual level</p> <p>Reduced ecological footprint of intensification in AAS</p> <p>Improved flow of ecological services</p>	<p>Reducing rural poverty</p> <p>Strengthening food security</p> <p>Reducing undernutrition</p> <p>Sustainable management of natural resources</p>

Constraints in Aquatic Agricultural Systems (AAS)	Hypothesis of Change to Relieve Constraint	Program Objective (Statement of Outcome)	Sample Indicators		CGIAR System-Level Objectives
			Outcomes	Impacts	
Missing or poorly functioning markets limit potential for acquiring inputs or selling farm surplus.	Productivity gains will yield sustained benefits only if producers and others are able to access markets equitably.	2. Increased benefits from improved markets and services available to poor and vulnerable AAS households.	<p>Improved engagement by the poor in AAS markets</p> <p>Equitable uptake of training, financial and business services by men and women</p> <p>Increase in the number of men and women engaged in production and market organizations</p> <p>Increased market participation by the resource poor</p> <p>Equitable market participation by women and men</p> <p>Improvement in access to productive resources for men and women farmers, especially the resource poor</p> <p>Equitable access to resources and skills for women and men</p> <p>Increased women's leadership of producer and trade organizations</p>	<p>Improved rural incomes in AAS-dependent households through engagement in markets</p> <p>Equitable sharing by men and women</p> <p>Increased use of income for intra-household food consumption</p> <p>Increased share for the poorest and most vulnerable</p> <p>Decreased poverty (measured by national indexes)</p>	Reducing rural poverty

Constraints in Aquatic Agricultural Systems (AAS)	Hypothesis of Change to Relieve Constraint	Program Objective (Statement of Outcome)	Sample Indicators		CGIAR System-Level Objectives
			Outcomes	Impacts	
AAS systems are frequently in risky environments and degraded.	Building the adaptive capacity of people in AAS will reduce asset losses from shocks and adverse trends.	3. Strengthened resilience and adaptive capacity in poor, vulnerable and marginalized groups and households.	<p>Improvement in land & water management practices</p> <p>Equitable increase in understanding by men and women of available options for diversifying livelihoods</p> <p>Equitable use by men and women of mitigation and adaptation options</p> <p>Better availability of options for reducing risk among poor and vulnerable households</p> <p>Increase in risk mitigation investments in AAS by development agencies</p>	<p>Reduced distance to access water, fodder and fuelwood</p> <p>Improved general health conditions</p> <p>Reduced gender gaps in survival rates after disasters</p> <p>Increased life expectancy</p> <p>Reduced gender gaps in general health conditions and life expectancy</p>	Sustainable management of natural resources

Constraints in Aquatic Agricultural Systems (AAS)	Hypothesis of Change to Relieve Constraint	Program Objective (Statement of Outcome)	Sample Indicators		CGIAR System-Level Objectives
			Outcomes	Impacts	
Gender disparities limit the productivity and sustainability of AAS and harm the well-being of poor and vulnerable households.	Greater access to and control of resources and decision making empower women, improving their productivity and well-being.	4. Reduced gender disparities in access to and control of resources and decision making through beneficial changes in gender norms and roles.	Improvement in the number and quality of extension facilities and incentives to reach women farmers	Improved rural incomes and well-being in AAS-dependent households	Reducing undernutrition Reducing rural poverty
			Increased labor saving innovations to reach women farmers	Equitable sharing by men and women	
			Reduced gender gap in time use	Increased share for the poorest and most vulnerable	
			Improved availability and diversity of food for women and children within households	Reduced gender gap in percentage of the poor (measured by national indexes)	
			Improved availability and diversity of food in households headed by women	Reduced workload for women's activities	
			Equitable access to training, assets, technology and services for women and men	Improved nutritional status and food security	
			Increased decision-making role for women within households and in community organizations	Reduced percentage of children underweight	
	Reduced gender gap in nutritional status and increase in food availability per capita				
	Equitable increase in food availability for females and males within households				
	Larger percentage increase for women and children with high levels of undernutrition				

Constraints in Aquatic Agricultural Systems (AAS)	Hypothesis of Change to Relieve Constraint	Program Objective (Statement of Outcome)	Sample Indicators		CGIAR System-Level Objectives
			Outcomes	Impacts	
Households in AAS are frequently poor, culturally and economically marginalized, and ill served by policy.	Strengthening rights of marginalized people will reduce inequality and poverty in AAS.	5. Improved policy and formal and informal institutional structures and processes to support pro-poor, gender-equitable and sustainable development.	<p>Increase in production and improvement in crop, fish and livestock productivity</p> <p>Policy recommendations adopted to strengthen institutional capacity in AAS</p> <p>Increased and equitable access for men and women to different types of training</p>	<p>Improved rural incomes and well-being in AAS-dependent households</p> <p>Improved nutritional status and food security</p>	<p>Reducing rural poverty</p> <p>Increasing food security</p>
Local successes rarely translate to wider impact at scale.	A scaling-up strategy combining expansion, replication and collaboration can engage partners to invest in diffusing AAS technologies and principles.	6. Expanded benefits to the poor in AAS through scaling up.	<p>Expanded engagement of development actors using technology and learning from the Program</p> <p>Adoption rates of new practices in non-Program sites</p> <p>Additional investments in AAS by development agencies</p>	<p>Improved rural incomes and well-being in AAS-dependent households</p> <p>Improved nutritional status and food security</p>	<p>Reducing rural poverty</p> <p>Reducing undernutrition</p>

The intent of this table is to illustrate the connections of the Program objectives and impacts to CGIAR system-level objectives. Moving down the impact pathways toward system-level objectives, each Program objective has the potential to contribute to every system-level objective. We present selected indicators on selected pathways in this table.

Figure 4 presents a simplified model of an impact pathway. Capturing the intent of the program goal, impact for this Program will be measured ultimately as reduced poverty and vulnerability. To use CGIAR terminology, the outputs and outcomes, or steps along the impact pathway, describe our vision of how we plan to move toward this impact. These steps from output to impact are presented in the four boxes on the left. Research outputs are the typical products of research, including new knowledge, technologies, processes and materials, which the Program researchers produce. Outcomes are defined as users using outputs. In the research-for-development paradigm — and especially in the more radical research-in-development approach we aspire to in this program — users are a broad range of actors, from partner research institutions to development professionals and intended beneficiaries such as producers, traders and consumers. Though the figure depicts a linear concept, research in development is very much a circular process with many feedback loops.

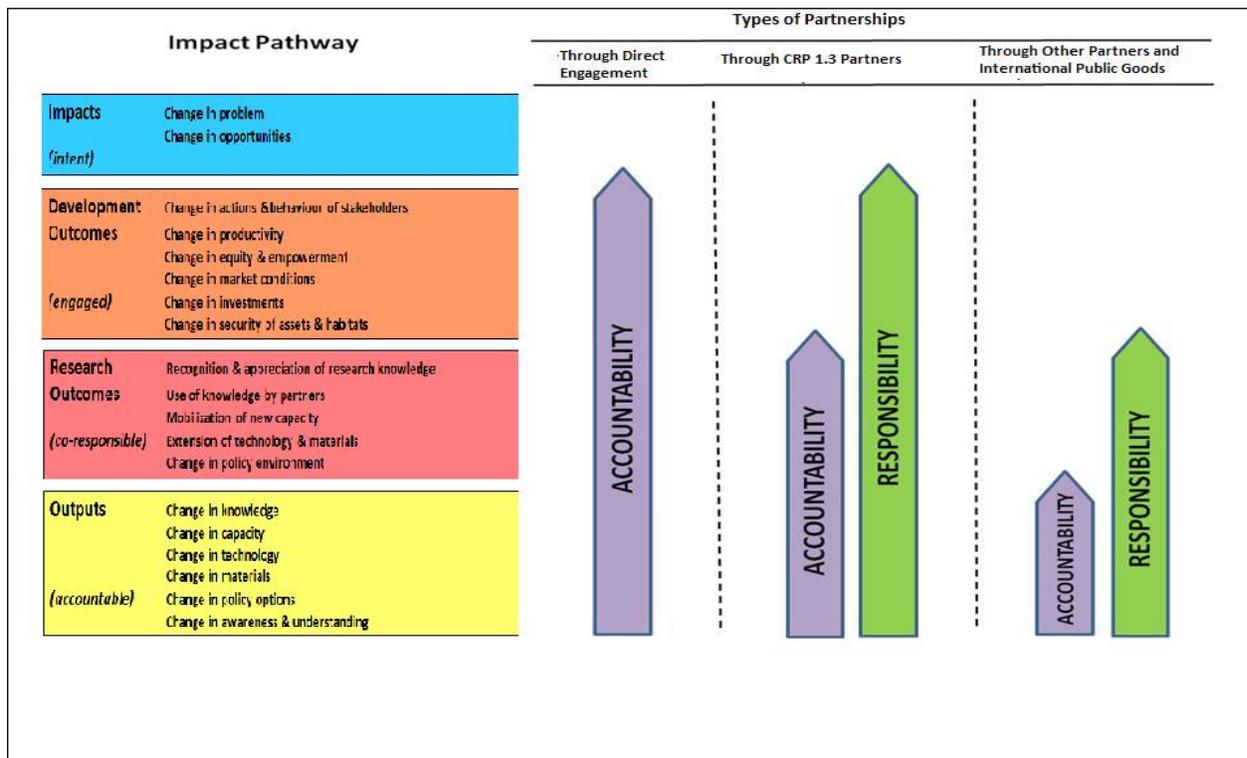


Figure 4: Program commitments along the impact pathway by type of partnership

Source: Adapted from Strategy and Results Framework at

www.cgiar.org/changemanagement/pdf/cgiar_srf_june7_2010.pdf.

With such a wide range of users, it is important to distinguish outcomes at different points along the impact pathway. Figure 4 illustrates two of those points. The first captures the utilization of research outputs by researchers or development professionals. Research products are often intermediate in nature, such as genetically improved plant or animal populations received by national programs for further breeding, screening and selection before their release. The second illustrates the utilization of the research outputs by intended final beneficiaries, such as farm households adopting a new crop variety or livestock breed.

The sample lists in Figure 4 can be thought of as indicators that reflect different steps on the impact pathway and are thus the bases for designing our M&E and impact assessment system (section 13). These generic statements will be converted into concrete, specific indicators in each country and hub through participatory diagnoses and consultations during program start up. These indicators will be multi-dimensional, based on the overall framework of asset and income poverty, marginalization and vulnerability, and will be used to monitor and analyze whether differentiated categories of the poor (chronic and transient) and vulnerable were able to move out of baseline poverty and vulnerability conditions. The approach and ethos of the program is that it will be aquatic agricultural systems users and their development partners that set the detailed agenda based on multi-stakeholder diagnosis or situational analysis, followed by prioritization and feasibility studies. In some cases, we will conduct formal ex-ante impact assessments to compare potential rates of return on different kinds of responses to the problems identified. In taking this approach, we will use the program start up to help instill the principles of results-based management at the heart of the program. This will involve taking program participants through a process that articulates the theory of change they believe their work can influence and the outcomes expected toward this, then it agrees on the indicators of those outcomes. More details on program inception are found in section 6.3.

The arrows in Figure 4 illustrate the different levels of commitment required for the Program to achieve outputs, outcomes and impacts. Where the Program is accountable, we have the resources and skills to undertake the activities required to deliver research outputs, translate outputs into outcomes and translate (with our partners) research outcomes into development outcomes. Where we are responsible, we seek to facilitate the uptake of the output by an intermediate user that will use its own resources and skills to pass the output product or knowledge to another user. This requires a distinct strategy for making research outputs available. The program's strategy for knowledge sharing and learning and Research Theme 6 address this with products, services and activities tailored to this need.

Any model represents a simplification of the real world, and the model in Figure 4 is no exception. Participatory research, innovation platforms and other demand-led methods fully involve the complete range of users in an iterative cycle of diagnosis, research and learning, feedback, evaluation, and so on, repeating the cycle as often as required. This is the case in impact pathway 1, in which the accountability arrow reaches deep into the development outcomes box. With the research-in-development paradigm, program partners will typically be the full range of users, including aquatic agricultural systems households, and with this level of involvement the program can be held accountable for achieving a broad range of outcomes, including the expected changes in beneficiaries' behavior, attitude, knowledge and aspirations.

Impact pathway 2 captures the first step in scaling out. The partnership strategy of the program is to embed our research within the larger development context in the focal areas, adding value to existing investments by research, development and beneficiary partners. In many cases, these investments cover aquatic agricultural systems communities where the Program will not be physically present. In this case, the Program partners will fully commit to assuring that the first users are well prepared with the knowledge and research products and processes of the Program for their encounters with the intended beneficiaries. Hence, there is a distinction between accountability and responsibility. With outcomes depending on the actions of Program partners

outside of areas of direct action, the program will seek to provide products and support knowledge sharing and learning with partners to effectively reach those beneficiaries.

Impact pathway 3 exploits the nature of the research outputs as regional and international public goods. Here the Program is accountable for the outputs and — through effective communication, knowledge sharing and other partnering strategies — responsible for raising awareness in the broader regional and global community. The conceptual framework of key research issues that the Program will focus on for this work is further specified in section 6.

6 Research Framework and Themes

6.1 Introduction

Three general principles guide the design of the CGIAR Research Program on Aquatic Agricultural Systems. First, our research is tightly structured around the major aquatic agricultural systems constraints and opportunities. Second, we seek quick payoffs through productivity improvements at the system level, but with careful attention to the sustainable use of natural resources and resilience under trends and shocks related to climate change. Third, we employ a gendered and nutrition-sensitive value chain perspective that includes agro-enterprises. We apply these principles through an action-research approach that responds to the call expressed at GCARD and in regional consultations for the CGIAR to engage more effectively with development processes and build more effective partnerships with the full range of organizations required to deliver development impacts. To do so, we will implement the program in close partnership with these stakeholders in a way that helps poor and vulnerable women and men to benefit from an improved environment for innovation and strengthening livelihoods (please refer to section 9 for details of our partnership strategy).

6.2 Research framework

The research proposed under this Program has been designed to meet the goal of improving the well-being of aquatic agricultural systems-dependent people. Working toward this overarching strategic goal, we have used the key hypotheses and theory of change described in Figure 3 to narrow our research focus to the six objectives and research themes described in Figure 5.

Theme 1: Sustainable increases in system productivity

Theme 2: Equitable access to markets

Theme 3: Social-ecological resilience and adaptive capacity

Theme 4: Gender equity

Theme 5: Policies and institutions to empower aquatic agricultural systems users

Theme 6: Knowledge sharing, learning and innovation

Figure 5 illustrates how action research activities under each theme address the three dimensions of poverty. Each of the themes is described below, including a set of key research questions and summary of research approach and methods we will use to pursue these. Taken together with the framework in Figures 3 and 5 these six themes provide the broad conceptual framework for the [27]

program's research agenda. However, this framework cannot by itself identify the research activities that the program needs to pursue in each country and hub. Rather, these activities need to be tailored to the specific needs and opportunities of each location, as identified through analysis of their development challenges and the role of agricultural research in addressing them. For example, in Zambia's Western Province the dominant development challenge is improving livelihood opportunities in locations where they are severely limited by the lack of farming technologies adapted to their floodplain environment and by major barriers to markets. In Bangladesh's Khulna hub the dominant development challenge is improving productivity and incomes in households coping with large fluctuations in salinity over the course of the annual farming cycle. The Program will need to tailor its research to meet these specific challenges. In view of the highly location-specific nature of the challenges faced by the poor and vulnerable, the detailed hub-specific research priorities of the Program will be agreed only through the participatory inception and priority setting process that the Program will pursue. This is detailed in the following section.

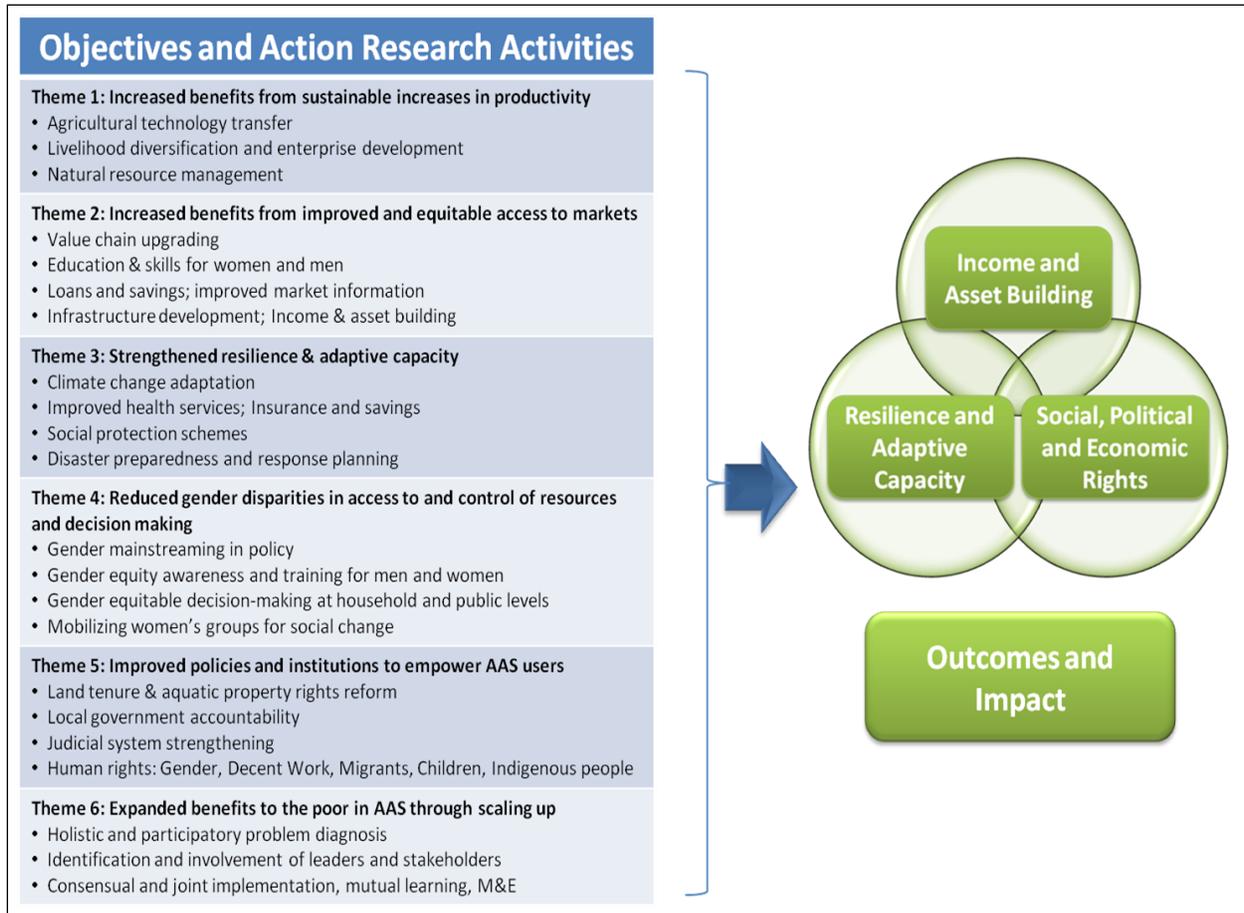


Figure 5: Program objectives, action research activities, and their impacts on drivers of poverty. CGIAR Research Program on Aquatic Agricultural Systems will work with partners to pursue action research in these six areas. The outputs generated will support, inform and guide further investments in each of these.

[Note: The activities indicated do not map directly to individual dimensions of poverty reduction because these overlap. For example, to reduce the vulnerability of landless AAS users, it may be necessary to adopt new livelihood activities such as small-cage aquaculture and floating gardens to supplement the use of wild common pool resources (Theme 1). This may entail developing new markets (Theme 2), investing in reducing disaster risk and early warning systems that reach mobile and itinerant populations (Theme 3), addressing gender inequity through gender-awareness activities and gender mainstreaming (Theme 4), and ensuring that the landless poor are not exploited in labor markets by promoting the application of the human right to decent work (Theme 5). Thus, vulnerability reduction activities are not confined to Theme 3.]

6.3 Research priorities

The focal country and hub approach is designed to provide the Program with the capacity to understand the complexity of aquatic agricultural systems and the ways through which research in development can support the poor and vulnerable in these areas to improve their lives. However, the countries and hubs reflect distinct differences in development contexts, aquatic agricultural systems, the vulnerability of communities dependent on them, and opportunities for improvement, among other things. The details of the program and the research we pursue therefore need to be [29]

tailored to the specific conditions and needs of each location. To do so, the Program will pursue the same broad process to identify our research priorities in each country and hub, building on learning developed through the implementation of other CGIAR and partner programs, notably the Cereal Systems Initiative for South Asia (CSISA) in Bangladesh and the basin focus of the Challenge Program on Water and Food (CPWF). This process will have three main steps:

National inception workshop. This will bring together key stakeholders with a view to preparing the detailed scoping and design of the Program in each country. The workshop will be preceded by preliminary participatory scoping with key stakeholders in each hub that will provide the basis for informed discussion during the workshop. The workshop will then build on this to target the Program toward the specific development challenges that it can address in each of the hubs.

The workshops will (i) describe the resources and farming systems in each hub; (ii) describe the communities who live there and the main drivers of poverty, with an emphasis on gender disparities; (iii) assess how possible interventions will contribute to reducing poverty and improving food and nutrition security; (iv) identify targets and indicators for these interventions to further focus the program on research investments that have the greatest scope for significantly reducing poverty and food and nutrition insecurity; and (v) inventory the existing information and gaps. Participatory tools to analyze impact pathways will, at this early stage, guide workshop participants toward research priorities, partnerships and the overall organization of the hub and country programs in ways that can better realize positive development outcomes and impacts. This will include agreeing on the districts and communities where the Program will focus its research in each hub, identifying the core teams for developing the program in each hub, and drawing up the terms of reference for participatory diagnoses in each hub.

Participatory diagnoses and ex-ante impact assessment. Building on the inception workshop, participatory diagnoses will be conducted in each of the hubs with female and male stakeholders representing different social groups. These will be designed to confirm the specific localities where the Program will focus research, identify the key development challenges confronting poor and vulnerable people in these communities, specify the challenges upon which the Program will focus, describe the initial hypotheses of change that the Program will focus upon in addressing each challenge, and agree on the research priorities that the Program will pursue to help bring about that change. As part of this diagnosis, the Program will conduct a stakeholder and institutional analysis in each hub, map out high-level outcome pathways, assess stakeholders' and target groups' capability, and identify indicators for monitoring significant change in poverty and food security. As part of this process, scoping will identify existing research and development projects already contributing to addressing the development challenges identified in the hub and work with partners engaged in these projects to identify how the research pursued in the Program can best leverage their contribution to meeting the development challenge. The scoping work will also identify gaps in existing and past research and development investments and work with partners to bring program research to new development projects that address these gaps. Finally, this phase of the work will confirm key partners operating in each hub and specify the roles of each in the Program. Several of these steps correspond to activities in the design and implementation strategy of results-based planning, M&E and impact assessment. This is discussed in more detail in section 13.

Program design. Participatory diagnoses and ex-ante impact assessments will provide the bases for program design in each hub and at the country level. The precise process by which this is done will be tailored to the specific conditions and capacities of each country and hub, with national workshops in some cases and more tailored hub workshops in others. For each hub, the design process will confirm the development challenges that the Program will focus on, refine them as needed and agree on the hypotheses of change that the program will pursue. Building on this, design workshops will confirm how ongoing research and development projects contribute to this process of change, with the Program adding value to ongoing work with new research, and confirm what partnerships should be developed to do so. In this way, the analysis will confirm research priorities for the Program in each hub, and workshop participants will develop research plans to pursue them. For illustrative purposes, examples of the development challenges, hypotheses of change and research questions that we expect to pursue in some of the hubs in Bangladesh are provided in Table 2. A fuller but still preliminary analysis of these issues for all eight hubs in Bangladesh is summarized in Annex 3. Table 3 further illustrates the commonalities and differences in our research agenda across focal countries using the example of Theme 1. Further analysis across all six research themes and five countries are provided in Annex 4.

The process described is designed to focus the Program's research efforts on the most important issues in each country and hub. However this focus on place brings with it the risk that the Program may miss the importance of changes in external drivers that may have an overwhelming impact at the local level. To guard against this the program will seek the expertise of the CGIAR Research Program on Policies, Institutions and Markets, and ARI partners to review and critique the research programs developed in each hub and country. The Program Oversight Panel will also have an important role in this regard as will the Program Forum both of which will seek wider perspectives on the research being pursued by the program, and allow for adjustment as needed.

6.4 Research themes

6.4.1 Theme 1: Sustainable increases in system productivity

Approach and methods. Many aquatic agricultural systems households have productivity or yield gap that can be narrowed by better inputs and adopting new, innovative production and postharvest technologies or practices. Theme 1 will develop and/or secure these inputs and technologies and work with partners to foster their adoption. Where appropriate, we will use existing technologies from other locations and countries but will also develop new technologies where necessary. Sustaining productivity improvements depends critically on maintaining ecosystem services and biodiversity, as well as on economic and social well-being. Theme 1 will attend to resource efficiency (e.g. in the use of water, land, energy, nutrients and other inputs) and avoiding adverse environmental impacts from increasing crop and animal productivity, taking into account economic and social factors as well as external drivers such as climate change. There will be clear linkage in this regard to Theme 3.

Research priorities for Program focus will be determined through the gendered participatory diagnosis of constraints and opportunities in each of the program's focal countries and hubs. Guided by these diagnoses, the Program will first draw upon the combined strengths of the CGIAR and international partners to identify existing research outputs, including those from other countries and regions that may be suitable for adoption in targeted aquatic agricultural systems [31]

communities. We will then take an action research approach to working with communities to adapt technologies to meet their specific needs, support them in taking ownership of the technologies, and gain confidence in continuing to develop technologies to meet changing circumstances such as market demands. We will assess uptake and impact of technologies, identify constraints and, where necessary, test alternative combinations. As this work proceeds, additional technology needs will be identified and, depending on needs and expertise, other CGIAR Research Programs will be tapped, or research will be conducted within the Program specifically to develop appropriate responses. Productivity-enhancing solutions may be genetically superior crops, livestock, trees and fish; integrated management to avoid losses, improve quality or improve yield or production efficiency; the provision of timely access to better production inputs; or reduced postharvest losses. The program will address opportunities for improved access to benefits for the poor and the more sustainable use of common resources such as fisheries, wild plants and animals. In pursuing these solutions we will also develop tools to assess (both *ex ante* and *ex post*) ecological resource use, efficiencies and services at the farm, household and landscape scale, and use these to assess the environmental sustainability of changes in system productivity. The technologies that combine productivity gains with sustainability will be used for scaling out. Research in this theme will link closely with the CGIAR Research Programs WHEAT and Livestock and Fish (commodity crops), as detailed in Table 8.

Gender mainstreaming will focus on closing the productivity gap between men and women by engaging both groups in priority setting, research, field trials, dissemination and monitoring. Emphasis will be on production areas that have traditionally excluded or burdened women to create better understanding of gendered preferences for traits, species and other technological innovations, taking into account taste, nutrition, food safety and postharvest processing that increase social and economic returns while reducing the time liability and drudgery inflicted on women. Participatory breeding of crops, livestock and fish will be pursued with greater attention to preferences, quality and needs that will reduce gender gaps in poverty and vulnerability.

Research questions. These will include:

1. Which technologies can effect sustainable crop, fish and livestock productivity increases, in terms of both quantity and quality, in different aquatic agricultural systems, and for which social groups in terms of gender, age, ethnicity, caste, and the chronic poverty of transient populations?
2. What gains can be realized from better integrating or linking crops, fish and livestock production at appropriate levels, taking into account efficiencies of water, feed and fertilizer use and the need to secure resource access for the poor?
3. How can the use of resources (e.g., water, land, energy, nutrients and other inputs) and ecosystem services from aquatic agricultural systems be optimized, while increasing crop and animal productivity and taking climate change into account?
4. How can these technologies and management practices be developed and disseminated most effectively for the benefit of smallholder producers, differentiated by social group and gender?

5. What are effective governance approaches and practices to safeguard and enhance the natural productivity and socio-ecological resilience of small-scale fisheries and other common property resources in aquatic agricultural systems that benefit the poor and vulnerable, including women?
6. How can an explicit focus on gender heighten the development benefits from these activities?

Outputs and outcomes. These will include improved varieties and species with high nutritional quality, improved disease- and crop-management practices, and technologies and processes to assure higher-quality inputs, especially seed. Knowledge-sharing tools and materials may be provided through community innovation platforms, extension bulletins and farmer field schools. Outcomes will include improved availability of these practices, varieties and species through quality seed, breeding or hatchery programs and farm families' adoption of these improved varieties, species and practices.

These outputs and outcomes are similar to those of traditional productivity-enhancing research-for-development programs. However, two important differences take this work beyond business as usual. First, by integrating Theme 1 research explicitly with our research under Themes 2-6, we will ensure that traditional constraints are addressed comprehensively by linking productivity improvement with other dimensions of the systems approach we are taking. Second, by developing and using tools to assess ecological resource use and efficiencies, we will explicitly assess environmental sustainability and foster the application of those practices that are most sustainable.

Table 2: Initial analysis of development challenges, hypotheses of change and key research questions for five hubs in Bangladesh

Hub	Development Challenge	Hypothesis of Change	Key Research Questions
Greater Mymensingh	Social exclusion of ethnic minority Adivasi communities	Adivasi communities can be successfully integrated into development efforts by carefully designed interventions that introduce appropriate forms of aquaculture. This can bring higher incomes, shorten annual food deficits for project participants and enhance their ability to interact with ethnic majority Bengalis.	Can some of the most successful intervention strategies developed for Adivasi communities (e.g., establishing netting teams and fish processing and trading activities) have similarly positive impacts elsewhere for Bengali project participants? Are the benefits equitable for women and men?
Haor Basin (Sylhet)	Wetland habitat degradation	Community based management initiatives to create dry season refuges for breeding populations of fish can enhance the productivity of fisheries in remaining wetland areas.	How can proven management strategies (i.e. fish sanctuaries) best be scaled out to ensure wider uptake? What are the differential costs, benefits and trade-offs for women and men?
Greater Khulna	Highly disaster prone	Adopting continuous rotational cropping cycles spreads risk and returns throughout the year, making households more resilient under the impacts of climatic shocks than they would be if reliant on a single annual crop.	To what extent does extending or modifying the cropping cycle reduce or create greater exposure to risk from extreme weather events for farm households? How these outcomes are socially differentiated?
Greater Barisal	Extremely high incidence of poverty and stunting	Developing culture or enhanced management and capture techniques for small, nutrient-dense indigenous fish species in waterlogged polders can contribute to improved nutrition among producing households and, if produced in sufficiently large quantities, make these fish more accessible to low-income consumers by reducing their cost.	What is the reproductive biology of small, nutrient-dense indigenous species? Which management strategies can be adopted to increase productivity from natural water bodies and intensify culture? Will such systems be commercially viable? Will increased small fish availability result in gender-equitable consumption and nutrition within households?
Greater Noakhali/Comilla	Likelihood of worsening saline intrusion with sea level rise	Adaptive strategies already deployed by farmers in the more saline districts of southwest Bangladesh (e.g., integrated rotational rice-fish cropping) can be model coping strategies for inhabitants in the southern districts of the Greater Noakhali/Comilla hub.	To what extent are the strategies deployed by farming households in Greater Khulna hub transferrable to Greater Noakhali/Comilla hub, given differences in, for example, market infrastructure? What adaptations or innovations will be necessary within and beyond the immediate farming system to enable the successful application of these approaches? What are the differential costs, benefits and trade-offs for women and men?

Table 3: Sample research questions under Theme 1

Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
Research Theme 1: Increased benefits from sustainable increases in productivity				
Which new crops and cropping cycles deliver sustainable productivity increases for small and marginal households in the environmentally challenging saline areas of southwest Bangladesh?	How can the food and nutritional intake of resource-poor households in rainfed rice regions of Cambodia be increased through integrated aquaculture-agriculture farming systems	What are the best options for environmentally sustainable productivity improvements to crops, livestock, fisheries and aquaculture in ASS systems in the different agro-ecological, social and economic settings?	What and where is the scope for increased sustainable productivity from capture fisheries in Solomon Islands?	What are the best options for improving the productivity of crops, fish and livestock in the focal hubs?
How can new stress-tolerant rice varieties for salt-affected soils and submergence-prone lowlands be integrated with fish and shrimp cultivation in coastal areas rich in surface water to reduce farmer risk and increase cropping intensity and incomes?	What are the best options for improving the income and nutrition of poor landless fishing households in the Mekong and Tonle Sap floodplains using vegetable and livestock production?	How can improved tilapia strains be best deployed to allow poor and vulnerable AAS households to benefit from growing market demand for aquaculture products?	Which new or improved technologies can deliver sustainable productivity increases for small and marginalized households?	What improvements would provide the greatest benefits to the landless and workers displaced from formal employment such as mining and by future dam construction?
Which technologies and/or sets of cropping systems offer the best opportunities for women and men to improve incomes, intra-household nutrition and household resilience under shocks in different agro-ecological and vulnerability settings?	Can the improved integration of aquaculture into conservation agriculture meet the goals of both poverty reduction and sustainability?	What diversification options can create impact at scale for poor and vulnerable fishers and farmers?	At the household level, which technologies and/or combinations of technologies for AAS offer the best opportunities for women and men to improve household incomes, nutrition and resilience to shocks?	How can women and men affected by HIV/AIDS benefit optimally from productivity improvements?

Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
What are the trade-offs for women and men between investments in household land improvements and off-farm opportunities?	How can the cost of entry to new aquaculture and agriculture technologies be reduced for the poor and vulnerable?	How can the natural resource and financial limitations of poor and vulnerable fisher and farmer households to scaling up be addressed?	Including sustainable financing, what are effective methods of introducing sustainable alternative and supplementary livelihoods to remote communities?	Can greater focus on productivity, sustainability and market chains for AAS crops help alleviate the hunger season and improve the nutritional quality of food intake in maize-dominated agriculture?
How can scaling up technology and investments ensure equitable benefits to women and men?	Will new technologies provide equitable benefits to women and men?	How can scaling up technology and investments ensure equitable benefits to women and men?	What are the comparative costs, benefits and trade-offs for women and men when adopting new technologies?	Would improving market chains and nutrition provide equitable benefits to women and men?
What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?	What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?	What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?	What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?	What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?

6.4.2 Theme 2: Equitable access to markets

Approach and methods. Research under Theme 2 will focus on understanding how to improve market access for crop, livestock and aquatic products produced by poor and vulnerable households in aquatic agricultural systems. We will take a gendered approach to this research that focuses on the actors in value chains for market products from AAS. The approach will recognize that the poor and vulnerable may be engaged along value chains for aquatic agricultural systems products such as fish seed nursing and trading, services such as pond cleaning and harvesting, and postharvest activities. Research will help identify more broadly opportunities for improvements that benefit the poor in value chains. Better understanding of markets will underpin our approach, and opportunities will be pursued in local, national and regional markets depending on commodities; market demand and access; and other constraints, risks and benefits.

Research will be guided by appropriate, participatory market chain analysis (PMCA). As illustrated in Figure 6, PMCA is a process in which researchers and market chain actors join together to identify products for equitable value chain development and jointly seek improved product technology, market innovation and institutional change. The pyramids in the figure, one inverted, illustrate changes in degree of participant commitment to implementing the value chain. Work starts with extensive leadership and commitment from researchers, but down the chain other actors progressively take on more leadership, reducing the role of research. Though PMCA is designed as a 1-year process, successfully sustainable cases have typically required research backstopping for longer periods.

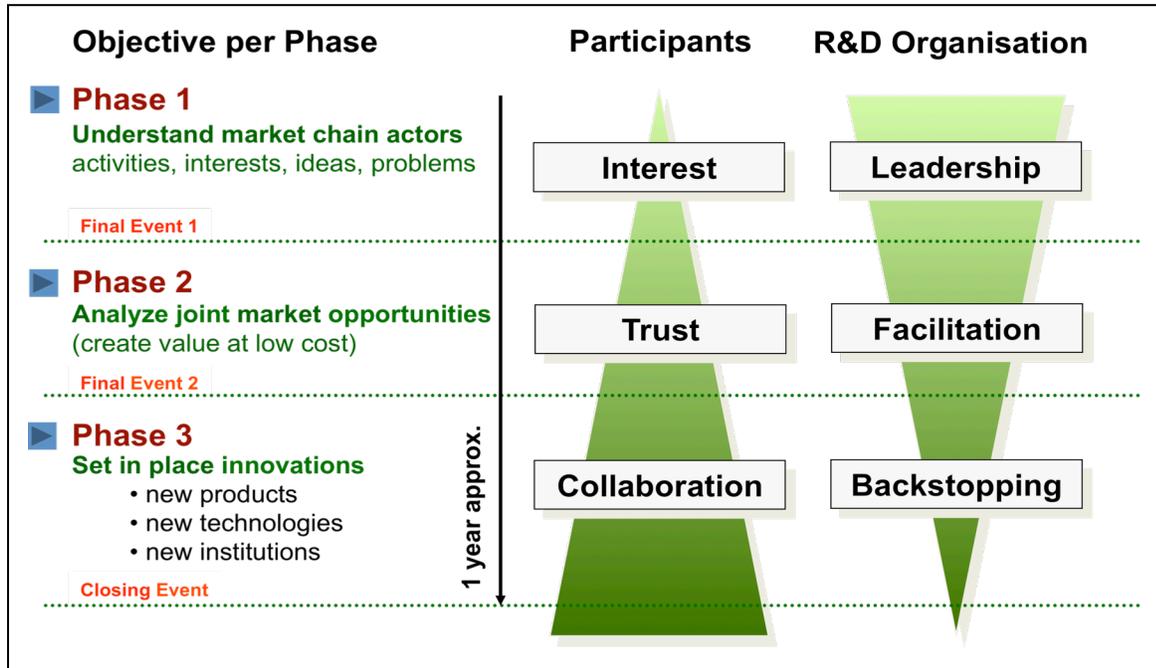


Figure 6: Responsibility in participatory market chain analysis shifts from researchers to users. Source: Devaux A et al. 2009.

Gender interventions will assess and address gender gaps along value chains, using a gendered value chain approach.⁹ This action research-based approach will reveal currently invisible, undervalued and under-remunerated work by women along value chains originating in aquatic agricultural systems; identify barriers to market entry and expansion; and test best options, processes and practices that bring about gender-equitable social and economic returns from market chains. It will integrate key dimensions of extra-market factors, power relations and motivations into the currently incomplete understanding of economic growth. Special emphasis will be placed on gender-responsive capacity and asset building such as entrepreneurship training, technological innovation, and financial and business services that ameliorate social exclusion and enable women to invest in pathways beyond microenterprise. Value chain research under this theme will include a nutritional dimension, considering the nutritional quality of the products and

⁹ The gendered value chain approach was developed by the International Labour Organization (see Mayoux & Mackie 2007).

ways to minimize harmful practices and loss in nutritional quality, as well as how value chain arrangements can best deliver positive nutritional outcomes, particularly among women, children and other vulnerable groups.

Research questions. These will include:

1. What are the opportunities for increased employment for the poor and vulnerable in crop, fish, and livestock value chains in aquatic agricultural systems?
2. How can input markets deliver to smallholder producers high-quality inputs more consistently, efficiently and affordably?
3. What technologies and practices must be developed and implemented along the value chain to ensure high quality products from aquatic agricultural systems, in terms of nutrition and food safety?
4. How do market drivers affect producers' methods and technologies, and what value chain interventions support production practices that are more economically, environmentally and socially sustainable?
5. What business-support arrangements work effectively for smallholder producers and traders, in particular microenterprises, in different environments? How can these services be delivered effectively and with due regard to such stakeholder constraints and limitations as labor, limited education and access to technology? What are the specific constraints for women and how can they be overcome?
6. How can small operators become and remain more competitive as market chains become increasingly integrated, notably for fish and livestock products? How do knowledge and skills among the poor and vulnerable need to be improved, and how can this be achieved? What are the special constraints on women moving up the value chain? What is the role of collective action by producers, processors and trader organizations?
7. What wider services and support are required to build healthier and more prosperous communities in aquatic agricultural systems that are marked by remoteness, high mobility, high variability in production and incomes, and heightened uncertainty about the future?

Outputs and outcomes. PMCA naturally creates demand for technological, commercial and institutional innovations. Outputs for this theme will result from the research stimulated by PMCA and include improved and new marketable products from aquatic agricultural systems households, households' and communities' adding value to them, new postharvest practices, new agribusiness arrangements, and better market information. Outcomes will include the adoption of technologies and practices that add value to products; private and public investment in value chains; the creation or strengthening of producer, trader and marketing organizations; the creation and utilization of new market information systems; and the provision of value-added products to consumers.

6.4.3 Theme 3. Social-ecological resilience and adaptive capacity

Approach and methods. People living in aquatic agricultural systems are vulnerable to a range of shocks and have limited capacity or resources to respond to them. Many of these people, such as those living in the Ganges Delta, are among the most vulnerable to macro level drivers such as climatic change and natural disasters that can overwhelm the gains in income and well-being achieved through improvements in productivity, access to markets or other areas. Compounding their physical vulnerability, unequal power relations and discrimination condemn many aquatic agricultural systems communities to marginalization in development processes that hinders their access to assets, knowledge and support. The insecurity — brought about through the combination of vulnerability, discrimination and marginalization — discourages innovation, dampens willingness to take the long view on resource stewardship, and helps undermine the long-term sustainability of the natural resources that these people depend on. Building capacity to adapt to irreducible risks, and strengthening rights that foster more equitable access to resources and services, are therefore key steps to building socio-cultural resilience and improved well-being in aquatic agricultural systems communities. Research Theme 3 focuses on understanding how to achieve this.

We will combine environmental and social systems research with action for social change. Environmental systems research will examine the questions of ecosystem resilience that a sustainable food production system depends upon, as maintaining ecosystem services and preserving biodiversity help ensure healthy soils, nutrients, water supply, pollination services, and fish, among other needs. There are links with agroforestry and aquatic resource management, as the presence of coastal mangroves and healthy seagrass and coral reefs, for example, provide important services for human livelihoods and well-being. Research in this theme will encompass fisheries governance questions and seek to expand existing WorldFish research on grounding resilience theory in the practice of aquatic agricultural systems governance (see Box 4). Work in this theme will draw upon advances achieved through the CGIAR Research Programs on Water Scarcity and Land Degradation and Climate Change, while providing focused opportunities for integration across most of the CGIAR Research Programs (Table 8). Social systems research will feature action research as defined in section 4. Work in this topic will draw on global analyses and key learning developed through the CGIAR Research Program on Policies, Institutions and Markets). The diverse ecological and social contexts of focal countries and hubs within the Program offer a unique opportunity learn from many different pathways can aquatic agricultural systems take. There are currently few examples of resilience-based interventions in the developing world, and this Program will draw on our work in these hubs to make important contributions to resilience theory and practice. Lessons learned across these systems will also contribute to other CGIAR Research Programs concerned with the governance of production systems.

The interdependence of ecosystems and societies is no more apparent than in aquatic agricultural systems. Insights from resilience research show that: (i) attempts to simplify aquatic agricultural systems to increase efficiency and production reduce the diversity of system responses and makes the system more vulnerable to stresses and shocks; (ii) addressing only the social or ecosystem dimensions of resilience will not be sufficient to promote sustainable outcomes – ultimately social and economic development depends on the ability of aquatic agricultural systems to supply ecosystem services; (iii) many aquatic agricultural systems are in highly resilient but undesirable states and enhancing the transformability of these systems is a major need in the developing world. Opportunities to transform systems to new states are poorly understood yet critical to

achieving the transformational development sought; (iv) flexible, dynamic governance arrangements that can operate at several scales are more likely to reduce vulnerability to macro-drivers and to promote effective self-organization. We will draw on these insights to guide our program of research in aquatic agricultural systems.

Gender mainstreaming will address gendered differences in vulnerability and risk in the face of seasonal and lifecycle events, natural hazards and climate change. Emphasis will be placed on food security, nutrition, health and survival disparities. A participatory approach to risk and vulnerability assessment based on public-private partnership will assess current gendered responses to risk and determine the best mitigation and adaptation options for reducing risk through public mechanisms such as social protection and/or private mechanisms such as micro-insurance, depending on the gendered capacity and preferences of individuals, households and poverty groups.

Research questions. These will include:

1. What are the likely future scenarios for hubs and research sites in focal countries, and what are the key constraints and opportunities for social and ecological resilience that can be addressed through multi-stakeholder research?
2. How do the main drivers of change and their gendered impacts affect the productivity and poverty-reduction potential of aquatic agricultural systems?
3. How do women and men perceive and respond to risks differently, and how is this taken into account in designing gender-equitable adaptation options and policies?
4. What processes predispose aquatic agricultural systems to transformation to new states? In the case of resilient but 'bad' states how can those processes be recognized and nurtured, or minimized if the system is to be made more resilient?
5. What are the relationships between ecosystem function (including biodiversity attributes) and the capacity of social-ecological systems to persist or transform?
6. How do the main drivers of change and their gendered impacts affect the productivity and poverty reduction potential of aquatic agricultural systems?
7. How do innovations spread among local and larger scale networks? What are the success factors that determine the spread of local innovations in governance? And how can that understanding be used to influence formal and informal social networks to accelerate poverty reduction?
8. What coping and adapting technologies, services and institutions may be appropriate to enable people to adapt to change and recover from shocks?

Outputs and outcomes. We will identify new practices, tools, technologies, knowledge products and organizational models, as well as provide dialogue, facilitation and advocacy. These will be used to generate outcomes including property rights consistent with policy objectives, the improved management of land and water resources, improved preparedness for and response to changing circumstances, disaster preparedness and response, effective compliance with [40]

management interventions to support natural resource management objectives, improved understanding of rights and strengthened ability to gain institutional and judicial support to address violations of rights (including gender rights), and appropriate constituencies empowered and effective at articulating their needs and aspirations.

6.4.4 Theme 4. Gender equity

Approach and methods. The CGIAR Research Program on Aquatic Agricultural Systems recognizes that there are significant gender disparities in access to and control of assets and decision-making within aquatic agricultural systems, and that they greatly reduce our ability to harness the benefits of these systems for human well-being. Accordingly, the program seeks not only to integrate gender with other research themes but to pursue research that will help fundamentally transform underlying gender norms and roles. The Program thus pursues a two-pronged gender strategy (section 7) that recognizes the need to explicitly address critical constraints on and opportunities for reaching gender-equitable outcomes, which cannot be fully achieved by gender mainstreaming across the other five themes alone. In doing so the Program responds to the CGIAR Gender Scoping Study and its analysis of mechanisms to incorporate a gender-research approach throughout the new portfolio of CGIAR Research Programs.

This theme adds to the gender-mainstreaming approach by focusing on three action areas. The first is to change norms, attitudes, beliefs and practices relating to gender roles that constrain equity by educating both women and men. Next is to strengthen the role of women in decision making in many contexts, ranging from households to local government; community organizations; producer, processor and entrepreneur associations; and regional and national governance bodies for fisheries, agriculture and forestry. The final action area emphasizes increasing women's access to, ownership of and control over productive resources, especially land, water, technology, finances and services.

The research and intervention strategy will follow the program's overall participatory action research approach, emphasizing gender mapping, gender-disaggregated vulnerability and risk assessment, value chain analysis and decision-making analysis, as well as interactive social media, along the five stages of the research-development cycle, as outlined in section 7. The program will be implemented with the involvement of partners aware of the importance of gender sensitivity and by linking with research and advocacy groups with gender expertise (see Annex 2a for a summary of partnerships for gender). Building implementing partners' capacity in gender-analysis methods and tools is integral to this theme, as is delivering gender-equitable outcomes and impacts. This theme responds to recommendations of the

Research questions. These will include:

1. What socio-cultural factors underlie gender roles in livelihoods in aquatic agricultural systems, and what are the corresponding constraints and opportunities for change?
2. What are the informal and formal institutional constraints on and opportunities for achieving gender equity in access to, ownership of and control over resources and the best practices that can be exchanged among program countries?
3. Do factors for gender equity in decision making differ between the household and public spheres, and do they change over time?

4. What are the options and models that can be tested for fundamental change toward achieving gender equity in decision making and the control of assets?
5. What options and models work best in what specific contexts, taking into account socio-economic change and impacts?

Outputs and outcomes. Outputs include tools^f mapping gender and gender-specific livelihood trajectories and decision making, training modules on gender equity, a gender and assets action network, and the documentation of best options for gender-responsive interactive social media. Outcomes include gender-equity awareness creation and training accessed by female and male beneficiaries, researchers, implementers and decision-makers; gender sensitivity increased through innovative social marketing and media (forum theater, television, information and communication technology, and radio) responsive to female and male beneficiaries, researchers, implementers and decision-makers; women's role in decision making in households and public bodies increased; and greater involvement of local women's groups and other groups in advocating gender-equitable access to and control of resources.

6.4.5 Theme 5. Policies and institutions to empower aquatic agricultural systems users

Approach and methods. While the focus of the Program is on the household, the program recognizes that the wider policy environment has a powerful influence on people's lives and that, in the absence of favorable policies and supporting institutions, improved technologies at the field level are generally of little long-term benefit. Accordingly Research Theme 5 focuses on understanding how policies and institutions at both national and international levels impact on aquatic agricultural systems and the people who use them. We will build on this understanding to (i) support aquatic agricultural systems communities to, where possible, adapt to the policies that will not change; and (ii) encourage the emergence and effective implementation of policies and institutional innovations that help maintain the resilience of aquatic agricultural systems and their communities.

The basic assumption here is that a constraining policy context stifles innovation and is a major barrier to reducing poverty and vulnerability and maintaining or strengthening the resilience of aquatic agricultural systems. On the other hand, enabling, coherent policies and good governance, together with investments that help buffer the poor and knowledge from negative effects of macro level policies, can galvanize innovation and change.

We define policy as both implicitly and explicitly coordinated action undertaken over the long term by those able to exert influence over others. The focal groups for work in this theme therefore include policymakers and their advisors at multiple levels. We will work with traditional authorities such as village heads; local, district and national government officials; regional organizations; and influential civil society groups that deliver services or advocate policy. The focal groups beyond the direct intervention sites in the hubs reflect our goal of institutionalizing change or vertical scaling up, and awareness of the need to understand and take account of macro level drivers. Several of the research questions below are seeking to institutionalize changes in the policy, legal and budgetary environment of aquatic agricultural systems.

^f See Annex 2b for details of participatory gender tools to be developed and tested.

Our research in development approach will involve working with government and civil society organizations to articulate and address citizen's concerns about policies and institutions that are identified as critically blocking the emergence of resilient, pro-poor aquatic agricultural systems. These may include commodity-based taxation that discourages enterprise diversification, taxes and controls on movement that stifle trade and labor mobility, ineffective health service delivery for mobile people, and weak or inappropriate property rights. We will complement this bottom up approach with consideration of macro drivers, including those that local communities may be less aware of, such as infrastructure, energy, water resource management, or trade and investment policies that could significantly impact the resilience of aquatic agricultural systems in the future. In doing so we will work with the CGIAR Research Program on Policies, Institutions and Markets, drawing on analysis in such areas as the political economy of agricultural sector reform, integration of multiple resource sectors in national strategies for food security and asset building, and policies to promote local collective action and place-specific property rights regimes.

We will also work with government and civil society organizations to identify ways to strengthen the implementation of good policy where it exists. The program will engage with change agents in government, those individuals or departments that attempt to develop new policy instruments to support development and sustainable environmental governance in aquatic agricultural systems. We will also partner with community organizations and civil society networks that foster creative institutional innovation within the frame of existing policies, or that demonstrate the feasibility and benefits of new approaches that can be applied and adapted elsewhere. Examples include locally-driven efforts to identify and resolve disputes over resource access, forming collectives to increase poor households' access to input and output markets, or combining the legitimacy of traditional authorities and state institutions in enforcing community-based management regimes. Research in this theme will be closely aligned with our work on impact pathways in each hub/country location, where we will seek and facilitate opportunities for policy change and intervention toward positive development outcomes and impacts for aquatic agricultural systems users. Learning from such experiences will be shared using video, policy briefs, and practitioner guidance notes that carefully specify the contextual factors that make a given approach suitable for adaptation in similar environments.

Gender-specific interventions will focus on policy and institutional processes that currently exclude women in agriculture, livestock, fisheries and aquaculture, and in natural resource management that contributes to the sustainable productivity of aquatic agricultural systems. They will address legal frameworks and organizing processes upholding the rights of women and children. We will pursue opportunities to improve gender equity outcomes through better mainstreaming in sectoral policies and by highlighting gender disparities in aquatic agricultural systems when engaging in broader policy processes on poverty reduction, market development, disaster reduction, and climate change adaptation plans at local, regional and national levels.

Research questions. These will include:

1. What are the specific sectoral and cross-sectoral policy requirements for fostering pro-poor, gender-equitable growth in aquatic agricultural systems, building on their productive potential and addressing the socially differentiated vulnerabilities of target populations?
2. What macro-level policies constrain national and local-level efforts to reduce poverty and improve livelihoods in aquatic agricultural systems?

3. What approaches best enable the poor and vulnerable to contribute in developing economic and social policies that foster increased benefits derived from aquatic agricultural systems?
4. What institutional innovations are most effective at reducing conflict over environmental resources in aquatic agricultural systems and enabling adaptive resource management regimes that accommodate the interests of users across multiple scales?
5. How can policies on enterprise development, poverty reduction, trade, and border security be aligned effectively to facilitate the development of cross-border markets for aquatic agricultural systems products—and an equitable share in the value chain for poor producers?
6. What are the constraints and opportunities for strengthening local governments' regulatory and service-provision functions in aquatic agricultural systems, and strengthening their accountability towards local communities?
7. How can neglected sectors such as fisheries and groups such as fisherfolk and women traders in aquatic agricultural systems be appropriately included in national policy and funding instruments that support climate change adaptation, export promotion schemes, disaster preparedness and response frameworks, and poverty reduction strategies?

Research outputs and outcomes. The outputs and products that we must produce to help deliver outcomes that contribute to the goal of the Program will include the identification of new practices and tools, products supporting change in knowledge, attitude and skills (KAS) among policy makers, and new organizational models, as well as dialogue, facilitation and advocacy and lessons learned for the wider sharing and scaling up and out of the outputs from other themes. The outcomes include more secure and equitable access to land and water; an improved policy and regulatory environment; improved access to financial services; improved access to social services, including health and education, for hard-to-reach mobile populations; clear, agreed and robust management objectives that are consistent with policy objectives; improved public services for communities in aquatic agricultural systems; increased accountability of government agencies serving these communities; and reductions in resource conflict.

6.4.6 Theme 6. Knowledge sharing and learning

Approach and methods. For the CGIAR Research Program on Aquatic Agricultural Systems to be successful, it must embrace a culture of knowledge sharing and learning that sustains productive relationships, partnerships and networks. To support this, strengthen the performance of program participants, and better achieve program outcomes, we will design and adapt innovative knowledge-sharing and learning practices. This will support the delivery of outcomes of other themes by catalyzing knowledge sharing and learning by and among partners and stakeholders. This theme is a major contributor to our strategy for scaling up. Horizontal scaling up consists of dissemination and advocacy. Effective communication products and tools are key investments to support these objectives. We will provide a framework for this as a component of research and development activities; partnership and capacity-development strategies; and program M&E and impact assessment. This requires strong, ethically guided engagement with stakeholders toward developing knowledge, sharing and learning, and a communication system that supports adaptive management across the program, allowing for continuous learning and improvement.

The Program is committed to learning by doing and demonstrating that activities will contribute to significant and lasting changes in the well-being of beneficiaries. The M&E system will be designed to provide information on the performance of the Program at various levels that will become the basis for reflection and learning, supporting the goal of knowledge sharing and learning.

The change process we envision will align with the current best practice of innovative approaches to social change. In particular, we will pursue cyclical, relational communication that allows outcomes of mutual change rather than one-sided, individual change (Figueroa et al. 2002). Advocating participatory knowledge sharing and joint learning will be supplemented with interventions that invite, rather than require, participation and that catalyze dialogue within a community in pursuit of collective action.

Gender mainstreaming in this theme will focus on gender-responsive communication and dissemination strategies, particularly interactive social marketing and media, such as forum theater and information and communication technology, which enable the participatory generation of options and aspirations and can be differentially mobilized for adults and youths. Learning networks will link the exchange of options and best practices across communities, regions and countries by building partnerships with women's and gender-advocacy groups and policymakers, to enhance the commitment of Program partners to gender equity. Learning and exchange will be further supported by tailor-made capacity-building modules for stakeholders on gender analysis and mainstreaming.

Research questions. These will include:

1. How best can we translate research outputs for diverse stakeholders' practical use and application?
2. How is knowledge sharing and learning conceptualized by different actors engaged in research and development in the program?
3. What types of knowledge-sharing and learning approaches and practices are prevalent at the different levels of program activity, and what influences their choice for different purposes?
4. What specific knowledge-sharing and communicative practices more effectively reach women than men, and what are key components for bridging gender gaps in learning and innovation?
5. What partnership and governance relationships are effective for organizational learning?
6. In process-intensive action research, what techniques work best for scaling out best practice? What communication methods, tools and partnerships will best support creating impacts at the scales envisaged by the Program?
7. In a physically dispersed action research program with a range of partner relationships, what indicators of communication and knowledge-sharing outcomes can be meaningfully included in the M&E system?

Outputs and outcomes. Outputs include information and communication products and processes made available to partners and stakeholders. Key outputs in this regard are knowledge

products that support partners' scaling up and out Program research to achieve significant development outcomes and impacts. Selected outcomes are understanding and comparisons of the relationships of power, information flows and governance in managing shared resources, the adoption of new technologies or governance for value chains, and improved efficiency and effectiveness resulting from greater knowledge sharing.

6.5 International public goods

While the program has been designed to focus operationally on focal countries and the hubs within them, it will build on this geographically focused research with steps to harness global learning from this work in the form of international public goods (IPGs). We will reflect on the commonalities and differences in development challenges to be addressed in the focal countries and hubs, together with their hypotheses of change and research questions. For example, poor communication has been identified as a barrier to market access and a challenge in four hubs in Bangladesh, one in the Philippines and two in Zambia; similarly, access rights have been identified as a challenge in four hubs in Bangladesh, all three hubs in Cambodia, two in the Philippines, one in the Solomons and two in Zambia. Hypotheses of change will be developed for these challenges in each hub, and research will be conducted to test them. From this program of diagnosis and research, we will distill a body of comparative learning and general principles that can be drawn upon to pursue development interventions elsewhere in focal hubs and countries, other aquatic agricultural systems, and, indeed, in other agricultural systems with similar challenges. An initial assessment of the key commonalities that will be the focus of IPG generation across aquatic agricultural systems, focal countries and focal hubs is summarized in Table 4.

In addition to the body of IPGs that the program will develop regarding specific challenges and their research questions, Program research on development approaches is designed to generate an important body of learning on processes for delivering development outcomes and impacts in aquatic agricultural systems. We will distill general principles to contribute to establishing best practices for scaling up from this learning and make them available to development practitioners working in aquatic agricultural systems and other agricultural systems. Our research themes 5 and 6 will contribute IPGs offering comparative experience in scaling out. Program level investment in communications for sharing and distilling lessons will support the preparation and dissemination of our IPGs.

It is important to note that the current areas for IPG development were assessed by proponents of the Program in the initial scoping conducted during the program design. As the Program moves toward implementation, IPG identification will be refined through participatory diagnoses conducted at inception in each country and hub. As implementation progresses, further adjustments will be made, reflecting the findings of annual program review and planning overseen by the Program Oversight Panel. The Program Forum will provide important opportunities for learning across the program and adjusting the focus of IPG development as needed.

Table 4: Generating international public goods through research across countries and hubs⁹

Research Theme	Key Development Challenges in AAS, Focal Countries and Focal Hubs	Asian Mega Deltas								Coral Triangle Islands						African Inland					
		Bangladesh								Cambodia			Philippines			Solomons			Zambia		
		1	2	3	4	5	6	7	8	1	2	3	1	2	3	1	2	3			
Theme 1	Sustainable increases in system productivity																				
	Low crops yields																				
	Declining fish catch																				
	Improved use of livestock																				
	Low quality nutrition																				
	Gender disparities in productivity																				
Theme 2	Equitable access to markets																				
	Value chains																				
	Poor communication Gender disparities in access																				
Theme 3	Resilience and adaptive capacity																				
	Rising salinity																				
	Flooding																				
	Infrastructure development																				
	Natural disasters																				
	Health and nutrition Gender disparities in risk																				
Theme 4	Gender equity																				
	Unrecognized & undervalued gender roles																				
	Inequitable access to and control of assets																				
	Inequitable decision making Restrictive gender norms and practices																				
Theme 5	Policies & institutions																				
	Access rights																				
	Gender mainstreaming in policies																				
Theme 6	Knowledge sharing, learning & innovation																				
	Absence of learning culture																				

⁹ Note: Most of the development challenges that the Program will address are important to all three of the aquatic agricultural systems in the program, and several recur in many focal countries and hubs. The learning developed in addressing these challenges and seizing the opportunities presented in a variety of circumstances will create an important body of IPGs. The current list of development challenges has been developed in preliminary scoping conducted to develop this proposal. The list will evolve as the program is implemented and participatory diagnoses are conducted.

7 Gender Strategy: A Transformative Approach to Gender Mainstreaming in Research and Development Interventions in Aquatic Agricultural Systems

7.1 Gendered processes of change in aquatic agricultural systems

Globalized market processes, population growth, migration and urbanization that rapidly change aquatic agricultural systems are all gendered. Rural-urban migration, a predominantly male phenomenon in Bangladesh, Cambodia and Zambia, has feminized agriculture. Cambodian women are estimated to provide 80% of the labor in food production (MAFF 2005), while Zambian women contribute 70% of labor inputs to agricultural production (World Bank 2004). Women constitute 57% of the labor force in small-scale fisheries in Cambodia (FAO et al 2008) not counting gleaning or aquaculture, in which women's involvement is likely to be higher. In the Philippines, women predominate among rural-urban migrants, while men remain in agricultural livelihoods, and women equal men in pursuing overseas migration (PCW 2010).

7.2 Gender relations and roles in the pursuit of livelihoods

Male and female members of households pursue different livelihood strategies, supporting or complementing one another's activities in the pursuit of well-being. However, women and men within households do not necessarily have the same preferences, motivations or aspirations. A preliminary gender analysis of the five proposed program countries reveals differences in the extent and nature of men's and women's participation along agricultural value chains and their use and maintenance of aquatic ecosystem services. Overall, women predominate in processing and trading activities while men's roles are more pronounced in farming and fishing, with some exceptions.

In the Zambesi-Niger freshwater system of Zambia, women and men tended to have separate "purses" based on complementary male farming systems concentrated on commercial crops and female farming systems focused on subsistence food crops, but this is changing with market processes and urbanization. Farming and small-scale trading are dominated by women, while mining and large-scale trading are male activities. In the floodplain systems of the Ganges in Bangladesh and the Mekong in Cambodia, male and female household members pool resources, pursuing supporting and complementary activities within the same farming system. In Bangladesh, women's productive roles in farming, fisheries and aquaculture are restricted mostly to caring for seedlings, fish and other animals; small-scale processing; and making and mending nets, while men engage in a wide range of production tasks and commercial processing, entirely dominating trade. In Cambodia, women provide labor for most farm tasks, caring for livestock and fish, engaging in small-scale fishing and a wide range of processing and small-scale trading activities, with women constituting 85% of fish traders in Tonle Sap (ADB 2007). Men prepare land for planting and engage in medium- and large-scale fishing and large-scale trading.

In Pacific coastal systems, women and men complement each other's activities, with women more responsible for gardening and men more focused on fishing, with some separation of purses. In Solomon Islands, 71% of women and 53% of men are estimated to be engaged in farming; conversely, 50% of women and 90% of men are estimated to be engaged in fishing (JICA 2010). Thus, both women and men participate in a range of livelihood activities, from production to the sale of goods, with local trading mostly done by women. In the Philippines, women support, complement or subsidize men's farming and fishing, as farming, fishing and aquaculture are predominantly male while processing and trading are predominantly female.

Women form the majority in the service, industrial and professional sectors (NSCB 2010). Women's engagement in producing, processing and selling tubers, other root crops, bananas, vegetables and other homestead garden crops in all focal countries is generally higher than men's but often invisible or underestimated. In all five countries, men provide labor for logging and harvesting poles and timber for agriculture and construction, and women primarily engage in fetching water and firewood; women also tap mangroves and other forests for food, handicraft materials and medicinal ingredients.

7.3 Gender disparities in asset poverty, social exclusion and vulnerability

These differences in the gender division of labor have implications for the nature of poverty, marginalization and vulnerability, all of which are gendered as well. Women's disproportionate suffering of asset poverty arises from socio-cultural norms that restrict access to, ownership of and control over natural, physical and financial resources. This is pronounced in Bangladesh, where rural women own only 8% of all productive assets (Quisumbing and Maluccio 2000). In Zambia, women have medium access to oxen, agricultural tools and inputs, and technical skills (World Bank 2004). Cultural beliefs and taboos restrict women's access to the sea in these countries other than Solomon Islands.

Equally significantly, women's poverty is characterized by social exclusion and marginalization from social welfare services and safety nets, and from decision making in household, institutional and governance structures that relate to livelihoods, resource management and the functioning of markets. Women's involvement in community-based aquatic resource management is often minimal because of customary power relations and time and mobility constraints related to domestic tasks and maintaining a reputation for decency. However, where poor women were granted conditions enabling them to claim long-term rights over public water bodies, as in the Oxbow Lakes Project in Bangladesh through the formation of fish-farming groups, the engagement of and benefits to women have been sustained (Nathan and Apu 1998). When development interventions increase market potential for traditional "women's crops" such as groundnuts in Zambia, men appropriate them, to the disadvantage of women farmers (World Bank 2004). Where productivity and income increases from fishponds occurred at the household level in Bangladesh, this did not necessarily translate into nutrition gains for women and girls (Kumar and Quisumbing 2010). Thus, despite differences in the extent of social exclusion in these countries, significant decision making on the allocation of resources remains primarily in the hands of men.

Women's vulnerability to risks and shocks are not merely exposure to seasonal and lifecycle events, natural disasters, and climate change. Women are more vulnerable to gender-based violence than men, both in private and in public. In Bangladesh, Solomon Islands and Zambia, over 50% of women experience physical or sexual violence at the hands of an intimate partner (NIPORT 2009, MWYCA & NSO 2009, World Bank 2004). Women have been especially vulnerable to gender-based violence during armed ethnic conflict in Solomon Islands (MWYCA & NSO 2009).

7.4 Gendered well-being outcomes

In all five focal countries, women's income from agriculture, livestock and fishing are lower than men's. Education and nutrition outcomes are lower for girls than boys in Bangladesh, Cambodia and Zambia (NIPORT 2009, JICA 2007, World Bank 2004). This is worst in Zambia, where the proportion of girls completing grade 10 or higher is half that of boys (World Bank 2004). In Solomon Islands, there are no disparities in education and nutrition outcomes between male and female children. In the Philippines, gender disparities in education and

nutrition disadvantage boys, and literacy is more prevalent in women than men — positive social outcomes that are reflected in a higher level of happiness indicated by women relative to men in the Philippines (NSCB 2010). Thus, development interventions need to redress costs to men as much as to women.

In gender analysis and designing development interventions in aquatic agricultural systems, it is important to take into account that women are not a monolithic group but differentiated by poverty level, class, ethnicity, caste and other social categories, which further compound variations in costs, benefits, preferences, motivations and aspirations. A dynamic framework that analyses linkages among agricultural production, poverty, social exclusion, vulnerability, food and nutrition security, health and ecosystem services within aquatic systems will provide in-depth understanding of these complex social relations, differentiation in the pursuit of livelihoods, and structural constraints that cause differential outcomes in well-being.

7.5 Overall rationale of the gender strategy

Decades of development activity have recognized the critical role of women's participation and empowerment in increasing the productivity of agricultural systems and the sustainability of the natural resource base upon which this productivity depends, ensuring household members' livelihoods, food security and nutritional needs — all of which contribute to poverty reduction. As a result, much of the development community today recognizes that achieving gender equity^h in agricultural research and development is not only an issue of social justice or rights affecting women but also critical to achieving development outcomes for society as a whole. Despite this greater awareness, moving beyond rhetoric and well-intentioned efforts to target and empower women in development interventions remains a critical challenge. This is equally true for aquatic agricultural systems, where wide gender disparities in well-being outcomes persist. The Gender Strategy of the CGIAR Research Program on Aquatic Agricultural Systems is designed to address these challenges.

The 1970s and 1980s saw many attempts to address gender disparity through separate programs or project components targeting women's participation and empowerment. However these initiatives generally remained localized and marginalized from the mainstream of development activities, therefore having limited potential for scaling out. The consequently limited effectiveness of these efforts led in the 1990s to the promotion of gender mainstreaming as an approach for integrating gender perspectives and the goal of gender equality into research, policy and legislative interventions at all stages and levels. Yet it is now recognized that mainstreaming often scatters gender concerns across a multitude of project component and interventions, depriving it of critical mass and diluting the resources invested on gender, thereby making implementation at the ground difficult, as well as M&E and impact assessment.

Current evidence reveals that one of the primary reasons for the slow progress in mainstreaming as a strategy, and its limited effectiveness in addressing gender disparities, is that gender analysis and interventions have been embryonic, partial, shallow or unsystematic in many projects that have attempted mainstreaming (OECD 2004). Similarly, a wide gap remains between policy commitment and resource allocation for gender mainstreaming (ESCAP 2003), despite recognition of the need to complement mainstreaming with specific targeted

^h Gender equity is fairness to women and men. To ensure fairness, measures must often compensate for historical and social disadvantage that prevents women and men from otherwise operating on a level playing field. Equity leads to equality (Status of Women Canada 1996).

interventions to promote gender equality (UNDP 2005), which is not always adopted. Recognizing these causes, the first GCARD in Montpellier endorsed a mandate for a “transformative” gender agenda in agricultural research and development that creates “opportunities, commodities, relationships and services that ultimately change the way people do things” (Meinzen-Dick et al. 2010). This recognition also forms the basis for the scoping study currently being carried out to design an appropriate mechanism for incorporating a gender research approach throughout the new portfolio of CGIAR research programs commissioned by the Consortium Board.

Consistent with this mandate, this Program proposes a two-pronged strategy to ensure that gender-related program activities are effective, adequately resourced and able to deliver outcomes. We will pursue gender mainstreaming across the Program and develop a targeted gender-transformative theme.

7.6 Gender mainstreaming

We will draw upon CGIAR best practice and recent analyses to ensure that our gender approach is crosscutting and does not remain marginalized by mainstreaming, doing this by grounding it and its activities within the program’s five thematic areas. The main thrust of gender-explicit interventions for each thematic area is described in section 6, and a more detailed list of gender mainstreaming activities is provided in Annex 2c.

Our process for gender mainstreaming will follow the five stages of the research and development cycle outlined by Meinzen-Dick et al. (2010):

Priority setting. The differential needs, interests and priorities of women and men are reflected. Female and male stakeholders representing different social groups participate in making decisions regarding the kinds of research and development that will receive investment, and mechanisms exist to take into account the needs of women and men as both producers and consumers.

Research in development. Researchers are attuned to gender issues and consult female and male users in research and development, including involving them in the participatory breeding of crops, livestock and fish.

Extension. Female and male extension workers deliver extension services; female and male producers receive extension services; women are recognized as farmers, fishers, processors, traders and clients of extension services; and gender-responsive extension services are delivered.

Adoption of innovations. The enabling conditions for adoption such as cash, credit, labor, skills and property rights will be taken into account.

Evaluation and impact assessment. Gender differences are taken into account in deciding on criteria or indicators that assess the costs and benefits of agricultural innovation and their related distribution. Gender differences discovered in evaluations and impact assessments are taken into account in feedback loops and in setting priorities for future research and interventions. An integral dimension of our gender strategy is documenting and monitoring the process, learning from mistakes and best practices, and steering the program toward improving the gender equity of outcomes based on feedback loops.

7.7 Gender transformative action

This will explicitly address critical constraints on and opportunities for reaching gender-equitable outcomes, supporting and adding value to the development effectiveness of interventions under the other five themes. By investing in an additional crosscutting thematic area that focuses specifically on gender, we envision that the Program will achieve transformative outcomes that cannot be achieved through gender mainstreaming alone. This approach will be based on rigorous gender analysis to identify critical constraints (especially underlying socio-cultural causal factors that are difficult to change in the lifetime of projects) and salient opportunities to fast-track strategic interventions that can close gender gaps. We will pursue three action areas that explicitly address the critical dimensions of gender roles and relations, based on underlying norms and attitudes, gendered decision making at all levels, and access to and control of assets constituting the core of the transformative potential of the gender strategy.

Action area 1. Gender gap mapping and interactive social media are complementary mechanisms proposed for changing attitudes and behavior relating to gender roles and relations. Gender gap mapping is a participatory process that reveals the extent of gender disparities at all levels, the willingness of participants to address these gaps and participants generation of pragmatic solutions to overcome them. Interactive social media such as forum theater for adults and computer simulation games for youths can be used to unravel gender roles and relations discursively, understand social justice and rights through empathetic engagement, and propose alternative ways of working toward gender equity based on new understanding of feminine and masculine natures.

Action area 2. The program proposes a livelihood-trajectory and decision-making tool to enhance the decision-making capacity of women in their communities, linking it to decision making regionally and nationally. This diagnostic tool helps women to understand their current roles and constraints in decision making and the importance of transforming capacities and using opportunities for decision making. The program will support the strengthening of structures, mechanisms and processes to increase women's participation, voice and decision making at all levels of governance. This includes understanding informal and formal mechanisms of customary, regional and national governance, as well as the relative effectiveness and legitimacy of competing governance systems.

Action area 3. A gender and assets action network is proposed as a mechanism for pursuing an integrated approach to assessing the current status of policies and processes for gender-equitable access to a wide range of productive assets in aquatic agricultural systems and fast-tracking the implementation of gender mainstreaming in these policies and processes. Building partnerships with agencies responsible for policymaking and implementation related to productive assets such as land, water, technology and finances will be critical.

8 Capacity Development

The highly networked and dispersed nature of this program demands skills and relationships outside the conventional domain of the CGIAR. The center of gravity of learning in the Program will be in the management and governance networks of aquatic production systems and in the M&E feedback loops therein, not in the laboratories of scientists. Within the CGIAR, the International Center for Tropical Agriculture (CIAT) and its partners (including CARE USA and Catholic Relief Services) have pioneered thinking in this area, using the phrase "learning [52]

alliance” to capture the nonlinear, iterative nature of learning and the relationships and networks needed to support it. The approach melds thinking in social learning and innovation systems to solve problems in development. In this approach, there are many modes of learning, different knowledge systems, and different capacities to engage and share knowledge. In short, there are multiple pathways to development impact.

8.1 Demand-driven investments in capacity

Recognizing the central importance of skilled and empowered participants ranging from farmers to scientists, the CGIAR Research Program on Aquatic Agricultural Systems will be systematic about its investments in people, communities and organizations. Demand and modes of meeting it will be as diverse as the program itself. The scope of training needs encompasses participatory research, action learning, mentoring, facilitation, communication, and the production of guidelines and tools, among many other modes. Without these investments, it is difficult to envision long-term, sustainable innovation beyond the life of the program or the spread of influence to geographic areas beyond initial program areas. Inefficient and poorly targeted knowledge sharing and training would impose high transaction costs and slow development impact.

We recognize that the broad area of capacity development is itself a researchable issue, closely linked to investments in impact assessment and knowledge sharing. The program will capitalize on the expertise of other Centers (see <http://gisweb.ciat.cgiar.org>) and link to other CGIAR Research Programs and System-wide initiatives in knowledge management and training such as the Information and Communications Technology and Knowledge Management Program (<http://ictkm.cgiar.org>). The design and implementation of a research-based capacity-development program will require people with expertise in adult education and knowledge management, as well as experts in communications and information and communications technology. Developing a research agenda to develop capacity better and an M&E program to guide its evolution is a significant challenge.

As partner universities, NARS and NGOs play critical roles in development at the hubs, they will be central in assessing capacity-development needs, prioritizing them, identifying approaches, and planning and implementing capacity development. This will involve formal and informal approaches, including mentoring schemes and creating forums for peer-to-peer learning. Mechanisms will be developed for disseminating information and knowledge locally to men’s and women’s groups, gender advocacy organizations, and policymakers.

8.2 Areas for investment

Capacity development is embedded in all aspects of the program’s research themes. In addition, specific technical areas highlighted in other sections of the proposal (on impact assessment, knowledge sharing and learning, and gender) will provide foci for technical training. More broadly, for the program to be successful, individual and organizational capacity in the following areas will need to be developed:

Technical skills in integrated natural resource management and resilience. The drivers of ecosystems and the aquatic agricultural systems in them need to be understood to ensure sustainability and guide management and governance responses. The multi-sectoral and multi-scale nature of the program will require training at a range of scales, from individuals and communities to national agencies and regional forums. Resilience theory will be used to organize thinking about complex socio-ecological systems, but a lot of work is required to allow this literature to have a greater impression on development practice. Specific examples of

training topics include ecosystem approaches to community-based resource management, participatory diagnosis and situation analysis, participatory impact pathway analysis, outcome mapping, stakeholder analysis, group facilitation, policy analysis, and resource and socioeconomic M&E.

Creating and strengthening learning networks. Because the Program will operate across contrasting systems, there will be a unique opportunity for learning within and among its modules. Scaling out from local to national and international scales is an enduring challenge that must be met if the program is to achieve its ambitions. Examples of training needs include creating and maintaining multi-stakeholder innovation platforms, social network analysis, and methods of analyzing innovation systems.

Organizational capacity of NARS partners to address challenges in aquatic agricultural systems. Strengthening the capacity of NARS partners will remain a core function of the CGIAR, and the program's engagement in this process will be linked to appropriate System-wide initiatives. Strong relationships with NARS in all program hubs provide a good foundation for improving organizational capacity. Capacity development in decision making, resource mobilization and management, communication, coordination, and conflict resolution will be considered.

Adaptive management of production systems (the business of "doing management"). Improving the ability of target communities to adopt, adapt and sustain innovation is of paramount importance for the program. This will involve developing individual and collective capability to produce and refine new innovations in resource management and the downstream management of household and community resources. At a larger scale, whereas most CGIAR Centers and NARS partners work within their mandated crops or disciplines, the Program will require a multidisciplinary and multi-commodity approach, as well as alliances with other sectors of society. The approach is, in essence, an action research agenda. There are many field-tested participatory methods for the adaptive management of natural systems. Refining and implementing them across the diversity of systems will require training across disciplines and organizations.

Action research. The CGIAR Research Program on Aquatic Agricultural Systems explicit commits itself to adopting an action research approach that seeks to learn by doing and to engage people in an explicit process of diagnosis and action. Our action research aims to go beyond finding useful information to guide action. It aims to place the capacity generate and use that knowledge in the hands of people who are trying to improve their lives. We recognize that full immersion into action research will require significant investment in skills and capabilities such as facilitation, co-learning, fostering dialogue, participatory diagnosis and planning, collaboration, observation, reflective learning, and ethics. We undertake to build this capacity.

9 Partnership Strategy

Effective partnerships are central to the success of the Program, and section 5 highlights the importance of partners in achieving the program's outcomes and impacts. This is reflected in intensive discussions held with multiple partners to develop this proposal, in partners' engagement in country consultations and national workshops, and in their letters of support and commitment. The program's partnership strategy builds on this engagement to strengthen

and expand partnerships as platforms for program implementation. To this end, our strategy is built on three core premises:

- The CGIAR is only one of many organizations engaged in aquatic agricultural systems. Other research, development and policy players together spend many hundreds of millions of dollars annually to improve the lives of people who depend upon aquatic agricultural systems.
- For the Program to add value in this complex institutional environment, we need to identify where and how the science insights we provide can strengthen the focus and delivery of other partners and where the convening and catalytic roles we play can foster more effective coalitions of partners around our research-in-development approach.
- Partners will devote the time and effort required to work effectively together only if the value of doing so is clear to them, which requires that, together, we identify mutual needs and expectations and satisfy them.

The Program's partnership strategy addresses these concerns locally, nationally, regionally and globally, tailoring our approach to the specific needs of the partnerships operating in each.

9.1 Different levels of partner engagement

We recognize that, while all Program partners need to be engaged with respect and careful understanding of mutual interests, strengths and constraints, not all partners will be equally involved in the program. To assist in understanding and managing these differences, we envisage three main types of partner engagement:

Core institutions are those whose contributions to the Program are essential for success and cannot be provided by another institution. Core institutions include national government agencies with explicit mandates for coordinating research and development in aquatic agricultural systems and/or provincial government structures responsible for coordinating development in program hubs. In some cases, core institutions can include civil society forums or private sector associations mandated to coordinate stakeholder representation in policymaking. The Program will develop strong working relationships with these partners, and they will play a central role in program planning and coordination nationally.

Key implementing partners are essential for success because of their capacity for implementation, demonstrated successes and the specific value they will add to Program partners. Our key implementing partners have been selected from a wider group of institutions because their particular combinations of skills, resources and enthusiasm for the Program have distinguished them from other potential partners (see criteria below). These key partners include major development NGOs such as CARE, Social Awareness and Voluntary Education (SAVE) and ACDI/VOCA (merging since 1997 Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance) in Bangladesh and Catholic Relief Services, Land O'Lakes and Concern in Zambia, as well as ARIs such as the Stockholm Resilience Centre, University of East Anglia in the United Kingdom and James Cook University in Australia. The Program will develop strong working relationships with key implementing partners at multiple levels, including national and local, with those partners working there, but also globally with ARI partners and development partners that have essential roles to play in scaling out the Program's outcomes and impacts. Key implementing partners will play important roles in program planning and implementation, but this will vary among countries and partners

depending on the scale of their engagement in the program. Criteria used to identify key partners include:

- a clear expression of willingness to engage intellectually and financially in the program, embrace the research-in-development approach, and pursue scaling out by adopting the approaches, processes and technologies that the Program will develop;
- demonstrated financial and human investments in aquatic agricultural systems and the capacity and willingness to align them with the program's goals;
- a significant track record of commitment and effective engagement in rural development policy and/or practice, including in subsectors of interest;
- demonstrated appreciation of the wider context within which agricultural development takes place and the need to engage effectively with it to achieve long-term change; and
- demonstrated commitment to gender, knowledge sharing and learning, and capacity development.
- Annex 5 details contributions made by selected partners, including co-funding and leveraging expectations.

General partners will contribute additional expertise, skills and experience that are important for the success of the program but can be secured from alternative sources. These partners bring a wide spectrum of constituencies and skills to the Program, but their engagement will be less intensive than that of key partners, and they will not have a role in planning globally or, generally, nationally. They may, however, play important roles in planning and implementation at the hub and project level. Criteria used to identify general partners include:

- a clear expression of willingness to engage in the program and in the research-in-development approach;
- capacity and willingness to align their work in aquatic agricultural systems with the program's goals;
- commitment and engagement to improved rural development policy and/or practice, including in subsectors of interest;
- demonstrated appreciation of the wider context within which agricultural development takes place and the need to engage effectively with it to achieve long-term change;
- demonstrated commitment to gender, knowledge sharing and learning, and capacity development.

The proponents of the CGIAR Research Program on Aquatic Agricultural Systems have already drawn heavily on this approach to partnership in the design of the Program proposal, adapting it to the specific needs of the program locally, nationally, regionally and globally. We continue to develop these partnerships through ongoing discussions with a range of institutions, and these discussions will be intensified when the Program is launched. To implement our transformative gender strategy, we have outlined a gender partnership network with expertise and experience in this area in Annex 2b.

9.2 Partnerships at different geographical scales

The CGIAR Research Program on Aquatic Agricultural Systems will identify core, key and general partners at different geographical scales. We recognize that there will be differences among partners in the breadth of their engagement in the program. Most core partners will be

engaged only in one country, or even one hub, while some of the key implementing partners will be engaged in multiple hubs and several countries, playing critical roles in scaling out the results of the Program through their wider presence in other countries and aquatic agricultural systems. The approach to working with these partners at these different scales is described below.

Local and national. We will work through local and national partners to deliver the Program in each country and hub, including field research, scaling and capacity development. We have worked with stakeholders already in identifying whose mandates and interests align strongly with those of the Program. These discussions are well advanced but will continue as program implementation proceeds. Key partners have made commitments in principle to engage in the Program (Annex 5), and these commitments will be converted into formal agreements when the Program moves toward implementation. In discussions with these partners, we have focused on identifying mutual needs and expectations, i.e., how the partners expect to benefit from the Program and what the Program expects from the partners in return. The generic roles of partners in achieving outputs, outcomes and impacts is detailed in the sections of this report on the research framework and themes (section 6) and impact pathways (section 5). Some will partner actively in research, others will manage development projects through which the Program will scale out, and still others will build links in the wider development policy arena. The contribution of different partners in Bangladesh is summarized in Table 5 to illustrate how the Program will work with partners nationally.

Table 5: Summary of engagement with some partners in the CGIAR Research Program on Aquatic Agricultural Systems in Bangladesh

Partners	Engagement level	How we work together in the Program
Government	Core	All CGIAR activities in Bangladesh including CGIAR Research Program on Aquatic Agricultural Systems are defined and conducted with the consent and engagement of the government, notably the Ministry of Agriculture and the Ministry of Fisheries and Livestock. The Program has been designed to support policy initiatives in areas of concern for AAS systems. Line agencies' technical specialists will work with the Program in collaboration with NARS and NGO partners to deliver technical support to farms. Outputs from the Program will contribute to the development of government policies relevant to AAS.
NARS	Core	NARS in Bangladesh have over 300 scientists and a large number of farms and research sites covering every ecotype in the country. The Bangladesh Agricultural Research Council (BARC) is the apex body for this system and coordinates all agriculture research. All major technological research in the Program will be conducted in close partnership with BARC institutes, in particular the agriculture, rice, livestock and fisheries research institutes. The Local Government Engineering Department (LGED) of the Ministry of Local Government is responsible for much of rural infrastructure development, particularly small-scale irrigation, feeder roads, many small wetlands and local markets. The Program will work with LGED in the northeast Haor Basin, the southwest and south, and elsewhere supporting its local infrastructure and wetlands programs, as well as cooperating with LGED on market and value chain programming.

Partners	Engagement level	How we work together in the Program
International NGOs	Key and general	SAVE, CARE, and other international NGOs work at scale providing services to millions of poor people in Bangladesh. They are known for their ability to manage very large interventions, working in almost every area of development. Each of these NGOs annually manages \$40 million dollars in programming in Bangladesh and \$1 billion worldwide. In developing the Program, WorldFish has established partnerships with SAVE, CARE and ACDI/VOCA (all key partners) and will pursue action research with each in specific hubs and scale out the learning for the Program. We will expand this partnership to other international NGOs as funding permits.
National NGOs	Key and general	Several of the world's largest NGOs engage directly with rural communities in Bangladesh. Because of their capacity, all international NGOs work with and often through national NGOs, and the Program will also do so, building on our existing collaboration with the Bangladesh Rural Advancement Committee (BRAC) and the Rangpur Dinajpur Rural Service as key partners and with many others. This will include supporting the agricultural technology capacity of these agencies. As the Program develops, we will expand CGIAR collaboration with national NGOs, working in the same fashion as with international NGO partners.
Universities	Key and general	Bangladesh has a rich university community, and the Program will work closely with it on selected research issues. Initially, we will conduct research individually with Bangladesh Agriculture University, Khulna University and Rajshahi University, as well as through the Krishi Foundation and the Bangladesh Fisheries Research Forum, which coordinate agriculture and fisheries research, respectively, on behalf of a consortium of agricultural universities. In addition, we will work with the Bangladesh training and planned graduate program in Dhaka of the International Institute for Environment and Development.

The Program will monitor the success of our partnerships by tracking partnership performance indicators. These will include: the inclusion of Program components in country investment plans and priorities; the subsequent adjustment of Program engagement in light of these plans and priorities; partners' expression of how their program role helps them achieve their mandates and objectives; the capacity of partners to deliver to stakeholders goods and services consistent with the Program; the number of successful technologies, processes and approaches jointly developed; and the number of publications coauthored by partners from focal countries.

Regional. Strong partnerships with regional bodies are important for disseminating the program's lessons, to inform and influence their policies and practices, and for scaling out to other countries with similar aquatic agricultural systems. To this end, regional organizations have been engaged in designing and writing the Program proposal and will play important roles in scaling out. Core regional partners are the Asia-Pacific Association of Agricultural Research Institutes, Secretariat of the Pacific Community, Network of Aquaculture Centres in Asia-Pacific, and, in Africa, the Forum for Agricultural Research and subregional research organizations.

Global. Global partnerships are needed to leverage our national and regional achievements and help change development thinking and policy globally. To this end, a number of development NGOs that work globally have been engaged in designing the CGIAR Research Program on Aquatic Agricultural Systems and will play central roles in program implementation. Their numbers are expected to grow as the program develops and establishes a global coalition of research and development organizations working in aquatic agricultural systems. Table 6 describes the skills that these global development NGOs will bring to the program.

Similarly, the Program will develop collaboration on research themes and issues with a range of advanced research institutes (ARIs). Discussions with a limited number of ARIs were held during the initial development phase of the program, and the strengths that some of these institutes will bring to our work are summarized in Table 6. The program will, however, seek to work with a wider range of ARIs and appropriate partnerships will be developed with them as the program moves toward implementation. Annex 6 summarizes where we see these ARIs contributing to the research themes of the program and shows where we expect these partnerships to build on existing collaboration and where new partnerships will need to be developed.

Table 6: Skills and achievements of some global partners

Research partners	Skills and achievements
Stockholm Resilience Centre (SRC), Sweden	SRC is a global leader in the science of resilient socio-ecological systems. It coordinates resilience research globally through the Resilience Alliance and partnerships with the Beijer Institute for Environmental Economics, Department of Systems Ecology at the University of Stockholm, and Stockholm Environment Institute. SRC has particular strengths in the analysis and governance of aquatic and coastal socio-ecological systems.
School of International Development, University of East Anglia (DEV UEA), United Kingdom	DEV UEA integrates multi- and interdisciplinary research, teaching and engagement in development policy and practice. Particular strengths are in environment and development and in rural development and gender.
James Cook University (JCU), Australia	JCU aims to produce innovative science for improved coral reef management. In terms of scientific influence, citation ranking places JCU first among the 1,644 institutions in 103 countries involved in coral reef research. JCU scientists are closely involved with the major Coral Triangle Initiative in Southeast Asia and the Pacific, which aims to safeguard biodiversity and livelihoods.
Development Partners	Skills and Achievements
Catholic Relief Services (CRS)	CRS delivers livelihood support to over 100 million people. In agriculture, CRS works to improve family well-being through agro-economic development and environmental stewardship and, ultimately, to strengthen the capacity of local agencies and farm communities to take control of their own development. CRS has offices in 90 countries and brings technical expertise in both agriculture and social development, as well as considerable operational experience and policy influence.
CARE USA	CARE serves individuals and families in the poorest parts of the world by promoting innovative solutions and advocating global responsibility to eradicate poverty. Guided by the aspirations of local communities, and with a strong focus on women's empowerment, CARE facilitates lasting change by strengthening capacity for self-help, providing economic opportunity, delivering relief in emergencies, influencing policy decisions at all levels, and addressing discrimination in all its forms. In 2009, CARE supported more than 800 projects in 72 countries to reach more than 59 million people
Land O'Lakes International Development	Land O'Lakes is a member-owned dairy cooperative in the American state of Minnesota. Through its nonprofit wing, Land O'Lakes International Development, it has since 1981 used its 85+ years of practical experience and knowledge in farm-to-market agribusiness to facilitate market-driven business solutions that generate economic growth, improve health and nutrition, and alleviate poverty. Key practice areas are agricultural productivity and competitiveness, enterprise and cooperative development, food systems and safety, nutrition and health, and food security and livelihoods.

9.3 Making partnerships work

It is relatively easy to identify partners, and even to enlist their support in developing programs that show promise. The more difficult challenge is to nurture this collaboration in ways that make partnerships mutually productive. To help achieve this, the Program focuses on identifying the shared agendas and mutual needs that are the foundation of successful partnerships. We recognize that partnerships will deliver on shared agendas and meet mutual needs only if they are sustained by mutual trust built on transparency, communication and a record of quality performance. Achieving this will require substantial investment as the Program moves to implementation. This will include a sustained focus on coordination together with investment in relationship building, communication, performance management, and the effective use of explicit agreements between the program and our partners. The importance of coordination across the Program is reflected in the governance and management structure proposed for the program (section 15), with substantial focus on management and coordination mechanisms both globally and nationally.

At this stage, it is impossible to identify all details of partnership arrangements for the Program, but we can say that the agreements between the program and its partners will have the following key elements:

- The role of each partner will be clearly specified at the hub, country or other geographic level, including research, development, capacity building and funding contribution.
- The mechanisms for pursuing this role will be identified, including funding sources and budgets, and the resource and budgetary contributions of the Program and the partner will be itemized.
- Outputs and outcomes required from the partner will be specified together with specific contributions required from the program.
- The timeframe for delivering outputs and outcomes will be specified, as will review mechanisms.
- Indicators of performance will be specified, building on those set out earlier in this section.

These formal agreements provide an important administrative architecture for the Program. However, the highly networked nature of the Program's approach requires an investment in partnerships that goes well beyond them. They will need to be accompanied by substantial investment in a range of communication and capacity-development efforts. Significant numbers of staffers from a great diversity of organizations, research disciplines, and national and regional cultures will need to be supported in working toward the common objectives of the Program, albeit normally at dispersed locations and doing different research. The Program has provided for the investment in communication and capacity development that this will require both to improve Program implementation and to help build the community of practice required for scaling out the Program's approach. In addition, we recognize that partnerships and networks are dynamic — forming, growing and changing as required to address particular needs. The Program will work with its partners to manage this complexity.

9.4 Funding partnerships

The Program's commitment to working through partnership is reflected in the budget, as 21% of the total budget managed by the Program has been earmarked for expenditure through partners. As shown in Annex 5, however, expenditures through partners are modest in comparison with the funds that we seek to leverage through the partnership approach. In view of this still modest volume of funding, and in line with the program's focus on leveraging

[61]

development impact through carefully targeted research in development, the focus of the CGIAR Research Program on Aquatic Agricultural Systems expenditure through partners will be on research they carry out, training to facilitate this research and the use of the outputs, and participation in program-level activities such as participatory assessments, M&E and knowledge sharing. Program-managed funds will not be used for development activities, as partners will pursue these activities using other funding, including that leveraged by program activities but managed directly by partners.

10 Integration of CGIAR Centers and Synergies with Other CGIAR Research Program

The three CGIAR Research Programs focusing on integrated agricultural systems share the core premise that the CGIAR can deliver greater benefits to the poor and vulnerable living in specific zones if it adopts a more effective approach to integrating the resources, skills and energy of its 15 Centers and the other 14 Research Programs. Considerable efforts have been made to pursue such integration through the design of the Programs, and substantial progress has resulted. However, this progress is variable and likely to remain so until the practical challenges of achieving integration are addressed in the first years of Program implementation. This is especially so for CGIAR Research Programs such as Aquatic Agricultural Systems that addresses issues or systems that have generally not been the focus of previous CGIAR attempts at integration and/or pursue especially innovative approaches to engagement in these systems. We have sought to take account for this in the timeframe for program implementation (Section 14).

The current status of Center and Research Program integration in the CGIAR Research Program on Aquatic Agricultural Systems is summarized in Tables 6 and 7 and can best be described as work in progress. Substantial investment has been made by individual scientists from several Centers through engagement in national consultations and in design and writing workshops. Our current assessment is that this will translate into the effective integration sought through the subsequent engagement of appropriate Centers and Challenge Programs in the design and implementation of detailed program activities in focal countries and hubs. Accordingly, program design and budget set out specific activities to achieve this, including in particular the engagement of appropriate CGIAR Centers and Challenge Programs for participatory diagnosis at the national and hub level. Table 6 provides an initial indication of the science that each Center and Challenge Program will bring to the Program, together with the current status of mechanisms to achieve this integration. Annex 7 expands on this for three Centers.

For some areas of CGIAR work, Centers believe that meaningful integration can best be achieved through collaboration between CGIAR Research Programs. We agree with this in principle but will test this hypothesis during program implementation by carefully defining and monitoring performance indicators. Table 7 details our current assessment of the scope for collaboration between the Program and other Research Programs and the contribution that each can make and proposes mechanisms for achieving integration. First indications are that integration will be strongest between this program and the CGIAR Research Programs on commodities where there is clear synergy between these programs at national levels. This is especially so in Bangladesh, where intensive collaboration pursued there in 2010 by the International Rice Research Institute (IRRI), International Maize and Wheat Improvement Center (CIMMYT by its Spanish abbreviation) and WorldFish has spawned the Cereal Systems Initiative [62]

for South Asia (CSISA), described in Box 7. In effect, this initiative brings together this Program, CGIAR Research Program on WHEAT and the CGIAR Global Rice Partnership and the Centers engaged in them, as well as the International Food Policy Research Institute (IFPRI) through another project funded by the same donor, the United States Agency for International Development. Similar integration will be needed in other focal countries where cereals are an important component of aquatic agricultural systems. We anticipate close collaboration between the CGIAR Research Program on Aquatic Agricultural Systems and the CGIAR Research Program Livestock and Fish, especially in Uganda, which will be the focus for fish value chain research in that Program and be developed as a focal country for this Program from 2012. Discussions to pursue this have already been held with stakeholders in Uganda. There will be strong synergies between this Program and the CGIAR Research Program on Climate Change, again especially in Bangladesh, where the Indo-Gangetic plain is a focus for this Program. Frameworks and methodologies will be exchanged in the areas of vulnerability analysis and climate change adaptation technologies, institutions and processes, both in Bangladesh and in the CGIAR Research Program on Climate Change regional programs in Africa (which do not currently overlap geographically with the CGIAR Research Program on Aquatic Agricultural Systems, as well as regarding the IPGs expected in the areas of vulnerability and adaptation. This Program will pursue a number of mechanisms to build on this initial progress in developing synergies with other Research Programs and integrating the capacities of Centers. These are referred to in Tables 7 and 8 and include the following:

- Engaging other CGIAR Research Programs and Centers in participatory diagnoses in focal countries and program hubs will build on the commitment of Bioversity, the International Livestock Research Institute and IWMI to participate in these diagnoses.
- An excellent example of collaboration with other Research Programs in designing and implementing grant-funded projects is the participation of the CGIAR Global Rice Science Partnership (GRiSP), the CGIAR Research Program on MAIZE and the CGIAR Research Program on Aquatic Agricultural Systems in the CSISA project in Bangladesh.
- CGIAR Research Programs and Centers will participate in annual program forums and other scientific events held under the auspices of the CGIAR Research Program on Aquatic Agricultural Systems.
- The Program scientists and partners will participate in events organized by other CGIAR Research Programs.

Table 7: Potential contribution and current engagement of CGIAR Centers and Challenge Programs in the CGIAR Research Program on Aquatic Agricultural Systems

Center	Potential contribution	Current status of engagement
Active role on aspects of aquatic agricultural systems		
Bioversity	Harnessing learning from research on livelihood improvement through appropriate tree crop diversity, especially bananas and coconuts in the Asia-Pacific and bananas and plantains in Africa; also banana system linkages with CGIAR Research Program on Grain Legumes	Active engagement in proposal design and writing; will engage in participatory scoping at national and hub level in focal countries and subsequent implementation
CIAT	Harnessing learning from research on fruit trees, including coconuts, and forage crops; scaling out to Latin America; shared learning in gender analysis and mainstreaming and participatory research; also via other Research Programs including the Program on Climate Change	Engaged in the early stages of developing CGIAR Research Program on Aquatic Agricultural Systems. See CGIAR Research Program on Climate Change (Table 8)
CPWF	Substantial learning from work of CPWF on aquatic ecosystems and impact networks	Engaged in the early stages of developing CGIAR Research Program on Aquatic Agricultural Systems; subsequent linkages via CGIAR Research Program on Water Scarcity and Land Degradation
IFPRI	Markets, policies and institutions, links to wider development environment; also via the CGIAR Research Program on Policy, Institutions and Markets; learning from long-term experience on gender analysis and mainstreaming in agricultural research	Limited engagement in proposal development; preference to build linkages via CGIAR Research Program on Policy, Institutions and Markets and on Improved Nutrition and Health; will seek to engage in participatory scoping at national and hub level in focal countries; active discussions with gender experts
ILRI	Livestock, value chains; also via the CGIAR Research Program on Livestock and Fish; dynamic household modeling to assess options for asset-building and livelihood diversification (with the CGIAR Research Programs on Agriculture in the Humid Tropics and Climate Change	Engagement in proposal design and writing, but limited capacity in focal countries for CGIAR Research Program on Aquatic Agricultural Systems; unsure of future direct engagement in CGIAR Research Program on Aquatic Agricultural Systems, but will engage in participatory scoping at national and hub level in focal countries; informal scientific exchange on dynamic household modeling approaches is planned, together with the CGIAR Research Program on Climate Change, as well as building linkages via the Program on Improved Nutrition and Health
IWMI	Water and wetland management	Active engagement in proposal writing and design; will engage in participatory scoping at national and hub level in focal countries

CGIAR Research Program on Aquatic Agricultural Systems

Center	Potential contribution	Current status of engagement
WorldFish	Fisheries, aquaculture, markets and value chains, governance, gender, nutrition; also via the CGIAR Research Program on Livestock and Fish	Led proposal design and writing; present in all focal countries; major role in implementation
No or limited direct contribution, but contributing via CGIAR Research Programs		
Africa Rice	Via the CGIAR Global Rice Partnership	None at present; will need to be pursued as the CGIAR Research Program on Aquatic Agricultural Systems engages in Mali
CIMMYT	Via the CGIAR Research Programs WHEAT and MAIZE	Limited to collaboration around the CSISA in Bangladesh
ICARDA	Via the CGIAR Research Programs on Agriculture in Dry Areas and Dryland Cereals	Comparison of approaches for CGIAR Research Programs on Agriculture in Dry Areas and Aquatic Agricultural Systems identification of synergies in Mali; no discussion as yet regarding the Research Program on Dryland Cereals
ICRISAT	Via the CGIAR Research Program on Dryland Cereals	No discussion as yet regarding the CGIAR Research Program on Dryland Cereals
IITA	Via the CGIAR Research Program on Agriculture in the Humid Tropics	Comparison of approaches for the Research Program on Agriculture in the Humid Tropics and Aquatic Agricultural Systems and identification of synergies in Zambia, Uganda and Cambodia
IRRI	Via GRiSP	Limited to collaboration in the CSISA project in Bangladesh, but exploring other opportunities; active engagement in gender mainstreaming activities of CSISA
No direct contribution, limited via CGIAR Research Programs: CIFOR, CIP, World Agroforestry Center		

Table 8: Collaboration & linkages between the CGIAR Research Program on Aquatic Agricultural Systems and other CGIAR Research Programs and mechanisms for achieving effective integration

Research Program	Scope for collaboration	Form of linkage			Mechanisms for achieving integration
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
Agriculture in Dry Areas	Large in Mali and through joint learning	Sharing learning from integrated approaches to agricultural production in dry areas	Sharing learning from approaches taken to focus the program on selected hubs, achieve integration, pursue impacts at scale, manage partnerships, and use livelihood and farmer-first approaches	Focus on the role of AAS in dry areas, using Mali and the Niger River as learning systems	<p>Participation in annual Program forum and reciprocal participation of the Program in similar events convened by the Research Program on Agriculture in Dry Areas</p> <p>Joint programming for activities in Mali to help ensure that the CGIAR conveys a coherent approach to integrated agricultural systems</p>
Agriculture in the Humid Tropics	Large in Zambia, Uganda and Cambodia, as well as through joint learning	Sharing learning from integrated approaches to agricultural production in humid tropics	Sharing learning from approaches taken to focus the program on selected hubs, achieve integration, pursue impacts at scale, manage partnerships, and use livelihood and farmer-first approaches	Focus on the role of AAS in humid tropics, using Luapula Province in Zambia, the Lake Kyoga region of Uganda, and the Tonle Sap Basin in Cambodia as learning systems	<p>Participation in annual Program forum and reciprocal participation of the Program in similar events convened by the Research Program on Agriculture in the Humid Tropics.</p> <p>Joint programming for activities in Zambia, Uganda and Cambodia to help ensure that the CGIAR conveys a coherent approach to integrated agricultural systems</p>

Research Program	Scope for collaboration	Form of linkage		Mechanisms for achieving integration	
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
Policies, institutions and markets	Large in all countries	<p>Global, regional and national analyses of macroeconomic factors, poverty scenarios, and other factors of importance for AAS; expertise in gender analysis and mainstreaming</p> <p>Provision of information on global best practice regarding institutional arrangements for agricultural research and extension, finance and insurance, and other areas of innovation, including application of social protection mechanisms in farming systems</p>	<p>Hub-level information on factors studied by Policies, Institutions and Markets at larger scales, providing grounded contextual information on the implications of these analyses and the applicability of their recommendations</p> <p>Comparison across hubs and focal countries on learning from CGIAR Research Program use of best practice and innovative approaches to institutional arrangements, including specific impacts of Research Program linkages with social protection mechanisms and support to improved extension</p> <p>Comparison across hubs and focal countries on learning from Research Programs use of best practice</p>	<p>Integrated research on policies, institutions and markets that brings together learning at focal hubs with national policy analyses; critical gender issues in AAS</p> <p>Joint gender analysis including sharing of gender disaggregated data</p>	<p>Building on participatory diagnoses to develop integrated projects in each country and hub that link both the Research Programs Aquatic Agricultural Systems and Institutions, Policies and Markets</p> <p>Sustain gender collaboration through gender focal points and through proposed gender platform should this be established</p>

Research Program	Scope for collaboration	Form of linkage		Mechanisms for achieving integration
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research
		<p>Provision of information and methods on global best practice on tenure and collective action for agricultural production and value chains, management of common property resources, pro-poor payment for environmental services, and gender analysis and mainstreaming</p> <p>Provision of best practice methodologies for identification of assets</p> <p>Provision of best practice on use of value chain approaches</p>	<p>Comparison across hubs and focal countries on learning from Program use of best practice regarding identification of key assets of the poor, including land, livestock, fisheries, agrobiodiversity, natural resources, and how to increase and protect these</p> <p>Comparison across hubs and focal countries on learning from CRP application of best practice whole value chain approaches to technology uptake and innovation</p> <p>Shared learning on gender analysis and mainstreaming</p>	
WHEAT	Important in a small number of hubs where winter wheat is grown in floodplains	Provision of improved germplasm and other technologies	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application of wheat technologies in them	<p>Joint analysis of how best to integrate wheat cultivation with other crop, livestock and fish production options in the CGIAR Research Program on Aquatic Agricultural System hubs where wheat is an important crop. Joint gender analysis including sharing of gender disaggregated data</p> <p>Building on CSISA collaboration described above and pursuing similar modalities where possible</p>

Research Program	Scope for collaboration	Form of linkage			Mechanisms for achieving integration
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
MAIZE	Important in a small number of hubs where maize is grown	Provision of improved germplasm and other technologies	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application of maize technologies in them	Joint analysis of how best to integrate maize cultivation with other crop, livestock and fish production options in Aquatic Agricultural System hubs where maize is important crop	<p>Building on the CSISA collaboration described above and pursuing similar modalities where possible</p> <p>Sustain gender collaboration through gender focal points & proposed gender platform should this be established</p>
GRiSP	Large in countries with important rice production, especially Bangladesh, India, Cambodia and Mali	Provision of improved germplasm and other technologies	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application of GRiSP technologies in them	<p>Joint analysis of how best to integrate rice cultivation with other crop, livestock and fish production options in the Research Program on Aquatic Agricultural Systems focal countries</p> <p>Joint gender analysis including sharing of gender disaggregated data</p>	<p>Close collaboration already underway among IRRI, CIMMYT and WorldFish in Bangladesh through the CSISA, which serves as a model for integrating Research Programs on Aquatic Agricultural Systems and Agricultural in the Humid Tropics with CSISA hubs serving as hubs for Aquatic Agricultural Systems</p> <p>In view of the success of this collaboration, will endeavor to replicate it in Cambodia, Mali and other focal countries of the Program on Aquatic Agricultural Systems as appropriate</p> <p>Sustain gender collaboration through gender focal points and through proposed gender platform should this be established</p>
Grain Legumes	Limited	To be determined	To be determined	To be determined	To be determined

Research Program	Scope for collaboration	Form of linkage		Mechanisms for achieving integration	
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems		Joint research
Roots, Tubers and Bananas	Large in countries with important production of bananas, plantains and cassava in AAS, especially the Philippines, Zambia, Uganda; other crops as identified in specific hubs	Provision of improved germplasm and other pre- and postharvest technologies and management	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application in them of technologies and good practice for bananas, plantains, cassava and possibly other crops	Joint analysis of how best to integrate the cultivation of banana, plantain, tubers and other root crops with other crop, livestock and fish production options in focal countries for the Program on Aquatic Agricultural Systems	Building on participatory diagnoses to develop integrated projects in each country and hub that link both Research Programs together
Dryland Cereals	Important in countries where sorghum and millet are grown in floodplains, in particular Zambia and Mali	Provision of improved germplasm and other technologies	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application of sorghum and millet technologies in them	Joint analysis of how best to integrate sorghum and millet cultivation with other crop, livestock and fish production options in hubs for the Program on Aquatic Agricultural Systems	Building on participatory diagnoses to develop integrated projects in each country and hub that link both Research Programs together
Livestock and fish	Large in all countries given the central importance of fish and livestock in AAS	Provision of improved germplasm and other technologies	Provision of comprehensive integrated framework in focal countries and sites, to better channel the application of livestock and fish technologies in them	Joint analysis of how best to integrate livestock and fish with other crop production options in Program hubs Joint gender analysis including sharing of gender disaggregated data	Building on participatory diagnoses to develop integrated projects in each country and hub that link both this Program and the one on Livestock and Fish, with particular attention given to Uganda, given the fish value chain focus being developed there by the Research Program on Livestock and Fish

Research Program	Scope for collaboration	Form of linkage		Mechanisms for achieving integration	
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
Nutrition and health	Large in all countries given the importance of nutrition and health in the livelihood framework adopted by the Program on Aquatic Agricultural Systems	Global, regional and national analyses of health and nutrition issues that need to be addressed in the focal countries and hubs of this Program, and provision of guidance on best practice as to how to do so. Development of mechanisms and methods for monitoring and evaluating changes in food and nutrition security indicators	Provision of comprehensive integrated framework in focal countries and sites, to better channel research on health and nutrition for communities dependent on AAS in them	Joint analysis of health and nutrition issues in focal countries and hubs Joint gender analysis including sharing of gender disaggregated data	Building on participatory diagnoses to develop integrated projects in each country and hub that link both Research Programs Sustain gender collaboration through gender focal points and through proposed gender platform should this be established

Research Program	Scope for collaboration	Form of linkage			Mechanisms for achieving integration
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
Water Scarcity and Land Degradation	Large in mega deltas and African inland AAS, including in particular the Ganges, Mekong, Zambezi and Niger systems	Global, regional, basin and national analyses of water management issues that affect the management of AAS in focal countries; involves in particular analysis of water management at the basin scale and assessment of impacts on ecosystems downstream, conducted together with analysis of development and management of irrigation systems	Improved integrated management of AAS demonstrating best practices for the use of water in these river systems and so contributing to better appreciation of options for water use in them	Joint analysis of water productivity in AAS, and of the local impacts of water management at the basin scale	Building on existing close dialogue with the Program on Water Scarcity and Land Degradation to design this research collaboration as the program proceeds
Forests and trees	Limited in the immediate future except for selected tree crops genetic resources and seed system elements; some potential in mangrove systems in the Coral Triangle and with some palm trees suitable for income generation	Immediate link to access coconut germplasm and diversity; others to be determined Shared learning on gender analysis and mainstreaming	Integration of coconut germplasm and diversity; others to be determined Shared learning on gender analysis and mainstreaming	Integration of coconut germplasm and diversity; others to be determined Joint gender analysis including sharing of gender disaggregated data	If appropriate, engagement of the Forests and Trees Program in participatory diagnoses, followed by developing integrated projects linking both Aquatic Agricultural Systems with Forests and Trees

Research Program	Scope for collaboration	Form of linkage		Mechanisms for achieving integration	
		Contribution to Research Program on Aquatic Agricultural Systems	Contribution from Research Program on Aquatic Agricultural Systems	Joint research	
Climate change	Large given the vulnerability of AAS to climate change-induced changes in floodplain extent, rainfall, lake levels and river flows, as well as sea level rise, and common interests and methodologies in building adaptive capacity and no-regrets approaches to planning adaptation (i.e., approaches that transcend adaptation to climate change and adapt to other drivers of change)	<p>Global and regional analyses of climate change vulnerability and adaptation, including implications for focal systems, countries and hubs</p> <p>Baseline studies conducted by the Climate Change Program in Bangladesh used as baselines for AAS.</p> <p>Sharing on adaptation frameworks, including those identified ex ante via dynamic livelihoods modeling</p> <p>As with all the Systems programs there is potential to help situate climate change in the context of other drivers of change, and climate change responses in the context of other sectoral and inter-sectoral policies</p>	<p>Provision of comprehensive integrated framework in focal countries and sites, to better understand issues of vulnerability and adaptation in them</p> <p>M&E of technological and institutional innovations in adaptation and mitigation, uptake and impact assessment</p> <p>Specialized input on aquatic components of agrarian landscapes (aquaculture, fisheries, wetland agriculture) and effects of climate change (e.g., sea level rise, salinization, changes in coastal storm protection from reef and mangrove loss)</p> <p>Best practice in gender research for transformative change</p>	<p>Joint analysis of the steps necessary to build adaptive capacity, and sharing and building on implementation experiences piloted in the Climate Change Program, e.g., through livelihood diversification, asset strengthening and index-linked insurance</p> <p>Joint gender analysis including sharing of gender disaggregated data</p>	<p>Building partnerships that span both Research Programs, both within the CGIAR and outside it (e.g., Tyndall Center for Climate Change Research at the University of East Anglia; CARE International)</p> <p>Building on participatory diagnoses to develop integrated projects to address identified adaptation needs in each country and hub that links both Research Programs.</p> <p>Potential to put into practice, through action research, some of the innovations in adaptation and mitigation options (e.g., blue carbon, adaptive mitigating landscapes and ecosystem-service payments) and learn from their implementation. Integration to address policy concerns common to both programs, e.g., joint participation in Agriculture and Rural Development Day at the UNFCCC and other national, regional and global policy forums</p> <p>As the Climate Change Program considers expanding from its current focal areas, integration with the Program on Aquatic Agricultural Systems may extend to Southern Africa and the Western Pacific. Sustain gender collaboration through gender focal points and through proposed gender platform should this be established</p>

11 Strategy for Knowledge Sharing and Learning

11.1 Introduction

The CGIAR Research Program on Aquatic Agricultural Systems seeks to deliver outcomes and achieve impact at multiple scales in local sites where we work directly; more widely through partners in the focal countries and hubs; and through the distillation, dissemination and use of IPGs in other aquatic agricultural systems and other agricultural systems. To achieve impact at these multiple scales, effective knowledge sharing and learning are essential. Specifically, we need to build upon existing knowledge, create new knowledge, and find effective ways of linking that knowledge to action that achieves impact.

Recognizing the importance of this work, the program has developed a research theme dedicated to knowledge sharing and learning. Building on this research the present section describes how we will work to share the knowledge and learning that the Program generates. Delivering this commitment will take significant financial and human resources, as well as shared engagement by all partners. Without this investment, the Program will not achieve the innovation and transformational impacts we seek.

11.2 Guiding principles

Knowledge sharing and learning are critical aspects of the planning, design and implementation of research in development. Program partners will work according to the following principles:

- Communication products must be relevant, accurate, clear, concise, consistent and timely.
- Knowledge sharing and learning processes must be participatory and inclusive, with an iterative process of dialogue providing options for engagement.
- Our work must respect the different values, gender, opinions and technological limitations of stakeholders.
- We must complement, inform and support other communication, knowledge sharing and learning activities, as well as encourage stakeholders to bring additional voices into Program dialogue.
- We must build on a diversity of existing social networks and communication, knowledge sharing and learning channels.

11.3 Target audiences

The Program's theory of change highlights the complexity of the environments the program will work in and the diverse audiences that need to be engaged in program implementation. Reflecting this complexity, the Program will recognize primary, secondary and tertiary audiences from among the large number of actors we will engage. These target audiences cannot be specified at this stage, but an important step in the participatory diagnoses in focal countries and hubs will be identifying target audiences from among our multiple program partners; beneficiaries; local, regional and national governments; and other policymakers in the wider development arena, the private sector, media, and the NGO community.

11.4 Approach

The Program will work at the system level, taking into account the range of actors who have a stake in developing these systems. We will be guided by learning from recent efforts to improve the planning and implementation of knowledge sharing and learning in research and development. A great deal of learning has arisen from these initiatives, including

- emphasizing knowledge sharing and learning aimed at enhancing the capacity of all the actors so that they can bring about innovation;
- bringing together the partners required to integrate knowledge from technology, social mobilization, dissemination and training strategies, business, credit delivery, marketing, and policy;
- integrating learning as a management tool in all projects; and
- engaging pro-actively with the policy systems to enhance the chances that improved knowledge will lead to policy change.
- No single approach is promoted by these initiatives. Rather, they highlight the importance of promoting a diverse set of knowledge-sharing approaches.

Our investment in participatory knowledge sharing and joint learning will be supplemented with interventions that invite, rather than require, participation and that catalyze dialogue within communities in pursuit of collective action. This builds on the Program approach described in section 4, in which we explicitly look to blur the line between the researcher and the researched.

From the outset, we will design an evaluation system for the knowledge-sharing and learning component of the Program. This will use both quantitative and qualitative indicators, including measuring early-stage awareness of challenges and opportunities, stakeholder involvement, the development of sustained and effective leadership, information equity, a sense of ownership, social cohesion, and social norms. This M&E will be developed and implemented jointly with Program partners and the end-users of the knowledge-sharing and learning efforts.

11.5 Making it happen

The partners implementing the Program will use both traditional and innovative communication processes and products that are inclusive, relevant, accurate, consistent and timely. This will help to ensure that the Program's knowledge flows freely both within the domains of the Program and in the wider development context. In this way, knowledge sharing and learning will be dynamic and ongoing.

Table 9 outlines very broad categories of key target audiences and some indicative processes and products from an array of information and communication technologies and social media that partners have identified during project design as potentially relevant and useful. However, it is understood that, to be truly effective and stimulate social change, the final identification of appropriate knowledge-sharing and learning tools and tactics must be part of the participatory diagnostics planned for each focal country and hub in the early stages of implementation. In this manner the different needs of target audiences in their social, educational and cultural contexts will be better cater for.

Table 9: Indicative list of categories of target audiences and the products and processes that may be used to build and sustain knowledge sharing and learning

Target audience	Products	Processes
Participating communities and households	Technical information packs, radio programs, comic books, school curricula, posters, and market information developed in the local language and accommodating local customs	Peer-to-peer learning, field visits, motivation and recognition, capacity development, theater, storytelling and songs, and road shows
Development audiences and international NGOs	Best practices, lessons learned, website and success stories	Presentations, round table, events and networks
Donors	Success stories, impact briefs and website	Presentations, round table and events
General public	Fact sheets, issues briefs and website	Media, nonviolent protest and direct action
Local and regional governments	Technical information packs, posters, fact sheets, best practices, website, videos, and computer simulation	Face-to-face meetings, input material for their own products, capacity development, learning alliances and networks
International science community	Working papers and peer-reviewed journal papers	Seminars and conferences
Local NGOs	Technical information packs, radio programs, posters, market information and videos	Capacity development, road shows, face-to-face meetings, learning alliances and networks
Partners in the program	Newsletter, website, lessons learned, activity reports and data repository	Learning platforms, networks, seminars, workshops and meetings
Policymakers and agents of change	Champion and key change agent, website and policy briefs	Seminars, workshops and events

12 Delivering the Program in Focal Countries

12.1 Focusing on countries

The Program will focus in the first instance on the major aquatic agricultural systems of the Asian mega deltas, the Asia-Pacific islands of the Coral Triangle and African freshwater systems. In each of these systems, we will work directly in only a few countries where the needs and opportunities to deliver the program are high. Our choice of countries has considered the extent of aquatic agricultural systems in each, their importance to the rural economy, the degree of commitment to implementing the program and the quality of partnerships for scaling out (Table 10). In addition, we have sought to start the Program by working in countries where implementation can move ahead rapidly and where we already have strong capacity to work with partners to this end. For this reason, the Program will begin in five countries where there is already strong operational capacity in place in the offices of the lead Center.

In the Asian mega deltas we will work in Bangladesh and Cambodia and, in 2012, extend to India and Vietnam. In Bangladesh, fertile alluvial floodplains cover some 80% of the country and the aquatic agricultural systems they support dominate the rural economy. Most of Bangladesh's 16 million rural farm households rely on these agricultural systems for a combination of rice farming, fishing, and rearing household livestock or vegetable cultivation. Over 60% of farming families are poor or vulnerable to poverty (Annex 5, Figures A1 and A2), and large parts of the delta are exposed to cyclones and sea level rise.

About 30% of Cambodia is covered by permanent water bodies or areas that are inundated during the flood season. Rice production and fisheries predominate in these areas, with rice grown by 70% of the rural population and fisheries providing income for 46% of the total population of 14.5 million people. Many of these rural households are poor (Annex 5, Figure A3), and stunting is common. Many farming households are unable to grow enough rice and seek income from fishing, poultry, livestock, other crops and wage labor to increase their income and ensure their food security.

With respect to the Asia-Pacific islands, we will work first in the Philippines and Solomon Islands, extending subsequently into Indonesia and the countries of the Pacific through partnership with the Secretariat of the Pacific Community. Nationally, the Philippines has a more diverse economy and less poverty than any of the other focal countries, but many of the provinces remain poor and vulnerable (Annex 5, Figure A4). With their extensive coastlines and heavy reliance on agriculture and fisheries in rural areas, these provinces find aquatic agricultural systems central to their economies.

Table 10: Rationale for initial country focus

System and countries	Rationale for country focus				
	National dependency on Aquatic Agricultural Systems	Government commitment	Partnerships	Extent of Aquatic Agricultural Systems	Degree of development focus on Aquatic Agricultural Systems
Asia mega deltas					
Bangladesh	Very high	Strong	Active & strong	Cover 60% of country	Major
Cambodia	Very high	Strong	Growing	Cover >25% of country	Major
Asia-Pacific islands (Coral Triangle)					
Solomons	Very high	Strong	Active & strong	All provinces	Major
Philippines	Very high in some provinces	Strong	Growing	All provinces	Major in some provinces
African Freshwater					
Zambia	Very high in some provinces	Strong	Emerging	20% of country	Major in some provinces

As a small island state, Solomon Islands consist largely of coastal and aquatic ecosystems, with aquatic agricultural systems dominating the rural economy. Three-quarters of Solomon islanders are subsistence smallholders and fishers, with 71% of women and 53% of men engaged in subsistence agriculture, and 50% of women and 90% of men engaged in fishing. In this subsistence economy, 23% of the population lives below the poverty line, and there is substantial interisland migration in search of employment (Annex 5).

Regarding Africa's inland systems, the program will start in Zambia but seek to extend to Uganda and Mali by 2012. Zambia's rivers and lakes cover 20% of the country; support extensive agriculture, fisheries and livestock production; and provide livelihoods for 3 million people, or 25% of the country's population. Poverty remains persistently high in the provinces dominated by aquatic agricultural systems, with 83% living below the poverty line in Western Province, 79% in Luapula District and 73% in Kafue District. Similarly, vulnerability to malnutrition, poor access to social services and disease are particularly high there (Annex 5, Figure A7).

A broad range of aquatic agricultural systems is represented in the program countries. The mix of fish, livestock, crops and off-farm activities is distinctive in each case. Fish enter the systems through salt and freshwater capture fisheries and aquaculture. Aquaculture encompasses a variety of production systems, from fish to shrimp. Livestock are present in Asia mainly as smaller animals such as poultry and pigs, while cows and goats are much more important in the African systems. Farming is variable, ranging from subsistence staple crop production to market-oriented vegetable production. Cropping systems range from very humid irrigated to drought-prone rainfed. Depending on infrastructure and other support services, households offer labor and other services off the farm. This variability provides important opportunities for the comparative analysis of the needs, opportunities and achievements at the different sites. As described in section 6 the aquatic agricultural systems we will work in present a variety of challenges and opportunities. The program will learn from these commonalities and differences across the focal countries and hubs and thereby develop an important body of IPGs (section 6.5; table 4).

12.2 Focusing on hubs

The Program's emphasis on research in development brings with it the commitment to places and relationships that is required to establish the trust and cooperation essential for implementing an action research approach. To this end, the program's engagement in program countries will be focused through research in development hubs. We define a hub as "a geographic location providing a focus for innovation, learning and impact through action research." A hub typically has fairly homogenous biophysical characteristics and production systems and presents a set of common challenges, opportunities and intervention points. It generally aligns with administrative units, either provinces or districts. Our choice of hubs in each country focuses the program in those areas where dependence on aquatic agricultural systems and poverty are both high. Figure 7 shows the location of hubs in Zambia. The locations of the hubs in other focal countries and summary descriptions of each are shown in Annex 5.

In each hub, the program will work with partners to identify communities and sites to be the foci of our direct research investment. At each of these sites, we will conduct participatory diagnoses with selected communities and households, and our work will build upon this to provide a basis for long-term learning with the communities in each area. We will develop learning alliances with all key stakeholders in the hubs and use participatory impact mapping to

Box 5: Implementing Program in the Greater Khulna hub, Bangladesh

Khulna District is one of the hubs in Bangladesh in which we expect the Program to proceed rapidly by building on a series of existing CGIAR programs: (i) the Greater Harvest and Economic Returns from Shrimp (GHERS) component of the Poverty Reduction by Increasing the Competitiveness of Enterprises program, funded by the United States Agency for International Development and managed by WorldFish; (ii) the Challenge Program for Water and Food (CPWF) Ganges Basin Development Challenges (GBDC) program, in which IRRI, IWMI and WorldFish all play important roles; and (iii) the Cereal Systems Initiative for South Asia (CSISA), which is an integrated program implemented in Bangladesh by WorldFish, IRRI and CIMMYT until 2015 as part of the Feed the Future Initiative.

CSISA, the largest of these initiatives, aims to achieve rapid and durable improvements in agricultural productivity and livelihoods. It is pioneering the hub-based approach to implementing research in development adopted by the Program on Aquatic Agricultural Systems. In Khulna, CSISA works through consultation with public and private service providers, including NGOs, to define agricultural development priorities. Working with these same partners, it provides training on and disseminates existing technologies when solutions already exist and, when new alternatives are required, implements on-farm action research.

In pursuing this work, CSISA is building implementation partnerships, in particular with the Bangladesh Rural Advancement Committee, which is currently operating an Islamic Development Bank-funded program offering interest-free agricultural credit to more than 32,000 households in Khulna and Barisal, and a crop-intensification project and cyclone rehabilitation program. Through this partnership, CGIAR staff working under CSISA will provide technical training for NGO field workers and support on-farm demonstrations and action research with farm households. A similar partnership is being discussed with SAVE UK, which is implementing the program Stimulating Household Improvements Resulting in Economic Empowerment, funded by the United Kingdom's Department for International Development in Khulna. CSISA will also work with private sector actors throughout agricultural value chains to leverage improvements in service provision and facilitate the delivery of embedded extension services and advice as part of commercial transactions. This latter approach is similar to that adopted by the GHERS project, which works with the owners of shrimp collection depots, hatcheries and testing laboratories to improve the science they draw upon and trains their staff. This work reaches 22,580 shrimp and prawn producers with extension messages that can improve productivity, increase on-farm integration, and deliver high-quality shrimp post-larvae and improved management practices that reduce the incidence of shrimp disease.

The CPWF GBDC is centered on the Khulna hub, where it focuses on reducing poverty and strengthening food security and livelihood resilience in coastal areas through improved water governance and management and more productive and diversified farming systems. This program provides an important platform upon which the Program will build. In particular, two GBDC projects will develop resilient agriculture-aquaculture production systems and improved water governance and management in polders. The applied participatory research carried out in these projects will complement and inform training and extension carried out under CSISA. Similarly, two other GBDC projects will enhance stakeholders' ability to predict and plan around future hydrological changes in the coastal zone that will frame the future form of agriculture there. As the lead Center for the Program, WorldFish has been tasked by the CPWF with coordinating the integration of these four projects with other research and development investments in Khulna. This is now being done in close alignment with the Program impact pathways, seeking to enhance impacts through communication, stakeholder participation, policy dialogue and effective coordination among the government, NGOs, and CGIAR- and donor-sponsored projects and programs, ensuring that gender and diversity are mainstreamed at all stages of implementation.

As we move toward implementation, the Program will add value to these existing efforts and contribute to further impacts in the Khulna hub. We will establish space for knowledge sharing among these programs through engagement with program implementers and beneficiaries. We will do this by using participatory diagnosis and ex-ante impact assessment to identify where additional research and expanded development partnerships can strengthen and/or complement existing research programs. Each of these programs has an M&E system, so where feasible the Program will develop its M&E system to compliment the others and to identify areas for future research investment as the results of the CSISA, CPWF and GHERS programs are analyzed and gaps and future directions are examined.

12.3 Partnership approach — scaling in focal countries

The Program has been designed to achieve greater impact at scale by working effectively in partnership with governments, national and international NGOs, and other stakeholders. To this end, our partnership strategy provides an overall framework that we have applied during proposal development to engage partners and reflect their interests, perspectives and capacities in program design (section 9).

Our approach to scaling up to the national level depends heavily on the success of this partnership approach. In each focal country, we have identified a first set of core partners, including the government and large NGOs, with whom the Program will work. All of these partners manage major agriculture and rural development programs that have the capacity to benefit large numbers of people. By aligning the investments of the Program on Aquatic Agricultural Systems with these partners, we will achieve impact at multiple levels. We will do so through four steps:

1. Pursuing action research in selected communities where partners are working will inform the development approach taken in these areas and improve the choice and use of technologies and methodologies.
2. Fostering linkages between partner projects that we work with in the same hub will allow them to share the learning achieved in each.
3. We will expand from these projects to develop learning networks combining all projects and partners in each hub.
4. Harnessing the learning from networks in all hubs and distilling recommendations and other guidance will support the emergence of national policy and practice.

The four stages in this process are summarized in Figure 8.

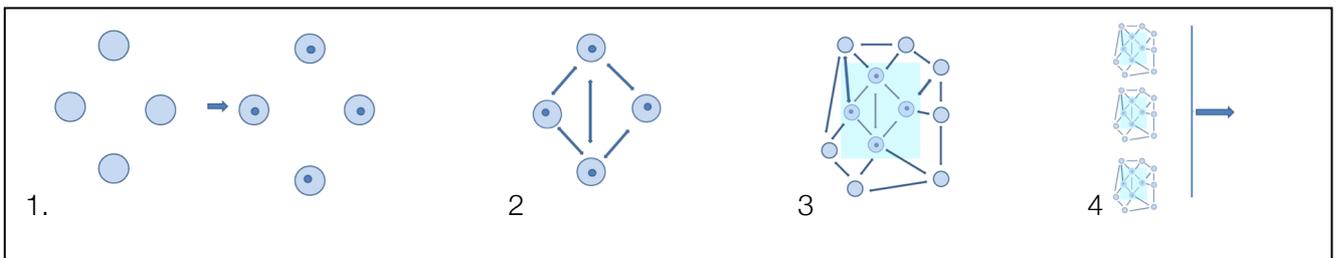


Figure 8: The four stages of building impact at scale.

(i) integrating action research (•) into development projects (X), (ii) fostering linkages between projects, (iii) building learning networks and (iv) harnessing learning for impact on national policy

13 Monitoring, Evaluation and Impact Assessment

The Program aspires to deliver development outcomes and impacts through a research-in-development process driven by a learning culture. In taking this approach, we will place strong emphasis on M&E and impact assessment within the program and adopt a suite of best practice tools. We will apply the principles of results-based management (Meier 2003) (Annex 8 has more details). We anticipate that the CGIAR will require certain monitoring information for performance evaluation and will tailor our plans to gather that information as well.

The Program's M&E and impact assessment will be rooted in the impact pathways developed during the inception phase in each country and hub (section 6.3). As described there and in section 5, the Program seeks to understand the pathways out of poverty for poor and vulnerable women and men in each hub, and our partnerships are tailored to help them move along these pathways. As described in detail in section 7 and Annex 2, we will use gendered participatory diagnoses and *ex-ante* assessments to identify key constraints in each hub and agree on a theory of change and a research agenda. This process will also be used to identify the process, output, outcome and impact indicators for monitoring the performance of the program in achieving research and development outcomes, the success of our partnerships, and ultimately our success in achieving impact.

The distribution of benefits by project interventions need to be analyzed by elaborating the overall framework of asset and income poverty, marginalization and vulnerability to formulate indicators which can measure changes in differentiated and dynamic categories of poor (such as the chronic and transient) and non-poor. Gender-disaggregated baseline data will be collected for these social categories in each hub. Our indicators which take into account the material dimension of wellbeing will include measures of poverty, food security, nutritional health, health, food consumption, diet diversity, and ecosystem health. Indicators which assess the social and institutional dimensions will include education, health, social capital and policy. The psychological and cultural dimension will be explored through indicators on perceptions of satisfaction and aspirations for change. Gender and age-disaggregated baseline data for these indicators collected in each hub. Follow-up data will be collected during the course of the program to monitor progress and assess ex-post impact. Many of the indicators will give prominence to gender equity (see table 1 and Annex 2). Wherever possible, the program will build on existing surveys carried out through projects already working in the location. In most cases, however, new surveys will have to be conducted.

The program's M&E team will use baseline and monitoring data to prepare annual program reports and other analyses as required. Special focus will be placed on providing these materials for annual program reviews at the hub and country level and at the biennial Program Forum. These reviews and other information on program management will help refine the program and adjust implementation as required. The reviews will form an important part of the program's annual reporting to the Program Oversight Panel and the Boards of both the Lead Center and the Consortium.

The program will build on the monitoring process to conduct periodic evaluations at the hub and country levels. We anticipate that some of these evaluations and assessments will be conducted through the CGIAR's independent procedures, or by those mandated by granting bodies. These external evaluations and assessments will be able to draw on those conducted internally by the program's M&E team. We will build upon our research-in-development focus to pursue innovative quantitative and qualitative evaluation methods with beneficiaries and development partners. The participatory approach that we propose seeks to foster the

sustainability of community-based initiatives by fostering upward commitment from participants and, through this, develop an enabling environment (Mansuri and Rao 2003). The techniques we use to pursue participatory impact evaluation will be adapted to the specific needs of each hub.

14 Timeframe

The Program will be implemented through a staged process of engagement in each of the focal aquatic agricultural systems and countries. The proposal development period has already seen this process start with intensive dialogue with partners in Bangladesh, Cambodia, Philippines, Solomons and Zambia. This has allowed the identification of first priorities, specification of partners' roles, and generation of enthusiasm and commitment. As the Program begins, the highest priority will be placed on delivery in these focal countries and so build on the momentum established. Steps in this process will include convening an inception workshop in each country, confirming agreements with project partners, establishing a Program Management Committee and management unit, and commencing participatory diagnosis in each hub; ongoing research projects will continue and new projects will be started.

Establishing the program in the first focal countries will be the primary focus of year 1. This will be followed in years 2 and 3 with roll out to other focal countries as indicated in Table 11. The precise timing of expansion to these focal countries will, of course, depend on the final budget approved for the program — with the expectation that, by the end of year 3, the Program will be fully functioning in the first five focal countries and the initial stages of implementation will be completed in the other five. The precise modalities of this will vary from country to country, with the greatest emphasis placed on Uganda and Mali.

Table 11: Three-year schedule for implementing the Program

Focal Systems and Areas		2011	2012	2013
Mega deltas	GBM (Bangladesh)	■ ■	■ ■ ■ ■	■ ■ ■ ■
	GBM (India)		■	■ ■
	Mekong (Cambodia)	■ ■	■ ■ ■ ■	■ ■ ■ ■
	Mekong (Vietnam)			■
Coral Triangle	Solomon Islands	■ ■	■ ■ ■ ■	■ ■ ■ ■
	Philippines	■ ■	■ ■ ■ ■	■ ■ ■ ■
	Indonesia		■	■ ■
African inland	Zambezi (Zambia)	■ ■	■ ■ ■ ■	■ ■ ■ ■
	Lakes (Uganda)		■	■ ■
	Niger (Mali)			■

■ = first priorities identified, ■ ■ = initial implementation of first priorities and new priorities identified, ■ ■ ■ ■ = ongoing implementation of priorities, GBM = Ganges-Brahmaputra-Megna.

In parallel with the program's launch nationally, the first year will require substantial investment to establish governance and management arrangements and procedures. Establishing the Program Management Committee and management unit will be a priority for all participating Centers and the lead Center in particular. A detailed work plan for the first year will be prepared in the first 2 months following program approval.

In launching the Program, careful attention will be paid to ensuring a smooth transition from the existing portfolio of Center research projects, which are largely managed independently and across a wider range of countries than the Program's focused approach proposes. Similarly, the Program begins with a rich set of existing partnerships that will need to evolve as the work develops.

We will build on this foundation by converting existing projects, partnerships, management arrangements and modes of operating to a more networked, cross-sectoral approach to addressing aquatic agricultural systems research and governance. Progress will proceed in a number of steps as existing projects run their course and contractual obligations are met. As the Program evolves, we will increasingly move to collaborative and interlocked projects that jump the disciplinary boundaries that have slowed rural development. This transition will proceed in different ways in different countries and production systems. In some systems and places, the legacies of entrenched ways of working in governments and research providers will take time to unwind. Others are primed to transform and will progress more quickly. We will use the participatory diagnosis process outlined above to prioritize the Program's investment in convening new partnerships and collaborations at the national and project level.

15 Governance and Management of the Program

The governance and management arrangements for the Program are designed to provide the necessary clarity and quality of oversight and management required to effectively implement the Program and achieve the outcomes and impacts described. The intent is to provide an environment where the resources of the Program are focused on achieving the programs objectives, rather than being diverted by complex administrative arrangements. We have sought to avoid a bureaucratic, top down management structure to facilitate efficiency and reflect the collaborative intent of the Program. To assist in this we have used the following criteria as a guide:

- Clarity of governance roles and accountabilities, including roles of the Consortium Board and Lead Center;
- Strong program leadership;
- Simplest possible management architecture to minimize transaction costs;
- Clarity on role of partners;
- Effective integration of other CGIAR Research Programs and Centers;
- Clarity on procedures for managing conflicts of interest.

The Governance and Management structure for the program is presented in Figure 10 and described below.

Consortium Board. The Consortium Board will establish a performance contract with the Lead Center, and will monitor progress against this. The Board will also support participating Centers in fund raising for the program where appropriate.

Lead Center. The Lead Center is responsible for managing the Program and will serve as the primary interlocutor between the Program and the Consortium Board and Fund. The WorldFish Center is the Lead Center for the CGIAR Research Program on Aquatic Agricultural Systems and will be accountable to the Consortium Board for program implementation as set out in the performance contract between the Board and the Lead Center. The WorldFish Board of Trustees will be fully accountable for the successful implementation of the program and for performance against contractual obligations. Under this arrangement the WorldFish Board will oversee execution of the Program's performance contract and account to the Consortium Board on financial and management issues. In doing so the WorldFish Board will, in line with standards set out by the Consortium Board, establish a monitoring and evaluation framework for the management of the Program. This will establish milestones and quality indicators against which the management of the Program can be judged and adapted.

Program Oversight Panel. To keep governance structures as simple as possible and reduce transaction costs, the Program will combine the roles of program oversight (more traditionally allocated to a Steering Committee) and scientific review (more traditionally allocated to Science Advisory Panel). The Program Oversight Panel (POP) will be appointed by the Lead Center to play this role. Membership of the POP will be established through a nomination process that seeks input from all CGIAR Centers and core and key partners. The POP will have a Chair, and seven members. Membership will consist of internationally recognized scientists and practitioners with particular strengths in science in development approaches and in the integrated management of agricultural systems. Membership will be balanced in terms of disciplinary mix, gender and diversity, and will include one seat for a representative of the Lead Center (normally the Director General or Board member), and one representative of other CGIAR Centers. The Chair will be appointed by the Board of Trustees of the Lead Center but will not be a member of staff or member of the Board of Trustees of any Center. POP members will normally be appointed for three years, but terms of 2-4 years will be used in the first instance to establish a staggered turnover in membership. The Chair will serve for two years. The members of the POP may be renewed once based on a recommendation from the Chair of the POP. The POP will normally meet twice each year with one of these meetings virtual where possible. More frequent meetings may however be needed in the first years of the program. The POP will report to the WorldFish Board after each meeting. The Chair of the Panel will attend one meeting of the WorldFish Board each year and provide an annual report to the Board at that meeting.

The POP will be responsible for providing oversight of the approach and implementation of the program. This will include review of annual and medium term program plans, together with review of annual reports and other major documents prepared by the program. These reviews will be conducted through robust interactions with the Program Management Team and (after revision as necessary) will be forwarded to the Board of Trustees of the Lead Center with recommendations for approval or amendment. The POP will also oversee the monitoring and evaluation process for the program on behalf of the Board of Trustees and recommend external reviews and course correction when necessary. The POP will also advise on where to build linkages and synergies with ongoing learning from related fields and activities of partner networks.

Program Leader. The Lead Center will appoint a Program Leader (PL) who will be responsible for day to day implementation of the overall program and serve as the primary spokesperson for the Program. The PL will have decision-making authority with respect to day-to-day operations of the program. He will report to the POP and be under the day to day supervision of the Director General of the Lead Center. The annual performance review of the

PL will be conducted jointly by the Director General of the Lead Center and the Chair of the POP. In fulfilling their role the PL will work with and through a Program Leadership Team and a Program Support Unit described below.

Program Leadership Team. The purpose of the Program Leadership Team (PLT) is to assist the PL and POP in ensuring scientific and operational coherence across the program as it is implemented. To this end the PLT will consist of one representative of each participating CGIAR Center, an equal number of representatives from partners, and Country Program Managers (see below). The PL will chair the PLT. The PLT will meet four times a year with at least two of these being face to face meetings, one of which will be in conjunction with the meeting of the POP. The PLT will develop appropriate reporting processes for the program and will review and approve annual and medium term workplans for submission to the POP and WorldFish Board of Trustees. They will also propose allocation of resources to countries, research themes and other program activities and oversee development and implementation of the program's fundraising plans. Finally the Committee will work with the POP in planning the meetings of the Panel, in convening the bi-annual Program Forum, and in organizing other events as appropriate.

Program Support Unit. The Program Support Unit (PSU) will consist of 3-5 program staff with responsibilities for coordination of activities across Center and other partners, and preparation of proposals, workplans, and reports. Where possible PMU staff will be drawn from across the participating Centers and partners, but collocated at the Lead Center. The PSU will work with the Consortium Office (unit to be developed to support the Board and Consortium CEO in Research Program portfolio performance management) in the management of the program.

Country Program Committee (CPC). A CPC will be established in each focal country and will oversee and coordinate implementation of program there. The CPC will consist of representatives of NARS partners, all participating CGIAR Centers and partner Research Programs, and core NGO partners. The CPC will be chaired by a representative from the NARS partners.

Country Program Team (CPT). A CMT will be established in each focal country and will be responsible for managing program implementation there. The CPT will consist of 4-6 program staff with responsibilities for implementation of activities in each country, including preparation of proposals, workplans, and reports. Where possible, CPT staff will be drawn from across the participating Centers and partners. They will be supported by a Country Program Support Unit (CPSU).

Country Program Manager (CPM). A CPM will be appointed from amongst participating Centers to lead the CPT, manage the CPSU and oversee program implementation at country level. The CPM will forge close links with the PMU and overall management of the program through participation in the PLT.

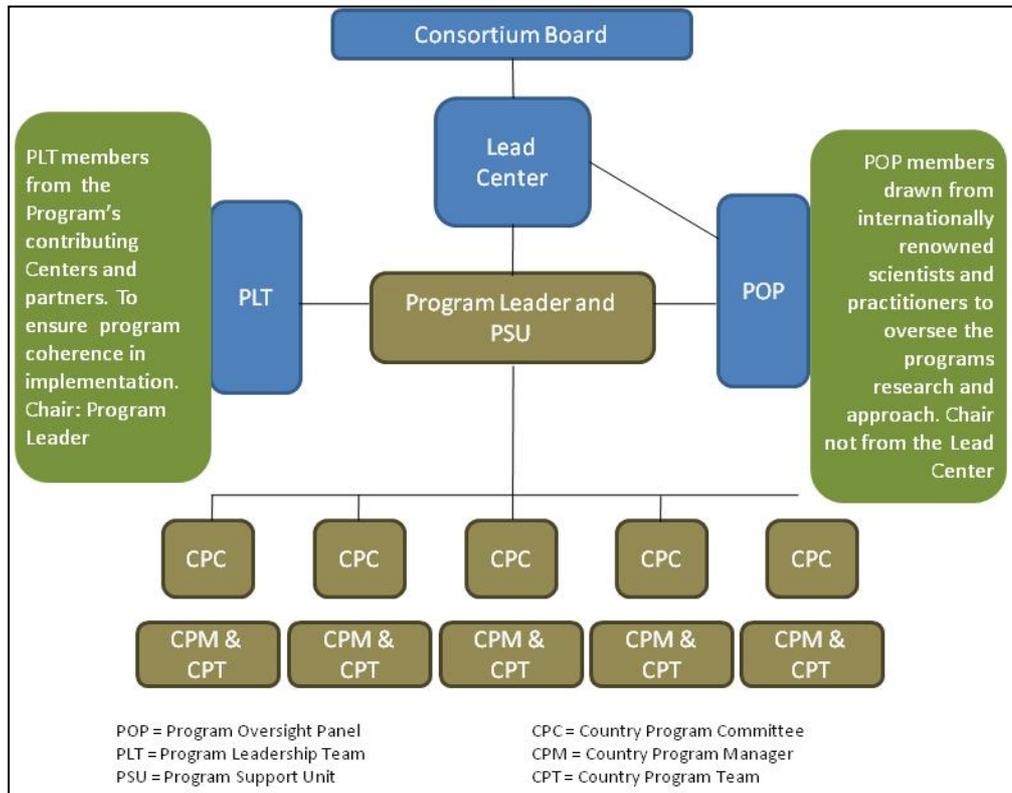


Figure 9: Proposed governance and management structure

Program Forum (PF). The Program Forum will be convened every two years to review program implementation together with partners from focal countries. This will serve to review progress in each country and globally, agree on priority science issues, identify common challenges and seek solutions. Most importantly the Forum will also serve as critical mechanism for cross-program learning that is a central part of the Program's approach. Other CGIAR Research Programs will be invited to engage in the Forum in order to foster learning and synergies across the Programs. The Forum will be held to coincide with a meeting of the POP and will rotate between focal countries. In addition the program will organize a number of thematic workshops each year to pursue specific science or operational issues such as gender mainstreaming, capacity development, partnership engagement, and impact assessment. Where appropriate these will be designed to inter-alia foster cross-learning between the Agricultural Systems Research Programs and with other Research Programs in the CGIAR portfolio.

Conflict resolution. As the Program progresses conflicts amongst partners will be referred to the Program Management Committee in the first instance. When they cannot be resolved at that level the issue will then be referred to the Chair of the POP if they concern programmatic issues and to the Director General of the Lead Center if they concern fiduciary, legal or reputational issues. If necessary the Board of Trustees of the Lead Center will be consulted, and the issue may, where appropriate, be referred to them. Only when the conflict cannot be resolved at these levels will it be referred to the Consortium Board.

16 Managing Risk

The Program has been designed to embrace the spirit and purpose of the CGIAR reform process. To this end, it seeks to work in new ways and target some of the world's poorest people in agricultural systems that have received only fragmented attention from the CGIAR and the wider agricultural research community. For these and other reasons, the Program faces substantial risks: partnership, management, political, governance, physical and financial.

To help manage these risks, the Program will develop a comprehensive risk inventory in which risks are defined and classified by their likelihood and potential adverse impact (see Table 12). This inventory will identify the key factors driving each risk, suggest potential mitigating factors, define warning indicators and designate risk owners whose job it is to manage that risk. The risk inventory will be reviewed annually in a joint process between the Program and host center governance and management.

Several of the risks are generic to the new Consortium program and funding mechanism. Others reflect the particular complexity of the Program focus on integrated agricultural systems. Nine particularly significant risks have already been identified and are described below. They will receive particular attention in the first stages of the program.

1. The Program seeks to raise CGIAR Center collaboration to a new level in a system in which many Centers have worked together only sporadically and superficially. Given the demand placed on all Centers by the CGIAR change-management process, the path of least resistance for all Centers will be to revert to more traditional forms of cooperation in systems where they have greater experience. The risk of inadequate engagement in the Program on Aquatic Agricultural Systems from Centers with appropriate expertise but conflicting demands is therefore high.
2. For its first few years, the Program will be required to transition through a phase in which Centers continue to implement their portfolios of research under previously signed research, much of which is in countries that have not been identified as focal countries for the Program. This will unavoidably disperse effort in the first stages of the program but needs to be kept within manageable limits.
3. The CGIAR Research Program on Aquatic Agricultural Systems is a complex program that will require strong management capacity and a quantum increase in the culture of collaboration across CGIAR Centers. In the absence of this capacity and collaboration, the Program cannot succeed.
4. Partners need to engage in integrated approaches to managing aquatic agricultural systems. Should they choose to pursue sectoral approaches, this will restrict the areas where the program can work.
5. The Program needs to be able to build coalitions with other development agents in the locations where it works to link its investments in research with the wider development context. Should this not happen, a core premise of the Program will be undermined.
6. We also need to be able to build effective partnerships at larger scale with the international development community so that the results of the program can be scaled out effectively. If this is not possible, the impacts of the Program will be constrained.

7. Aquatic agricultural systems are frequently affected by extreme weather events. The Program has the risk of significant setbacks to implementation should disaster occur, requiring the Program collaborators to focus elsewhere.
8. The funding required for the Program on Aquatic Agricultural Systems is modest relative to other areas of investment in agricultural research but will nevertheless require significant increases in resources. If these resources are not forthcoming — and insufficient investment is made in participatory processes, gender mainstreaming, capacity building, and knowledge management and learning that are at the core of the Program — then it cannot succeed.
9. The Program's development process has generated great enthusiasm and energy for its work. Building on this effectively will be greatly facilitated by rapid implementation during 2011. If implementation is delayed, enthusiasm will dissipate, and the credibility of the Program and its sponsors will be brought into question.

These risks are significant and reflect the challenge the CGIAR faces in working in the new ways required to have greater impact. Managing these risks will require careful investment as the Program is implemented, including steps to support the changes in behavior required. Our current assessment of the actions to be taken to manage the risks currently identified is provided in Table 12.

Table 12: Preliminary analysis of the nine major risks identified for the CGIAR Research Program on Aquatic Agricultural Systems

Risk	Likelihood	Potential impact	Initial risk management actions
Limited engagement of CGIAR Centers	Medium	Medium	The Program will seek guidance of CB as to how best to address this should it emerge as an issue; Early Program management involvement with all centers; Where appropriate, engagement of ARIs and NARS will be increased.
Existing projects leading to dispersion of effort	High	Medium	Management contracts will focus on working in focal countries and research that contributes to these; Existing projects that are not aligned to the Program will be managed separately; New projects will focus on these countries and hubs and only allow work in other locations where this is clearly justifiable for reasons of supporting scaling out; A project proposal review system will ensure alignment of Center proposals to the Program.
Absence of strong management	Medium	High	The participating Centers will give priority to hiring the right people and the Lead Center to appointing a high quality Oversight Panel and Program Leader; Early identification of the leadership team from existing resources.

Risk	Likelihood	Potential impact	Initial risk management actions
Sectoral approaches by partners	Low	High	Sustained high quality communication with partners and their engagement in Program events; If necessary excluding non-performing partners or switching locations.
Inadequate collaboration with other development agents in hubs	Low	High	Sustained high quality communications and marketing of the Program and the benefits it brings to other development agents; If necessary switch locations.
Ineffective wider partnerships with development community	Low	High	Early engagement with key partners; Sustained high quality communications and marketing of the Program; Partnership review to assess why this partnership is not happening.
Natural disasters	Medium	Medium	The Program will develop a contingency plan to be used in the event of such events.
Inadequate funding	Medium to High	High	Sustained high quality communications and marketing of the Program; Initial full understanding of donor intentions and assessment of funding gaps; Program review after 3 years; Effective and frequent project pipeline and funding reviews and forecasts.
Rapid start up	High	High	Effective communication with partners on process and planning; Early events to promote program and sustain momentum; Strong and effective project manager(s) appointed early.

17 Budget

17.1 Program costs 2011-2013

The proposed three year budget (2011-2013) for the Program is estimated at US\$ 59 million. The annual budget figures presented are based on current best assessment of the activities required to implement the program according to the timeline specified in the proposal. These figures will need to be adjusted on a pro rata basis according to the precise start date of the program.

Projected expenditure is shown according to major cost categories for each research theme, together with coordination and governance & management (Table 13 a, b, c). Table 14 a, b, c shows this expenditure according to major cost categories for each country, also together with coordination and governance & management. Expenditures according to cost categories, research themes, geography and CGIAR Centers and partners are summarized in Figures 11, 12, 13, 14.

Table 13a: Program budget 2011 by major cost categories vs research themes, coordination and governance & management

2011 Project Cost (USD '000)		System Productivity	Markets & Value Chains	Resilience	Gender & equity	Policies & Institutions	Knowledge Sharing	Impact Assessment	Country & Hub Coordination	Program Governance & Management	Total
Description											
1	Personnel including service charges	1,246	447	722	437	535	634	245	990	259	5,515
2	Travel	271	101	125	103	104	108	49	204	442	1,507
3	Operating expenses	324	174	195	119	56	157	58	225	-	1,308
4	Training / Workshop	216	65	90	86	39	108	67	152	75	898
5	Partners/Collaborators	748	173	443	251	309	253	94	1,251	-	3,521
6	Consultancy	204	72	57	95	57	117	28	94	-	723
7	Capital and other equipment	252	66	49	65	13	123	27	470	-	1,064
8	Contingency	97	13	99	32	29	18	20	43	47	399
	Sub total	3,357	1,112	1,779	1,188	1,143	1,517	589	3,429	822	14,935
9	Overhead	548	175	307	193	155	247	97	557	88	2,366
	Total Project Cost	3,905	1,286	2,085	1,381	1,297	1,764	686	3,986	910	17,301

Table 13b: Program budget 2012 by major cost categories vs research themes, coordination and governance & management

2012 Project Cost (USD '000)		System Productivity	Markets & Value Chains	Resilience	Gender & equity	Policies & Institutions	Knowledge Sharing	Impact Assessment	Country & Hub Coordination	Program Governance & Management	Total
Description											
1	Personnel including service charges	1,547	610	924	575	738	814	219	1,200	321	6,948
2	Travel	316	133	136	114	156	121	59	223	464	1,723
3	Operating expenses	346	177	200	120	66	186	48	277	-	1,419
4	Training / Workshop	238	101	102	94	52	122	50	166	79	1,004
5	Partners/Collaborators	989	457	595	262	337	263	79	1,302	-	4,284
6	Consultancy	236	97	67	93	68	121	29	88	-	799
7	Capital and other equipment	134	70	85	8	17	11	4	35	-	364
8	Contingency	133	64	121	32	35	19	14	45	50	513
	Sub total	3,940	1,709	2,230	1,298	1,469	1,657	503	3,335	913	17,054
9	Overhead	644	279	343	216	191	275	82	570	101	2,701
	Total Project Cost	4,584	1,988	2,573	1,514	1,660	1,933	585	3,905	1,013	19,755

Table 13c: Program budget 2013 by major cost categories vs research themes, coordination and governance & management

2013 Project Cost (USD '000)		System Productivity	Markets & Value Chains	Resilience	Gender & equity	Policies & Institutions	Knowledge Sharing	Impact Assessment	Country & Hub Coordination	Program Governance & Management	Total
Description											
1	Personnel including service charges	2,420	745	925	661	248	932	242	1,319	361	7,854
2	Travel	423	151	141	123	135	132	61	242	487	1,894
3	Operating expenses	416	173	204	144	53	196	49	272	-	1,506
4	Training / Workshop	304	139	121	110	44	144	56	184	83	1,186
5	Partners/Collaborators	1,434	650	666	292	54	293	87	1,432	-	4,909
6	Consultancy	273	102	120	103	85	136	33	94	-	946
7	Capital and other equipment	171	115	72	8	14	16	4	50	-	451
8	Contingency	161	90	129	35	18	20	16	39	52	561
	Sub total	5,603	2,164	2,379	1,477	651	1,870	548	3,632	983	19,306
9	Overhead	852	355	364	247	98	314	91	622	115	3,058
	Total Project Cost	6,455	2,519	2,743	1,724	749	2,183	639	4,254	1,097	22,364

Table 14 a: Program budget 2011 by major cost categories vs country, coordination and governance & management

2011 Project Cost (USD '000)		Bangladesh	Cambodia	Philippines	Solomons	Zambia	Country & Hub Coordination	Program Governance & Management	Total
Description									
1	Personnel including service charges	1,924	736	428	452	727	990	259	5,515
2	Travel	412	95	133	97	124	204	442	1,507
3	Operating expenses	439	169	100	178	197	225	-	1,308
4	Training / Workshop	415	22	65	10	160	152	75	898
5	Partners/Collaborators	1,004	368	73	5	819	1,251	-	3,521
6	Consultancy	443	22	120	8	37	94	-	723
7	Capital and other equipment	425	8	45	-	116	470	-	1,064
8	Contingency	35	39	27	-	208	43	47	399
	Sub total	5,095	1,459	991	750	2,388	3,429	822	14,935
9	Overhead	835	177	182	117	410	557	88	2,366
	Total Project Cost	5,931	1,636	1,173	867	2,798	3,986	910	17,301

Table 14 b: Program budget 2012 by major cost categories vs country, coordination and governance & management

2012 Project Cost (USD '000)		Bangladesh	Cambodia	Philippines	Solomons	Zambia	Country & Hub Coordination	Program Governance & Management	Total
Description									
1	Personnel including service charges	2,348	1,195	527	700	657	1,200	321	6,948
2	Travel	435	140	187	125	148	223	464	1,723
3	Operating expenses	454	175	121	200	192	277	-	1,419
4	Training / Workshop	454	36	78	24	168	166	79	1,004
5	Partners/Collaborators	1,044	444	87	35	1,373	1,302	-	4,284
6	Consultancy	460	25	142	6	77	88	-	799
7	Capital and other equipment	47	25	49	30	178	35	-	364
8	Contingency	36	58	31	-	294	45	50	513
	Sub total	5,279	2,099	1,223	1,119	3,086	3,335	913	17,054
9	Overhead	893	264	199	174	501	570	101	2,701
	Total Project Cost	6,172	2,363	1,422	1,293	3,587	3,905	1,013	19,755

Table 14c: Program budget 2013 by major cost categories vs country, coordination and governance & management

2013 Project Cost (USD '000)		Bangladesh	Cambodia	Philippines	Solomons	Zambia	Country & Hub Coordination	Program Governance & Management	Total
Description									
1	Personnel including service charges	2,613	725	589	763	1,483	1,319	361	7,854
2	Travel	463	108	231	144	219	242	487	1,894
3	Operating expenses	468	174	148	219	224	272	-	1,506
4	Training / Workshop	531	26	101	31	230	184	83	1,186
5	Partners/Collaborators	1,156	89	111	38	2,083	1,432	-	4,909
6	Consultancy	509	38	179	7	120	94	-	946
7	Capital and other equipment	47	40	56	71	187	50	-	451
8	Contingency	36	41	39	-	353	39	52	561
	Sub total	5,823	1,241	1,455	1,273	4,899	3,632	983	19,306
9	Overhead	993	189	216	189	734	622	115	3,058
	Total Project Cost	6,816	1,431	1,671	1,462	5,633	4,254	1,097	22,364

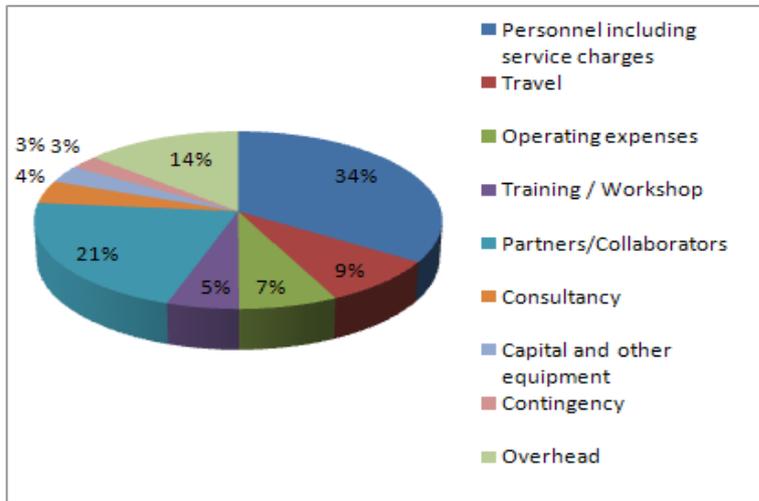


Figure 10: Comparison of Program expenditure by major cost categories

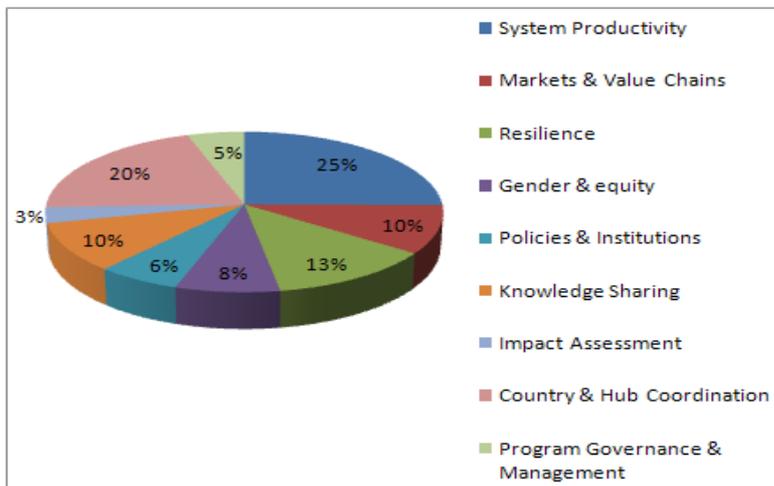


Figure 11: Comparison of Program expenditure by research themes

Note: in this presentation of the budget, cross-cutting costs for gender mainstreaming, capacity development, and knowledge management and learning are included under each research theme.

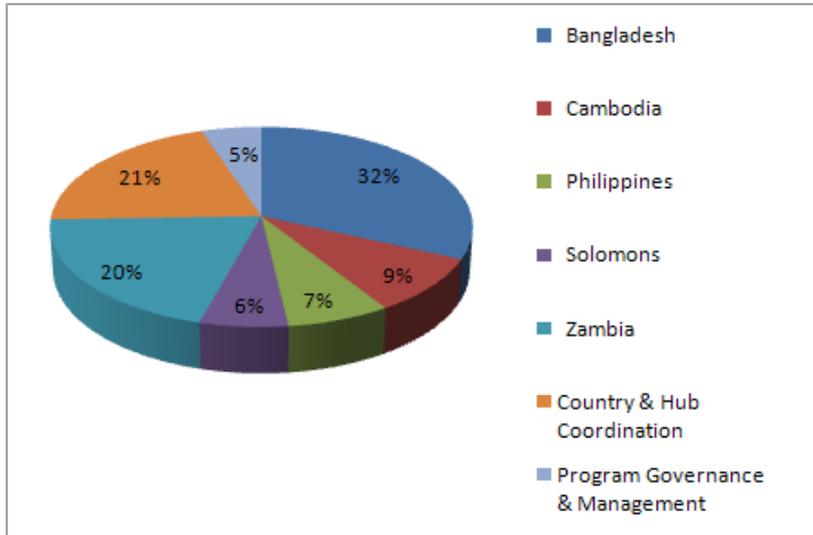


Figure 12: Comparison of Program expenditure by country

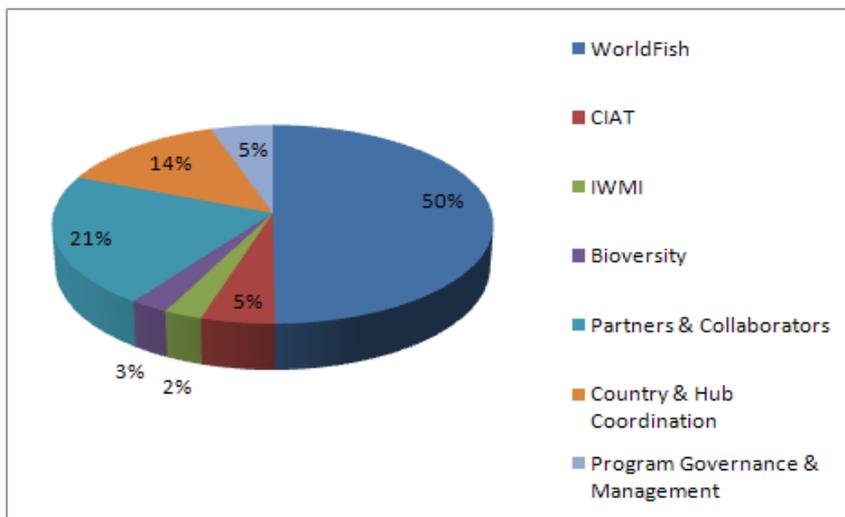


Figure 13: Comparison of Program expenditure by CGIAR Centers and partners

17.2 Program costs 2014-2016

In constructing the detailed budget for the first three years of the Program we have also used our discussions with partners at country and hub level to construct a first budget for 2014-2016. At this stage we expect that this second three year phase of the Program will expand our work in current focal countries by increasing the number of sites where we will operate, and expand to other countries most notably Uganda and Mali. The projected costs over this three year period are \$85.5m, with \$26.8m in 2014, \$28.6m in 2015, and \$30.1m in 2016. A summary breakdown of these costs is provided in Table 15.

Table 15: Program Cost 2014 - 2016 (USD '000)

Description		2014	2015	2016	Total
1	Personnel including service charges	9,406	9,502	9,792	28,701
2	Travel	2,102	2,133	2,368	6,603
3	Operating expenses	1,766	1,860	2,065	5,691
4	Training / Workshop	1,827	1,954	2,049	5,830
5	Partners/Collaborators	5,821	6,823	7,077	19,720
6	Consultancy	1,196	1,272	1,364	3,832
7	Capital and other equipment	406	451	501	1,358
8	Contingency	622	691	767	2,080
	Sub total	23,146	24,687	25,982	73,815
9	Overhead	3,666	3,910	4,116	11,692
	Total Project Cost	26,813	28,597	30,098	85,508

Cost categories

The main cost categories used in preparing the budget are described below.

Personnel includes all CGIAR personnel that will be involved directly in the delivering the program. The figures provided therefore group together different categories of staff. The number of scientist years required for each research theme in the first three years of the program is summarized in Table 16.

Table 16: Program Personnel Resources 2011 – 2013

Country	Research Theme (Scientist years)					
	Productivity	Markets	Resilience	Gender	Policies	Knowledge
Bangladesh	20.7	8.1	3.3	8.1	3	12.6
Cambodia	2.1	3	4.5	3.6	8.7	3
Philippines	5.4	3	6.3	5.4	5.4	3
Solomons	3	3.9	4.2	3.6	3.6	5.1
Zambia	10.8	1.8	7.8	4.2	2.4	2.4
Total	42	19.8	26.1	24.9	23.1	6.7

Travel includes all international and local travel for CGIAR staff.

Operating expenses include non-equipment items or services purchased specifically to carry out the projects. It includes the costs of websites & publications.

Training/Workshops include major workshops and training events, including those to be used for scoping, planning and review of program implementation. It includes costs (travel, per diems, etc) of participants and presenters. It excludes costs of time of CGIAR and partner personnel. The key events included in the country activity budgets, and country and hub coordination budgets, presented in Figure 14, are summarized in Table 17.

Table 17: Program estimated trainings and workshops 2011 – 2013

Events	Bangladesh	Cambodia	Philippines	Solomon Is	Zambia
Workshops	33	5	8	5	12
Training	17	3	4	3	5

Partners/collaborators include all of the costs of engagement by institutional partners in the research dimensions of the Program for which funding will be channeled through the Program’s management structure. This will include costs of partner’s staff, their travel, and other operating costs. It does not include these costs in those instances where they are covered by matching funds that the partners bring to our partnership. It also does not include any consultancy costs.

Consultancy includes the costs of hiring short-term expertise to support the Program in specific areas of work where the CGIAR Centers and partners cannot provide this.

Capital and other equipment includes large specific capital items including cars, motorbikes, boats, and other equipment required for research. The key items included in the country activity budgets, and country and hub coordination budgets, presented in Figure 14, are summarized in Table 18. Computer equipment is included in operating expenses.

Table 18: Program Estimated Capital and Other Equipment 2011 - 2013

Capital Expenditure	Bangladesh	Cambodia	Philippines	Solomons	Zambia
Cars	9	1	2	1	6
Motorbikes	40	6	6	0	12
Boats	8	3	3	6	6

Contingency is included to cover unforeseen extra costs. This line also includes inflationary costs of later years

Institutional overhead covers the institutional costs that are not directly attributable to this Program. They include the costs for each Center of the Director General’s office, Board of Trustees, Corporate Finance and HR and other costs of a general nature.

17.3 Funding scenarios: 2009 + 10%

The basic funding for the Program (Table 19) is based on the following estimates:

- Basic unrestricted funding (from the Fund) equivalent to 2010 unrestricted funding received by the Centre and a 5% increase in 2012 and 2013;

- Projected growth in grant funding according to best information available to participating Centers (including confirmed grants and growth projected using existing fund-raising processes at country and regional levels);
- A funding gap that needs to be filled.

Table 19: Initial funding scenario for the Program

Description	2011	2012	2013	Total
Unrestricted Funding (From the Fund)	3,901	4,095	4,300	12,296
Retricted	8,419	9,157	9,571	27,147
Funding Gap	4,981	6,503	8,493	19,977
Total	17,301	19,755	22,364	59,420

It is understood that the Fund will be unable to contribute to filling the funding gap in 2011, and these funds will need to be found from restricted grants. The capacity to do this is limited given the timing, and the activities in 2011 will therefore need to be tailored to the funding that is available.

For 2012 and 2013 the participating Centers will work with partners to also help meet the funding gap using additional restricted funding. However unrestricted funding from the Fund will play a critical role in supporting the work on gender, capacity building and knowledge management that lies at the core of innovation in the Program. We therefore hope that the Fund will be able to allocate significant unrestricted funding to closing the gap in 2012 and 2013. We look to the Consortium Board and Fund Council for guidance on this. We also look forward to working with the Consortium Board to secure increased bilateral funding at national and regional level.

17.4 Funding scenarios: -20%

In this reduced funding scenario (Table 20) the budget has been reduced by 20% overall. In the event that income does not meet the targeted levels in this scenario, we will proceed to reduce costs as follows:

- Delay roll out of the program in Uganda, Mali, India, Vietnam and Indonesia. With significantly reduced funding the program will have significantly fewer staff and other resources available to work with partners in scoping, designing and implementing the program's research. In view of this we will give priority to targeting these more limited resources are ensuring best possible start up of the program in the five focal countries. The program will only consider modifying this approach if there is an, as yet unidentified, increase in restricted funding for one of these countries that would allow increasing staff resources.
- Reduce scale of role out in first focal countries by engaging with a smaller number of hubs. Because of the reduced staff and resources described above we will also need to reduce the number of hubs that the program will engage with, and the number of sites in each. The specific hubs that will be given priority will be identified by the program team in each country. Priority will be given to covering a balanced set of development challenges and geographies, although the availability of restricted funding will also play

a key role in these decisions. To give an idea of scale, a 20% cut is equivalent to halving our proposed program in Bangladesh or abandoning the program in Zambia in its entirety. In practice the program's flexibility in making these decisions will be influenced heavily by the mix of restricted and unrestricted funding, the former often tied to specific countries, and the latter allowing more strategic choices.

- Reduce investments in program coordination, including by appointing existing staff to lead and manage the program. Many current CGIAR staff will play a central role in the implementation of the program. However it is envisaged that additional staff will be hired. The scope to make these additional hires will be reduced in a -20% scenario, and a greater proportion of program tasks will be performed by existing staff. This will of course be subject to the skills required being available from amongst existing staff.
- Reduce investments in overall science coordination, including knowledge management, capacity building, gender mainstreaming and the distillation of IPGs. With a reduced research budget, reduced staff, and reduced activity, there will be a reduced requirement for these core areas of the program. This will however have to be handled especially carefully as the knowledge management, capacity development, and gender mainstreaming activities are essential for much of the innovation that the program seeks to bring. Special priority will therefore be given to fund-raising for this work to ensure that all research conducted by the program is adequately resourced in these key areas.

Table 20: Funding scenario for the Program with a 20% budget cut to be updated

Description		2011	2012	2013	Total CRP1.3 Cost
1	Personnel including service charges	4,412	5,558	6,283	16,253
2	Travel	1,205	1,378	1,515	4,098
3	Operating expenses	1,047	1,135	1,205	3,387
4	Training / Workshop	718	803	949	2,470
5	Partners/Collaborators	2,817	3,427	3,927	10,171
6	Consultancy	579	639	757	1,975
7	Capital and other equipment	852	291	361	1,504
8	Contingency	319	410	449	1,178
	Sub total	11,948	13,643	15,445	41,036
9	Overhead	1,893	2,161	2,446	6,500
	Total Project Cost	13,841	15,804	17,891	47,536

Annex 1: Proposal Development

The proposal for the CGIAR Research Program on Aquatic Agricultural Systems was developed through an extensive process of consultation and engagement with partners at global, regional and country levels. Two global workshops were held in Penang, Malaysia from 19-21 July and 23-25 August, and focused first on design of the program and at the second workshop on writing the proposal. These workshops brought together regional and international partners, as well as representatives from participating Centers and national partners.

Country consultation processes took place in Bangladesh, Cambodia, Philippines, Solomons and Zambia during the course of June-August (and from April in Bangladesh). These involved national workshops in each to discuss the program and agree priority issues and areas for focus. Table A1 summarizes participation in these processes.

Following feedback from the Consortium Board early in 2011 the proposal was revised drawing upon inputs from the same group of partners that developed the proposal.

Table A 1: Summary of national consultations and engagement of partners and CGIAR Centers

Global/National	Process/event	Dates	# CGIAR Centers	# partners				
				Gov.	NARS	NGO	ARIs	Private Sector
Global	Design workshop	19-21 July	4 (Bioversity, CIAT, IWMI, WorldFish)	2	4	3	0	1
	Writing workshop	23-25 August	5 (Bioversity, CIAT, ILRI, IWMI, WorldFish)	1	4	2	0	1
National								
Bangladesh	1:1 consultations	April - August	4 (CIMMYT, IFPRI, IRRI, IWMI, WorldFish)	6	3	9	0	2
	National workshop	5 August	3 (CIMMYT, IRRI, WorldFish)	8	2	10	1	3
Cambodia	1:1 consultations	June-August	1 (IRRI)	4	0	13	0	0
	National workshop	11 August	1 (IRRI)	7	3	9	0	9

CGIAR Research Program on Aquatic Agricultural Systems

Global/National	Process/event	Dates	# CGIAR Centers	# partners				
				Gov.	NARS	NGO	ARIs	Private Sector
Philippines	1:1 consultations	June – August	1 (Bioversity)	14	11	3	1	5
	National workshop	12-13 August	1 (Bioversity)	1	6	0	0	2
Solomons	1:1 consultations	July - August	0	2	0	3	0	0
	National workshop	29 July	0	1	0	4	0	0
Zambia	1:1 consultations	May-August	1 (IITA)	4	2	4	1	1
	National workshop	9-10 August	0	4	4	6	0	2

Annex 2: Gender Partnerships, Participatory Gender Tools for Out-Scaling, Gender Mainstreaming in Research Themes, Gender Strategy Monitoring and Evaluation

Annex 2a: Gender Partnerships

Forging strategic partnerships at community, national, regional and global levels is critical for working towards the objective of gender equity under this program. In preparing this proposal, consultations were conducted and the potential for partnerships explored with gender specialists and representatives of regional organizations including the Mekong River Commission and Secretariat of the Pacific Community, ARIs such as the Asian Institute of Technology, Memorial University of Newfoundland, and University of Manitoba, and national agencies such as the Cambodian Department of Fisheries, the International Center for Diarrhoeal Disease Research Bangladesh (ICDDR), Philippine Commission on Women, National Network on Women in Fisheries and University of Philippines in Visayas.

Criteria that will be considered for effective partnerships during the planning and implementation stages of the program are:

- Involving partners with proven track record in gender sensitivity and commitment
- Identifying potential role and contribution of partners to implementing gender strategy
- Strengthening capacity of implementing partners for gender analysis and mainstreaming in interventions using participatory approaches
- Linking and networking with organizations which have gender expertise and have influence over policy-making on gender issues and rights

We will build on current partnerships and synergies with on-going and planned projects with a strong gender focus at the regional and national levels for implementation of the gender strategy and out-scaling.

Regional

Mekong River Commission (MRC). This regional organization implements a gender mainstreaming project. We will collaborate with the Regional Network for promoting Gender in Fisheries Development (NGF) comprising coordinators from each MRC member country to address gender gaps in national policies and action plans to ensure equitable benefits for both women and men engaged in aquatic livelihoods. This will include sharing gender disaggregated socio-economic data, knowledge of currently used frameworks and tools, and best practices.

Secretariat of the Pacific Community (SPC). The corporate policy of this regional organization representing 22 Pacific island countries and territories is committed to gender mainstreaming in all technical areas of its work. Under its Human Development Program, SPC has a major focus on gender equality in fisheries, agriculture, climate change, technology, transportation and energy amongst other areas. The SciCOFish (Scientific Support for Management of Coastal and Oceanic Fisheries in the Pacific Islands region) project, funded by the EU and implemented by SPC for the conservation and sustainable use of coastal and oceanic fisheries resources has a strong gender component, focused on community-based interventions that address poverty and vulnerability. We will collaborate with this project on gender equitable technology development and dissemination, asset-building and decision-

making. The Land Resources Division of SPC which focuses on land use issues related to agriculture and forestry has an emphasis on gender, value addition in agriculture and climate issues in rural communities in the Pacific and also provides opportunities for partnership in sharing gender-disaggregated data and knowledge, disseminating best practices and building capacity in gender analysis and mainstreaming.

United Nations Economic Commission for Africa (UNECA). The African Center for Gender and Social Development (ACGD) within UNECA supports capacity-building for gender mainstreaming into sector-related policies at national and sub-regional levels, as well as monitors compliance with international conventions and agreements on gender equality. We will explore collaboration with ACGD to incorporate gender issues in aquatic agricultural systems into their on-going initiatives in gender **mainstreaming in relevant national policies, as well as share best practices.**

National

Bangladesh. We will work with the researchers, implementers, and policy makers working on gender and aquatic agricultural systems in Bangladesh to improve gender analysis and mainstreaming. Thus, important members of the network will be gender focal points in agencies responsible for aquatic livelihoods such as Fisheries, Agriculture, Livestock and Forestry; research organizations and academic institutions such as, ICDDR,B, Bangladesh Development Institute, Bangladesh Institute for Development Studies; and NGOs such as D.Net, Engender Health and Bangladesh Rural Advancement Committee (BRAC). ICDDR,B and BIDS offer gender expertise that can enhance our interventions. We will collaborate with these and other organizations on advocacy initiatives for policy change, as well as share data, knowledge and best practices.

Cambodia. The program will work with the network of gender focal points in agencies responsible for aquatic livelihoods such as Fisheries, Agriculture, Livestock and Forestry. Cambodia has comprehensive gender mainstreaming policies in all of these natural resource-dependent sectors. The program will collaborate to strengthen policy implementation that is currently constrained due to lack of resources and capacity. We will also support capacity-building to improve gender analysis and mainstreaming, share gender-disaggregated data and best practices, and collaborate on on-going advocacy initiatives for policy change.

Philippines. We will work with the Philippine Commission on Women (PCW), a network of 120 research, advocacy and policy organizations committed to improving the lives of women and girls, to support the implementation of the Philippines Magna Carta of Women, which has special provisions for improving economic and social benefits to marginalized rural women. The Program will also collaborate with the University of Philippines in Visayas with expertise in gender, aquatic farming, fisheries and coastal resource management, as well as the National Network on Women in Fisheries (WINFISH). We will also support capacity-building to improve gender analysis and mainstreaming, share gender-disaggregated data and best practices, and collaborate on on-going advocacy initiatives for policy change.

Solomon Islands. The Program will collaborate with the Ministry of Women, Youth and Children's Affairs which coordinates the National Policy on Gender Equality and Women's Development focusing on health, education, economic status, decision-making and leadership, violence against women, gender mainstreaming, and monitoring and evaluation. The policy has provisions for full and meaningful participation of women in training and development in agriculture and fisheries, enabling a link with our capacity-building objectives. The Program will

also collaborate with the New Zealand supported project on “Strengthening community-based fisheries towards gender equity in rural Solomon Islands communities” focusing on improving food security by creating an enabling environment for women and youth to engage in livelihood diversification activities and decision-making in adaptive management of aquatic resources. We will support gender equitable technology adoption, asset-building and decision-making in aquatic communities, share knowledge and best practices.

Zambia. The Program will work with the Gender in Development Division (GIDD) of the Cabinet Office in Zambia. GIDD, one of the four professional and technical Divisions, facilitates mainstreaming of gender into macro and sectoral policies, as well as institutional capacity building, and ensures provision and dissemination of information to increase gender awareness and knowledge in Zambia. GIDD networks with other government, non-governmental organizations and donors to ensure gender equality in the development processes at all levels, and is responsible for coordination, monitoring and evaluation of all gender activities and programs. Through its decentralized structure this high level national institution will provide policy guidance and oversight on gender issues at different levels of the Program, at national, provincial and district level. The Program will draw upon the insights and expertise of the Gender Focal Persons established by GIDD at each line ministry and Provincial Administration. The Program will also work with gender experts of the key partner, Catholic Relief Services (CRS), at both regional and national level, as well as with local organizations working to advance women’s rights and gender issues in development.

Advanced Research Institutes

Asian Institute of Technology, Bangkok. The Asian Institute of Technology is a regional academic institute for graduate education. The program will collaborate with the Gender & Development Studies (GDS) of the School of Environment, Resources & Development in research and capacity-building. Since the mid 1990s, GDS has engaged in teaching and research on natural resource management, offering 10 graduate level courses, as well as research and outreach programs, with a robust network of alumni and partners globally. GDS has been actively involved in Mekong-wide networks for democratizing water governance in fisheries, irrigation and hydropower development, as well as gender issues relating to livelihoods and cross-border fish trade. The Program will collaborate with AIT to enhance the quality of gender analysis tools and capacity-building modules, as well as external monitoring and evaluation.

International Food Policy Research Institute, Washington D.C. We will collaborate with the gender research and interventions that IFPRI will be leading in the CGIAR Research Program on policy, institutions and markets and contributing to in the CGIAR Research Program on Improved Nutrition and Health to maximize synergies and outcomes. IFPRI will contribute its long term expertise in gender analysis and mainstreaming in agricultural research to improve the quality of our overall interventions toward gender equity.

Memorial University of Newfoundland. The Memorial University of Newfoundland has strong expertise in issues of globalization, gender, fisheries and interactive governance of aquatic resources in the Sociology and Geography departments. We already collaborate with this University on a CIDA-supported project on governing small-scale fisheries for wellbeing and resilience and would build on this to enhance the quality of gender analysis and capacity-building modules for this program, as well as external monitoring and evaluation.

University of Manitoba. We are also engaged in collaborative research with the University's Anthropology department on the CIDA-supported project on governing small-scale fisheries for wellbeing and resilience. The department offers expertise in linking interactive governance, wellbeing and resilience in fisheries, with an emphasis on integrating gender. We will build on this partnership to generate innovations in our conceptual frameworks and tools for gender analysis in aquatic agricultural systems.

CGIAR Centers

Where possible the program will collaborate with the gender teams of other CGIAR Research Programs and through these the gender expertise in other CGIAR Centers. Of these IFPRI is especially important given their leadership of the CGIAR Research Program on Policies, Institutions and Markets and the Research Program on Improved Nutrition and Health. We will work with them to maximize synergies and outcomes. IFPRI will contribute its long term expertise in gender analysis and mainstreaming in agricultural research to improve the quality of our overall interventions toward gender equity.

Annex 2b: Participatory Gender Tools for Out-Scaling

A range of participatory gender tools for action research will be tested and used, based on demand. Proposed tools include gendered value chain analysis (GEVCAL), Gender Gap Mapping, Gendered Vulnerability and Risk Assessment, and Gendered Livelihood Trajectory and Decision-making.

Gendered value chain analysis (GEVCAL). The GEVCAL approach (Mayoux and Mackie 2007⁹) developed by the ILO is based on action research and focuses on the often invisible dimensions of value chains where women's livelihoods are located. It highlights the critical nature of gender inequalities encompassing the "weakest links" within value chains and the most vital areas for upgrading quality and growth, as well as reducing poverty. This approach emphasizes that many of the complex issues highlighted by gender analysis are often not confined to gender itself, but reflect other inherent inadequacies in the types of economic analysis which commonly dominate value chain analyses and development. Thus, gender analysis provides a starting point for integration of key dimensions of extra-market factors, power relations and motivations into the currently incomplete understanding of economic growth. Understanding and incorporating these dimensions are essential not only for gender, but to designing effective and sustainable pro-poor growth and development strategies that can respond to global drivers such as changing markets, price fluctuations and climate change.

Gender Gap Mapping. This tool will be adapted for aquatic agricultural systems from gender mapping initiatives conducted by a number of organizations such as IWMI, CARE and PROFOUND to make visible differentiated gender roles and relations in farming systems, gender gaps in access to and control of resources, as well as vulnerability and social exclusion, and in achieving wellbeing outcomes. Mapping can be based on GIS at regional and national levels.

⁹ Mayoux, L. and Mackie, G. 2008. A practical guide to mainstreaming gender analysis in value chain development. ILO, Addis Ababa.

Gendered Vulnerability and Risk Assessment. This will be designed as a gender-sensitive financial instrument to examine gender variations in risk perceptions, aversion and adaptation, focusing on motivational factors (economic, social, cultural and psychological), which contribute to risk-averse behavior and coping/adaptation strategies. Existing local knowledge and best practices that support adaptation strategies and resilience will be assessed. This analysis will contribute to exploring the viability of a range of social protection options ranging from market (e.g. micro-insurance) to social safety net (e.g. transfer) approaches to enable vulnerable and currently excluded categories of households to reduce potential production threats/losses, consumption volatility, health and survival risks. Promising approaches will be tested through public-private partnerships (PPP) and ways to spread financial risks between the public and private sector explored.

Gendered Livelihood Trajectories and Decision-making. Gendered livelihood strategies and pathways, perceptions of well-being that motivate these trajectories, current constraints and opportunities in decision-making and aspirations for change will be assessed. This will enable an understanding of future trajectories, towards which women and men within different categories of households are working and the internal and external factors influencing these decisions. In addition to standard global economic and human development indicators, social relations, personal security and peace of mind emerge repeatedly as important criteria of subjective well-being by people; these perceptions are often gendered and insights are relevant to understand socio-cultural factors underlying decision-making of women and men, and why some types of development interventions work, while others do not.

Annex 2c: Gender Mainstreaming Activities for each Research Theme

Gender mainstreaming activities will be country and location-specific, as well as demand driven, but can include the following:

Theme 1:

- Conduct participatory assessments of gendered preferences for species, traits and technological innovations along aquatic agricultural value chains
- Design training modules and facilitate workshops for implementing partners on participatory plant and fish breeding, including gender equity in priority setting, field trials, dissemination and monitoring in aquatic agriculture communities
- Monitor activities, outcomes (gender equitable participation, comparative economic and social return to men and women) and impacts (reduction of gender gaps in poverty and vulnerability indicators)

Theme 2:

- Conduct participatory gendered value chain analysis (GEVCAL) to identify the location of women and men in AA value chains and relative barriers for market entry and equitable returns
- Design training modules and facilitate workshops for implementing partners on GEVCAL
- Facilitate gender-responsive capacity and asset building (entrepreneurship training, financial and business services) for beneficiaries

- Conduct action research to test best options for gender-equitable returns from value chains
- Monitor activities, outcomes (gender equitable participation, comparative economic and social return to men and women) and impacts (reduction of gender gaps in poverty and vulnerability indicators)

Theme 3:

- Conduct participatory gendered vulnerability and risk assessments in aquatic agriculture communities
- Design training modules and facilitate workshops for implementing partners on gendered vulnerability and risk assessments
- Facilitate a public- private partnership model for mitigation and adaptation to climate-related risks and test best private (e.g. micro-insurance) and public (e.g. social protection) options for women and men, representing different social groups
- Monitor activities, outcomes (gender equitable participation, comparative benefits to women and men from piloted options) and impacts (reduction of gender gaps in resilience indicators such as food security, nutrition, health and life expectancy)

Theme 4:

- Conduct participatory gender gap mapping and livelihood trajectory/decision-making assessments in AA communities
- Design training modules and facilitate workshops on gender gap mapping and livelihood trajectory/decision-making assessments
- Facilitate the formation of national/regional forum theater groups to discuss and disseminate gender equity messages in aquatic agriculture communities
- Facilitate the design interactive computer games for youth and children to disseminate gender equity messages in aquatic agriculture communities
- Facilitate the introduction of gender equity messages in school curricula in aquatic agriculture communities
- Initiate the formation of gender and assets action networks at local, regional and national levels
- Monitor activities, outcomes (gender equitable participation, relative benefits to women and men/female and male children/youth) and impacts (changes in perceptions of gender norms and beliefs, reduction of gender gaps in access and control of assets and resources)

Theme 5:

- Assess laws, policies, institutional structures and processes relating to aquatic agricultural systems, such as of agriculture, livestock, fisheries, aquaculture, natural resource management, poverty, disasters and climate change for gender disparities and social exclusion
- Build partnerships with agencies and organizations working towards reform of such laws, policies, institutional structures and processes for gender equity
- Monitor activities, outcomes (changes in laws, policies towards gender equity) and impacts (reduction of gender gaps in poverty and vulnerability)

Theme 6:

- Conduct assessments to identify gender responsive communication and dissemination strategies in aquatic agriculture communities
- Facilitate a learning network and workshops to exchange knowledge on effective communication strategies that can reach women and men
- Monitor activities, outcomes (gender equitable reach, relative benefits to men and women) and impacts (influence of capacity-building modules on changing gender perceptions)

Annex 2d: Monitoring and Evaluation of the Gender Strategy

This Program has a strong emphasis on monitoring and evaluation of gender-responsive outcome and impact indicators, which are already mainstreamed in the impact pathways and M&E matrix. However, when the workplan is completed at inception in a participatory process with stakeholders, relevant process and output indicators to monitor the implementation of the gender strategy, appropriate to the context of each country will be generated. The broad framework proposed for M&E of the Gender Strategy is summarized in the following list.

Process indicators

- A gender-sensitive monitoring and evaluation system in operation
- Mechanisms in place for consultation and participation of both female and male stakeholders/beneficiaries in the design, implementation, dissemination of findings, and lessons learnt
- Equitable participation of both male and female researchers
- Budget reflects the gender-specific strategies and activities of the project

Output indicators

- Gender disaggregated data collected
- Gender analysis conducted
- Gender tools and training modules developed
- Gender training workshops held
- Reports, papers and other publications with gender analysis produced and disseminated

Outcome indicators

- Evidence that services and activities of the project reach both women and men equitably
- Project interventions demonstrate that gender equity concerns are addressed and voices of both gender groups are heard
- Evidence of satisfaction levels of project activities and services by both women and men
- Positive change in perceptions of gender norms and practices towards equity
- Uptake by other projects and initiatives of best practices and lessons learnt
- Incorporation of gender into fisheries and aquaculture policies

Impact indicators

Gender gaps reduced in:

- time/labor spent on livelihood activities
- income levels
- control over assets
- decision-making at household, community, regional, national levels
- food security/nutrition levels
- education enrolment and completion rates of girls and boys
- literacy rates
- reduction in gender-based violence

Annex 3: Initial Analysis of Development Challenges, Hypotheses of Change and Key Research Questions for Program Hubs in Bangladesh

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
1	Haor Basin (Sylhet)	Wetland habitat degradation	<p>Community based management initiatives to create dry season refuges for breeding populations of fish can enhance the productivity of fisheries in remaining wetland areas</p> <p>Modification of roads and irrigation/flood control hardware to improve habitat connectivity will enable fish passage and enhance productivity of natural fisheries.</p> <p>Strengthening governance mechanisms to reduce land-grabbing, illegal occupation, infilling and industrial pollution of important wetland areas could help maintain the ecological integrity of critical areas of habitat</p> <p>Increased uptake of IPM, integrated rice/fish culture and conservation agriculture techniques can reduce the application of pesticides and fertilizers, thereby limiting agricultural pollution of, and improving biodiversity and productivity in, aquatic agricultural systems</p>	<p>How can proven management strategies (i.e. fish sanctuaries) best be scaled out to ensure nationwide uptake?</p> <p>How can institutional support for these initiatives be marshaled, in which locations will they deliver the greatest impacts, and what will the scale of these impacts be?</p> <p>Which wetland areas should be prioritized for protection and by which mechanisms can protection be implemented or enforced?</p> <p>Which of these approaches are most attractive to farming households and most effective in reducing impacts on aquatic biodiversity?</p>
		Poor infrastructure	Improving transport infrastructure will enhance the capacity of producers to deliver perishable goods to market in a timely fashion and improve their access to a larger range of marketing intermediaries, thereby reducing transaction costs and spoilage and increasing the price received for primary products (e.g. by increasing the ease and rapidity with which high value fish from <i>beel</i> fisheries in remote areas of Sunamganj district can be delivered to Dhaka	Would opening up the haor basin accelerate extraction of natural resources (particularly fish), or result in undesirable social outcomes? If so, what steps could be taken to improve market access but ensure that such eventualities might be avoided?

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
2	Greater Khulna	Extremely high incidence of poverty and stunting	<p>Enhancing the productivity and cropping intensity of agricultural systems (e.g. through dissemination and uptake of saline tolerant rice varieties, greater integration between on-farm enterprises, etc) will increase both subsistence and market-oriented household production thereby improving direct and indirect (income dependent) availability of and access to food</p> <p>Introducing new components or activities to the farming system which are complementary with women's space for agency (e.g. pond or <i>gher</i> dyke cropping; production of farm-made feeds) will lead to more favourable allocative decision making and consumption strategies within the household which support improved female and infant nutrition.</p> <p>Increasing the productivity and international competitiveness of shrimp production through improved sectoral governance (e.g. by improving product safety and traceability to prevent rejections of product by foreign buyers and development of improved brood and seedstock) will create additional employment throughout the value chain for landless labourers, including women, and reduce vulnerability of existing employment to trade related shocks.</p>	<p>What constraints presently prevent more complete on-farm integration and the uptake of more productive technologies, and how can these be overcome? What are the tradeoffs between subsistence and market oriented production strategies in terms of food security, nutrition and poverty reduction? Are complementary strategies (e.g. educational initiatives to promote better sanitation) required for nutritional gains to be realized?</p> <p>Which components or activities have the greatest scope for contributing to these outcomes? Which approaches to dissemination are likely to result in their adoption? Does their adoption lead to demonstrably improved female agency and female and infant nutrition? Are there any unforeseen negative consequences of promoting these activities and how can they best be avoided?</p> <p>Can Bangladeshi shrimp producers obtain third party certification and is this a necessary or desirable competitive strategy? If so, how can obstacles to certification of small producers be overcome? Would attaining certification significantly reduce the incidence of trade related shocks? What other steps can be taken improve quality and value of Bangladeshi shrimp and prawn? Will gains in productivity or export price be transmitted backwards along value chains to producers and labour providing ancillary services?</p>

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
		Highly disaster prone	Adopting continuous rotational cropping cycles spreads risk and returns throughout the year, making households more resilient to the impacts of climatic shocks than they would be if reliant on a single annual crop	To what extent does extension or modification of the cropping cycle reduce or create greater exposure to risk from extreme weather events for farm households? How are these outcomes socially differentiated?
		High salinity conditions inhibit rice productivity	<p>Increased availability, dissemination and uptake of salinity tolerant rice varieties will bring about significant yield improvements</p> <p>Improved community-based water governance in polders can reduce conflict between rice and shrimp producers over use of saline water</p> <p>Wider uptake and further adaptation of integrated seasonal rotation-based cropping systems (e.g. rice/vegetable – rice/prawn/fish/vegetable – shrimp/fish/vegetable) can make otherwise detrimental environmental conditions advantageous</p>	<p>What are the tradeoffs between the cultivation of saline tolerant varieties and those currently used? In the event that there are negative as well as positive outcomes how can these be managed or mitigated?</p> <p>Which governance arrangements allow for the most inclusive and equitable outcomes regarding water management in polders?</p> <p>What are the constraints to wider adoption of highly integrated rotational cropping systems? How can these be overcome? What adaptations can be made to improve productivity further?</p>
3	Greater Barisal	Extremely high incidence of poverty and stunting	Development of culture or enhanced capture techniques for small nutrient dense indigenous fish species in waterlogged polders could contribute to improved nutrition among producing households and (if produced in sufficiently large quantities) could make these fish more accessible to low income consumers by reducing their market value	What is the reproductive biology of nutrient dense SIS? Which management strategies can be adopted to increase productivity from natural water bodies and intensify culture? Will such systems be commercially viable?
		Highly disaster prone	Adoption of pond-based aquaculture contributes to household resilience in the face of major shocks (e.g. cyclones) since any fish remaining following such events can be harvested as a readily fungible asset that can be converted to cash to cover the cost of housing repairs, etc and thus increase the speed with which disaster affected households are able to recover	How can ponds be better protected to prevent losses of fish in the event of extreme events? How can aquaculture be rapidly re-established following cyclones etc?

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
		Shortage of fresh water for agriculture and household consumption	Participatory development of improved rainwater harvesting technologies could reduce dry season shortages of potable water	Which technologies or devices represent the most viable and affordable means of rainwater harvesting to provide safe drinking water? Which irrigation strategies are most appropriate for dry season agriculture?
4	Greater Faridpur/ Jessore	Prolonged deep water flooding	<p>Enhancing fisheries through effective co-management strategies can increase the incomes of fisher households during periods of inundation and contribute to the social-ecological resilience of wetlands and the communities dependent upon them</p> <p>Introduction of types of aquaculture and management strategies compatible with the environmental and time constraints of deeply flooded agro-ecosystems (e.g. pen or cage culture in open water bodies; or, producing and/or stocking ponds with large fingerlings capable of attaining marketable size in the short period pre or post-flooding) can enhance productivity and increase household incomes</p>	<p>How can local power relations be negotiated to ensure sustainable institutions for co-management which deliver benefits to all?</p> <p>Which types of aquaculture are most suitable in deeply flooded agro-ecosystems? Are they accessible to the poor? Are there any negative environmental impacts associated with these approaches and if so how can they be reduced or mitigated?</p>

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
5	Greater Bogra/ Rajshahi	Ground water depletion	<p>Forms of conservation agriculture (e.g. alternate wet/dry irrigation) may reduce groundwater mining</p> <p>Alternate instruments for water governance (e.g. water pricing, reducing some subsidies for electricity) may promote more efficient water use</p> <p>Emphasis on alternative crops to rice and more integrated cropping systems may help to reduce dependence on groundwater irrigation</p> <p>Short duration types of fish production (e.g. nursing fingerlings in seasonal rain-fed ponds) may maximize the productivity of scarce water resources</p>	<p>Which forms of CA are likely to be most effective in reducing groundwater use in the context of Bangladesh given structural constraints such as unreliable electrical supply, small plot sizes and low levels of mechanization?</p> <p>Can instruments such as these be successfully applied in the context of Bangladesh's political economy and how can any potentially adverse outcomes of their application be avoided or mitigated?</p> <p>Which alternative crops and cropping systems are most suited to the agro-ecology of the region and are they compatible with livelihood strategies and market opportunities in the region?</p> <p>Do these systems meet the needs of farming households and provide substantive advantages of established fish production systems?</p>
6	Greater Noakhali/ Comilla	Likelihood of increasing saline intrusion with sea level rise	Adaptive strategies already deployed by farmers in the more saline districts of Southwest Bangladesh (e.g. integrated rotational <i>gher</i> cropping) can act as a model coping strategy for inhabitants in the southern districts of the hub	To what extent are the strategies deployed by farming households in Khulna hub transferrable to this hub given different market infrastructure etc? What adaptations or innovations will be necessary within and beyond the immediate farming system to enable successful application of these approaches?

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
		Very low agricultural productivity	<p>Improved access to inputs of a sufficiently high quality along with technical advice and better road access to markets will provide opportunities and incentives which help to raise cropping intensities and increase yields for both rice and fish, which are presently among the lowest in the country in the southernmost districts in the hub</p> <p>Planting short duration <i>rabi</i> (winter season) crops such as mustard and mung bean to utilise residual soil moisture can increase cropping intensity and farm income</p>	<p>What are the most appropriate mechanisms for improving the availability and quality of inputs? What facets of the agrarian structure have historically inhibited agricultural development and which factors might induce a change in this situation? What incentives and capabilities need to be in place in order to bring about gains in farm productivity and incomes?</p> <p>Does introduction of these crops offer a good fit with the livelihood strategies pursued by farming households in coastal districts of this hub?</p>
7	Greater Mymensingh	Social exclusion of ethnic minority <i>Adivasi</i> communities	Adivasi communities can be successfully integrated into development efforts by carefully designed interventions based on the introduction of appropriate forms of aquaculture. As demonstrated by WorldFish's Adivasi Fisheries Project (2006-2010) this can lead to higher incomes and reduce the duration of annual food deficits for project participants, and enhance their agency in interactions with ethnic majority Bengalis.	<p>How to replicate the successes of the Adivasi Fisheries Project with a larger client group and at lower cost per participant?</p> <p>Can some of the most successful intervention strategies developed for Adivasi communities (e.g. establishment of netting teams and fish processing and trading activities) produce similar positive impacts elsewhere for Bengali project participants?</p>
		High prevalence of stunting/infant malnutrition	<p>Supporting women's engagement in and ownership of economically productive agrarian activities will increase the equity of intra-household food distribution</p> <p>Enhancing farm profitability and productivity via the introduction of improved varieties and management techniques will improve household nutrition</p>	<p>Which on and off-farm activities and approaches to facilitating women's engagement in them are most appropriate for this location, and how exactly does women's participation in them translate into improved nutritional outcomes?</p> <p>Which varieties and management strategies are acceptable to farming households and result in improved nutritional outcomes? Are improvements in farm productivity or in farm income more important with regards to improved household nutrition?</p>

Hub #	Hub name	Development challenges	Hypotheses of change	Key research questions
8	Greater Rangpur/ Dinajpur	Extremely high incidence of poverty and seasonal food insecurity (<i>'monga'</i>)	<p>Supporting the development of high value market-oriented forms of agriculture/aquaculture will lead to creation of greater off-farm employment upstream and downstream opportunities (e.g. input supply, transport, marketing), thereby reducing rural unemployment, pushing up wage rates and improving access to purchased food items</p> <p>Carefully designed gender differentiated approaches to project intervention can support women's increased use of and control over productive assets, thereby enhancing their power to take allocative decisions regarding household resources which benefit the nutritional status female household members and children</p>	<p>What are the most appropriate options for stimulating the development of commercial forms of agriculture/aquaculture?</p> <p>Which strategies and implementation approaches are best suited to facilitating enrollment in economically productive activities?</p> <p>How can interventions be structured to avoid overburdening women with additional activities or creating gendered intra-household conflicts?</p>
		Flash flooding	Encouraging of dyke cropping vegetables and fruits, which reinforces and raises pond and rice field dykes could reduce vulnerability to losses of fish and crops in the event of flash floods.	Why do some households integrate agriculture and aquaculture more fully than others, and what implications does this have for strategies to promote of dyke cropping?

Annex 4: Country Research Questions by Program Theme

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
Theme 1: Sustainable productivity increase	<p>Which new crops and cropping cycles deliver sustainable productivity increases for small and marginal households in the environmentally challenging saline areas of southwest Bangladesh?</p> <p>How can new stress-tolerant rice varieties for salt-affected soils and submergence-prone lowlands be integrated with fish and shrimp cultivation in coastal areas rich in surface water to reduce farmer risk and increase cropping intensity and incomes?</p> <p>Which technologies and/or sets of cropping systems offer the best opportunities for women and men to improve incomes, intra-household nutrition and household resilience under shocks in different agro-ecological and vulnerability settings?</p> <p>What is the trade-offs for women and men between investments in household land improvements and off-farm opportunities?</p>	<p>How can the food and nutritional intake of resource-poor households in rainfed rice regions of Cambodia be increased through integrated aquaculture- agriculture farming systems</p> <p>How can the cost of entry to new aquaculture and agriculture technologies be reduced for the poor and vulnerable?</p> <p>Will new technologies provide equitable benefits to women and men?</p> <p>What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?</p> <p>Can the improved integration of aquaculture into conservation agriculture meet the goals of both poverty reduction and sustainability?</p>	<p>What are the best options for environmentally sustainable productivity improvements to crops, livestock, fisheries and aquaculture in ASS systems in the different agro-ecological, social and economic settings?</p> <p>How can improved tilapia strains be best deployed to allow poor and vulnerable aquatic agriculture households to benefit from growing market demand for aquaculture products?</p> <p>What diversification options can create impact at scale for poor and vulnerable fishers and farmers?</p> <p>How can the natural resource and financial limitations of poor and vulnerable fisher and farmer households to scaling up be addressed?</p> <p>What technologies need to be developed and adopted to ensure that increased productivity takes into account both quantity and nutritional quality of foods and food products?</p>	<p>What and where is the scope for increased sustainable productivity from capture fisheries in Solomon Islands?</p> <p>Which new or improved technologies can deliver sustainable productivity increases for small and marginalized households?</p> <p>At the household level, which technologies and/or combinations of technologies for aquatic agricultural systems offer the best opportunities for women and men to improve household incomes, nutrition and resilience to shocks?</p> <p>Including sustainable financing, what are effective methods of introducing sustainable alternative and supplementary livelihoods to remote communities?</p>	<p>What are the best options for improving the productivity of crops, fish and livestock in the focal hubs?</p> <p>What improvements would provide the greatest benefits to the landless and workers displaced from formal employment such as mining and by future dam construction?</p> <p>How can women and men affected by HIV/AIDS benefit optimally from productivity improvements?</p> <p>Can greater focus on productivity, sustainability and market chains for aquatic agricultural crops help alleviate the hunger season and improve the nutritional quality of food intake in maize-dominated agriculture?</p>

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
Theme 2: Engaging and developing equitable markets	<p>What and where are the opportunities for increased employment in crop, fish, and livestock value chains in aquatic agricultural systems in Bangladesh?</p> <p>How can investments best enhance these opportunities for the rural poor and vulnerable?</p> <p>Given an annual urban growth rate of over 3% per year and increasing urban demand for food, which crops or cropping cycles would provide rural smallholders the best opportunities in urban and other domestic markets?</p> <p>How can the ability of small holders to adapt to the changing requirements of international markets be enhanced?</p> <p>How can services for the poor and vulnerable be embedded in input and output market chains?</p>	<p>How can rainfed rice farmers engaging in integrated aquaculture-agriculture farming improve product diversity and quality and develop opportunities for adding value and promoting market links?</p> <p>How can investments in value chains for aquaculture best capture opportunities for the poor and vulnerable?</p> <p>How can the necessary enterprise support be delivered effectively?</p> <p>What are best practices in post-harvest processing of aquaculture products for Cambodia?</p>	<p>What are the opportunities for adding value to major fishery commodities, such as sardines, in ways that help improving livelihoods of the poor and vulnerable?</p> <p>What market information systems and linkages are required to make value chains function better for the poor and vulnerable?</p> <p>How can compliance to market requirements be achieved among poor and vulnerable farmers/fishers?</p> <p>How can access of poor and vulnerable farmers to quality feed and seed inputs be improved?</p> <p>What mechanisms can be introduced to allow consolidation of the low production capacities of poor/vulnerable fishers/farmer households to benefit from economies of scale and improve bargaining power for better prices for their produce?</p>	<p>What and where are the opportunities for increased valuing of agriculture, horticulture and fish value chains in aquatic agricultural systems in Solomon Islands?</p> <p>How can investments best enhance these opportunities for the poor and vulnerable?</p> <p>What actions are needed to improve opportunities for rural small holders to benefit through meeting growing urban demand associated with rising urban populations in Honiara?</p> <p>How can access to, and economic return from, international markets be improved?</p>	<p>How can the poor and vulnerable, including women and those affected by HIV/AIDS, best participate in expanding regional and urban markets for aquatic agricultural commodities?</p> <p>In particular, how can they participate in new high value markets, including livestock, horticulture and fish products?</p>

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
<p>Theme 3: Resilience and adaptive capacity of social and ecological aquatic agricultural systems</p>	<p>What are the likely future scenarios for focal aquatic agricultural systems across the varied agro-ecological systems in Bangladesh, anticipating external hydrology changes on water resources, cyclones and flooding regimes?</p> <p>How can we best build partnerships and collaboration across sectors and scales to address these constraints and opportunities through ‘innovation platforms’ or other such mechanisms?</p> <p>What can we learn from recent natural disasters in Bangladesh, and can these experiences lead to new approaches for coping and adaption that enable people to recover from shocks?</p> <p>What improvements in water governance and management are needed for resilient production systems?</p> <p>Which cropping cycles and technologies will build greater resilience in the face of cyclones and rising salinities and sea levels for small and marginal farmers in the water rich southern areas of the country.</p>	<p>How can the multiple use (e.g. farming, fisheries and other aquatic products, tourism) of Tonle Sap and wetland habitats be enhanced so that equitable benefits improve the livelihoods of poor people dependent on aquatic agriculture?</p> <p>What are the options available in Tonle sap and Mekong floodplain-dependant households for increasing resilience in the face of impending changes in water flow regimes and climate change?</p>	<p>How can technologies and management systems best improve resilience and adaptive capacity of poor and vulnerable communities in situations where geophysical features amplify vulnerability?</p> <p>What are the likely future scenarios for focal aquatic agricultural systems across the varied agro-ecological systems in the Philippines?</p> <p>How can improvements help reduce vulnerability in regions with a volatile peace and order situation?</p>	<p>How can we best build partnerships and collaboration across sectors and scales to improve the adaptive capacity of coastal communities reliant on aquatic agriculture?</p> <p>How can community based management of coastal resources be effectively and sustainably made available to all rural Solomon Islanders?</p>	<p>What are the likely future scenarios for focal aquatic agricultural systems across the varied agro-ecological systems in Zambia?</p> <p>How can ecosystem services, lost through over-exploitation of swamp fisheries and future dam construction and other water infrastructure investments be replaced?</p> <p>How can livelihood options for displaced or marginalized people be strengthened under different future scenarios?</p> <p>How can conflicts over contested land and water resources be resolved to ensure gender and poverty equitable solutions?</p>

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
<p>Theme 4: Empowerment of groups and households (policy and institutions) in aquatic agricultural systems</p>	<p>What are effective governance for safeguarding and enhancing the natural productivity and socio-ecological resilience of small-scale fisheries and other common property resources in aquatic agricultural systems that benefit the poor and vulnerable, including women?</p> <p>Who are the water users in coastal polders, what purposes do they use water, how are they affected by existing water governance and land use arrangements?</p> <p>What are the best approaches to reducing vulnerability through community based management of polders, and how can these be scaled up?</p> <p>Which governance systems offer the best outcomes, in terms of resilient economic and livelihoods opportunities for small farmers, women and other disadvantaged communities?</p> <p>What tools and information are needed to improve community decision making in water management?</p> <p>What policy changes are needed to cope with various external drivers e.g. climate change, hydrological change and markets?</p> <p>How can the necessary changes be put into practice?</p>	<p>What are new institutional structures and capacities needed to capture pro-poor benefits from the fast growing aquaculture sector?</p> <p>How can promising community-based approaches to wetland management be further strengthened and be scaled up?</p> <p>What are implications for policy associated with climate and hydrological changes and how can the necessary changes be put into practice?</p> <p>What are the combinations of public and private sector institutional arrangements required to deliver and sustain the necessary extension services?</p>	<p>How have recent policy changes and legal frameworks emphasizing decentralized management and multiple stakeholder partnerships been translated into improved benefits for the poor and vulnerable living in aquatic agricultural systems?</p> <p>How can such changes be strengthened and what more needs to be done to increase development impacts?</p> <p>Can the private sector be more positively engaged to create AAS improvements that benefit the poor and vulnerable?</p> <p>If yes, what are the necessary enabling conditions and roles of government and business?</p>	<p>What are effective governance approaches and practices to safeguard and enhance the natural productivity and socio-ecological resilience of small-scale fisheries in AAS?</p> <p>Of the governance systems in use, which offer the best outcomes for small farmers, communities, women and the disadvantaged, in terms of resilient economic and livelihoods opportunities?</p> <p>What tools and information are needed to support community decision making on resource management?</p> <p>What are the policy implications of the need to cope with anticipated changes associated with external drivers, such as climate change and markets?</p>	<p>How have recent policy changes and legal frameworks (e.g. fisheries legislation) emphasizing decentralized management and multiple stakeholder partnerships been translated into improved benefits for the poor and vulnerable living in aquatic agricultural systems?</p> <p>How can the capacity of stakeholders in aquatic agricultural systems be strengthened for increased accountability of policy development?</p>

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
Theme 5: Gender	<p>Given the remoteness of communities in SW Bangladesh, how can an explicit focus on gender improve development benefits from these activities?</p> <p>Which extension approaches, including embedded services from the private sector, have the greatest capacity to ensure active participation in agriculture by and tangible benefits for women?</p> <p>What cropping systems, options and models work best in what specific contexts, based on gender sensitive impact assessment?</p> <p>Does increased participation by women in agricultural activities result in greater gender equality, including improved intra-household nutrition in Bangladesh?</p>	<p>What are the gendered pathways and approaches to aquatic agriculture improvements that can secure the nutrition of all household members?</p> <p>How can an enabling policy environment be created so that women equitably benefit from AAS interventions?</p> <p>What tools could be developed to improve assessment of impact and trade-offs associated with gendered approaches?</p> <p>What is the role of community based organizations in enhancing the status of women and supporting gender specific priorities for the homestead food production techniques (e.g. female headed households might make a different choice of vegetable seeds than a male headed households depending on the ultimate aim of vegetable production).</p>	<p>How can an explicit focus on gender improve development benefits from AAS productivity improvements?</p> <p>What options and models work best in what specific contexts?</p> <p>How can technology development be influenced to provide women access to gender sensitive technologies that could improve their productivity?</p> <p>What mechanisms can be introduced to allow women to have access to credit and other technical assistance needed to benefit from improved AAS?</p>	<p>How can an explicit focus on gender improve development benefits from these activities?</p> <p>Which extension approaches, have the greatest capacity to ensure active participation in AAS by and with tangible benefits for women?</p> <p>What options and models work best in what specific contexts, based on impact assessment?</p> <p>Does increased participation by women in AAS activities result in greater gender equality, including improved intra-household nutrition?</p>	<p>How are benefits from AAS currently distributed by gender? How can we harness the improved policy context to deliver more gender equitable outcomes from AAS opportunities?</p> <p>How can we address the specific gender related vulnerabilities that exist in Zambia to ensure gender equitable benefits from improvements in AAS?</p>

Research Theme	Bangladesh	Cambodia	Philippines	Solomon Islands	Zambia
Theme 6: Knowledge sharing and learning	<p>How can our existing CGIAR system CSISA outreach platforms be used to create greater impact?</p> <p>How can better technologies and management practices be disseminated most effectively for the benefit of smallholder producers in Bangladesh, differentiated by social group and gender?</p> <p>How can we best harness learning that can be scaled out nationally and regionally to other areas with similar conditions?</p> <p>What precise actions and mechanisms are needed to transform research into developmental outcomes in Bangladesh?</p> <p>How do current research in development networks in Bangladesh deliver impacts, and how can these be improved to better benefit the poor and vulnerable at scale?</p> <p>How can the outputs of the Program best be tailored to meet the needs of a range of development partners in cost-effective ways?</p>	<p>How can better technologies and management practices be disseminated most effectively for the benefit of smallholder fishers and farmers in Cambodia?</p> <p>How can we best harness learning that can be scaled out to other similar parts of the country?</p> <p>What precise actions and mechanisms are needed to transform research into developmental outcomes?</p> <p>How can networking, in the form of engagement in multi-stakeholder platforms and other modalities, work to link research to generation of outcomes?</p> <p>How can dialogue and negotiation in stakeholder platforms be most effectively informed to deliver the best development outcomes?</p> <p>How can the effective networking and community voice from the Wetland Alliance be expanded and sustained?</p> <p>How best to link with local NGOs and their grassroots network to create geographical spread, long-term committed presence, organizational development skills and local credibility?</p>	<p>How can existing partnerships (PCAMRD, PCARRD, DA-BAR) and associated networks - be further leveraged to create greater impact on the poor and vulnerable?</p> <p>How can learning best be harnessed and scaled out to other parts of the country, and elsewhere within the coral triangle region of SEAsia?</p> <p>How can we build a learning approach that can have national and regional impacts?</p>	<p>What mechanisms are required for improved sectoral integration within AAS?</p> <p>How can better technologies and management practices be disseminated most effectively for the benefit of rural communities in Solomon Islands, differentiated by gender?</p> <p>How can we best harness learning that can be scaled out through the country and region to other areas with similar conditions?</p> <p>What precise actions and mechanisms are needed to transform research into developmental outcomes?</p> <p>How can dialogue and negotiation in Solomon Island stakeholder platforms be most effectively informed to deliver the best development outcomes for the poor and vulnerable?</p> <p>How can the outputs of the Program best be tailored to meet the needs of a range of development partners?</p>	<p>How is learning best harnessed and scaled out to other parts of Zambia and the Region?</p> <p>How can SROs, such as ASARECA and CARDESA, be supported to scale up outcomes and strengthen professional networks and capacities in the Region?</p> <p>How can national policy forums, such as the National Food and Nutrition Commission and the Agricultural Consultative Forum be supported to identify and advocate for policy change?</p> <p>How can the energies and interests of the private sector be harnessed to provide opportunities for market-based interventions and scaling-out of viable options for the poor and vulnerable?</p> <p>How can basin-wide approaches in the Zambezi be effectively implemented?</p>

Annex 5: Country Details

Bangladesh

Context

Roughly 80% of Bangladesh is made up of fertile alluvial floodplains. With such extensive areas at low elevation and numerous rivers, water and flooding are the predominant physical features of the country. In a normal year monsoon flooding routinely extends over 30-40% of the landscape while in high flood events over 60% can be covered.

Most of Bangladesh's 20 million rural farm households are heavily dependent on the aquatic agricultural systems that characterize these flooded areas. For example the north-east Haor Basin is flooded over 500,000 ha during the monsoon season. Fishing is the key livelihood opportunity here, but the Basin is also one of the country's most important sources of winter rice (*boro*). The south and southwest coastal regions are also dominated by aquatic agricultural systems, but are amongst the most disaster-prone areas of the country (with two major cyclones in the past 3 years (Sidr and Aela)). These regions are flooded due to drainage congestion and tidal surges, yet also experience seasonal drought and with acute seasonal freshwater shortage. For the more than 8 million people living in these coastal floodplain areas, rice cultivation is the principal source of agricultural employment and income, with capture fisheries and aquaculture second.

Despite the numerical importance of the rice and fish sub-sectors, Bangladesh's aquatic agricultural systems offer opportunities for a variety of farm household strategies that can strengthen household resilience and increase cropping intensity. For example while 75-80% of agriculture land is used for rice cultivation, Bangladesh farm families engage in subsistence and commercial agricultural activities ranging from household livestock or vegetable cultivation to highly commercial vegetable, maize, poultry or fish/shrimp production. A central challenge of aquatic agricultural systems in Bangladesh is to harness the potential these systems provide for more integrated and more resilient farming livelihoods.

With GDP growth of 5-6% since the mid 1990's Bangladesh has made great strides in almost all HDI indicators. Yet in spite of these achievements inequality is growing, almost 50% of the population remains poor and more than 60% of those engaged in agriculture are reported to be vulnerable to poverty; disproportionate numbers of these poor and vulnerable people are women and childrenⁱ.

The Government of Bangladesh, the international development and research communities, and other partners, recognize that business as usual in Bangladesh will not achieve significant reductions in persistent rural poverty, food insecurity or malnutrition. To do so, future investments in agriculture need to focus on improvements in a number of areas, chief among them smallholder productivity and resilience for a population that will grow by almost 100 million by 2050 and do so in a context of increasing rural underemployment, rapid urbanization and continuing losses of agricultural land, declining access to fresh water, increasing salinities and the expected impacts of climate change.

To meet this challenge, the Government of Bangladesh (GOB) has developed a new Country Investment Plan (CIP) with a focus on achieving significant improvements in food security,

ⁱ Food Security Investment Forum, governance and gender, May 2010.

agriculture, and nutrition. The CIP identifies priority areas for investment in agriculture, including crops, fisheries and livestock, as well as addressing national needs in terms of income growth, social safety nets, marketing and trade, nutrition, and cross-cutting issues such as gender and governance. In support of this effort and in line with GOB policies (the PRSP, MDGs, etc.); Bangladesh's international partners (World Bank, ADB, USAID, DFID, EC, SDC, DANIDA, various UN agencies and others), are now targeting increased investments as laid out in the CIP and elsewhere.

One of the investments is the Cereal Systems Initiative for South Asia (CSISA) project. This project is a major focus of existing collaboration of CIMMYT, IRRI, IFPRI and WorldFish in Bangladesh. The centers are working to ensure that development investments transcend simple monetary measures to embrace a more diversified and interconnected approach to agriculture focused on the needs of the poor and vulnerable. This approach recognizes that there have been many recent successes in AR4D in Bangladesh, and we will build on these. However past investments have generally impacted limited populations; to have wider impact our efforts need to be integrated across sectors, targeted more tightly to address gender inequities, and scaled out with a wider group of private and NGO sector partners. In addition, further innovation is needed in technologies and practices that are tailored to the needs and assets of male and female smallholders and landless, and are resilient to environmental and climate changes.

The focus of the CGIAR Research Program in Aquatic Agricultural Systems in Bangladesh

The Program has identified 48 districts in 8 hubs (Figure A1) with the highest proportions of poverty and populations dependent on aquatic agricultural systems. We will work initially in the 31 districts in 6 hubs where existing CSISA and IFAD projects have been designed to work closely with programs seeking large scale development impacts. The hubs are distinctive in their environment, poverty and agricultural contexts (Table A2).

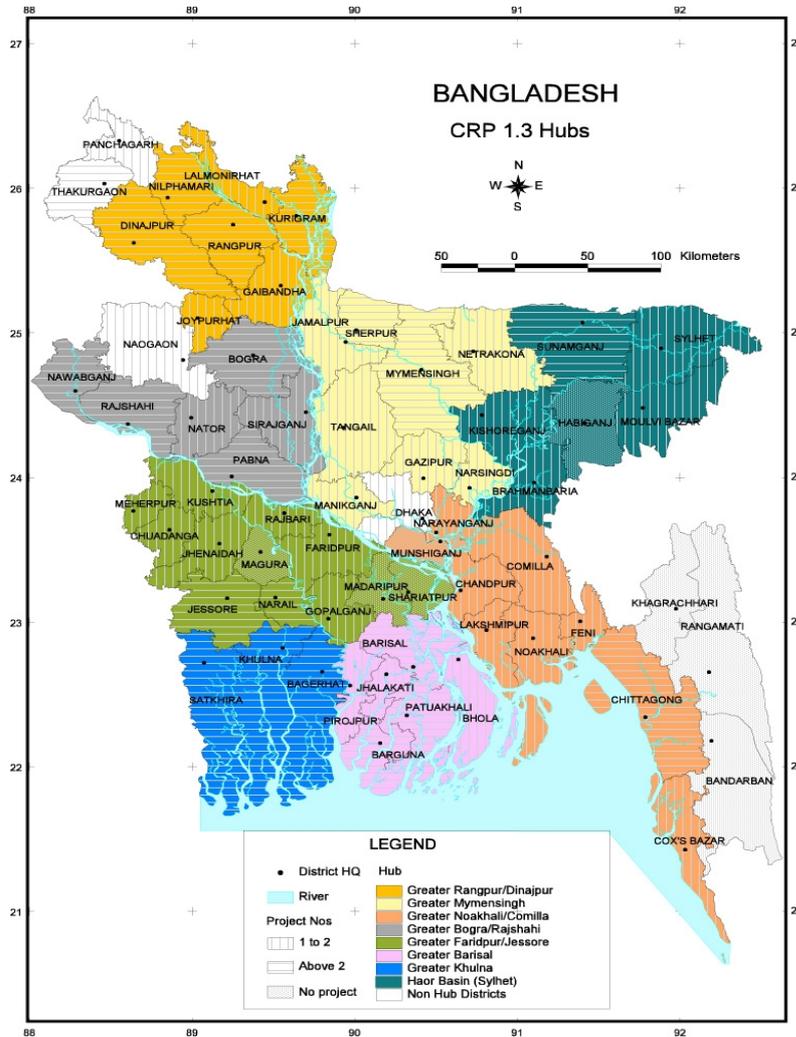


Figure A 1: Program hubs in Bangladesh

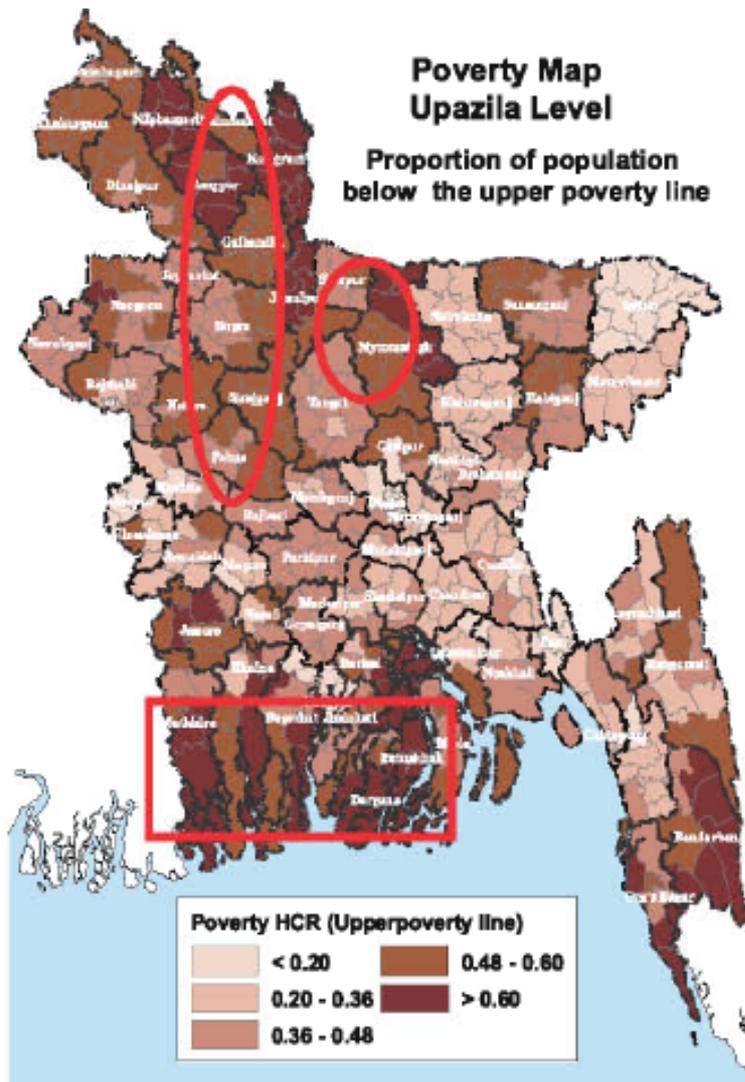


Figure A 2: Map of poverty and vulnerability (red boundaries) in Bangladesh

Table A 2: Program hubs in Bangladesh

Hub	Aquatic agricultural system elements	Key development challenges	Selected aquatic agricultural system based opportunities
Hub 1. Haor Basin (Sylhet)	Very large tectonically depressed floodplain remains under water 6 months, fishing and <i>boro</i> rice cultivation are major livelihood options.	Yield gaps, flash floods during boro rice, declining fish catches, access rights to natural resources and poor communication.	Community-based capture fisheries management, governance and conservation.
Hub 2. Greater Khulna	Saline and acid-sulfate soils; abundance of seasonally high salinity surface water; rice dominated with fishing and aquaculture strong alternative.	Low yields, increasing salinity, natural calamities, poor communications, vulnerable populations.	Increased productivity of gher systems including dyke cropping.
Hub 3. Greater Barisal	Abundance of surface water; seasonal flood and drought; fish, livestock and rice are major sources of livelihoods.	Yield gaps, high incidence of natural calamities, increase salinity and poor communication.	Greater integration of saline tolerant rice with rotationally cropped shrimp, prawn, fish and vegetables.
Hub 4. Greater Faridpur/Jessore	Calcareous, slightly alkaline soil, depressed floodplain areas; crops, fish and livestock are major livelihoods.	Flooding, river erosion, limited access of the poor to common property water resources.	Improved hatchery management to increase carp seed quality.
Hub 5. Greater Bogra/Rajshahi	Monsoon floodplains, depressed areas, drought prone; crops, livestock and fish main source of livelihoods.	Flooding in areas with depressed lands (Chalan Beel), seasonal drought reduced cropping intensity.	Introduction of fish cultivation techniques for flooded areas.
Hub 6. Greater Noakhali/Comilla	New lands accreting in or adjacent to Bay of Bengal; rice, fish main livelihoods.	Flash floods and short term crop submergence, high incidence of arsenic in ground water and soil.	Substantially increasing the productivity of crop agriculture and aquaculture in coastal districts.
Hub 7. Greater Mymensingh	Alluvial, slightly acidic soil; crops, fish and livestock are important livelihood options.	Flash flooding, river erosion, large number of vulnerable people with high dependence on crops and fish.	Enrollment of ethnic minority communities in aquaculture related activities.
Hub 8. Greater Rangpur/Dinajpur	Alluvial, slightly acidic soil; drought and flood prone; crops, fish and livestock important livelihood options.	Drought, river erosion, seasonal flooding and flash floods, poor water holding capacity of soil.	Increased agricultural productivity through high value short duration crops.

Implementation partnerships

In Bangladesh we will apply the partnership approach of the Program to work with government, development and CGIAR partners and improve the lives of 10 million poor and vulnerable people by 2016. We will achieve this impact at scale by working at three levels. First we will work with partners to conduct participatory research in the eight hubs described above and through this improve the lives of the communities we will work with directly there. Second we will work with development partners to scale out the learning from our research sites to the other parts of the hub. Third we will work with this coalition of partners and other focal countries to translate the learning from the Program into national and regional development policy and so reach to other districts in Bangladesh and other countries where aquatic agricultural systems can make a greater contribution to the rural economy. The key NGO partners in Bangladesh who will work with the Program in association with government partners, and CGIAR Centers to achieve this impact at scale are CARE, SAVE, BRAC and RDRS. Their programs will be implemented in areas with high poverty, with the objective of direct targeting of improving nutrition, alleviating poverty and building resilience to disaster. The Program will work with these large relief and development organizations to improve the quality of their outreach and technical capacity, and that of their partner NGOs and the private sector.

Government and development NGO partners committed to this approach as of March 2011 will deliver Program outputs and outcomes to approximately one million households (Table A3). These are GOB programs conducted with the support of Bangladesh's international development partners and international NGOs. We expect this coalition to expand by at least 0.5 million households by the time the Program begins, and reach a minimum of 2 million households by 2016. By doing so, the CGIAR's limited investment through the Program will influence over \$200 million in other development investment in the first six years, and substantially more than this in future years both directly through partners and through policy impacts.

The CGIAR's major research partnerships will build on and enhance our longstanding relationship with national research organizations principally through the Bangladesh Agriculture Research Council and the associated NARs. The Program will coordinate its activities with GOB line agencies working in food, agriculture, fisheries, livestock and water. In addition the program will work with national agriculture and fisheries Universities, and the Bangladesh Fisheries Research Forum (BFRF), the Krishi Foundation^k, and other Bangladeshi organizations engaged in agriculture and fisheries. We will also work with advanced research institutions such as the Institute of Water Modeling (Dhaka), and Stirling University (UK).

^k BFRF & Krishi Foundation are research forums- for fish and agriculture that includes Universities and others.

Table A 3: Partnerships through which the Program will work to have impact in Bangladesh

Partners	Households (Direct and Indirect)	People (Million)	Aquatic Agriculture households	Investment (Million \$)	Status
GOB-RFLP	150,000	1	85%	\$ 29	Ongoing project
DANIDA					
ACDI-VOCA/ ProShar, MYAP	150,000	1	85%	\$35	2011-2015
USAID					
CARE Shouhardo MYAP	300,000	1.5	80%	\$110	2011-2015
SAVE USAID	MYAP, 250,000	1.2	80%	\$50	2011-2015
CSISA, USAID					
BRAC (IDB revolving fund)	32,683	0.15	85%	\$5	2009-2014
IFAD	10,000	0.05	90%	\$0.5	2010-2012
Total	1.0 million	5 million		\$252	

The coalition brought together for the Program will develop a shared implementation strategy and by 2016, will have delivered (i) productivity improvements for over 2 million households (10 million people, including 5 million women); (ii) working with IFPRI and others, practices and policies for poverty reduction through aquatic agriculture that are embedded in government and donor investments; and (iii) institutions and private sector that are better servicing poor farmers.

From 2017-2022 the Program will seek wider impacts on poverty in Bangladesh, through catalyzing government and donor investments that allow a further scaling up and out. The optimal position and strategy for CGIAR engagement within this wider scale up period will be determined based on best practices learned through the first 6 years. By sustaining the activities started in 2011 and expanding our impacts through scaling out, the Program coalition will, by 2022, have delivered productivity improvements for a minimum additional 3 million households (15 million people, including 7.5 million women).

Cambodia

The Context

[129]

aquatic agricultural systems are central to Cambodia's rural economy. Some 30% of the country is covered by permanent water bodies or areas that are inundated during the flood season. The floodplains of the Mekong River and Tonle Sap Lake are the most extensive systems and support the largest number of people.

The economy of these aquatic agricultural systems is dominated by rice production and fisheries. Rice is grown by more than 70% of the rural population, occupies 80% of the total cropping area, and accounts for 70% of overall crop production; while some of this production is in upland rainfed areas, much of it is in aquatic agricultural systems. In the past decade, rice production per capita has grown by 8.7% per year increasing from 339kg in 2000 to 535kg in 2008. However, paddy yields per hectare remain the lowest in Asia. The fisheries sector provides income and livelihood to 46% of the total population, or about 6.7 million people, and represents over 10% of GDP. Fish and other aquatic animals contribute 80% of animal protein in the typical Cambodian diet.

Given this national picture it is not surprising that household economies in aquatic agricultural systems depend heavily on rice farming and fishing. However other resources are also important. For example, the typical livelihood portfolio of households in the Tonle Sap floodplain involves some combination of fishing, crop farming, fish culture, livestock, firewood collection, small businesses, and wage labor, regardless of their primary occupation. In "farming villages"¹ in provinces around Tonle Sap, 80% of households are also involved in fishing and 28% are involved in livestock raising (Hap *et al.* 2006). While rice farming is the core activity for many of these households, the average plot size of 1.4 hectares and yields between 0.5 – 0.8 tons/ha mean that farmers cannot produce enough rice for a full year's consumption. As a result 75% of households in farming villages also fish in order to generate cash income and purchase rice to cover the shortage. Income from poultry/livestock, other crops, and wage labor also contribute where income from fishery is also not enough (Hori *et al.* 2006 and 2007).

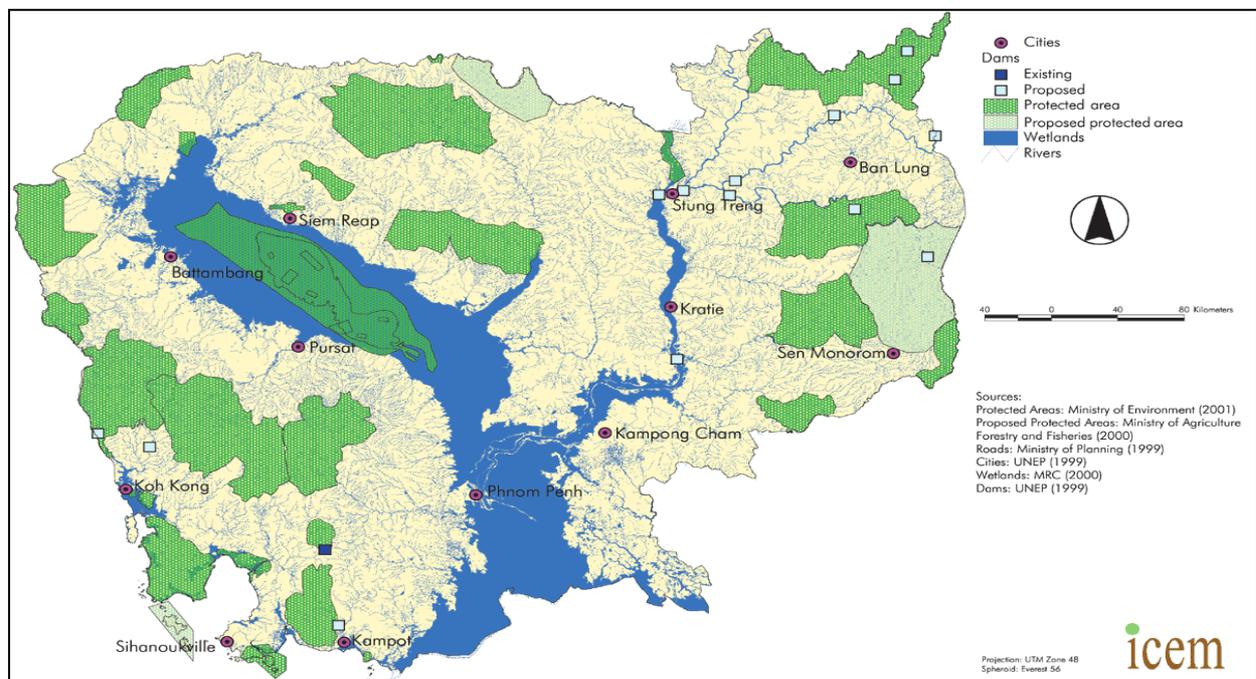


Figure A 3: Map of Cambodia showing wetlands

¹ villages where 80% of the households call farming as primary occupation [130]

The development of the agriculture sector has been an important element of the Royal Government's strategy to reduce poverty in rural communities, achieve food security and foster equitable and sustainable economic growth. The Program builds on MAFF Agriculture Sector Strategy 2006-10 and is aligned with the Royal Government of Cambodia's (RGC) Strategic Framework for Food Security and Nutrition (SFFSN), 2008-2012, the Strategy for Agriculture and Water (SAW), and the more recent Strategic Planning Framework for Fisheries (2010-2019). These policy and planning frameworks aim to increase productivity of existing production systems, promote agricultural intensification and diversification, strengthen value chains and maintain wealth and biodiversity of Cambodia's unique natural resources. The Program will support implementation of these plans and work with development partners to support increased investment in the agricultural sector. This has received increased attention in recent years due to the global food crisis and growing concern over the sustainability of the Mekong fisheries in light of hydropower developments, the prospect of climate change impacts on water flows, increasing fishing pressure and population trends.

The Program therefore contributes directly to country priorities for increasing aquatic agricultural systems productivity. We will build on past collaborative projects with key RGC agencies (FiA, IFRDI and DAE of MAFF, CARDI and MoE), Learning Institute (LI), Cambodia Development Resource Institute (CDRI) and NGOs, and support partners implementing integrated agricultural development projects (e.g. Supporting Partners for Livelihood Improvement in Cambodia (SILIC), Pailin Food Security Project (PFSP), and Integrated Farming and Marketing System (IFMS) – see Table A5 below). The added value from the Program to these projects, as identified by the NGOs themselves, will be the combined cross-sectoral technical expertise provided by the consortium of CGIAR centers, bridging institutions for improved knowledge sharing and services, and working together to provide enhanced potential to influence change at the highest levels.

The focus of the Program in Cambodia

The Program will focus initially in three hubs (Table A4) where improvements in aquatic agricultural systems can make significant contribution to improving the livelihoods of poor and vulnerable households. We will build on our existing projects in these hubs and develop new partnerships with NGOs and other stakeholders already working in specific locations.

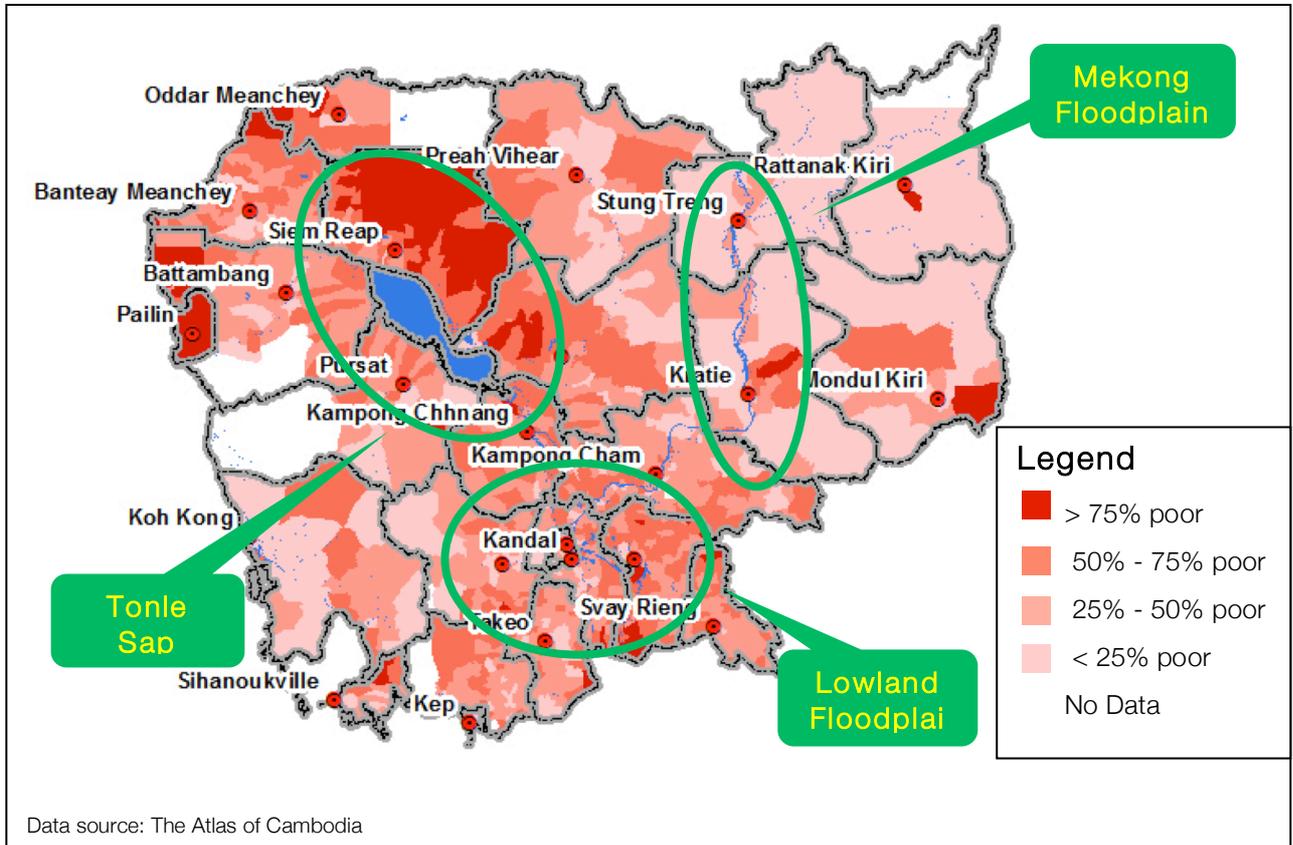


Figure A 4: Poverty map and research hubs in Cambodia

The Program will target the poor and vulnerable in each of these hubs, and adapt our approach to the social, economic and agro-ecological conditions in each. For example whereas income poverty is high in Tonle Sap floodplains and Lowland Plains, chronic malnutrition is more prevalent in the Mekong River floodplains (Figure A4). The Program will use the participatory diagnoses in each hub to deepen our understanding of these issues and differences and target our efforts appropriately.

Table A 4: Program hubs in Cambodia

Hub	Aquatic agricultural system elements	Key development challenges	Selected aquatic agricultural system-based opportunities
Tonle Sap Floodplain	Highly productive lake fisheries with flood recession zone with intensive rice cropping; recession and floating rice fishing; concessions & CFI, paddy.	Highly precarious livelihood dependence of fisheries; high rural population density and high incidence of poverty; over-exploitation of natural resources; unregulated fishing, habitat destruction and potentially significant impacts from hydropower development and climate change.	Strengthening the management of fisheries and other common property resources in order to enhance the natural productivity and resilience of these systems so that sustained equitable benefit improves livelihoods of AAS dependent poor people.
Lowland Floodplain	Rain-fed lowland rice cropping and diverse agricultural products. Seasonal rice field fisheries.	Highly precarious livelihood dependence of fisheries; high rural population density and high incidence of poverty; over-exploitation of natural resources; management of common property aquatic resources to improve yield, biodiversity and economic and environmental sustainability.	Increasing food productivity at homestead and SME scales through integrated fish-agriculture farming system development; improve product diversity and quality and develop opportunities for value adding and promote market linkages.
Mekong Floodplain	River and floodplain; “Chamcar” river bank; recession rice.	Chronic malnutrition; high dependency on natural resources and vulnerability to shocks; inadequate community management of floodplain resources; need to improve landscape and trans-boundary management.	Opportunities to improve river and floodplain management, sustainable riparian vegetation production, crops and river bank gardens.

Table A5 shows the on-going and projected research projects that together offer greater potential for scale up and impact for the poor and vulnerable through development partner engagement. Across the three hubs there are groups of projects clustered around outcome priorities characterized by the type of intervention and approaches to achieve the same overall goal of livelihood improvement within different agro-ecological settings.

Table A 5: Partnerships through which the Program will work to have impact in Cambodia

Partners	# poor reached	Hub	Investment (\$)	Status (years)
Concern – SILIC-2	150,000	TLS	2.9 m	On-going
CARE (IRDM & PFSP)	77,285	Lowland FP	2.7 m	On-going
CRS – IFMS-2	3,431	TLS FP	NA	On-going
HARVEST	2.0 million	TLS and Lowland FP	40 m	Start 2011
Wetland Alliance	7,000	Mekong FP (kratie, Stung Treng)	538,000	On-going

Implementation partnerships

The Program will help improve the lives of over 2 million poor and vulnerable in Cambodia. We will achieve this impact at scale by working at three levels. First we will work with partners to conduct participatory research in three hubs and through this improve the lives of the communities we will work with directly there. In doing so we will mobilize a coalition of development partners from government, national and international NGOs, and the private sector. Second we will work with these development partners to scale out the learning from our research sites to the other parts of the hub. Third we will expand our work with this coalition of partners, and link with other focal countries, to translate the learning from the Program into national and regional development policy and so reach to other parts of Cambodia and other countries where aquatic agricultural systems can make a greater contribution to the rural economy.

In pursuing this approach the Program will seek to build on existing research projects and partnerships to leverage outcomes and impact through new investments managed by our development partners. Working closely with our key partners (government agencies - FiA, IFRDI DoE, CARDI and MAFF) and program partners (e.g. CARE, Concern, Oxfam) we will build on their successes delivering multi-disciplinary programs by enhancing technical skill sets, advancing our collective knowledge on how to manage aquatic agricultural systems for improved livelihoods at scale and ensure a project legacy of improved knowledge capital for these agencies. One new opportunity of this type in Cambodia is HARVEST (Helping Address Rural Vulnerabilities and Ecosystem Stability) which is a large multi-component project led by US private sector firm. HARVEST will work across all three hubs impacting upon over 2 million people. The CGIAR, led by WorldFish in Cambodia will engage with HARVEST to pursue a research agenda in support of the project goals of increased food availability, improved food access through rural income diversification, improved natural resource management, and resilience to climate change. One very important research area for us to build synergies will be USAID's Feed the Future Initiative, with particular emphasis on nutritional benefits from fisheries and agriculture. This will be implemented through the HARVEST programme.

An existing project that we will build on is the Wetlands Alliance. This long term capacity building project will scale out impact and broaden partner engagement across larger areas of wetland environments. The Wetlands Alliance works with communities largely dependent

directly on aquatic agricultural systems, with local authorities and NGOs to deliver demand driven poverty focused initiatives across scale and geographical focal areas. The Alliance, by design, is a network of partners and facilitates inter-agency cooperation and provides a mechanism for rapid community level uptake and a broad platform for brokering and expanding relationships between development partners such as SENSEA's and UNDP's interest to expand the community based adaptation initiative underway in north-east Cambodia.

At a regional level the program will continue to expand engagement with MRC and FAO on trans-boundary issues related to fisheries, ecosystems services, land and water management and community led initiatives. Coalitions formed through the Program will build further on the current regional partner base of Wetland Alliance project, MRC commissioned linkages, and existing work under the Challenge Program on Water and Food to usher in a new innovative participation and improve coordination for the ultimate benefit of the poor and vulnerable in the region.

Philippines

The Context

In macroeconomic terms the importance of agriculture, forestry and fisheries has declined in the Philippines in recent years, and contributed only 16% of the country's GNP in 2009. However these sectors still employ 7 out of 10 Filipinos and play critically important roles in selected provinces and communities. In most of these places dependence on aquatic agricultural systems is very high, with for example 50% of the population of the Visayas dependent on aquatic agricultural systems. Similarly in Northern Mindanao and Zamboanga Peninsula which together account for over 45% of total fisheries production of the country, more than 65% of the total population depend on aquatic agricultural systems as major sources of employment and income.

The communities who depend on these aquatic agricultural systems face a growing series of challenges. Fish resources are depleted and there is an urgent need to improve management while also developing alternative livelihood options. Many upland areas have already been degraded and most of the original forest cover has been converted to agriculture, settlements, and industrial zones. With this expansion has come pollution, and widespread erosion.

In addition to these direct effects of human land resource use, the Philippines is highly vulnerable to climate variability and change and to natural disasters, with 20 climate events in 2008 alone affecting 10% of the population. More recently flooding in Northern Mindanao and the Visayas has caused considerable damage to agriculture production as well as properties and infrastructure affecting not only the supply of staple crops such as rice and fish but also supply to urban markets in Luzon and other areas..

In the face of these challenges growing attention is being given by government, and by the aid community in the Philippines, to strengthening efforts to harnessing the full value of the benefits of these systems. Legislative reforms since the 1990s have improved agricultural production and fisheries and coastal resource management, and provincial government units have developed Agriculture and Fisheries Development Plans that identify and prioritize development programs at the provincial and municipal levels. Working in this policy context, international development investments have included a USAID-funded project on Fisheries Improved for Sustainable Harvest (FISH); a FAO Regional Fisheries Livelihoods Program; World Bank support [135]

to several agriculture and fisheries programs in Mindanao, an ADB-funded program on Integrated Coastal Resources Management Program, a GTZ-funded project on Environment and Rural Development and two USAID projects on biodiversity conservation and climate change adaptation and mitigation measures. The Program will directly engage with these and other ongoing and pipeline investment to develop strategic partnerships and impacts.

The focus of the Program in the Philippines

The Program will work in three hubs in the Philippines covering varied coastal ecological zones in the Visayas Island Group, Northern Mindanao including the indigenous people’s region of CARAGA and the Zamboanga Peninsula (See A5). These sites were selected in view of the number of people dependent on aquatic agricultural systems, poverty incidence and vulnerability to climate change, as well as the current and future plans of government and the international development community. Table A6 summarizes key features of the hubs including development challenges and selected aquatic agricultural systems based opportunities.

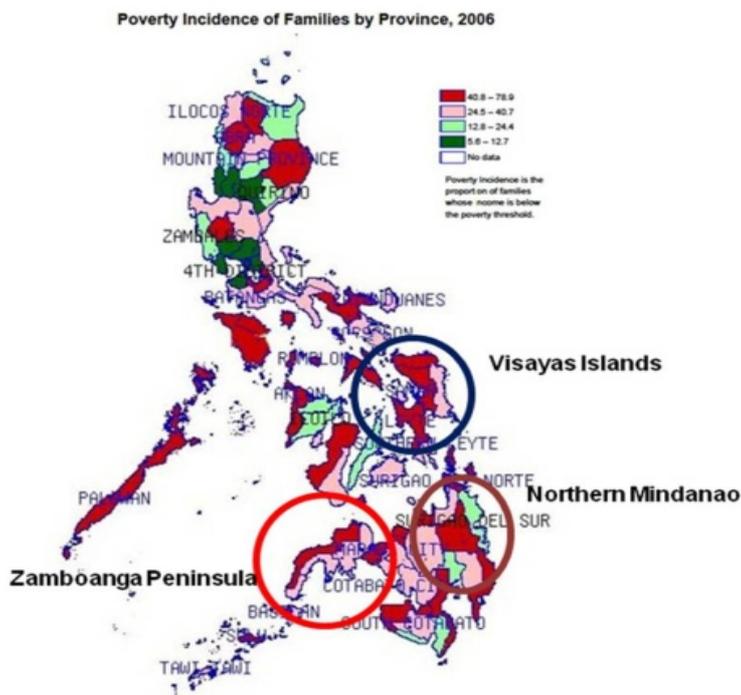


Figure A 5: Poverty map and research hubs in the Philippines

Table A 6: Program hubs in the Philippines

Hub	Aquatic agricultural system elements	Key development challenges	Selected aquatic agricultural system-based opportunities
Leyte (Visayas islands)	Main products: abaca, coconut, rice, corn, sugar cane and pineapple. Livestock production basically backyard level primarily pigs and native chicken; aquaculture activities mainly on shrimp/prawn production with increasing trend towards culture of milkfish and tilapia.	Vulnerability to natural hazards; low level of productivity for major crops and livestock; declining fisheries stocks due to degradation of natural resources.	Potential for expanding aquaculture production; emerging markets for AAS products due to expansion of tourism.
Zamboanga del Norte (Zamboanga peninsula)	Fishing and farming including aquaculture is a major source of income for more than 65% of the population.	Vulnerability to natural hazards; low level of productivity for major crops and livestock; declining fisheries stocks due to degradation of natural resources; poor infrastructure and communications; post conflict conditions; limited institutional capacity.	Improvement of governance structures for natural resources management leading to improved policies and institutional arrangements; introduction of appropriate and more efficient AAS technologies to increase productivity and improve income; in consultation with stakeholders and beneficiaries introduce other livelihood diversification alternatives from AAS.
Surigao del Sur (Northern Mindanao including CARAGA)	Farming and fishing main economic activities in the province; about 45 % of the total land area is developed to agriculture. Major crops are rice, corn, coconut, abaca, soybeans, coffee, and other high value crops; fishponds are concentrated to producing milkfish, prawns and crabs.	Mining activities and environmental degradation; significant income disparities and inequitable access to resources due to conflicts and peace and order issues; natural disasters especially flooding.	Expansion of AAS production to meet increasing demand from tourists and the expanding export market; sustainable aquaculture for high valued species.

In each of these hubs, the Program will establish and maintain partnerships with stakeholders to implement priority activities. Important partners in the sites include agencies from the national R&D and innovation system and international development partners.

Implementation Partnerships

The CGIAR Research Program on Aquatic Agricultural Systems will work with a consortium of academic, national government, local government and non-government institutions geographically clustered at the Philippines regional level for development planning and program implementation. Each consortium will share a common set of priorities and provide a pool of human and financial resources for technical interventions and an administrative set-up that provides for linkages at the regional level with local stakeholders, including local government units, civil society organizations, as well as international development agencies. The Philippines agencies PCAMRD, PCARRD and DA-BAR are expected to coordinate these networks, enabling the Program to support and build competencies in the Philippine research and development system to address poor and vulnerable aquatic agricultural systems -dependant people. Linkage shall likewise be established with the Zonal Research Centers of the Commission on Higher Education.

The Program will help improve the lives of about 1.7 million poor and vulnerable people in the Philippines. We will do so by working at three levels. First we will work with partners to conduct participatory research in three hubs and through this improve the lives of the communities we will work with directly there. In doing so we will mobilize a coalition of development partners from government, national and international NGOs, and the private sector. Second we will work with these development partners to scale out the learning from our research sites to the other parts of the hub. Third we will expand our work with this coalition of partners, and link with other focal countries, to translate the learning from the Program into national and regional development policy agenda to reach out to other parts of the Philippines and other countries especially in the Coral Triangle where aquatic agricultural systems can make greater contribution to the rural economy.

To pursue this approach in the Philippines the Program will work with a consortium of academic, national government and non-government institutions for program planning and implementation. The focus of these partnerships will be directed towards the three hubs and specific partnership networks developed in each. The Philippines agencies PCAMRD, PCARRD and DA-BAR have agreed in principle to coordinate these networks, enabling the Program to support and build competencies in the Philippines R&D systems to address poor and vulnerable aquatic agricultural systems dependent people. The member agencies of the PCARRD, PCAMRD and BAR networks will also provide expertise, funding and modalities for technology transfer, policy advocacy and capacity building needed to expand interventions and impact.

Finally, to scale out at the regional level in the coral triangle region, the Program will work regional bodies in South East Asia such as the ASEAN-Committee on Science and Technology (ASEAN-COST) for the development and transfer of science and technology based interventions, and APAARI to reach out to other NARS for expanded research in development efforts. It will also contribute learning to the development and implementation of the Regional and National Plans of Action (RPOA/NPOA) for the Coral Triangle.

Government and development NGO partners consulted on this approach as of March 2011 and who will deliver Program outputs and outcomes are listed in Table A7.

Table A 7: Partnerships through which the Program will work to have impact in the Philippines

Partners	# of poor reached	Hub	Value \$	Status (years)
Strengthening governance for small scale fisheries management (local governments)	250,000	Leyte	306,000	2009-2013
		Zamboanga del Norte		
		Surigao del Sur		
Alternative livelihood diversification strategies (local governments)	200,000	Leyte	150,000	2010-2012
		Zamboanga del Norte		
		Surigao del Sur		
FISH 2	Na	Leyte		2011 – 2014
		Surigao del Sur		
Growth and Equity in Mindanao Program (GEM)	903,540	Zamboanga del Norte	n.a.	1995-2012
		Surigao del Sur		
Mindanao Peace and Development Program	800,000	Zamboanga del Norte	n.a.	Ongoing project
		Surigao del Sur		
GEF5: System for Transparent Allocation of Resources (STAR)	not yet established	Idea is to influence DENR to cover the hubs as project sites	25 million	2011-2015
Techno-Gabay	1.8m	Leyte	21 million	Ongoing project
		Zamboanga del Norte		
		Surigao del Sur		
Regional Fisheries Livelihoods Program	300,000	Zamboanga del Norte	19 million	Ongoing

Solomon Islands

The Context

The Solomon Islands is typical of the small island states of the Pacific region in its great reliance on fish for food and income. Of a total population of just over half a million people (WDI, 2010), 75% of Solomon Islanders are subsistence-oriented small holder farmers and fishers. Most rural people live on the coastal margins, small islands and atolls of otherwise mostly mountainous and uninhabitable islands. At the macro level, fishery products (mostly tuna) account for 19% of the total export revenues of the country. Apart from their contribution to output and foreign exchange earnings, fish and fish products are also valuable food sources for the population. The 2006 national household income and expenditure survey indicated that fish accounted for 73% of total expenditures on animal protein.

Real per capita income for Solomon Islanders has declined since independence because population growth has outpaced economic growth (3.1% and 2.5% respectively per annum from 1980 to 2007). These trends have left Solomon Islands with the second-lowest average income in the Pacific region. Further, job creation has not kept pace with increases in the labor supply. The unemployment rate rose to 11% in 1999 with youth unemployment rising to 45% in 2010 (ADB, 2010). Almost 23% of the population lives below the national basic needs poverty line (JICA 2010). The densely populated provinces such as Malaita and Temotu with their combination of a shortage of agricultural land, declining fisheries and insufficient employment opportunities, experience high rates of out migration. Since the 1970's inter-provincial migration has steadily increased and at the time of the 1999 census 17% of Solomon Islanders were living outside their province of birth.

One of the main characteristics of the Solomon Islands economy is the predominance of subsistence activities. The 1999 census reported that 45% of the population was involved in unpaid activities, largely subsistence farming, fishing within coral reef-related artisanal fisheries, and household-related craft work. The census showed 71% of women and 53% of men are engaged in subsistence agriculture in the Solomon Islands, while 50% of women and 90% of men are engaged in fishing activities. In this context aquatic agricultural systems provide an essential source of income, food and well being for a large part of the Solomon Islands' population.

Despite the importance of aquatic agricultural systems, research and development initiatives in agriculture and fisheries remain disconnected. Agricultural market chain development initiatives are underway in some parts of Solomon Islands (e.g. cocoa, coconut products, rice farming) and effective community based management of coastal fisheries is slowly gaining traction. Marine coastal capture fisheries are the dominant component in aquatic agricultural systems in Solomon Islands and are expected to remain so for some time. Opportunities for economic development of value added marine products remain in a nascent stage, and more promising opportunities for alternative livelihoods to complement marine resource management regimes are often identified as lying within the agricultural sector. Aquatic agricultural systems provide a strategically important resource for food security and socio-economic development in Solomon Islands and the CGIAR Research Program on Aquatic Agricultural Systems provides an unprecedented opportunity to foster sectoral integration. Implementation of marine resource management regimes is expected to provide the necessary basis for improved opportunities for sustainable economic development of marine resources, and improved access to agricultural livelihood opportunities for rural fishers and gardeners can broaden the livelihood base to incentivize implementation of such regimes. The challenge is to effectively integrate

development efforts in these systems and develop a learning approach that can have national and regional impacts.

The rural economy has been based upon the production and marketing of a small number of commodities—food crops and fresh fruit, coconut, cocoa, timber, fish and marine products, oil palm, plus livestock. Investment in fish production to date has been almost exclusively focused on marine capture fisheries. Although the Solomon Islands has not completed a comprehensive national development strategy, there are other policy documents that guide development interventions. The Solomon Islands Medium Term Development Strategy (2008-2010) outlines the desired rural development outcomes for the Government. The Agriculture and Rural Development Strategy (ARDS) (2007) emphasizes the high priority assigned to rural development. The Government's 2006 Policy Framework Document emphasizes "development through a bottom up and holistic approach that encompasses the empowerment of the people through rural advancement strategies, the pursuit of the Millennium Development Goals, the revitalization of the economy, improved law and order, effective service delivery and the devolution of powers and functions and decision-making authority to the periphery". The Program will contribute to implementing these policies through its Research in Development approach to harnessing the value of aquatic agricultural systems.

The ARDS identifies potential for growth in aquatic agricultural systems through coconut and cocoa production, garden food, livestock - including the revival of the dormant cattle industry, pigs and poultry, and commercial and artisanal fishing. In 2008 the ARDS began implementation through the Rural Development Project (RDP). The RDP is coordinated by the Ministry of Development Planning and Aid Coordination and addresses agriculture, forestry and to a lesser extent, fisheries. The Ministry of Fisheries and Marine Resources (MFMR) are tasked with the conservation, management and development of fisheries to ensure their long-term sustainable use under the national Fisheries Act. MFMR believes that coastal communities are the best managers of their fisheries and marine resources and seeks to work as a partner in securing the potential of these resources. The Inshore Fisheries Strategy (IFS) (2010-2012) is intended to provide guidance for a sustainable and secure inshore fisheries sector.

The ARDS, the RDP and the IFS are framework within which activities of the Program will be embedded. While agriculture will continue to play a major role in terms of income generation and employment opportunities for rural Solomon Islanders, the Program presents a unique opportunity to integrate existing and new development actors to transform aquatic production systems through reinvigorating traditional marine management regimes to secure coastal fish production and in developing new, integrated freshwater production systems. Through those investments, markets and value chains relying on smallholder production can be diversified to extend beyond fish and fish products.

The focus of the Program in the Solomon Islands

The Program will focus initially on three geographically distinct hubs encompassing six of the nine national provinces (Western and Isabel; Central, Malaita and Guadalcanal, and Makira and Temotu) of Solomon Islands where the population pressure is highest (Figure A6 and Table A8), and / or remoteness means that livelihood options are particularly limited, and where there is a presence of partners to facilitate implementation in these difficult to access isolated island groups. It is expected that learning from action research in these provinces will enable extension to the remaining three provinces by years 5-6. Within each hub we will focus on rural community clusters for participatory research in development in these systems. We will pursue participatory diagnosis of the current situation, future prospects and risks/vulnerabilities being

faced by communities dependent upon aquatic agricultural systems. Opportunities for implementing aquatic agricultural solutions in concert with other development priorities will be identified and resources sought for implementation. Achieving the program goals will also require significant capacity development of partners. Lessons learned will feed back into the wider Solomon Islands development planning through Solomon Islands Government partners.

We will operate through a network of partnerships operating at different scales. In addition to the existing strong relationship between WorldFish and The Ministry for Fisheries and Marine Resources (MFMR), the Program will partner with the Ministry for Environment, Climate and Meteorology (MECM), the Ministry of Agriculture and Livestock (MAL), the Ministry for Women, Children and Youth Affairs (MWCYA), and with development NGOs Save the Children and World Vision. At a regional scale, the regional intergovernmental agency Secretariat of the Pacific Community (SPC) will be a key regional partner. Through these partnerships we will align programs and utilize the relative strengths of the partner organizations to achieve program goals. Other partners will be engaged as their programs and funding permit, including OXFAM, UNDP, Kastom Gaden, a national NGO that works to promote self-reliance, strengthened food security and sustainable livelihood development for rural farmers. Developing and nurturing new cross-sectoral partnerships will be a primary focus throughout the life of the Program but will be given particular emphasis in 2011-2012.

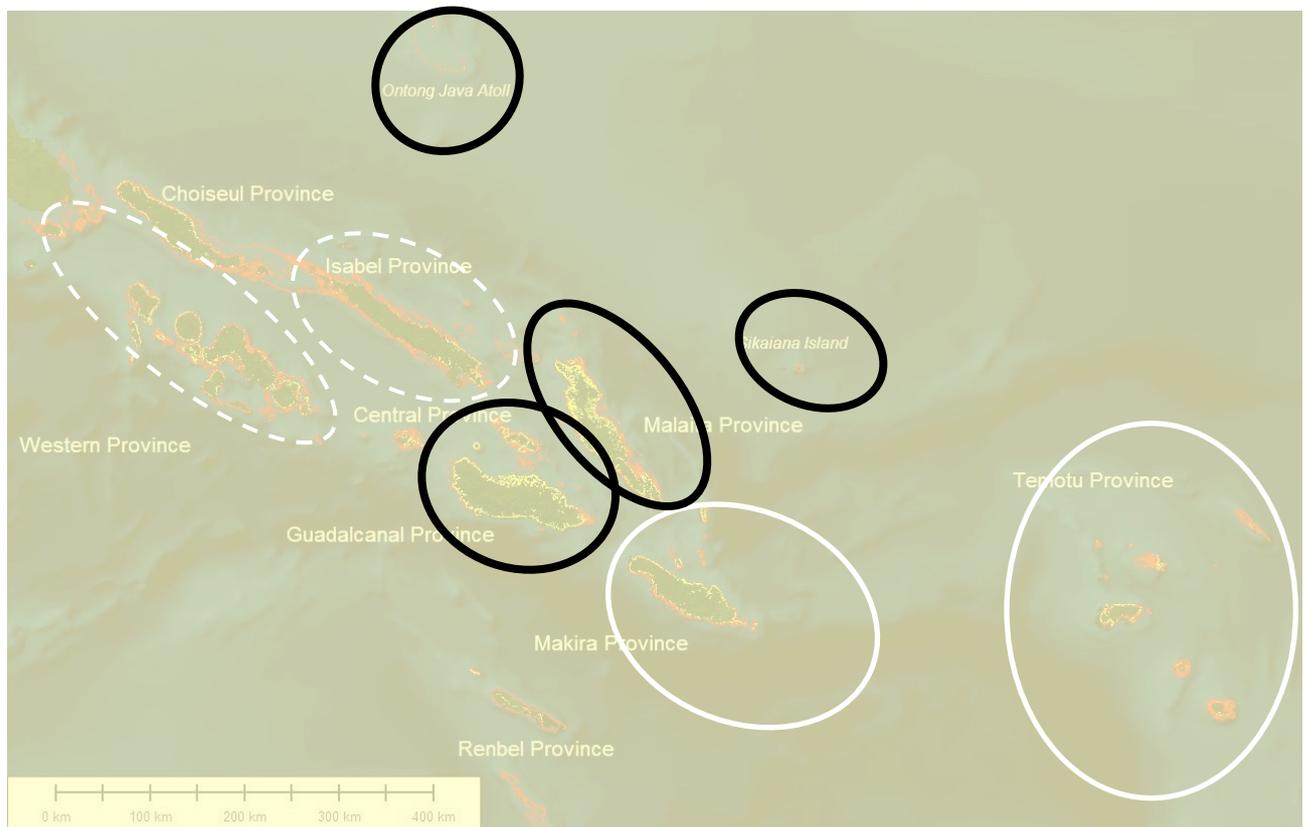


Figure A 6: Program hubs in the Solomon Islands

Hub 1 (Western bloc, Western and Isabel Province) = dashed white lines; hub 2 (Central bloc; Central, Guadalcanal and Malaita Provinces, including the outer islands of Malaita Province) = solid black lines; hub 3 (Eastern bloc, Makira and Temotu Provinces) = solid white lines.

Table A 8: Program hubs in Solomon Islands.

Human Poverty Index (HPI) indicators in Solomon Islands are taken from Solomon Islands Human Development Report 2002.

Hubs	Aquatic agricultural system elements	Key aquatic agricultural system development challenges	Selected aquatic agricultural system-based opportunities
1. Western and Isabel Provinces	Coastal coral reef, mangrove fisheries, agriculture/gardening (coconut, cocoa, root crops, leafy vegetables, fruits), small scale livestock (chickens, pigs). Irregular transport networks, limited air service, main transport to urban centers by sea.	Declining fisheries resources, habitat quality, salt water intrusion and pests on agricultural crops; high market transaction costs; poor access to finance, lack of infrastructure, limited access to productive land owing to land tenure structure, high proportion of youth.	Action research to develop community-based adaptive management of marine resources, improved market chain and market linkages for fisheries and land based livelihood opportunities; improved agricultural technologies.
2. Central, Malaita and Guadalcanal	Some artisanal coastal fisheries, includes main urban centers, fish imported from the provinces, river and pond freshwater fisheries on a small scale; extensive market gardens supplying urban areas agriculture (coconut, cocoa, root crops, leafy vegetables, fruits), small scale livestock (chickens, pigs). Rice farming in early stages of development. Relatively good access to road, shipping and air transport compared to other hubs.	High population, rapidly increasing cost of fresh fish high proportion of youth. Declining fisheries resources, limited access to productive land owing to land tenure structure. Gender inequity in development opportunities.	Action research to develop community-based adaptive management of marine resources; fish and livestock markets emerging; for horticulture, fish, livestock products; increasing demand for rice and opportunities for integrated AAS based around freshwater systems.
3. Makira and Temotu	Productive coastal fisheries, agriculture (coconut, cocoa, root crops, leafy vegetables, fruits), small scale livestock (chickens, pigs). Some islands limited access to productive land. Remote. Main transport to urban centers by sea, many islands within the bloc only irregular shipping transport if any.	Maintaining productive fisheries resources and habitat; salt water intrusion and pests on agricultural crops; high market transaction costs; improving access to markets, poor access to finance, lack of infrastructure.	Action research to develop community-based adaptive management of marine resources, improved market chain and market linkages for fisheries and land based livelihood opportunities; improved agricultural technologies.

Implementation Partnerships

Solomon Islands are typical of Melanesian culture in having a complex social structure of mutual interdependencies bound by history, culture and language. There are at least 70 distinct languages in the country. Individual communities, language groups, and provincial governments provide natural nodes in a multi-scale network. Innovation spreads quickly among communities and 'wontoks' (people who share language), but new ways of spreading impact will be required to jump the barriers of language and remoteness. Administratively, the provincial governments within the three hubs will be used to organize activities and partnerships.

By pursuing this approach the Program will reach >100,000 poor and vulnerable people in Solomon Islands. We will achieve this impact at scale by building on CGIAR investments to mobilize a coalition of development partners from government, national and international NGOs, and the private sector. Government and NGO partners committed to this approach as of August 2010 will deliver Program outcomes to 2000 households. We expect this coalition to expand to reach a minimum of 20,000 households by 2016. By doing so, the CGIAR's limited investment through the Program will influence over USD \$3,000,000 in other development investment in the first three years (Table A9).

Table A 9: Partnerships through which the Program will work to have impact in the Solomon Islands

Partners / projects	#poor reached (people)	Hub	\$ value 2011 to 2013 (USD)	Status
Ministry of Fisheries and Marine Resources	5800	Western bloc	\$390,000	2008-2013
Ministry of Fisheries and Marine Resources	6600	Central bloc	\$490,000	2008-2013
Ministry of Fisheries and Marine Resources	3000	Western bloc	\$202,500	2011-2013
Ministry of Fisheries and Marine Resources	4000	Central bloc	\$270,000	2011-2013
Ministry of Fisheries and Marine Resources	1000	Eastern bloc	\$67,500	2011-2013
Save the Children	8000	Western bloc	\$43,200	2010-2013
Save the Children	8000	Central bloc	\$43,200	2010-2013
Save the Children	8000	Eastern bloc	\$43,200	2010-2013

Partners / projects	#poor reached (people)	Hub	\$ value 2011 to 2013 (USD)	Status
World Vision	8080	Central bloc	\$1,425,000	2010-2014
World Vision	3800	Eastern bloc	\$375,000	2011-2013
Total	56280		\$3,349,600	

The outcomes delivered by 2014 will lay the foundation for expanded impacts. From 2015-2016 the Program will consolidate these outcomes, while working to expand the areas of impact where possible. By 2016, the Program will have delivered (i) productivity improvements for over 20,000 households (>100,000 people, including 50,000 women); (ii) practices and policies for poverty reduction through aquatic agriculture that are embedded in government and donor investments; and (iii) institutions that are better servicing poor farmer-fishers.

From 2017-2022 the Program will seek wider impacts on poverty in the western Pacific region through catalyzing government and donor investments that allow a further scaling up and out. The optimal position and strategy for CGIAR engagement within this wider scale-up period will be determined based on best practices learned through the first 6 years. By sustaining the activities started in 2011 and expanding our impacts through scaling out, the Program coalition will, by 2022, have delivered productivity improvements for a minimum additional 400,000 people.

Zambia

The context

Zambia's rivers and lakes support extensive agriculture, fisheries and livestock production and provide livelihoods for about 3 million people or 25% of the country's population. Through its share of the Zambezi and Congo basins, Zambia contains 40% of Southern Africa's freshwater and seasonally about 20% of the country (150,000 km²) is inundated. Most of the people living in provinces dominated by aquatic agricultural systems live below the poverty line (83% Western Province; 79% Luapula Province; 73% in the Kafue districts – compared to 67% nationally). Similarly, vulnerability to malnutrition, marginalization from social services and disease are particularly high in these locations. The Human Development Index for aquatic agricultural system districts averages around 0.37 compared to 0.43 nationally^m and stunting among under-5 year olds is amongst the highest in Luapula Province (56%) and Western Province (53%) compared to a national average of 46%ⁿ. HIV prevalence in these provinces and districts has risen by over 2% over the past 5 years whilst the national rate has declined in

^m UNDP (2007): Human Development Report Zambia 2007

ⁿ National Food and Nutrition Commission, Zambia (2009): *National Nutrition Surveillance Report 2009*.

the same period. Today, Luapula (16.5%), Western (15.0%) and Central (18.0%) Provinces are above the national prevalence of 14.3%.^o

Despite the poverty and vulnerability of many aquatic agricultural system users, these systems also provide a strategically important resource for food security and socio-economic development in Zambia and the wider SADC region. The 'tri-economy' of floodplain agriculture, animal husbandry on seasonal communal pastures, and extensive fisheries, provide important opportunities for poor households, including many landless populations and workers displaced from formal economic sectors, in particular mining. The challenge is to overcome the constraints that have frustrated development efforts in these systems and develop a learning approach that can have national and regional impacts.

Conditions in Zambia for making progress in these areas have improved. Regional and domestic markets for aquatic agricultural systems commodities including for livestock and fish products are strengthening rapidly^p and recent public policy and legal frameworks emphasize decentralized management and multi-stakeholder partnerships^q. The main research in development challenge is to generate and scale out viable interventions that enable poor farmers, herders, and fishers and their communities to harness these opportunities and translate them into sustained economic benefits and increased wellbeing.

There is an on-going transformation of the Zambian economy from heavy dependence on mining to greater diversification and the potential for agricultural growth is increasingly recognized by Government of Zambia as a main pillar for overall growth and for addressing the country's persistent food and nutrition security crisis. In many years, agricultural production in Zambia is insufficient to ensure national food security. The traditional 'hunger season' during December to March, however, is becoming more difficult due to the increasing impacts of climate variability and climate change^r. There is a 75% to 80% likelihood of flooding or drought affecting some of the major food production zones in the country^s.

At national level, the emphasis for food security has been on maize production, storage and marketing, and while growth has been achieved this has not translated into deep inroads against malnutrition and seasonal hunger. A variety of crops, including cassava, sorghum and millet, that are of local importance for food and nutrition security have been marginalized in policy and support services. These crops are particularly important in aquatic agricultural systems environments that are on the whole unsuitable for maize production. Greater attention to productivity, sustainability and market chains of these crops can help alleviate the 'hunger season' that is inherent in a maize-dominated sector as well as improve nutritional quality of staple food intake nationwide. To this end, the Program will strengthen links with the CGIAR Research Program on Agriculture in the Humid Tropics in Luapula Province to improve cassava production in aquatic agricultural systems and related market chains, as well as work with the Golden Valley Agricultural Research Trust (GART) in Western Province to strengthen seed supply, production and marketing for sorghum and millet.

^o National Council for HIV/AIDS, Tuberculosis and Malaria, Zambia (2009): Joint Mid Term Review of the National AIDS Strategic Framework 2006-2010 , January 2009.

^p USAID (2010): Feed the Future Zambia FY 2010 Implementation Plan; Musumali et al 2009;

^q Government of Zambia: Fifth National Development Plan (2005); Fisheries (Amendment) Act of 2007; National Livestock Policy (2009);

^r IFPRI (2009). The Impact of Climate Variability and Change on Economic Growth and Poverty in Zambia. IFPRI discussion paper no.890.

^s USAID (2010) Feed the Future. Zambia FY 2010 Implementation Plan.

To spearhead the move towards diversification, Government of Zambia has strengthened the policy and legal environment in the agricultural sectors. The Ministry of Agriculture and Cooperatives and the Ministry of Livestock and Fisheries Development, have spearheaded the development of new agriculture and livestock policies, new legislation and policies governing the fisheries sector, and renewed support to the National Food and Nutrition Commission. The Agriculture Consultative Forum (ACF), comprising key civil society, private sector and government stakeholders, has emerged as the main societal forum for information exchange, policy dialogue and advocacy for change.

The CGIAR Research Program on Aquatic Agricultural Systems will add value to these government initiatives by working through ACF to establish wide stakeholder dialogue on development of aquatic agricultural systems. This will involve integrating the perspectives of the agriculture research sector, including the Zambia Agricultural Research Institute (ZARI), and the research units of the Departments of Agriculture, Fisheries and Livestock, the environmental sector (Ministry of Tourism, Environment and Natural Resources, Environmental Council of Zambia, and Zambia Climate Change Network), and the social development sectors (JCTR, Zambia Land Alliance, Women for Change). This dialogue will foster a shared understanding of the development potential of aquatic agricultural systems among national stakeholders and build on this to develop integrated technical and policy approaches.

The focus of the Program in Zambia

The Program will focus on three hubs in Zambia, the Upper Zambezi (Western Province and Southern Province), Luapula Province, and the Kafue Flats (Southern and Central Province) (see Figure A7). These locations were identified through stakeholder consultations as representing most of the strategic challenges and opportunities of aquatic agricultural systems development in Zambia and the wider SADC region. Table A9 gives an overview of the characteristics, challenges and opportunities of the three hubs in Zambia.

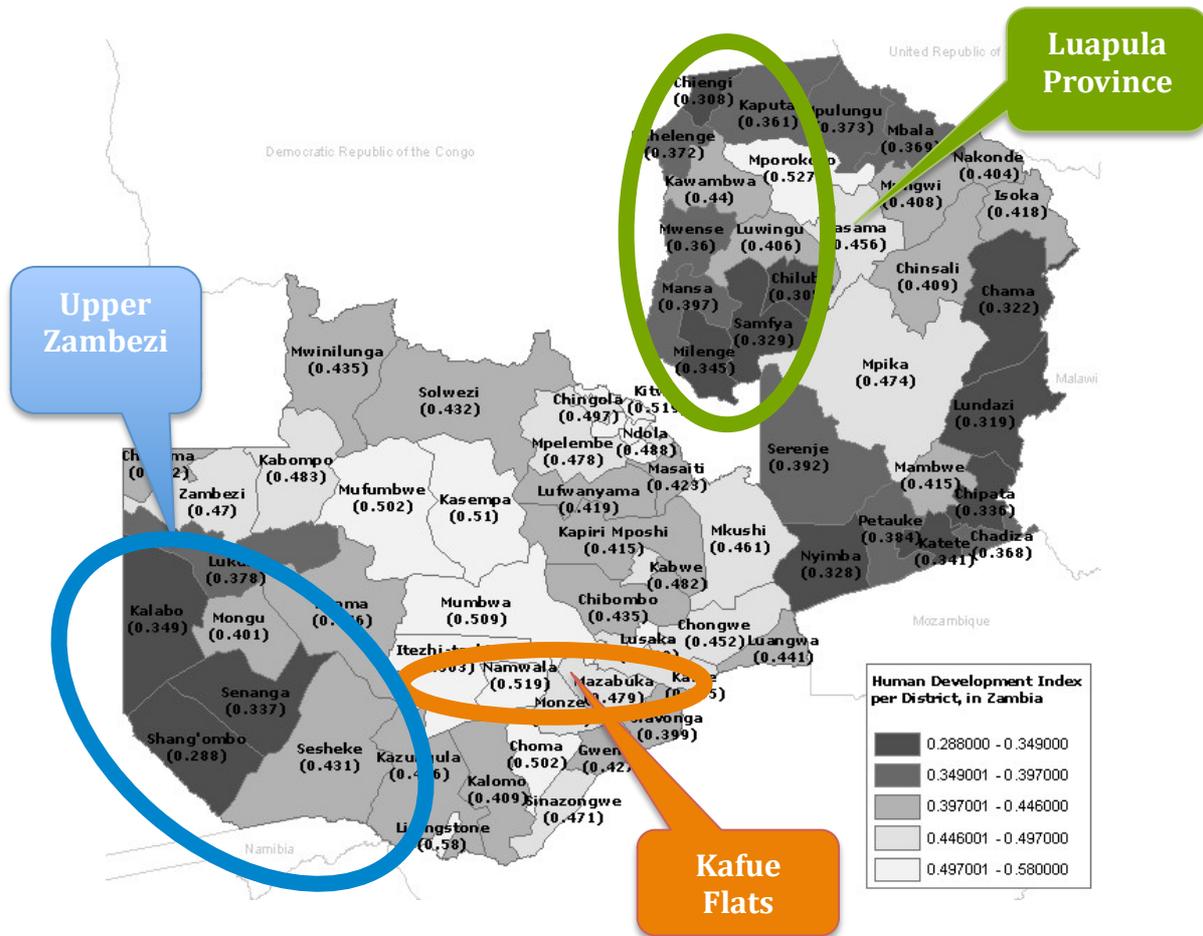


Figure A 7: Poverty map and research hubs in Zambia
 The Program will start in the Upper Zambezi and Luapula Province where existing partnerships with on-going programs of Government and NGOs allow for immediate start-up (Table A10).

Table A 10: Program hubs in Zambia

Hubs	Aquatic agricultural system elements	Key aquatic agricultural system development challenges	Selected aquatic agricultural system-based opportunities
Upper Zambezi (Western Province: Kaoma, Mongu, Senanga, Shang'ombo and Sesheke Districts; Southern Province: Kazangula, Kalabo and Sinazongwe Districts)	Zambezi floodplain; fisheries; cattle on seasonal pasture (common property); few crops only (incl rice, cassava); forestry resources; some horticulture.	Low productivity of crops; low livestock and dairy productivity; declining fisheries resources; declining productivity of common pastures; depletion of forestry resources; high market transaction costs; HIV/AIDS.	Fish and livestock markets emerging; demand for rice; horticulture (Sesheke) for cross-border trade.
Luapula Province (Mansa, Mwense, Nchelenge and Samfya Districts)	Lake fisheries; extensive swamps (10,000km ²); small livestock and ruminants; cassava; millet.	Declining fisheries resources; overreliance on fish; poor diversification of farming and livelihoods; HIV/AIDS.	Cross-border markets in Katanga Province (DRC) for most food commodities (esp. fish and livestock).
Kafue Flats (Southern Province): Namwala, Monze and Mazabuka Districts; Central Province: Itezhi-Tezhi, Mumbwa and Kafue Districts)	Floodplain fisheries ; cattle on communal pastures; irrigated commercial crop production with outgrowers; aquaculture; maize main food crop; horticulture close to main towns and roads.	Declining fisheries resources; Impacts of hydropower dam on flood pulse and crops, livestock and fisheries; conflict over water and land; high rates of seasonal migration; HIV/AIDS.	Strong urban and regional markets for horticulture, fish, livestock products.

Table A11 gives a summary of those projects that have already agreed to start collaboration immediately, or at the time of their inception. Working with Government, NARS, other main partner institutions and their projects, the Program will use CGIAR funding to pursue network mapping and participatory diagnostics involving stakeholders at community and hub level. Based on this diagnosis further collaborative research projects in support of ongoing and new development investments will be developed.

Table A 11: Partnerships through which the Program will work to have impact in Zambia

Partners	# poor reached	Hub	\$ value	Status
Concern Worldwide	256,000	Upper Zambezi	3.5m	On-going projects;
Golden Valley Agricultural Research Trust (GART)	10,000	Upper Zambezi	8.1m	On-going projects;
Catholic Relief Services (CRS)	25,000	Upper Zambezi	12.5m	On-going projects;
	8,000	Luapula	1.0m	To start in 2011;
Program for Luapula Agricultural and Rural Development (PLARD)	210,000	Luapula	14.0m	On-going project to 2014;
Ministry of Agriculture and Cooperatives, Strategic Program of Climate Resilience (Agriculture Component)	300,000	Upper Zambezi; Kafue	35.0m	To start in 2012;
Total	809,000		44.3m	

Implementation Partnerships

The Program will work through partnerships to improve the lives of 1 million poor and vulnerable people by 2016. We will do so first through participatory research in the three hubs described and through this improve the lives of the communities we will work with directly there. Second we will work with development partners to scale out the learning from our research sites to the other parts of the hub. Third we will work with this coalition of partners to translate the learning to all other main aquatic agricultural systems in Zambia, including the Lower Zambezi, Lukanga Swamp and the farming systems around the lakes and wetlands of Northern Province. Working in this way we expect to reach up to 2 million people dependent on aquatic agricultural systems by 2022.

The Program will support these efforts by working with main national stakeholder groups to strengthen capacity for supporting scaling-out investments. Key Government agencies, in particular the Ministries responsible for Agriculture, Livestock and Fisheries as well as the National Food and Nutrition Commission, have already identified the opportunity for the Program to focus their strategies and plans on utilizing and scaling-out opportunities demonstrated by the Program (see letters of support in Annex 9). The Program will build on this opportunity and the initial collaboration with NARS institutions (Zambia Agricultural Research Institute, University of Zambia, Copperbelt University) to develop targeted research and training support strategies and plans which, with additional support, will position the NARS more effectively as research and training partners for scaling-out these knowledge-intensive integrated research-for-development approaches throughout the country. The Zambia National

Farmers Union and several private sector companies engaged in aquatic agricultural systems commodity chains in the Upper Zambezi, Luapula and Kafue will participate in the participatory diagnostics in these areas with a view of identifying specific opportunities for market-based interventions and improving their linkages with wider development investments for scaling-out viable options.

For scaling-out at regional level the Program will link with the programs of SADC on the management of Zambezi basin trans-boundary fisheries and natural resources (seven countries), and of COMESA on climate change adaptation through agricultural innovations including in the Zambezi basin and the Great Lakes region. As the Program expands to engage in Uganda and Mali our investment there will build explicitly on learning from Zambia.

Annex 6: Selected Global Research Partnerships to be pursued through the Program

Program Research theme	Existing partnerships that will be expanded (with areas of focus)	New partnerships to be developed (with areas of focus)
System productivity	<p>Stockholm Resilience Centre (ecosystem services, productivity and resilience)</p> <p>James Cook University (Coral Reef Fisheries)</p> <p>Institute of Aquaculture, University of Stirling (development and adaptation of aquaculture technologies)</p> <p>University of Copenhagen (nutrition, nutrient quality of foods and value added products, food and nutrition security monitoring and evaluation)</p> <p>Wageningen University (pond aquaculture technology expertise, innovation systems; development of resilience approaches)</p>	<p>Boston University (Genetic improvement of tilapia species in Uganda)</p> <p>University of Minnesota (Large Lakes Observatory)</p> <p>Kasetsart University, Thailand (aquaculture life cycle analysis)</p> <p>CIRAD (aquaculture production systems; genetics and breeding expertise)</p> <p>University of Florida (development and management of stocked fisheries; modeling of multiple water uses and conflict resolution)</p>
Markets	<p>Department of Marketing, University of Stirling (fish markets and marketing of produce)</p> <p>Danish Institute for International Studies (governance of global value chains)</p> <p>Wageningen University (value chains)</p>	<p>Private sector (e.g. seafood buyers, service providers, social investments)</p> <p>Cornell University (Marketing and food distribution systems; food and nutrition policy; agribusiness development; agricultural finance)</p> <p>Australian National University, Department of Economics (ecosystem service markets)</p>
Resilience and adaptive capacity	<p>School of International Development and Tyndall Center for Climate Change Research, University of East Anglia (coastal and inland resilience and adaptation, river basin adaptive management, livelihood adaptation, building individual capacity and resilience, health and environment)</p>	<p>Harvard Univ. (Sustainability Science Program, Kennedy School of Government)</p> <p>Coastal Resource Center – Univ. of Rhode Island (coastal resource assessment, inter-sectoral governance)</p> <p>Wilfrid Laurier Univ., Ontario (resilience in SSF)</p> <p>Univ. of Manitoba (wellbeing and resilience in SSF)</p>

Program Research theme	Existing partnerships that will be expanded (with areas of focus)	New partnerships to be developed (with areas of focus)
	Stockholm Resilience Center (coastal management resilience, reefs) JCU (coastal ecological resilience, reefs)	University of Ulster (wellbeing, resilience and tradeoffs in SSF)
Gender equity	Asian Institute of Technology (gender, livelihoods, environment and value chains) University of Manitoba (gender and wellbeing in SSF) Memorial University of Newfoundland (gender, globalization and fisheries)	East Carolina University (globalization and gender in fisheries) School of International Development, University of East Anglia (Action research for transformation, empowerment, gender frameworks, human rights, wellbeing)
Policies and institutions	Adelphi Research (Berlin; environmental security, resource competition, assessment and investment guidance) Saint Mary's University (wellbeing and fisheries governance instruments) PROFISH World Bank (drawing lessons from policy reform and institutional development experiences) FAO in the development and normalization of international policy instruments	IDS-Sussex (governance team; participation, power, and social change team) ICSF (human rights and fisheries livelihoods, links to international norms, FAO, etc.) Oxfam International (policy dialogue and advocacy drawing on successes and obstacles in focal regions) Earth Institute (Columbia Univ; linking policy & institutional development experiences to broader UN/ MDG learning & investment targeting) MARE, University of Amsterdam (interactive governance in SSF)
Knowledge sharing and learning	University of Stirling (distance learning; internet based information provision) Stockholm Resilience Center (knowledge networks; resilience alliance) World Bank HLSS team (sharing data on rural livelihoods)	AED/ Global Fish Alliance (lessons on stakeholder engagement and fisheries management reform, scaling out) Environmental Defense Fund (lessons on stakeholder engagement and fisheries management reform, scaling out)

CGIAR Research Program on Aquatic Agricultural Systems

Program Research theme	Existing partnerships that will be expanded (with areas of focus)	New partnerships to be developed (with areas of focus)
	Wageningen University (innovation systems; aquaculture training, specialist capacity building)	Online networks such as the Food Security and Nutrition network, International Food Security network, South Asia Poverty network, Eldis, dgCommunities, Siyanda (information sharing platforms with communities of practice outside of the immediate program scope to increase reach)

Annex 7: Contribution of CGIAR Centers to the Program

Bioversity International: Using Agro-biodiversity in Aquatic Agricultural Systems

Bioversity International contributes/participates in the Program through its regional office of the Asia and Pacific and the Commodities of Livelihood Programme (CfL) sharing its project activities on the use of agro-biodiversity (in tropical fruit trees, bananas and coconut) in improving on-farm sustainability, resilience and livelihood.

Bioversity will contribute to the holistic approach of the Program through the incorporation of important aspects of agro-biodiversity in improving productivity, sustainability, and resilience among aquatic agricultural systems households and communities. It will draw from its experiences, expertise and networks on various crops for this very important contribution. Incorporation of practices promoting the conservation and sustainable use of agro biodiversity can contribute to minimizing risks, ensuring stable yield, and enhancing sustainability. This can also contribute in reducing the impact of intensifying production and increasing productivity on the environment.

Bioversity International had extensive research experiences on livelihood enhancement and poverty reduction in a coconut based farming system. Coconut perennial crops are naturally associated in the coastal agroecosystem. The coconut growing areas, however, are home to the poorest among the poor in many countries (particularly in aquatic agricultural systems) because of the price volatility of coconut products, low productivity (high cost, poor technology and high losses), lack of farm diversification and the nature of farm ownership. Benefits from better access to improved planting materials and management, post-harvest technologies and new marketing opportunities are likely to accrue to the poorest of rural populations. Coconut is often the most viable cash crop partly owing to its non-perishability and product-diversity. Coconut systems also allow for other cash crops such as bananas, vegetables to be intercropped, generating additional income. An integrated farming strategy as espoused by the Program in synergy with other CGIAR centers with expertise in other crops would be relevant in the coconut based aquatic agricultural systems.

The coconut program of Bioversity has significant outputs from previous livelihood and poverty reduction projects funded by ACIAR, ADB, IFAD during the past several years. Current research project on coconut germplasm distribution and sharing will provide added value to this project activity in the aquatic agricultural systems. Banana is another strategic element in integrated farming system in enhancing income in the aquatic agricultural systems. It is a resilient and widely adapted high value cash crop that could feasibly be integrated in a cropping system and could significantly contribute to increase income of farmers and provide nutritious food all-year round. Bioversity has done significant work on germplasm conservation, evaluation, promotion and use, IPM, production system improvement and adaptation for small scale farmers, and value-addition (i.e. processing activities which increase participation of women and elderly in the value chain). These could be adapted to contribute in alleviating poverty and providing foods in target areas of the aquatic agricultural ecosystem.

Banana is another strategic element in integrated farming system in enhancing income in the aquatic agricultural systems. It is a resilient and widely adapted high value cash crop that could feasibly be integrated in a cropping system and could significantly contribute to increase income of farmers and provide nutritious food all-year round. Bioversity has done significant works on germplasm conservation, evaluation, promotion and use, IPM, production system improvement and adaptation for small scale farmers; and value-addition (i.e. processing activities which increase participation of women and elderly in the value chain). These could be

[155]

adapted to contribute in alleviating poverty and providing foods in target areas of the aquatic agricultural ecosystem.

Bioversity International in its role in strengthening national partners is currently providing technical support and guidance in a nationally funded banana livelihood project in several provinces in the Philippines. PCARRD has allocated US\$ 1 million for a period of 4 years. The research outputs of these project activities will also provide relevant synergies in the success of the project activity in the aquatic agricultural systems in the country.

Bioversity works closely with national partners on coconut through COGENT, the global coconut genetic resources network. Bioversity and Philippine Coconut Authority had extensive livelihood projects in the Philippines that can be adapted in the aquatic agricultural system site in the Philippines. For banana, in Asia we work through the Bioversity-coordinated Banana Asia Pacific Network, (BAPNET), and in Africa through the Banana Research Network for Eastern and Southern Africa (BARNESA), which are platforms for priority-setting and collaborative, technical support and information sharing. These partners are also important impact pathway players. In the Philippines, Bioversity works with PCARRD and its national research networks, DA-BAR and its research networks, as well as Bioversity's partners in the private industry. Bioversity partners closely with the National Agricultural Research Organization of Uganda and the local private sector.

Bioversity International initially will focus its participation in the Program in Asia particularly in the Philippines, with potential engagement in other sites as opportunities are identified. Bioversity's expertise contribution will be drawn from in-house technical scientists based in the regions, drawing knowledge-base from global programs and regional partners, and integrating expertise and facilities of national and regional partners.

ILRI: Livestock in Aquatic Agricultural Systems

Livestock is an integral component of smallholder livelihood enterprises in many aquatic agricultural systems. Livestock contributes to the functioning of the system in myriad ways under various contexts of aquatic agricultural systems, for example, as a source of inputs to fish production and crop production, as a source of raw materials for generating power from biogas digesters, as a risk diversification option to cushion the household from effects of systematic shocks and also to enhance livelihood opportunities from aquatic agricultural systems, and as an important source of protein to improve food and nutrition security of smallholders in these systems. Certain parts of these systems can also contribute to improving livestock productivity, for example, by utilizing surplus fish production as ingredients in feed ration for pigs and poultry during times when other feed sources are in low supply or have rising market prices. Thus, in specific contexts and where appropriate, livestock-related improvements and interventions may potentially redound to an enhanced performance of the aquatic agricultural systems, thereby ensuring its viability and sustainability. Livestock can also be a potential destabilizing component of aquatic agricultural systems, for example, when livestock production is constrained by livestock diseases and other production shocks that can compromise the viability of the entire aquatic agricultural systems. In such instances, addressing the livestock-related constraints through appropriate interventions may be a more effective and efficient response to sustain the viability and performance of the aquatic agricultural systems.

ILRI has the expertise and experience in livestock research for development and is thus well-positioned to address the livestock-related constraints to productivity improvements in aquatic

agricultural systems. This can be achieved through a number of pathways. At the global scale, ILRI can provide the scientific expertise for basic research that could lead to solutions for livestock-related productivity constraints, e.g., identifying appropriate animal breeds that could thrive in an optimal manner and are suitable to smallholder conditions in specific aquatic agricultural systems and working with partners to deliver those through effective breeding strategies, providing appropriate technical solutions to livestock production constraints in animal health and in developing optimal feeding strategies and working with partners to effectively disseminate and/or deliver those through effective institutional arrangements and policy advocacies, and supporting the capacity strengthening of partners in basic research for livestock through access to ILRI's laboratory facilities at headquarters in Africa and working with ILRI scientists during this process.

At the regional and country level, where ILRI has a presence, the Program can tap existing scientific expertise for specific research areas where available. ILRI also has a network of partners working in close collaboration with ILRI scientists on specific areas of livestock research for development, and these partners could also be tapped as collaborators, providing their technical and logistical support to specific Program activities where appropriate and feasible. ILRI has a presence in the Mekong, specifically in Vietnam and in Laos and in Mozambique for its South Africa hub, in addition to those located in headquarters in Nairobi, Kenya and principal site in Addis Ababa, Ethiopia. In Vietnam, current work with Vietnamese and international collaborators involve identifying technical, institutional and policy solutions to enhancing competitiveness of smallholder pig producers, collaboration with Vietnamese partners in identifying appropriate strategies for animal genetic resources (specifically pigs and chicken) conservation through utilization, and collaboration with CIAT and Vietnamese partners in identifying suitable forage-based feeding strategies to improve smallholder incomes from beef value chains. In Laos, current work involves developing in-country capacity to implement ecosystem approaches to address zoonotic infectious diseases through a combination of action research and capacity-building initiatives. In Bangladesh, current work involves identifying appropriate strategies for animal genetic resources (specifically chicken and goat) conservation through utilization. Previous work in Cambodia involved collaboration with Cambodian collaborators in diagnostic activities to characterize pork value chains, identify constraints to smallholder linkages in pigs and pork markets and the appropriate technical, institutional, and policy options to address these. Relevant work on feed technology development from previous ILRI projects in the region could also provide potential sources of intervention options where appropriate in specific contexts of aquatic agricultural system target sites, for example, the research outputs from CASREN feed technology testing and validation in Southeast Asia, specifically in Vietnam, Thailand, Indonesia, Philippines, and the provinces of Yunnan and Sichuan in China, and also research outputs from collaborative work on sustainable parasite control in the same countries. Recently concluded work on Avian influenza control and surveillance in Indonesia could also be tapped for lessons as appropriate in specific aquatic agricultural systems context in the target countries. Previous and ongoing work on smallholder dairy in East Africa will also have available lessons for dairy-development related constraints in appropriate aquatic agricultural system sites. ILRI's global work on livestock value chain analysis and livelihoods can also inform appropriate tools and approaches for context specific diagnostics at the target countries of the focus aquatic agricultural systems.

In the target AAS in the proposed country sites of the Program, ILRI does not have in-country staff nor ongoing projects, so would not be able to commit either staff time or other resources to the Program at this time. Instead, ILRI can identify appropriate partners in these countries where such expertise may be required to address livestock-related productivity and other issues in the target aquatic agricultural systems as articulated in the description and

discussions of country-level aquatic agricultural systems issues and opportunities. In the near future, with ILRI's involvement in other CGIAR Research Programs that may have overlapping country sites with this Program, such as in the CGIAR Research Program on Agriculture in the Humid Tropics (e.g., Cambodia, Laos), opportunities for more direct involvement by ILRI may emerge depending on specific activities that will be implemented.

IWMI: Water Management in Aquatic Agricultural Systems

IWMI has expertise on water management for integrated aquatic agricultural systems in floodplains, deltas and coastal zones, including wetland management, hydrodynamic and water quality modeling, water management options and livelihoods assessments and impacts at farm and irrigation system levels as well as institutional and policy analysis at site and larger basin scales. Since water is one of the key factors in improving and applying new production systems, IWMI's contribution is essential for the feasibility and sustainability of innovative aquatic agricultural systems at the study sites of the Program. As an International Partner Organisation of the Ramsar Convention, IWMI also brings a linkage between the results of the Program and global and national policy making on wetland systems.

In Bangladesh, with experiences in water management for shrimp-fish-rice systems in Khulna under the project CPWF PN10 on Managing Water and Land Resources for Sustainable Livelihoods at the Interface Between Fresh and Saline Water Environments in Vietnam and Bangladesh in collaboration with IRRI, WorldFish, Bangladesh Rice Research Institute (BRRI), the Bangladesh Fisheries Research Institute (BFRI), Bangladesh Rural Advance Committee (BRAC), Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED) of Bangladesh, Education and Economic Development of Bangladesh, SocioConsult Limited of Bangladesh, Bangladesh Academy for Rural Development, IWMI will contribute to land and water zoning suitable for different integrated aquatic agricultural systems, and impacts on water quantity and quality of these systems at both inside and outside of the study sites.

In Cambodia with experience in bringing fisheries parameters, including fisheries biology, land and water, livelihoods and governance aspects into the community agro-ecosystem analysis (CAEA) process to support the community investment plan (CIP) under the project CPWF PN71 on Water Allocation in the Tonle Sap system through a close collaboration with WorldFish, Department of Agriculture Extension (DAE) and Inland Fisheries Research and Development Institute (IFReDI), IWMI can contribute to the study of new aquatic production systems at community level and impacts on the livelihoods of local people. The revised CAEA Manual provided by this project will be applied by the Ministry of Agriculture, Forestry and Fisheries (MAFF) for over a thousand communes in Cambodia.

In Zambia, IWMI is in charge of the water component for water resources assessment of both demand and availability from farm (field) to catchment (landscape) to sub-basin levels under a project led by WorldFish on enhancing adaptive capacity to climate change impacts through well-managed water use for aquaculture integrated with small-scale irrigation in the Chinyanja Triangle. With the integrated agriculture-aquaculture (IAA) and integration of aquaculture in small-scale irrigation (IIA) by improved water management to avoid conflicts over demand and use of water resources this study will strongly support the objectives of the Program.

In Philippines, with experience in Land Use Planning and Analysis System (LUPAS) in Ilocos Norte province IWMI scientists will contribute effectively to land and water use through a process of land and water resources assessment, analysis of inputs/outputs of aquatic

agricultural systems suitable for different agro-ecological land units and optimizing the use of available resources (land, water, labor, capital...) for improving livelihoods and assuring food security of the municipalities.

Besides, with the experiences in research on wetland management in various countries, IWMI will also contribute to the environmental and livelihoods impact assessments at these study sites as well as at the sites in other countries that will be opened by the Program in later stages.

Annex 8: Using Results Based Framework for Monitoring, Evaluation and Impact Assessment

The program's approach to monitoring, evaluation and impact assessment is based on the principles of results based management (RBM) (Meier 2003). As shown in Figure A8 RBM adopts a life-cycle approach working through planning and program definition, to monitoring and evaluation, which in turn inform adjustments in program planning and so on. At the heart of an effective learning cycle lies substantive stakeholder participation and good communication.

The Program has drawn on this approach already in its design, notably through effective consultation with stakeholders in focal countries. We will build on this during program inception to design the details of our monitoring and evaluation and impact assessment. The main stages of this are summarized below.

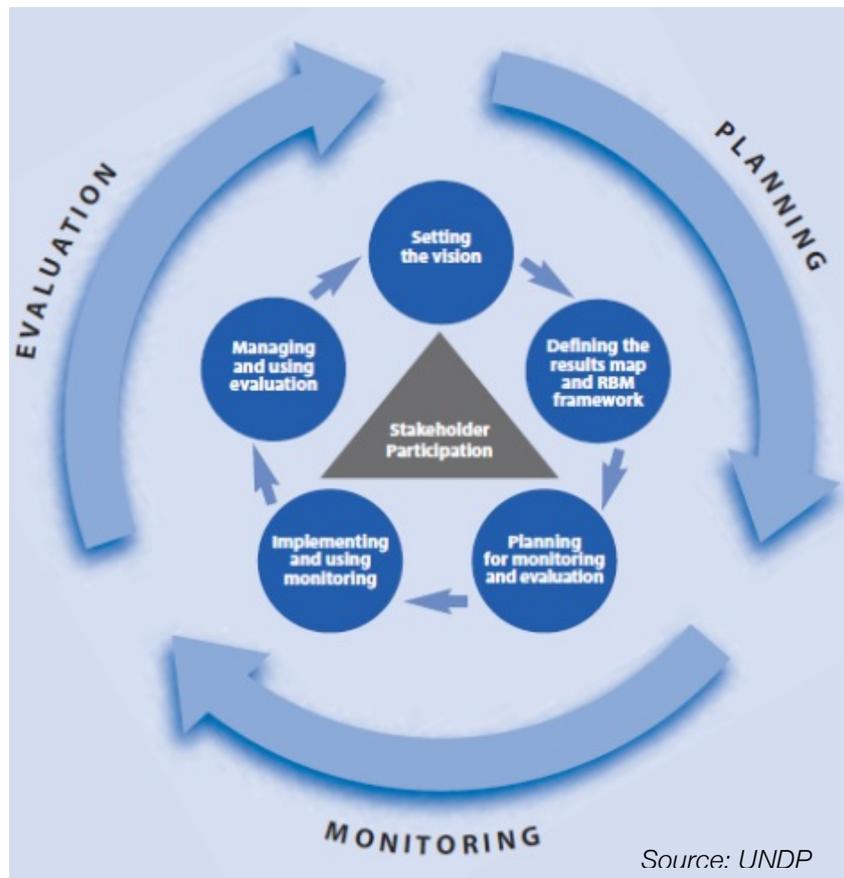


Figure A 8: RBM life-cycle approach

Planning. One of the key features of the Program is the participatory nature of our approach, from planning through implementation. Program inception will continue the planning process by conducting a participatory appraisal and ex ante analysis in each country and hub. These analyses will include consideration of: i) the poverty situation, development challenges, and aquatic agricultural systems opportunities in each hub and how these relate to national priorities, strategies and plans; ii) identification of hypotheses of change and research questions to support this change; iii) stakeholder and institutional analysis, including assessment of

stakeholders' and target groups' capabilities; iv) assessment of results on CGIAR System-Level Objectives (SLO); and v) a quantitative ex-ante impact analysis of possible scenarios of impact.

Monitoring. As the Program proceeds to implementation we will use monitoring to review progress, inform decisions on program direction and management, and in doing so enhance overall accountability and learning. Specific steps in our monitoring will include: i) periodic analysis of the extent to which outcomes have been or are being achieved; ii) identification and analysis of factors contributing to or impeding achievement of outcomes, iii) review of the extent to which individual partners are achieving outputs as planned, iv) review of partnership strategies to ensure partners have a common appreciation of problems and needs and v) document lessons learned and supply information for the creation of knowledge products for wider sharing. In pursuing this work the program will take a participatory approach design to build stakeholder engagement and accountability.

Evaluation. The Program will build upon the monitoring system to conduct periodic evaluations of program progress. The precise form and intensity of these evaluations will vary depending on purpose ranging from rapid appraisals, and analyses of case studies, to full scale project evaluations. The evaluations will normally be undertaken at the end of specific projects or program phases, and a formal evaluation will be done of work in each hub on a three yearly basis. The evaluations will use data from the monitoring system but may also need to collect additional data. As for monitoring, the Program's evaluations will favour participatory approaches where appropriate.

Impact Assessment. The Program's approach to impact assessment will use the skills of the monitoring and evaluation team to build on the monitoring and evaluation framework described above. This approach will include planning for impact assessment during project start up. We will use outcome mapping and participatory impact pathway analysis to identify rigorous indicators of impact (Walker et al. 2008), and our assessments will use a range of methods including both quantitative and qualitative approaches. Conventional adoption studies and related cost-benefit analyses are a mainstay of impact assessment and these will be used where appropriate. However the systems approach of the Program requires that our impact analysis reach further down the impact pathway to measure indicators such as nutritional, health, environmental and social consequences of our work.

Annex 9: Letters of Support

During development of the CGIAR Research Program on Aquatic Agricultural Systems particular attention has been given to establishing and strengthening partnerships required for Program implementation. At the time of proposal submission a number of letters of support have been received from these partners as listed below. A selection of these letters is provided here. The others are available on request.

Scale of engagement Letter of support received during development

Global	CRS; CARE-US
Regional	APAARI, SPC, FARA, NEPAD
National	Bangladesh: BARC, ACDI-VOCA, CARE-Bangladesh, Cambodia: MAFF, CARE-Cambodia, CONCERN, OXFAM, Philippines: DOST-CARAGA, BAR, BFAR, PCAMRD, PCARRD, The Solomon Islands: MFMR, SAVE the CHILDREN, World Vision Zambia: MLFD, ACF, CONCERN, CRS, GART, NFNC



Letter of Support: MP 1.3

Dr Steve Hall,
Director General,
The WorldFish Center,
Penang, Malaysia

September 6, 2010

Dear Dr Hall,

May I first take the opportunity to thank you for facilitating CRS participation in the preparation of the proposal for this programme which we see as an appropriate and sustainable means to reach the poor and vulnerable, especially women.

Catholic Relief Services (CRS) is the international relief and development agency of the Catholic community in the United States with the mission to serve impoverished and disadvantaged people throughout the world regardless of their race, religion or ethnicity. CRS now reaches over 100 million people and has offices in over 90 countries.

CRS has a sustained and evolving relationship with a number of CGIAR Centres and we believe that close partnerships between research and development and between the CGIAR and NGOs is the means of reaching our common goal to have a significant impact on hunger and poverty at scale. We believe that by working with researchers and other specialists, we can identify critical elements and formulate and test measures to evaluate and improve them. CRS has a core of highly-qualified agricultural staff stationed at our headquarters in Baltimore, Maryland and worldwide. With our many partners, we bring a wealth of practical experience to bear upon any issue and at the same time through these partnerships assure a rapid diffusion of new technologies and ideas.

CRS pursues an integrated livelihoods approach to support the wellbeing and dignity of all household members. We have activities in all the countries proposed for MP 1.3 and we believe that our capacity and effectiveness will be strengthened through working closely with your Centre for technical support and joint problem identification and solving. At the same time, we believe that our experience in working with multiple partners across countries will assist MP 1.3 to go to scale effectively.

CRS believes that global partnerships are an effective means of learning and rapidly transferring ideas and technologies at scale. MP 1.3 is innovative and particularly exciting as it will bring together a range of diverse partners at all stages of research and development to look at livelihoods in their entirety. Agriculture is fundamental to most rural livelihoods and only by addressing all aspects of household livelihoods can we be sure that the key issues are being addressed in an appropriate manner. MP 1.3 supports fully this belief and we believe that the research to understand the influences of the various external factors and to manage and communicate within such a diverse programme is paramount for the development of further large-scale projects.

CRS expresses its strong support for this Programme and commits to engage as an active partner at the global, regional and country level.

May I wish you all the best with your submission.

Yours sincerely,



Dr Tom Remington

Principal Agriculture Technical Advisor
Catholic Relief Services
Bujumbura, Burundi
Tel: + 257 71 228 058
tremington@earo.crs.org
Skype: nairobiem



CARE USA
Program Division
151 Ellis Street, NE
Atlanta, GA 30303-2440
USA
tel 404.681.2552
fax 404.589.2620
www.care.org

September 3, 2010

Dr. Patrick Dugan
Deputy Director General
The WorldFish Center,
Penang,
MALAYSIA

Subject: Letter of Support for MP 1.3

Dear Patrick,

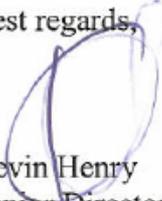
CARE has been very pleased to have had the opportunity to participate with you and your WorldFish/CGIAR colleagues in the development of the proposed mega-program focusing on harnessing the development potential of aquatic agricultural systems for the poor and vulnerable. My colleagues and I support the proposed approach and underlying conceptual framework for the design of this program. We believe that, if implemented, this program would break important new ground for the CG system and its external partners and, most importantly, that it would produce significant benefits for millions of poor households in the focus countries (and ultimately beyond).

CARE would be very pleased to be a global partner with WorldFish and the CG system in the implementation of this program as it moves forward. Our respective teams are already engaged in dialogue in a number of the mega-programs focus countries—including Bangladesh, Cambodia, and Zambia—and we would also be very interested in supporting the program's expansion to Mali and the Niger River basin when you are ready to engage there. I also took the opportunity of meetings I had in Bangkok earlier this week to brief our Asia Regional Management Unit on the status of this program, and they also expressed their support for the program's strong focus in the Asia/pacific

region. We see the mega-program's focus on livelihoods dependent on aquatic agriculture systems as very well aligned with CARE's strategic focus on sustainable agricultural production and markets, and food security more broadly.

Please do keep us apprised of the program's process and reach out to me for any further input you may need at either the global level or in any of the focus countries.

Best regards,



Kevin Henry
Senior Director, Sustainable Livelihoods Cluster
CARE USA
151 Ellis St. NE
Atlanta, GA 30303
USA
(404)-979-9197
henry@care.org
www.care.org
www.careclimatechange.org



African Union



www.nepad.org
info@nepad.org
Tel: +27 (0) 11 256 3600
Fax: +27 (0) 11 206 3762

P.O. Box 1234
Halfway House 1685
Midrand, Johannesburg
South Africa

6th September 2010

Dr Simon Heck
Country Manager
The WorldFish Center
Lusaka, Zambia

Dear Dr.,

Endorsement of new CGIAR Program 1.3 on “Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable”

NEPAD Agency welcomes the development of the new CGIAR Program 1.3 on ‘**Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable**’. We support the objectives and approaches of the Program which are well aligned with the CAADP and other relevant African strategies and plans, including the NEPAD Action Plan for the Development of African Fisheries & Aquaculture and the CAADP Companion on Livestock .

The African continent is rich in aquatic resources that are an important foundation of agricultural production and rural economies. In view of the persistent challenges of food insecurity, we expect that the CGIAR Program will be able to support African countries and stakeholders to increase the productivity and sustainability of fish, livestock and crop production in these systems and to achieve broad impacts of development efforts on the livelihoods of the poor.

We are specifically interested in establishing linkages between the CGIAR Program and the CAADP process at country and sub-regional levels. The integrated approach and the partnerships proposed by the CGIAR will be essential for success. We expect that these partnerships can be established early on in Zambia, Uganda and Mali and linked to the country CAADP processes in these countries; and later be scaled-out in the respective sub-regions through the Regional Economic Communities and sub-regional research organizations. At the NEPAD Agency we look forward to close collaboration with the Program to ensure that this regional scaling-out of outputs and lesson learning will be owned by and strengthen our regional capacities.

We look forward to working closely with the CGIAR Centres under this program and hope that implementation can start in 2011 as envisaged.

Sincerely yours,

Dr. Sloans Chimatiro
Senior Fisheries Advisor – NEPAD Agency

SECRETARIAT OF THE
PACIFIC COMMUNITY
BPD5
98848, Noumea Cedex
New Caledonia

TELEPHONE: +687 26.20.00
FAX: +687 26.38.18
E-mail: spc@spc.int



SECRETARIAT GÉNÉRAL DE LA
COMMUNAUTÉ DU PACIFIQUE
BPD5
98848 Nouméa Cedex
Nouvelle-Calédonie

TÉLÉPHONE: +687 26.20.00
TÉLÉCOPIEUR: +687 26.38.18
Mél : spc@spc.int

In reply please quote file: PRO 7/54/2/1
En réponse, veuillez indiquer :

30 August 2010

Dr Neil Andrew
Regional Director, Pacific
The WorldFish Center
PO Box 500 GPO Penang
Malaysia

Re: CGIAR MP1.3 Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable'

Dear Neil,

I write to follow up on discussions regarding the new CGIAR initiative to develop an integrated programme titled "Reducing poverty by improving livelihoods in aquatic agricultural systems".

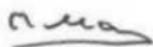
The small island states and territories of the Pacific region are heavily dependent on aquatic systems, particularly nearshore marine resources. As a result they are vulnerable to a range of external threats and opportunities for development. We welcome the inclusion of Solomon Islands and region more generally in this CGIAR initiative. SPC is firmly of the view that integrated approaches, consistent with the livelihoods of rural people and the national policies and visions of our member states, have the greatest likelihood of success.

We have made good progress in partnership with WorldFish in Solomon Islands. The long term in-country presence of WorldFish nicely complements the broader regional obligations and networks of SPC. As discussed, we see many opportunities to align initiatives, particularly in scaling out learning from Solomon Islands to other countries in the western Pacific region.

Because our programme is multi-sectoral we are a natural partner in reaching beyond the sectoral barriers that slow progress in rural development. This integrated approach will both strengthen the work of the CGIAR and deliver greater benefits to the coastal communities of Solomons.

This is an exciting and ambitious programme. We wish you well as you develop the programme and look forward to seeing its ambitions realized for the people of the Pacific region.

Best Regards



Richard Mann
Deputy Director General



Asia-Pacific Association of Agricultural Research Institutions

C/o ICRISAT, National Agricultural Science Centre Complex
Dev Prakash Shastri Marg (Near Todapur)
New Delhi - 110012, INDIA

Email: apaari@apaari.org
Website: www.apaari.org

Tel: 91-11-65437870
Fax: 91-11-25843243

Dr. Raj Paroda
Executive Secretary

Ref.: APAARI/2010/1048
Date: 31st August, 2010

Dear Dr. Dugan,

It gives me great pleasure in writing to you on behalf of APAARI to support the on-going efforts by The World Fish Center, being the lead center, to submit a CGIAR Consortium Research Program 1.3 proposal on "Harnessing the developing potential of aquatic agricultural systems for the poor and vulnerable" for consideration of funding by the CGIAR. We consider this program to be highly relevant and in accordance with the priorities of APAARI recently revisited and redefined in the context of GCARD RoadMap. Highest concentration of poverty and hunger is currently residing in South Asia and the Pacific, and these sub-regions are also faced with the threat of climate change, food and nutrition security. We firmly believe that Asia-Pacific region needs much greater attention for new innovations aimed at Integrated Farming System, being the best option to meet successfully the Millennium Development Goals. Moreover, it is only through the farming systems research that one can attain resilience. Precisely for this reason, stakeholders of APAARI firmly endorse Mega Program 1.3 for its immediate implementation/proper funding support.

APAARI had been associated all through with the development of MP 1.3 and we look forward to build an effective partnership with the CGIAR Centers and the developing country NARS of the Asia-Pacific region.

Finally, we wish MP 1.3 a great success and look forward to work with The World Fish Center and all other key partners involved for an effective implementation of this Mega Program.

With my best regards,


(Raj Paroda)

Dr. Patrick Dugan
Deputy Director General
The World Fish Center
Jalan Batu Maung, Batu Maung, -
11960 Bayan Lepas, Penang
Malaysia



6 September 2010

Our ref: 2010/FARA/EDU/ 028

Dr Simon Heck
Country Manager
The WorldFish Center
Lusaka, Zambia

Dear Dr Heck,

Endorsement of new CGIAR Program 1.3 on 'Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable'

The FARA Secretariat welcomes the development of the new CGIAR Program 1.3 on 'Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable'. We recognize the importance of freshwater systems for agricultural productivity, food security and socio-economic development in Africa. The objectives and approaches proposed in the new Program are well aligned with CAADP, FAAP and other pertinent African frameworks and strategies aimed at agriculture-led growth on the continent.

FARA sees the particular value added from the CGIAR Program 1.3 in drawing attention to some of the most important yet under-invested agricultural systems in Africa. Aquatic agricultural environments have very high natural productivity and with expanding markets for produce from these systems (fish, livestock and high-value crops), real opportunities exist to demonstrate that small-holder food production and trade can indeed be a transformative force for socio-economic development. FARA is keen to play a guiding role in the design and implementation of the Program in Africa. Specifically, we see our contributions as follows:

- To provide an Africa-wide platform for information exchange and professional networking for NARS, SROs and their partners working in Aquatic Agricultural environments;
- To provide experiences and tools from on-going FARA programs that will facilitate scaling-out of local and country-level results from the three initial focal countries (Zambia, Uganda, Mali) to regional and system-wide levels;
- To facilitate the mobilization of capacity-strengthening support from other agricultural environments with a view of directing these to the needs of NARS and their partners in aquatic agricultural systems in Africa;

THE FORUM FOR AGRICULTURAL RESEARCH IN AFRICA
HEADQUARTERS -12 ANANEA STREET, ROKET RIDGE • P.M.B. 07 173 Cantonments Accra Ghana • T.EL: + 233 21 772623 / 779421
Fax: +233 21 773676 • Email: nyam@fara-afriac.org • Web: www.fara-afriac.org

- To provide a platform for policy advocacy and resource mobilization to increase investments in agricultural research-for-development in these systems.

FARA expects to work closely with a range of CGIAR Centers under this Program and help facilitate good collaboration with SROs and NARS.

We hope that the Program will be able to start implementation as envisaged in 2011 and we look forward to being actively involved.

Sincerely yours,

Prof Monty Jones
Executive Director

BANGLADESH AGRICULTURAL RESEARCH COUNCIL
Farm Gate, New Airport Road, Dhaka-1215

TELEPHONE
G.P.O BOX
PHONE
FAX

৯৬০০১ ৯৬০০১ ৯
৯৬০০১ ৯৬০০১
৯৬০০১ ৯৬০০১
৯৬০০১ ৯৬০০১



Ref: ARC/MD(Fish)/50/98

Date: 08/09/2010

Mr. William J. Collis
Director South Asia
The WorldFish Center
Bangladesh and South Asia Office
Dhaka

Subject: Consent Letter in Favour of the WorldFish Center to the CGIAR Mega Program 1.3 "Harnessing the Development Potential of Aquatic Aquaculture System for the Poor and Vulnerable"

Dear Mr. Collis,

We are pleased to inform you that CGIAR Mega Program 1.3, 'Harnessing the Development Potential of Aquatic Agricultural Systems for the Poor and Vulnerable', proposal development with the leadership of the WorldFish, worth progressing. Our scientists are providing input right from the beginning in designing this Mega Program 1.3, which is going to be implemented in several countries of Asia and Africa in partnership with national and international organizations, including NGOs. The major focus will be in Bangladesh on promotion of agricultural aquatic systems to have broader impacts on improvement in the livelihoods of large numbers of poor households.

The Bangladesh Agricultural Research Council (BARC) under the Ministry of Agriculture is the apex of the National Agricultural Research System (NARS). It has the responsibility to strengthen the national agricultural research capability through planning and integration of resources. It is the umbrella body under which the Bangladesh agricultural research effort is coordinated by several ministries, namely Ministry of Fisheries & Livestock and Ministry of Environment & Forest.

BARC will be happy to be partner of proposed Mega program 1.3. However, the financial and administrative matters of BARC's association will be addressed with the involvement of Ministry of Agriculture.

Dr. Wais Kabir
Executive Chairman
BARC



September 2, 2010

William J. Collis
Director—South Asia
WorldFish Center-Bangladesh Office
Dhaka, Bangladesh

Dear Mr. Collis,

I am very pleased to see the CGIAR Research Program (MP) 1.3 '*Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable*', led by the WorldFish Center, moving forward.

The purpose of this letter is to express ACDI/VOCA Bangladesh's interest in and support for MP 1.3. Aquatic Agriculture Systems are at the center of most rural livelihoods here in Bangladesh and a pathway out of poverty for millions of poor farm households. Our hope is that this MP 1.3 effort will direct more attention to sound integrated aquaculture development investments that will cut hunger and to facilitate the scaling up and replication of successes.

ACDI/VOCA PROSHAR operates in Bangladesh working with vulnerable rural households in three upazilas of Khulna Division. Poverty and food insecurity are prevalent, and without concerted support they risk worsening conditions. It is important to remember that Bangladesh has already achieved successes in aquatic agriculture systems that have fed millions – more can be accomplished through scale, impact and sustainability. To be successful, ACDI/VOCA needs the MP 1.3 – to access relevant research, contextual aquatic agriculture technologies and to strengthen our implementing partners' practical knowledge and skills.

ACDI/VOCA hopes to build on our promising partnerships and ongoing communications with both the WorldFish Center and other CGIARs through MP 1.3. Please do not hesitate to let us know how ACDI/VOCA can further support the WorldFish Center as PM 1.3 moves closer to fruition.

Best Regards,

A handwritten signature in cursive script that reads 'Colette Powers'.

Chief of Party PROSHAR
ACDI/VOCA Bangladesh
House 30, Road 19A
Dhaka 1213, Bangladesh
www.acdivoca.org



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និង នេសាទ
រដ្ឋបាលស្រាវជ្រាវ

លេខ : 2053 ជជ

Phnom Penh, 31 August, 2010

To: **Alan C. Brooks**
Director
Greater Mekong Region
The WorldFish Center, Phnom Penh,
CAMBODIA

Ref: **The CGIAR mega-programme 1.3; "Reducing poverty by improving livelihoods in aquatic agricultural systems (AAS)"**

Dear Mr. Alan,

I wish to follow-up on our recent discussions and our engagement in the preparatory consultative stages for the CGIAR mega-programme 1.3; "Reducing poverty by improving livelihoods in aquatic agricultural systems (AAS)".

Over the years we have valued the good progress in partnership with The WorldFish Center collaborating on a wide range of projects and we also value the contributions the Center makes to capacity building and participation in our technical working groups.

We welcome the new CGIAR led initiative bringing together the CGIAR centers for a more integrated approach to aquatic agricultural systems development. This is in line with the synergies and integrated programme implementation within our own Ministry, the MAFF. This integrated approach will both strengthen the work of the Ministry and deliver greater benefits to the vast majority of the population who are dependent on agriculture and fisheries.

This is an exciting and ambitious programme and we fully support the MP 1.3 initiative. We look forward to deepening our partnership and forging new partnerships including the opportunity to work with a wider range of CGIAR centers in the near future.

Yours Sincerely, ជ ឃ

Dr. Nao Thuok
Delegate of the Royal Government of Cambodia
In charge as Director General of Fisheries Administration, MAFF



#36, Street 352, Quarter Boeung Keng Kang I
District Chamkamon, Phnom Penh, Cambodia
email: cambodia.admin@concern.net
tel: (855) 23-214879/23-214891
fax: (855) 23-210314
P.O. Box 485
www.concern.net

Alan C. Brooks
Director
Greater Mekong Region
The WorldFish Center, Phnom Penh,
CAMBODIA

Date: September 1, 2010.

Dear Alan

Subject: Letter of Support

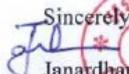
First of all we would like to thank you for providing us an opportunity to participate and share our experiences in the CGIAR led workshop for the mega-programme, "Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable – sharing lessons, identifying research needs".

We would like to follow up the discussions we had in the above mentioned workshop. As you are aware, Concern has been working in Cambodia since 1990 with a focus on working with the extreme poor to enable them to improve their livelihoods so that they can lead reasonable standard of life. Over the last twenty years, Concern has tried a range of initiatives in rural Cambodia and has gained a lot of experience from these long years of working with the poor and extreme poor. Currently we are working in partnership with 17 local NGOs in Pursat, Kompong Chhnang, Kompong Cham and Siem Reap with a programme aimed at 'Supporting Initiatives for Improvement of Livelihoods in Cambodia'.

We welcome the new CGIAR led initiative (MP 1.3) bringing together the CGIAR centers and the opportunity this brings to build on our initial successes in improving the livelihoods of many poor people who struggle to realize the potential benefits from their own farms, resources, services and the entire aquatic agricultural system. We believe this represents a unique opportunity to forge new partnerships and project synergies bringing together our complementary strengths in applied agricultural research, technical expertise and development approaches.

Through this letter, we would like to reiterate that we fully support the MP 1.3 initiative and look forward to further collaboration with The WorldFish Center and a wider range of CGIAR Centers in the future. Let us keep in touch as the initiative progresses so that we can explore areas of partnership and collaboration.

Sincerely,


Janardhan Rao
Country Director



Concern Worldwide: Committed to a world without poverty

Concern Worldwide, a company limited by guarantee, Registered number: 30647, Registered charity number: CHY 5745, Registered in Ireland, Registered address is 52 – 55 Lower Camden Street, Dublin 1.

Directors: Anne Cummins, Brendan Duffy, Chinedu Onyejiem, David Gwynn-Morgan, David Regan, Eamonn Moore, Evanna Barry, Frances O'Keeffe (secretary), Ged King, Jim Miley (Chairperson), John Trea, Mark Shinnick, Mary Humphreys, Mary Liston, Nick North, Nora Owen, Patrick Harle, Paul Jelffutt (British), P.J. Howell, Patrick McManus, Sally-Anne Kinahan, Jan Rotte (Dutch), Tom Lavin, Tom O'Higgins.
Chief Executive: Tom Arnold

Alliance 2015



Alan C. Brooks
Director
Greater Mekong Region
The WorldFish Center
Phnom Penh

East Asia Regional Office
2nd - 3rd Floor
54 Street 108 (Oknha Ing Bun Hoaw)
P.O. Box 4
Sangkat Wat Phnom,
Khan Daun Penh,
Phnom Penh,
Cambodia

Tel: 855 (0) 23 210 357
Fax: 855 (0) 23 223 119

email: eastasia@oxfamamerica.org
www.oxfamamerica.org
www.oxfammekong.org

30th August 2010

Dear Alan

I wish to follow-up on our recent discussions and participation in the CGIAR led workshop for the mega-program: Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable – sharing lessons, identifying research needs.

We welcome the new CGIAR led initiative (MP 1.3) bringing together the CGIAR centers and the opportunity this brings to build on our initial successes in improving the livelihoods of many poor people who struggle to realize the potential benefits from their own farms, resources, services and the entire aquatic agricultural system..

We believe this represents a unique opportunity to forge new partnerships and project synergies bringing together our complementary strengths in applied agricultural research, technical expertise and development approaches. We support the MP 1.3 initiative and look forward to further collaboration with The WorldFish Center and a wider range of CGIAR Centers in the future.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Brian Lund", written over a light blue horizontal band.

Brian Lund
Regional Director
East Asia Regional Office
Oxfam America



Republic of the Philippines
PROVINCE OF SURIGAO DEL SUR
TANDAG

Office of the Governor

August 18, 2010

MR. LYNDO G. VILLACORTA
Regional Director
DOST CARAGA

Dear Director Villacorta:

This refers to the MEGA Program (MP) 1.3 **"Harnessing the Development Potential of Aquatic Agricultural Systems for the Poor and Vulnerable"** spearheaded by the WorldFish Center in cooperation with Department of Science and Technology – Caraga Region proposed for establishment in Surigao del Sur particularly in the municipalities of Cantilan, Tago, Lianga and Tandag City.

I wish to express our interest and warmly welcome the above-mentioned project as this can generate income and employment to our very low earners in the province. It will also be appreciated if the proposed project can be stipulated in the format of CY 2010 ANNUAL INVESTMENT PROGRAM (AIP) of this province we provided to the DOST-provincial S and T center based at Surigao del Sur State University (SDSSU) Campus, Tandag City, a few days ago. Please have the assurance of our full support.

Let me hand in our profound gratitude to the WorldFish Center and DOST Caraga for including Surigao del Sur for the future joint undertaking.

Very truly yours,

JOHNNY T. PIMENTEL
Provincial Governor

For the Governor:


EFREN E. RIVAS, JR.
Provincial Administrator



Bureau of Agricultural Research

DEPARTMENT OF AGRICULTURE
REPUBLIC OF THE PHILIPPINES
e-mail: rd@bar.gov.ph website: www.bar.gov.ph

ISO 9001:2000

*"Negosyo sa sakabayan - laban sa kalirapan,
paghain sa mesa - random ko ang kasulangan"*



Reference no. 2010-08-140
04 August 2010

DR. MARIPAZ L. PEREZ

Regional Director for Asia and Country Manager-Philippines
International Center for Living Aquatic
Resources Management (The WorldFish Center)
SEAMEO-SEARCA
College, Los Baños, Laguna

Dear **Dr. Perez**:

- This refers to our meeting last 03 August 2010 wherein you have presented the change process the CGIAR System is undergoing by which there will now be Mega Programs by different CGIAR Centers that will drive its engagements at the country level for the next 12 years.

As you have highlighted during the presentation, the WorldFish Center was tasked to develop one of the CGIAR System's Mega Programs titled "**Harnessing the Development Potential of Aquatic Agricultural Systems for the Poor and Vulnerable (Mega Program 1.3)**." The mega program is envisioned to focus on improving the lives of people through development pathways that harness the full potential of aquatic agricultural systems by strengthening the capacity of smallholder producers and by building partnerships in support of producer led agricultural innovation, which are in line with the Bureau of Agricultural Research's National R&D thrusts and agenda thru its banner programs – the Community Based Participatory Action Research (CPAR) and the National Technology Commercialization Program (NTCP).

In this regard, the Bureau of Agricultural Research would like to express its support to the Mega Program 1.3 towards the improvement and development of the agriculture systems for the poor and vulnerable.

Thank you and best regards.

Very truly yours,

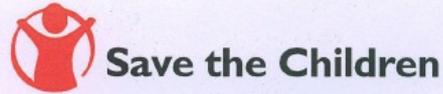
DR. NICOMEDES P. ELEAZAR, CESO IV
Director

FN: D/FAPs/WorldFish/letter of support to MP 1.3

Office of the Director
E-mail: od@bar.gov.ph

Research and Development Management & Information Center (RDMIC)
Visayas Ave., cor. Elliptical Rd., Diliman, Quezon City 1104
Trunklines: (632) 928-8624, 928-8505, Fax No. (632) 927-5691





Dr Anne-Maree Schwarz,
Country Manager,
WorldFish Center-Solomon Islands,
P.O. Box 438,
Honiara,
Solomon Islands.

August 25, 2010

**Re: Mega Programme: Reducing Poverty by Improving Livelihoods in
Aquatic Agricultural Systems**

Dear Anne-Maree,

Following on from the discussions we have had with the WorldFish Center regarding the new mega-programme entitled "Reducing Poverty by Improving Livelihoods in Aquatic Agricultural Systems" currently being developed by the CG Centers, Save the Children would like to confirm its preliminary interest in the programme and its commitment to exploring potential synergies as the action research develops.

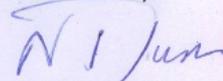
We appreciate the intent of the programme to advocate focused integration of agriculture sub-sectors in aquatic agricultural systems and to promote effective engagement with wider rural development processes.

Save the Children is the world's leading independent organisation for children. Our vision is a world in which every child attains the right to survival, protection, development and participation. Save the Children works in more than 100 countries worldwide and has been working in Solomon Islands for 25 years.

Currently, Save the Children is implementing a Youth Outreach Partnership Project in 21 communities across six provinces of the Solomon Islands. Over the next three years Save the Children will be engaging in a Children and Youth in Conflict with the Law project which will work with approximately 40 communities. One component of both of these projects is support to livelihood options for young people, particularly in rural communities. We believe that the research generated technologies that will emanate from this project may have positive impacts on livelihood options for rural communities. Save the Children is interested to explore how this research may feed into our livelihood programming, which itself is likely to expand in the mid-term.

We look forward to collaborating with World Fish as the mega programme evolves to capitalise on the learning and experience of the programme in order to support livelihood options across a greater number of communities.

Yours sincerely,


Niamh Murnaghan
Country Director



Dr Anne-Maree Schwarz
Country Manager
The WorldFish Center – Solomon Islands Offices
MAIL PO Box 438, Honiara, SOLOMON ISLANDS
PHONE (+677) 250 90
FAX (+677) 232 96

World Vision

SOLOMON ISLANDS

World Vision Solomon Islands
PO Box 1359 • Honiara
Phone: +677 23092 • Fax: +677 21941

24 August 2010

Dear Mrs. Schwarz,

Based upon earlier discussions with the World Fish Center regarding partnership opportunities in Malaita, Temotu and Guadalcanal provinces, I would like to reaffirm our support and willingness to partner with your organization.

World Vision is a community focused organization that has been working in the Solomon Islands since 1981. The organization's primary focus is geared towards empowering communities to shape and drive their own development. Community participation is central to WV's pursuit of transformational development that is community based and sustainable, focused especially on the needs of children. Our approach rests on formalised WV principles for community engagement, which are built into all program design processes. Over the past 29 years, WVSI has built solid relationships with more than 45,000 people in five provinces.

As we discussed previously, World Vision is interested in working with the World Fish Center to promote sustainable environmental practices, specifically in relation to fishing and agriculture. Through the promotion and adoption of sustainable practices, communities will be able to minimize the negative impacts on the environment, mitigate the long-term impact of climate change, and protect rural livelihoods and food security, which are vital to their survival.

World Vision believes that we can add significant value to the work of the World Fish Center in Marau Sound and Weather Coast (Guadalcanal), Small Malaita and Temotu in the following ways:

- Community Mobilization: Organize communities and provide opportunities to reach remote communities with project staff embedded in communities, opportunities to implement aquatic agricultural solutions in concert;
- Lessons Learned: Collect and share lessons learned gathered opportunities for lessons learned to be fed back into the Solomon Islands development approach as well as
- Monitoring and Evaluation: Provide ongoing monitoring support of impact during and after the project has ended through World Vision's on-going area programs.
- Linkages to Integrated Programs: World Vision presently operates 5 area programs in the Solomon Islands, which incorporate projects in health, education, disaster risk reduction and economic development sectors. World Vision will facilitate linkages between within the community to other development activities implemented by the organization in the target areas, such as in the Education (Early Childhood Education, Adult Literacy) and Health sectors. This will help to insure that the project's impact is maximized more broadly across the targeted communities.

World Vision supports the application of the World Fish Center. We look forward to working together based upon shared goals and a common vision of sustainable development in the Solomon Islands.

Please do not hesitate to contact me for additional information.

All correspondence should be addressed to
The Permanent Secretary
Telephone: Lusaka 253933/45
Telex: AGRIM ZA 43950
AGRIC: ZA 40093
Telegrams: AGRIM



In reply please quote:

No.

MLFD/72/7/25

REPUBLIC OF ZAMBIA

MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT

MULUNGUSHI HOUSE, INDEPENDENCE AVENUE
P.O. BOX 50060
15100 RIDGEWAY
LUSAKA, ZAMBIA

2 September 2010

Dr Simon Heck
Country Manager
The WorldFish Center
LUSAKA, ZAMBIA

Dear Dr Heck,

ENDORSEMENT OF NEW CGIAR PROGRAM 1.3 ON "HARNESSING THE DEVELOPMENT POTENTIAL OF AQUATIC AGRICULTURAL SYSTEMS FOR THE POOR AND VULNERABLE"

The Ministry of Livestock and Fisheries Development welcomes the development of the new CGIAR Program 1.3 on 'Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable'. These systems are of great importance for national food security and livelihoods for the poor in Zambia. With the right investments and support, we believe these areas can experience significant growth in productivity and improvements in the wellbeing of communities. The research proposed in the new CGIAR Program will contribute to achieving this transformation.

We were proud to co-host the national consultations to prepare the Program over the last few months. We recognize the particular value this Program will add through integrated approaches that bring together research in livestock, crop and fish as well as other relevant natural resources and socio-economic sectors. Secondly, we appreciate the emphasis on partnerships between the CGIAR, government agencies, national research system, NGOs and private sector in support of common goals and targets. Through these partnerships, the Program will be able to demonstrate greater impact of agricultural research on poverty and food security.

We look forward to guiding the further development of the Program in Zambia and actively participating in its implementation. We want to make

1

full use of the opportunities under this Program to collaborate with a number of CGIAR Centers in order to strengthen the agricultural research capacities in Zambia.

We hope that the Program proposal will be approved quickly and implementation can start in the near future.

Sincerely yours,

Prof. Isaac K. Phiri
PERMANENT SECRETARY
MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT



The Agricultural Consultative Forum

Our Reference: ACFS/lts/4/09/2010

6th September, 2010

Dr Simon Heck
Country Manager
The WorldFish Center
Lusaka, Zambia

Dear Dr Heck,

RE: Endorsement of The CGIAR Program 1.3: Harnessing The Development Potential of Aquatic Agricultural Systems For The Poor and Vulnerable

The Agricultural Consultative Forum (ACF) of Zambia participated in the national consultations to develop the new CGIAR Program 1.3 on '*Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable*'. In our view, the Program is well targeted to improve the agricultural systems in the floodplains and other aquatic environments in Zambia. This will make important contributions to increasing food and nutrition security in Luapula, Western Province, the Kafue Flats and Zambia as a whole.

We endorse the objectives and integrated approaches proposed by the Program. Specifically, ACF appreciates the emphasis placed on enabling small-holder producers and the rural poor to actively participate in the Program and through the Program to strengthen their stake in national policy development.

As the main national policy forum for agriculture and food security, ACF comprises a wide spectrum of organizations and enterprises. We look forward to using the CGIAR Program to strengthen our links with agricultural and related socio-economic research. Specifically, we believe the Program can help us increase our effectiveness and impacts with respect to aquatic agricultural environments, but also on poverty and food security challenges more widely.

We look forward to working actively with the Program.

Sincerely yours,



Hyde Haantuba (Dr)

Coordinator

AGRICULTURAL CONSULTATIVE FORUM SECRETARIAT



Zambia Head Office:
Plot No. 6110 Manchinchi Road
P.O. Box 36700, Lusaka.
Tel Lusaka Office: +260-211-291580/292467
Fax: 260-211-290106
E-mail: concern.lusaka@concern.net
website: www.concern.net
Reg. No. ORS/102/35/3059

3rd September 2010

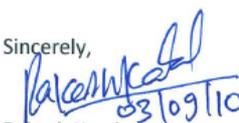
Dr Simon Heck
Country Manager
The WorldFish Center
Zambia

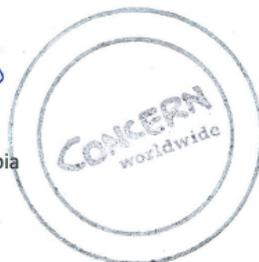
Dear Dr. Heck:

This letter confirms the exclusive commitment of Concern Worldwide Zambia to collaborate with the CGIAR in their Mega Program 1.3: 'Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable'. Should CGIAR be awarded the program, Concern Worldwide Zambia is prepared to work with a range of CGIAR centers under this Program. We are also interested in working with the CGIAR to scale out results from the Zambia activities in the wider region.

We look forward to participating with CGIAR on this important endeavor.

Sincerely,


Rakesh Katal
Country Director
Concern Worldwide Zambia



Mongu Office: Tel +260-217-221028/222447 Fax +260-217-221857 Kaoma Office: Tel +260-217-360056 Fax +260-217-222005 Senanga Office: Tel +260-217-230078 Fax +260-217-230132

Concern Worldwide: Committed to a world without Poverty

Concern Worldwide, a company limited by guarantee Registered Charity Number: CHY5745, Registered in Ireland, Registered address is 52-55 Camden St, Dublin 2

Directors: Anne Cummins, Barbara O'Reilly, Chinedu Onyejelem, David Gwyn Morgan, Evanna Barry, Frances O'Keeffe (Secretary), Helen Burke, Jan Rotte (Dutch), Jim Miley (Chairman), John Treacy, Mark Shinnick, Mary Considine, Mary Finn, Mary Humphreys, Nick North, Nora Owen, Nurul Amin, Paddy Harte, Paul Jeffcut (British), Sally-Anne Kinahan, Teresa McColgan, Tom Lavin, Tom O'Higgins, Tom Shipsey, Chief Executive: Tom Arnold



Promoting Sustainable
Agriculture

Golden Valley Agricultural Research Trust

P.O. Box RW. 50834 LUSAKA - ZAMBIA
Telephone: (260-211) 213739 / 213780 Director: 214718/214719
Fax: (260-211) 213832 E-Mail: gart@zamnet.zm

GART/RESEXT/11

September 6, 2010

Dr. Simon Heck
Country Manager
The World Fish Centre
ZAMBIA

Dear Dr. Heck

Thank you for updating us about the CGIAR initiative, entitled "CGIAR Mega Programme 1.3: Harnessing the development potential of aquatic agricultural systems for the poor and vulnerable". We congratulate you with this mega initiative.

We would like to inform you that Golden Valley Agricultural Research Trust is fully supportive of such a programme and is grateful having been earmarked as a potential collaborating partner. We look forward to working with a range of CGIAR centres under this Programme and with the other collaborating partners.

We would like to take the opportunity to highlight our collaboration with the Indian Council of Agricultural Research (ICAR). In October 2009, GART and ICAR signed a Memorandum of Understanding (MOU) for long-term scientific cooperation. In fact, the Zambian agricultural scientific cooperation with India could be channeled. We would like to strengthen this particular South-South cooperation through our possible involvement in the Mega Programme.

Further, bringing to your attention our expertise as a regional knowledge centre and manager of regional programmes, we would like to work with the CGIAR to scale out results from the Zambian activities in the wider region.

We request to be kept updated about the progress of the initiative and look forward to a fruitful collaboration with CGIAR.

Yours faithfully

GOLDEN VALLEY AGRICULTURAL RESEARCH TRUST

Stephen W. MULIOKELA (Dr)
DIRECTOR

Annex 10: References

- ADB 2007. Promoting gender equality and women empowerment. Gad activity: enhancing the role of women in inland fisheries in Cambodia. "Asian Development Bank, Manila, Philippines. 124 pp.+ Appendixes
- Allison, E.H. 2005. The fisheries sector, livelihoods and poverty reduction in Eastern and Southern Africa. In: F. Ellis and H. A. Freeman (Eds). *Rural Livelihoods and Poverty Reduction Policies*. Routledge, London, pp 256-273.
- Allison, E.H., C. Béné and N.L. Andrew, 2010. Poverty reduction as a means to enhance resilience in small-scale fisheries. In: R. Pomeroy & N. L. Andrew (Eds.), *Managing Small Scale Fisheries: Frameworks and Approaches*: CABI. (in press)
- Allison, E.H., B.D. Ratner, B. Åsgård, R. Willmann, R. Pomeroy, and J. Kurien, 2011. Rights-based fisheries governance: From fishing rights to human rights. *Fish and Fisheries* online.
- Andrew, N.L., C. Béné, S.J. Hall, E.H. Allison, S. Heck and B. D. Ratner, 2007. Diagnosis and management of small-scale fisheries in developing countries *Fish and Fisheries* 8: 227-240
- pAtkinson, Anthony B. 1998: "Social Exclusion, Poverty, and Unemployment." *CASE paper* 4: 1-20.
- Barrett, C.B.& B.M. Swallow 2006. Fractal Poverty Traps. *World Development Report* 34, No 1: 1-15
- Berkes, F., & Seixas, C. S., 2005. Building resilience in lagoon social–ecological systems: a local-level perspective. *Ecosystems* 8: 967-974.
- Birner, R., Davis, K., Pender, J., Nkonya, E., Ananajayasekeram, P., Ekboir, J., Mbabu, A., Spielman, D., Horna, D., Benin, S., Kisamba-Mugerwa, W., 2006. From "Best Practice" to "Best Fit": A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services. IFPRI, Washington.
- Collier, P. 2008. *The Bottom Billion*. Oxford University Press, New York.
- Cornwall, A. 2004. Spaces for transformation? Reflections on issues of power and difference in participation in development. In: S. Hickey & G. Mohan (Eds): *Participation: From Tyranny to Transformation?* Zed Books, London, pp 75 -91.
- Devaux A., D. Horton, C. Velasco, G.Thiele, G. López, T. Bernet, I. Reinoso and M. Ordinola, 2009. Collective action for market chain innovation in the Andes. *Food Policy* 34: 31-38.
- DFID 2005. *Reducing poverty by tackling social exclusion*. Department for International Development, London. [online] Available at: <http://www.dfid.gov.uk/pubs/files/social-exclusion.pdf>

- Ekbior, J., 2009. The CGIAR at a Crossroads: Assessing the role of international agricultural research in poverty alleviation from an innovation systems perspective. ILAC Working Paper 9
- ESCAP [Economic and Social Commission for Asia and the Pacific]. 2003. Putting Gender Mainstreaming into Practice. United Nations, New York.
- FAO, 2006. CAADP Companion Document “Integrating livestock, forestry and fisheries subsectors into CAADP
- Figuroa, M.E., D.L. Kincaid, M. Rani, G. Lewis. 2002. Communication for Social Change: An Integrated Model for Measuring the Process and its Outcomes. Rockefeller Foundation and John Hopkins University Center for Communication Programs
- Giller, K.E., P. Tittonell, M.C. Rufino, M.T. van Wijk, S. Zingore, P. Mapfumo, S. Adjei-Nsiah, M. Herrero, R. Chikowo, M. Corbeels, E.C. Rowe, F. Baijukya, A. Mwijage, J. Smith, E. Yeboah, W.J. van der Burg, O.M. Sanogo, M. Misikom, N. de Ridder, S. Karanja, C. Kaizzi, J. K’ungu, M. Mwale, D. Nwaga, C. Pacini, B. Vanlauwe. 2011. Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. *Agricultural Systems* 104: 191-203.
- Hall, S. J. (2011). Climate change and other external drivers in small-scale fisheries: Practical steps for responding. . In R. Pomeroy & N. L. Andrew (Eds.), *Managing Small Scale Fisheries: Frameworks and Approaches*: CABI.
- S. Hickey & G. Mohan, Eds, 2004. *Participation: From Tyranny to Transformation?* Zed Books, London
- Hickey, S. and Mohan, G. 2005. Relocating participation within a radical politics of development. *Development and Change*, 36(2): 237-262.
- Hoanh, C.T., B. Szuster, S.P. Kam, A. Ismail & A. Noble (Eds), 2010. *Tropical Deltas and Coastal Zones: Food Production, Communities and Environment at the Land–Water Interface*. CABI, London.
- Hulme, D., Moore, K., & Shepherd, A. (2001). Chronic poverty: meanings and analytical frameworks. Working Paper 2. Manchester: IDPM/Chronic Poverty Research Centre (CPRC).
- IPCC [Intergovernmental Panel on Climate Change] (n.d.) *Working Group II: Impacts, Adaptation and Vulnerability*. [online] Available at: <http://www.ipcc-wg2.org/> (accessed 29 July 2010).
- JICA 2007. CAMBODIA: Country Gender Profile”, Japan International Cooperation Agency, Phnom Penh Cambodia
- JICA 2010. Country Gender Profile: Solomon Islands
- Kabeer, N. 1996. Agency, Well-Being and Inequality: Reflections on the Gender Dimensions of Poverty. *IDS Bulletin*, 27(1)

- Kabeer, N. 2001. Resources, agency, achievements: Reflections on the measurement of women's empowerment. In Sisask, A. (Ed.) SIDA Studies No. 3: Discussing women's empowerment – theory and practice. Stockholm: SIDA.
- Kristjanson, P., Reid, R. S., Dickson, N., Clark, W. C., Romney, D., Puskur, R., MacMillan, S., & Grace, D. (2009). Linking international agricultural research knowledge with action for sustainable development. *Proceedings of the National Academy of Sciences* 106 (13): 5047–5052.
- Kumar, N. and Quisumbing, A. R. 2010. Access, adoption and diffusion: understanding the long-term impacts of improved vegetable and fish technologies in Bangladesh. IFPRI, Washington D.C.
- MAFF [Ministry of Agriculture, Forestry and Fisheries]. 2005. Final Draft on Gender Mainstreaming Policy and Strategy in Agriculture. MAFF, Phnom Penh.
- Mahon, R., McConney, P., & Roy, R. N. (2008). Governing fisheries as complex adaptive systems. *Marine Policy*, 32, 104-112.
- Mansuri, G. and V. Rao 2003. Community-Based and -Driven Development: A Critical review of the evidence. World Bank [subsequently published in *World Bank Research Observer* (2004) 19 (1): 1-39].
- Mayoux, L., and G. Mackie, 2007. Making Stronger Links: Gender and Value Chain Action Learning: a Practical Guide., International Labor Organization, Geneva.
- McGregor, J. A. 2007. Researching wellbeing: From concepts to methodology. In Gough and McGregor. Eds. Wellbeing in Developing Countries: From Theory to Research. Cambridge University Press, Cambridge.
- McGregor, J.A., Coulthard, S. and D. Johnson. Forthcoming. Poverty and sustainability in the global fisheries crisis; A social wellbeing approach.
- Meinzen-Dick, R., Quisumbing, A., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C. and Beintema, N.. 2010. Engendering Agricultural Research. Paper prepared for the Global Conference on Agriculture and Rural Development, Montpellier, France, 28-31 March 2010.
- Meier, W. 2003. Results-Based Management: Towards a Common Understanding among Development Cooperation Agencies. Ottawa: CIDA Performance Review Branch Discussion Paper (Ver. 5.0) October 2003.
- Mills, D., Béné, C., Ovie, S., Tafida, A., Sinaba, F., Kodio, A., Russell, A., Andrew, N.L., Morand, P. and Lemoalle, J. (2009) Vulnerability in African small-scale fishing communities. *Journal of International Development* 26. [online] Available at: <http://dx.doi.org/10.1002/jid.1638> (accessed 31 May 2010).
- Moewaka Barnes, H., 2000 Collaboration in community action: a successful partnership between indigenous communities and researchers. *Health Promotion International* 15 (1): 17-25.

- Moore, K. (2001). Frameworks for understanding the inter-generational transmission of poverty and well being in developing countries. Working paper 8. Manchester: IDPM/Chronic Poverty Research Centre (CPRC).
- MWYCA & NSO (Ministry of Women, Youth and Children Affairs and National Statistics Office). 2009. Solomon Islands Family Health and Safety Study. Noumea: Secretariat of the Pacific Community.
- Nathan, D. and Apu, N.A. 1998. Women's Independent Access to Productive Resources: Fish Ponds in the Oxbow Lakes Project, Bangladesh. *Gender Technology and Development* 2:3: 397-413.
- National Institute of Population Research and Training. 2009. Bangladesh Demographic and Health Survey, 2007. Dhaka, Bangladesh.
- North, D.C. 1996 *Understanding The Process of Economic Change*. Foundations Books, New Delhi.
- NSCB 2010. NSCB Fact Sheet: Update on Women and Men in the Philippines. NSCB, Makati City.
- OECD.2004. Effective strategies for Promoting Gender Equality. OECD DAC Network on Gender Equality, Paris.
- Olsson, P., Folke, C., & Hughes, T. P. (2008). Navigating the transition to ecosystem-based management of the Great Barrier Reef, Australia. *Proceedings of the National Academy of Sciences*, 105, 9489.
- Ostrom, E. (2007) A diagnostic approach for going beyond panaceas. *Proceedings of the National Academy of Sciences* 104, 15181-15187.
- Pomeroy, R. & N. L. Andrew (Eds.), *Managing Small Scale Fisheries: Frameworks and Approaches*: CABI.
- PCW [Philippine Commission on Women]. 2010. Fact Sheet: Filipino Women and Men. PCW, Manila.
- Quisumbing, A.R. and Maluccio, J.A. 2000. Intrahousehold allocation and gender relations. FCND Discussion Paper 84. IFPRI, Washington D.C.
- Reason, P., and Bradbury, H. (Eds), 2008. *The Sage Handbook of action research: Participative Inquiry and Practice*, 2nd Edition.. Sage Books, London.
- Rodrik, D. 2006. Goodbye Washington Consensus, Hello Washington Confusion? A Review of the World Bank's Economic Growth Strategy in the 1990s: Learning from a Decade of Reform. *Journal of Economic Literature* 54: 973–987.
- Rockstrom, J., P. Kaumbutho, J. Mwalley, A.W. Nzabi, M. Temesgen, L. Mawenya, J. Barron, J. Mutua, S. Damgaard-Larsen. 2009. Conservation farming strategies in East and Southern Africa: Yields and rain water productivity from on-farm action research. *Soil & Tillage Research* 103 (2009) 23–32.

- Small, C. and R.J. Nicholls, 2003. A global analysis of human settlement in coastal zones. *Journal of Coastal Research* 19(3): 584-599.
- Status of Women Canada. 1996. Gender-based analysis: A guide for policy making.
- UNDP. 2009. Handbook on planning, monitoring and evaluating for development results. New York: UNDP. 232 pp. viewed at: <http://www.undp.org/evaluation/handbook/index.html>
- UNDP [United Nations Development Program], 2005. Gender Mainstreaming. UNDP, New York.
- Van der Brugge, R., & Van Raak, R. (2007). Facing the adaptive management challenge: insights from transition management. *Ecology and Society*, 12, 33.
- Walker, B.D., J. Saver, N.L. Andrew and B.D. Campbell, 2010: Resilience in practice: challenges and opportunities for natural resource management in the developing world. *Crop Science*, 50: 10-19
- Walker, T., M. Maredia, T. Kelley, R. La Rovere, D. Templeton, G. Thiele, and B. Douthwaite. 2008. Strategic Guidance for Ex Post Impact Assessment of Agricultural Research. Report prepared for the Standing Panel on Impact Assessment. CGIAR Science Council Secretariat. Rome, Italy
- Welcomme, R.L., I. G. Cowx, D. Coates, C. Béné, S. Funge-Smith, A. Halls & K. Lorenzen, 2010. Inland capture fisheries. *Philosophical Transactions of the Royal Society B* 365, 2881-2896
- World Bank 2004. Zambia: Strategic Country Gender Assessment. Lusaka: World Bank.
- World Food Programme 2007 *Vulnerability analysis and mapping (VAM)*. [online] Available at: <http://www.wfp.org/operations/vam/>

Annex 11: List of Acronyms

AAS	Aquatic agricultural systems
AASDP	Aquatic Agricultural System development Program
ACDI-VOCA	Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance
ACF	Agriculture Consultative Forum
ADB	Asian Development Bank
AFMA	Agriculture and Fisheries Modernization Act
AFSP	Aquaculture scenario development project
APAARI	Asia Pacific Association of Agricultural Research Institutions
APEC	Asia-Pacific Economic Cooperation
APF	Annual Program Forum
AR4D	Agricultural research for development
ARDS	Agriculture and Rural Development Strategy
ARI	Advanced research institute
ASEAN-COST	ASEAN-Committee on Science and Technology
BAR	Bureau of Agricultural Research
BARC	Bangladesh Agricultural Research Council
BDHS	Bangladesh Demographic and Health Survey
BFRF	Bangladesh Fisheries Research Forum
BRAC	Bangladesh Rural Advancement Committee
CARDI	Cambodian Agricultural Research & Development Institute
CARE	CARE USA
CB	Consortium Board
CBOs	Congressional Budget Office
CDRI	Cambodia's Leading Independent Development Policy Research Institute
CGIAR	Consultative Group on International Agricultural Research

CGIAR Research Program on Aquatic Agricultural Systems

CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	Country Investment Plan
CMT	Country Management Team
COMESA	Common Market for Eastern and Southern Africa
CPC	Country Program Committee
CPM	Country Program Manager
CRP	CGIAR Research Program
CRS	Catholic Relief Services
CSISA	Cereal Systems Initiative for South Asia
DA-BAR	Department of Agriculture - Bureau of Agricultural Research
DAE of MAFF	Department of Agricultural Extension of Ministry of Agriculture, Forestry and Fisheries
DANIDA	Danish International Development Agency
DENR	Department of Environment and Natural Resources
DEV UEA	School of International Development, University of East Anglia
DFID	UK Department for International Development
EC	European Commission
EIARD	European Initiative for Agricultural Research for Development
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FiA	Fisheries Administration
FISH	Fisheries Improved for Sustainable Harvest
GART	Golden Valley Agricultural Research Trust
GBM	Ganges-Brahmaputra-Megna
GCARD	Global Conferences on Agricultural Research for Development

GDP	Gross Domestic Product
GEM	Growth and Equity in Mindanao Program
GHC	General Health Conditions
GMP	Good Manufacturing Practice
GNP	Gross National Product
GOB	Government of Bangladesh
GRiSP	Global Rice Science Partnership
GTZ	German Agency for Technical Cooperation
HACCP	Hazard Analysis Critical Control Point
HARVEST	Helping Address Rural Vulnerabilities and Ecosystem STability
HDI	Human Development Index
HPI	Human Poverty Index
IAR4D	Integrated Agricultural Research for Development
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT-KM	Information and communications technology and knowledge management
IFAD	International Fund for Agricultural Development
IFMS	Integrated Farming and Marketing System project
IFPRI	International Food Policy Research Institute
IFReDI	Inland Fisheries Research and Development Institute
IFMS	Integrated Farming and Marketing System project
IFS	Inshore Fisheries Strategy
IIED	International Institute for Environment and Development
IITA	Agricultural Research for Development in Africa
ILO	International Labour Organization
IRD	Institut de recherche pour le développement

IRDM & PFSP	Integrated Rural Development and Disaster Mitigation and Pailin Food Security Project
IRRI	International Rice Research Institute
IWMI	International Water Management Institute
JCTR	Jesuit Centre for Theological Reflection
JCU	James Cook University
JICA	Japan International Cooperation Agency
LGED	Local Government Engineering Department
LI	Learning Institute
MAFF	Ministry of Agriculture, Forestry and Fisheries
MAL	Ministry of Agriculture and Livestock
MDGs	Millennium Development Goals
MECM	Ministry for Environment, Climate and Meteorology
MFMR	Ministry of Fisheries and Marine Resources
MK1-3	CPWF projects (MK-1 Water Valuation, MK-2 Reservoir management and MK-3 impact of cascades)
MoE	Ministry of Environment
MPs	Mega Programs
MRC	Mekong River Commission
MWCYA	Ministry for Women, Children and Youth Affairs
NACA	Network of Aquaculture Centers in Asia-Pacific
NARs	National Agricultural Research
NCCC	National Commission on Climate Change
NEDA	National Eating Disorders Association
NEPAD-CAADP	New Partnership for Africa's Development- The Comprehensive Africa Agriculture Development Programme
NGO	Non-governmental organization
NRM	Natural Resources Management

NSCB	Philippine National Statistical Coordination Board
NSO	National Statistical Office
OECD	Organisation for Economic Co-operation and Development
OXFAM	Oxfam International
PCAMRD	Philippine Council for Aquatic and Marine Research and Development
PCARRD	Philippine Council for Agriculture, Forestry and Natural Resources and Development
PCW	Philippine Commission on Women
PFSP	Pailin Food Security Project
PIPA	Participatory Impact Pathways analysis
PL	Program Leader
PLARD	Program for Luapula Agricultural and Rural Development
PMC	Program Management Committee
PMCA	Participatory market chain analysis
PMU	Program Management Unit
POP	Program Oversight Panel
PRSP	Poverty Reduction Strategy Paper
RDP	Rural Development Project
RDRS	Rangpur Dinajpur Rural Service
RGC	Royal Government of Cambodia
RinD	Research in development
RPOA/NPOA	Regional and National Plans of Action
SADC	Southern African Development Community
SAVE	SAVE the Children
SAW	Strategy for Agriculture and Water
SDC	Swiss Agency for Development and Cooperation
SEAFDEC	Southeast Asian Fisheries Development Center

SFFSN	Strategic Framework for Food Security and Nutrition
SILIC	Supporting Initiatives for Livelihood Improvement in Cambodia
SPC	Secretariat of the Pacific Community
SRC	Stockholm Resilience Centre
SRF	Strategy and Results Framework
STAR	System for Transparent Allocation of Resources
STEPS	Social, Technological and Environmental Pathways to Sustainability Centre
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WDI	World Development Indicators
ZARI	Zambia Agricultural Research Institute



**Research
Program on
Aquatic
Agricultural
Systems**

The CGIAR Research Program on Aquatic Agricultural Systems is a multi-year research initiative launched in July 2011. It is designed to pursue community based approaches to agricultural research and development that target the poorest and most vulnerable rural households in aquatic agricultural systems. The Program is partnering with diverse organizations working at local, national and global levels to help achieve impacts at scale. The CGIAR Lead Center of the Program is the WorldFish Center in Penang, Malaysia. For more information, visit www.aas.cgiar.org



Find out more by scanning this QR code with your smartphone's QR code reader.

Contact Details

CGIAR Research Program on Aquatic Agricultural Systems
The WorldFish Center
Jalan Batu Maung, Batu Maung,
11960 Bayan Lepas, Penang, MALAYSIA
Tel: +(60-4) 626 1606
Fax: +(60-4) 626 5530
Email: aas@cgiar.org

Design and layout
Communications & Donor
Relations Division
The WorldFish Center
Penang, Malaysia

Photo credits:
Front cover: Eric Baran

This publication should be cited as: CGIAR Research Program on Aquatic Agricultural Systems (2012) Program Proposal, Penang, Malaysia. AAS-2012-07

© April 2012. The WorldFish Center. All rights reserved. This brief may be reproduced without the permission of, but with acknowledgement to, The WorldFish Center.