Working Paper: AAS-2013-05

Ex-ante impact evaluation: case studies from Malawi, Bangladesh and Ghana

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Introduction and summary

This document presents ex-ante impact evaluations of research for development projects related to aquaculture in Bangladesh, Malawi and Ghana. The Ghana chapter also includes an ex-ante evaluation of a fisheries project. The case studies utilized preliminary versions of guidelines developed specifically for ex-ante evaluations of aquaculture and fisheries projects. The guidelines, found in *A Practical Guide for Ex-Ante Impact Evaluations in Fisheries and Aquaculture*, are designed to provide an approach for a qualitative examination of the potential for a project to deliver impacts. Using a conceptual framework based on the outcome focus of results-based management, the guidelines stress careful examination of the setting, internal consistency, a sound theory of change, and an examination of stakeholders' interests and potential partnerships.

Two of the case study teams utilized existing projects and their proposals as the basis for analysis. The Ghana team formulated a new proposal as part of the case study. In each case, the teams gathered information through secondary data sources, existing literature, and interviews with key stakeholders. Feedback from the case study teams provided for improvements in the design and content of the guide.

The case study reports illustrate the variability with which the guidelines may be interpreted and applied. The different teams, operating with limited time and budget that constrained the collection of new data, were forced to utilize existing secondary data and information and consult with key stakeholders to complete their analyses. The varying levels of reporting reflect the differences among the cases in the amounts of existing information and variety of stakeholders potentially involved in the projects being examined.

The case study reports are a type of proposal evaluation. Their utility is that of an external pair of eyes checking the work of a proposal development team in a step-by-step sequence that pressure tests the internal logic and assumptions of the project team. These reports, though conceived as an exercise for testing and providing feedback on the guidelines, illustrate the complex nature of what might be considered a straightforward technology-centric project. Modern development exists in a setting where there are multiple additional efforts and multiple stakeholders with sometimes competing positions. Accounting for these is a key element for the success of a proposed project.

EX-ANTE IMPACT EVALUATION, BANGLADESH CASE STUDY

Aquaculture intensification in southwest Bangladesh

Ben Belton and Khondker Murshed-E-Jahan

Introduction

This case study presents an ex-ante evaluation of a set of development interventions planned under the USAID-funded Cereal Systems Initiative for South Asia (CSISA), implemented in Bangladesh. WorldFish is one of three implementing partners in CSISA, the other two also being CGIAR centers; namely, the International Rice Research Center (IRRI) and the International Maize and Wheat Improvement Center (CIMMYT). The five-year project has been underway for one year, and at the time of the case study, planning preparations were being made for the second year, running from October 2011–September 2012. The range and scope of activities covered by the project as a whole are very large (reflecting its total budget of US$25 million). In order to make the analysis presented below more manageable, this case study focuses on the evaluation of interventions which WorldFish plans to implement in Jessore. (Jessore is one of six geographical working areas, or "hubs," in which CSISA is operating.) Of these interventions, this case study focuses specifically on the subset designed to bring about improvements in agricultural productivity. These account for the majority of interventions planned under the 2011/12 work plan. The analysis presented in the following section assesses the logic of this set of interventions mainly with reference to the work plan and outcome logic model for Jessore hub developed at planning workshops in September 2011, as these are clearer and more fully articulated than those of the original project proposal.

Module 1: Check the intervention logic

What is being evaluated?

Figure 1 below provides a simplified visual representation of the intervention logic for a series of activities and outputs that contribute to the outcome of increased on-farm productivity. (Three other outcomes were also identified during the planning process; namely, increased livelihood opportunities in agricultural value chains, improved household nutritional status, and enhanced capacity of CSISA partner institutions to deliver better services. The activities and outputs associated with these outcomes, which are less numerous than those feeding into increased agricultural productivity, are not included in the analysis presented here.) The work plan developed by Jessore hub staff for outputs and activities pertaining to increased agricultural productivity is also somewhat more complex than is represented in the diagram below, which has been simplified for clarity of presentation and to minimize the need to repeat the inclusion of similar activities.

An overarching narrative describing the outcome logic presented in Figure 1 could read as follows:

> Increases in on-farm productivity are crucial to bringing about sustainable, long-term reductions in poverty and hunger. The quickest and most effective way to bring about increases in on-farm productivity is through the introduction of proven technologies using on-farm demonstrations as a means of facilitating training, which will result in wider adoption of said technologies in the target area. Increases in farm productivity may also be supported by adaptive research aimed at fine tuning technologies with as yet untapped productive potential and through actions taken to strengthen the capacity of suppliers to deliver high-quality inputs.

How will the project make its impact on poverty?

The primary transmission channel by which it is envisaged that the project will make an impact on poverty is through assets. Specifically, it is envisaged that the skills and knowledge of project clients will be strengthened through training and demonstrations. In some cases, this knowledge may be translated into increased physical capital (through, for instance, improvements to pond or converted rice field (*gher*) dikes which allow horticulture to take place). More fundamentally, it is anticipated that building human capital will catalyze increases in financial capital through higher farm revenues. It is also anticipated that certain outcomes (particularly those relating to production of nutrient-dense fish and vegetables) will result in enhanced human capital in the form of improved nutritional status among members of client households. Participation in groups formed to promote technology dissemination might promote enhanced social capital in some instances, particularly for women if their participation results in subsequent successful adoption of promoted technologies, but this is by no means a primary outcome. Employment might also serve as a secondary transmission channel for poverty reduction should production gains for commercial operations be of sufficient magnitude to stimulate expansion warranting the employment of additional hired labor and should efforts to strengthen input supply-side value chains create significant additional demand for related services.

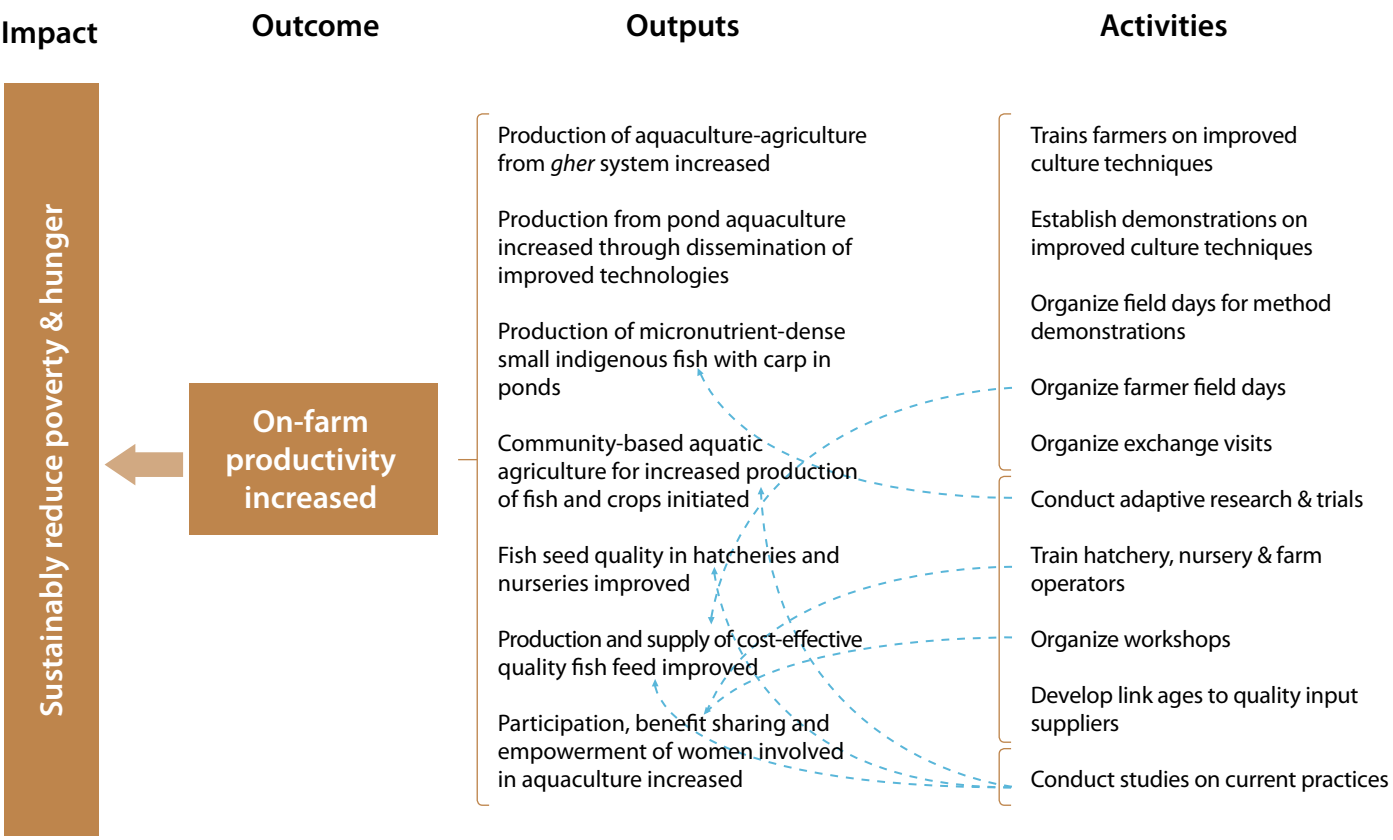

Figure 1. Simplified representation of change pathways for CSISA-WorldFish Jessore hub pertaining to the outcome of increased on-farm productivity.

What dimensions of poverty are being targeted?
The ultimate intended project impact is that of the overarching Feed the Future[1] goal: to "sustainably reduce poverty and hunger" (Figure 1). However, mechanisms for poverty alleviation are not prominently addressed in the project proposal except in rather general terms. An important intermediate impact flagged in the proposal that has a rather more imperative bearing on its modus operandi is that "by the end of the project in Year 5, the project will reach 60,000 direct client households across six hubs, with net income increases of US$350/household from project inception" (IRRI, p. 16). The size of the increase in income required means that by definition it is problematic for the project to concentrate a major portion of its efforts on working with those with limited physical assets (land), although the relatively high value of aquaculture, as compared to cereal cultivation, means that there may be more scope for WorldFish to work with clients who are relatively more asset poor than those of its partners. It is assumed that there may be spillover effects as secondary adoption occurs among households not directly involved in the project who may operate from a lower income base than direct clients themselves. The basic measurement of what is to be assessed is therefore productivity increases, as well as imputed income gains. Aspects of interventions designed to promote improved household nutrition security (e.g., cultivation of vegetables in home gardens and on pond and *gher* dikes, and small indigenous nutrient-dense fish species) explicitly target nutrition security, particularly that of women and children.

Who are the target beneficiaries?
The direct target group is made up of 1862 farm households within Jessore hub, specifically in the following areas: in four unions of Monirampur upazila and two unions of Avoynagar upazila (both in Jessore district), two unions of Kaliganj upazila, Jhenaidah district, and three unions of Narail Sadar upazila in Narail district. Although the proposal places significant emphasis on gender inclusiveness, and training is to be delivered through a "whole family approach" wherever possible, there are no gender-disaggregated goals in the work plan with regard to the numbers of men and women who will receive training or other support. There is no specific requirement in the project proposal for intra-household impacts to be assessed, but planned monitoring activities will collect data to make this analysis possible. There is no emphasis on the targeting of any particular group (as defined by age, ethnicity, landholding, etc.), with the project document stating only that "in some circumstances, a maximum landholding size may be imposed. Participant selection will be guided by the principles of inclusive growth, with particular attention given to the role of women in agriculture" (IRRI p. 30). However, in practice field staff make a conscious effort to select households with small or marginal landholdings wherever feasible. The other main criteria for selection are location (i.e., within the selected working area and within accessible range of a demonstration plot), possession of physical resources suitable for adoption of the technology being promoted, and a willingness and enthusiasm to participate in the activities suggested by field staff.

What are the boundaries of the project?
This case study deals with activities included in the work plan for 2011/12, thus defining its temporal boundaries within those of the wider project, which runs October 2010–September 2015. The spatial boundaries of the project are described above. Certain interventions are bounded by the activities pursued by their clients (e.g., training on integrated *gher* culture can only be provided to clients with access to *ghers*).

[1] Feed the Future is the program under which all USAID funds for agricultural development are dispersed.

When will the outputs, outcomes and impacts occur?
Training and extension activities in the work plan for 2011/12 will be delivered to client households over the course of a single growing season (running approximately April to December in most instances). Project participants from year two of the project will also receive one-off refresher training during the 2012/13 growing season. The assumption is that support for demonstration and target farmers over this time frame will be sufficient to enable sustained primary adoption of promoted technologies to occur, and that secondary adoption is likely to continue during and beyond this period as the technologies prove their value.

What are the external influences?
Weather is perhaps the most critical factor liable to influence project outcomes over the short term, given the vulnerability of Southwest Bangladesh to extreme weather events. In particular, flooding associated with monsoon rain or cyclonic events, or severe drought, may adversely affect yields over the single growing season with which this ex-ante evaluation is concerned. Trade-related shocks might negatively impact the profitability of farms culturing shrimp or prawn, as has happened on several occasions in the past (e.g., Bangladesh's recent self-imposed ban on prawn exports to the European Union). Disease also has the potential to seriously impact production at a sector-wide level, particularly for shrimp. Political unrest (e.g. general strikes) could also disrupt some training schedules. Problems of attribution will be minimized by a monitoring and evaluation strategy which makes use of a counterfactual design (i.e., comparison of project and non-project households before and after the intervention).

What Are The Risks?
Key assumptions on which the intervention logic hangs can be summarized thus:

1. Demonstrations and associated trainings are an adequate means of ensuring the adoption of proven improved technologies by client households.
2. Adoption of technologies promoted by the project will be sufficient to bring about increases in farm income averaging US$350 per household.
3. Adaptive research will yield successful results, which can be scaled out later in the project.
4. Partners of CSISA-WorldFish will deliver training and extension to client households.

There are a number of risks associated with these assumptions. Demonstration and training is the standard model used in agricultural technology transfer projects in Bangladesh. The level of success it enjoys depends in large part on the quality of service delivery and the appropriateness of the technology promoted. Field staff must therefore be sufficiently skilled and possess sufficient time and resources to ensure consistently high levels of adoption by target households, and must promote only technologies that yield benefits sufficient to attract widespread uptake. Some of the technologies promoted by the project do have the potential to generate income gains of US$350 or more per household, provided that recommended procedures are followed by clients. However, the extent of adoption of a suite of management practices across any given population is generally heterogonous, meaning that the average income achieved will not necessarily reach the target level. By its very nature, adaptive research yields unpredictable outcomes, meaning that it is not possible to prejudge whether results can be scaled up. This does not have direct implications for interventions during the period under review (2011/12), however, as scaling up of results would be unlikely to take place during this period. Perhaps the most critical assumption is that partners (government, non-government and private sector) will collaborate with CSISA-WorldFish to support service delivery. This point is particularly important because the small number of CSISA-WorldFish staff in each hub (one hub manager and three assistant development officers) makes it difficult for them to deliver the required level of services to clients.

The intervention model is that CSISA-WorldFish will provide training to partners (e.g., the field staff of local NGOs and Upazila Fisheries Officers of the Department of Fisheries) who will use their roles as service providers to train project beneficiaries. However, there is very limited budget for supporting these institutions and their staff beyond training for trainers. It thus remains somewhat unclear as to exactly how the full program of training set out in the work plan will be implemented.

What indicators are planned to measure impacts?
The main indicators used to measure project success will relate to increases in productivity over baseline values and the monetary equivalents (these contribute directly to both outputs and outcomes listed in Figure 1), and to the numbers of project clients (disaggregated by gender where applicable) achieving these.

Intervention complexity
Trialability: The planned interventions are fairly scale-neutral; if desired, they can be trialed with a small numbers of clients. However, the majority have a proven history of promotion to large numbers of end users under a variety of projects implemented by WorldFish and other development institutions in Bangladesh.

Observability: Many results or benefits from adoption (certainly those relating to productivity increases and income) are easy to observe, providing that appropriate monitoring systems are in place. Other benefits, such as improvements in nutritional status or accumulation of social capital, may be more difficult to capture.

Similarity to existing practice, and who uses it: Most of the interventions in the work plan do not introduce novel technologies, but rather build upon existing practices of clients through initiating simple improved management to increase yields. They are thus relatively easy for clients to adopt if they are receptive to doing so. These technologies are also largely appropriate within the context of social and cultural norms regarding gender roles.

Number of elements, their complexity and independence or interdependence: Most of the interventions proposed are fairly simple to implement. Some interventions, although potentially complementary (e.g., steps to improve fish seed quality in hatcheries, and dissemination of improved pond management strategies), are not mutually interdependent.

Minimum scale of adoption: The innovations introduced are easily divisible and largely scale-neutral. They require ownership of or access to land (and ponds/*ghers*) as a prerequisite for participation, but the areas can be relatively small, although working with larger farmers increases the chances of achieving income gains at or above the target level for the project.

Institutional demands: All the interventions, with the possible exception of a small intervention relating to community-based aquatic agriculture, will be implemented on privately owned property and do not make any special demands with regard to formation of institutions, collective action, access rights, credit, etc.

Adoption risks: Risks of adopting the innovations to be promoted are slim, as they build upon existing practice. Intensified management of more commercial operations does bear some increased risk in terms of greater investment in feed, which incurs the risk of greater financial losses in the case of a shock such as severe disease or flooding, but the degree of intensification promoted is not so great that clients will be unable to bear any such losses.

Livelihood contribution: As described above, the innovations promoted may potentially contribute to strengthening a variety of assets and capabilities for adopters; most importantly, those relating to human and financial capital.

Innovation uptake process: Uptake of innovations is planned to center largely around demonstrations. Groups of 25 households will be formed for each demonstration and will receive pond-side training at key points in the production cycle. Demonstrations will be implemented for proven technologies. Newer experimental technologies will be developed through adaptive trials with farmers; results, if successful, will be scaled out through subsequent rounds of demonstration and training later in the project cycle.

Market prospects and risks: The scale of increases in production is very unlikely to have any significant impact on the market value for commonly cultured fish species and prawn, and it is not anticipated that any marketing problems will ensue, given the well established and effective marketing channels and high levels of demand for these products.

Target beneficiaries: As noted above, target beneficiaries are very loosely defined in the project proposal. In essence, anyone possessing the resources and willingness to participate and living within the vicinity of the working areas targeted by the project could be a participant, although preference will be given where feasible to small or marginal landholders and women.

Module 2: The development and Environmental setting and relevance to national strategies and plans

This section addresses the poverty and hunger situation of the area where the intervention is planned to take place, as well as its environmental setting.

What is the baseline poverty situation in the country or region?
Bangladesh is ranked 154 out of 180 countries in terms of PPP GDP per capita (CIA, 2011). The most recent Household Income and Expenditure Survey (BBS, 2011), which is conducted every five years, estimates the national incidence of poverty based on the upper poverty line at 31.5% at the national level, 35.2% in rural areas and 21.3% in urban areas. This represents a sharp overall decline of 8.5% since 2005. National per capita per day intake of food items has also increased by 5.5% to 999.9g. The rates of increase in rural and urban areas are 6.2% and 3.5% respectively. Overall, calorie intake per capita per day also increased by 3.6% to 2318.3 K.cal in 2010 (BBS, 2011). Access to education has increased during this period, and the literacy rate of the population aged 7 years and over stands at 58% nationally. Landlessness is very prevalent, with the proportion of the rural population considered functionally landless (i.e., possessing less than 0.2ha) close to 60% (Hossain and Bayes, 2009).

What is the baseline poverty situation within the project?
Regional figures of the type presented in the previous section are not readily available for Jessore hub. However, as Figure 2 indicates, the prevalence of poverty is particularly high in some southern upazila (sub-districts) of the hub. Current livelihood systems are predominantly agriculture based. Aquaculture is advanced and dynamic in Jessore district, and includes culture of prawns and fish in converted rice fields (*ghers*) and one of the most important centers in the country for fish seed production. Commercial cultivation of vegetables, much of which has satisfactory market access due to good rail and road linkages, is also common in Jessore. However, infrastructure is much poorer in the more remote districts of Chuadanga, Narail and Jenidah, where aquaculture and agriculture are also generally less productive and less commercially oriented. Access to credit is generally good due to the large number of NGOs that provide microcredit services.

What are the relevant national/regional strategies or programs?
A number of national strategies are highly relevant to the project. Most important of these is the Bangladesh Country Investment Plan (CIP), a country-led planning, fund mobilization and alignment tool which "supports increased, effective public investment to increase and diversify food availability in a sustainable manner and improve access to food and nutrition security." Guiding principle 6.6 of the plan states, "Particular attention should be paid to the Southern part of Bangladesh. Key activities of the CIP should focus on this part of the country in view of its higher poverty and food insecurity levels, as well as the adverse effects of climate change." Fisheries and aquaculture development comprises a distinct program within the CIP: "Developing small-scale aquaculture, through access to quality inputs, advice and skills," is identified as a priority intervention (GoB, 2010). Jessore hub also lies within the "zone of influence" selected for an intensive program of investment under the USAID Feed the Future initiative, which aims to sustainably reduce poverty and hunger by stimulating inclusive agricultural growth and improving the nutritional status of women and children.

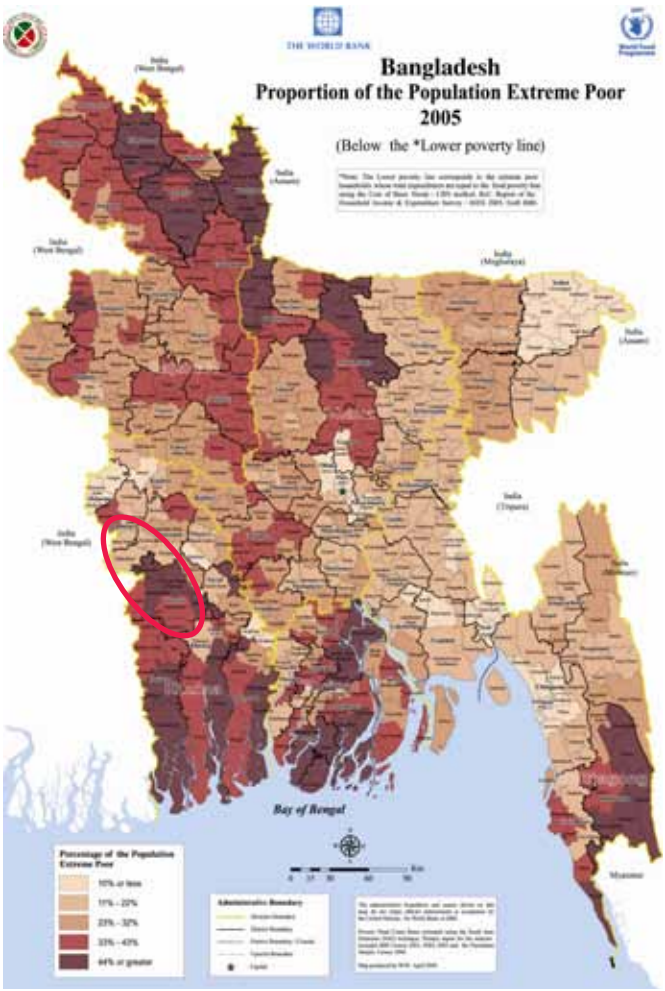

Figure 2. Upazila-wise poverty incidence in Bangladesh (Jessore hub indicated by red circle).

What is the relationship between the poverty needs of the intervention and the national/regional strategy?
The intervention represents a very good fit with both national and international policy strategies that aim to avert food insecurity and reduce poverty by catalyzing significant improvements in farm productivity. The target location of the intervention is also appropriate given the high levels of poverty and food insecurity found in Jessore hub.

Module 3: Stakeholder and institutional analysis

The following sections present an analysis of the stakeholders and institutions likely to affect, or to be affected by, implementation of productivity-focused project interventions.

Department of fisheries

	Observations	Rating*	Data source & quality
Stakeholder or stakeholder group	Department of Fisheries (DOF) officers (may simultaneously influence, be influenced by and be intermediaries in the project)		Discussions with key informants, data considered reliable
Stakeholder description	District and Upazila Fisheries Officers		
Interests in the project	The project is aligned with the professional interests of DOF officers and can support them in performing their duties.	+	
Effect of the project on their interest(s)	Likely to be complementary	+	
Capacity and motivation to participate	Stakeholder possesses the capacity and resources to participate, as well as a pro-poor mandate.	+	
Level of influence of stakeholder	Significant	++	
Level of importance of stake-holder	High	++	
Mitigating measures	Dialogue between hub staff and appropriate DOF personnel; completion of an MOU between the Ministry of Agriculture and WorldFish		

Partner NGOs

	Observations	Rating*	Data source & quality
Stakeholder or stakeholder group	Local partner NGOs Jagorani Chakra Foundation and Banchte Sheka (intermediaries)		Discussions with key informants, data considered reliable
Stakeholder description	Well-established local NGOs in SW Bangladesh: Banchte Sheka works to improve the status of poor women and children through a range of programs. Jagorani Chakra Foundation seeks to address the needs of disadvantaged and vulnerable people.		
Interests in the project	The project will build the capacity of NGO field staff and enhance their institutions' capacity to deliver better extension services and to reach larger numbers of clients.	+	
Effect of the project on their interest(s)	Likely to be complementary	+	
Capacity and motivation to participate	These NGOs possess a strong pro-poor mandate but mechanisms for supporting their participation in the project have yet to be finalized, as they require funds with which to operate.	+	
Level of influence of stakeholder	Significant	++	
Level of importance of stakeholder	High	++	
Mitigating measures	Working closely with appropriate personnel to ensure mutually beneficial implementation arrangements		

Private sector stakeholders

	Observations	Rating*	Data source & quality
Stakeholder or stakeholder group	Private sector (likely to influenced)		Discussions with key informants, data considered reliable
Stakeholder description	One hatchery, two feed retailers, one depot owner		
Interests in the project	May provide additional customers and help to promote the reputation of the businesses	+	
Effect of the project on their interest(s)	Likely to be complementary	+	
Capacity and motivation to participate	These actors have no pro-poor orientation, but possess the capacity to motivate their customers to adopt practices promoted by the project.	+	
Level of influence of stakeholder	Moderate to high	+	
Level of importance of stakeholder	Moderate to high	+	
Mitigating measures	Regular contact and dialogue to ensure continued support		

Producer associations

	Observations	Rating*	Data source & quality
Stakeholder or stakeholder group	Narail District Fish Farmer Association (likely to influence)		Discussions with key informants, data considered reliable
Stakeholder description	Association of commercial fish and prawn producers in Narail district		
Interests in the project	Receiving and extending additional support to its members	+	
Effect of the project on their interest(s)	Likely to be complementary	+	
Capacity and motivation to participate	The association only has commercial farmers as members, but also supports a small local NGO which works with small-scale fish producers.	+	
Level of influence of stakeholder	Moderate	+	
Level of importance of stakeholder	Moderate	+	
Mitigating measures	Regular contact and dialogue to ensure continued support		

Women

	Observations	Rating*	Data source & quality
Stakeholder or stakeholder group	Women are among the intended recipients of project support.		Discussions with key informants, data considered reliable
Stakeholder description	Although Bangladeshi women do not comprise a homogenous group, gender relations generally act to disempower them relative to men.		
Interests in the project	Training and extension provided by the project offers the possibility of increasing the capacity of women to produce greater quantities of nutritious fish and vegetables and to earn additional incomes.	+	
Effect of the project on their interest(s)	If successfully implemented, the project should support their interests by increasing their incomes and, it is hoped, their agency in making decisions regarding how this income is deployed, although there is a risk that they may be subjected to greater time- and work-loads than at present.	+	
Capacity and motivation to participate	Some women may be motivated to participate in project activities, but may be constrained in their capacity to do so by social conventions or intra-household power dynamics that restrict their participation in trainings and other activities.	0	
Level of influence of stakeholder	As individuals, rural women generally lack power and agency, although they may be better able to exercise agency as part of groups; the project is proactively responsive to their situation.	0	
Level of importance of stakeholder	Very high	++	
Mitigating measures	Consciously design activities and targets to include women, and carry out assessments and ongoing adaptive management to ensure a high degree of meaningful participation.		

Institutional and organizational analysis

	Information or data	Data source & quality
Informal institutions	A range of formal or semi-formal institutions govern social life in Jessore, as they do throughout Bangladesh. Of these, one of the most important with respect to project goals and implementation is the ideal of *purdah* (literally "veil"), to which women are supposed to conform. In principle, this is supposed to preclude the appearance of women in the public sphere, although in practice it is often transgressed in a variety of ways and to different extents, particularly among very poor or elderly women. This has obvious implications for the ability of the project to fully engage women in its activities and, more fundamentally, is symptomatic of the very large ingrained gender power differentials and the manner in which these constrain the agency of women, thereby disempowering them. Religion, primarily Islam and Hinduism, is an institution fundamental to the fabric of Bangladeshi society, and can be characterized as semi-formal, given the variety of associated forms and practices which it encapsulates. Religious identity has important implications for project implementations with regard to female involvement in project activities, as women from Hindu communities are generally less constrained in their movements and participation in agricultural activities (though this freedom does not necessarily mean they are any more empowered) than women from Muslim communities. These differences in identity may thus have important practical implications for the implementation of project activities.	White (1992);
Formal and informal market institutions and organizations	A crucial market, with both formal and informal sectors, is that for credit. Microcredit is now widely accessible throughout rural Bangladesh, including Jessore hub, as a result of the activities of NGOs—almost all of which offer microcredit as a core service. The implications and efficacy of microcredit delivery in Bangladesh have been widely debated, often with divergent conclusions as to the outcomes generated. Informal credit is also widely available. The terms of its provision vary considerably and are closely linked to the nature of the relationships between creditors and debtors, often being extended in the context of long-established patron-client relations, which, although exploitative, also offer security. Informal credit can include advances of working capital or inputs. Sometimes this occurs as part of sharecropping arrangements that facilitate access to land, while in other instances advances are tied to future sale of the crop to the creditor at below-market rates.	Lewis and Hossain. (2008); Crow (2001) White (1992)

Module 4: Analysis of transmission channels

The table below presents a summary of transmission channels through which the project is expected to achieve impact. As the table reveals, the primary transmission channel through which the interventions under consideration operate is asset value. This is closely connected to the prices transmission channel, since the productivity-focused interventions assessed here result in both increased production and increased consumption by participating households, though not on a scale at which significant impacts on market prices are likely. However, increasing production and consumption of fish, and the processes which must be followed in order to make these increases (attendance of meetings, receipt of training, improvements to ponds and other physical assets, knowledge acquisition, etc.) contribute to building a range of assets (human, physical and, in some cases, social capital associated with the processes listed above, and financial and human capital associated with increased farm incomes and better nutritional status derived from increased fish and vegetable production).

The main stakeholders considered here are the male and female members of farm households who receive technical training under the project and, to a lesser extent, secondary adopters of the technologies promoted. Effects are generally positive in both the short and medium term, although there is a lesser degree of certainty with regard to medium-term effects, since we cannot be certain that adoption of innovations occurring under conditions of project support will continue indefinitely, or whether linkages formed (e.g., with government or NGO extension personnel) will be maintained. It is reasonable to assume that the human and, in some instances, the social capital of staff of partner organizations involved in delivering training will also be enhanced as staff acquire new knowledge and build new relationships.

As the production-based interventions assessed here take place over the course of a single growing season, the length of time required to fully establish the main transmission channels is one year. Assuming that the extension approach adopted is an effective one in and of itself, the biggest risk to the effectiveness of this channel is whether the project has the ability to enroll sufficient institutional support from its partners to enable effective implementation to the numbers of beneficiaries targeted. This issue may be problematic given that only a limited portion of the budget is allocated to operationalize these partnerships. Given also that additional funds cannot be allocated for this purpose, it will be crucial to negotiate with partners to ensure that low-cost, mutually beneficial implementation arrangements can be agreed upon.

Transmission channels

Transmission channels and details		Details of the change initiated by the intervention Short-term* rating for stakeholders +/-	Ratings		Data source and quality
			Medium-term* rating for stakeholders +/-		
Prices	Production	Increase in fish production in the hub	+	+	Own observations
	Consumption	Increase in fish consumption in the hub	+	+	Ditto
	Wages	Constant	=	=	Ditto
Employment	Public formal	None	=	=	Ditto
	Private formal	Possible but limited	=	+	Ditto
	Informal	Probable but somewhat limited	=	+	Ditto
Transfers	Taxes	Limited, if any	=	=	Ditto
	Public welfare	None	=	=	Ditto
	Public subsidy	None	=	=	Ditto
	Private remittance	Unlikely	=	=	Ditto
Access	Public goods & services	Improved	+	?	Ditto
	Private goods & service	Improved	+	+	Ditto
Authority	Formal institutions	Improved	+	?	Ditto
	Informal institutions	Effect unknown	?	?	Ditto
Assets value	Physical	Enhanced in some cases	+	?	Ditto
	Natural	Neutral	=	=	Ditto
	Human	Enhanced	+	+	Ditto
	Social	Enhanced in some cases	+	?	Ditto
	Financial	Enhanced	+	+	Ditto

Module 5: Development outcomes

The tables presented below summarize the likely impacts of production-focused elements of the project on the capabilities of male and female target groups. However, although an attempt is made to generalize, it should be emphasized that there will be considerable variation within what is likely to be a fairly socially heterogeneous group of project clients.

Farm households practicing aquaculture						
Capability	Pre-project description state of capability	Change to capability		Description of change to capability	Risks to change of capability, mitigating factors	Data source, quality and gaps
		Short term* + or -	Medium term* + or -			
Economic	Variable, but generally constrained	+	+	Should increase substantially if target of an additional US$350 per household is achieved	Small possibility that in some instances greater investment in more productive technologies will lead to greater losses in the case of unforeseen circumstances—partly mitigated by conscious attempts to design low-risk innovations	Discussions with key informants; quality considered reasonable
Human	Variable, but generally rather limited	+	+	Increase in knowledge, skills, and consumption of a diverse, high-quality diet	Dependent on knowledge transfer being sufficiently effective and skills retained and utilized by project clients	
Political	Variable	=	=	Unlikely to be significantly affected by project in most instances	Politically influential individuals manage to assume control of project resources or manipulate project activities to further their own ends. Attempt to mitigate by careful selection of beneficiaries and partners.	
Socio - cultural	Variable	=	=	Unlikely to have any discernable effect	n/a	
Protective security	Variable	=	=	Unlikely to have any discernable effect	n/a	

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EX-ANTE IMPACT EVALUATION, MALAWI CASE STUDY

Enhancing fish production and marketing for food security and rural Incomes of small-scale producers in Malawi

Joseph Nagoli, Levison Chiwaula and Regson Chaweza

Introduction

The ex-ante evaluation of "Enhancing Fish Production and Marketing for Food Security and Rural Incomes of Small-scale Producers in Malawi" project involved the review of the project document, national and international development strategies, and interviews with major stakeholders, especially the implementing district assemblies and benefiting clients in Mchinji and Dowa districts of Central Malawi. In general, the project is very innovative in the aquaculture sector in that it uses academic research to find solutions to production bottlenecks. Improvements in small-scale aquaculture have the potential of moving poor communities out of poverty through increases in household food, income and employment for most Malawians.

Aquaculture in Malawi has grown by over 350% in less than 20 years, from 173 metric tons in 1985 to 800 metric tons in 2002, with the highest growth happening between 1996 and 2002. Currently, fish contributes about 4% to the country's GDP but provides almost 70% of animal protein and 40% of total protein. Aquaculture contributes at least 10% of aquaculture households' income (Dey et al., 2006; **Hecht and Maluwa**, 2005), but less than 2% of total fish production in Malawi, compared to 30% worldwide. The high potential for aquaculture growth emanating from abundant water resources and high prevailing market prices (US$3.25/kg) can help in achieving the overall objective of increasing fish yields from the current 750 kg/ha/annum to at least 1500 kg/ha/annum, with an increase in farmers' incomes of at least 50%.

Module 1: Check the intervention logic

Enhancing Fish Production and Marketing for Food Security and Rural Incomes of Small-scale Producers in Malawi is a project in the Community Action Reserch Programme (CARP) of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). Three guiding principles underlay the implementation of this project. Firstly, it ensures buildup of a learning community action research. Through this, farmers will become co-researchers in designing and executing research questions. Secondly, the proposed project is embracing a value chain approach by identifying gaps in technology generation, input and output markets. Once gaps are identified, best bet technologies will be tested using scientific methods together with value chain players to enhance shared learning. Finally, the project is directed at reducing the University-farmer gap by a) strengthening engagement of university with other actors especially farmers; c) promoting lecturer involvement and student attachment opportunities; and d) establishing opportunity for long-term engagement with communities with the overall aim to inform curriculum changes. The conceptual model that informs this project is illustrated in Figure 1.

Overall Objective of the project

The overall objective of this project is to increase fish production and rural incomes through application of aquaculture innovations in the value chain

The specific objectives are as follows:

1. To build capacity in action research, value chain analysis, organizational development and marketing in relation to aquaculture through graduate training and research.
2. To engage key actors and identify gaps, constraints, opportunities and innovations in the fish value chain for experiential learning and curriculum reform.
3. To consolidate breeding nuclei for improved strain at Bunda College and link it with multiplier fish farmers.
4. To determine and adapt Best-Bet technologies for production of improved *Oreochromis shiranus* strains.
5. To estimate marketing efficiency and identify best marketing strategies for fish value chain.
6. To determine critical success factors and impact of grass root farmer organizations and microfinance institutions on rural livelihoods.
7. To sustain project activities beyond the current project life.

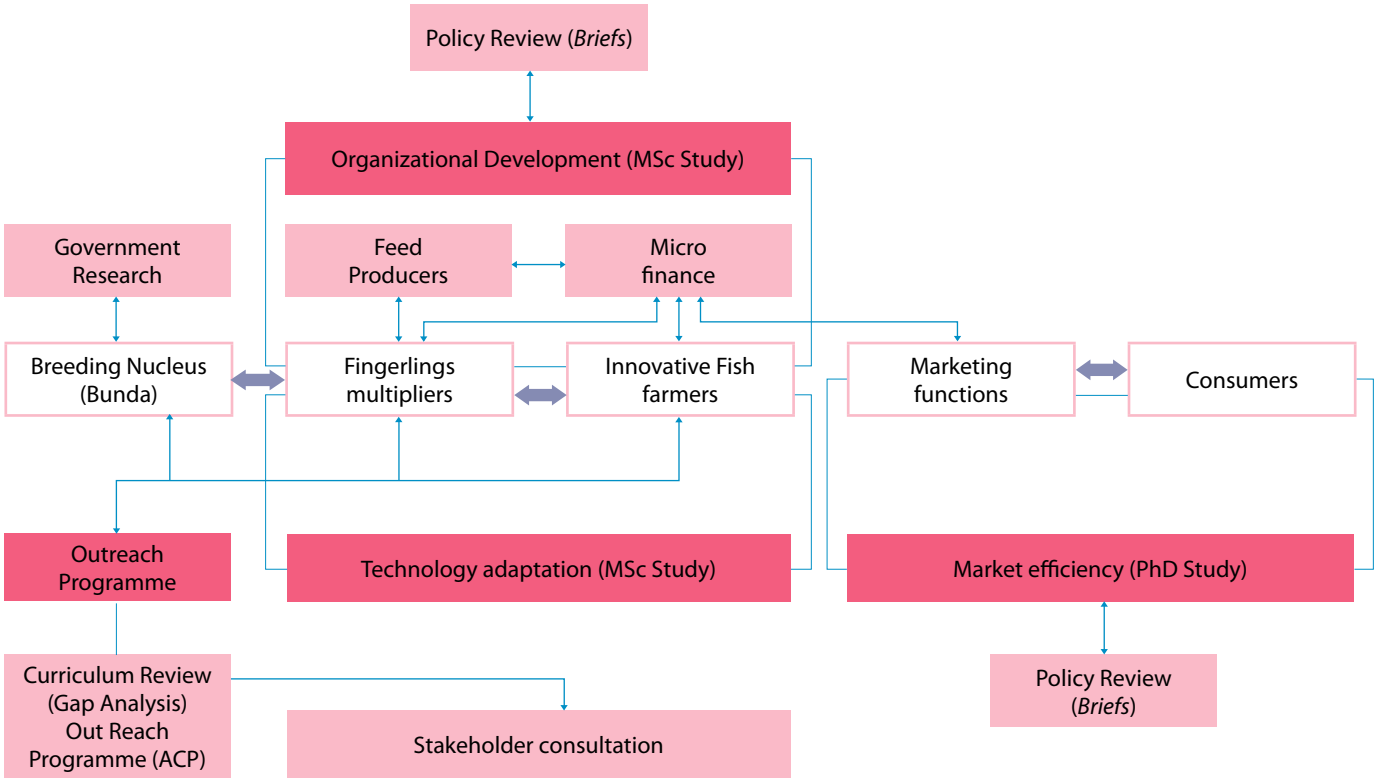

Figure 1. Value Chain of fish farming in Malawi, and possible interventions in the context of Innovation System Approach.

The project is implemented by a consortium comprising of the partners described in the table below:

	Main Roles
Bunda College, University of Malawi	Lead agency in the implementing of project in collaboration with NEPAD Regional Fish Node-SANBio Bunda College. Also responsible for socio-economic studies.
Farmers Union of Malawi (FUM):	Farmers' organizational development including technical backstopping of students doing work on farmer's organizational issues.
Research Into Use Programme	Work hand in hand with FUM in mobilizing farmer groups and link farmer clusters to the ongoing work of the Innovative Fish Farmers Network Trust.
Initiative for Development and Equity in African Agriculture (IDEAA)	Value chain and marketing studies.
Trustees of Agricultural Promotion Programme (TAPP)	Provide best management practices on livestock as animal manure in livestock-fish farming integration.
WorldFish	Responsible for Farmer Innovations and co-supervise a student on Innovations.
National Commission for Science & Technology (NCST)	Fish breeding and alignment of the project to the national breeding program.
National Aquaculture Centre (NAC):	Ensure that results are translated into government policy and will be responsible for linking the breeding nuclei at Bunda with smallholder multiplier farmers.
KAWJO Foundation	Microfinancing: provide leadership in managing farmers' savings and soft loans and linking farmers or farmers organizations to other micro-finance institutions.

The intervention logic

Figure 2 below is a graphic representation of the intervention logic. The underlying principles of community action research will be used entrenched within the value chain analysis of the various actors along value chain from production to consumers. Implementation of activities is organized in the following key result areas (KRA):

1. Capacity in action research, value chain analysis, organizational development and marketing in relation to aquaculture built through graduate training and research.
2. Key actors engaged, gaps, constraints, opportunities and innovations in the fish value chain for experiential learning and curriculum reform identified.
3. Breeding nuclei for improved strain at Bunda College consolidated and linked to multiplier fish farmers.
4. Best Bet technologies for production of improved *Oreochromis shiranus* identified and adapted.
5. Marketing efficiency estimated and best marketing strategies of fish determined.
6. Critical success factors and impact of grass root farmer organizations and microfinance institutions on rural livelihoods identified.
7. Project effectively, successfully and sustainably managed.

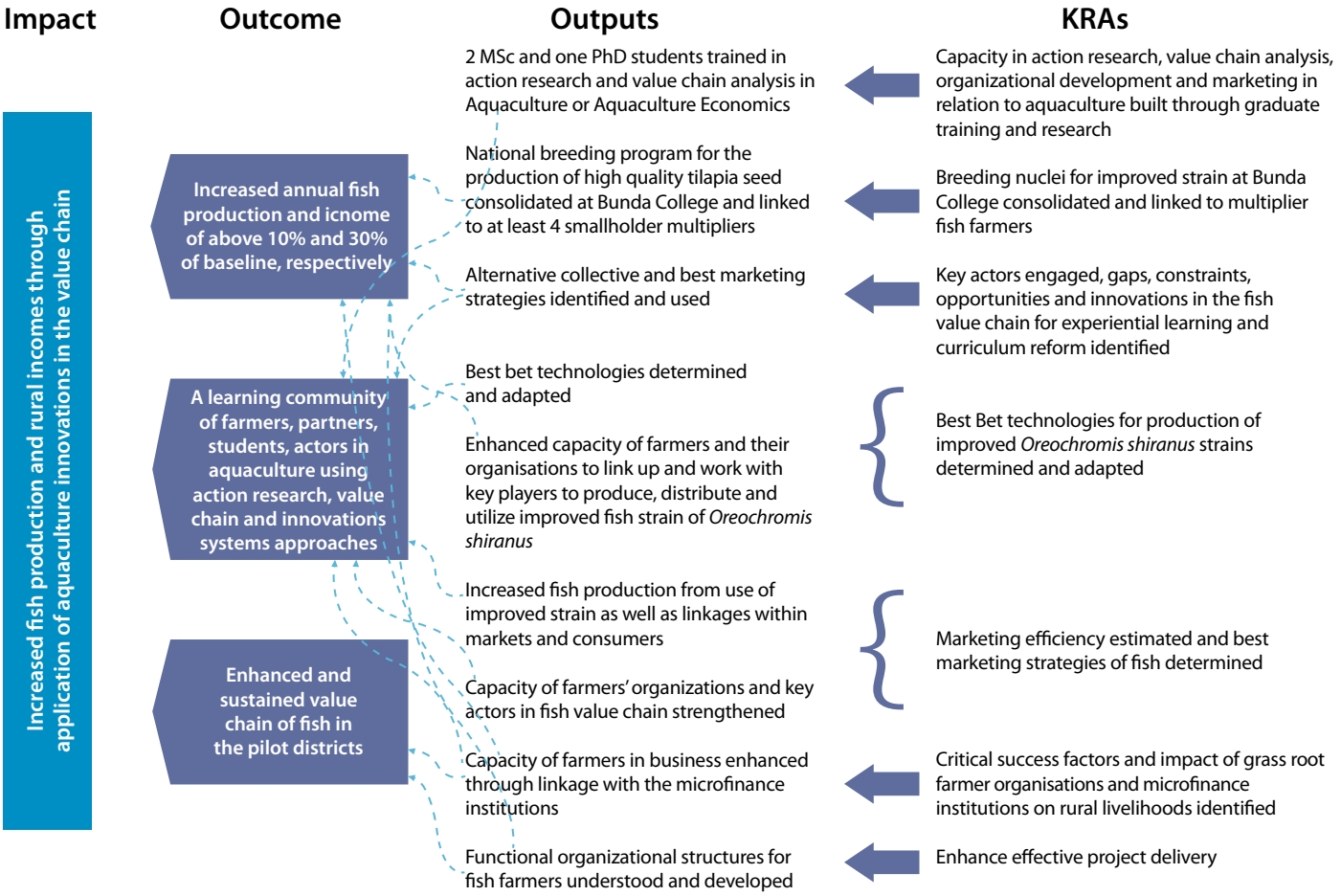

Figure 2. Intervention pathway for Enhancing Fish Production and Marketing for Food Security and Rural Incomes of Small-scale Producers in Malawi" project.

Assumptions, risks and external influences

Key assumptions made for effective delivery of the project activities are mainly on national policies that includes trade and macro-economic and the collaboration and effective participation of partners. However, when this project was presented to farmers, the following risks and questions were raised:

- The effects of the project on Natural Resource Management like cutting of trees during pond construction, any Environmental Impact Assessment?
- Why does the project target individuals if it needs farmers who can have at least 1000m2 of land to make profits?? Why not clubs or groups of people?
- Who gets the credential and how does partnership work?
- There is need for statistical evidence that these technologies have worked out before the testing is done here, what are the best technologies here? What are the gross margins and profitability analysis?
- What if there is not enough water to sustain all the 80?
- How does the project keep track with these farmers after the pilot phase?

The evaluators also observed some shortfalls in the project KRAs to achieve its overall objective:

No reliable and regular production estimates in aquaculture: The sector uses old (2002) production estimates of 800 metric tons from small-scale farmers, an indicator for the need to undertake a formal and detailed study of fish production in Malawi, without which it may be difficult to quantify the contribution of the project to aquaculture production. This implies that the project does not have a reliable baseline for aquaculture production.

Unclear linkages with other local stakeholders: District assemblies have more than one stakeholder (mostly NGOs) promoting aquaculture at the district level. The project should develop clear linkages and add value to existing programs. This would enhance

cost sharing and activity ownership once the project finishes.

Value and sustainability of partnerships: Partnership in the project is more on an individual basis than on an organizational basis. It is therefore difficult to deduce organizational interest in and commitment to the pro-poor agenda of reducing poverty among small-scale farmers. Clear partnership understandings need to be formalized—led, of course, by those with the required expertise in the organizations.**Clarity on action research:** The project's main thrust is research that will result in academic achievements. It's not clear, however, how and when these research findings will inform action. The project should build upon existing reports from the Agricultural Research and Development Program (ARDEP) on marketing by looking at market preferences and the Malawi Gold Standard gross margins to inform production practices for targeted markets, rather than repeating the same studies. Full analyses of markets and profitability should take into account production costs, yields, risks, industry structure, competition and production practices.

High input costs and loan management: It is critical that farmers access fingerlings of high purity, having high survival rates; and feed of good quality. However, the costs for these inputs are high due to poor distribution networks. It is therefore risky to encourage the farmers to get input loans if these major variables in profitability are not addressed first. Loan management and administration issues should be clearly disseminated to the farmers before disbursement.

Limited project budget: The US$300,000 budget for three years, the heavy research outputs, the few target clients and the many implementing stakeholders may not improve aquaculture production unless the project links well with ongoing aquaculture programs at the assembly level.

Module 2: The development and environmental setting and relevance to national strategies and plans

What is the baseline poverty situation in the country or region? Like most countries in sub-Saharan Africa, poverty remains a major characteristic for the large majority of the Malawian population and according to IFAD (2010) this deeply entrenched poverty is a major obstacle to Malawi's development and economic growth. About 8 million people, or almost 70 per cent of Malawians, live below the national poverty line. In addition, more than 90 per cent of Malawians live in rural areas and depend on subsistence farming for their livelihoods. Even in years when rainfall is adequate, 40 per cent of Malawian population do not have the purchasing power to be able to satisfy their daily basic needs. Interestingly for Malawi, it is the smallholder sub sector that produces over 85 percent of the food consumed in Malawi. There are a number of challenges that affect agricultural production in Malawi. Malawi's agricultural production is characterized by low productivity as well small landholding size. On average, households cultivate 1.2 hectares of land while per capita landholding size for the rural poor households is as low as 0.23 hectares posing a great challenge for these farmers to have adequate production to satisfy both their food and cash needs. In addition the cost of inputs such as fertilizers is very high and most of the poor households are not able to access them. The current intervention of the state in providing input subsidy for maize has improved food security in Malawi, albeit only as a short term solution.

In Malawi, fish production is still low with the small-scale fish farming operations having fish productivity of as low as 750kg per ha per annum. Within the context of food and nutritional security fish is a major source of animal protein, vital minerals and vitamins, it is no longer available in quantities sufficient to meet the nutritional requirements of individuals for these food ingredients. Per capita consumption of fish in Malawi has therefore declined by about 100 per cent from 13 kg/person/year in the 1970s to less than 4 kg/person/year in 2005, a situation caused by reduced catches, increasing population and urbanization.

What is the baseline poverty situation within the project? Dowa and Mchinji Districts where the project is being implemented fall within high pond aquaculture potential areas mapped in 1980s (Figure 3). However, aquaculture expansion and production even with government and non-governmental organizations, over the years, has been very slow. Aquaculture production still remains at subsistence level. Technological limitations range from unavailability of quality fingerlings, high cost of feed as well as inability to manipulate pond environment to improve fish growth. Despite the efforts of the WorldFish and the Malawi National Breeding Program to develop an improved strain of *Oreochromis shiranus* through selective breeding with 30% improved growth, the availability of the improved strain has been limited to few pilot areas hence many fish farmers continue using unimproved fish seed. Furthermore, available breeding nuclei (Bunda College and National Aquaculture Center) are not consolidated enough to allow constant flow of fingerlings to farmers. In addition, lack of purchasing power and lack of credit further limits majority of fish farmers to purchase fingerlings from reliable hatcheries.

Smallholder fish marketing is highly unorganized. Farmers cannot determine the prices for their produce neither are they able to forecast such prices. The prices are mostly determined by middlemen who in most cases offer very low prices to farmers without due consideration to the costs of production. Lack of institutional capacity limits fish farmers bargaining power to purchase inputs in bulk. The existing Innovative Fish Farmer network is weak to serve its clients, resulting in poor linkage strategies between fish farmers and other players in fish farming innovation chain such as hatcheries. Thus poorly organized harvests and marketing portfolios pursued by fish farmers cause the whole fish farming enterprise operated with gross technical inefficiencies thereby limiting income earnings from fish production. In addition, extension messages concerning fish farming are not readily available due to staffing challenges from the Department of Fisheries.

What are the relevant national/regional strategies or programs? The growth of aquaculture in the southern Africa and Malawi in particular, face many challenges most of which were highlighted at the NEPAD Fish for All Summit in Abuja in 2005 (NEPAD, 2005). These challenges have formed investment areas within the framework of the Comprehensive Africa Agriculture Development Program (CAADP). This project supports the CAADP and specifically the goals and objectives of the Presidential Initiative on Aquaculture Development (PIAD) initiated by the President of the Republic of Malawi. It complements existing programs that are aimed at implementing PIAD by various actors such as the WorldFish, Malawi Department of Fisheries Breeding Program; two Bunda College's Norwegian supported projects on Aquaculture. In addition the programs of the National Aquaculture Centre (NAC), DfiD funded Research Into Use (RIU) and NEPAD SANBio Fish Node working on Fisheries and Aquaculture will also be used as a platform to achieve the objectives of the project. The project is also designed to fit in the national and global policy framework, namely the National Aquaculture Strategic Plan (NASP) (2006-2015) which was conceived to recognize and address the most pertinent international and national development frameworks such as Millennium Development Goals (MGDS), Chambo Restoration Strategic Plan, National Fisheries and Aquaculture Policy (NFAP). Additional frameworks and strategies include the Agriculture Sector Wide Approach (ASWAp). The project is a direct compliment of the regional PhD programs in Aquaculture and Fisheries Science and Agricultural and Resource Economics which RUFORUM has mounted at Bunda College.

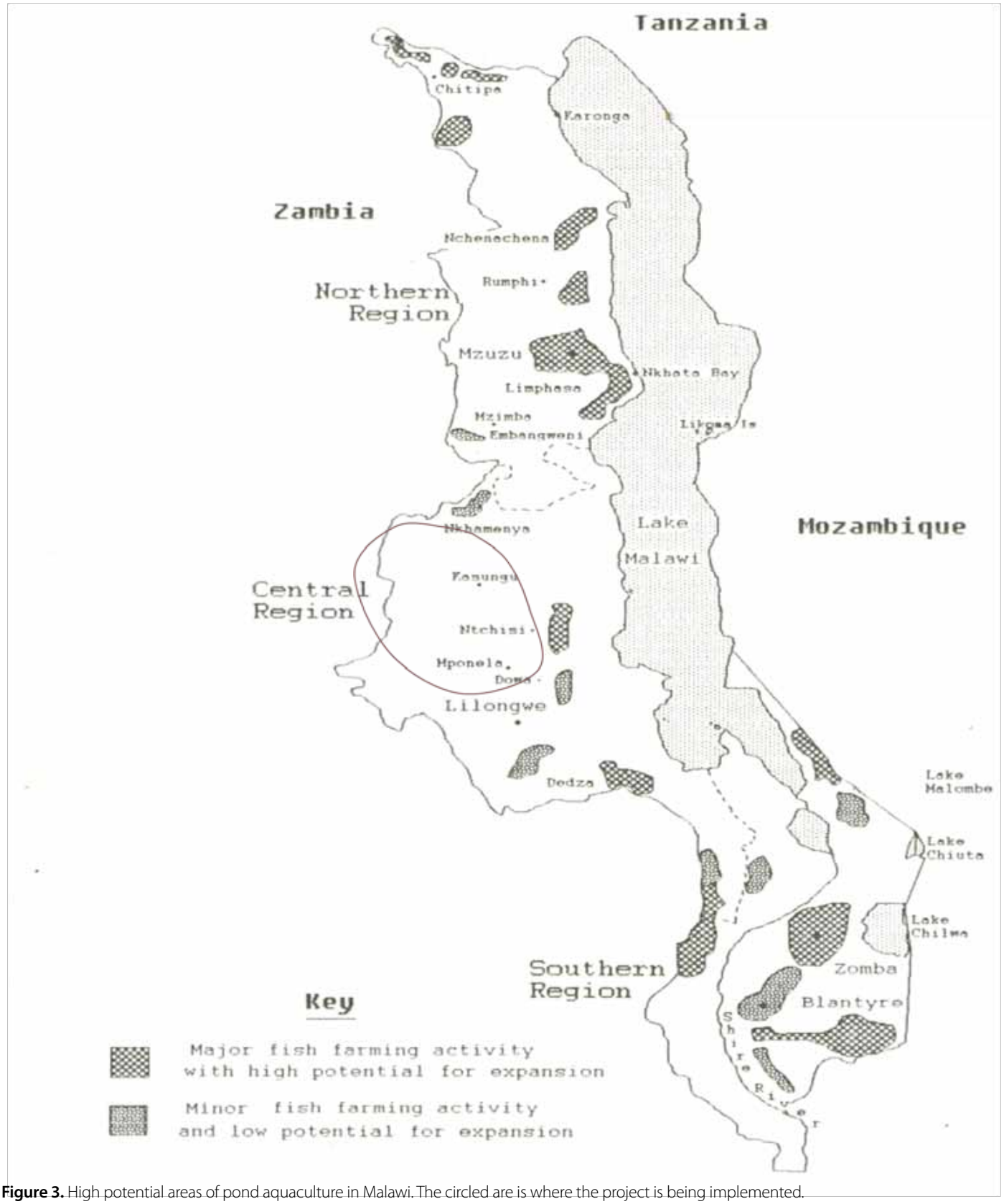

Figure 3. High potential areas of pond aquaculture in Malawi. The circled are is where the project is being implemented.
Source: ICLARM, 1991

Module 3: Stakeholder and institutional analysis

The following section presents an overview of stakeholders' interests in fish production and marketing in the advancement of a pro-poor agenda.

Stakeholder group	Name of stakeholder	Main tasks	Interest in the project	Capacity and motivation to participate	Level of influence of stakeholder	Level of importance of stakeholder	Rating
Public institutions	• National Aquaculture Center (NAC) • National Commission for Science and Technology (NCST) • Kasungu Agricultural Development Division • Local assemblies	Provide legal framework and support in research and implementation of aquaculture projects	Support for the public/ private sector investment in aquaculture in order to promote and sustain the growth of the sub-sector in line with the NEPAD Fish for All, Abuja Declaration	Good structures and frameworks available	Critical	Significant	++
Academic institutions	• Bunda College of Agriculture	Capacity building and research	Develop technologies that enhance fish production and improve the perfor-mance of fish value chains	Strong professional expertise	Moderate	Critical	++
International public research center	• WorldFish	Research and capacity building	As above	Strong professional linkages	Low	Significant	+
Farmer organizations	• Farmers Union of Malawi (FUM) • Innovative Fish Farmers	Organizing farmers and linking them to service providers	Improvements in poverty status of the farmers through improved incomes	Highly motivated but lack capacity	Low	Critical	++
Local NGOs	• Trustees of Agricultural Promotion Program (TAPP) • Initiative for Development and Equity in African Agriculture (IDEAA) • KAWJO Foundation	Provision of market information and micro-loans	Equity and poverty reduction	Highly motivated and modest capacity	Moderate	Significant	0
International NGO	• Research Into Use	Coordination and funding	Ensuring growth in aquaculture sector	Low motivation	Low level of influence	Low	0
Service providers	• Transporters • Traders	Facilitating produce and input marketing	No interest	High	Low	Low	0

Module 4: Analysis of transmission channels

The table below summarizes the transmission channels through which the project is intended to achieve impact.

Transmission channels and details		Details of the change initiated by the intervention Short-term* rating for stakeholders +/-	Ratings		Risks
			Medium-term* rating for stakeholders +/-		
Prices	Production	The value chain analysis and market efficiency study will help to understand and improve producer prices of fish from farm gate to the consumer, as well as identifying potential areas for reducing market costs.	++	++	Improvements in efficiency would require improvement in the general infrastructure, which is not targeted by the project.
	Consumption	The project may increase production through the dissemination of improved fish strains and quality fingerlings backed up by better micro-finance services. Consumer prices may go down because of this.	+	+	This prediction assumes no price competition from other sources of protein and that sector growth for other protein sources and consumer preferences will remain stagnant.
	Wages	Increase in farm production and improvements in marketing efficiencies may lead to increased labor returns.	+	+	Same as production prices risks
Employment	Public formal	The training and research provided by Bunda College and NAC may provide more employment opportunities.	0	+	The government may not have plans to employ more researchers even if there is need.
	Private formal	Improvements in the performance of hatcheries through training and upgrading may attract private sector investors, leading to more employment opportunities.	+	0	The participation of the private sector is not clear after the project subsidies on training and hatchery improvements.
	Informal	The project is expected to organize farmers to access microloans that promote entry of many farmers into fish production.	+	0	Farmers are not insured against environmental variability.
Transfers	Taxes	Not significant			
	Public welfare	Not significant			
	Public subsidy	The training, brood stock and upgrading of hatcheries will be subsidized by the project.	++	0	Targeting the subsidies may not be easy and may further discourage capable investors.
	Private remittance	Not significant			
Access	Public goods & services	The project will improve access to training, credit, improved fingerlings and markets.	++	+	Access can be affected by institutional and social barriers such as gender or marginalization.
	Private goods & services	Not targeted	-	-	The project has not included issues of access to land and other natural resources in increasing production area.
Authority	Formal institutions	Government local institutions, such as ADDs and local assemblies, will not actively manage the project.	-	-	Ownership of the activities after the project is risky.
	Informal institutions	The project promotes the creation of farmer groups and organizations such as the Innovative Fish Farmers Trust and marketing groups.	0	0	The project is not explicit on how the created structures will work with the existing structures such as VDCs, traditional leaders, NRMCs, etc. to avoid leadership conflicts.
Assets value	Physical	Improvement of hatcheries	+	+	Management of hatcheries is not known in the post-project life.
	Natural	Not significant in the project			Access to land and other natural resources was not included in the project.
	Human	Graduate training and training of farmers	++	++	
	Social	Formation of farmer groups and their linkages to other agencies like microfinance companies	++	++	
	Financial	Improvement in farm income and access to credit	+	+	

Rate for stakeholders using strength/direction of impact (++, +, 0, -, --)

Results on target groups' capabilities

The following two tables present the capabilities of the target groups.

Target Group	Capabilities										Pre-project description state of capability	Description of change to capability	Risks to change of capability, mitigating factors	Data source, quality and gaps
	Economic		Human		Political		Social-Cultural		Protective Security					
	Short term	Med term	Short term	Med term	Short term	Med term	Short term	Med term	Short term	Med term				
Fish producers (1)	-	+	+	+	-	+	+	+	+	+	D1.1	D2.1	R1	High
Fish seed multipliers (2)	+	+	+	+	+	+	-	-	-	-	D1.2	D2.2	R2	High
Traders (3)	+	+	-	+	-	-	-	-	+	+	D1.3	D2.3	R3	Mod
Students (4)	-	-	+	+	-	+	-	+	+	+	D1.5	D2.5	R5	Mod

Rate the target group using strength/direction of impact (+ or -)

Note: For detailed descriptions refer to table below.

Target Group Number	Detailed description of state and change of capabilities and potential risks to be worked on			
	Capability	**Pre-project description state of capability (D1)**	**Description of change to capability (D2)**	**Risk (R)**
1	Economic	Poor economic gains from low productivity (750kgs/ha) and poor prices	High costs of fingerlings and feed supplied through a loan facility may result in negative economic gains in the short term that will improve in the long term with experience.	Dropouts are expected in the short term.
	Human	Farmers have low knowledge and skills in aquaculture; poor nutrition from low per capita fish consumption	Skills will improve with training and supervision in the short term and improvements in nutrition are expected in the medium term.	No significant risk expected
	Political	Farmers operate on individual basis and have weak representation in the local assemblies and marketing	No significant change is expected in the short term. Farmer groups/clubs may grow into associations or cooperatives that will improve bargaining power on input and output markets including district assemblies.	If aquaculture is not proved profitable at the outset, growth in farmer organization is not likely.
	Socio-cultural	Strong local social networks and traditional leadership	Strong leadership and local networks will further be improved through organizations and trainings.	Creation of new institutions may cause leadership conflicts.
	Protective - security	Weak economic diversity; enterprises are mostly agro-based	Aquaculture provides an additional source of income plus a good environment for diversification through integration.	No risk expected
2	Economic	No quality seed multipliers in the target areas	Seed multipliers will immediately make profits from high demand and current cost of fingerlings.	High initial infrastructure costs
	Human	Some potential multipliers, especially in Mchinji (innovative farmers)	Specialized skill through trainings in both short and medium term	High monitoring costs
	Political	Not significant	Even if not in a group, fingerling producers will have market power as long as there is demand for quality fingerlings.	Quality is maintained to induce demand.
	Socio-cultural	Not relevant	Weak social relationships because of the market power in both short and medium term	Social conflicts
	Protective - security	Not relevant	High labor demand for hatchery management therefore reduces diversification.	High labor demands reduces availability in other enterprises.
3	Economic	Currently all fish sold on farm—no traders involved in the value chain	Development of value chain to include traders will diversify their sources of income and create more employment.	Low fish production volumes
	Human	Potential traders available	Due to current volume, few traders—most of whom have low capital—will be attracted. In the medium term when the trade proves profitable they may be a source of inputs and market information.	More producers producing bigger volumes
	Political	Not relevant	Not significant	Not significant
	Socio-cultural	Not relevant	Negative social relations in both short and medium term as traders bargain to increase profitability	
	Protective - security	Not relevant	Not relevant	Not relevant
4	Economic	MSc and PhD students	No significant economic impact in both short and medium term	No significant risk
	Human	MSc and PhD candidates capable of providing empirical evidence to aquaculture production bottlenecks	Student research will not only result in academic achievements but also provide a basis for future engagement of students in answering development questions.	If not well timed, the research may not be relevant for this project.
	Political	Not relevant	In the medium term, as coordination and information on production gaps become resolved, both parties will become better informed and reduce marginalization.	Risk of viewing the project as an academic theory
	Socio-cultural	Not relevant	Relations with other beneficiaries will improve with time.	Conflicts on data management and use
	Protective - security	Not relevant	Not relevant	Not relevant

Module 5: Development outcomes

The tables presented below summarize the likely impacts of the project on the Malawi Growth and Development Strategy (MGDS) and the Millennium Development Goals (MDGs).

Impact on Malawi growth and development strategy (MGDS)

MGDS theme	Outputs/outcomes/ impacts		Details & risks
	Short term (+/-)	Medium term (+/-)	
Sustainable economic growth	+	+	Aquaculture production encourages use of agricultural byproducts. However, use of these byproducts may not be economically viable.
Social development	+	+	Increase in fish production improves availability of fish, which is the major source of animal protein in Malawi, thereby improving the health status of the population. Additionally, the two MSc and the PhD scholarships add to specialized capacity in aquaculture development.
Social support and disaster risk management	0	0	
Infrastructure development	0	0	
Improved governance	0	+	The project is encouraging farmers to participate in decision making.
Cross-cutting issues	0	0	

Rate the strength/direction of impact (+, 0, -)

Impact on millennium development goals (mdgs) and other relevant goals
Enhancing fish production and marketing for food security and rural incomes of small-scale producers in Malawi.

MDGs and other strategic goals	Outputs/outcomes /impacts		Details & risks
	Short term (+/-)	Medium term (+/-)	
MDG 1: Eradicate extreme poverty/ hunger	0	+	The value chain studies will assist in the establishment and recommendation of better market prices and therefore higher incomes.
MDG 2: Universal primary education	0	+	High income attained may be used on children's education.
MDG 3: Gender equality/empower women	0	0	
MDG 4: Reduce child mortality	0	0	
MDG 5: Improve maternal health	0	0	
MDG 6: Combat HIV/AIDS, malaria and other diseases	0	0	
MDG 7: Environmental sustainability	+	+	Pond aquaculture is environmentally sustainable because it encourages bio-resource flows.
MDG 8: Develop a global partnership for development	+	+	The project involves both local and international partners.

Rate the strength/direction of impact (+, 0, -)

Conclusion

In general, the project is very innovative in the aquaculture sector in the way that it engages academic research in responding to aquaculture production bottlenecks. However, improvements need to be made mostly in regard to partnerships, linkages to other aquaculture projects at local level, and loan management.

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EX-ANTE IMPACT EVALUATION, GHANA CASE STUDIES

Capture fisheries and aquaculture in Ghana

Marie Caroline Badjeck and Anne Delaporte

Introduction

In Ghana, two case studies were conducted. The first study addresses the fisheries sector, focusing on the use of qualitative methods to undertake ex-ante impact evaluation of an intervention related to community-based management in capture fisheries. The second case study is on aquaculture and technology adoption. By using different entry points in terms of intervention and methods, the two rapid evaluations are a stress test for the guidelines in terms of their flexibility and applicability to different types of interventions. The report follows the general structure of the guidelines for each case study. Literature review, key informant interviews and stakeholder workshops provided the information utilized by the analysts. In contrast to the Malawi and Bangladesh case studies, the analysts use participatory methods in a workshop setting to identify a potential project and use the guidelines to assist in defining it, rather than examining an existing proposal or project. The case studies are presented following the module format of the guidelines.

Ex-ante impact evaluation for capture fisheries

While the guidelines suggest a project concept note as a starting point for the ex-ante impact evaluation, the case study exercise was used to propose a new project developed directly with stakeholders. These included chief fishermen, fishmongers, and fisheries service and district assembly staff who met during a three-day workshop in Ghana. This workshop was a good opportunity to test some of the participatory tools suggested in the guidelines, especially outcome mapping. Among the potential projects discussed, the participants prioritized the reduction of illegal fishing through a gear exchange program and community-based enforcement (Figure 1). Gear exchange programs have been shown to have positive effects. Some workshop participants had seen such a program in Tanzania as part of a study tour. The proposed project components and outcome pathways are further illustrated in Figure 3 below.

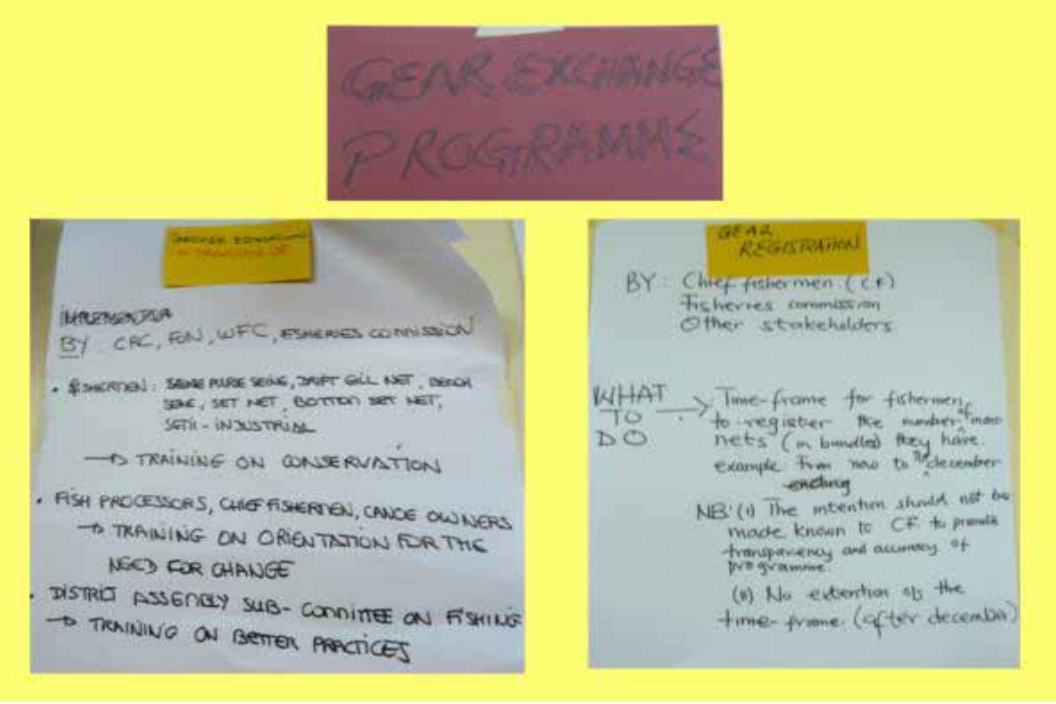

Figure 1. (a) Group work on reduction of illegal fishing practices; (b) the gear exchange program identified as a possible intervention for reducing illegal fishing in the Western Region.

Module 1: Check the intervention logic

The project to reduce illegal fishing is proposed to be part of the *Hɛn Mpoano* project focusing on coastal fisheries in the Ghana Western Region. The *Hɛn Mpoano* initiative is funded by USAID as part of the Feed the Future program and is currently in its third year of activities. During the second year, the project team organized scenario training and a needs assessment survey. The results of the scenarios developed by three groups of participants were useful to validate the intervention logic.

The Western Region is composed of six districts. The project to reduce illegal fishing should be piloted in two districts: Ahanta West and Nzema East. This project should target 27 communities: 16 in Ahanta West, which comprises around 60,000 inhabitants and 1,184 canoes (CRC/FoN, 2010a), and 11 in Nzema East, which comprises around 90,000 inhabitants and 797 canoes (CRC/FoN, 2010b).

In Nzema East, one interesting feature is that "coastal communities practice solely fishing" (CRC/FoN, 2010b). The characterization reports for both districts helped identify the issues and needs in the community. These include the following:

- Smaller fish catch implies less income.
- Poor fish quality due to illegal fishing methods causes smoking to be more difficult and shortens shelf life of processed fish.
- Unsustainable fishing methods lead to smaller catch, which in turn leads to a supply deficit, which can lead to an increased price of fish.
- Political issues regulating the supply of premix fuels, causing shortages.
- Erosion.
- Destruction of mangroves.
- Poor road access.
- Poor sanitation.

Illegal fishing, especially light fishing, is one of the biggest problems for coastal communities in the Western Region. The future scenario exercise on the main drivers of the widespread adoption of light fishing are a decline in fish stocks, inadequate enforcement of fisheries regulations, inadequate resources, influence of foreign fleets, lack of alternative livelihoods, political issues, availability of fish in the lean season, and a lack of peer pressure to discontinue this practice (see Figure 2).

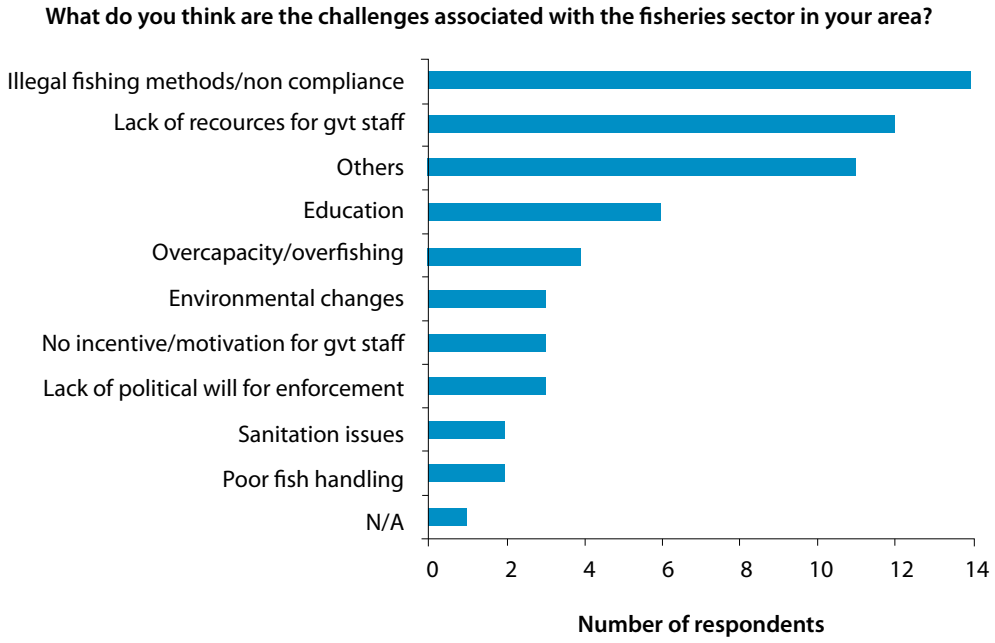

Figure 2. Fisheries Working Group perception of challenges in the fisheries sector (needs assessment survey, May 2011).

The proposed project will address various dimensions of poverty, including monetary and empowerment dimensions. While it is strongly indicated in the guidelines that the dimension of gender is important, and women are a vulnerable group in our project area, it is less clear how the gender dimension will be captured in the project and how the objectives of the project will give a voice to women. Women traditionally prioritize health and education in the family and thus in the community. They also play an important role in fish processing. The guidelines urge the analyst to consider gender issues and how women are included in project design. With a decrease in the quality of fish having been identified as an issue related to illegal fishing, women will have a role in the project and can be project beneficiaries.

The proposed project targets food security through inclusive agriculture growth, one of the two first-level objectives of the Feed the Future initiative. Looking at the results chain, the intended transmission channels will be as follows:

- Access: Access to fisheries will be conditional on gear registration and canoe licensing.
- Assets: In particular, human and social capital will improve through capacity building.
- Natural: The gear exchange program will have positive and negative short-term outcomes.
- Authority: There will be the creation of volunteer groups and enforcement of the law.
- Prices and employment are secondary channels.

The proposed project should be designed as a two-year effort. Workshop participants had already participated in training events to envision future scenarios. During that training, participants had to think about a timeline for expected outputs and outcomes. They suggested that awareness creation through education to ban light fishing will take one year. Awareness for women not to buy poor-quality fish will take longer, perhaps till 2015. Participants felt effective co-management and other activities will achieve fish stock recovery by 2019.

External influences:
There are various external influences to be considered during project implementation.

- A World Bank project to support the sustainable management of Ghana's fish and aquatic resources, of which one output seeks to reduce illegal fishing. One of the activities will be the "intensive education of fishers to foster voluntary compliance with fisheries laws, regulations and local by-laws .... This will include some support for gear replacement of fishers to facilitate compliance .... A focus in these efforts will be on the protection of juvenile fish." (World Bank, 2011)
- Government agreements with foreign trawlers/commercial vessels.
- Oil development projects: It is still unclear how oil field development will affect fishing and the coastal communities.
- Elections in 2016. Fisheries in Ghana are highly political and interests may be manipulated by politicians for electoral gain.

Key assumptions of the intervention logic (adapted from the workshop):

- If the government empowers the fisheries commission to complete registration of canoes and gear, then with monitoring, control and surveillance, better practices will occur. "Fishermen are willing to give up nets if government meets them halfway."
- Fishermen are willing to comply with fisheries laws because of the decline in fish stocks.
- If applied to all the districts, voluntary compliance will work.
- The government will commit to providing the necessary resources (especially for monitoring, control and surveillance).

Risks:

- Canoe fishery is open access, with high inward migration to the study area; this implies a need to ensure timely changes to the registration/licensing regime.
- Some people still make quite a lot of money from fishing. A new management measure could have a negative impact on their profits, and these people can be expected to use whatever political influence they have to forestall such measures.
- Chief fishermen may be resistant.
- Elite capture is a risk that could be mitigated with careful consideration for the role of traditional authorities to assure equitable access.
- There is the possibility of "If my neighbor doesn't do it, I will not do it" logic.
- Corruption: If some fishers escape penalty when fishing illegally, this will undermine the project, as traditional fishing communities might not be willing to comply anymore.

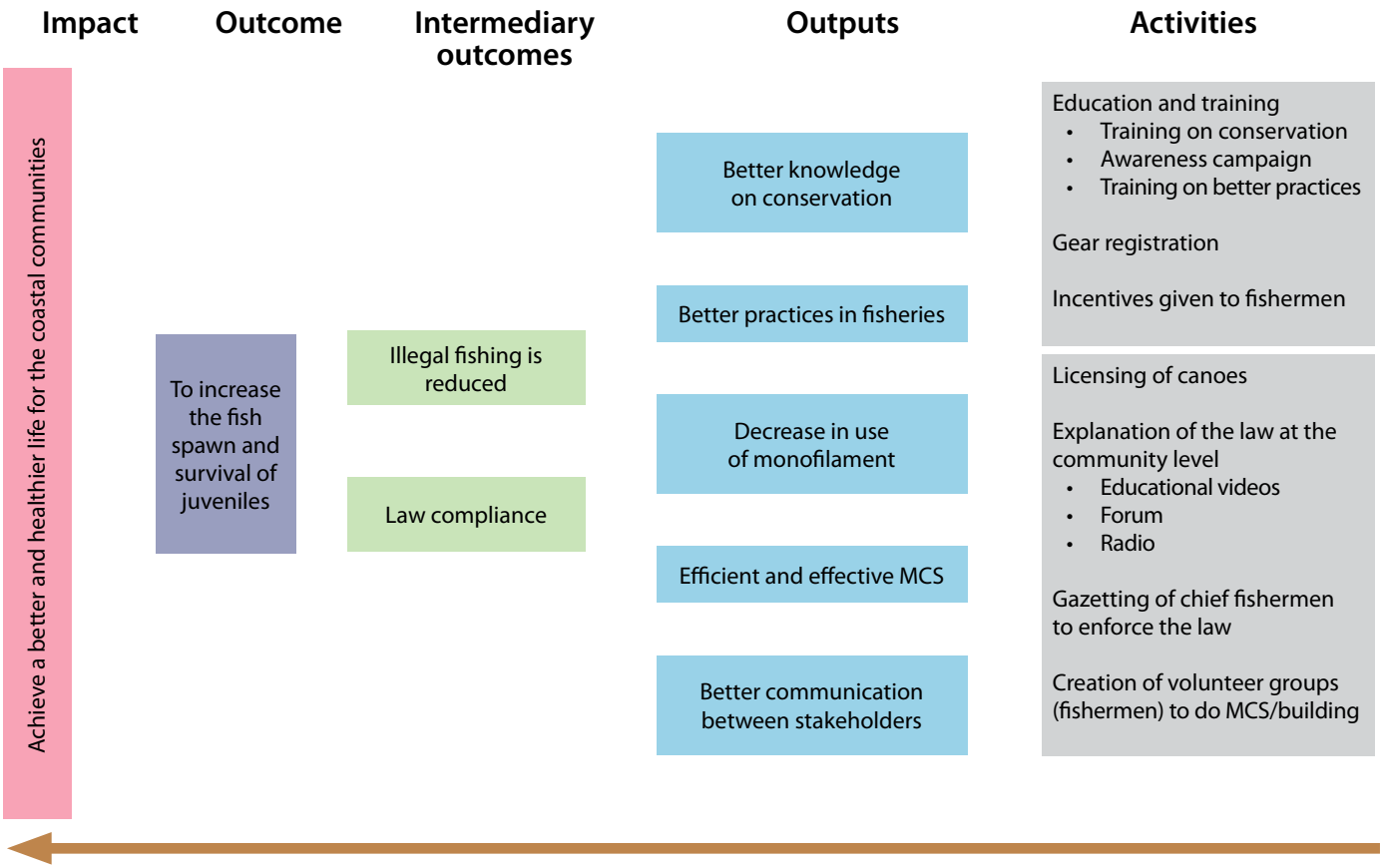

Figure 3. Outcome Logic Model of a community-based management intervention in the Western Region.

Module 2: The development and environmental setting and relevance to national strategies and plans

Ghana's government provides useful websites for each district on the various sectors, the development issues, the MDGs and related economic information at the district level. Along with the reports published on the Western Region and the rapid assessments of coastal communities in the Western Region for various districts, these websites provide enough information for the purpose of the exercise.[2]

The proposed project is suggested to be part of the two-year *Hεn Mpoano* initiative. The goal of *Hεn Mpoano* is to "support the government of Ghana in achieving its development objectives of poverty reduction, food security, sustainable fisheries management and biodiversity conservation by contributing to the vision of: 'Ghana's coastal and marine ecosystems are sustainably managed to provide goods and services that generate long term socio-economic benefits to communities while sustaining biodiversity.'" (CRC, 2011)

For the analysis for Module 2, we relied heavily on secondary data. Some knowledge about the regional environmental situation is useful.

Poverty situation

a) At the country level

- In 2007, Ghana was ranked 152 out of 182 countries, with only a slight improvement over the previous year, placing it at the lower end of the "medium human development" countries.
- Between 1991 and 2006, Ghana nearly halved the national poverty rate to 28.5% (World Bank, 2006) and absolute numbers of poor dropped too (despite population growth).
- There has been growing inequality between regions (the north is markedly poorer) and between men and women.
- Fishing activity accounts for an estimated 3% of GDP (USAID, 2008). Fish capture, processing, marketing and associated services constitute a significant source of livelihood.
- A recent study in Ghana suggested that one fishing job created seven additional jobs. The household security effect is even wider, since each of these will help support an extended family.
- "As many as 2.2 million people are dependent on the fisheries sector for their livelihoods including some 135,000 fishers in the marine sector ..." (Gordon and Pulis, 2010).

[2] Ghana district websites: http://nzemaeast.Ghanadistricts.gov.gh/?arrow=atd&_=142&sa=5014 http://ahantawest.Ghanadistricts.gov.gh /?arrow=atd&_=133&sa=3790

b) At the regional level

- There is a 3% population growth rate in the region—higher than the national average.
- Road infrastructure is relatively good, and access to health services is not a big issue.
- GLSS5 (Ghana Statistical Service, 2008) indicates that 63% of Ghana's rural coastal households draw water from a well or from pipes, but 34% rely on "natural sources" (river, rainwater or pond)—compared with 19% for all Ghana.
- Only 29% of households in rural coastal areas have electricity mains for lighting (most use kerosene lamps)—compared with 49% for all Ghana.
- Sanitary toilet facilities are lacking in many of the fishing communities in the Western
- Region. Similarly, the disposal of rubbish is also an issue raised by many communities. There are perceived short-term financial trade-offs in the fishing communities to keeping a child in school—both in terms of meeting schooling costs and in foregoing the income that the student might contribute to household revenues.
- It is very difficult to generalize about social capital in fishing communities, since communities vary significantly by location, ethnic group and socioeconomic status.
- There are clearly considerable levels of investment within the fishing communities at present: Boat building of semi-industrial ships and large canoes can be observed at or near almost all the landing sites. The increases in effort described in the WorldFish Western Region Fisheries Sector Review (Finegold et al., 2010) include investment in new nets and larger outboards, and some of the fishmongers regularly purchase and trade large volumes of fish. Some of the boat building, particularly of semi-industrial vessels, may reflect investment from outside the fishing community, but some of this investment is coming from within the coastal communities.
- Individual and family savings, as well as Rotating Savings and Credit Associations, which are commonly used by women, seem to be the main sources of financial capital. Many of the fishmongers lament the lack of affordable credit, apparently reflecting their wish to buy larger quantities of fish when the prices at the landings are low.
- However, many of the people whose livelihoods depend on fish are very poor. They are able to participate in fishing, portering, processing or petty trade in the fishing community by virtue of the fact that these activities do not require capital investment. For many, lack of access to financial capital is a constraining factor in developing small business activities
- In general, fishing communities, particularly migrant communities, do not have small landholdings, although some communities have been allocated inland plots by local chiefs. Their main source of natural capital is the sea and the coastal lagoons and estuaries.

c) At the district level

Nzema East

- There is a considerable degree of movement of migrants in and out of the district. This is attributed to seasonal fishing activities, as well as migrant farm laborers and the influx of small-scale mining operations in the municipality.
- Fishing is mostly done by people along the coast. During the major season (between July and September), there is brisk economic activity in the municipality coupled with migration into the area. However, during the off season economic activity drops and unemployment rises sharply. Individual income drops, which also affects the revenue base of the municipality (Ministry of food and agriculture, Republic of Ghana 2011).
- Poor sanitation exists.
- There are fears about oil production.
- Difficulty in accessing credit is a common problem.
- The district development goal is to improve the living conditions of the people in the district through sustainable growth and equitable poverty reduction. One of the objectives is to achieve "Accelerated Agricultural Modernization and Sustainable Natural Resource Management." For this purpose, the district plans to do the following:
  - Train 100 fishermen/fishmongers in improved culture fisheries and technologies.
  - Train 500 fishermen on the use of life-saving equipment and navigation at sea through workshops and demonstrations.
  - Train 500 fish processors/mongers in modern fish presentation methods and hygiene.
  - Monitor and provide extension/technical assistance to fishers and stakeholders.
  - Educate the general public/fishing communities on the fishers Act 625, LJ 1968 and negative effects of inappropriate fishing methods through the local FM station.

- There are other projects within the district that prioritize human resource development. However, there is no specific emphasis on fisheries apart from education about the damage caused by illegal fishing methods. The district is one of the major fish-producing areas in the region, but most fishing activities are still based on traditional techniques, and fishing is very seasonal. There is potential to introduce management innovations to improve catch.
- Since unemployment in the district is high during the lean season, the district plans to create opportunities for non-farming employment through promotion of small/medium-scale, labor-intensive, rural enterprises.

Ahanta West

- In this district, 16 communities out of 123 are coastal.
- The current population growth rate is 3.2%, which is the same as the regional growth rate.
- Migration patterns are significant.
- The fishing industry employs about a quarter of the population and mostly immigrant fishermen, a decline from 30%. This downward trend is a result of declines in fish catch and other fisheries issues.
- Currently, about 70% of the fishermen have shifted from the use of paddles to outboard motors, which were introduced in the 1960s.
- Land use: The context includes construction of hotels and resorts since 1990 and the hospitality business associated with oil find; oil/gas works, including refinery factories, imply a future problem of space for fishermen to put their vessels in and mend their nets. In view of this situation, the district assembly is seeking to ensure the orderly development of the district. The assembly has sought the assistance of the Korean Embassy for the development of a strategic land use planning scheme to build a modern city in the district.
- Incidence of sand mining and sea erosion are destroying arable land.
- There is poor road access and infrastructure.
- There are poor sanitary facilities and a lack of basic amenities.
- One of the district development goals is to provide efficient and effective services to improve the quality of people's lives. One of the objectives is to "ensure effective participation of all people in decision-making processes."

Existing national/regional strategies relevant to the project[3]

The second Ghanaian Poverty Reduction Strategy (GPRSP II) aims to double the size of the economy and raise per capita income to middle-income levels by 2015. The fisheries and aquaculture sector development plan for 2010–2015 by the Ministry of Food & Agriculture (MoFA) is summarized below.

Table 1. Fisheries and aquaculture sector development plan for 2010–2015.

Policy strategy area focus	Five-year target
Management of fisheries, conservation of natural resources and protection of their natural environment	• Volume of capture fisheries production maintained (no fish stock collapse)
Promotion of value addition in the fisheries sector and improvement of livelihoods in the fisheries communities	• Value of annual fish income increased by US$50 million from value-added projects • Fisheries sector achieving annual surplus of income over costs of US$50 million from value-added projects and efficiency gains • Ghana remains a landing processing hub within the West Africa tuna fishery
Sustainable development of aquaculture	• Production has expanded 10 times by volume to 35,000 tons
Improvement and sustainability of services provided to the sector by the Fisheries Commission and the other supporting institutions	• Fisheries management and compliance systems are in place to allow effective control of all the commercial fishing efforts in Ghana • Government of Ghana fisheries management costs are self-funded

Source: Finegold et al. (2010)

Apart from MoFA, there are other public organizations that look into achieving similar outcomes. The proposed project would be under the Environmental Protection Agency, which seeks, among other objectives, to create awareness of mainstream environmental issues in the development process at the national, regional, district and community levels.

Module 3: Stakeholder and institutional analysis

There are numerous stakeholders interested in the economic development and environmental sustainability of Ghana's fisheries. The list below was compiled on the basis of literature review and consultations with workshop participants and others interviewed during field work. They are grouped by scope of the organization. Portions of the stakeholder analysis are included with discussion in Module 2.

Table 2. Fisheries stakeholders.

Scale	Stakeholder group	Legitimacy	Power	Effect of project on their interests	Capacity and motivation to participate
Supra-national	World Bank, FAO	medium	high		+
	NEPAD, DFID	medium	med-high	+	++
	USAID, AECID	medium	medium	+	++
	ICAAT, international fishing companies	high	high	+	0
	LME commission	high	medium	0	0
	International oil companies & oil service companies	low	high	0	0
National	Ministry of rural development and local government	medium	high	+	+
	Environmental protection agency	medium	medium	++	++
	Fisheries commission, fisheries department, national fisheries association of Ghana (industrial)	high	med-high	++	++
	National inshore fishers association	high	low-med	++	++
	National canoe fishers association	high	low	++	++
	Oil negotiators	low	high	0	0
	NGOs	low-med	varied	+	+
District	Fisheries commission, fisheries department	high	medium	++	++
	Regional coordinating councils	low	medium	+	+
	NGOs	low-med	varied	++	++
Local	Canoe fishers, CBFMCs, fish traders and processors	high	low	++	++
	Chief fishermen, konkohene	high	varied	--	-
	Semi-industrial fishers	high	med-high	-	0
	Traditional authorities	varied	varied	++	-
	Local fisheries service providers	medium	low	++	0
	Other local economic actors	low	varied	0	0

List adapted from Finegold et al. (2010).

[3] This section borrows extensively from Finegold et al. (2010).

Module 4: Analysis of transmission channels

This module examines how changes can happen in the project. The guidelines suggest various methods; one suggestion is to use a matrix and evaluate a set of factors, including employment, financial transfers, access to services, value of assets, and political and traditional authority. An alternative method relies on theory of change and outcome pathways. Figure 4 below illustrates outcome pathways for the proposed project. Starting at the top of the figure are proposed activities that, combined with two key assumptions in the second line, create outputs and outcomes. These in turn lead to the second-level outcomes, which if the set of risks and potential negative outcomes are managed, could eventually contribute to the goal of improved livelihoods for the fishing communities.

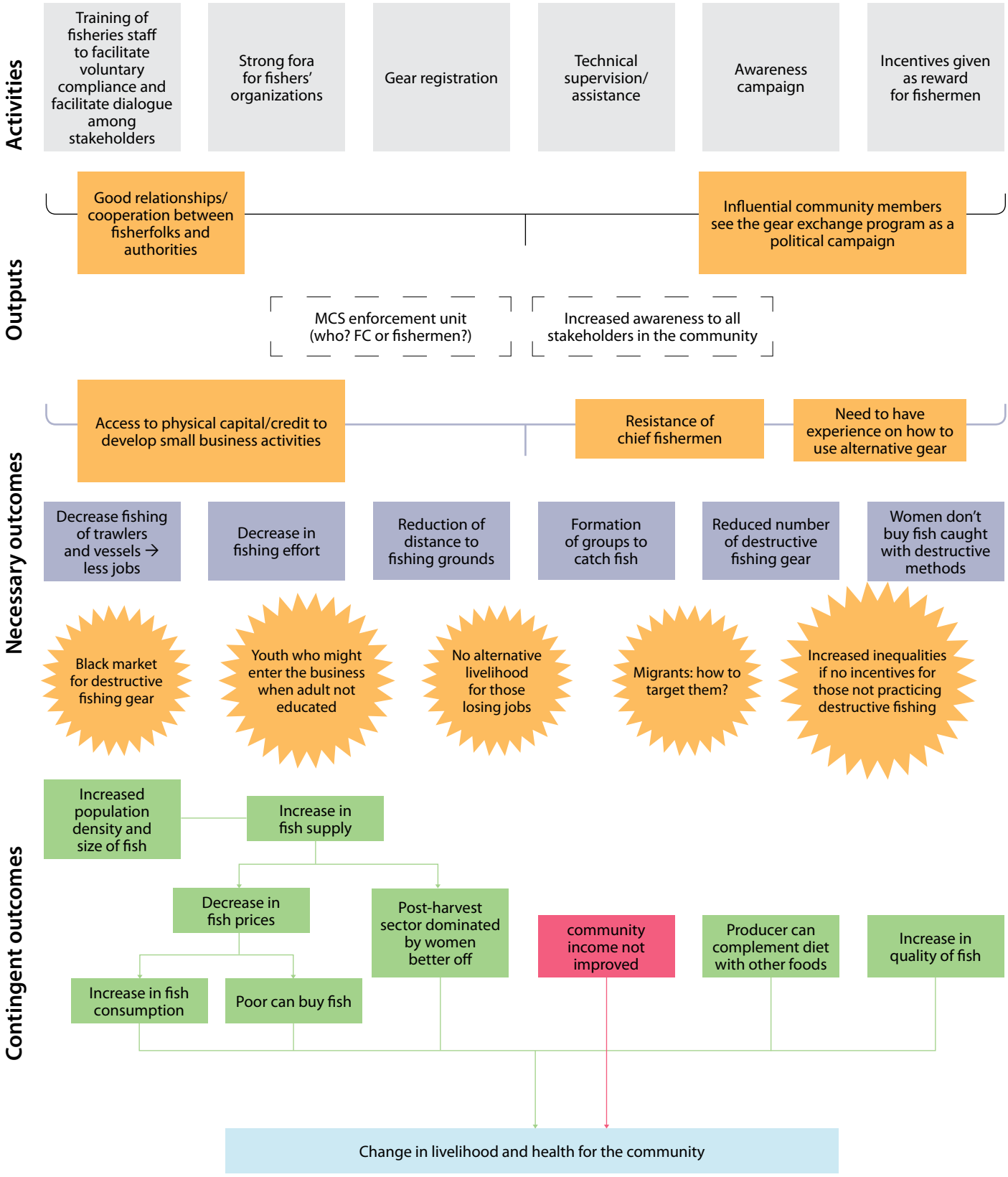

Figure 4. Impact pathways analysis for the Western Region.

Note: The green color shows the positive outcomes, whereas the red stars indicate risks or negative outcomes. MSC stands for monitoring , control and surveillance. (By authors)

Module 5: Development outcomes

As illustrated in the outcome pathways in Figure 4, the proposed aquaculture project may have several positive development outcomes:

- There may be increased employment opportunities through spillover effects of sector growth.
- With sector growth the potential for increases in women's employment in fish post-harvest activities is considerable.
- With the importance of fish in the diet and with increased rural household incomes, fish consumption may increase. Since fish is an important source of animal protein in Ghana, improvements in nutrition in rural areas can be expected. Further, if fish prices decline, then fish consumption in non-producing households, especially those in urban areas, may also increase, with the consequent improvements in nutrition.

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Ex-ante impact evaluation for aquaculture in Ghana

Module 1: Check the intervention logic

The project was initially developed with eight research partners from the Council for Scientific and Industrial Research (CSIR) – Water Research Institute in Ghana during a workshop in August 2011. In November, two research partners were invited for a four-day training session in Penang, Malaysia, on using a modeling approach to assess economic and social impacts of interventions in aquaculture. During this training, the team designed a possible project (Figure 5). The goal of the project is to promote aquaculture growth in the Eastern Region of Ghana via the introduction of the Akosombo strain of improved tilapia.

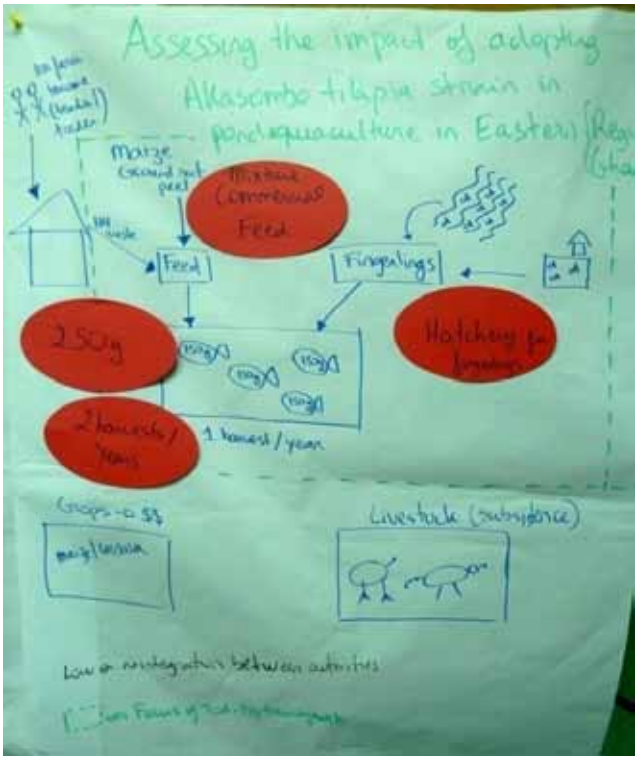

Figure 5. Boundaries of the intervention refined during the training.

This region, as illustrated in Figure 6, was chosen for various reasons:

- The region ranks second in the country in pond aquaculture production, with 8,411kg per year (MoFA, 2006). The Ashanti Region ranks first and produced 9378kg of pond fish in 2010.
- Fingerlings are more easily accessible because the breeding station is there.
- There were 239 ponds in 2006 (166 according to Asmah (2008)) and 188 fish farmers, with a total area of 76.25ha (Hiheglo, 2008). The average fish farmer has about 2 ponds.
- Since the project "Breeding and selection of *O. niloticus* for faster growth" started in 1999, very little, if any, monitoring and evaluation on the Akosombo strain has been conducted.

Figure 6. Map of Ghana: The circled area shows the Eastern Region

The two workshops with the Ghanaian team helped to refine and validate the intervention logic (Box 1). The proposed project aims at improving food security through income, employment and consumption. Brainstorming sessions helped the team to refine the intervention logic and recognize possible constraints. Ideally, a full participatory impact pathway analysis would have been conducted (Douthwaite et al., 2008).

Box 1. Narrative of the intervention logic.

Activities: Selection and testing of tilapia strains and dissemination to fish farmers. Training of hatchery managers, growers, extension officers in best management practices.

Outputs: Potential outputs include farmers' capacity to manage ponds/cages increased, 25% increase in fish growth rate, number of people trained, Akosombo strain disseminated to six West African countries. These might need to be revised to lower numbers or only certain regions/districts in Ghana.

Outcomes: In the short term, increase of aquaculture fish production by 20%, increased number of farmers adopting aquaculture, decrease of fish prices benefiting the consumer and increase in employment. In the medium/long term, there will be increased income for fish farmers and other actors involved in the sector. A negative outcome could be reduced access to fishing grounds caused by fish cages, resulting in conflicts with fishermen. If fish prices decrease, this will affect capture fishermen.

Impact: The expected long-term impact of this project is to achieve better education, health and food security for target groups and final beneficiaries. Some of the potential negative impacts of the project include pollution (effluents, escapees with impact on wild fish population) and the appearance of diseases.

Since very few publications on dissemination of the Akosombo strain are available, additional investigation is needed to evaluate the potential of this strain in the target area. This case study required close contacts with economists, social scientists and geneticists as well as the local partners. The search utilized cross-comparisons of the adoption and impacts of new technology in other West African countries, as literature on technology adoption in Ghana is scarce[4]

Project characteristics

The project will primarily target three categories of farmers within the Eastern Region:

- Those who have already adopted the improved tilapia strain. In total, more than 40% of fish farmers currently use the Akosombo strain in polyculture with catfish (Ponzoni et al., 2009).
- Those who operate fish ponds without the Akosombo strain.
- Those who don't have ponds.

According to experiences with the introduction of improved tilapia strains in Asia, the dissemination and adoption of improved tilapia will take one to two years. Outputs are expected to occur in less than a year. Outcomes will depend on the adoption success of the strain. Negative environmental impacts can occur in the short term and positive impacts in five years. This timeline is based on various factors, including the following:

- Tilapia is a very popular fish in Ghana.
- Tilapia and catfish dominate aquaculture production (tilapia represents 80% of aquaculture in Ghana, all production systems included).
- Demand is higher than supply (see Table 3), which implies high potential for aquaculture development.

Table 3. Projected fish supply and demand to 2023

Year	Supply (tons)	Demand (tons)
2012	584,767	1,044,226
2017	668,090	1,193,017
2022	763,286	1,363,010
2023	783,894	1,399,811

Source: Hiheglo (2008)

The intervention will primarily make its impact on poverty through two factors:

- Prices: Current tilapia retail prices are very high. The project should make tilapia more affordable and accessible to low-income families (Hamenoo, 2011).
- Asset accumulation through income growth.

One of the main assumptions is that increased fish production will translate into improved household food security. The second assumption is that farmers will be willing to start or improve pond aquaculture if provided with the means of doing so. The list below details a selection of opportunities and risks.

- Improved tilapia requires the use of commercial feed. However, there is a problem in getting access to good-quality feed in Ghana; this is the main bottleneck according to Hiheglo (2008).
- Accessibility issues include lack of readily available fingerlings and the distance that must be travelled to acquire the improved seed.
- Often the price of a fingerling is 40% of the price of a finished fish. This could be addressed by strengthening an informal market for seed access or through more hatcheries being implemented in the region.
- Access to markets is an issue (market-oriented approach vs. production-oriented approach).
- It is possible to stimulate the development of aquaculture as a business rather than an additional farm enterprise.
- There is a lack of technical capacity for managing fingerling stocks and optimizing feed rates and stock density.
- Farmers may want to switch from pond to cage aquaculture because it is more profitable (see, for example, Orchard and Abban, 2011: 5).
- Lack of capital is a problem—both difficulty in accessing formal credit and very high interest rates.
- Marketing of fish is an issue; extension officers should be trained to give marketing advice to farmers.
- Aquaculture is perceived as being a high-risk activity.
- According to Hiheglo (2008), problems of land tenure are not uncommon and can undermine the development of aquaculture. Information on how land ownership is affecting women in Ghana is scarce.
- The role for women in the aquaculture sector is unclear. They may have a role in the post-harvest sector or in providing financial services. There is little information on this subject.
- Lack of inputs such as seed, feed and fertilizer is the main shock that can affect production.

Several external factors may influence the outcomes of the project:

- A Tilapia Volta program has been working for two years in the Volta Basin to develop and distribute an improved strain of *Oreochromis niloticus* tilapia in order to expand the aquaculture sub-sector.
- An accreditation process is being developed for hatchery operators using the Akosombo strain of Nile tilapia. This process would enable hatchery managers to adopt best management practices that would ensure that the fish being supplied to farmers is the Akosombo strain and not something else. This may be a risk to the project if it reduces the potential for an informal market.
- Tilapia cage culture is popular in Ghana. Current work aiming at further developing cage culture could adversely affect the recognition of the proposed project's outcomes.
- US$5 million is designated by the World Bank for small-scale aquaculture development, which "will support the entry and growth of new small-scale individual investors with profitable business plans into the aquaculture sector."

Module 2: The development and environmental setting and relevance to national strategies and plans

Poverty situation

1. At the country level

In the Eastern Region, there were 802,000 households in 2006, with a mean household size of 3.7 family members. In the rural areas, 73% of adults went to school (83% men, 63% women). Return migrants make up 41% of the population. The mean annual per capita income in the region (379GHC) is just below the national mean (397GHC). Only 5% of the households in the region are in the first or wealthiest quintile, while 26% and 32% are in the bottom two quintiles.

Five percent of Ghana's population is food insecure. In the Eastern Region, that number is 8% (Figure 7). Further, at the national level about two million more people are vulnerable to becoming food insecure (MoFA, accessed in 2011).

[4] For example, see Balgah and Buchenrieder (2011) and Dibba (2010).

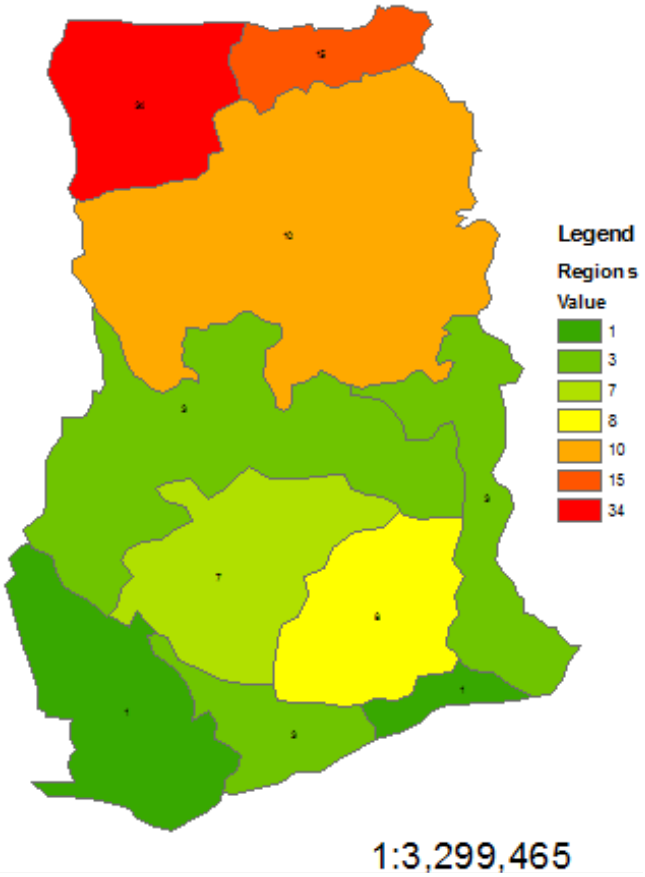

Figure 7. Percentage of people who are food insecure (MoFA, accessed in November 2011)

The percent of household source of income for the Eastern Region is diversified as indicated in Table 4 below.

Table 4. Source of household income, Eastern Region of Ghana.

Percent	Category
21	wage income from employment
42	agricultural income
28	non-farm self-employment
2	rental
6	remittances
>1	other

2. In the Kwaebibirem district[5]

About two-thirds of people in the rural areas of the district are vulnerable to shocks due to poverty. Some cannot meet their nutritional requirements and other basic necessities such as clothing, good housing and health care. Among the vulnerable and the excluded are rural food crop farmers, the unemployed and disadvantaged women.

The district has to deal with problems such as the following:

- Unplanned and haphazard development.
- Soil erosion in communities.
- Poor quality of houses.
- Inadequate telecommunication facilities.
- Inadequate distribution of electricity.
- Inefficient extension services that lead to low levels of adoption of improved and modern agricultural technology.

3. In the East Akim district[6]

The district also ranks sixth in terms of well-being in the region. Income in the district is concentrated in the hands of a few of the residents; 18% of people in the district earn only 8% of total income, with 55% earning 28% and the upper 27% of residents earning 52% of the total income. Poverty levels in the district are high.

Nearly 60% of the working population is in the agricultural sector, which is mostly subsistence. About 80% of the total active labor force is engaged in economic activities, while the remainder are unemployed.

Existing national/regional strategies or programs relevant to the project

In Ghana, the development of aquaculture is one of the strategies to bridge the gap between domestic demand and supply of fish and to produce a surplus for exports (Hiheglo, 2008). Ghana has a huge potential for aquaculture, but this potential is still under-exploited. The government launched a program in the 1980s for the development of pond aquaculture; however, this wasn't a great success, with many ponds abandoned after a few years and very few making reasonable returns on investment. This failure was mainly caused by the lack of technical assistance offered to farmers.

According to Hiheglo (2008), Orchard and Abban (2011), and Hamenoo (2011), many factors have been constraining the development of aquaculture in Ghana. These include the following:

- Inadequate supply of seed.
- Lack of suitable feed.
- Weak extension support.
- Lack of financial resources, especially credit.
- Lack of organized markets.
- Incomplete understanding of what aquaculture can do.
- Shortage of trained staff.
- Poorly motivated technical staff in ministries.

Currently, priorities are designated in the following areas:

- Genetically improved tilapia (GIFT) dissemination in the Volta basin.
- National aquaculture development plan seeking to build capacities in aquaculture planning skills. In its technical cooperation program, FAO is supporting the Ghana Fisheries Commission to implement an aquaculture strategic framework by mapping high-potential aquaculture areas that will help fish farmers to find suitable areas to go into fish production and to improve yields.
- Diversified Agriculture Program (Aloha Ecowas, 2009) aiming at making fingerlings reliably available in large quantity, year-round, at a cost between 2% and 7% of fish prices.
- A World Bank (2011) project development component to develop inland aquaculture. The project aims at increasing total aquaculture production to 35,000 tons compared to the current 9,000 tons. Two of the sub-components are complementary to the intervention: improving the genetic quality of tilapia fingerlings and brood stock and supporting small-scale aquaculture development. Activities proposed for these sub-components include *"developing a hatchery certification and fingerling dissemination plan; supporting the entry and growth of new small-scale individual investors with profitable business plans into the aquaculture sector. Upon successful completion of a training program, individual investors will be supported with grants to partially cover the costs of acquiring inputs and marketing their produce. They will also be supported with access to extension services, technical assistance and business*

[5] http://kwaebibirem.Ghanadistricts.gov.gh/?arrow=atd&_=72&sa=3771
[6] http://eastakim.Ghanadistricts.gov.gh/?arrow=atd&_=70&sa=3884

advisory services to ensure a high success ratio among the new start-ups. Under this activity, various business models for small-scale investors will be identified and tested. Only business models that prove profitable and technically feasible will be promoted among prospective investors, which would include existing businessmen and university graduates who meet the basic eligibility criteria. Training, extension and business advisory services will also be provided to existing individual investors and small-scale firms that are already in the aquaculture business but are struggling to remain profitable due to high costs or low yields."

- Role of the government in motivating people to enter the sector by providing training, extension services, capacity building of farming agents, access to fingerlings, and subsidies for lease or purchase of land for agricultural purposes.
- The Ghana PRSP (2006), which provides support for aquaculture development (see Table 5 below)
  - training of fish farmers, which started in 2005 at the Kumah farms complex and continued with the development of fish farming skills of 300 youth, drawn from the central, eastern, greater Accra and other districts.
  - training for pond construction.

- Ghana aquaculture strategic framework: The government seeks to develop the aquaculture sub-sector rapidly and raise its production to about 20% of local fish production.

Table 5. Policy objectives that concern aquaculture in the Ghana Poverty Reduction scheme.

Policy Objective	Activity & Measures	Status
AGRICULTURE MTP Modernized Agriculture based on rural development	Promotee farm mechanization Provide irrigation facilities Acquire land for commercial farming Rehabilitate fish hatcheries Improve access to inputs for livestock and crop production Promote the production of high value crops	The farmers-tractor ratio improved from 1:180,000 to 1:150,000 Total land area under irrigation is 0.08% of arable land (target of 0.12 for 2005) Inventory of agricultural land acquired by government undertaken Several on-going projects were continued Not much progress achieved though several projects embarked on
MOTI MTP Development of agro-processing	Providing processing equipments to micro and small-scale producers Promote the development of agri-business zones Facilitating access to credit Encouraging exports of MSEs	Not on course Not on course No information No information

Ghana Statiscal Service, 2003 CWIQ data in GPRS 2004:59 & 61

Note: MTP = Medium Term Plan, MOTI = Ministry of Trade and Industry, MSE = Medium and Small-Scale Enterprises, HIPC = Highly-Indebted Poor Country, MDBS = Multi-Donor Budget Support, PRSC = Poverty Reduction Support Credit Source: Hiheglo (2008)

Environmental setting

The recommendation domains for pond aquaculture[7] (Kam et al., 2008) will help identify if the Eastern Region is suitable for pond aquaculture.

1. Water availability

Brummett (2007) notes that "... about 70 percent of the total land area of Ghana is drained by the Volta river system, including the Volta lake, which covers some 8500km2 plus 1684km of tributaries." The Eastern Region has many water bodies and two dams that give potential for irrigation and farming.

The Kwaebibirem district is drained by the Birim River, which flows from north to south. In addition to the Birim River, there are other notable rivers, such as Kadepon, Pram, Subinsa and Abaam. Apart from the Birim River, all the other rivers are bounded by large tracts of low-lying land that are liable to flooding in the rainy season. As land around is cleared for farming activities, the smaller rivers experience excessive evaporation for most parts of the year. This leads to dry season water shortages. This situation could be addressed by embarking on reforestation along the banks of the rivers. Drainage systems for streams within built-up areas (especially low-lying areas within settlements) should be properly managed so as to avoid flooding during rainy seasons. In the East Akim district, the rivers and streams are a potential resource base for fishing and small-scale irrigation schemes.

The district is also rich in ground water resources as a result of light rainfall and underlying rock formations in the region.

2. Land conditions

- The climate is ideal for farming tilapia and other species.
- Environmental boundaries are natural boundaries, which can include trans-boundary impacts.
- Land tenure issues: Problems with land tenure can affect agricultural and aquacultural development projects.
- In land ownership, the Northern Region showed very outstanding improvement.
- In July 2011, five districts were affected by flooding: Fanteakwa, Atiwa, Kwaebibirem, West Akyem and Birim Central. Workshop participants noted floods destroyed many houses and farms. However, the frequency of flooding seems to be very low and might not influence the project outcomes.

Module 3: Stakeholder and institutional analysis

This stakeholder analysis focused on the potential target groups, government and non-government support agencies, and producer associations.

[7] This document provides sets of conditions and constraints that need to be overcome for a successful and sustained adoption of aquaculture with different production systems.

Primary stakeholders

Stakeholder group	Description	Information
Target group	The project will primarily target three categories of farmers: • Those who have already adopted the improved tilapia strain (more than 40% of current fish farmers) • Those who farm fish without the Akosombo strain • Those who don't have ponds	
Final beneficiaries	Rural households, communities, district, region, entire country Landless rural poor	Employment/find labor

Secondary stakeholders

Stakeholder group	Name	Role
Lead government agency	Ministry of fisheries	
	District fisheries commission	
	Regional fisheries commission	Need to give equipment and staff to fish farmers, lead agency vested with the administrative control of aquaculture
Extension services	Directorate of fisheries	Provide free extension services and other technical services to fish farmers, including the production of fingerlings for sale at government-operated fish hatcheries. Provide free extension services and training of fish farmers in aquaculture techniques. Groups of youths have been trained to construct ponds so as to reduce the cost of pond construction. The organizational capacities of fish farmer associations have been strengthened through training in bookkeeping, group dynamics and the preparation of business plans. Fingerlings are also produced and sold to farmers. Also, the importation of farmed fish is prohibited except with a permit from the Ministry of Fisheries to prevent competition from cheap imported products.
Research and training institutes	Water Research Institute (WRI) Institute of renewable natural resources	
Dominant producers		
Other notable producers	Hatchery operators	
Producer organizations	Fish farmers association of Kwaebibirem district	Encourage youth to engage in tilapia farming; can establish own fingerling production center
Other stakeholders	FAO, WorldFish	

Module 4: Analysis of transmission channels

Transmission channels are examined in the form of an income pathway map illustrated in Figure 8 below. Starting at the top are the expected project outcomes as a result of farmers adopting the improved Akosombo strain and associated production practices and expanding the number of fish ponds. These results are achieved through knowledge transfer activities and produce changes in income, labor productivity, diversification of livelihoods, and growth in human capital among participating households. The group of star figures illustrates several of the potential risks to successful project outcomes.

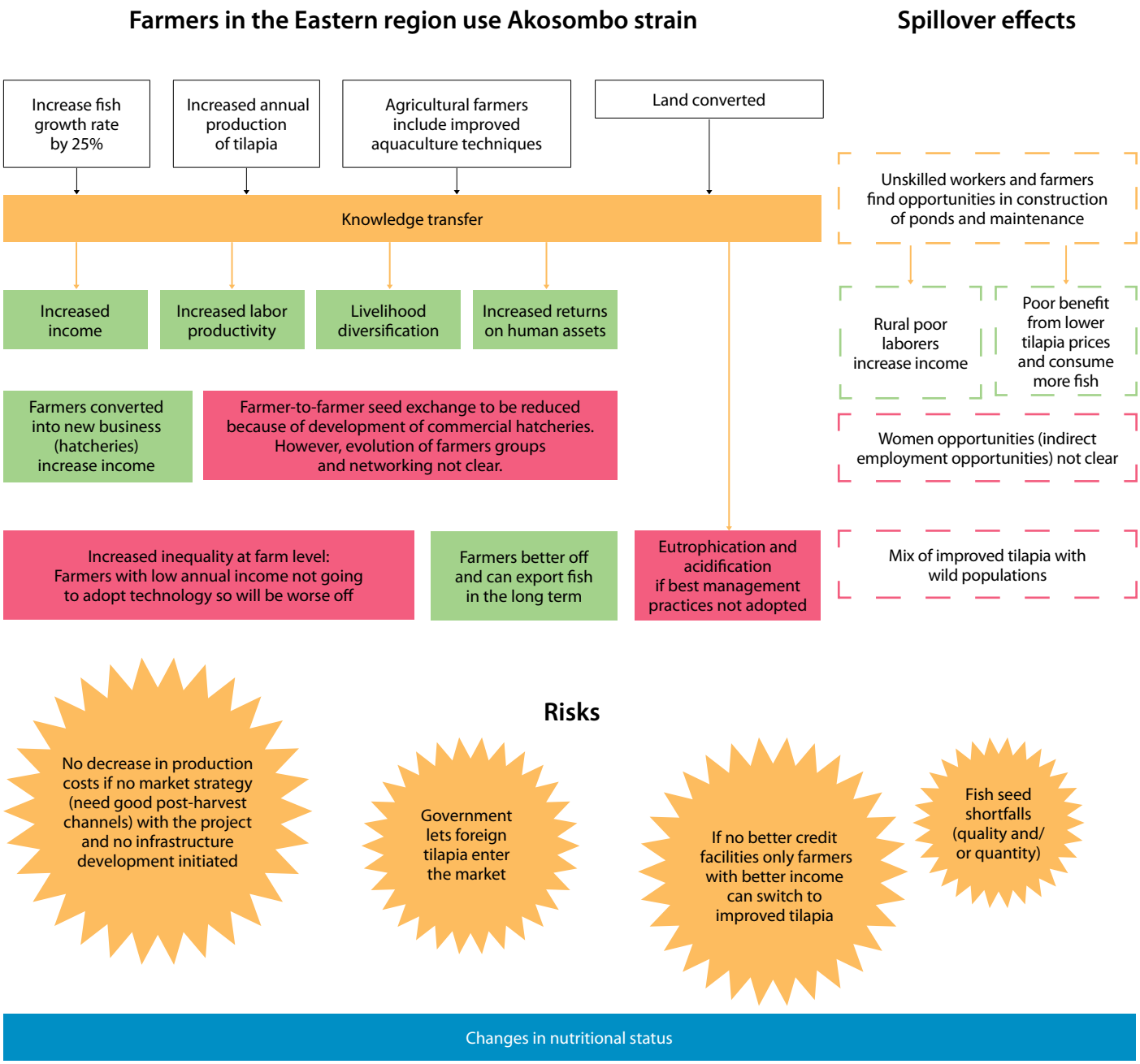

Figure 8. Impact pathways for the Akorsiosmksbo strain intervention in the Eastern Region of Ghana.
Note: Green shows positive outcomes and red shows negative outcomes.

Module 5: Development outcomes

As illustrated in the outcome pathways in Figure 8, the proposed aquaculture project may have several positive development outcomes:

- Fish farming productivity can be increased through improved tilapia strains. Improved productivity can increase farm revenues and possibly farm profits, leading to poverty reduction.
- An increased number of privately owned hatcheries strengthens the farm input sector, supporting growth through the improved supply of quality inputs. This contributes to rural employment growth with associated income improvement.
- There may be increased employment opportunities through spillover effects of sector growth.
- If the new strain is more resilient to environmental change, then this is also an asset.
- With sector growth, the potential for increases in women's employment in fish post-harvest activities is considerable.
- With the importance of fish in the diet and with increased rural household incomes, fish consumption may increase.

Since fish is an important source of animal protein in Ghana, improvements in nutrition in rural areas can be expected. Further, if fish prices decline, then fish consumption in non-producing households, especially those in urban areas, may also increase, with the consequent improvements in nutrition.

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