Value chain transformation: Taking stock of WorldFish research on value chains and markets

CGIAR CGIAR RESEARCH PROGRAM ON Livestock and Fish

CGIAR RESEARCH PROGRAM ON Aquatic Agricultural Systems

VALUE CHAIN TRANSFORMATION: TAKING STOCK OF WORLDFISH RESEARCH ON VALUE CHAINS AND MARKETS

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CONTENTS

LIST OF ACRONYMS

AAC	Aceh Aquaculture Cooperative
AAS	CGIAR Research Program on Aquatic Agricultural Systems
AIN	Aquaculture for Income and Nutrition
BMP	best management practice
BMZ	German Federal Ministry for Economic Cooperation and Development CultiAF Cultivate Africa's Future
EU	European Union
FISH	CGIAR Research Programs on Fish Agri-Food Systems
G9	Generation 9 of the Abbassa improved strain of Nile tilapia
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IDH	Sustainable Trade Initiative
IDOs	Intermediate development outcomes
IEIDEAS	Improving Employment and Income through Development of Egypt's Aquaculture Sector
LCA	Life Cycle Assessment
L&F	CGIAR Research Program on Livestock and Fish
NGO	nongovernmental organization
SDC	Swiss Agency for Development and Cooperation
SILC + GTA	Saving and Internal Lending Communities + Gender Transformative Approach
SILC	Saving and Internal Lending Communities
STREAMS	Sustainable Transformation of Egypt's Aquaculture Market System
USAID	United States Agency for International Development
VC	Value Chain

EXECUTIVE SUMMARY

The goal of WorldFish's research on markets and value chains is to increase the benefits to resource-poor people from fisheries and aquaculture value chains by researching (1) key barriers to resource-poor men, women and other marginalized groups gaining greater benefits from participation in value chains, including barriers related to the availability, affordability and quality of nutrient-rich fish for resource-poor consumers; (2) interventions to overcome those barriers; and (3) mechanisms that are most effective for scaling up of value chain interventions.

This paper aims to promote and document learning across WorldFish's value chain research efforts in Asia and Africa. It has three main objectives: (1) to take stock of WorldFish's past and ongoing research on value chains; (2) to draw out commonalities and differences between these projects; and (3) to provide a synthesis of some learning that can guide future work. It is based on an analysis of the present project portfolio related to value chains and markets implemented by WorldFish, their associated documents, peer-reviewed publications of past WorldFish research, and a workshop with WorldFish's value chain researchers, held on 29 September to 1 October 2015 in Penang, Malaysia, which aimed to answer the following question: "Which value chain interventions have the most potential for equitable and lasting value chain transformation for resource-poor men and women?"

The analysis of WorldFish's publications database focused on science outputs published between 2006 and 2015, tagged with the keywords "value chains," "markets," "certification" and "fish trade." Themes covered in these publications included environmental sustainability and certification issues; impacts from trade on poverty, equity and social relations; value chain governance and institutions not related to environmental sustainability; and gender issues (to a lesser degree). The value chain framework has been quite loosely defined and applied in these publications, and a distinction can be made between projects that aimed to address a value chain research question and those that merely used the value chain approach as a framework for other research. The topics listed as key components of WorldFish's value chain research agenda—gender, innovation platforms, and the testing of suitable models to link smallholders to input and output markets and improve access to inputs and services—do not feature strongly in past research, but have been found to be an important focus of current projects. The shift has been largely a result of the combined focus of the CGIAR Research Program on Aquatic Agricultural Systems (AAS) and the CGIAR Research Program on Livestock and Fish (L&F).

The analysis of the current portfolio of ongoing projects highlights the wide diversity of project and activity objectives—some articulated as long-term development goals, others as more immediate outcomes, as well as the diversity in donor demands. Scope, target population and focus also show great variation as a result of the diversity of donors and their priorities, as well as the participatory approaches used in some projects and the variety of ways in which gender is integrated. The majority of projects tend to focus on the production node of the value chain by supporting access to quality inputs and adopting various approaches to achieve gender equity and empowerment.

The project portfolio also shows great diversity in terms of the outcomes that are targeted, and the causal pathways of how research yields these outcomes have not been clearly articulated in a coherent theory of change. Drawing on project documents and the discussions and stories developed during the value chain workshop, we developed a theory of change with underlying assumptions for four intermediate outcomes. Evidence from a systematic literature review on the impact of value chain interventions provided some support for parts of this theory of change. The four intermediate outcomes were (1) improved access to financial services; (2) improved access to information, extension and knowledge; (3) improved value chain linkages and reduced power asymmetries; and (4) gender-equitable control of productive assets and resources. These outcomes

are stepping stones in achieving the higher-level development goal of poverty reduction in particular, although the gender outcome cuts across all higher-level goals of poverty reduction, increased food and nutrition security, and improved natural resources management. The diversity in project approaches and development objectives may be more effective in achieving these development goals because they can meet the particular requirements of a specific context. However, this diversity also makes drawing conclusions across the project portfolio challenging.

The theory of change for the research that aims at equitably enhancing access to, participation in and benefits from markets is based on the concept of value chain transformation. In the context of our programs, value chain transformation aims to enhance access to value chains for resource-poor and vulnerable value chain actors, notably women, and address the structural barriers that make access to value chains and the benefits derived from them inequitable for these actors. In the present project portfolio, this has translated into seeking opportunities for equitable value chain upgrading and addressing the factors that shape inequalities among actors. These factors relate to power relations, including gender relations, and the distribution of capabilities, assets and resources, access to information, technologies and high-quality inputs. Apart from identifying suitable models that enable resource-poor women and men to derive more benefits from value chain participation, the value chain approaches tested aimed to address underlying constraints in the institutional context that prevent equitable outcomes from being achieved, including policies, rules and regulations, as well as social norms, habits and attitudes, and resulting power dynamics at various levels.

The analysis highlights that, given the wide range of outcomes and approaches used and their inherently place-based nature, it remains difficult to draw any firm conclusions on the most effective approaches for value chain development. Although some commonalities were identified, including the potential to combine transformative approaches—which spark opportunities for locally led shifts in norms and practices towards enhancing gender and social inclusion and equality—with the scaling of technologies and innovations. Building trust and improving chain linkages and relations also seem to be building blocks for value chain transformation.

The broad range of potential research topics that were identified within the theory of change raises a question of prioritization for future WorldFish value chain research. The prioritization needs to be linked to the refreshed WorldFish strategy, and the new CGIAR Research Program on Fish Agri-Food Systems (FISH) needs to be based on recognition of internal research capacity and the highest potential to add value to global development research. The WorldFish strategy refresh was still ongoing at the time of writing this paper; however, it is expected that this strategy will not include new elements that go beyond FISH, although the focus on components of the research agenda may differ from how it has been in the past. FISH has the following overarching research question: "How can we optimize the joint contributions of aquaculture, small-scale fisheries and fish value chains in select geographies to reduce poverty and improve food and nutrition security, while enhancing environmental sustainability?" Research on value chains, markets and trade in FISH seeks to (1) develop aquaculture value chains to enable resource-poor men and women to improve their livelihoods; (2) overcome gendered barriers and take advantage of opportunities in fish value chains; (3) develop value chains to meet the nutritional, product and pricing needs of resource-poor consumers and overcome fish postharvest losses; (4) assess trade along domestic and intraregional small-scale capture fisheries value chains and develop trade policy for those value chains to support poverty reduction and food security; and (5) develop business and entrepreneurial models for scaling. This research reflects the continued relevance of the current value chain research agenda, with some additions—most notably the focus on fish postharvest waste and losses. Going forward, we recommend that the components of the theory of change described in this paper be further developed, the assumptions and supporting evidence be documented and the research hypotheses be refined.

INTRODUCTION

Value chain development has become an important component of programs in agricultural and rural development that aim to reduce poverty and food insecurity. The International Fund for Agricultural Development, for example, reports that 69% of its projects in 2011 were labeled as value chain projects, up from 14% in 2004 (Hartmann et al. 2013). The scientific literature on value chains covers a broad range of topics, including upgrading,[1] value chain governance, issues of inclusion and equity, and mechanisms to improve access to finance, information and inputs, to name a few.

The international agricultural research institutes that are part of CGIAR have also been expanding their value chain research over the last decade. Traditionally, CGIAR social science focused on issues related to technology generation and delivery, in particular related to "the extent of and constraints to adoption; the impacts of adoption on yields and cropping income; and ex-ante returns to new technologies" (Rozelle and Tripp 2007). It has now expanded to cover policy-oriented research on natural resource management, markets and institutions (CGIAR Science Council 2009). WorldFish made markets an explicit part of its research agenda in 2006, when it included the topic in the medium term plan 2006–2008 (WorldFish Center 2006), while value chain terminology was adopted in the medium term plan 2007–2009 (WorldFish Center 2007). A large diversity of bilaterally funded projects that have since been implemented, and more recently AAS and L&F, apply some form of the value chain framework to meet a variety of objectives, covering many of the themes of the academic debate on value chains. This paper aims to make a first step towards drawing out learning across these projects, and has three main objectives: (1) to take stock of WorldFish's past and ongoing research on value chains; (2) to draw out commonalities and differences between these projects; and (3) to provide a synthesis of some learning that can guide future work. The overarching research question that guides this process is "Which value chain interventions have the most potential for equitable and lasting value chain transformation for resource-poor men, women and youth?"

This paper is based on an analysis of the present project portfolio related to value chains and markets implemented by WorldFish and associated documents, an analysis of peer-reviewed publications of past WorldFish research, and a workshop held on 29 September to 1 October 2015 in Penang, Malaysia. The workshop brought together a cross section of WorldFish researchers working on aspects of value chains in AAS, L&F and a number of bilateral projects. The workshop aimed to share and reflect on experiences and approaches used for value chains across locations and document these, as well as to draw out lessons for our future programs.

The remainder of this paper is structured as follows: First, WorldFish's approach to value chain research is summarized, including the overarching research questions and the main features of the research agenda. Then, WorldFish's past and present project portfolio on value chains is presented, based on an analysis of the peer-reviewed literature published between 2006 and 2015, as well as the content of the present portfolio of ongoing projects and initiatives. Subsequently, the paper takes the first steps in developing a theory of change for WorldFish value chain research, starting to unpack selected elements of the impact pathways. Finally, a way forward is presented for WorldFish's research agenda on value chains.

VALUE CHAIN APPROACHES AT WORLDFISH

The definition of a value chain typically used in WorldFish research is *"[…]the full range of activities which are required to bring a product or service from conception, through the different phases of production […], delivery to final consumers, and final disposal after use"* (Kaplinsky and Morris 2001: 4). A value chain analysis or framework considers the actors involved in the value chain, who are linked through the flow of the product under consideration; the chain supporters, who support the chain actors through the supply of services or inputs; and the chain context, in the form of the institutional and policy environment (KIT et al. 2012). Interpreting this framework loosely, a broad range of development interventions concerned with improving the linkages between value chain actors, or between value chain actors and value chain supporters, as well as those focused on improving the chain's enabling environment, can be considered value chain interventions. For research purposes, a particular intervention that is evaluated for its effectiveness as part of a package of value chain interventions that can be applied in combination to achieve development outcomes is therefore considered a value chain intervention. However, in the development context, a single intervention that only addresses a particular issue in a single node of the value chain (e.g. interventions that only focus on providing farmers with access to improved-quality seed) cannot be considered as applying a value chain framework.

The goal of WorldFish's research on markets and value chains is to increase the benefits to resource-poor people from fisheries and aquaculture value chains. The research agenda covers a range of questions, which can be summarized as follows:

- What are the key barriers for favorable participation in value chains of resource-poor men, women and youth? How can these be overcome through value chain, policy and institutional interventions?
- What are the key barriers that keep resource-poor consumers from accessing affordable, good-quality, nutrient-rich fish? How can these be overcome through value chain, policy and institutional interventions?
- What mechanisms are most effective for scaling up value chain interventions?

Photo Credit: Jens Peter Tang Dalgaard/WorldFish

Women fish retailers in Shakshouk, Fayoum, Egypt.

The following principles characterize the current WorldFish research agenda as it has been defined:

- Where appropriate, participatory diagnosis and value chain development methods are used. A range of more formal qualitative and quantitative researcher-led methods are also used to analyze the structure and functioning of value chains and evaluate the impacts of interventions.
- The approaches used are always gender integrated and will, where possible, aim to pursue a gender-transformative approach.
- The facilitation and support of commodity-specific innovation and learning platforms bringing together different value chain stakeholders is used as a major vehicle for pursuing transformation in value chains.
- Value chain research aims to develop and test suitable models to link smallholders to input and output markets and improve the benefits farmers and other resource-poor value chain actors derive from the chain, including the following:
  - mechanisms for the sustainable delivery of good-quality agricultural inputs, finance, and information and extension
  - improved postharvest processing technologies
  - processes to enhance bargaining power and make power relations more equitable
  - improved quality and benefits of employment along the chain
  - value chain upgrading
  - approaches to achieve a more conducive enabling environment for the value chain
  - testing of best-bet interventions (e.g. in fish health, breeding and feed technologies, and management practices in farms and hatcheries).
- In addition, value chain research will start to put a larger focus on resource-poor consumers and how they access fish products. This includes enhancing understanding of the following:
  - where resource-poor consumers buy their products, what they buy and what their preferences are
  - how resource-poor consumers adjust their buying behavior in response to price changes (price elasticities of demand)
  - how intra-household division of food (fish) is affected by changes in product characteristics (e.g. smaller fish).

Photo Credit: M. Yousuf Tushar/WorldFish

Local fish market in Khulna, Bangladesh.

Analysis of science outputs generated between 2006 and 2015

The WorldFish publications database was queried for peer-reviewed science publications (including book chapters and excluding working papers and conference proceedings) using the keywords generated during entry into the database. The keywords "value chains," "markets," "certification" and "fish trade" were included. The years covered in the search were 2006–2015. The analysis excluded more general policy papers related to fish demand and supply, and research on elasticities of demand. A total of 29 unique entries were found after excluding a few entries that were deemed inappropriately labeled; some had more than one relevant keyword attached to them. These articles were categorized into general categories based on journal keywords and a reading of the article. A summary is provided in Figure 1; Annex 1 presents a complete overview.

A number of observations can be made from this categorization. First, the key topics of past WorldFish research have been environmental sustainability and certification issues; impacts from trade on poverty, equity and social relations; value chain governance and institutions not related to environmental sustainability; and gender issues (to a lesser degree). Many of the articles cover more than one of these categories.

The majority of papers on environmental sustainability in value chains relate to issues around certification and how and to what extent this may contribute to improved fisheries management and environmental performance of fish farming (Belton et al. 2011; Bush and Belton 2012; Tran et al. 2012; Bush et al. 2013; Jonell et al. 2013; Eriksson and Clarke 2015). Two of the papers deal with other forms of value chain governance to address environmental concerns in the value chain (Brooks et al. 2010; Perry et al. 2010). These papers also show how the value chain research agenda has been linked to other areas of WorldFish research, in particular research on natural resources management and environmental sustainability.

The research related to the impacts of domestic and international trade on poverty, equity and social relations is quite diverse. There are three papers that specifically examine the issue of transactional sex in capture fisheries value chains in Africa and the effects on the prevalence of HIV/AIDS (Béné and Merten 2008; Nagoli et al 2010; Hüsken and Heck 2012). Three papers deal with issues around inclusion and social and livelihood impacts of aquaculture in three different Asian countries: Bangladesh (Ahmed et al. 2009), Cambodia (van Brakel and Ross 2011) and Vietnam (Belton and Little 2011). Another paper explores a specific capture fisheries global value chain—that of East African Nile perch being traded to the European Union (EU)—and looks at mechanisms to improve the relative income positions of primary producers (Kambewa et al. 2008). The final paper analyzes the potential role that international fish trade plays in

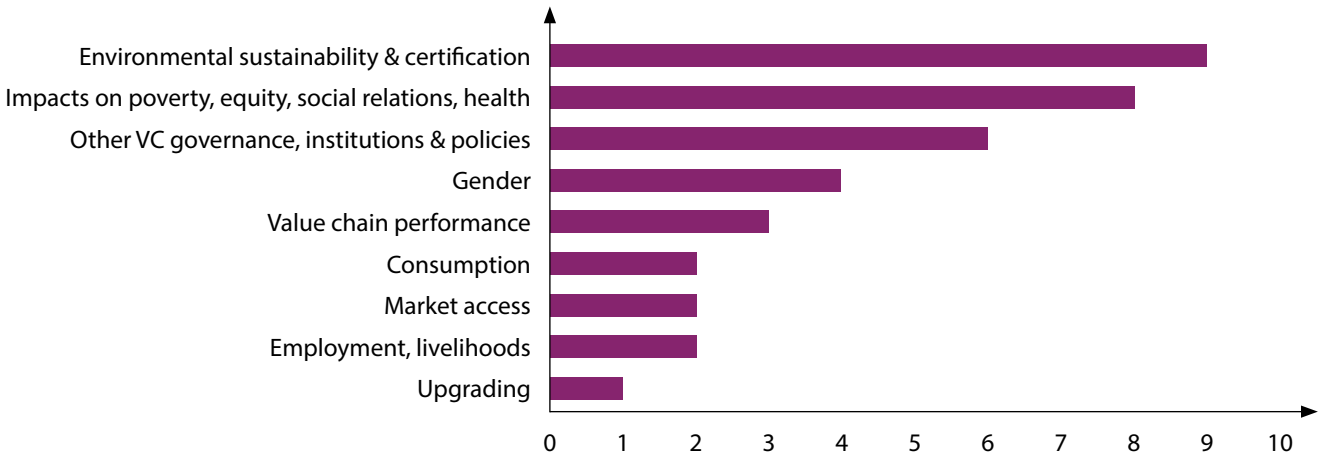


Figure 1. Analysis of WorldFish science outputs on value chains and markets 2006–2015 (N=29).

economic development and poverty in Africa, finding evidence neither of direct negative impacts of international fish trade on food security, nor of any positive pro-poor outcomes (Béné et al. 2010).

Out of the six papers that deal with value chain governance, institutions and policies and are not specifically related to environmental outcomes, two explore food safety outcomes (Tran et al. 2013; Tran et al. 2014), two examine specific value chain governance mechanisms and institutions in aquaculture value chains from Asia into the EU and how these relate to upgrading opportunities (Jespersen et al. 2014; Ponte et al. 2014), and two analyze the (lack of) conduciveness of general policies and institutions, one for aquaculture development in Africa (Brummett et al. 2008), the other for the fisheries of Lake Nasser in Egypt (Béné et al. 2008).

The papers on gender are the three mentioned above that focus on transactional sex in fish value chains (Béné and Merten 2008; Nagoli et al. 2010; Hüsken and Heck 2012) and one that develops a better understanding of gendered employment in fisheries and aquaculture (Weeratunge et al. 2010). Finally, the three papers on value chain performance offer analyses of a particular value chain, specifically the aquaculture and the aquaculture feed value chains in Egypt (Macfadyen et al. 2012; El-Sayed et al. 2015), and a more general description of how the value chain approach can be utilized for the development of small-scale fisheries markets (Jacinto and Pomeroy 2011).

The second observation that can be made from the analysis of publications is that the value chain framework has been quite loosely defined and applied. The projects informing these publications varied greatly in their aims and were not designed to systematically compare and assess the effectiveness of different types of value chain interventions with the same objectives. A distinction can be made between projects that aimed to address a value chain research question and those that merely use the value chain approach as a framework for other research or apply a value chain approach as part of a development project. This makes drawing conclusions about the representativeness, external validity and likelihood of successful replication elsewhere challenging.

Finally, the topics listed as key components of the value chain research agenda—gender, innovation platforms, and the testing of suitable models to link smallholders to input and output markets and improve access to inputs and services—do not feature strongly in past research; however, as will be presented later, they are an important focus of present projects. For example, the start of the CGIAR research programs marked a significant increase in WorldFish's investment in gender research as a research topic in itself, and in particular the experimentation with gender-transformative approaches (Box 1). Gender is also being integrated into other areas of WorldFish research, with the view that closing the gender gap in access to resources, including technologies and knowledge, provides an important contribution

Box 1. The gender-transformative approach

Compared to gender-integrative approaches, gender-transformative strategies bring an additional focus on the following:

- gender relations and the importance of research and development working with both women and men on gender, acknowledging shared and conflicting interests within the home, and responding to the multiplicity of identities shaping women's and men's positions, motivations and opportunities;
- encouraging critical awareness among diverse men and women of inequalities embedded within gender roles, relations, norms and practices and their effects on the well-being of individuals and households;
- locally led identification and testing of locally appropriate strategies and options to enhance roles, relations and norms that foster equity and equality, in such a way as to enable greater and sustained development outcomes.

Sources: AAS 2012; McDougall et al. 2015.

to improving productivity, incomes and food security. The value chain framework is highly suitable for the application of a gender lens and provides ample opportunities to experiment with gender-transformative approaches.

Present CGIAR research programs and bilateral projects

As a next step, the present portfolio of WorldFish projects and CGIAR research programs was analyzed. A short description of each of the projects can be found in Annex 2. Table 1 provides an overview of these projects, their specific activities related to the value chain, the country of implementation, the specific value chain constraint or topic the activity deals with, the particular value chain node of focus, the key approach to value chain interventions and the intended outcomes of the interventions. From this table, the wide diversity of projects and activities becomes apparent, with a range of objectives—some articulated as long-term development goals, others as more immediate outcomes. There is also a great variation in scope, target population and focus. This is in part a result of a diverse range of donors, each with their own set of priorities. It also results from the bottom-up approach used in some cases, ensuring that projects align with community objectives.

To understand this diversity, it is useful to compare the projects in four dimensions. The first axis focuses on the scope of the intervention, ranging from solely research to full-scale development implementation. The second axis is related to the first and assesses the scale of the initiative, ranging from a pilot project in which approaches or interventions are tested for their effectiveness in addressing a particular constraint to the implementation of a proven approach to reach a large number of value chain actors. The third axis refers to the process of identifying entry points for interventions, from a top-down and supply-driven process to a more iterative, participatory and demand-driven identification of entry points for action, using participatory action research methods and involving stakeholders in determining priorities. Related to this is the group of actors or node of focus, with CGIAR research being traditionally focused around the producer's node of the chain. Finally, the fourth axis refers to the approaches used for gender and inclusion, ranging from being gender blind to applying transformative processes. These axes were developed during the value chain workshop. Figure 2 presents the results of this exercise.

Type and scale

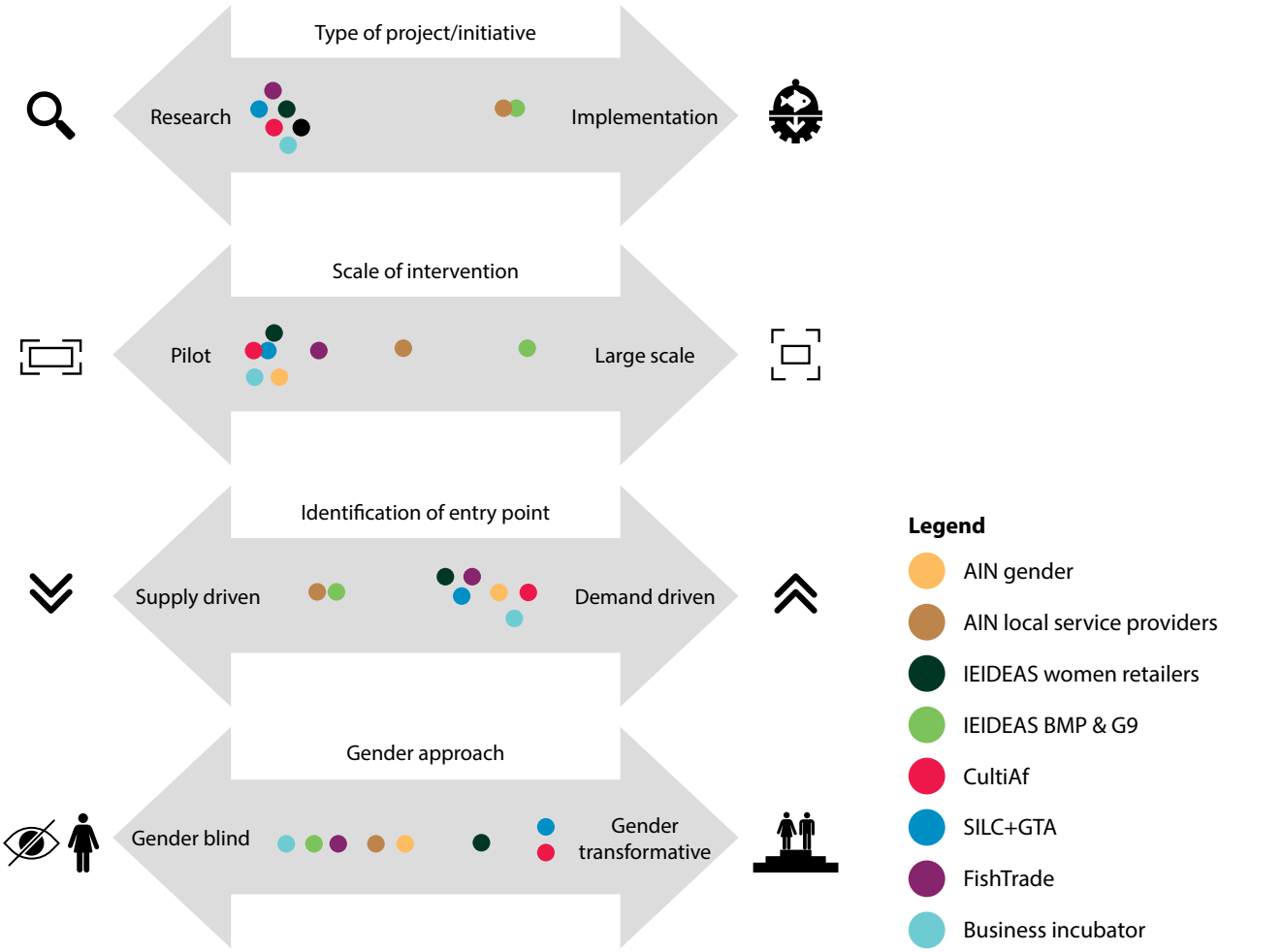
In most cases, research is the main type of initiative implemented, consistent with the research mandate of WorldFish. The type of initiative is closely linked to the scale of the interventions. Pilots and smaller-scale initiatives are more likely to be designed with the specific objective of research and learning, while large-scale interventions are more likely to be implementation-oriented, adopting tested tools and methods. There is often a tension between achieving immediate development results in the lifetime of the project and the timeline that research may need when moving from the development and testing of approaches to large-scale interventions. Moreover, research is often embedded in implementation projects. Collaboration and partnerships with other organizations may create the necessary space for WorldFish to do research on the processes and outcomes of the initiatives while partners scale up and implement researched approaches. It seems that the larger the size of a project and the higher the focus on development implementation, the less likely it is that space for research is created.

An extended partnership approach is also the basis of the FishTrade project, which aims to strengthen the evidence base for coherent policy development at national and regional levels. The research to be conducted in 21 countries by nine universities will substantiate the knowledge on intraregional fish trade and markets, and support the formulation and implementation of appropriate policies, standards and regulatory frameworks to promote intraregional fish trade and strengthen the capacity of private sector associations—in particular of women fish traders—to enhance the competitiveness of small- and medium-scale enterprises engaged in this trade (L.E. Banda, value chain workshop 2015).

Entry points

The next axis refers to the determination of entry points for value chain projects, referring to the methodology used, and in particular the level of participation of value chain actors

or beneficiaries in the process of identifying topics or interventions. A well-recognized and common tool used for determining entry points is value chain analysis. It allows assessment of dynamics between actors, services and their environment. It is useful to uncover challenges and opportunities facing groups of actors, or the sector as a whole, and is used to identify the type, scale and level of intervention for an initiative (Jacinto and Pomeroy 2011). On the supply-driven side of the priority-setting continuum, the funding and/or implementing agencies are responsible for determining entry points. In some cases, calls for proposals from donor agencies may stem from an analysis that has already been conducted (or a perception of what is needed in a particular context). In this case, calls may be prescriptive about what should be achieved and what intervention types are eligible for funding. In other cases, there may be more flexibility for the implementing agency to propose areas of intervention, but organizations may develop projects based on existing strengths or to fit within a particular research agenda or to align with a particular program within the boundaries of what is expected by the donor, or develop a project based on a value chain analysis that is driven by the researchers and does not involve the stakeholders in identification or analysis. In contrast, on the demand-driven side of the continuum are value chain approaches that regard joint analysis and prioritization as the start of an engagement process, which is intended to lead to value chain improvements and development outcomes. Examples of such approaches include the participatory market chain approach developed by the International Potato Centre (Bernet et al. 2006) and the LINK methodology developed by the International Center for Tropical Agriculture (Lundy et al. 2012).



Source: Value chain workshop 2015.

Figure 2. Projects assessed against four dimensions: type, scale, entry point and gender approach.

Project name	Specific activity	Country	Topic	Value chain node	Key approaches to value chain interventions	Intended outcomes
AAS Productivity, Markets and Nutrition Initiative	Savings and internal lending committees + gender-transformative approach (SILC + GTA) initiative in Zambia	Zambia	Foster agricultural investments through access to finance	Production, processing and retail	• Gender-transformative approach combined with training on business skills, investments in agricultural production, processing and retail	• Improved access to finance • Improved agricultural activities through investment in productive assets • Increased equitable household decision-making
L&F Systems Analysis for Sustainable Innovation Flagship	Bangladesh fish value chain assessment and social and gender analysis	Bangladesh	Gender norms and relations combined with technology	Production	• Gender-transformative approach as part of the value chain analysis and development • Aim to develop interventions linked to gender-transformative exercises	• Enhanced economic, social and personal empowerment of women and men • Improved value chain performance
Aquaculture for Income and Nutrition (AIN)	Local service providers model	Bangladesh	Access to quality inputs	Production	• Local service providers model to support producers • Capacity building of a number of actors in the chain, including hatcheries, nurseries, fry and postlarvae traders, and feed millers to provide services to producers • Training of trainers approach	• Increased aquaculture productivity • Increased income • Improved nutritional status
	Gill nets for women		Technology adapted to women	Production	• Technology development adapted to women's needs • Women's empowerment to improve income and nutrition	• Improved income • Improved nutrition
Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS), Sustainable Transformation of Egypt's Aquaculture Market System (STREAMS)	Empowering women fish retailers	Egypt	Women's business skills and tools	Retail	• Community development associations received capacity-building training to help them to support the formation of representative retailer committees and present business plans for interventions for subsidization by the project through small grants	• Increased employment • Improved incomes • Improved nutrition
	Best management practices and improved seed		Productivity of fish farms	Production	• Wide availability of Abbassa strain of tilapia combined with lead farmers training producers in best management practices, a curriculum developed by lead farmers themselves	• Enhanced productivity • Improved yields • Increased employment

Project name	Specific activity	Country	Topic		Value chain node	Key approaches to value chain interventions	Intended outcomes
Reducing Postharvest Fish Losses and Providing Social Change Interventions That Allow for Equitable Access to Processing Technologies Also referred to as Improving Livelihood Security and Gender Relations in Rural Zambia and Malawi through Postharvest Fish Value Chain Innovations and Social Change Interventions (CultiAF)	Postharvest losses	Zambia	Postharvest losses, gender dynamics in fishing camps		Processing, retail and transport	• Participatory action research, the gender-transformative approach and the practical needs approach • Project aims to pilot the technologies in six fishing camps in the floodplain through a participatory action research method that aims to develop ownership of postharvest loss-reducing technologies to men and women and adapting technologies to the local context with a gender-transformative focus on challenging gender roles • Participatory action research method, together with gender-transformative communication tools, challenges people to reduce postharvest fish losses and share the responsibility of processing and trading of fish • Practical needs approach incorporates the basic needs of women in the project without necessarily looking at gender-transformative interventions • Comparison of practical needs approach and gender-transformative approach is assessed to see which has a higher impact on gender relations and postharvest losses	• Reduced biophysical and economic losses of fish • Equitable transformative change for increased incomes
Improving Food Security and Reducing Poverty through Fish Trade in sub-Saharan Africa (FishTrade)	Policy development to support intraregional trade in Africa	All Africa, 4 corridors covering 21 countries	Informal trade, value chain analysis, geographical information systems, policies, nutrition, marketing		All, with a focus on women processors and retailer groups	• Value chain analysis, gender analysis, trade flow study, GPS analysis, economic analysis and policy analysis with the idea that policies can be influenced to support intraregional trade flows • Support to traders, especially female groups, is foreseen	• Strengthened evidence base for coherent policy development at national and regional levels • Enhanced intraregional fish trade • Strengthened capacity of private sector associations to enhance the competitiveness of small- and medium-scale enterprises
Business Incubator	Piloting and testing of an inclusive business model where small producers and the private sector can benefit from business relations	Indonesia	Business relations between producer groups and the private sector		Producers (groups) and private sector operators	• Innovative business model of microfranchising for producer groups to engage with the private sector in a more sustainable manner • Using the cooperative structure in the Aceh Aquaculture Cooperative (AAC) as a platform to engage smallholder aquaculture enterprises in inclusive business partnerships with the private sector • Making use of the partnership to attract formal credit and making use of the brand name of the product	• Improved incomes of smallholder aquaculture enterprises • Development of cooperative farming structure and transitioning this into a more formal profit-making business unit

Source: Value chain workshop 2015 and WorldFish project database.

Table 1. Overview of selected current projects assessed.

The portfolio of WorldFish projects reflects this range in entry points (Box 2). The Cultivate Africa's Future (CultiAF) project is an example of a project resulting from a participatory approach to the identification of entry points into value chain development, while the Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS) project (now Sustainable Transformation of Egypt's Aquaculture Market System [STREAMS]) had a less demand-driven approach. The research-in-development approach, an important component of AAS, seeks "to use research not only as a problem solving device, but more importantly as a device to empower and support people … in a development process that they themselves define" (Apgar and Douthwaite 2013, 3) and uses participatory action research as its main vehicle to achieve this. This has meant that AAS value chain research and development has started with a visioning and prioritization exercise by value chain actors at all levels to create space for people to shape their priorities and articulate their needs and to give greater power and voice to the stakeholders to identify, act on and solve constraints, turning participants into co-researchers. In addition, the data collection process served to collect baseline data.

As part of AAS, a participatory fish value chain analysis was conducted, which brought together value chain stakeholders of various backgrounds, ethnicities and communities to discuss priorities for interventions in the value chain and identified postharvest losses as part of their top five priorities, second after improved fisheries management. This priority was then taken forward in proposal development, which resulted in the CultiAF project. While the process created buy-in and cohesion among stakeholders, the fact that the issue that was addressed was not the first issue on the priority list has given rise to questions from community members (Box 3).

Participatory action research is more likely to be used in pilots or small-scale interventions due to its lengthier process and more intensive

Box 2. Two perspectives on value chain analysis

Implementation of the fish value chain initiative in the Barotse floodplain (Zambia)
In the fish value chain analysis in the Barotse floodplain, an AAS hub, three rounds of data collection were undertaken to capture seasonal changes and dynamics. The preliminary results from each round of data collection were shared and discussed with various groups, including members of the data collection team, key value chain actors, and stakeholders of the fish value chain working group, to allow feedback and learning at different levels. The results were also presented at a participatory planning workshop involving fishers, processors and trader representatives from communities and local markets. These various stages of feedback and reflection helped to develop a more in-depth analysis and build consensus on the research findings and the design of interventions to develop the chain. The identification of priority areas then led to the development of project proposals for funding to address these issues. The CultiAF project and SILC + GTA initiative were developed as a result.

Value chain analysis in the IEIDEAS project
The value chain analysis for the IEIDEAS project used a more hands-off method to identify key indicators, such as that Egyptian aquaculture employs 14 full-time equivalents along the value chain for every 100 metric tons per year of production. Thus, increased production was needed to meet the employment target of 10,000 extra jobs over the project lifetime. A seed value chain analysis then identified the entry point for the dissemination of an improved tilapia strain, developed over a more than 10-year period at the WorldFish research station at Abbassa. Seed was supplied to broodstock multiplications centers (private, large-scale hatcheries) in 2012, which supplied hatcheries with improved-strain seed in 2013, which in turn supplied fish farms with mono-sex Abbassa strain fry to fish farms in 2014.

Source: M Dickson, value chain workshop 2015.

engagement with communities. It is also more suitable for some types of research than others. For example, in research and experimentation on novel grassroots technologies, a participatory action research approach may foster co-learning between implementers and chain actors and foster the social capital and social relations that are often missing from value chain projects. In addition, the participatory action research approach and the ways in which it creates local innovation are still research topics in themselves.

Nodes of focus

Traditionally, CGIAR has had a major focus on agricultural production, especially related to breeding and genetics. In most cases, the project activities are concentrated around the producer node (Figure 3). At node level, many of the interventions focus on training and skills development, such as better production management practices and finance. Because many projects focus on access to quality inputs, complementary work is being done around service provision in the chain, including research and capacity development around the services offered by nurseries and hatcheries.

Gender continuum

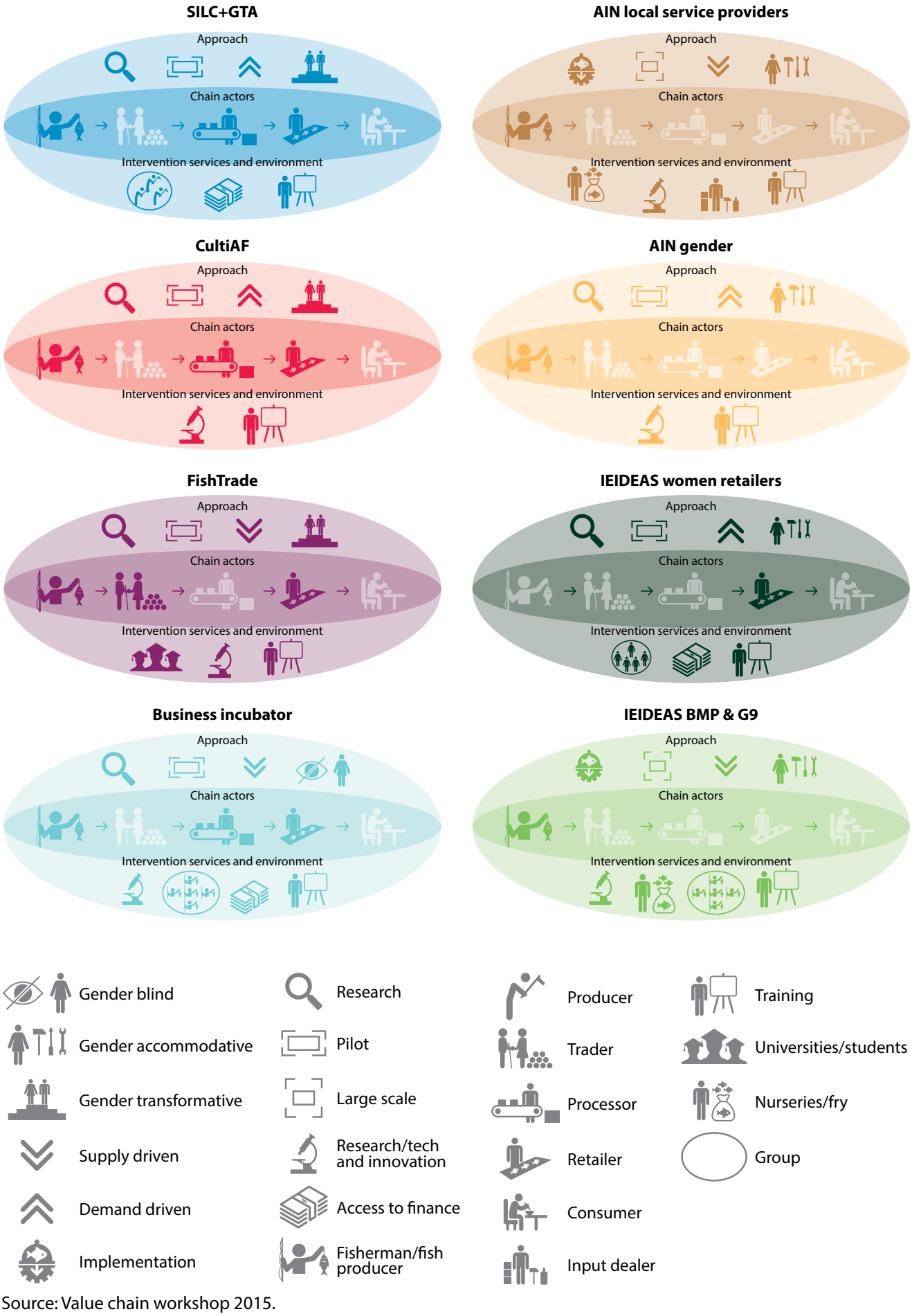
The final axis refers to how gender is included in value chain projects. Concerted efforts have been made to ensure that CGIAR research incorporates gender. At the right-hand side of the spectrum are the transformative approaches that aim to overcome gender inequalities by addressing the underlying

Box 3. We cannot process fish if there are no fish

Although postharvest losses also surfaced as an important issue in the AAS prioritization exercise of the participatory fish value chain analysis, the biggest concern among fishers, processors, traders and other fish value chain stakeholders in the Barotse floodplain was the rapid decline of fish stocks. As a result of the priority-setting exercise, several interest groups were formed around the issues prioritized as part of the fish value chain platform, comprising representatives from the stakeholders present in the priority-setting meeting. A group also formed around the topic of declining fish stocks; however, it was also realized that addressing this issue would require a long time period and a large multipartner approach. The CultiAF proposal was developed with inputs from the processing interest group, and in theory the project should therefore cover one of the main issues in the fish value chain. However, participants in the project questioned this, saying, "If you want to help us, why don't you help us to catch and protect our fish? We cannot process fish if we do not have fish." After participating in the project for a while, however, the enthusiasm of participants has grown as they realized that the postharvest loss technologies were practical tools to help them add value and reduce fishing effort.

An important challenge arising from this experience is that regardless of whether a participatory approach is used to identify priorities, the difference in scope and size of issues identified may mean that a lower-priority issue is tackled first. Donor priorities, stakeholder enthusiasm, the manageability of an issue, and the structure of the program (dividing work under several themes, with fisheries management as part of the governance theme, rather than the value chain development theme) may result in the highest-priority issues not being addressed first. This is sometimes difficult to articulate on the ground. Nevertheless, preliminary observations seem to suggest that a focus on postharvest losses is sparking innovation and participation in the communities. It has started to generate more control of the product and is building capacity for cooperation and forging better relations in the value chain, which can create the social capital that is required for good resource management regimes. It is also starting to lead to improved relationships between communities and the Department of Fisheries, as they are now seen to also assist in the development of the value chain, rather than combatting illegal fishing only.

Source: A. Kaminski, value chain workshop 2015.



Source: Value chain workshop 2015.

Figure 3. Value chain interventions in current WorldFish projects.

rules and norms (Box 4). In the WorldFish project portfolio, there is much diversity in the way gender is addressed. A key principle underpinning the value chain research agenda is that projects should, at the minimum, be gender aware and do no harm. Yet the level of awareness and capacity to deal with gender questions varies greatly across projects, and this is visible from the way they are reflected on the gender axis.

Most projects apply a gender-accommodative approach. Those that aim for a gender-transformative approach are generally smaller in size, as they require piloting new strategies and a longer-term engagement with the same people. WorldFish's gender-transformative work in value chains is still in its early days, and there is still limited published evidence from these approaches. Ongoing research should shed light on which approaches work under what circumstances. The value chain framework is seen as a highly suitable context for operationalizing a gender-transformative approach, as gender inequities are clearly linked to specific constraints and related outcomes in a value chain.

The IEIDEAS project mostly focuses on access to inputs and sustainable fish production at the producer level. In Egypt, virtually all fish producers are men, leaving limited space to work with female stakeholders. However, women are involved in the fish value chain as retailers. Hence, it was decided to work with women retailers to address the key barriers they face in gaining greater benefits from their activities through participation in value chains. The method adopted consisted of working directly with women-only retailer groups. Clusters of women retailers were specifically targeted and supported to form representative retailer committees and present business plans, which could be used to receive small grants. One of them, the Fayoum retailer committee, quickly moved ahead and requested ice boxes and motor-tricycle transport. However, more importantly, they were able to lobby the local authority for a dedicated fish market space in Shakshouk where they could legally practice their economic activities (M. Dickson, value chain workshop 2015). This project is an example of a gender-accommodative approach, where women retailers have been empowered

Box 4. The gender continuum

Gender-blind projects do not attempt to address gender. Instead, they ignore gender implications and assume that gender relations have no effect on who participates in or benefits from a project. Gender-blind projects do not collect gender-disaggregated data and ignore gender considerations altogether.

Gender-aware projects examine gender roles, responsibilities and dynamics between men and women.

Gender-exploitative projects (intentionally or unintentionally) reinforce or take advantage of gender inequalities and stereotypes in pursuit of project outcomes.

Gender-accommodating projects acknowledge gender differences in pursuit of program goals but do not attempt to challenge inequitable gender norms. Instead, they may make it easier for women to fulfill the duties ascribed to them by their gender roles. The practical needs approach is an example of this.

Gender-transformative projects seek to transform gender relations to promote equity as a means to reach project goals. Strategies attempt to overcome gender-related barriers to value chain participation by fostering critical examination of inequalities, shifting the balance of power, the distribution of resources, or the allocation of duties between women and men or between women and service providers. Projects work with both men and women to achieve this.

Source: Adapted from Interagency Gender Working Group, no date.

to stand up for their rights through collective action, but underlying gender norms and rules are not being addressed, and there is most likely limited impact on the level of their control over the benefits derived from their business at the community and household levels.

While a women-only approach proved to be successful in Egypt, similar approaches used in Zambia and Bangladesh have in the past resulted in distrust and insecurity for members of communities that were not included in an intervention, and the likelihood of success of such an approach therefore appears to be highly context specific. The CultiAF project specifically researches the differences between the two approaches, comparing a practical needs approach by itself and in combination with a gender-transformative approach to address postharvest fish losses; both are coupled with technology demonstrations. The practical needs approach is an accommodative approach that focuses on meeting people's needs and livelihood strategies. Initially, an analysis of the needs and constraints of different gender groups in the fishing community was conducted, which informed the subsequent steps in the intervention. In reality, this approach translates into planning meetings close to communities and/or at times when women are free from their household responsibilities (care, cooking). Again, the approach is focused on providing equal opportunity to women and men to participate in and benefit from an intervention but does not change inequities in gender roles or norms. In the case of the fishing camps, the practical needs approach is complemented with gender-transformative communication tools such as dramas and workshops focused on gender, generational and power dynamics. Here the aim is to specifically address unequal gender roles and relationships, and enable the opportunity for women and men to reflect critically on,

Photo Credit: Foto Agencies

Woman with gill net, Bangladesh.

challenge and shift gender norms that create and perpetuate inequalities around these roles in communities. In the context of postharvest losses, the dramas show that if women had some assistance with their daily duties and responsibilities and if they could share the burden of processing fish and household duties, postharvest losses could be reduced and more income could be earned. By linking gender to the goal of the project (reducing postharvest losses), practical examples are showcased to challenge beliefs and norms. This goes beyond empowerment of women in the value chain, tackles issues of agency and opens up ways for men and women to work together to tackle everyday issues. The process is facilitated by trained individuals who guide the groups.

Initiatives in Bangladesh also use gender-transformative approaches to address constraints of women in fish value chains. It is the process that is important, while the skills of and trust in the facilitator are crucial to prevent negative or harmful behavior such as gender-based violence as a result of change processes in gender norms. While there is still limited data available on the impact of the gender-transformative approaches used by WorldFish, early evidence suggests that it is the combination of a technology or other type of intervention and a gender-transformative approach that brings about acceptance of changes in behaviors by sparking constructive, critical reflection among women and men.

The major difference between an accommodative and a transformative approach to gender in value chain research and development appears to rest in the extent of the value chain transformation being achieved. While a gender-accommodative approach may offer opportunities for women to increase their benefits from value chain participation, a gender-transformative approach addresses inequities in relationships in the chain and underlying factors, thus fundamentally expanding the range of options women have. Transformation is not only experienced within the value chain, but norms and traditions are challenged to allow for more equitable relations among members of a community outside of the chain (Box 5).

Box 5. Me, my husband and my in-laws

The Cereal Systems Initiative for South Asia's technology extension package has been re-designed to combine technical aquaculture training with gender-consciousness-raising exercises from Helen Keller International's manual *Nurturing Connections*. Multiple family members are involved, and smaller subgroups are formed to support adoption. "Because our husbands, fathers-in-law and mothers-in-law were included in some sessions, it was easier for them to understand what we told them; they don't create any barriers to our participation," said a woman participant. The training is modularized to interact with different stages of the production cycle and address social issues that may arise as a result of applying new knowledge. Changes in production and knowledge, attitudes and practices (both technical and social) have been monitored among participating women and their spouses through survey research methods and process documentation.

Source: A. Choudhury, value chain workshop 2015.

DEVELOPING A THEORY OF CHANGE FOR VALUE CHAIN RESEARCH AND DEVELOPMENT

The building blocks

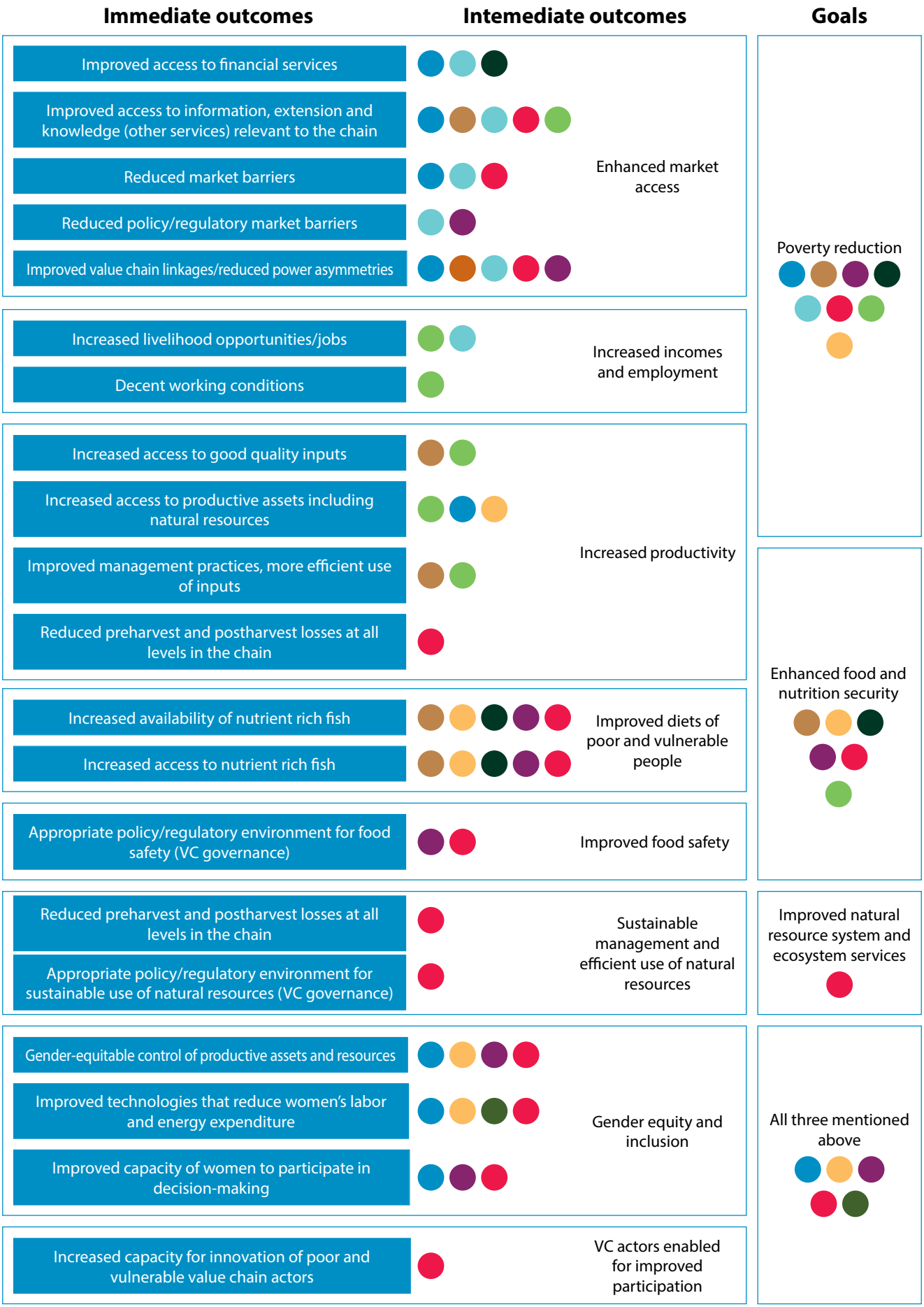
The analysis of WorldFish's past and present research portfolio highlights how a value chain approach can be used to fit many needs and to achieve a diversity of outcomes. The causal pathways of how research yields these different outcomes have, however, not been clearly articulated, including the implicit assumptions behind these causal pathways and whether these are supported by a body of scientific evidence or require further testing. While value chain interventions are inherently place-based, as they tackle particular issues that arise from an analysis of a specific value chain in a particular location with a very specific context, the theory of change behind the use of a value chain approach to achieve a particular outcome should not necessarily be place-based. A uniform theory of change for each of the intended outcomes of a value chain approach will assist to clarify which assumptions are being made, and whether these are supported by existing evidence (generated both by WorldFish and by others) or whether there is a need for further research to test and/or revise these assumptions. A uniform theory of change will provide a better focus for the research agenda as projects can better address particular questions, providing a framework for comparison, and new projects can be more focused on addressing assumptions for which evidence is still weak.

As a starting point for the development of this theory of change for WorldFish value chain research, the key goals and immediate and intermediate outcomes of ongoing value chain research have been identified for the projects analyzed during the value chain workshop (Figure 4). For other projects (presented in Annex 2), the full picture is added in Annex 3. Colored dots in the diagram refer to the specific projects discussed above and the outcomes they aim to contribute to. As much as possible, the terminology has been aligned with the intermediate development outcomes and system-level outcomes of the CGIAR Strategy and Results Framework (CGIAR 2015).

The figure shows that most projects have a range of immediate and intermediate outcomes, and many projects even address more than one goal (or system-level outcome). The goal of improved natural resource management is covered by only one of the value chain projects, indicating a shift away from a topic that was high on the agenda in the past (as shown by Figure 1). This may in part be because of the overall classification of projects; some projects that were not included in the analysis may in fact have components that relate to value chain research that were not picked up in the overall portfolio analysis, while other projects were not represented in the workshop; Annex 2 contains a description of some in the latter category. While this may be an issue for understanding the breadth, scope and relative focus of the project portfolio, their exclusion is of less importance for the purpose of developing the theory of change, as we focus on particular elements that are represented by the projects that were part of the workshop. Moreover, the general trends remain the same when all projects are added to the figure (Annex 3).

Unpacking components of the theory of change

For this paper, we will further unpack the theory of change for a subset of immediate outcomes. The outcomes chosen are those commonly cited as the main barriers to market access for small-scale value chain actors in developing countries; i.e. a lack of market information and knowledge of technologies, weak linkages with other value chain actors, poor input and output markets, and lack of access to credit, which makes it difficult for them to take advantage of market opportunities (Markelova et al. 2009). In addition, we include the cross-cutting issue of gender equity. This subset of outcomes includes those that have the highest coverage in the present project portfolio: (1) improved access to financial services; (2) improved access to information, extension and knowledge; (3) improved value chain linkages and reduced power asymmetries; and (4) gender-equitable



Note: The terminology is aligned as much as possible with CGIAR's Strategy and Results Framework.

Figure 4. Outcomes of value chain approaches used at WorldFish.

control of productive assets and resources. These outcomes are stepping stones in achieving the higher-level development goal of poverty reduction in particular, although the gender outcome cuts across all higher-level goals.

Drawing on project documents and the discussions and stories developed during the value chain workshop, we start to develop a theory of change with underlying assumptions for these four intermediate outcomes, and through the comparison of several projects we test whether the theory of change for a particular outcome is uniform across the project portfolio. If this is not the case, we should either question the validity of the theory of change behind some of our projects or the assumption that value chain research can yield results that are applicable outside of the specific context they were developed in—a key prerequisite for the development of international public goods.

The theory of change for the research that aims at equitably enhancing access to and participation in markets is based on the concept of value chain transformation (Figure 5). In the context of our programs, value chain transformation aims to enhance access to value chains for resource-poor and vulnerable value chain actors, notably women, and address the structural barriers that make access to value chains and the benefits derived from them inequitable for these actors. This means seeking opportunities for equitable value chain upgrading and addressing the factors that shape inequalities in value chains among producers, other value chain actors and consumers. These factors include power relations, of which gender relations are one important subset. In our value chain approach we focus on the distribution of capabilities, assets and resources; equality in decision-making power; equitable access to information, technologies and high-quality

Woman drying fish in a Nyimba fishing camp, Zambia.

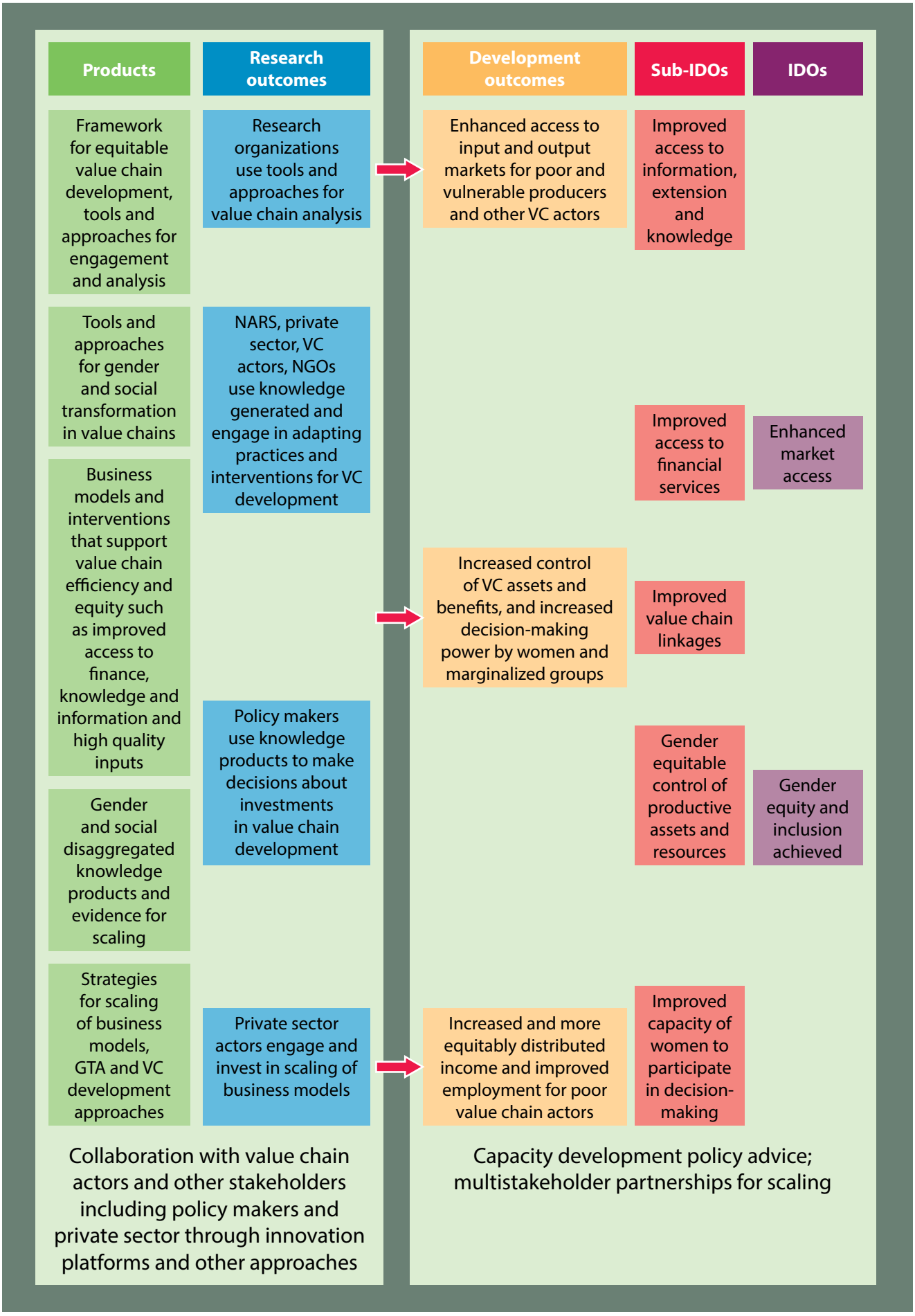


Figure 5. Impact pathways for equitably improved access to value chains.

inputs and the ability to use them; and equitable access to and control over benefits derived from participation in the value chain. This perspective draws heavily on the gender-transformative approach. Apart from identifying suitable models that enable resource-poor women and men to derive more benefits from value chain participation, the value chain approach aims to address underlying constraints in the institutional context of the value chain that prevent equitable outcomes from being achieved, including policies, rules and regulations, as well as social norms, habits and attitudes, and resulting power dynamics. This includes those in the wider context of the value chain as well as at the community and household levels.

Access to capital and financial services are commonly cited by value chain actors as among the main bottlenecks for enhanced participation in value chains. The lack of financial opportunities translates into the inability of actors to seize opportunities and operate to their full potential in markets (KIT and IIRR 2010). Many development programs have experimented with different types of financing models. A systematic review on the topic has shown that these interventions generally result in positive outcomes such as the adoption of technologies and ensuing increases in production, productivity, and/or farm income and profits, although the results are mixed for different groups of beneficiaries (Nankhuni and Paniagua 2013). However, for microcredit to lead to women's empowerment through their control over household spending, it has to be accompanied by behavioral change triggers, related to the way in which microcredit is delivered (Vaessen et al. 2014).

Access to knowledge, skills and different types of information, including market information, are also important limitations. Farmer training has been shown to produce positive impacts on adoption of technologies; however, most of the successful training programs provide training alongside other interventions (such as the provision of credit or in-kind inputs and equipment or infrastructure) to enable farmers to adopt the technology being taught. Adoption of the technology may increase production or productivity and farm profits; however, this also depends on other factors, such as access to markets, the policy environment and political commitment (Nankhuni and Paniagua 2013), highlighting the importance of the more comprehensive view on development issues that the value chain approach can offer.

Communication is also important in establishing and strengthening stakeholder interactions, while reducing knowledge and information asymmetries can empower chain actors (Bode et al. 2008). Limited ability or willingness of actors to share information is often a constraint to knowledge dissemination. Social capital is an important component of access to information; thus, approaches that combine improving the quality of information with the building of trust are more likely to yield positive results. Co-innovation and tailored information are important components of approaches to reducing power asymmetries (Bode et al. 2008).

A key assumption underpinning this theory of change is that pro-poor improvements in the productivity, profitability and adaptability of value chains can only be achieved to their full potential and be sustained in the future if they occur jointly with changes in the social norms and attitudes that underlie inequalities in the access to, the control over and the ability to take advantage of key resources and assets in the value chain (AAS 2012). It is well established in the literature that gender issues shape value chains through behaviors and the distribution of roles, responsibilities, resources, assets and benefits, and have implications for value chains' efficiency and competitiveness. There is a growing body of evidence that addressing gender inequality in value chains improves overall outcomes (USAID no date). The following sections provide examples of how WorldFish projects are tackling different issues that are part of the theory of change to identify whether they are implicitly based on similar pathways.

Improving access to information and knowledge

WorldFish interventions target two types of information: technical (e.g. best management practices, processing technologies, fish nets for women) and, to a lesser extent, access to market information (e.g. markets, prices,

demand dynamics). Technical information is often shared via different types of extension models. The models adopted by current WorldFish projects vary according to the scale of the intervention, but are also influenced by the context in which the projects operate. Projects analyzed during the workshop have a stronger focus on technical information dissemination.

A first model to share technical knowledge and know-how makes use of a training-of-trainers approach and was implemented in Egypt through the IEIDEAS project, which trained a number of farmers who then became trainers for farmers in their vicinity. Working with trusted (lead) farmers in the communities has proven to be a viable approach to reaching producers at scale. The volatile political situation and the inability of nongovernmental organizations (NGOs) to operate in the Egyptian context demanded an alternative solution, and the training-of-trainers approach, in which farmers served as knowledge providers, proved to be effective (Dickson et al. 2016).

The training curriculum was developed in close collaboration with producers to harness local knowledge and ensure that the curriculum was well tailored to the needs of producers. The initial step was to survey Egyptian fish farmers to define their best management practices, complemented by workshops involving key private sector experts. This resulted in verified and contextualized knowledge for the training curriculum. An assessment found that farmers who had adopted best management practices increased their profits from 12% to 30% while also decreasing food conversion ratios. While the adoption of best management practices did not increase production and employment as much as planned, it has led to a successful increase in the benefits to fish farmers in Egypt. This approach also proved successful in reaching a large number of producers (Box 6).

The second model of knowledge delivery is a local service provider approach, adopted by the United States Agency for International Development (USAID)-funded Aquaculture for Income and Nutrition (AIN) project in Bangladesh. This was done after the initial model—the delivery of services by local NGOs to train producers and value chain actors on practices and access to inputs—proved to be challenging. NGO staff had limited time available for such activities, and the approach was costly and unsustainable beyond the project's lifetime. Local service providers are chain actors with whom the project was already working. Using a training-of-trainers approach, the stakeholders were trained to deliver services to the producers through a client-based relationship. The local service providers act as liaisons between farmers and different types of private input supply companies, as well as providing information and support to producers. They are responsible for (1) delivery of training and technical messages to the farmers; (2) developing mechanisms for quality inputs in farmers' locality; (3) expansion of business and income through community services; and (4) awareness raising and network building with the government,

Box 6. Farmers as experts (IEIDEAS project)

- 15 subject areas: site selection to postharvest handling
- 3287 training sessions delivered, each session with around 10 trainees
- 2400 trainees (graduates)
- training cost equivalent to USD 80/farmer
- 2000 fish farmers received best management practice training and/or the Abbassa improved strain of Nile tilapia, achieving much higher net profits (~30%) than the control group of fish farmers (~11%)
- extra profit equivalent to USD 18,000/farm/year
- project beneficiaries achieve food conversion ratios of 1.5:1 compared to 1.8:1 for control group
- use of Abbassa strain resulted in a 12% production increase in 2014.

Source: M. Dickson, value chain workshop 2015.

NGOs and private sectors. To support this process, user-friendly training material was developed, including pictorial posters of practical examples, guidebooks and audio-visual material. The approach is similar to the first model; however, instead of co-designing the information content with producers and training them as trainers, AIN trains existing chain actors, such as nursery operators, fry and postlarvae traders, hatchery operators, feed traders and millers, and input sellers (of lime, fertilizers, chemicals, etc.), among others, to include information delivery in their services offered to producers with the idea that it will become part of their service portfolio. The knowledge delivery helps chain actors to nurture their relations, enhancing not only access to information, but also market linkages and business promotion (M.M. Islam, value chain workshop 2015).

A complete assessment of the approach has not been conducted yet, but the approach seems useful in reaching a large number of farmers, making use of the existing networks and resources in the communities instead of relying on NGO and external staff to conduct trainings. The idea is that the local service providers will become self-sustaining through the services they offer to communities. At this stage, cost-sharing remains a constraint, with the initiative still bearing most of the costs of content development and dissemination by the local service providers. However, some providers are becoming increasingly recognized for their services in the communities and are developing their businesses accordingly. A challenge to this approach is to ensure the delivery of services to a wide range of stakeholders, including women. Most local service providers are men, and their services cater more specifically to male producers. The AIN project is now attempting to find "mobile women"—women who due to their unique circumstances are already more mobile than other women—who could play the role of local service providers that cater specifically to women's needs, with tailored services and knowledge. In addition, male local service providers are encouraged to see female producers as customers for their business (Box 7).

The third and final model for improving access to information and knowledge is the co-innovation approach adopted by the CultiAF project (as described above), embedded in participatory action research. To promote the uptake of new technologies for fish processing, simple demonstrations have been conducted in fishing camps. Much room was left for fishers and processors to experiment with the technologies and find out what works for them. This has resulted in improved technologies that fit the local context, such as adaptations in when technologies can be

Box 7. Changing tactics, learning from local service providers (AIN)

The project has identified some challenges related to the following:
(1) The cost of training materials and leaflets. In future, the local service providers will need to produce materials from their own funds and sell to farmers.

(2) Local service providers' association formation. Capacity building, business promotion and contact with authorities will be more sustainable if the local service providers coordinate their activities within their working area by forming an association.

(3) Training quality. Training by local service providers is challenging, as most of them are illiterate or less educated. Based on the above challenges, the project has revised the local service provider model for 2015–16. The training of the local service providers will be more intensive. A total of 9 days of training (8 hours each) will be provided: 2 days of basic technical skills, 2 days of training on facilitation skills, and 5 full-day follow-up sessions on different topics spread over several months. The trained local service providers will train at least 60 farmers each in 2016, with a total target of 60,000 farmers trained.

Source M.M. Islam, value chain workshop 2015.

used, the materials they are made of and their structural design. This was combined with discussions on needs and opportunities related to fish processing. In this case, a co-learning approach is used to experiment and pilot adapted technologies in the communities, making it possible to deal with questions around suitability and adaptability in specific contexts. The overarching hypothesis is that increased participation will result in increased ownership and adoption (A. Kaminski, value chain workshop 2015).

These three different models, each through a different strategy, aim to enhance uptake of technologies and practices among farmers, with varying levels of co-innovation. The expected outcomes are enhanced productivity and profit margins in the Bangladesh and Egyptian cases, and improved fish processing to enhance incomes and reduce waste and losses in the chain in the Zambian case. This is consistent with the theory of change illustrated above.

Improving access to finance

Informal credit is often the (only) way for smallholder and poorer actors in the chain to access credit, as formal credit is often outside the reach of resource-poor producers without collateral. Informal finance is central to the intervention in Western Province, Zambia. In this case, AAS chose a saving and internal lending community (SILC) approach for the interventions. Through SILC meetings, farmers build trust, learn basic financial literacy skills and improve the group's sustainability. Funds saved are lent to members on a rotating basis. The SILC approach has been implemented with great success in Zambia's Western Province by the NGO Caritas. This success is demonstrated by the large uptake of SILCs, the continuing request for new groups and the records on savings and loans (C. Muyaule, value chain workshop 2015).

The theory behind the approach was that these accessible loans could contribute to investments in productive assets for agricultural activities. However, the short loan repayment period, which is common in saving and internal lending schemes, hindered the use and full participation of members in remunerative agricultural value chain activities. Loans accumulated 20% interest monthly (lower than what banks would charge), making it prohibitive for producers to invest in agricultural activities for which the return on investment takes a few months. As such, members preferred to invest in small businesses (such as petty trade) where they could generate a return within a few weeks to repay the loan. The project put efforts into re-aligning the SILCs with the planting season (October–December). The money raised could be made available to procure inputs and other agricultural products. The rainy season corresponds with the lean period of the year, when farmers' food and financial reserves are depleted, but investments for the next growing season are required. Hence, the lean period is when the SILC groups could support producers to make the most out of their value chain activities. The idea is that, through lower interest rates compared to formal loans and basic training, producers should be enabled to invest in agricultural production and processing of products to improve their livelihoods. Moreover, the cohesion and accountability emerging in the groups seem to be used as leverage for other activities and projects, such as bulking and marketing groups (C. Muyaule, value chain workshop 2015).

A project examining the feasibility of developing inclusive business models is testing innovative ways to support formalization of the business activities of small aquaculture enterprises in Aceh, Indonesia. Currently, small aquaculture enterprises are not positioned to receive funding from commercial sources. They rely on *tokes* (informal credit providers offering loans at usury rates) and a multitude of other services in the communities. Banks and investors have yet to show interest in the small aquaculture enterprises, as they have no proven cash flows and variable product output, in addition to a lack of collateral for loans. The approach involves using the cooperative structure of the Aceh Aquaculture Cooperative (AAC) as a platform to engage small aquaculture enterprises in inclusive business partnerships with the private sector. The model, which is based on microfranchising, includes a strategy to strengthen the AAC to attract investment interest on its own merits. At the same time, the management of the cooperative is accountable to its members and ensures that all members benefit from their

activities. The project will explore the validity of using a microfranchising model between a private sector partner and the AAC to create a mutually beneficial partnership. The objective of this pilot is to foster sustainable and equitable business relations in the value chain. The model is seen as a way to unlock the value held at various levels in the chain by improving transparency and access to information. The idea is to create equity in value chain relations by improving voice, transparency and ownership through market-driven activities and having a clear value proposition for the producers and the private sector (C. Dawson, value chain workshop 2015).

These two very different approaches to improving access to finance are both based on the premise that equitable access to finance is the key to investments in productive assets and enterprise development, along the same pathways as those described in our theory of change. The differences are found in the pathways by which access to credit is enhanced. While the SILC group relies on an informal structure and peer-to-peer accountability, the inclusive business model is experimenting with formalized arrangements between producers and buyers, where accountability is of equal importance.

Improving value chain linkages and reducing power asymmetries through building of trust

Trust is of primary importance for actors to upgrade in the value chain, but also for a well-functioning value chain in general (Drost et al. 2012). Increased levels of trust enable actors to create a shared vision and fuel collective action (KIT et al. 2006). Beyond the value chain, trust and respect in communities can support actors to upgrade their activities, enabling men, women and youth to gain greater benefits from their activities. In order to make value chains more equitable for resource-poor men and women, trust dynamics are tackled at different levels by WorldFish projects, both horizontally and vertically in the chain.

Building trust among actors in different nodes in the value chain

Multistakeholder processes are one way of improving relations among value chain actors (vertical relationships). Innovation platforms have the objective of bringing stakeholders with different interests together to identify, diagnose and solve common problems to improve the functioning of the system. It brings actors together to collaborate and develop trust beyond natural bonds such as family, religion or ethnicity. The outcomes of an innovation platform vary according to the context and the situation. However, access to knowledge and inputs, improved communication among actors, linkages to markets, and collective action are among the expected results (Homann-Kee Tui et al. 2013).

An example of collective action for the benefit of the sector is found in the Barotse floodplain of Zambia, where the innovation platform brings fish value chain actors together. Depletion of fish stocks is a major concern for the communities, which are experiencing increasing difficulties in catching fish for consumption and sale. As a result, the innovation platform is now engaging with and advocating to the Barotse Royal Establishment[2] to ban the sale of small immature fish at the market. The desired result of the process is to curb fishing with illegal nets and protect the ecosystem, allowing enough time for the fish to reach reproductive maturity before being caught (C. Muyaule, value chain workshop 2015).

In Egypt, an innovation platform was established to build the ability and space for innovation among different value chain stakeholders. This included the development of supporting policies and the strengthening of institutions at all levels. The innovation platform is meant to develop and address a commonly agreed-upon set of constraints to improve profitability of existing fish farms, increase employment in the retailing sector and improve the policy and regulatory environment for Egyptian aquaculture (M. Dickson, value chain workshop 2015).

Building trust within value chain nodes

Trust can also be built horizontally, between actors performing the same function in the chain. Trust and collective actions within a node can be a powerful tool to challenge power dynamics in the chain. A group is generally able to make use of collective action to market and bargain their crops together, as well as to access knowledge and inputs. In Egypt, the support

offered to women retailer groups not only led to access to motor-tricycles and ice boxes, but also to improved working conditions. It also provided the groups the leverage and power from within to shift dynamics in the chain and the ability to approach more powerful actors in the chain (Box 8). Other WorldFish projects have also experimented with gender-specific activities, yielding less success. Focusing on women-only groups has, in some cases in Bangladesh, led to some distrust among members of a community because of the perceived exclusivity of the groups (M. Dickson, value chain workshop 2015).

Group dynamics are also an important component of the SILCs in Zambia, described in the section on access to finance on page 31. Working together in saving and lending groups, the members feel accountable to one another by putting in place transparent systems to regulate group activities. The cohesion in the groups creates an incentive to work toward joint benefits. The groups can then be used as platforms to introduce new technologies or to experiment with new initiatives (C. Muyaule, value chain workshop 2015).

In terms of the theory of change, the assumption that improved value chain linkages enhance market access seems to hold true. First, actors who are part of the same value chain node and who share a certain level of trust can engage in collective action such as bulking and marketing, while their joint actions may also improve their bargaining power in the chain. Across the chain, trust among actors enhances and facilitates trade relations. Beyond market access, trust among the value chain actors can trigger collaboration and agreement, which can result in policy dialogue and change.

Enhancing gender-equitable control of productive assets and resources

A study of AAS examined technology and related knowledge-transfer approaches in existing projects in order to support ongoing efforts to integrate gender-transformative approaches with technical interventions. This objective is based on an understanding that interventions that combine technology dissemination with gender-responsive dissemination methodologies will result in lasting productivity, development and equity outcomes (Farnworth et al. 2015). Another study of AAS and the CGIAR Research Program on Climate Change, Agriculture and Food Security that looked into women-targeted technology dissemination concluded that perceptions around women's ability to perform the required tasks due to limitations in knowledge or physical strength may enable men to maintain control over technology use and the related benefits (Morgan et al. 2015). This knowledge was used in the USAID-funded AIN project, introducing improved homestead aquaculture technology. The purpose was to give women an opportunity to increase their income-earning and nutritious food options from ponds located in the vicinity of their homes. The ability to harvest fish is of

Box 8. Retailer empowerment in Egypt (IEIDEAS)

The Fayoum retailer committee was quickly able to place a request for ice boxes and motor-tricycle transport, as well as lobby the local authority for a dedicated fish market space in Shakshouk.

After some staff changes in CARE, the focus of the project switched from business plans and supplying equipment to empowerment training on issues such as decision-making, negotiation skills and responding to day-to-day challenges such as harassment. Also, village savings and loans associations, headed by retailer committee members, were launched in two of the groups.

A sense of empowerment was apparent in most of the groups. The women felt that as a group they were able to stand up for their rights, whereas on their own they were ignored. The village savings and loans associations also proved to be very popular.

Source: M. Dickson, value chain workshop 2015.

key importance to benefit from aquaculture activities. However, when women need to rely on men to harvest their produce, men are more likely to retain control over the produce and its sale (Morgan et al. 2015). Special attention was therefore given to harvest tools, with the aim of developing technologies that suited women's needs and enabled them to collect the fruit of their labor (Box 9). Designing harvesting technology for homestead aquaculture also made it possible for the nutrition and income of the households to be improved (A. Choudhury and H.J. Keus, value chain workshop 2015). A key question to be answered before this technology can be scaled up is whether participants are willing and able to pay for such technologies. An assessment of the enhanced consumption and sales patterns of fish in communities resulting from the use of these technologies is also necessary.

Gender-transformative approaches are used in the SILC approach in Zambia. Caritas has facilitated SILCs in the AAS communities, with AAS experimenting with an approach to improve women's access to and control of loans and benefits derived from activities paid for through these loans. This was done by adding a gender-transformative approach for five of the SILCs and comparing them with five SILCs where this was not done. A baseline and endline were conducted for all 10 SILCs, assessing the outcomes of the gender exercises. The gender-transformative approach meant adding community discussions and dramas on gender roles, norms and traditions to the regular SILC activities (C. Muyaule, value chain workshop 2015).

The CultiAF project is working on understanding and sparking local reflection on gender norms and roles in the fishing camps in relation to equity and outcomes, as well as increasing the ability of women to gain more equitable access to technologies. Through the gender-transformative communication tools and co-learning approaches, women and men are already starting to show an interest in participating and developing technologies. A major challenge to the approach is getting women to join the participatory action research groups in testing processing technologies, while men enroll in large numbers. However, the project can also take advantage of having a high number of men involved in the project to introduce social interventions that may challenge the roles of men and women. Since processing of fish is traditionally a woman's job, including men in the process allows for gender-transformative approaches that challenge men's attitudes and beliefs so that they are able to assist in processing or with other duties, leading to lower losses and higher-quality products.

These three examples of how gender is integrated in value chain projects all tackle different barriers related to equitable value chain participation by women. These examples also show that although gender is defined partly by its context, approaches to tackling participation are not context specific. By focusing on the root causes limiting women's participation, projects are able to trigger transformation in norms and traditions, fostering more equitable value chains.

Box 9. No wet sarees

The USAID AIN project is conducting trials and research with gill nets, which women can easily use without getting in the water in their sarees or exerting too much physical effort. The gill net was designed with these requirements in mind, allowing women to remain on the bank and catch mola, a small indigenous fish. While the net is in the water, women can continue to do their other work. Preliminary results show that a gill net is easy to operate and catches small fish, especially mola, in volumes that can be adjusted by varying the duration the net is in the pond. Women were enthusiastic that with little effort they had access to mola. Separate gender-consciousness-raising exercises have been conducted with men and women to ensure that men in the households have no objections to women performing the new role of catching fish with a gill net.

Source: A. Choudhury and H.J. Keus, VC workshop 2015.

DISCUSSION AND THE WAY FORWARD

Value chain research at WorldFish has taken a variety of forms and has covered a broad range of topics over the past decade. This paper aimed to take stock of the projects implemented and approaches used, identify commonalities and differences, draw out learning for future projects and develop a theory of change. It is useful to reflect on the achievements of past and ongoing projects to inform and shape the future research agenda, in particular at a time when WorldFish is engaging in a strategy refresh, organizational restructuring and the start of FISH.

The categorization of the publications database and the analysis of the present research portfolio along the four selected dimensions have shown the diversity in both past and present work on value chains, both in terms of approaches used and development outcomes aspired to. A shift in focus was triggered by the start of AAS and L&F, such as in terms of the attention given to gender issues in value chains. It is expected that FISH will result in yet another shift, adding more attention to postharvest waste and losses, as well as a particular focus on low-income consumers as a key consumer segment to target through fish value chains.

The goal of WorldFish's research on markets and value chains is to increase the benefits to resource-poor people from fisheries and aquaculture value chains. At the start of this paper, we identified three key areas of research: (1) barriers and mechanisms to enhance favorable participation in value chains for resource-poor men, women and youth; (2) barriers and mechanisms to enhance access and affordability of good-quality fish for resource-poor consumers; and (3) mechanisms for scaling of value chain interventions. This paper has focused particularly on the first topic, as the other two are still relatively new, underdeveloped, and under-represented in past work and present projects.

We have identified several broad categories of approaches and have started to develop these as components of an overarching theory of change. We have unpacked some of the assumptions behind the theory of change and examined the scientific literature to understand whether these assumptions are supported by evidence. What has become clear is that the place-based nature of value chain research and development, as well as the specific characteristics of each separately funded project, makes it challenging to draw conclusions that cut across these projects and contexts. Furthermore, among the broad range of potential research topics that is embodied by this broad theory of change, which ones should be prioritized when research capacity is limited by funding? This decision needs to be based on internal research capacity and an analysis of where WorldFish has the highest potential to add value to global development research in an already crowded field. For example, the topic of access to value chain financing is an area that already receives significant attention from other organizations both within and outside CGIAR. Focusing WorldFish's limited capacity on such a topic may therefore not result in the largest incremental contributions. It is most likely at the intersection of value chain issues with technical issues related to aquaculture, natural resource management issues in capture fisheries, and the area of postharvest waste and losses and food safety where WorldFish can contribute the most. A strong contribution can potentially also be made in the research on gendered barriers to participation in fish value chains, as these chains have particular dynamics in terms of the division of labor and issues around ownership that are unique.

Going forward, there are several important vehicles for WorldFish value chain research. The first vehicle is the WorldFish strategy that, at the time of writing of this paper, was being refreshed. The second is FISH. The proposal that has been submitted for consideration has as its overarching research question, "How can we optimize the joint contributions of aquaculture, small-scale fisheries and fish value chains in select geographies to reduce poverty and improve food and nutrition security, while enhancing environmental sustainability?" Research on value chains, markets and trade in FISH seeks to accomplish the following:

- **Develop aquaculture value chains** to enable resource-poor men and women fish farmers and other value chain actors to improve and stabilize their livelihoods. Research on value chain innovations will seek to translate increases in fish farm productivity into gender-equitable livelihood and nutritional gains. This includes work on access to inputs and services (in particular seed and feed) and the design of profitable and environmentally sustainable fish production systems and value chain interventions that increase employment and income opportunities for resource-poor women, men and youth.

- **Assess gendered barriers and opportunities in fish value chains and address them**. These may include constraining and enabling factors to enhance women's access to and control over productive assets and natural resources; barriers to and opportunities for women's successful wealth generation through entrepreneurship and employment in fish value chains; fit of aquaculture technologies with women's needs and preferences; and strategies to influence the formal and informal gender rules, norms and behaviors that shape the above toward gender equality.

- **Develop value chains to meet the needs of resource-poor consumers** (and understand these needs) and ensure their access to affordable and good-quality, nutritious fish. This includes determining the extent of and factors shaping **postharvest losses**, nutritional degradation, and food safety hazards and risks, and developing ways to overcome these and other **value chain inefficiencies** that reduce the availability and affordability of fish to resource-poor consumers.

- **Assess trade along complex domestic and intraregional small-scale capture fisheries value chains**, and how **trade policy** and other measures can influence the **livelihood and nutritional benefits** of fish from these sources for the resource-poor and marginalized. The aim is to ensure that policy will better sustain the role of small-scale fisheries for poverty reduction and food security. Activities focus on **governance of fish food systems** and alternative future trajectories for selected systems and intraregional trade, examining regulatory and institutional barriers that incentivize unsustainable fisheries exploitation and reduce equitable access to livelihood opportunities.

- **Develop inclusive, gender-sensitive business and entrepreneurial models for scaling** aquaculture technologies and value chain interventions in ways that generate wealth and benefits for smallholder farmers and resource-poor value chain actors.

The above reflects the continued relevance of the current value chain research agenda described in section 2, with one notable addition: the issue of fish postharvest waste and losses in both aquaculture and fisheries value chains. More attention will also be given to the area of value chains for low-income consumers, which we have given limited attention to in this paper. The issues of access to information and knowledge, access to finance, value chain linkages and power asymmetries, and gender-equitable control of productive assets and resources described in more depth in this paper will continue to be of high relevance. Going forward, we recommend that the different components of the theory of change described in this paper be further developed, the assumptions and supporting evidence be documented and the research hypotheses be refined.

NOTES

[1] Upgrading in a value chain is the process of moving to higher value-added activities, using more sophisticated or more efficient technologies and processes, and increasing knowledge and skills, with the ultimate goal of increasing the benefits derived from value chain participation (Gereffi 2005).

[2] The Barotse Royal Establishment is a monarchic institution that is the traditional authority and representative of the Lozi people in Western Province, Zambia. In the context of the Barotse floodplain, the main role of the Barotse Royal Establishment is to oversee the utilization and ownership of all natural resources on Lozi land. The Barotse Royal Establishment shares with the Government of the Republic of Zambia the responsibility of coordinating the management of natural resources, including land, water, forests and fisheries.

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ANNEX 1: ANALYSIS OF 2006–2015 WORLDFISH PEER-REVIEWED PUBLICATIONS

Title	Lead author	WorldFish author(s)	Year	Journal keywords	Topic assessment	Publication type
Chinese market responses to overexploitation of sharks and sea cucumbers	H Eriksson	H Eriksson	2015	Consumption, demand, fisheries, supply, sustainability, trade	Certification, sustainability, governance, trade	Journal article
Value chain analysis of the aquaculture feed sector in Egypt	AFM El-Sayed	M Dickson, GO El-Naggar	2015	Value chain analysis, aquaculture, aquafeed sector, Egypt	Performance	Journal article
The blue revolution in Asia: Upgrading and governance in aquaculture value chains	S Ponte	F Kruijssen	2014	Upgrading, governance, global value chains, aquaculture, Asia	Upgrading, governance	Journal article
The differential effects of food safety regulations on animal products trade: The case of crustacean product trade	N Tran	N Tran	2014	-	Certification, governance, food safety	Journal article
The socio-economic context for improving food security through land based aquaculture in Solomon Islands: A peri-urban case study	N Cleasby	AM Schwarz, M Phillips, J Pant	2014	Mozambique tilapia, fish preference, nutrition, food security	Consumption	Journal article
What shapes food value chains? Lessons from aquaculture in Asia	KS Jespersen	F Kruijssen	2014	Aquaculture, value chains, governance, institutional frameworks, Asia	Governance, institutions	Journal article
Eco-certification of farmed seafood: Will it make a difference?	M Jonell	M Phillips	2013	Eco-certification, aquaculture, seafood, LCA, sustainability, environmental impacts	Certification, sustainability, governance, trade	Journal article
Global food supply: Certify sustainable aquaculture?	SR Bush	B Belton, F Kruijssen	2013	-	Certification, sustainability, governance, trade	Journal article
Governance of global value chains in response to food safety and certification standards: The case of shrimp from Vietnam	N Tran	N Tran, M Phillips	2013	Vietnam, global value chains, shrimp, aquaculture, international trade, small-scale producers, small-scale traders	Certification, governance, food safety	Journal article
Out of the factory and into the fish pond: Can certification transform Vietnamese pangasius?	SR Bush	B Belton	2012	-	Certification, sustainability, governance, trade	Book chapter
Standard harmonization as chasing zero (tolerance limits): The impact of veterinary drug residue standards on crustacean imports in the EU, Japan, and North America	N Tran	N Tran	2012	-	Certification, sustainability, governance, trade	Journal article
The 'Fish Trader+' model: Reducing female traders' vulnerability to HIV	SMC Hüsken	SMC Hüsken, S Heck	2012	Community profiles, fisherfolk, fishing communities, HIV/AIDS, informal sector, Kafue Flats, participatory research, women, Zambia	Gender, HIV/AIDS	Journal article
Value-chain analysis: An assessment methodology to estimate Egyptian aquaculture sector performance	G Macfadyen	AM Nasr-Alla, D Al-Kenawy, M Fathi, H Hebicha, AM Diab, SM Hussein, RM Abou-Zeid, G El-Naggar	2012	Value chain analysis, Egypt, aquaculture, tilapia	Performance	Journal article
Aquaculture development and scenarios of change in fish trade and market access for the poor in Cambodia	M van Brakel	M van Brakel	2011	Aquaculture, market access, poverty, scenarios of change	Market access, inclusion, poverty	Journal article

ANNEX 1: ANALYSIS OF 2006–2015 WORLDFISH PEER-REVIEWED PUBLICATIONS

Title	Lead author	WorldFish author(s)	Year	Journal keywords	Topic assessment	Publication type
Certifying catfish in Vietnam and Bangladesh: Who will make the grade and will it matter?	B Belton	B Belton	2011	Certification, Pangasius catfish, Vietnam, Bangladesh, small-scale producers, sustainability	Certification, sustainability, governance, trade	Journal article
Developing markets for small-scale fisheries: Utilizing the value chain approach	ER Jacinto	ER Jacinto	2011	-	Market access, performance	Book chapter
The social relations of catfish production in Vietnam	B Belton	B Belton	2011	Vietnam, aquaculture, social relations, agrarian change, development, class	Trade, social impacts	Journal article
Whitefish wars: Pangasius, politics and consumer confusion in Europe	DC Little	B Belton	2011	Pangasius, international trade, Vietnam, EU, seafood, risk governance	Certification, sustainability, governance, trade	Journal article
Fisheries, large-scale trade, and conservation of seahorses in Malaysia and Thailand	AL Perry	AL Perry	2010	Hippocampus, syngnathid, trawling, bycatch, traditional Chinese medicine, aquarium fish, CITES	Sustainability, governance, trade	Journal article
Gleaner, fisher, trader, processor: Understanding gendered employment in fisheries and aquaculture	N Weeratunge	N Weeratunge, CP Sze	2010	Africa, aquaculture, Asia-Pacific, employment, fisheries, gender	Gender, employment, retail, processing	Journal article
HIV and AIDS vulnerability in fishing communities in Mangochi District, Malawi	J Nagoli	J Nagoli, K Holvoet	2010	Fisheries sector, HIV prevalence, Lake Malawi, migration, participatory research, small-scale enterprises, transactional sex, usipa, vulnerable groups	Gender, HIV/AIDS, traders, fish for sex	Journal article
Snake prices and crocodile appetites: Aquatic wildlife supply and demand on Tonle Sap Lake, Cambodia	SE Brooks	E Allison	2010	Wildlife trade, conservation, trade regulation, exploitation, crocodile farming, consumer preferences, substitutability, price elasticity	Consumption, sustainability, domestic trade	Journal article
Trade matters in the fight against poverty: Narratives, perceptions, and (lack of) evidence in the case of fish trade in Africa	C Béné	C Béné, E Allison	2010	Food security, international fish trade, poverty reduction, small-scale fisheries, Africa	Trade, poverty impacts	Journal article
Fish trade in Africa: Its characteristics, role and importance	A Gordon	A Gordon	2009	-	Trade	Book chapter
The sustainable livelihoods approach to the development of freshwater prawn marketing systems in Southwest Bangladesh	N Ahmed	E Allison	2009	Bangladesh, market, prawn, sustainable livelihoods	Livelihood impacts	Journal article
Improving income positions of primary producers in international marketing channels: The Lake Victoria EU Nile perch case	E Kambewa	E Kambewa	2008	Sustainability, distributive justice, marketing channels, case study research	Income distribution, equity, governance, trade	Journal article
Liberalization reform, 'Neo-centralism', and black market: The political diseconomy of Lake Nasser fishery development	C Béné	C Béné, B Bandi	2008	Small-scale fisheries, governance, political economy, economic reform, Africa, Egypt	Institutions, policy	Journal article
Women and fish-for-sex: Transactional sex, HIV/AIDS and gender in African fisheries	C Béné	C Béné	2008	Artisanal fisheries, vulnerability, poverty, public health, Africa	Gender, poverty, HIV/AIDS, traders, fish for sex	Journal article
African aquaculture: Realizing the potential	R Brummett	R Brummet	2008	Fish farming, development	Policy, institutions	Journal article

ANNEX 1: ANALYSIS OF 2006–2015 WORLDFISH PEER-REVIEWED PUBLICATIONS

ANNEX 2: OVERVIEW OF PRESENT AND RECENT WORLDFISH PROJECTS

Project name	Description	Country	Donor	Duration
Ongoing projects				
Aquaculture for Low Income Consumers (AquaLINC)	This project aims to increase supplies of more affordable and more nutritious fish for resource-poor consumers. This will be achieved by exploring innovative production strategies aimed at producing smaller-sized tilapia (that are less expensive per weight unit than those produced to a larger size) and testing alternative approaches to feeding fish to improve the nutritional quality of fish for human consumption.	Bangladesh, Egypt	German Federal Ministry for Economic Cooperation and Development (BMZ)/Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	January 2016–December 2018
WorldFish Business Incubator	The WorldFish Incubator seeks to boost aquaculture productivity and efficiency and help communities reliant on fish as a major source of income and nutrition by assisting the development of small and medium enterprises that form a crucial element of global fish production. With demand for fish rising along with population growth, this program supports startup small and medium enterprises in the adoption of sustainable technologies to help them achieve their potential. It provides the kinds of knowledge-sharing support they need to scale up: access to capital, business management expertise and the technical know-how to make a positive impact on local economies while fostering practices that preserve valuable ecosystems. The expansion of the WorldFish Incubator program will see USD 10 million invested in small and medium enterprises by 2020.	Indonesia	Aqua-Spark	January 2015–December 2018
Promoting Inclusive and Sustainable Growth in the Agricultural Sector in Cambodia	As part of a wider EU-funded project to improve food security for the people of Cambodia, this project focuses on the fisheries and livestock sectors and aims to promote inclusive and sustainable growth in aquaculture and fisheries for the resource-poor. This important subcomponent of the program seeks to develop and modernize the fisheries sector, improve productivity and efficiency in aquaculture, look at ways of enhancing the value chain for the benefit of communities, and reinforce Cambodian fisheries administration management capacities. In addition, grants will be made to support the emergence of strong local partners in the sector and local conservation projects.	Cambodia	European Commission	July 2014–June 2018
Sustainable Transformation of Egypt's Aquaculture Market System (STREAMS)	This project aims to increase production of inexpensive, nutritious and safe fish from sustainable aquaculture systems to help improve the health and nutrition of Egypt's resource-poor while creating employment and increasing incomes along the aquaculture value chain. STREAMS builds on the significant gains realized in sustainably transforming Egypt's aquaculture market system through the Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS) project.	Egypt	Swiss Agency for Development and Cooperation (SDC)	December 2015–December 2017
Improving Youth Employment in Aswan, Egypt (YEAG)	This 3-year project, funded by the Swiss Agency for Development and Cooperation (SDC) and led by CARE, aims to increase youth employment in areas of Egypt badly hurt by the downturn in tourism. WorldFish will deliver the fisheries and aquaculture components of the project, including support for the development of aquaculture, value addition for fisheries products and improved fisheries management in Lake Nasser. The project will establish an agriculture support center covering a range of fish, livestock and horticultural value chains, creating 2500 jobs for women and youth in this area of high unemployment.	Egypt	SDC	November 2014–October 2017

ANNEX 2: OVERVIEW OF PRESENT AND RECENT WORLDFISH PROJECTS

Project name	Description	Country	Donor	Duration
Ongoing projects				
Reducing Postharvest Fish Losses and Providing Social Change Interventions for Equitable Access to Processing Technologies (part of the CultiAF fund)	This project aims to gain an understanding of the value chain to develop postharvest loss reduction strategies and technologies to reduce biophysical and economic losses and build equitable transformative change for increased incomes.	Zambia, Malawi	International Development Research Centre	October 2014–March 2017
Improving Fish Production, Consumption and Nutrition Linkages for the Poor	Focusing on Bangladesh and Zambia but with a global scope, this project aims to find ways to meet the food and nutrition needs of the resource-poor, particularly women and children, by gaining valuable insights into fish consumption patterns. It seeks to quantify the contribution of fish and fish products to the diets of resource-poor men, women and children and examines existing aquaculture systems and value chains with respect to the food and nutritional requirements of resource-poor consumers. It studies the development of future fish supply and demand structures that reflect the dietary needs of resource-poor households and identifies sustainable production systems that better respond to future needs.	Bangladesh, Zambia	BMZ/GiZ	March 2014–February 2017
Improving Food Security and Reducing Poverty through Fish Trade in sub-Saharan Africa	The project seeks to improve sub-Saharan food security through the promotion of trade in fish and fish products within the region and beyond. It aims to strengthen the capacities of regional and pan-African organizations to integrate intraregional fish trade into their development and food security policy plans. It builds a knowledge base of the structure, products and value of intraregional fish trade and formulates recommendations on policies, certification procedures, standards and regulations. The project will prioritize how the private sector and women can become more engaged in trade opportunities.	Africa	European Commission	January 2014–December 2017
Farmers in Transition	This project aims to introduce a quality certification scheme for farmed tilapia to improve the image and quality of farmed fish reaching Egyptian consumers. In collaboration with a fish farmer producer organization and an international certification organization, the project will develop and audit standards for key actors in the value chain.	Egypt	Sustainable Trade Initiative (IDH)	September 2015–August 2017
CGIAR Research Program on Livestock and Fish (L&F) Systems Analysis for Sustainable Innovation Flagship	L&F conducts research on fish value chains in Egypt and Bangladesh. Value chain research and development aims to enhance productivity and remove obstacles that prevent value chains from providing high-quality and affordable food for resource-poor consumers, including those in urban areas, while improving incomes and livelihoods of small- and medium-sized value chain actors along the value chain.	Bangladesh, Egypt	L&F	2012–2016
Feed the Future Aquaculture for Income and Nutrition (AIN)	This project tests technical and institutional options to improve productivity in aquaculture. The value chain improvements mainly relate to improved access to high-quality seed and other inputs, and the project tries to do so in a gender-inclusive manner.	Bangladesh	USAID	October 2011–September 2016

ANNEX 2: OVERVIEW OF PRESENT AND RECENT WORLDFISH PROJECTS

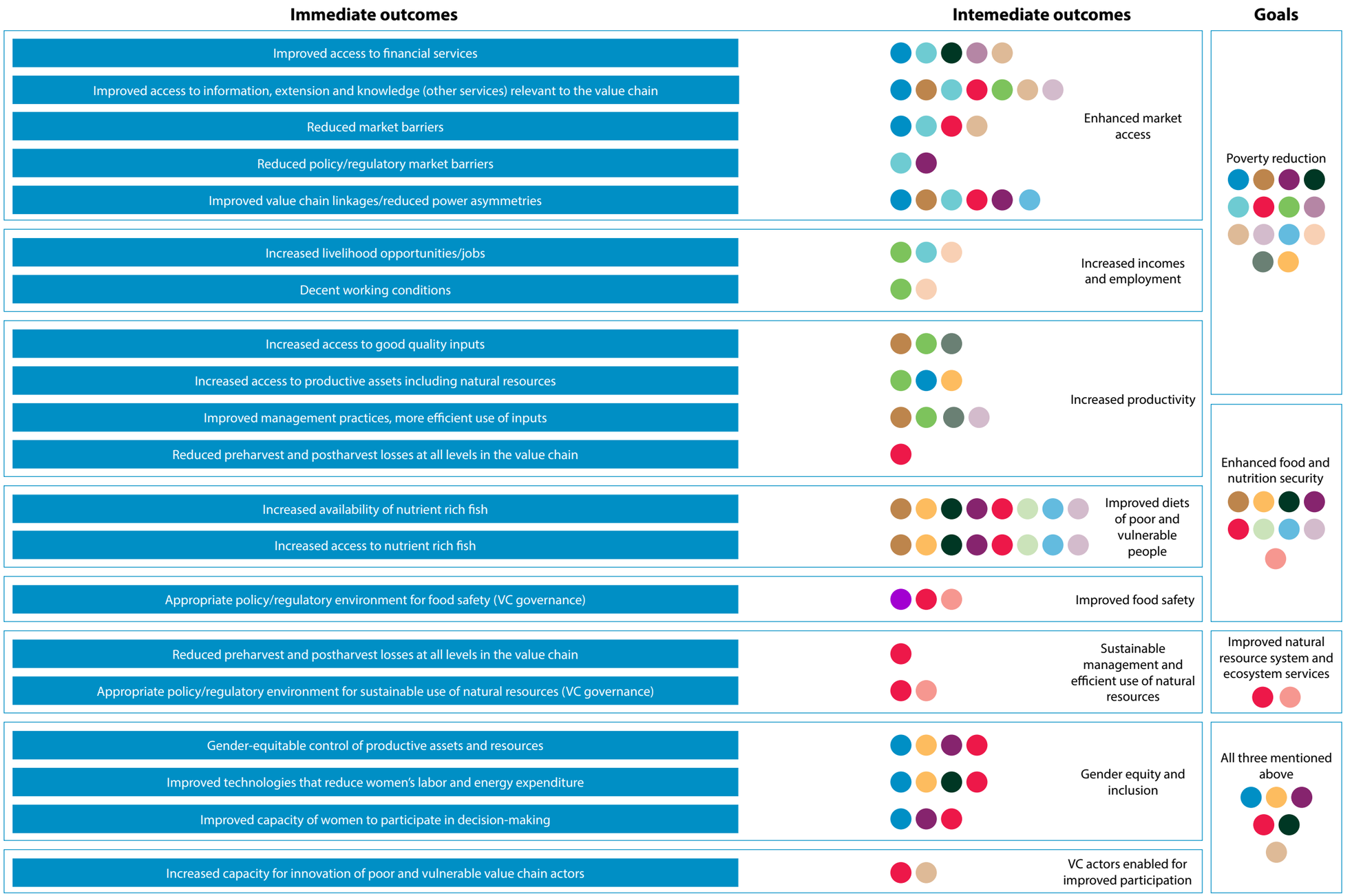
Project name	Description	Country	Donor	Duration
Ongoing projects				
Building Trade Capacity of Small-Scale Shrimp and Prawn Farmers in Bangladesh	WorldFish and the Government of Bangladesh have come together to develop effective "bottom of the pyramid" solutions for small-scale shrimp and prawn farmers to comply with the World Trade Organization's agreement on the application of sanitary and phytosanitary measures (WTO/SPS) and the related Codex Alimentarius Commission and World Organisation for Animal Health (OIE). The project aims to help small-scale shrimp and prawn farmers work collaboratively and scale up their collective participation in export market value chains. The project also focuses on food safety, animal health and environmental and social issues associated with shrimp and prawn production.	Bangladesh	Food and Agriculture Organization of the United Nations	November 2013–September 2015
Reducing Undernutrition and Poverty through Aquaculture in Timor-Leste	Extreme poverty and food insecurity are stark facts in the lives of many people living in rural Timor-Leste. This project aims to improve nutrition security and increase incomes for approximately 1500 farming households in six rural districts of Timor-Leste by promoting freshwater aquaculture. Additionally, the project aims to increase awareness about good nutritional practices and the importance of fish and other nutritious foods, such as orange-fleshed sweet potatoes, leafy greens and legumes. The project encourages economic linkages through fish traders and input providers and, where feasible, through the inclusion of fish in school feeding programs.	East Timor	National Institute of Water & Atmospheric Research Ltd	January 2014–June 2016
Projects that have recently ended				
CGIAR Research Program on Aquatic Agricultural Systems (AAS) Productivity, Markets and Nutrition Initiative	The equitable markets initiative in AAS aimed to contribute to the achievement of the hub development challenges of the respective hubs. In each hub, community priority processes have identified key commodities for value chain research and development. Examples of initiatives that are part of AAS's access to markets theme are the SILC + GTA initiative in Zambia and the technology review in Bangladesh (Morgan et al. 2015).	Zambia	AAS	2015–March 2016
Market Development for Quality Feed Production in Bangladesh (MDQF)	This project supported the upgrading of skills and capacity in the feed sector by working closely with the private sector to train feed mill technicians on fish nutrition, feed formulation and optimal selection and operation of milling machinery. The project also worked to develop new operators of small semi-automatic feed mills as rural entrepreneurs who can produce feeds on farm for their own use and for sale to neighboring commercial smallholder producers, while linking them to feed ingredient suppliers, machine workshops and potential customers. The project also analyzed the nutrient content of a variety of potential alternative feed ingredients locally available in Bangladesh. Enhancing the supply and quality of feed in this manner and reducing production costs through increased production efficiencies will enhance farmer access to feeds and increase feed-use efficiency, making intensification of production more affordable and attractive to smaller producers.	Bangladesh	Katalyst	October 2014–August 2015

ANNEX 2: OVERVIEW OF PRESENT AND RECENT WORLDFISH PROJECTS

Project name	Description	Country	Donor	Duration
Projects that have recently ended				
Mobile Solutions Technical Assistance and Research (mSTAR)	Funded by USAID and implemented by FHI 360, this project aimed to increase people's knowledge of mobile technology among resource-poor, civil society, local government institutions and private sector stakeholders. Through a grant provided by mSTAR, the USAID AIN project piloted the use of mobile financial services in southwest Bangladesh. The people living in remote areas of Bangladesh, who have no access to traditional banks, are experiencing a new way of receiving money, saving and paying instantly. The project focused on women farmers to increase their access to agriculture services. Local capacity building, awareness raising, technical assistance and sustainability were key activities in this project.	Bangladesh	USAID	April 2014–April 2015
Improving Employment and Income through Development of Egypt's Aquaculture Sector (IEIDEAS)	This project aimed to make a positive impact on communities in Upper Egypt through the introduction of improved tilapia strains with greater yields, training of small-scale aquaculture businesses in best management practices, and improving conditions for women fish retailers. Investment was targeted at key areas of production and retailing with the aim of boosting employment, especially for women. The project also worked at a national level to influence policy and bolster Egypt's ability to manage change. It has been followed by the STREAMS project since December 2015.	Egypt	SDC	December 2011–December 2015
Sustainable Shrimp Farming in Aceh, Indonesia	Since 2007, WorldFish has been working with the farmers of the Aceh region of Indonesia. In 2014, it launched a project to develop shrimp farming and improve the livelihoods of some of the area's poorest farmers. Working with the Aceh Aquaculture Cooperative (AAC), the aim was to lend technical and financial support to promote sustainable and responsible shrimp farming. Its goals were to improve the commercial capacity of the AAC through sharing practical knowledge, building capacity and imparting the business skills required to manage an ongoing enterprise; to facilitate further AAC investment in member farms; and to reach 1500 farmer members producing product for the export market. The WorldFish Incubator, working with the AAC, provided technical and business management support.	Indonesia	IDH	February 2014–December 2015

ANNEX 2: OVERVIEW OF PRESENT AND RECENT WORLDFISH PROJECTS

ANNEX 3: OUTCOMES OF VALUE CHAIN APPROACHES USED AT WORLDFISH: ALL PROJECTS



ANNEX 3: OUTCOMES OF VALUE CHAIN APPROACHES USED AT WORLDFISH: ALL PROJECTS

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About the CGIAR Research Program on Aquatic Agricultural Systems
Approximately 500 million people in Africa, Asia and the Pacific depend on aquatic agricultural systems for their livelihoods; 138 million of these people live in poverty. Occurring along the world's floodplains, deltas and coasts, these systems provide multiple opportunities for growing food and generating income. However, factors like population growth, environmental degradation and climate change are affecting these systems, threatening the livelihoods and well-being of millions of people.

The CGIAR Research Program on Aquatic Agricultural Systems (AAS) seeks to reduce poverty and improve food security for many small-scale fishers and farmers depending on aquatic agriculture systems by partnering with local, national and international partners to achieve large-scale development impact.

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