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Assessment of the local service provider model in Bangladesh

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Assessment of the local service provider model in Bangladesh

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Citation

This publication should be cited as: Kruijssen F, Golam F, Bråten Y and Minneboo E. 2019. Assessment of the local service provider model in Bangladesh. Penang, Malaysia: CGIAR Research Program on Fish Agri-Food Systems. Working Paper: FISH-2019-10.

Acknowledgments

This publication was made possible through support from the Feed the Future Initiative of the United States Agency for International Development through the Aquaculture for Income and Nutrition project. This work was undertaken as part of the [CGIAR Research Program on Fish Agri-Food Systems \(FISH\)](#) led by [WorldFish](#). The program is supported by contributors to the [CGIAR Trust Fund](#). We would like to thank Afrina Choudhury, Nhung Tran, Naseem Ahmed Aleem, Nazneen Khan, Kazi Zenifar Hossain, Imran Khan and Bappy Shahrier for their useful input in parts of the study and/or for reviewing the report. A review by Olivier Joffre was very helpful in making improvements to an earlier draft.

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List of abbreviations

AIN	Aquaculture for Income and Nutrition
DFID	Department for International Development of the United Kingdom
DOF	Department of Fisheries
FGD	focus group discussion
IDI	in-depth interview
IDO	Intermediate Development Outcome
IFSL	Improving Food Security and Livelihoods
LSP	local service provider
M&E	monitoring and evaluation
MSF	market systems facilitator
MTP	master trainers pool
RCE	rural community extensionist
SLO	System Level Outcome
SPA	service providers associations
ToT	Training of Trainers
TP	trainers pool
USAID	United States Agency for International Development

Executive summary

This working paper presents the results of an assessment of the local service provider (LSP) model for agricultural advisory services. Two projects in Bangladesh have implemented the model: the Aquaculture for Income and Nutrition (AIN) project, funded by the United States Agency for International Development (USAID) and led by WorldFish, and the Improving Food Security and Livelihoods (IFSL) of poor farming households through better rural service provision in Bangladesh project, funded by the Department for International Development of the United Kingdom (DFID) and led by Concern International. Using a qualitative approach, evaluating the impacts in six domains (technical, economic, social/inclusion, gender, governance and nutrition), the study evaluates the implementation of the LSP model for each project to understand its effectiveness in delivering services and development impact among farmers, creating a win-win situation between business owners and farmers, and the sustainability of such an approach.

The LSP model is a decentralized extension model whereby local actors (farmers, business owners, breeders, etc.) are trained to provide extension services (knowledge, technology transfer, training, etc.) to farmers. LSP models can differ in the ways extension services are delivered to farmers and in those who are acting as the extension service providers, including public and private sector actors. The LSP model is in principle based on farmer demand, though companies that sell inputs sometimes also provide services to increase sales of their products. Therefore, many LSP models are designed to generate profit for those providing the extension, either through direct payment or, perhaps more likely, by increased sales of inputs.

Below we present six key findings from the study, with some recommendations.

Key finding 1

While the content of the training delivered to farmers through the LSPs was the same, the two projects had different objectives they aimed to achieve. AIN was an aquaculture project focused on adopting improved technologies and practices, while IFSL included more commodities and had more emphasis on market links. The two projects also had differences in other key characteristics, such as the incentives provided to LSPs to participate, types of market actors included as LSPs, and organization of the LSPs. This resulted in differences in outcomes in two of the six domains: AIN farmers scored higher in the technical domain and IFSL farmers in the governance domain. It is recommended that both elements (technical support or practices, and improved market links) are more strongly developed in a follow-up phase of the LSP model.

Key finding 2

The assessment suggests many positive, emerging outcomes of the LSP models, both in adopting improved practices as well as the outcomes of these practices, such as improved yields. There have also been some more intangible benefits related to increased awareness and self-confidence of farmers to interact with service providers, and also in their problem-solving abilities, notably among women. Including other types of LSPs such as feed traders, input traders or fish buyers could further diversify the services and make them more relevant.

Key finding 3

Farmers' relative wealth was an important determinant for the degree to which LSP services lead to positive impacts, especially as a result of poor farmers being unable to afford the inputs to put advice into practice.

Another issue relates to the distance of farmers to an LSP; rural or remote farmers have more difficulty accessing LSP services. The use of mobile phones overcame some of the constraints of remote farmers, but farmers preferred meeting LSPs face to face. More written and visual materials, such as videos and pictures, would not only help farmers retain more of what they are taught, but could perhaps also help to spread knowledge further. LSPs also suggest finding solutions to provide access to more affordable inputs, such as through group deals with input or feed companies, as well as more credit provisions for poor farmers.

Key finding 4

There are still some limitations for women to access LSPs, related to social norms and mobility. These issues cast doubt on the inclusiveness of the LSP model, and therefore need further scrutiny and effort in future projects using the model. More LSPs, and in particular more women LSPs, could help to overcome these constraints. This would then need to be linked to raising more public awareness and recognition of women's role as aquaculture farmers and LSPs, to start addressing constraining gender norms. To overcome the mobility barriers women face, LSPs suggest providing more inputs and services directly in women's homes.

Key finding 5

LSPs believe that their role has helped them expand their businesses. In the IFSL model, LSPs earned a small commission from helping farmers acquire the inputs they need, which seems a model with higher potential for financial sustainability than having farmers pay for services. There is some scope to introduce a model where farmers pay for specific services, such as for soil and water quality testing and disease analysis. These are also services that farmers requested more of. LSPs would also like to do more practical training, such as demonstrations, rather than theoretical training.

Key finding 6

It is still unclear how service providers associations (SPAs) play a role in the sustainability of the LSP model. However, LSPs would like to see these formalized and registered with the government, which suggests they see value in them. This could then be linked to service centers where LSPs can access the latest information. This would provide an entry point for organizations such as WorldFish to continue to provide up-to-date information to LSPs. The need to keep LSPs up to date on knowledge and skills is an obvious prerequisite for their services to continue to be of use to farmers.

1. Introduction

The LSP model has gained some popularity in Bangladesh in recent years and has been implemented by several projects. This assessment focuses on the LSP models implemented by Aquaculture for Income and Nutrition (AIN) and Improving Food Security and Livelihoods (IFSL), specifically. This study intended to (1) describe how the models were implemented, (2) what the outcomes were, and (3) what could be done in the future to use the LSP model for scaling, especially for improving the involvement of women as LSPs. This includes understanding the enabling conditions and obstacles women LSPs face in running a business as well as playing the role of extension agents.

Specifically the assessment aimed to evaluate the LSP models as implemented by AIN and IFSL to understand:

- their effectiveness in delivering services and development impact among farmers;
- their effectiveness in achieving a win-win situation¹ for both business owners (LSPs) and farmers; and
- the financial sustainability of such an approach.

This working paper starts by reviewing the key literature on the LSP model and how it has been applied in Bangladesh and elsewhere—both in the aquaculture and agriculture sectors. This review was not intended to be exhaustive. Rather, it provides an overview of some key publications on advisory services from the general literature with specific attention given to available literature focusing on Bangladesh. The review is followed by a general description of the impact pathway of the LSP model. After that we describe the methodology for the assessment of the implementation and outcomes of the LSP model as applied by the two projects. This includes a framework with a set of indicators covering six broad domains: technical, economic, gender, social/inclusion, governance and nutrition. We then present the results of the assessment, starting with a description of how the model was applied in the two projects, followed by the outcomes of these activities. Finally, we provide some recommendations on future implementation.

2. Literature review

2.1 Public and private extension models

Agricultural extension and the provision of advisory services for farmers have played important roles in realizing the broader goals of increasing farm income and improving rural livelihoods in developing countries (Swanson and Rajalahti 2010; Mangnus and Bitzer 2015). However, the ways in which agricultural extension systems have been designed, implemented, monitored and financed are dynamic and context or project specific (Birner et al. 2009). Moreover, how extension is defined has evolved over time (Birner et al. 2009; Mangnus and Bitzer 2015). For the purpose of this study, agricultural extension has been defined as “the application of scientific research and knowledge to agricultural practices through farmer education.” Generally, agricultural extension can be defined as the “delivery of information inputs to farmers.” (Anderson and Feder 2007).

Historically, agricultural extension activities have been almost exclusively publicly funded. They have been implemented in a top-down manner and have featured standardized models, such as the training and visit system (Birner et al. 2009; Mangnus and Bitzer 2015). The past two decades, however, have seen the emergence of extension models focused on decentralization, outsourcing and privatization (Birner et al. 2009). These “contemporary” extension models build on the premise that stakeholders outside of the public extension system are better positioned to effectively provide quality advisory services and technologies to farmers, or that these stakeholders can play important roles in complementing existing extension programs. This shift has seen the rise of “pluralistic advisory services,” a term that captures the variety of “new” extension models, but also the myriad of extension service providers that have emerged in recent years, including nongovernmental organizations (NGOs), farmer-based organizations and private companies. In Bangladesh, private sector companies, individual entrepreneurs and farmers are key stakeholders in the country’s agricultural extension system (Anonymous 2003). Currently, the main source of extension advice for both male and female farmers in Bangladesh is other farmers, followed by private

organizations (Anonymous 2003). One can argue that this a result of inefficient public extension systems that have failed to convey important information, technology and knowledge to many farmers operating in a range of different agricultural subsectors (Nippard 2014). Research undertaken by the Bangladesh Agriculture Development Cooperation in 2008 highlighted that nearly 75 percent of all farm holdings in Bangladesh were unaware of the best application of agricultural inputs and productivity enhancing cultivation and pest control practices (Nippard 2014). The same study also revealed that only 46 percent of the survey respondents recalled ever having been in contact with a public extension officer for agricultural advice.

The literature points to several key reasons for the shifts from centralized to decentralized extension systems. First, public extension services, especially in low-income countries, have not been successful in overcoming the incentive failure of extension services to respond to the needs and aspirations of farmers and remain accountable to them (Bitzer 2016). According to Bitzer (2016), the main cause for this is the “bureaucratic structures of extension administration” and the resulting lack of recognition, incentives and facilities for extension staff, which has led to low motivation among them. Private and need-based decentralized extension models are designed to counter resource constraints within governmental institutions (Danida 2009).

Second, public extension agencies, especially in low-income countries, are constrained by a daunting lack of resources, both in terms of labor and finances. In Bangladesh, this has effectively hindered agricultural extension agents from meeting the principal information needs of farmers operating in their jurisdiction (Nippard 2014). Additionally, government extension workers appear to concentrate mainly on larger farmers for greater immediate impact and ease of work when there are no project supported extension workers or donor pressure. Moreover, limited resources effectively prevent extension agencies and extension workers from continuing to monitor and evaluate extension programs after they have been rolled out (Thompson et al. 2006).

Third, “traditional government aquaculture extension systems have been widely criticized for being top-down and inappropriate to the social conditions and needs of many farmers” (Thompson et al. 2006). As such, local extension service providers are believed to be better positioned to cater to the actual needs of farmers, especially if they are based in the same communities as farmers who need extension services. This is because these local extension service providers are considered to be familiar with local conditions, farming practices and the needs of farmers (Hansra et al. 2004).

Fourth, public extension systems have a poor reputation when it comes to including small farmers, especially women (Manfre et al. 2013). This is a result of how advisory services are targeted to more well-off households (e.g. based on land size), a general tendency of women being overlooked as farmers, and services being targeted toward the “head of household” or those earning a majority of income from agriculture. The poor reputation further stems from how extension is being delivered, not accounting for mobility and time constraints or restrictive gender norms related to men and women interacting in groups where training is delivered (Manfre et al. 2013).

The literature is abundant with discussions of the benefits and possible dangers of shifting from centralized to decentralized extension. For the purpose of this paper, however, the remainder of this review will focus on specific models of agricultural extension that engage LSPs and private actors as extension agents only.

2.2 Local service providers

The LSP model is a decentralized extension model whereby local actors (farmers, business owners, breeders, etc.) are given training to provide extension services (knowledge, technology transfer, training, etc.) to farmers. Although based on common principles, versions of the model can differ in terms of who delivers these services and how. Moreover, depending on the project design, the training and capacity building activities of LSPs can be provided by public sector institutions, donor agencies, private companies, NGOs or through public-private partnerships. The LSP model is in principle demand-based in that individual farmers, farmers’ groups and/or

communities ask LSPs directly to deliver specific extension services (Rivera 2001; Gershon et al. 2010). Further, companies that sell input may also provide services in an effort to increase sales of their products. Hence, many LSP models are designed to generate profit for those providing the extension, either through direct payment, or, perhaps more likely, by increased sales of inputs.

The following sections discuss challenges and opportunities of the LSP model to overcome previously discussed difficulties that cause public- and state-led extension systems to be inefficient.

2.2.1 Opportunities

In general terms, it is thought that LSPs are well positioned to

- deliver training, services and technology to farmers who are unable to access government or private sector support;
- potentially be more inclusive toward small farmers and women;
- develop mechanisms for quality inputs in farmers’ location based on their expressed needs, since LSPs are thought to be able to overcome the often observed “mismatch” between information demanded by farmers and the information supplied by public extension workers;
- expand their own business and income by delivering community services that are in demand from farmers;
- connect farmers to markets and upstream segments of agricultural and aquaculture value chains;
- overcome high transaction costs of reaching remote areas since LSPs live in the same communities as their target farmers;
- benefit from the social capital of local farming communities and farmers organizations.

LSP models are often built on the assumption that LSPs themselves benefit from accumulating new knowledge and technical skills by charging for their services and thus generating additional income. Indeed, LSP models aim to build links between LSPs and government extension departments and private input suppliers to enable LSPs to update their skills and buy quality inputs on a regular basis. Another perceived strength of the LSP model is that LSPs are, in theory, directly accountable to the farmers since both actors

are part of the same community. As a result, the LSP model can overcome the incentive failure (discussed above) to perform to the satisfaction of farmers (Rivera 2001; Coupe and Pasteur 2009; Gershon et al. 2010). There is, however, limited rigorous evidence to show if these benefits actually materialize and to what degree.

2.2.2 Challenges

Despite these opportunities, there are several practical challenges associated with community-based extension models. First, these models are prone to bias in implementation, which has led to favoring wealthier farmers and excluding poorer ones, especially women. This is particularly prominent in areas where poor farmers might not be able to afford the cost of services provided by LSPs (Gershon et al. 2010). Private sector service providers and private companies may be reluctant to enter poor rural markets, because transaction costs and the risks of doing business are often too high to make it worthwhile (Penrose-Buckley 2007). Second, even though community-based extension systems are, in theory, demand driven, service providers have struggled to reflect farmers' priorities in the advice and services delivered at the community level (Gershon et al. 2010). Third, the LSP model has faced serious shortcomings in settings where there is inadequate availability of qualified service providers (Gershon et al. 2010). The extension staff are likely to have limited education themselves, and their skills focus on generic technology messages rather than the "more specific and localized issues that farmers tend to identify as their priorities" (Gershon et al. 2010). Finally, deep-seated organizational cultures might hinder the effective implementation and monitoring of LSP models when these models maintain a dependence on public sector organizations or when they are introduced with the encouragement and initial funding of external donors (Gershon et al. 2010). As a result, the success of these extension models can be contingent on supportive public extension agencies and coherent national extension policies.

2.3 The LSP model in practice in Bangladesh

Over the past 20 years, several donor-led initiatives and projects have implemented community-based aquacultural or agricultural extension models in Bangladesh. Is it also worth noting that

the Government of Bangladesh (GOB), in various policy documents such as the National Agriculture Extension Policy (2012) and National Livestock Extension Policy (2013), has expressed the need for public sector extension agencies to partner with the private sector to deliver extension services to farmers more efficiently (Nippard 2014).

In Bangladesh, however, little is known about the efficiency and effectiveness of these models. Literature is scarce, and most often the sources of information discussing the impacts of the LSP models come from the implementing organizations themselves. The next section summarizes findings from the grey literature on key elements that have contributed to both the successes and shortcomings of three different LSP models implemented in Bangladesh in recent years (by Swisscontact, Practical Action, and USAID and United Purpose). All three models have been designed and implemented by international development agencies or NGOs. It is important to emphasize that this information stems from project reports, so it may contain some bias. Only findings from the projects directly linked to the LSP models, and not to other programmatic interventions, have been highlighted.

2.3.1 Katalyst – Improving Public Agricultural Extension Services in Bangladesh using the M4P Approach

The Agri-Business for Trade Competitiveness Project, branded as Katalyst, is a market development project implemented by Swisscontact under the GOB's Ministry of Commerce. The project was initiated in 2006, and it concluded in March 2017. Its overall aim was to help increase the income of poor men and women in rural Bangladesh. More specifically, the project set out to address the underlying causes of the constraints that affect the performance of extension services in Bangladesh and to identify the subsequent hindrances faced by farmers. As such, a key approach of this project was to assess how resources allocated for agriculture and aquaculture extension could be used more efficiently and effectively.

To achieve its goals, Katalyst developed an extension model that sought to "leverage local private sector initiatives and skill-sets in order to

circumvent the known and binding constraints of public offices—namely limited manpower and the high transactions costs associated with performing certain roles” (Nippard 2014). Targeting already established (market-based) local trader associations comprised of, for example, small shop owners and individual entrepreneurs, Katalyst aimed to create links between public and private actors to increase outreach and coverage to farmers untouched by previous extension efforts, reactivate farmers groups formed by closed training programs, and introduce greater responsiveness to real constituent demand for agricultural information among both unreached and recently reached farmers.

Katalyst’s agricultural extension model aimed to encourage local private sector actors in Bangladesh to take on some of the responsibilities of extension services traditionally held by public extension agents. The model was built on the premise that many of the targeted trader associations had pre-established networks with local farmers and that the associations could capitalize on these networks to help disseminate agricultural information and services to and from farms. Through the interaction with private sector extension agents, farmers were invited to join trader associations as “honorary members.” According to Nippard (2014), this allowed farmers to tap into streams of market information (both formal and informal). It also gave them access to the associations’ endowment funds. For more detailed information about the Katalyst extension model, see Nippard (2014).

While the overall impact of Katalyst is still to be evaluated, key lessons learned from the first 6 years of the implementation and scaling up (2006–2011) are worth highlighting. By 2011, the 14 trader associations had inducted over 700 members into farmers groups, giving over 25,000 farmers access knowledge and agricultural services (Nippard 2014).

The project itself claims to have gone “beyond” just training a new set of extension agents. Nippard (2014) argues that the Katalyst model built sustainability and efficiency into pre-existing extension structures because of the nature of interaction between farmers, trader associations and the public sector. Indeed, an evaluation study of the model (Nippard 2014) shows a change in the information-seeking behavior among

targeted farmers, whereby farmers expressed that they are more likely to seek extension services and information from farmers groups and trader associations than from public extension agents. This change, if sustained, holds the promise of lessening the demands on local public extension agents, as well as enabling farmers to get access to “real time” information from their networks that can increase overall farm production and mitigate sudden farm emergencies. Both the surveyed farmers and trader association members expressed their commitment to continue working together in the future, which would increase the likelihood of long-term sustainability.

The evaluation survey found that the motivation of trader association committee members to support extension services included social incentives, better backward and forward links, and improved business performance. Surveyed government extension agencies were highly satisfied with the project, because it lessened both financial and time burdens of public extension systems. As a result, a lesson learned for future projects is the need to understand the incentives and motivations for existing and potential LSPs extension agents and agencies, and to align these motivations with project objectives. Here, it is also worth highlighting the nature of engagement between Katalyst project staff and the government officials or extension agents who enabled the project to grow from 14 to 116 upazilas. Indeed, by promoting the Katalyst model as “complementary” to existing extension practices in Bangladesh, and not as their replacement, project staff were able to garner buy-in from, and gain the trust of, local government officials.

Through facilitated interaction between farmers, associations and public extension agents, a new and updated extension curriculum has been developed as a direct response to the learning needs of farmers, as identified by trader association committees. This new curriculum was developed by both private and public institutions, and it complements curricula from past or present extension programs. As such, the Katalyst model has been successful in allowing farmers to shape extension services based on local realities.

The Katalyst model has also enabled farmers to accrue benefits outside income gains derived from the attendance of formal training and other

activities. Therefore, future projects aimed at improving extension services should be mindful of, and strategically approach, potential informal benefits for targeted farmers, such as access to markets, access to market information, informal contracts with associations and trading groups, and access to non-information services.

While the Katalyst 2011 evaluation concluded that the model was successful in delivering extension services to poor farmers, it is not clear to what extent the project has been successful in engaging women farmers. Indeed, much of the data presented is not sex-disaggregated, and it is difficult to get a sense of how the model performed in the areas of gender equality and women's empowerment.

2.3.2 Practical Action Bangladesh—the Food Production Project

In 1998, Practical Action Bangladesh launched the Improving Food Production in Greater Faridpur project (Food Production Project, for short), with a duration of 5 years. The overall objective of the project was to improve the food and livelihood security of 1000 poor households. The project's design was centered around the farmer-led Participatory Technology Development approach, which sought to enhance the capacity of smallholder farmers to manage social, environmental, technical, economic and policy changes. As part of the project, Practical Action established a community-based (farmer-farmer) extension system. This "system" was designed to give "specialized and intensive technical training to 1 or 2 people in a community to become 'Rural Community Extensionists' (RCEs) with the potential to develop into independent, self-deploying service providers on a long term basis" (Coupe and Pasteur 2009). These specialists would then stimulate improved production practices in their communities. Practical Action also encouraged RCEs to create links with public extension agents and relevant private sector stakeholders. It is important to note that the RCEs were not given a salary, as it was believed they would be able to use their new skills to earn additional salaries alongside their regular income. A total of 127 RCEs were trained during the project.

Evaluation of the Food Production Project provides some interesting lessons (see Coupe and Pasteur 2009). For example, the evaluation notes that Practical Action was dependent on the buy-in from both other NGOs and relevant government institutions to successfully roll out the project (Coupe and Pasteur 2009). A lack of political buy-in particularly compromised Practical Action's ability to influence public institutions to support the project and potential scaling up efforts for the community extension approach. The evaluation concludes that "broader support to and scaling up of community extension approach by government is still needed and is a continuing focus of Practical Action's efforts in Faridpur and nationally" (Coupe and Pasteur 2009).

Surveyed RCEs mentioned income as a main motivation for taking up the training and joining the project, alongside strong commitments to provide beneficial services to their communities (Coupe and Pasteur 2009). This echoes the findings from the Katalyst model and illustrates the importance of incorporating the incentives and motivations of LSPs into decentralized extension models to ensure that they are committed to providing extension services in the long run.

Coupe and Pasteur (2009) observed a clear difference between RCEs of different gender and agricultural backgrounds (e.g. livestock versus fisheries) and the number of villages covered and distances traveled. This is interesting because it indicates that both social identities and agricultural background influence extension strategies employed by the RCEs. In other words, all RCEs are not the same, and this has to be considered when designing and implementing LSP models. Income figures from the evaluation study were not broken down by gender and agricultural background.

Advice from RCEs to farmers is invariably embedded within the sale of the inputs. For example, aquaculture RCEs gave advice with the sale of inputs, such as fingerlings. It was also found that RCEs were able to reach poor farmers with their services and that RCEs sometimes served the poor free of charge if they were unable to pay up front. This finding complements the assertion that several RCEs were motivated to join the project to provide beneficial services to their communities.

Strong evidence was found that training RCEs opened up the possibility of permanent, long-term, yet informal, employment in the rural economy. This indicates that many RCEs trained by Practical Action had sustained a high level of time and dedication to their role even after the project ended. In addition, despite the lack of formal organization of the RCEs, many were connected through informal networks. It also appeared that RCEs were not in need of more formal arrangements, as they have maintained beneficial informal links with upazila government service providers. This highlights the importance of creating links between LSPs and local government agencies.

In general, the food security situation where the project operated has improved significantly and vulnerability to the impacts of flooding has been significantly reduced in these communities. These results have partly been attributed to the training and engagement of RCEs.

Gender was not thoroughly discussed in the evaluation study, and impacts of the Food Production Project on gender equality and women's empowerment were not clear.

2.3.3 USAID and United Purpose—Local Agriculture Sector Service Providers in Bangladesh: Roadmap to Successful Support Practices

A joint USAID and United Purpose initiative was aimed at reviewing current and historical roles of LSPs in Bangladesh (Kamp et al. 2017). Their review offers concrete recommendations regarding the best practices “for providing support to the non-formal sector of locally based agribusinesses who are ‘the last mile’ of providing services to farmers in rural Bangladesh” (Kamp et al. 2017). The review included hosting a series of dialogues with relevant stakeholders who have engaged with LSPs in providing extension services to farmers. Box 1 presents the full list of recommendations from the review.

What became clear during the dialogues is that LSPs have always been important actors in agricultural value chains in Bangladesh, regardless of donor-driven efforts to boost the capacities of LSPs to deliver extension services. The key is to

better understand how international organizations, development agencies and public extension programs can work together with LSPs to provide agricultural services to farmers on a for-profit basis.

2.4 Summary

This literature review has provided a brief overview of different conceptual opportunities and challenges of the LSP model. While it holds the promise of overcoming several barriers associated with traditional “top-down” public extension systems, the model also has limitations that might hinder the effectiveness of delivering knowledge, technology and agricultural extension services to farmers.

The review of these three examples used in Bangladesh to strengthen agricultural extension has shown that the LSP models differed slightly in each project, especially in terms of the formal organization of the LSPs in Katalysts (in trader associations) and the more informal organization that organically developed between LSPs and other extension agents in the Practical Action-led initiative. However, this review has shown that key findings from the three projects complement each other and can provide useful insights for development practitioners who seek to design and implement LSP models in Bangladesh in the future.

Some of the key issues identified from these projects that are key to the success of the LSP model include the following:

- understanding and incorporating the incentives and motivations for existing and potential new extension agents and agencies
- promoting the LSP model as “complementary” to existing extension practices
- allowing farmers to shape extension services and training content based on local realities
- ensuring the LSP system not only promotes income gains as the main target but also secondary benefits such as enhanced social networks and market links
- creating buy-in from other NGOs and relevant government institutions to successfully roll out the project for scaling up community extension models
- ensuring that design is gender-sensitive and includes the poor and that monitoring data is disaggregated for sex and income.

Box 1. Recommendations for how to engage with LSPs to provide services to farmers in rural Bangladesh.

Selecting LSPs

- Work with LSPs who already have links to private sector agribusinesses and help strengthen those connections.
- Work only with LSPs who have a demonstrated history and capacity to operate viable agriculture businesses.
- Work with both men and women LSPs, as well as youths. It is difficult for men LSPs to meet the needs of women and for women LSPs to meet the demands of men.
- Work with “couples” so that both the man and the woman are part of the business and can be more responsive to both women and men customers. By doing so, they can also make more profit.
- Work with a range of LSPs to ensure they provide important services for both agriculture inputs and as buyers, middlemen or collectors of outputs.
- Work with LSPs who have the financial means to accept a moderate level of business risk.
- Work with LSPs who are literate, as they need to be able to read and explain products and their proper use to their farmer clients.
- Work with LSPs who already have established links to input companies or retail markets and middlemen.

Enhancing LSP capacity

- Provide high quality training to LSPs on financial management and accounting, including business planning, accounting ledger maintenance, negotiation skills, advertising and marketing.
- Search for and link LSPs to sources of high training rather than providing training via a project (e.g. government, private sector or other NGOs). Help to negotiate and/or arrange training.
- Connect LSPs to agribusiness companies for education on agricultural product use, product safety, product availability and new products. Help to negotiate and/or arrange training.
- Connect LSPs to training on the use of mobile phones and other electronic sources of information and services.
- Bring LSPs together to discuss specific experiences on selling agriculture products in local areas.
- Provide support to LSPs to understand all forward and backward links in the value chains they are involved in, including the transportation system.
- Ensure that LSPs pay for training themselves, even if only part of it.
- Make strong connections between LSPs and government, private sector businesses and sources of credit.

Building business

- Create links to government agriculture officers, other local government offices, private sector input providers, forward and backward market actors, farmers groups, women’s groups, the Women’s Affairs Office, NGOs, etc.
- Create long-term links to and agreements with established private sector agriculture companies. This ensures they will receive regular training on new products and support that will enhance their business. Encourage commissions for LSPs for products sold for specific companies.
- Help LSPs develop marketing strategies. Be innovative. This may include business cards, good signs, a market presence (signs and sales during market days), stalls at local fairs, visits to producer groups, visits to women’s issue groups, rickshaws and vans with phone numbers, and providing technology advice sheets to buyers.
- Establish a permanent physical shop. Make the business and services visible. This can be done at home, especially for women. There should be a dedicated area for displaying products, information and marketing materials. Put a big sign outside that is easy to see.

- Encourage LSPs to conduct demonstrations of the products they are selling and also to pay for the demonstrations themselves.
- Encourage LSPs to make regular visits to farmers in the community and leave them with business cards, brochures, product information, etc.
- Encourage LSPs to give advice to farmers.
- Encourage LSPs to make special efforts to market their products to women. Take advantage of programs that are addressing women's or gender efforts. Connect them to the Upazilla Women's Affairs Office.
- Link LSPs to sources of credit, either NGOs or commercial banks. Ensure LSPs have a good understanding of the cost of credit.
- If the trading or selling of agriculture products is limited, expand business to sell other non-agricultural products as well.

Source: Kamp et al. 2017.



Photo credit: Foto Ajaranis

Selling tilapia fry.

3. Generalized impact pathway and indicators

Although often similar in principle, LSP models can differ in both personnel and method, as we found in our assessment of the AIN and IFSL projects. In

the AIN project in particular, the LSP model had additional goals apart from enhancing aquaculture production, as it also included efforts related to

entrepreneurial skills, nutrition knowledge and gender awareness. The impact pathways of the AIN and IFSL projects were not well developed in any of the project documents. Through interviews with project staff, examining different project documents and the theory behind LSP models, we developed a generic impact pathway for the

LSP model that roughly applies to the two projects and better articulates the outputs and outcomes (Table 1).

Project activities	Project outputs	Immediate impacts (outcome level)		Long-term impacts
		Domain	Immediate impacts	
<ul style="list-style-type: none"> LSPs selected and trained Training materials distributed and used Farmers trained, including on gender and nutrition On-farm trials and field days organized Matchmaker events organized Technical services provided 	<ul style="list-style-type: none"> LSPs enabled to provide services to farmers Farmers collaborating in functioning producer groups Farmers trained or services received 	Technical	<ul style="list-style-type: none"> Farmers have adopted improved aquaculture production practices and technologies. Farmers have increased fish yields. Farmers experience lower incidence and/or impacts of fish disease. Farmers have increased efficiency in production or reduced use of inputs. Farmers have enhanced experimental or problem-solving skills. 	<ul style="list-style-type: none"> Poverty reduced Nutrition status improved Natural resources more efficiently used Gender equity enhanced
		Economic/market	<ul style="list-style-type: none"> Farmers have enhanced business and entrepreneurial skills. Farmers have reduced costs of production. Farmers have improved market links (downstream). Farmers have become more commercialized (sell a larger percentage of the fish they grow). Farmers receive a higher market price. Farmers are more competitive. Farmers have a higher level of income from fish or shrimp farming. LSPs are involved in economically sustainable businesses and have expanded their business. Farmers have improved access to (quality) inputs for aquaculture. Farmers have improved access to (quality) information and services for aquaculture. Commercial aquaculture is spreading (increased overall production). 	
		Social	<ul style="list-style-type: none"> Farmers have enhanced social capital (i.e. improved social networks) through producer groups, improved farmer collaboration and/or innovation platforms. Farmers have improved communication skills. LSPs have enhanced social capital through farmers and market links. 	
		Gender/inclusion	<ul style="list-style-type: none"> There are sufficient LSPs to reach all farmers in a particular geographic area. LSP services are accessible to farmers of all wealth levels. LSP services are affordable for farmers of all wealth levels. LSP services are accessible for women farmers. Farmers and LSPs have improved gender awareness. Women LSPs are accepted and recognized in their roles by their community. Women (farmers and LSPs) have increased decision-making power in aquaculture, income and nutrition. Women (farmers and LSPs) have more control over productive assets and resources. 	
		Governance	<ul style="list-style-type: none"> Farmers and LSPs have improved links to public institutions. The governance structures for service provision are sustainable in the long term. Methods for training, dissemination or capacity development used by LSPs to train farmers are effective, efficient and sufficient. Content of training or capacity development is relevant and up to date. Services provided are reliable and relevant. Services are provided when they are required. 	
		Nutrition	<ul style="list-style-type: none"> Farmers have improved knowledge on nutrition practices. Farmers have adopted nutrition-related production practices. Farmers use more nutritious fish for home consumption. 	

Table 1. Generalized impact pathway for the LSP model (combination of AIN and IFSL).

Immediate impacts are found in six key domains: technical, economic, social/inclusion, gender, governance and nutrition (Box 2). The overall development outcomes align with CGIAR's System Level Outcomes (SLOs) of poverty reduced,

nutrition status improved and gender equity enhanced. The Annex 1a shows how the outcomes and impacts align to CGIAR's SLOs, Intermediate Development Outcomes (IDOs) and sub-IDOs.

Box 2. Definition of the six impact domains.

Technical: impacts on aquaculture practices and outcomes such as the adoption of improved aquaculture practices, increased fish yields, lower incidence of fish disease, improved production efficiency, and the ability to solve technical problems.

Economic/market: impacts associated with the ability to do business, improved incomes, reduced costs, access to inputs and services, and the spread of commercial aquaculture.

Social: impacts related to social networks and communication.

Gender/inclusion: impacts related to the inclusivity of the model for remote, poor and women farmers, and women's decision-making power.

Governance: impacts related to the way the models are set up, such as methods and content of training, quality of the content, and financial sustainability of the service provision

Nutrition: impacts associated with knowledge and adoption of nutrition practices



Photo credit: Foto Agencies

Local service provider talking on phone.

4. Methodology for assessing the LSP models

For the assessment, we used a mixed methods design that included the following:

- A (small) structured survey was used on the functioning and outcomes of the LSP model among farmers and LSPs. This survey aimed to provide an overview of farmers' and LSPs' perceptions on how the model was implemented, the potential benefits they derived from it and the potential negative effects they experienced, corresponding with a set of criteria. Surveys allowed the team to collect the perceptions of a wider range of stakeholders in a relatively short timeframe.
- Focus group discussions (FGDs) with farmers provided information for a more in-depth understanding of the effects of the LSP model, and they supported the interpretation and triangulation of the survey data.
- Key informant interviews (KIs) with a subset of LSPs provided a more in-depth understanding of the effects for LSPs.
- KIs with project staff provided information on the process of implementation and perceptions of project staff.

4.1 Survey

The short survey was designed to gather the perceptions of a large number of farmers effectively in a short timeframe. Questions were drafted to address the key indicators as framed in Table 1, linking to the IDOs and focusing on "what" questions. Given the limited timeframe for this research, rather than attempting to quantify improvement in selected indicators, the survey aimed to assess whether, in the opinions of farmers and LSPs, indicators have improved in a qualitative sense. This choice was made because, with a lack of available baseline data, recall would be unreliable. It would also take significantly more time to implement a survey that attempts to quantify these indicators, so the sample size would become too small to make any claims about the effect of the LSP model. In addition, attribution was an issue because the present study had no control group outside the project zone.

Two versions of the survey were used: one for farmers and one for LSPs. The farmer survey

consisted of three parts: (1) respondent identification, which recorded basic information, such as age, gender, income level and aquaculture activities, (2) degree of participation in different elements of the LSP model, and (3) perceptions of the benefits and negative effects of the LSP model recorded through statements and a Likert scale. The LSP survey consisted of three similar parts but distinguished between perceptions of the benefits and negative effects of the LSP model for farmers and for LSPs themselves. The questions were all directly linked to a specific indicator (Table 1) and were all categorical and based on a Likert scale.

There are five different types of Likert scales: agreement, increase, decrease, frequency, and number.¹ The type of answers depend on the questions and are allocated in such a way that a higher score is always the "better" option to enable easy interpretation of the scores. We used tablets and ODK software for data collection to enable efficient data collection and entry.

4.2 Focus group discussions

A semi-structured FGD tool was developed to complement the survey. It relied on a fixed format to efficiently analyze the recorded data. The emphasis of the FGDs was on addressing the "why" and "how" questions. This allowed for an understanding of the constraining and enabling factors behind the functioning of the LSP model and the conditions under which this takes place.

4.3 Sample

We focused our sample on a limited geographical area (Khulna and Barisal regions) to efficiently implement the fieldwork and to take advantage of the geographical overlaps between the AIN and IFSL projects. Because of the limited time and budget available for data collection, we used a pragmatic approach to sample selection. The fieldwork took place in five upazilas: three for AIN and two for IFSL² (AIN's project reach among aquaculture LSPs was substantially larger). The upazilas were selected based on three criteria: (1) variation of the number of women LSPs (including at least three with women LSPs), (2) selection of

different upazilas for the two projects, and (3) the spread in geographies, production practices and social and economic conditions. Table 2 provides an overview of the selected upazilas.

Sample selection was carried out as follows:

- Survey of farmers: In total, 200 farmers (40 in each of the five upazilas) participated in the survey. As a result of some variation in the availability of these farmers, 201 were interviewed. Farmers were randomly selected from the project database in the case of AIN and from farmer lists from LSPs in the case of IFSL.
- FGDs with farmers: In each upazila, FGDs were held with one group of men and one of women farmers. While we aimed to select farmers randomly for these groups, the duration of the FGDs (about 2.5 hours) meant that some pragmatism was required about how farmers were selected. In practice, 15 were invited to each FGD, of which about six to 10 participated. This may have biased the sample to those that had the most time and willingness to discuss the LSP issues.
- In-depth interviews (IDIs) with nonparticipant farmers: In each of the five upazilas, we conducted six IDIs (20 men and 10 women in total) with nonparticipant farmers to understand why they were unable or unwilling to benefit from the services of the LSPs. Nonparticipant farmers were identified from two villages in each upazila, about 3–5 km away from LSP supported villages. Pond or gher farmers willing to participate in the interviews were identified.
- Survey of LSPs: In total, 60 LSPs (12 for each upazila) were surveyed, of which 25 percent were women. LSPs were selected randomly from the list of LSPs available from the projects.

In the case of AIN, we also tried to cover as many different types of LSP actors.

- IDIs with LSPs: These were conducted with a subsample of the surveyed LSPs. Four were done in each upazila (three men and one woman). This was decided randomly, for men and women separately.

The sample did not include a formal “control” group of farmers outside the intervention zones of the two projects. While having a control group would have been desirable, the scope of this assessment did not allow for one. We did include farmers who were not targeted directly by the project but were within the intervention zone. These farmers did not serve as a control group as such, but the aim was to understand why these farmers were unable or unwilling to access an LSP. An overview of the sample size is provided in Tables 3 and 4.

4.4 Data analysis

Data from the survey was used to construct an index for each domain (technical, economic, social, inclusion/gender, governance and nutrition), using the scores for each question. Where an indicator is composed of one or more sub-indicators, a simple arithmetic average of the sub-indicators was used, and t-tests to test for significant differences. Where appropriate, comparisons were also made between perceptions of men and women, youths and other people, between poor and well-off farmers, between fish and shrimp farmers, and between small and large farmers. Data from the FGDs and IDIs was used to triangulate the information provided in the survey and to provide information on how and why changes occurred. This data was analyzed using qualitative analysis techniques.

Division	District	Upazila	Project	AIN (2017)			IFSL		
				men	women	total	men	women	total
Khulna	Bagerhat	Morrelganj	AIN	17	6	23	-	-	-
	Bagerhat	Mollahat	AIN, IFSL	21	0	21	13	4	17
	Khulna	Batiaghata	AIN, IFSL	15	5	20	13	4	17
Barisal	Barguna	Amtoli	AIN	21	3	24	-	-	-
	Jhalokatil	Nalchity	AIN	17	3	20	-	-	-

Table 2. LSPs for AIN and IFSL projects.

4.5 Limitations

There are a number of obvious limitations to this study that may have an effect on the validity of the results and recommendations. Most importantly, this study is based on recall, and perceptions of farmers and LSPs, rather than objective measurements. The approach is more closely related to so-called “outcome harvesting” and is more like a review than an impact assessment or evaluation. As the intention of the study was to generate learning on the LSP model as implemented by WorldFish, we argue that this approach was appropriate in this context. For future implementation and evaluation of the LSP model, a rigorous mixed methods assessment

should take place that is able to establish contribution and counterfactuals. The study used a qualitative approach because of an interest in understanding the reasons why certain changes happened. However, a lack of baseline data for a rigorous quantitative assessment and limitations in timeline and resources available made it difficult to use a mixed methods approach. The approach therefore evaluated the perceptions of farmers and LSPs (men and women) to assess whether the LSP model is considered useful. While farmers who did not participate in the projects were included, this data was weak and did not provide a reliable control group.

Upazila	Farmers			LSPs			All
	men	women	total	men	women	total	
Mollahat (Bagerhat) – IFSL	27	13	40	9	3	12	52
Morrelganj (Bagerhat) – AIN	28	13	41	9	3	12	53
Amtoli (Barguna) – AIN	26	13	39	9	3	12	51
Nalchity (Jhalokatil) – AIN	27	13	40	9	3	12	52
Batiaghata (Khulna) – IFSL	28	13	41	9	3	12	53
Total	136	65	201	45	15	60	261

Table 3. Sample size for questionnaires by upazila.

Upazila	Farmers FGDs			LSPs			Nonparticipants			All
	M	W	All	M	W	All	M	W	All	
Mollahat (Bagerhat) – IFSL	1	1	2	3	1	4	4	2	6	12
Morrelganj (Bagerhat) – AIN	1	1	2	3	1	4	4	2	6	12
Amtoli (Barguna) – AIN	1	1	2	3	1	4	4	2	6	12
Nalchity (Jhalokatil) – AIN	1	1	2	3	1	4	4	2	6	12
Batiaghata (Khulna) – IFSL	1	1	2	3	1	4	4	2	6	12
Total	5	5	10	15	5	20	20	10	30	60

Table 4. Sample size for questionnaires, FGDs and IDIs by project.

5. Results

5.1 How has the LSP model been implemented?

5.1.1 Aquaculture for Income and Nutrition (AIN)

Introduction to the LSP model implemented

AIN was a 5-year project that started in September 2011 (with a no-cost extension up to September 2017). It was implemented by WorldFish in collaboration with the GOB's Ministry of Fisheries and Livestock and was funded by USAID's Feed the Future program. The main goal of the project was to improve income and nutrition through increased productivity of fish and shrimp in 18 of 20 Feed the Future districts (85 upazilas) in the divisions of Dhaka, Khulna and Barisal in southwest Bangladesh.

The LSP model was introduced as a result of the program development and monitoring and evaluation (M&E) process. Initially, AIN promoted or extended improved aquaculture technologies and practices by forming farmers groups (25–30 farmers per group) and training farmers through formal training sessions by extension facilitators. The results were not completely satisfactory. As a result, a discussion on adding a new component to the program to achieve more lasting impacts was initiated. The sustainability issues were discussed in a meeting between USAID and AIN in 2014. During this meeting, it was agreed to test the alternative LSP approach.

The LSPs are professional fish and/or shrimp value chain actors (input traders) living and doing business in and around the farming communities. AIN piloted the LSP model in aquaculture technology promotion in 2015 and adopted it as a main extension approach of the project in 2016 and continued with a limited number of LSPs in the extension year of 2017.

In implementing the LSP model, AIN aimed to achieve the following outputs:

- capacity of LSPs enhanced through providing services (knowledge and farm inputs) to aquaculture farmers
- enhanced LSP businesses as a result of operating as LSPs.
- increased adoption of improved aquaculture technologies and practices among farmers through improved knowledge and services from LSPs
- increased pond productivity and farmers' income as a result of adopting improved aquaculture technology
- a gender- and nutrition-supportive and inclusive LSP model
- sustained, long-term skills or capacities developed through the LSP model.

The following were the targeted outcomes of these activities:

- improved livelihoods of farmers through increased pond productivity and income
- improved nutrition status and gender equity in aquaculture farming households
- improved livelihoods of LSPs through increased aquaculture business.

Staff and partners and their roles

A range of staff and partners were involved in developing and implementing AIN's LSP approach:

- Team leader: led strategy design, planning and follow-up implementation
- Project manager: assisted in LSP modeling and planning, and coordinated LSP development activities and overall support in LSP program implementation
- Training manager and training specialist: implemented and coordinated all training programs and capacity building activities using the LSP approach
- Technical specialists: delivered training of trainers (ToT) for LSP coaches and coordinated implementation of the LSP model in the field and follow-up in respective districts
- Market systems facilitator (MSF): identified potential LSPs in the community; supported LSPs in field to organize farmer training in groups and to increase LSPs' business; formed associations and mobilization; collected data and reported LSP activities
- Department of Fisheries (DOF): took part in different training and capacity building processes, and provided information and other services to LSPs and farmers in their upazilas.

Location of implementation

AIN's LSP model was implemented at the upazila level, working in 65 upazilas in 2016 and scaling down to 38 in 2017, during the project's bridging period (Figure 1 and Table 5).

Selection process and criteria for LSPs

Selecting aquaculture input traders to develop as LSPs was important to the AIN project. The process for selecting LSPs included the following:

1. Listing input value chain actors: AIN developed a list of aquaculture value chain actors (e.g. fry traders, nursery owners, hatchery owners, feed

retailers, feed millers and chemical or medicine shop owners) for each upazila.

2. Survey on listed value chain actors: Each listed actor for every upazila was surveyed individually through a semi-structured questionnaire to establish their characteristics.
3. Final selection of LSPs: Based on the survey results, about 20 value chain actors (both men and women) who met most of the selection criteria (Box 3) and were nominated as AIN LSPs were selected in each upazila. Special attention was given to women LSPs to ensure that a sufficient number was included.



Figure 1. Map of locations where AIN implemented the LSP model.

Division	Districts	Number of upazilas included	
		2016	2017
Khulna	Satkhira, Khulna, Bagerhat, Jessore, Magura, Nariyal	28	16
Barisal	Barguna, Barisal, Bhola, Jhalokati, Patuakhali, Pirojpur	21	18
Dakha	Faridpur, Gopalganj, Madaripur, Rajbari, Shariatpur	16	4
Total		65	38

Table 5. Locations covered in 2016 and 2017 by AIN's LSP model.

Box 3. Selection criteria for AIN LSPs.

- active aquaculture input value chain actor (e.g. professional input trader) year-round
- experience in fish farming, shrimp farming, trade or inputs
- good interactions with farmers
- willing and interested to serve the farmer while conducting business or supplying inputs
- willing and interested to organize farmers groups and provide formal training
- willing and interested to help farmers build their service-acquiring network
- previous experience working with AIN (where applicable or suitable).

A total of 1275 LSPs were selected, of which 10 percent were women (Table 6). While effort was made to include more women LSPs, they were difficult to identify. The ease in identifying women LSPs also varied across the different types of LSPs. The highest share of women LSPs was among fish commission agents, shrimp depots, fish input sellers (not feed), shrimp commission agents and postlarvae traders.

LSPs received some incentives to participate, including training, a simple water quality testing kit, natural food abundance testing kit (such as a plankton net and Secchi disk), a field bag and umbrella with the WorldFish logo, training materials to distribute to farmers, and a large container for fry trader LSPs. A 50 percent investment (about BDT 85,000) was made to establish feed mills (for feed miller LSPs only) and was also linked to another AIN project component.

Capacity building process for LSPs and project staff

Capacity building in terms of accessing and delivering technical messages and input trading to the farmers was one of the key elements of the LSP approach. AIN used a four-tier capacity building and follow-up process for different categories of LSPs to implement the approach at the field level. This consisted of (1) setting up a master trainers pool (MTP), (2) the MTP training the LSP trainer pool (LSP-TP), (3) the LSP-TP training selected LSPs, and (4) the LSPs training farmers.

Developing a master trainers pool: An MTP was formed from experienced and trained project staff. In collaboration with the MTP, the training unit developed a curriculum for different types of training. The master trainers provided 5 days of ToT to the LSP-TP, which was selected from project staff employed in different upazilas and DOF staff

who were responsible for training the LSPs. The key subjects of the ToT were (a) basic aquaculture-best practices for fish ponds and shrimp ghers, (b) enhancing household nutrition through culturing and eating small fish, (c) gender aspects, (d) small-scale business promotion, (e) training delivery, and (f) forming LSP associations.

Training LSPs: The LSP-TP trained the selected LSPs using a two-step process at the upazila level. In each upazila, a trainers team consisted of a technical specialist, a MSF and an upazila fisheries officer from the DOF. The technical specialists covered three to four upazilas each, while the MSF and DOF officers focused on just one each.

1. A 3-day residential ToT was provided to all selected LSPs following the same six modules listed above. The content was simply to enable understanding and delivery to farmers.
2. LSPs were provided refresher training on the above mentioned six subjects (a-f), delivered on 5 different days throughout the year.

LSP services and reaching farmers

After receiving training from the LSP-TP, the LSPs organized and mobilized farmers groups consisting of both men and women to train farmers in a session of 3–4 hours. The training consisted of the first three modules listed above (best aquaculture practices, nutrition and gender). The best aquaculture practices covered are listed in Box 4.

Subsequently, the LSPs provided technical information and advice on specific problems to the farmer groups, as needed. Frequently asked questions by farmers related to (1) the frequency of fertilizer application, (2) types, sources and quantities of feed and feeding practices, (3) identification, sources and prices of fingerlings and shrimp postlarvae as well as stocking practices, (4)

Box 4. Messages delivered in training of farmers (AIN).

- Natural feed: Ensure the color of the water is sufficiently green (gher and pond).
- Pond preparation: Remove weeds, black soil and tree leaves (gher and pond).
- Feed: Regularly use supplementary feed (gher and pond).
- Nursery: Set up a permanent or temporary nursery or nursery pocket (shrimp).
- Stocking: For fish farmers, stock species using the three layer method for gher and pond water. For shrimp farmers, stock specific pathogen free (SPF) or polymerase chain reaction (PCR) shrimp postlarvae (gher).
- Integration: Grow vegetables on dikes (gher and pond).
- Small fish: Stock small fish, such as mola, in the pond.
- Water depth: Maintain proper water depth (gher and nursery).
- Shelter: Establish shelter for shrimp (gher).
- Gender: Encourage women's participation in any pond or fish culture activities.

pond or gher management practices, (5) disease identification and management, and (6) harvesting and marketing fish or shrimp.

In most cases, the LSPs responded timely by advising farmers on how to solve their problem. On many occasions, the LSP visited the farmer's pond or gher and provided suggestions accordingly. When LSPs were unable to provide the information and/or inputs requested, they connected farmers to other sources of information and inputs.

The LSPs sold different types of inputs to the farmers, depending on their particular business. LSPs also connected farmers with other input suppliers as needed (both LSPs and non-LSPs). In addition, LSPs developed networks among themselves and also between farmers and other LSPs in the upazila. They further formed an LSP association in each upazila and attended monthly coordination or networking meetings with AIN staff. Finally, LSPs were required to provide data and information to the AIN project.

All LSPs were responsible for organizing and supporting 60 farmers in the community. However, they were free to sell inputs and provide advice to any farmer. Almost 76,000 farmers were reached with training, of which nearly 44 percent were women (Table 7). The highest share of women farmers were reached by LSPs from fish nurseries, hatchery owners, fish input sellers (not feed) and fish commission agents. Interestingly, this does not fully overlap with the categories of LSPs among which the highest share of women is found. For example, the groups of fry traders and hatchery

owners among LSPs both reached over 40 percent of women, while less than 1 percent were women themselves.

Ensuring long-term sustainability of the LSP model

Many factors were intended to ensure long-term sustainability of the LSP model. First, LSPs were selected in and around their communities to ensure that capacity building of LSPs remained in the community. Second, links between LSPs and farmers during the project were expected to continue in the long term and benefit both LSPs in business promotion and farmers by receiving inputs and advice as required. As long as this win-win situation both for LSPs and farmers continued, the relationship and exchange of services were expected to continue.

However, the project found that long-term sustainability depended on building sufficient capacity among LSPs based on two factors: (1) knowledge and competencies on aquaculture technologies so that they can deliver the correct messages during training and correctly advise farmers on problems arising in farm management, and (2) delivering training and advice in a simple and understandable form to farmers. In addition, the personal qualities of LSPs were important, including an attitude to serve farmers, a long-term plan to continue and increase their business, and an understanding of the benefits of having increased contact with farmers.

Lessons learned from AIN's LSP model

After 9 months of implementation, the AIN project summarized the main lessons learned as follows:

LSP types or domain	Division	District	Upazila	Number of farmers supported			Share of women farmers
				Men	Women	Total	
Fry trader	4	17	61	8,062	5,566	13,628	40.8%
Postlarvae trader	1	3	13	1,941	780	2,721	28.7%
Shrimp depot	1	3	5	180	130	310	41.9%
Fish nursery	4	17	64	14,097	11,127	25,224	44.1%
Shrimp nursery	1	3	13	1,972	1,000	2,972	33.6%
Hatchery owner	4	8	12	689	500	1,189	42.1%
Feed miller	4	14	31	1,715	842	2,557	32.9%
Feed trader	4	17	55	5,445	2,426	7,871	30.8%
Fish input seller (not feed)	3	8	18	1,268	1,610	2,878	55.9%
Shrimp input seller (not feed)	1	3	13	1,373	388	1,761	22.0%
Fish commission agent	3	13	39	3,980	7,683	11,663	65.9%
Shrimp commission agent	1	3	14	1,969	1,006	2,975	33.8%
Total				42,691	33,058	75,749	43.6%

Table 7. Number of farmers trained by LSPs by type of LSP and share of women farmers.

- The LSP concept is good in theory, but the initiative began too late in the project cycle for LSPs to fully realize their potential. The project identified and conducted initial technical training and evaluation of LSP effectiveness, but the project ended before staff could follow up after the first year of LSP activity to more fully develop the capacity of LSPs as trainers.
 - Effectiveness of the approach depends on the capacity and attitude of the individual LSP.
 - LSPs should be supported for 3–4 years to build their capacity and competencies on (i) technological knowledge and skills and delivering extension services, and (ii) understanding and acting on business promotion (how to increase business by servicing farmers).
 - The use of LSPs to deliver training is good in theory, but more rigorous vetting and selection are needed to identify effective LSPs.
 - Intensive follow-up and support in the field are required to provide guidance, coordination and development of additional capacity.
 - LSP associations should have a strong platform.
 - Effective mechanisms should be developed so that LSPs are updated with new technology and improve management information.
 - The LSPs identified and trained in the AIN project should be recruited and used in future projects as farm-level trainers in household aquaculture, but more rigorous vetting and selection are needed to identify effective LSPs.
 - Over time, AIN progressively shifted the responsibility for training from project staff to NGO partners and ultimately to private sector LSPs, who are deeply embedded in and well accepted by the communities they serve. LSPs were recognized as providing a valuable mechanism for delivering training to beneficiaries, including many outside the project. Many of these LSPs provided training as a value-added embedded service in addition to their livelihood as nursery pond operators, seed traders, feed traders or feed millers. Most LSPs view ongoing training to be in their business interest.
- No lessons were formulated related to the success of gender integration.

5.1.2 Improving Food Security and Livelihoods (IFSL)

Introduction to the LSP model implemented

IFSL was a 3-year project funded by the DFID that ran from April 2015 until March 2018 in the north and south of Bangladesh. United Purpose was the lead and implementing partner in the south (six subdistricts of Khulna and Bagerhat) in partnership with WorldFish, while HELVETAS implemented IFSL in the north (12 upazilas of Jamalpur and Gaibandha). Its aim was to improve food security and livelihoods for poor and vulnerable farming communities in Bangladesh. IFSL sought to achieve this through improved income and livelihoods of smallholder and landless farmer households by promoting rural service provision. The objective was to establish private extension services to improve farmers' links with market actors, other private sector actors and public experts and advisory services on agricultural technology, marketing and business development.

Staff and partners and their roles

The following staff and partners were involved in implementing IFSL's LSP model:

- LSP coach: identified training needs of LSPs; developed a functional relationship with line agencies, market actors and private companies; improved organizational capacity building of LSPs; SPAs to keep various records and organize different events; monitored LSPs activities in the field.
- Area manager: coordinated and managed all activities of LSP coaches at the district level.
- Government line department (DOF, Department of Agricultural Extension, Department of Livestock Services, etc.): provided technical capacity building for LSPs and involved them with regular activities; followed up the activities in the field done by trained LSPs.
- Private companies: built technical capacity of LSPs; involved them with their regular activities; followed up activities in the field done by trained LSPs; made quality inputs available at the community level.

Location of implementation

The project was implemented in the north and the south of Bangladesh and targeted different commodities in those regions. Vegetables were included in all locations, while aquaculture and

poultry were only included in the south and livestock only in the north (Table 8 and Figure 2).

To select locations for implementing the LSP approach, IFSL identified the areas (villages or unions) where farmers were farming according to traditional practices and where they lacked support from government extension or other projects. This was done by collecting secondary information and through conversations with other NGOs. As a second step, the selected areas were visited, and formal and informal meetings were held with farmers to collect in-depth information. Based on this information, final areas (unions and villages) were selected with the greatest potential to implement the LSP approach.

Selection criteria and process for LSPs

To fulfill the role of LSPs, producers groups in the selected locations identified people who most closely met the selection criteria (Box 5) and who could provide services based on farmers' needs. The producer groups proposed these to IFSL, and the project (LSP coach) verified the LSP candidates' capacities in terms of knowledge and skills, as well as relationships with farmers. The vetted candidates were then sent to the related government departments (depending on the commodity) for endorsement, after which they were nominated as LSPs.

A total of 789 LSPs were selected, of which 43 percent were women (Table 9). There was, however, variation between the different commodities in terms of women's participation. Aquaculture and livestock had the lowest number of women LSPs (26 percent), while poultry (79 percent) and dairy (51 percent) had the highest. This is likely associated with differences in the gender division of labor between commodities. There was also variation across regions, with more women LSPs in Khulna (54 percent), Bagerhat (50 percent) and Jamalpur (49 percent) than in Gaibandhi (26 percent). In the case of aquaculture, all the LSPs that IFSL supported were commission agents.

Incentives provided to LSPs included capacity building support through training, exchange visits and on-farm trials. In some cases, financial incentives were also given to LSPs for training farmers (BDT 140 per session).



Figure 2. Map of locations where IFSL implemented the LSP model.

District	Commodity						
	Aquaculture	Chili	Dairy	Livestock	Medicinal Plant	Poultry	Vegetables
Khulna	X					X	X
Bagerhat	X		X			X	X
Gaibandhi				X	X		X
Jamalpur		X		X			X

Table 8. Commodities included in LSP model by district for IFSL.

Box 5. Selection criteria for IFSL LSPs.

- Age: 18 to 45
- Education: Must have a minimum class five (in the north) and class eight (in the south) in general, while a secondary school certificate is the minimum requirement for the livestock domain.
- Must be a permanent resident of the community.
- Must have previous experience on related subject matter.
- Must be accepted among community members.
- Should be self-motivated and have a professional (volunteer) attitude.
- Must be willing and interested to serve their community.
- Priority given to advanced farmers developed by respective extension departments.

Capacity building process of LSPs

The capacity building process of the LSPs included a 4-day residential training, provided by IFSL with support from WorldFish. Follow-up support and coaching was also provided on a needs basis. For aquaculture, the training was similar to that in the AIN project: (a) basic aquaculture-best practices for fish pond and shrimp gher productivity, (b) enhanced household nutrition through culturing and consuming small fish, (c) gender aspects, (d) small-scale business promotion, (e) training or message delivery and (f) forming LSP associations.

In addition, SPAs were formed to provide an institutional structure for LSPs. One SPA was formed in each subdistrict to act as a hinge between poor farmers, private sector entities and government line agencies to help smallholder farmers enter and successfully act in markets. The SPAs enabled LSPs to establish mechanisms for peer support, monitor services, and to control and strengthen their networks. This further facilitated the regular update of competencies, established functional links with public and private sector entities and other stakeholders, and helped monitor activities of service providers. The project facilitated matchmaking between LSPs, producers groups and private and public sector actors to identify opportunities for collaboration and to initiate common action.

Services provided by LSPs

The LSPs supported farmers to organize into producer groups³ and identify markets for their products. LSPs also provided farmers with the

required technical and business knowledge as well as services (inputs and information) in the same or neighboring villages. One LSP supported about 250 farmers. Similar to the AIN model, all LSPs in the IFSL project provided the main technical messages on improved or best aquaculture practices in their formal training and informal conversations. The LSPs organized formal training for farmers, and farmers contacted LSPs for help whenever they had any problems regarding their pond or gher.

The LSPs also supplied all types of inputs to farmers as requested. The LSPs sold fish fingerlings, shrimp postlarvae, fertilizer, feed, medicine and other chemicals used for maintaining water quality and oxygen. However, as indicated above, all LSPs supported by IFSL were commission agents, so they did not have their own input business. They took orders for inputs from farmers (type and amount), which they transferred to the required input traders. They then delivered the inputs to the farmer who ordered them, and the LSP would receive a small commission from the input trader.

Ensuring long-term sustainability of the LSP model

The IFSL project tested different fee models for acceptance and sustainability.⁴ Aquaculture farmers made a voluntary cash or in-kind contribution to the LSP, while for some other commodities farmers paid a fee for training. For all value chains, LSPs received a commission from private sector companies on sales of inputs and outputs.

Commodity	Number of LSPs			Share of women LSPs
	Men	Women	Total	
Aquaculture	77	27	104	26.0%
Chili	13	8	21	38.1%
Dairy	17	18	35	51.4%
Livestock	132	47	179	26.3%
Medicinal plant	46	35	81	43.2%
Poultry	16	60	76	78.9%
Vegetables	147	146	293	49.8%
Total	448	341	789	43.2%

Table 9. Overview of IFSL's LSPs by commodity and sex.

5.1.3 Comparing the IFSL and AIN LSP models

Both projects used the LSP model to provide improved technical assistance to farmers. WorldFish was involved in developing the content of the training for both, so the type of technical aquaculture training provided was similar. Differences between the two projects are summarized in Table 10.

5.2 Emerging outcomes of the LSP models

This section presents the results of the survey, FGDs and IDIs for the rapid assessment. First, we present the overall profile for all six domains for farmers and five for LSPs. The results are then presented by domain (technical, economic, social, inclusion/gender, governance and nutrition). Relevant results for the FGDs and IDIs in each domain are presented alongside the indexes. As described, each domain consists of between two and 10 indicators, which are composed of scores from between one and seven questions. Each

question generated a perception score between 0 and 4 (with 0 signifying a very negative change or high disagreement to a statement and 4 a very positive change or high agreement to a statement). Indexes were generated by taking the unweighted mean of these scores. Annex 2 contains the details on the questions composed and the indicators for each domain.

The survey included 201 farmers, of which 65 (32 percent) were women, and 60 LSPs, of which 15 (33 percent) were women. Each respondent was classified into several categories (man or woman, young or not young, small farm or large farm, poor or not poor, fish or shrimp, and AIN or IFSL). Where significant differences were present between subgroups, we present these in the main text or graph. Where they are not presented, significant differences did not appear. Annex 3 contains further details on the scores for the indicators for each domain, disaggregated by subgroups.

	AIN	IFSL
Objectives	Improve the way in which better aquaculture technologies and practices are disseminated.	Establish private extension services to better link farmers with market actors, other private sector actors and public experts and advisory services on agricultural technology, marketing and business development.
Types of LSPs	Wide range of value chain actors, such as hatchery owners, feed dealers, other input dealers, depots owners and commission agents.	Only commission agents.
Incentives for LSPs	<ul style="list-style-type: none"> • Training received • Provided with small equipment (e.g. testing kits, umbrella, field bag), and feed miller LSPs were supported with an investment into their feed mill. 	<ul style="list-style-type: none"> • Training received • Payment for some LSPs for carrying out training (BDT 140 per session), though it was not clear what the criteria were for making these payments. • LSPs received a commission from the input suppliers they ordered inputs from on behalf of farmers.
Institutional arrangements	No organization of LSPs	<ul style="list-style-type: none"> • LSPs organized in SPAs. • Not clear if SPAs contributed to the performance of LSPs.
Inclusion of women	<ul style="list-style-type: none"> • 10% women LSPs • Potentially lower than for IFSL because of an absence of women in some roles in the value chain. 	25% women LSPs.

Table 10. Comparison of AIN and IFSL implementation of LSP model.

5.2.1 Overall profile

The aggregated profile for the six domains (only five for the LSPs, excluding nutrition) is shown in Figure 3. For all domains, the aggregated indicators show a perception of no change to very positive change. LSPs appear more convinced of these changes than the farmers, except for the technical indicator that relates to outcomes of technology adoption, increased efficiency and yields, where farmers have a higher score than the LSPs.

For farmers, we found only a few significant differences in the aggregated scores for each domain between subgroups (e.g. men and women, poor and non-poor, shrimp and fish farmers). For LSPs, on the other hand, the scores for men and women are significantly different across all domains. The aggregated scores for men LSPs are consistently higher than for women for all domains, except the technical domain, where they score lower.

The aggregated profile hides significant variations for individual indicators within each domain, as well as variations between different groups. This has been further disaggregated in the following sections.

5.2.2 Technical goals

Farmers

According to our survey results (Figure 4), farmers are moderately positive about the adoption of improved practices and technologies. This indicator is composed of five specific practices for fish or seven for shrimp that LSPs taught during the training. Among them, two scored particularly low: (1) whether the color water in the pond, gher or pocket nursery was sufficiently green and (2) whether shrimp farmers most recently stocked SPF or PCR-tested⁵ shrimp postlarvae. We did not inquire about the availability of SPF or PCR shrimp postlarvae, which could contribute to the lack of adoption of this practice.

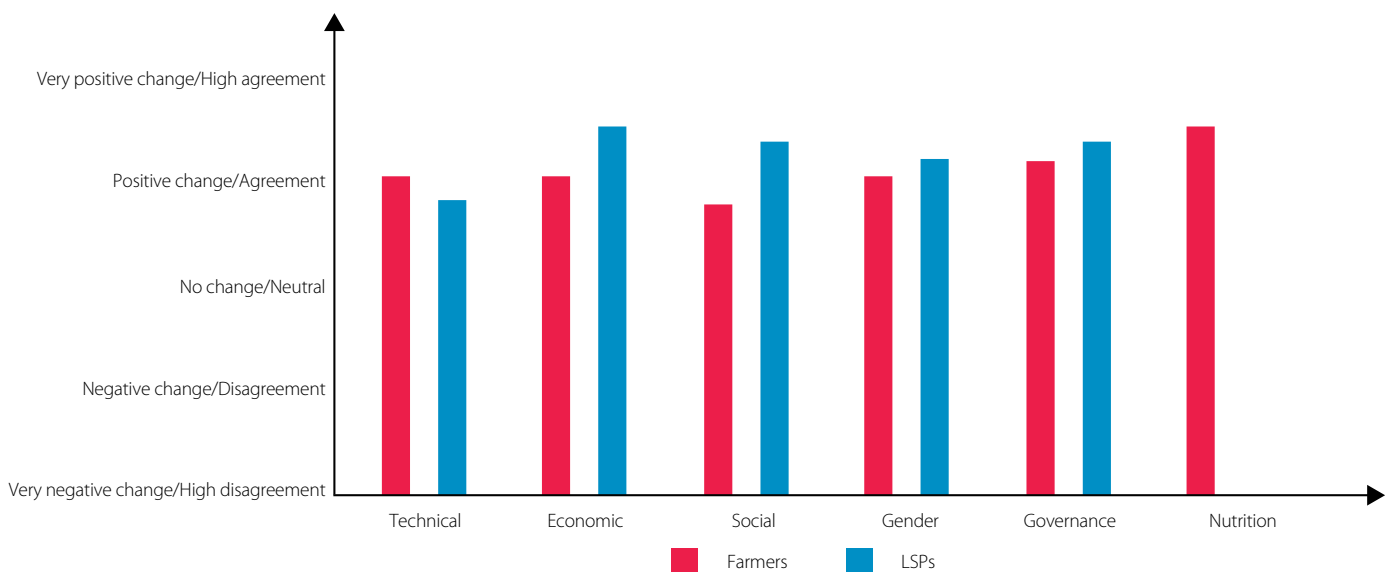


Figure 3. Aggregated profile for all domains of farmers and LSPs.

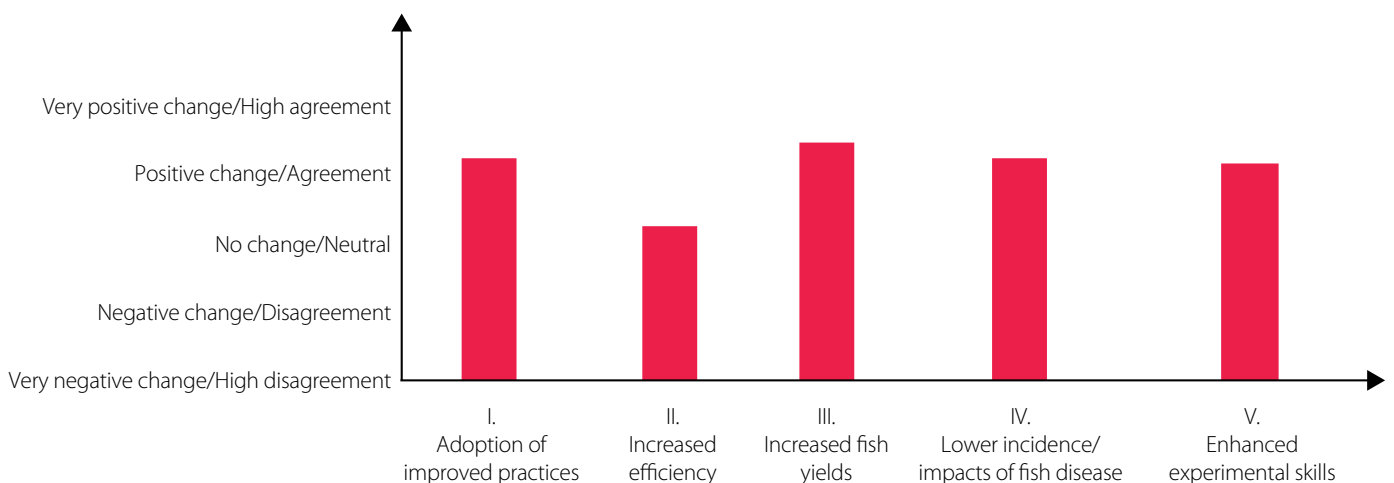


Figure 4. Technical indicators for farmers.

For fish farmers, the two highest average scores are for (1) the adoption of the practice of sunlight management of ponds, such as removing excess trees branches and providing shade for vegetables so that around 70 percent of water gets sunlight at noon, and (2) maintaining three layers of fish stocks in ponds. For shrimp farmers, it is (1) the adoption of the practice of maintaining a water depth of 3 feet above the level of mud in their gher and (2) creating a shelter for shrimp in the gher. These practices scored highest because they are easier to manage.

The FGDs with farmers confirm that they have adopted improved aquaculture production practices and technologies over the past 2 years. These include

- maintaining a proper green color of gher or pond water;
- maintaining an appropriate water level (3 feet);
- controlling weeds, as well as removing black soil and tree leaves;
- pulling *horra* (a *horra* is made up of a rope fixed with several sinks, when it is pulled, the sinks hit the surface of the pond bottom and help emit toxic gases from the pond);
- practices to ensure the proper ratio of feed, fertilizer, lime, medicine, gas control, shelters, pocket nurseries, etc.;
- introducing the three-layer stocking system;
- better knowledge on how to use and store fingerlings to increase pond production.

“ *Before training, we did not give any feed to the fish. That’s why our fish become very thin and we can’t know the reason for it.* ”

— *female farmer from Amtoli* ”

The other technical indicators relate to the effects of adopting improved practices. While the survey results show limited effects on efficiency, farmers in the FGDs are more positive about it. All groups expressed that they are now using inputs more efficiently because of better knowledge of proper

feed ratios, and that they have better knowledge of what constitutes quality inputs. Some groups also mentioned that they are now using commercial feed instead of rice, bran and snails (for shrimp). As such, several groups mentioned that they are using feed “more scientifically” compared to before.

“ *Before training, we did not know the doses of liming. Sometimes, we used excess lime, and now we know the doses and calculation, which reduced our production cost.* ”

— *female farmer from Morrelgonj* ”

All in all, the FGDs show that costs per unit of production have declined or stayed the same in spite of increasing prices of inputs and feeds in recent years. Farmers have been able to offset increasing prices for specific inputs by increasing pond production. One group also mentioned that they have reduced labor requirements for aquaculture, because they have become more efficient in pond preparation.

Farmers see moderately positive changes with respect to their fish yields and the incidence or impact of fish and shrimp disease. There are significant differences (t-test, $\alpha = 0.05$) between shrimp and fish farmers for the scores on two indicators: (1) whether an increase in efficiency in input use had occurred, and (2) whether they had a lower incidence or impact of shrimp or fish disease. In both cases, fish farmers are more positive than shrimp farmers (Figure 5).

All groups that took part in the focus group discussions said that training by LSPs has resulted in higher yields than before training. Many groups stated their yields have increase by between 150%–200%. All groups further stated that farmers who received training from LSPs have higher yields than farmers who did not receive training.

Box 6. Technical indicators.

- Farmers have adopted improved aquaculture production practices and technologies.
- Farmers have increased efficiency in production or reduced their use of inputs.
- Farmers have increased fish yields.
- Farmers experience lower incidence and/or impacts of fish disease.
- Farmers have enhanced experimental or problem-solving skills.

“ Before training, we sold fish once in year, but now three times in a year.

— female farmer from Amtoli ”

Interestingly, the main reasons provided for improved yields differ between men’s and women’s groups. Men mainly attribute it to improved technology, while women relate it more to their improved ability to identify quality seed, use better feed and because of better feeding management. However, some of the groups (mainly men) also said that there are differences in outcomes between poor and non-poor farmers in terms of productivity, because poor farmers cannot afford to buy the inputs needed to put into practice what they have learned from LSPs. In the sample, a slightly higher share of men (27 percent) than women (23 percent) were from poor households.

Shrimp and fish disease have declined significantly according to all groups, because farmers have enhanced knowledge on good pond practices after receiving training from LSPs. Farmers can now identify the causes of the disease, such as a lack of oxygen, and they use proper medicine to increase pond health. For example, fin rot disease and the number of fish with a “thin tail” and a “thick head” have decreased in Morrelgongj, according to both men’s and women’s groups. Two women’s groups said that farmers who did not receive training from LSPs are now asking trained farmers for advice on how to deal with diseases in their ponds.

With respect to farmers’ experimental skills, survey results show positive changes. This was confirmed by the FGDs, as farmers now try to solve problems themselves first, using the knowledge gained from LSP trainings. If they are unable to solve the problems themselves, then they ask LSPs for advice. If LSPs are unable to provide advice, men said they will ask for advice from the upazila fisheries department office. LSPs sometimes help farmers connect with the DOF when they need help, though this seems less accessible for women.

“ Still now, we never communicate with any DOF or any other public extension agents.

— female farmer from Nalchity ”

Two groups said that they seek help from WorldFish staff when LSPs are unable to provide adequate support. This suggests an increased level of confidence to identify and solve problems and ask for advice.

Local service providers

LSPs (Figure 6) have similar perceptions as farmers on adopting improved practices, though women LSPs are slightly more positive than men LSPs. Low average scores in particular were found among shrimp farmers for establishing permanent or temporary nurseries or nursery pockets, and for stocking SPF or PCR postlarvae in their gher. Removing weeds, black soil and or tree leaves

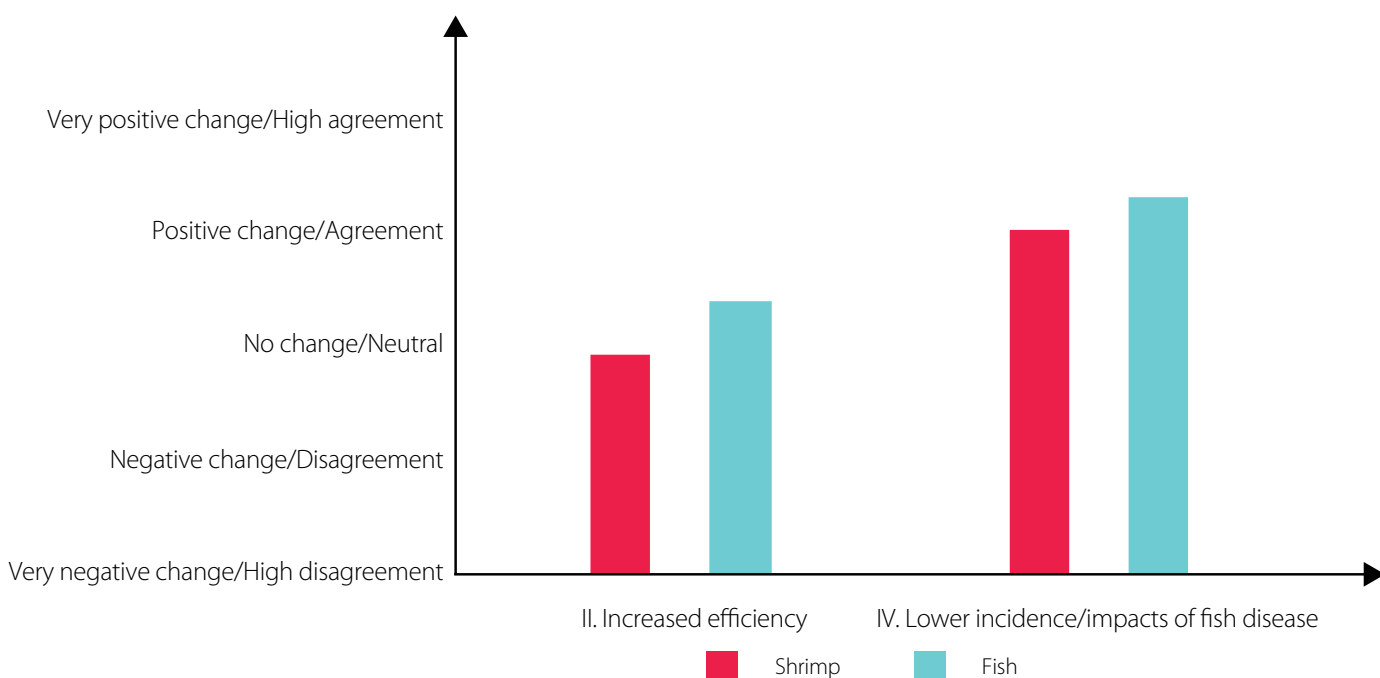


Figure 5. Significant differences between shrimp and fish farmers for technological indicators.

from a pond or gher and the regular use of supplementary feeds in the pond or gher are practices that have high average scores. The latter two practices received higher scores because they are easier to adopt than the first two.

All 20 LSPs (15 men and five women) included in the IDIs said that farmers have adopted improved aquaculture production practices and technologies. For example, farmers now prepare their gher or pond properly by removing rotten mud from the bottom, drying their pond and applying lime, stocking better fish seed from different species in correct numbers, and feeding their fish regularly. This supports the farmer survey data that also shows a positive adoption of improved fish farming techniques.

“ Farmers are more aware about water color, weeds and predator fish. Now they remove black soil regularly. I trained them. I can make them understand its benefit.

— male LSP in Mollahat ”

“ Farmers used to follow traditional practices. Now farmers know the good improved practices and are using their knowledge in practice.... Farmers are more aware now. They know benefits about fish farming. From adopting the improved practices, the production of fish increases a lot for the farmers.

— male LSP in Amtoli ”

However, various LSPs also suggested that the financial situation of farmers determines their ability to invest in all the required inputs needed. The very poor farmers are not able to buy the required inputs and this affects the production and yield.

“ The input cost is high, so some of the poor farmers cannot afford to give all inputs at proper rate.

— male LSP in Morrelgonj ”

Finally, one LSP from a women’s group in Amtoli mentioned a positive spillover effect. She said untrained farmers have become inspired to do the same as trained farmers because they see the benefits of the improved techniques.

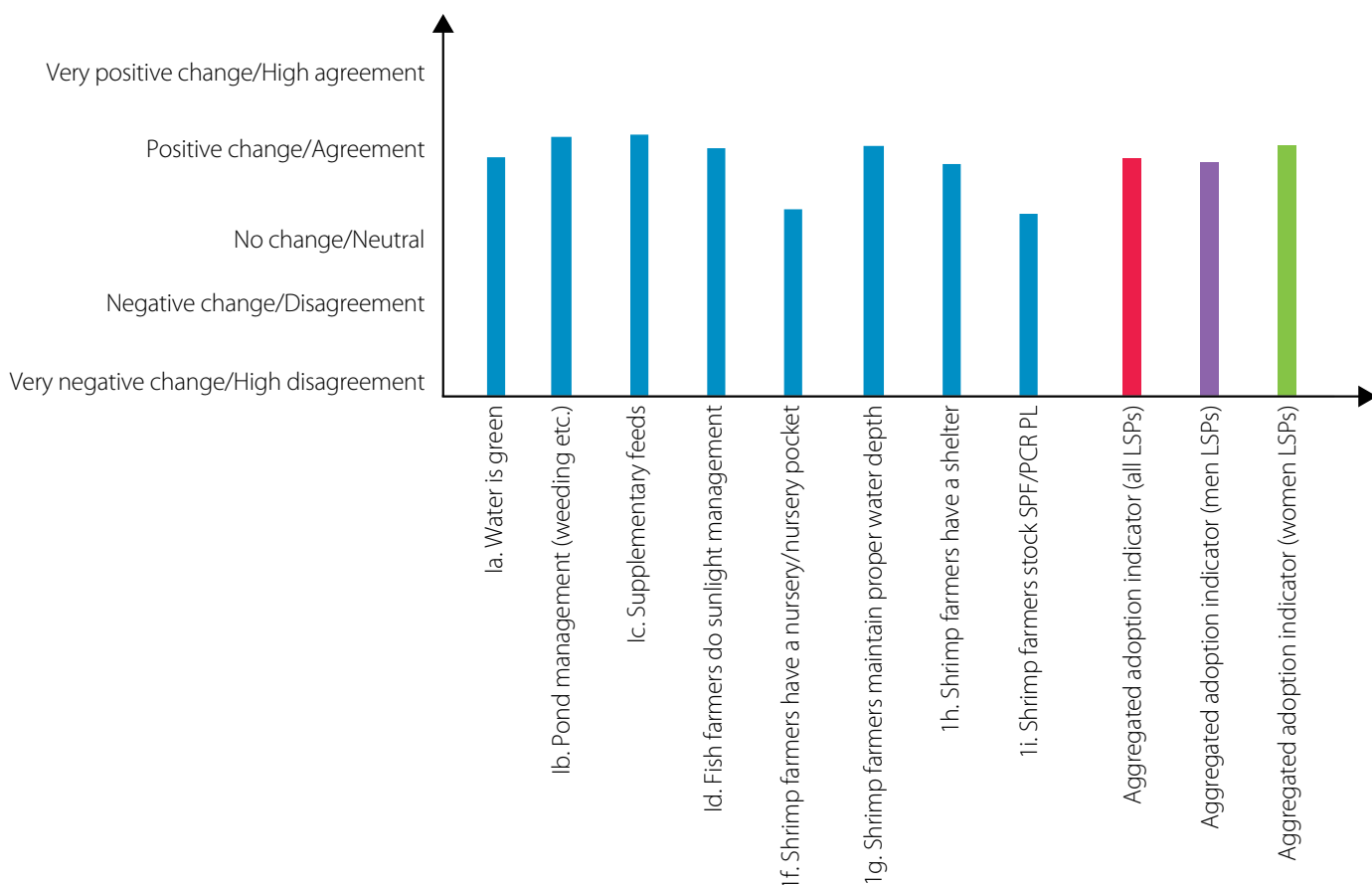


Figure 6. Technical (sub)indicators for LSPs.

5.2.3 Economic and market goals

Farmers

In the survey, farmers scored most indicators moderately positive (Figure 7), except the ones related to reduced costs of production and the sustainability of the LSPs business. One that scored low was the indicator that represents whether LSPs are involved in sustainable businesses with respect to service provision. This is because the indicator is composed of two statements. One represents the present situation while the other represents a potential future scenario: “When I access information and services (not inputs) from the LSP, I pay for these services” and “I am willing to pay for the services provided by the LSP.” At the moment, few farmers pay for services, though 61 percent said they would be willing to do so (they somewhat agree or strongly agree to this statement).

From the FGDs, it became clear that this enhanced access to inputs comes directly from the links to the LSPs, though not in all cases. Six out of 10 FGDs said they get inputs from LSPs. Most of the other groups said that, although they do not buy from an LSP, they have easier access to inputs in local markets than before. Even when they do not access inputs from an LSP directly, they may be supported by LSPs to access them. One group stated:

“ Once, LSP Shahidul gave us the address of a feed dealer where we can get best quality feed, and its market price was less than other feed traders. We did not have options like this two years ago.

— male farmer from Morrelgonj ”

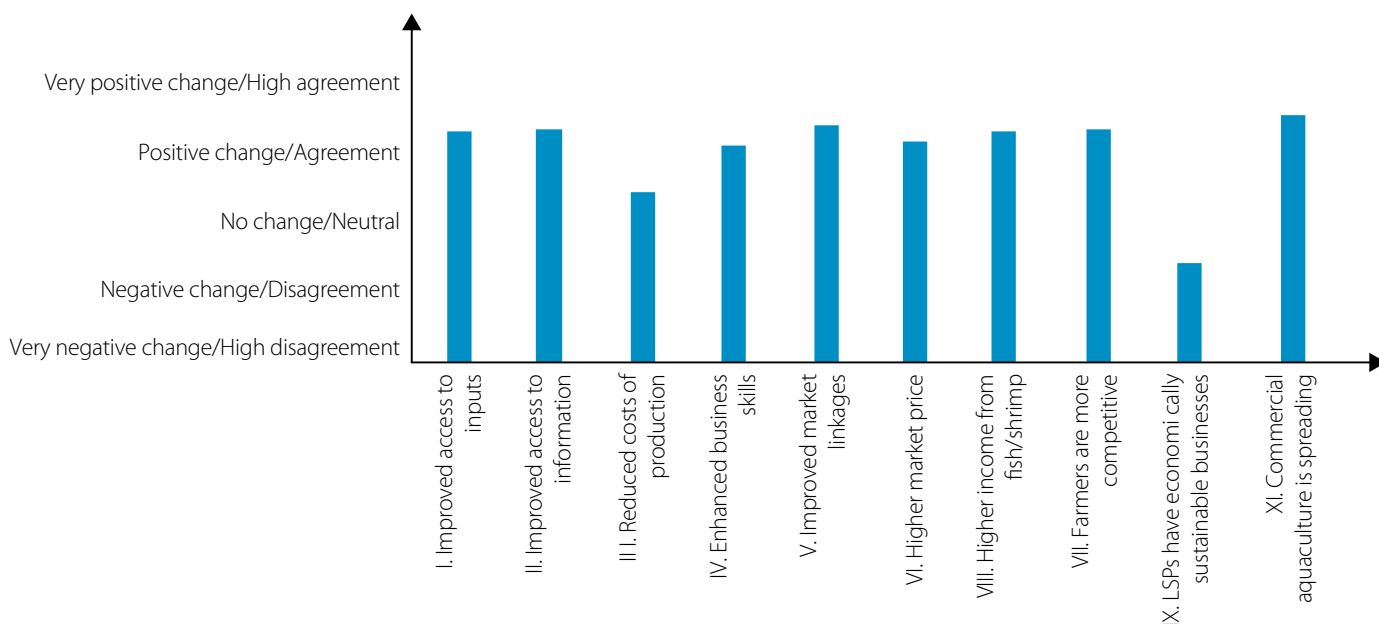


Figure 7. Economic indicators for farmers.

Box 7. Economic and market indicators.

- Farmers have improved access to (quality) inputs for aquaculture.
- Farmers have improved access to (quality) information and services for aquaculture.
- Farmers have reduced the costs of production.
- Farmers have enhanced business and entrepreneurial skills.
- Farmers have improved market links (downstream).
- Farmers receive a higher market prices.
- Farmers are more competitive.
- Farmers have a higher level of income from fish or shrimp farming.
- LSPs are involved in economically sustainable businesses.
- LSPs have expanded their business.
- Commercial aquaculture is spreading because of increased overall production.

It is mostly the male members of the households that buy inputs from the market, though women in female-headed households sometimes do so themselves. Three groups (one men's and two women's groups) also said that "women are now more aware." LSPs also help verify market prices of various inputs.

“ *Most of the time, we buy fish feed, fertilizer and lime from our LSP Imam Hossain. He is a commission agent of inputs. In some cases, he arranges inputs on short-term credit basis. If he could not manage it immediately, he asks for some time. Within 2 to 3 days, he delivers the input at our home, but the male members of the family also purchase inputs from the nearby market. We buy input through him [the LSP] because he assures the quality and manages many hassles for us.*

— **female farmer from Nalchity** ”

This highlights that some LSPs are effectively supporting women to overcome barriers that prevent them from purchasing inputs from local markets that are deemed to be male-dominated spaces.

According to the FGDs, all farmers contact LSPs for technical and market information. They may also verify it from other sources. According to the women's groups, their male household members are mainly in charge of collecting relevant market information, but they may consult with their spouse once they have obtained it. Some farmers also said that they collect information from the internet.

Although the survey results suggest there was no change in the cost of production, farmers in the FGDs have reduced their cost of production. The highest cost of production is for feed, while pond digging is the highest investment for aquaculture. Farmers said that the costs per unit of input have increased in recent years but that they buy fewer inputs now that they have better knowledge of good production practices. Productivity has increased so that the overall cost of production per unit has decreased.

“ *The highest cost of fish production was for fish feed. Now our input cost has increased a little bit, but our production has increased much more, so our unit production cost has reduced a bit. Two to three years ago, the situation was different. Sometimes we used inappropriate inputs, and that effected our production. Like, some of us used less feed in their gher. Because of that, their production was much lower.*

— **male farmer from Morrelgonj** ”

As indicated by some women's groups for disease, some men's groups said that trained farmers provide advice to untrained farmers, which helps them to also reduce the cost of production.

While the survey data shows that farmers have enhanced business and entrepreneurial skills, most farmers in the FGDs currently are not managing their fish farm as a business. Most mainly use the fish they produce for home consumption, though most sell their shrimp. At the same time, all groups said they would like to turn their farms into businesses in the future now that they are more "aware," more knowledgeable and have support from LSPs. The main obstacles to operating their fish farm as a business are still a lack of skills and also a lack of access to credit. However, farmers believe that LSPs can help them overcome these challenges.

When farmers do sell fish or shrimp products, they sell them to intermediaries, through local auctions, or in the local market. Sometimes, they compare the prices for their products in different markets. None of the farmers in the FGDs sell their fish directly to an LSP. But five said that LSPs help them find the best local markets for their products, which shows there is some improvement in downstream market links. Some farmers now also adjust their harvesting time to coincide with high prices. Overall, farmers, both men and women, are more confident about marketing their fish or shrimp.

“ *We previously used to sell fish once a year, but now three to four times, and in most cases we check price with LSPs and other people.*

— **female farmer from Amtoli** ”

Farmers receive a higher market price for their fish in particular. (Prices seem to have stagnated for shrimp and prawn, because they are much more dictated by international prices than fish.) This is partly because of increased demand, but it also points to improvements in quality and, in particular, size. It is also a common belief that untrained farmers do not achieve the same results.

“ It is very easy to identify the difference between trained and non-trained farmers production. Our fish quality is better than theirs.”

— male farmer from Amtoli ”

Farmers believe they are now better able to compete with other fish farmers because they now produce better quality products thanks to the training and advice from LSPs. They also said that demand has increased, which also plays a role in their perceived increased competitiveness. At the same time, farmers said that they can compete better with untrained farmers, because the latter make more “mistakes” than they do. Importantly, farmers also said that they are more “confident” after having received training from LSPs.

Income from both fish and shrimp farming has increased because of improved pond management, and resulting higher production levels, as well as the higher price of fish on the market, even though input costs have increased. However, five groups (mainly men’s groups) said that income from fish and shrimp fluctuates because market prices are

unstable and slightly unpredictable. One women’s group said that the overall cost of buying fish for home consumption has dropped because they are producing more themselves.

“ Fish price increased a little bit, but our production increased a lot. That’s why we are benefited ultimately.

— male farmer from Naichity ”

Among the farmers, there is a clear perception that aquaculture is spreading, though mainly for home consumption and not necessarily commercial aquaculture. Farmers said that they feel many of these new fish farmers have been inspired by the success of existing fish farmers. The overall volume of fish produced in the communities has also increased because of both increased yields from existing farmers and the rise in the number of fish farmers. This has resulted in more fish available on the market. One group said that some young people are among the many new farmers who have been inspired by the new apparent profitability of aquaculture. According to one women’s group, women have also become more interested in fish farming.

“ The number of fish farmers increased undoubtedly. Now, almost 90 percent of people in our community are involved in fish farming instead of 40 percent of people 2 to 3 years ago.

— male farmer from Naichity ”



Few or no farmers have recently seized aquaculture production, though some have changed the species they are cultivating. For example, some shrimp farmers in Morrelgongj and Battiagata have switched to carp production. In one location, farmers said that existing farmers have also increased the number of ponds they cultivate. In Mollahat, only space limitations have hindered further expansion of aquaculture.

According to the survey data, the poor have slightly less positive perceptions than the non-poor for six of the 10 indicators in the economic domain (Figure 8). We also analyzed this for both smaller and larger farmers. (Small was defined as having a pond area under 0.37 ha for shrimp and

under 0.14 ha for fish, which was based on average pond area from Jahan et al. (2015)). However, we found only significant differences for one indicator (related to business skills) between these groups. There is weak correlation between perceived poverty levels and pond size. Some FGDs also confirm this difference between poor and non-poor farmers, because the poor are more likely to be unable to afford recommended inputs.

There are also significant differences between shrimp and fish farmers (Figure 9). Shrimp farmers score significantly higher on the three indicators related to business skills, competitiveness and level of income, while fish farmers score higher on reduced costs of production.

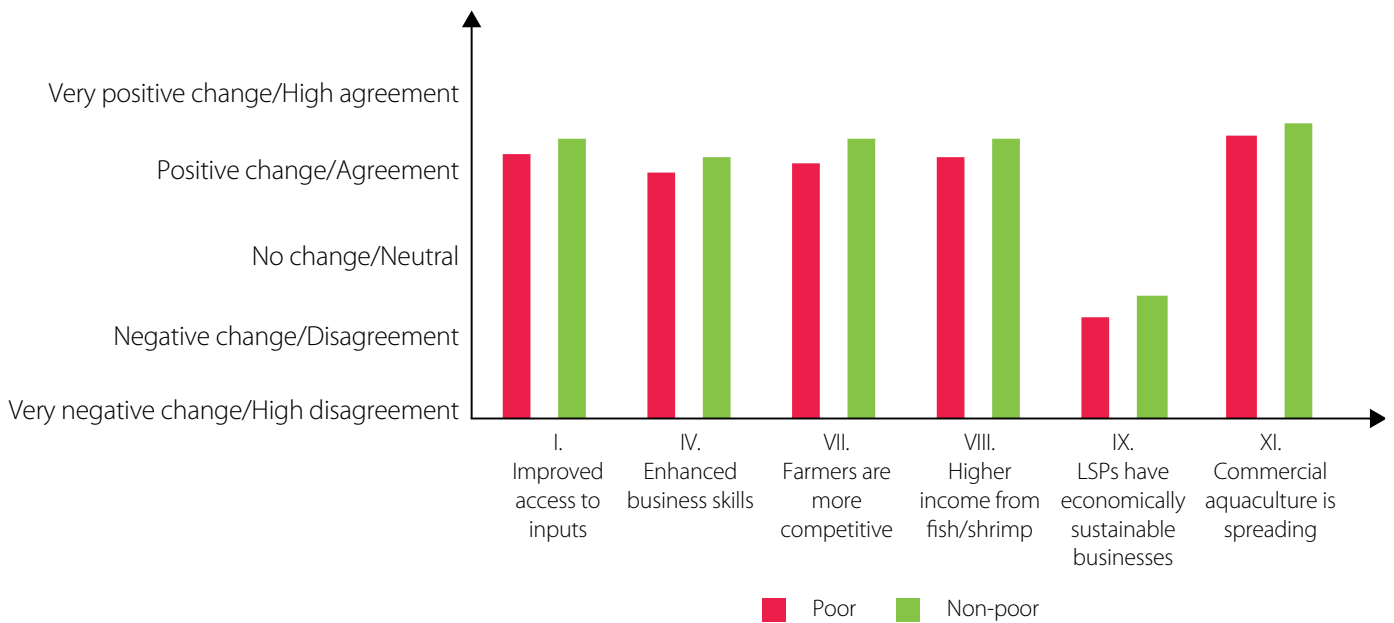


Figure 8. Significant differences between poor and non-poor farmers for economic indicators.

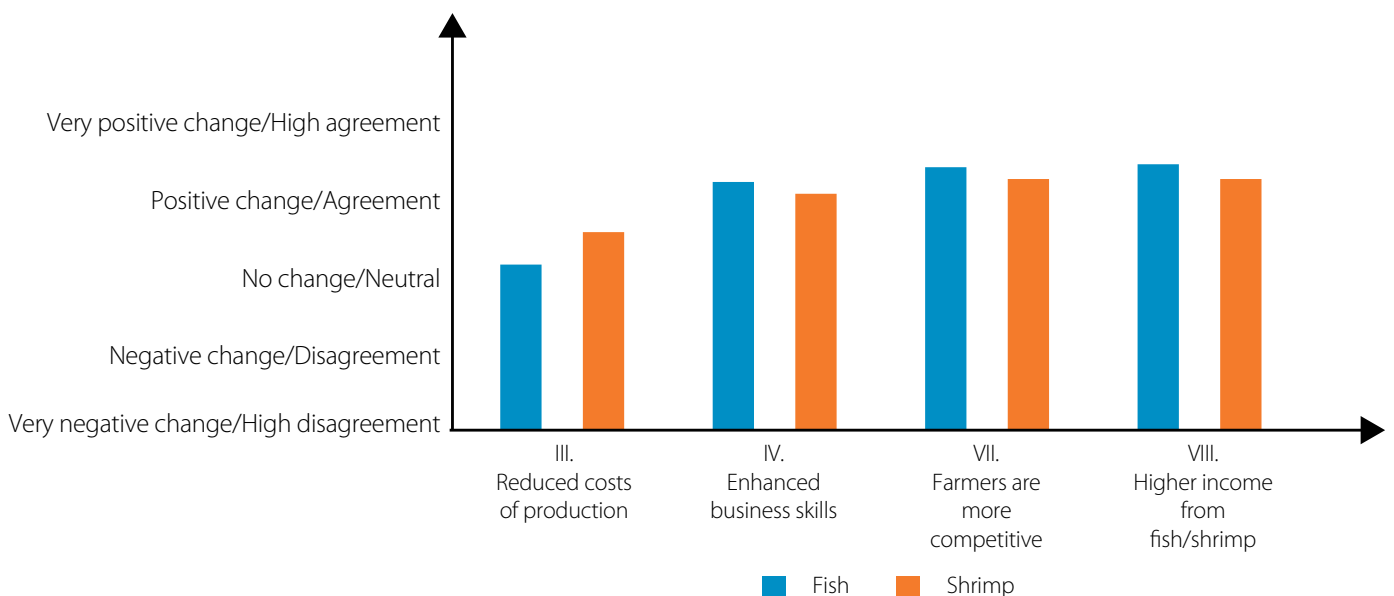


Figure 9. Significant differences between shrimp and fish farmers for economic indicators.

Local service providers

LSPs have slightly higher survey scores than farmers on the economic indicators (Figure 10). They also have a positive perception on the sustainability of the LSP model in the future. Significant differences between men and women LSPs were found for all economic indicators, with men having higher scores on all of them, except for the sustainability of the LSP model, on which both men and women agree.

In the IDIs, LSPs said that there is an increase in the supply of quality inputs for fish farming, because fish farmers are more aware of the higher yields by using quality inputs. This has increased the demand for inputs significantly, and more input shops are opening to respond to this increased demand. Besides the increase of input shops, a processing company established in town has seen the potential of the market, according to one interview from a male LSP in Batiaghata. However, many LSPs also said that poorer farmers are unable to buy all the inputs needed because they do not have the financial means to do so.

“ Rich farmers can better access the inputs, and poor farmers have problem to afford the prices. Farmers who can provide sufficient inputs [for their fish] got maximum benefits from their farm.

— female LSP from Morrelgonj ”

Of the 20 IDIs with LSPs, 16 said the increase in yield and income opportunities has also led to an rise in the number of fish farmers. Six LSPs said that within the group of fish farmers, many poor ones are benefiting, while another six said that young farmers are entering aquaculture because of the perceived economic opportunities. Finally, four LSPs said that women are getting more involved in fish farming.

“ The number of farmers in my community has increased a little bit. Especially the number of women farmers increased more.

— male LSP from Mollahat ”

All 20 LSPs said that farmers have improved access to quality information and services provided by the LSPs. Those farmers who live nearby meet an LSP in person, while those who live farther away access information by telephone. The information LSPs give is free of charge—one LSP even said he does not to take cash for the services he offers—though some LSPs said that farmers give them fish or other products in-kind to thank them for the support.

“ Very often [LSP and farmers] meet at the local tea shop and talk about their farming, any information needed and solutions for any problems. That’s why they face fewer problems now in pond.

— male LSP from Amtoli ”

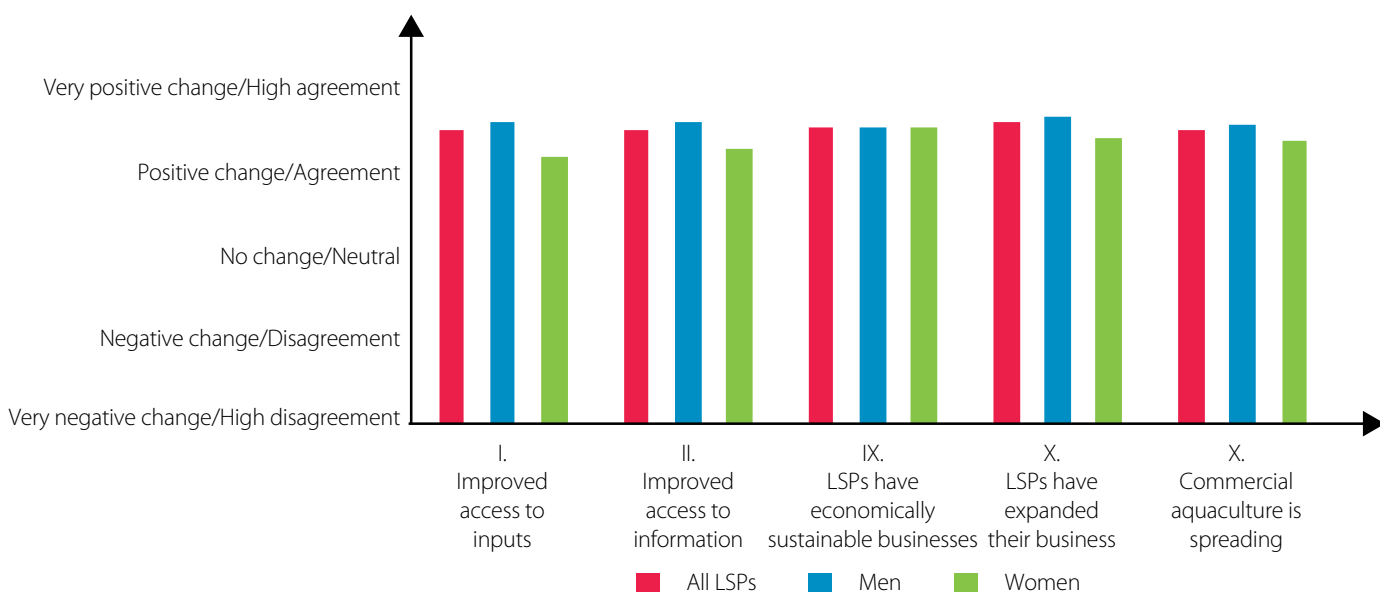


Figure 10. Economic indicators for all men and women LSPs.

In the IDIs, seven LSPs have seen an increase in their business activities (most of the LSPs have an input provision shop). Two said that being an LSP has increased their social status and reputation, which has positively affected their business. Only one LSP said that the increase in competition of input stores could hamper his business activities.

5.2.4 Social goals

Farmers

The survey results for farmers and LSPs are shown in Figure 11. The farmers' scores on enhanced social capital are low. This indicator is composed of two statements related to group membership, as this is considered important for the governance and sustainability of the LSP model: "I am a member of a farmers group or organization for fish or shrimp farming" and (for those that answer

yes to this question) "The farmers group I am a member of for fish or shrimp farming functions well and brings me benefits." Despite the fact that the IFSL project formed producers groups as part of its approach, only 13 percent of farmers said that they are a member of a group. The group formation seems to be ad hoc and for the purpose of receiving training only. Almost all of the farmers that are members of a group agree to a lesser or higher degree that this membership functions well and brings them benefits. Significant differences exist between different subgroups. For example, men, non-poor and large farmers score significantly higher on the improved communication skills indicator than women, poor and small farmers. Shrimp farmers score significantly higher on the enhanced social capital indicator, as 20 percent of them are members of a group compared to only 10 percent of fish farmers.

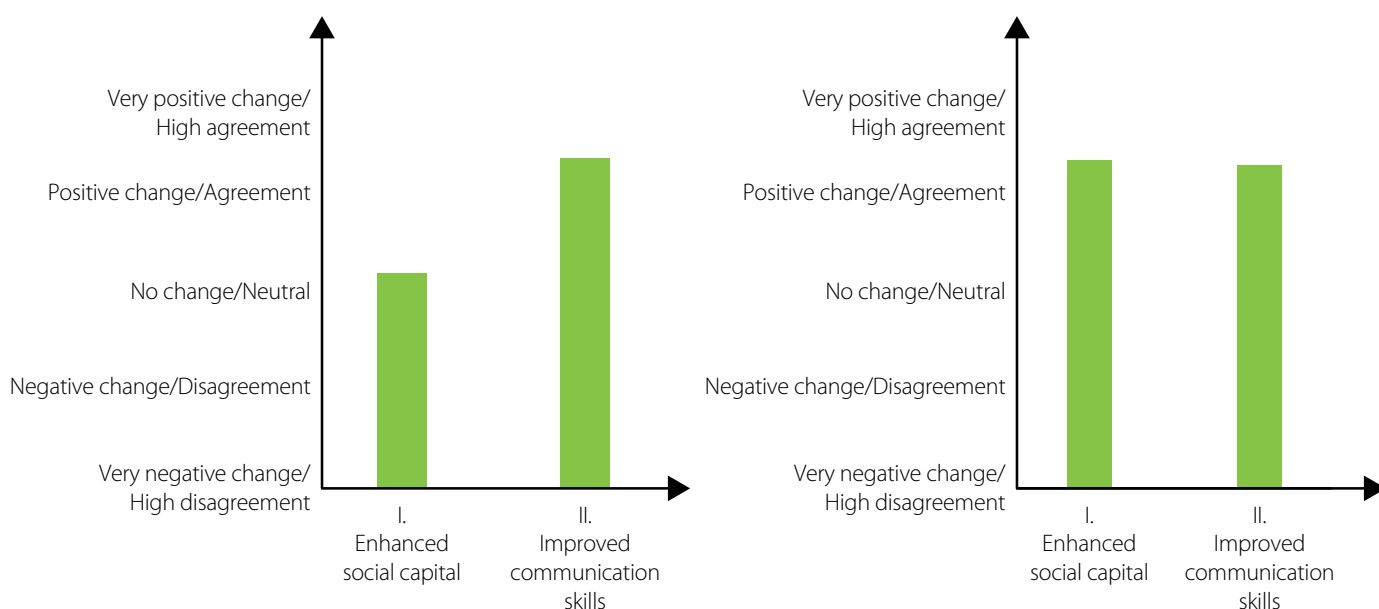


Figure 11. Social indicators for farmers and LSPs.

Box 8. Social indicators.

For farmers:

- Farmers have enhanced social capital through producer groups, improved farmer collaboration, and/or innovation platforms.
- Farmers have improved communication skills.

For LSPs:

- LSPs have enhanced social capital through farmers and market linkages.
- Farmers have improved communication skills.

The FGDs confirm that few farmers are members of a formal group, except for ad hoc groups formed for the purpose of the training only. However, social capital exists, as all groups said they share their knowledge with other farmers and support them when needed. Trained farmers are keen to provide support to untrained farmers (on an individual basis) despite the fact that it might increase competition, though this is not a result of the existence of the LSP model.

According to the FGDs, farmers' communications skills have improved in recent years, and all farmers are now communicating with LSPs and other extension stakeholders confidently and "without hesitation." For example, farmers are now communicating better with input traders to verify the quality of inputs. The LSPs seem to have formed a key intermediary for women, in particular, as they use their LSP to communicate with other value chain stakeholders.

In one focus group, one woman said, "Sometimes I feel a little hesitation contacting farmers or service providers of the opposite sex." However, another woman, from a women's group in Mollahat, disagreed, saying, "Women are now more confident and smart. This is also applicable to buyers (of fish or shrimp). On a needs basis, we contact a depot buyer. It makes us more profitable." This not only relates to the ability to communicate with input sellers and traders, but also to overcoming specific constraints for women to interact with men and circumvent or even overcome prevailing gender norms related to social interactions.

Local service providers

For LSPs, the social capital indicator is composed of six statements related to the number and diversity of farmers, and other value chain actors an LSP interacts with, and the number of interactions an LSP has with each individual farmer or value chain actor. Scores were highest for the increase in the number of farmers an LSP interacts with, and lowest for the increase in interactions with other value chain actors. The LSP model is geared toward enhancing the interactions between LSPs and farmers and less at downstream nodes of the chain.

In the IDIs, all 20 LSPs said they increased their communication and interaction with farmers. This is in line with the LSP model that supports interaction between LSPs and farmers. The level of interaction differs per LSP. Some meet farmers on a daily basis, while others interact with them three to four times a month. The LSPs said they see farmers who live close to their house more often and in person, while those farmers who live out of town they see less often and instead interact with them more through mobile phones.

“ *Farmers living close to my house I usually contact three to four times in a month, while it is one to two times for the farmers living far.*

— male LSP from Batiaghata ”

“ *For example, previously I only interacted with my customer farmers, but after becoming LSP I had to give information and suggestions to various types and number of farmers. This increased interaction results in higher sell of my inputs along with my profits.*

— male LSP from Morrelgonj ”

Three LSPs said that, in general, mobile phone use has increased among fish farmers. This gives fish farmers easier access to information, especially those living farther away from LSPs. Some LSPs said that fish farmers ask more questions now, while two LSPs added that the questions farmers raise are more relevant than before.

“ *Every Tuesday, I arrange counseling on fish culture and inputs. Farmers increasingly ask different types of information.*

— male LSP from Batiaghata ”

“ *Farmers want information on specific problems. Farmers used to ask irrelevant questions, but now they ask specific questions.*

— female LSP from Amtoli ”

One female LSP said that women in particular are now more open to communication. (More gender specific issues are discussed in the next section.)

“ After receiving training, they want to know how could they remove red-colored surface cover of water, water condition checking, should they apply organic feed. My interaction with farmers increased.... They feel free to contact me for information and inputs, especially women.

— female LSP from Batiaghata ”

5.2.5 Gender and inclusion goals

Farmers

Overall, the survey scores for the gender and inclusion indicators are moderately positive (Figure 12).

In the survey, the highest scores are for the acceptance and recognition of women LSPs by their community, and women’s increased decision-making power over household nutrition. The lowest score is for sufficient LSPs to reach all farmers. The FGDs also show that there are insufficient LSPs to cover the area because the

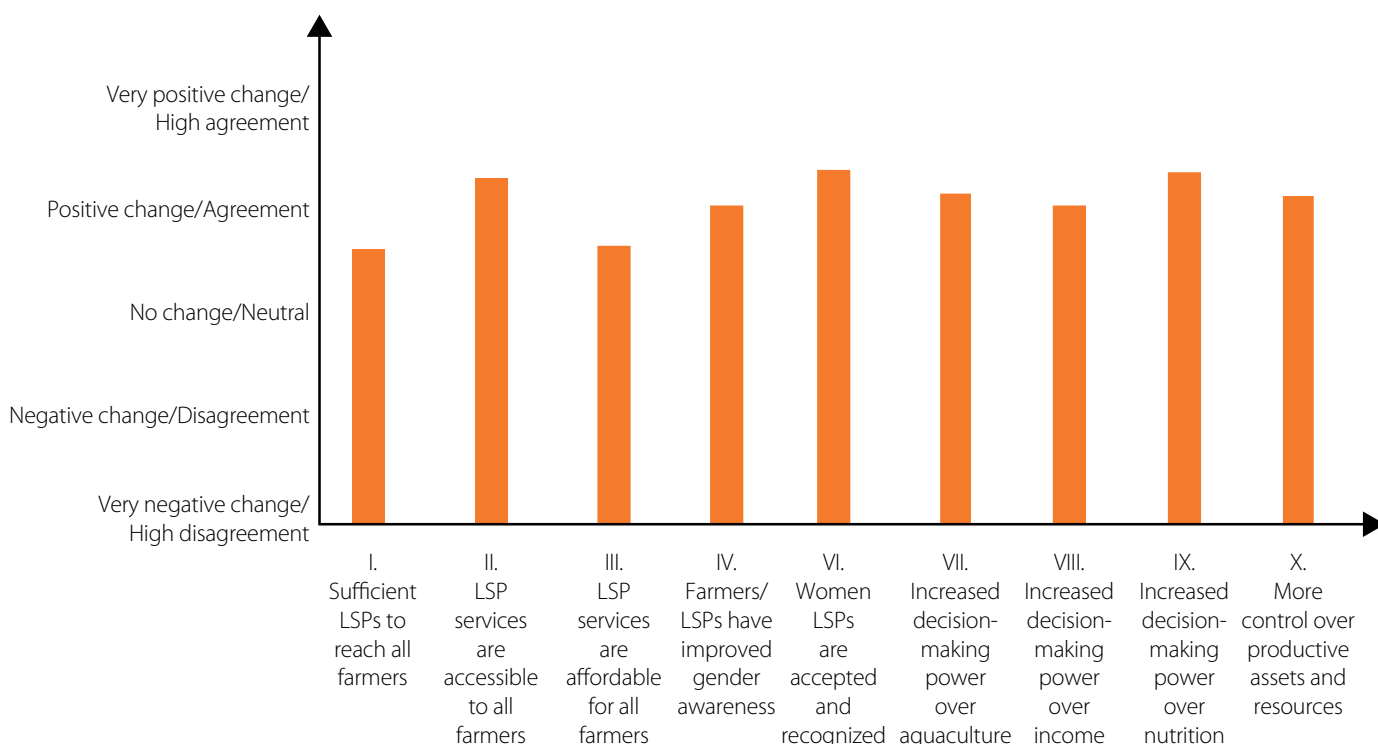


Figure 12. Gender and inclusion indicators for farmers.

Box 9. Gender and inclusion indicators.

- There are sufficient LSPs to reach all farmers in a particular geographic area.
- LSP services are accessible to all farmers.
- LSP services are affordable for farmers of all wealth levels.
- Farmers have improved gender awareness.
- LSPs have improved gender awareness (for LSPs only).
- Women LSPs are accepted and recognized in their roles by their community.
- Women have increased decision-making power in aquaculture.
- Women have increased decision-making power over income.
- Women have increased decision-making power over household nutrition.
- Women have more control over productive assets and resources.

number of fish farmers is increasing, particularly in Morrelgonj and Batiaghata. Farmers see the need to increase the number of LSPs. For farmers who are far from LSPs, it is particularly difficult to access their services. Some of these farmers use mobile phones to do so, but many prefer to visit LSPs in person. None mentioned being excluded from services of LSPs, as long as they are nearby. Proximity also helps with receiving information in a timely manner.

“ *In our community, everybody gets input support timely. LSP Jalil is a nursery owner. We all can get fish fingerlings from him and other inputs from the local market. If we face any trouble to get input, Jalil helps us. If any input is not available, then sometimes he collects from Upazila Amtoli. Doing this, he also expands his business. We both benefit.*

— **female farmer from Amtoli** ”

However, there was some question whether the training, in particular, benefits all farmers in the same way.

“ *Our training was conducted a long time ago, so it is a little difficult to always recall the training content fully. In our training, our trainer gave us a leaflet and book. But only educated people were benefiting, because they learn from the book and take help after the training also. If there were more training materials, that would be good for all farmers.*

— **male farmer from Nalchity** ”

The extent to which LSP services are affordable for farmers of all wealth levels also scored lower. From the FGDs, it became clear that this score is more related to the affordability of inputs than to services, which are unpaid.

Almost all the focus groups agreed that the LSP model has increased gender awareness among farming households and that relationships between men and women have changed for the better. In addition, several men’s groups said that women can also be LSPs, and just as well as men.

“ *In previous days, in our families we underestimated the opinion of women, but now the situation has been changed. Now we think women LSPs can also work like a men LSPs.*

— **male farmer from Batiaghata** ”

LSPs seem to have improved gender awareness, as almost all groups said that they treat women and men equally and provide men and women the same services. Women LSPs are accepted and recognized in their roles by their community, though not all communities have women LSPs. Although some men said that the sex of the LSP makes no difference to them, women farmers think men are hesitant to seek advice from a woman LSP—a notion that some male respondents confirmed. Finally, men also said that women LSPs may face barriers that men LSPs do not, such as working at night. In the survey, over 90 percent of all respondents somewhat or strongly agreed with the statement “I trust the advice given by a man or a woman LSP equally.”

“ *We do not have women LSPs in our community, but we are comfortable to deal with women LSPs because we don’t consider the sex of the LSP. We are more alert about our services. We feel that men and women are equally capable of fulfilling the role of LSP, but sometimes it will be difficult for a woman to support the farmer any time anywhere. Women LSP is better for women farmers.*

— **male farmer from Mollahat** ”

“ *All women in the community get easy access to LSPs Fahmida and Lipia, although all men do not come to them.... The men have also other sources of information, so they usually do not come to Fahmida.*

— **female farmer from Morrelgonj** ”

Some men also said that women may be more comfortable contacting women LSPs than men LSPs, a feeling shared by some women as well. One women’s group suggested that it might be beneficial to have men and women LSPs work side-by-side.

With regard to decision-making over aquaculture production, both men's and women's groups said that men listen more to women's opinions after receiving training and that men and women now work more equally on the farm. Men generally make the final decisions when it comes to fish farming, but they consult more with their wives and other household members. Some focus groups said that men and women make decisions together.

As women have become more involved in farming activities in recent years, many male respondents said that their attitudes toward women have changed because of women's increase in knowledge and technical skills.

“ *My wife and I work together in our gher now. We share opinions and consult together to make many decisions for fish farm.*

— **male farmer from Morrelgonj** ”

“ *Previously, if we tried to give any opinion our husbands ignored it, sometimes beat us, but now the situation is a little improved. The men consider our opinion and suggestions most times.*

— **female farmer from Morrelgonj** ”

“ *These days, women are more aware than men. They know better how to improve business, where to invest and spend money.*

— **male farmer from Naichity** ”

This change cannot be fully attributed to the LSP program, as other NGO programs have also contributed to raised gender awareness. However, the improved technical skills and knowledge strongly support it.

Men still control most of the income generated through fish farming, but they are increasingly aware of women's opinions and needs when they are spending money, and husbands increasingly consult their wives in this regard. In some cases, women have joint decision-making power over the income from aquaculture, particularly when it is spent on smaller household expenditures. Men still seem to be in control over larger purchases.

Decision-making power over household nutrition is traditionally the domain of women (wives and mothers), in the sense that they are in charge of preparing meals. Both women and men agree that women are more aware of nutritional needs than men, such as what types of nutritious small fish to cook. However, both men and women farmers believe they now know more about nutrition as a direct result of training provided by LSPs, as well as also other NGOs and government programs. One group mentioned television as another source of information on nutrition.

“ *Most of the time, we take decision on what to cook in the household and also give suggestion what is more nutritious for the family member. We are more aware about nutrition these days. We learned from training and also other sources.*

— **female farmer from Batiaghata** ”

All groups agreed that men make the final decisions about land and equipment use. For fish farming, men now consult their wives before making a final decision, as women have become more involved in fish farming since receiving training from LSPs. Women now have a larger say over certain resources than before, though ownership patterns may not have changed.

“ *I suggested my husband to take lease of land for cultivation. My husband appreciated that very positively and took land on lease. In the last few years, the situation has changed positively, which is the same in our whole community.*

— **female farmer from Nalchity** ”

For the gender and inclusion domain, it is of particular interest to examine the differences in scores between men and women and between the poor and non-poor. Significant differences were found in three of nine indicators for both men and women as well as poor and non-poor. Women farmers agree less with the statements related to access and affordability of LSP services and inputs and more with the statements about the acceptance and recognition of women LSPs (Figure 13).

We also found significant differences in the distribution of answers from men and women farmers on the statement related to personal control over land and assets. A chi-squared test has rejected the hypothesis that the distribution of answers is independent of gender if the statement is related to the farmer, but not if the statement is related to women in the community in general ($\alpha = 0.05$). While women say they have gained decision-making power, men feel so more strongly (Table 11). The expectation was that men's decision-making power would have remained the same, with women's increasing more, but this is not the case. There is no clear explanation for this finding.

The non-poor have significantly higher values for indicators in the gender and inclusion domain related to decision-making power (over aquaculture, nutrition and assets) than the poor (Figure 14).

Each indicator is composed of two statements: one related to the respondents themselves and one to women in the community in general. A chi-squared test has rejected the hypothesis that the distribution of answers is independent of farmers' poverty level for all statements related to themselves, but not to women in the community in general ($\alpha = 0.05$). Table 12 shows the

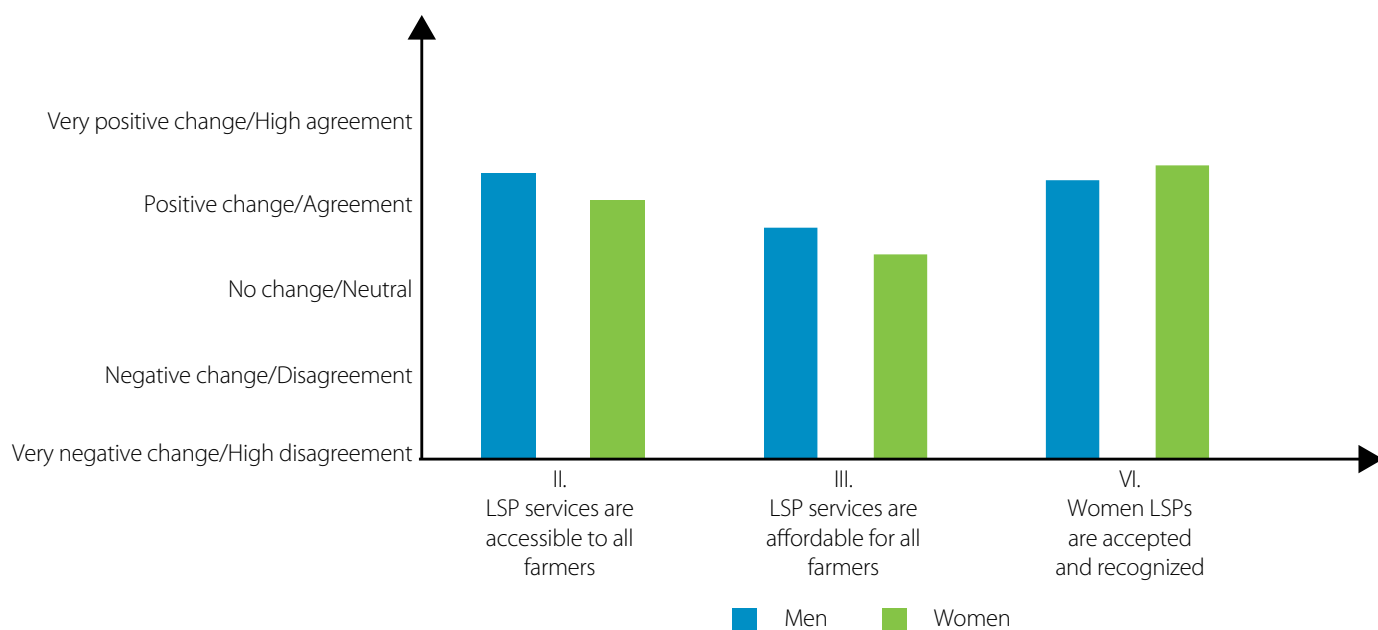


Figure 13. Significant differences between men and women farmers for gender and inclusion indicators.

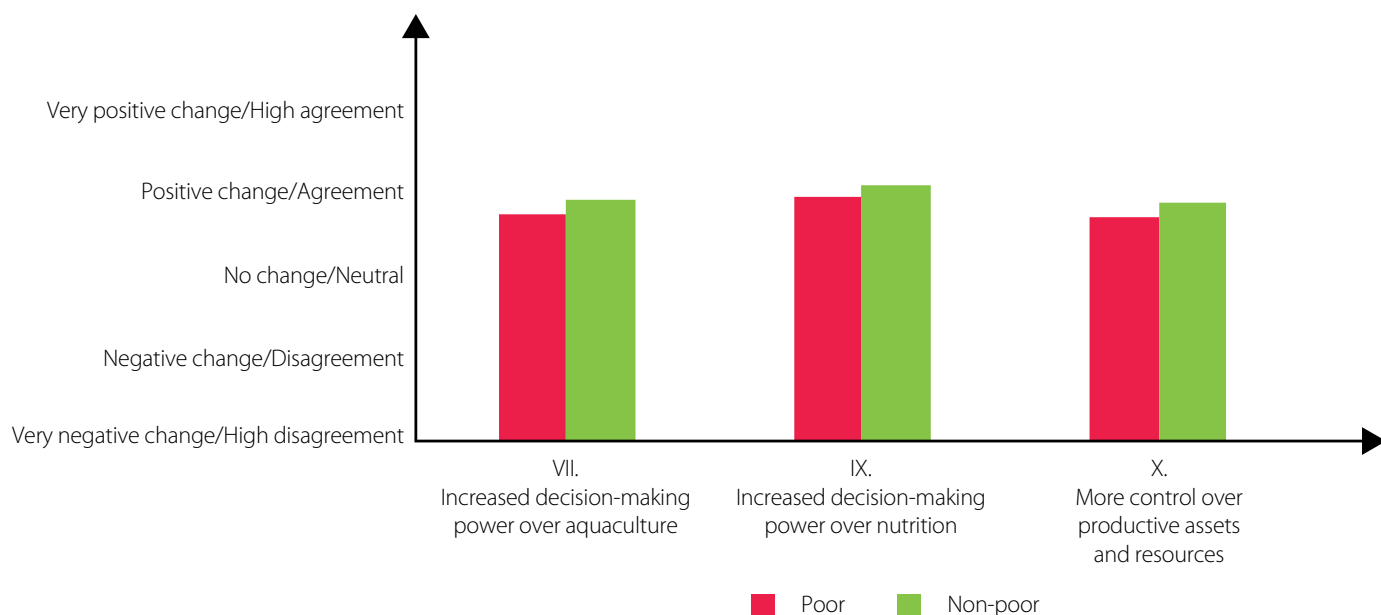


Figure 14. Significant differences between poor and non-poor farmers for gender and inclusion indicators.

distributions of answers for the poor and non-poor regarding statements on their own situation. The non-poor responded more positively to all three statements, implying that they have gained more decision-making power than the poor.

Local service providers

For LSPs, the gender and inclusion indicators show a similar pattern as with farmers, with the highest and lowest overall scores found for the same variables. Significant differences exist between men and women for almost all indicators, except for decision-making power over aquaculture. Women LSPs have significantly lower values for all these indicators (Figure 15).

Similar to what farmers expressed in the FGDs, 16 out of the 20 LSPs said in the IDIs that there are insufficient LSPs to serve all farmers. This affects

those farmers that live in remoter areas the most. Some LSPs also said there is a specific need for more women LSPs.

“ There aren't sufficient LSPs in my community, because I cannot serve the neighboring communities such as Sjukdara, Bittikhali and so on. We need more LSPs, both male and female, to provide better service.

— male LSP from Batiaghati ”

Twelve LSPs said that farmers have equal access to the products and services LSPs provide. Nevertheless, half of the LSPs said that there are differences in the level of accessibility for certain groups. According to them, gender, wealth and age influence the accessibility of products and services. Six LSPs said

	Sex of farmers	Not applicable/ Do not know	Much lower	A little lower	The same	A little higher	Much higher
Xa. “Compared to 2 years ago, the control I personally have over how my household uses land and equipment has become...”	Men	0%	0%	1%	19%	33%	47%
	Women	0%	0%	2%	20%	54%	25%

Table 11. Difference in scores for women’s decision-making power over assets and resources by sex.

	Poverty status of farmers	Not applicable/ Do not know	Much lower	A little lower	The same	A little higher	Much higher
VIIa. “Compared to 2 years ago, the influence I personally have on decisions related to fish or shrimp farming is...”	Poor	0%	0%	5%	5%	70%	20%
	Non-poor	0%	0%	1%	4%	55%	41%
IXa. “Compared to 2 years ago, the influence I personally have on decisions related to household nutrition is...”	Poor	0%	2%	0%	3%	63%	33%
	Non-poor	1%	1%	1%	7%	37%	54%
Xa. “Compared to 2 years ago, the control I personally have over how my household uses land and equipment is...”	Poor	0%	0%	2%	25%	50%	23%
	Non-poor	0%	0%	1%	17%	35%	47%

Table 12. Farmer scores for statements for indicators on decision-making power by poverty status.

that for women who have limited access to LSPs because of social norms, the LSPs make home visits to help them with the information and inputs as requested.

“ Old and women farmers face difficulties to access me physically, so they contact me by phone and I help them providing them inputs at home.

— male LSP from Batiaghata ”

One woman LSP said that she cannot interact with men easily. This was also mentioned in the FGDs with farmers. Another woman LSP said she mostly services female clients. This suggests that while women LSPs, in theory, are accepted, in practice they are still constrained by social norms.

“ In my family and society, it’s not completely comfortable for me to interact with all male farmers, especially at night.

— female LSP from Morrelgonj ”

In the IDIs, nine LSPs said that farmers do not pay for advice, and some even said they do not accept payment. All 20 LSPs said that poor to very poor farmers are unable to buy inputs. Some farmers can buy them on credit, but most simply buy less or none at all.

“ Moderate to rich farmers only can afford the inputs, and poor to very poor farmers can afford some of the inputs all the time. They sometimes get inputs on credit or take a loan.

— male LSP from Batiaghata ”

Some LSPs said that they have improved gender awareness, six of whom said they have increased their interaction with the other sex. Male LSPs said that working with men is more convenient for them than with women because of social and cultural norms.

“ I had interactions with both men and women farmers. Sometimes I can’t reach [the women farmers]. Some of them feel shy, but I don’t feel restricted to do so, [though] I can interact with men farmers more easily and effectively. They can say anything to me and I can work with them more easily than women.

— male LSP from Morrelgonj ”

Contrary to the above quote, however, three male LSPs said that they prefer working with women over men, because they are better listeners, follow instructions and have more time for visits from an LSP. Men are perceived to be busier with other activities outside the home, while women are restricted to their homes.

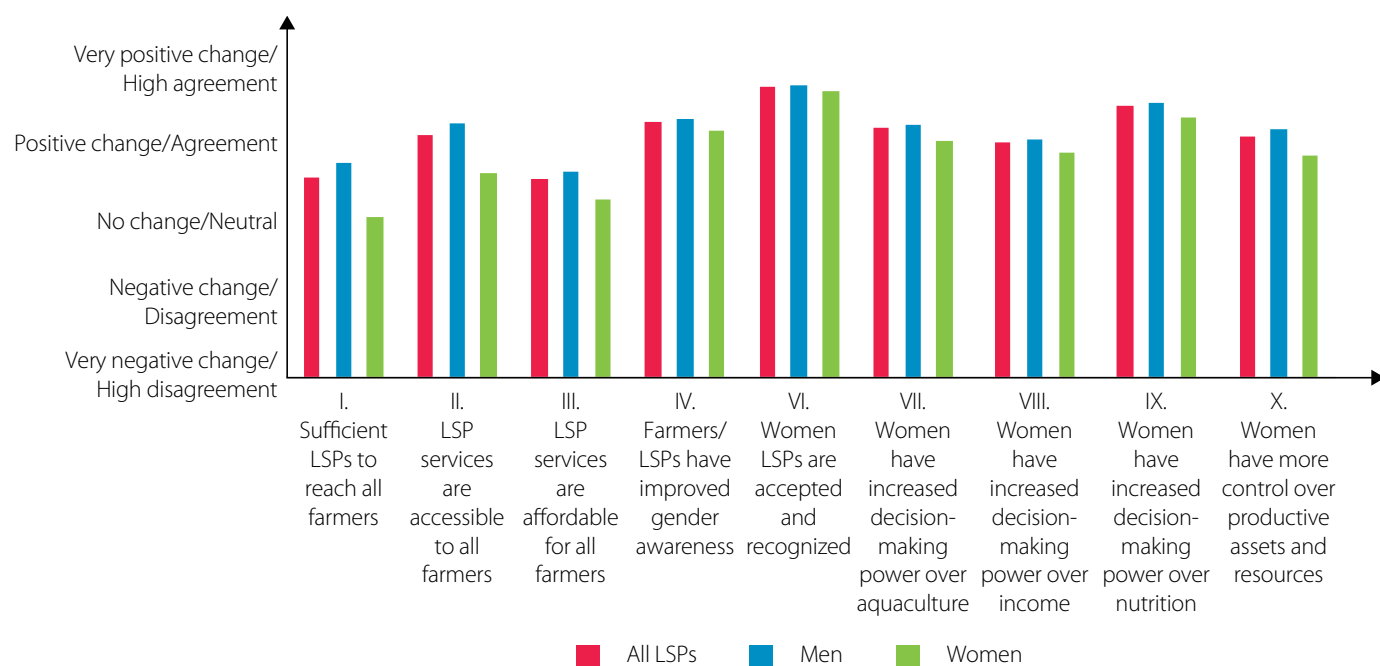


Figure 15. Social and inclusion indicators for LSPs.

“ I didn’t have any problem to interact with women. Rather, it is easy to communicate with women farmers, as they can give time and follow instructions carefully, while the men farmers are busy in other works, give less time for training. In some cases, women are restricted by women’s family.

— male LSP from Mollahat ”

Opinions vary among women LSPs. One said it was easier for her to interact with women, because she believes men farmers think women are less qualified, while four other women LSPs said they experience no difference in the relationships and interactions with their clientele based on sex.

“ I contact men farmers without any hesitation. They did not face any difficulties to understand and follow my advice. In the same way, I have contact with women farmers. I treat men and women farmer equally. I am comfortable to work with them also.

— female LSP from Mollahat ”

In the IDIs, all 20 LSPs said they are accepted in their roles in their community, with no difference between men and women, and all LSPs, whether men or women, make decisions themselves regarding LSP activities. Men control the decision-making for household needs, with some consultation with their family members, while women take the lead in decision-making regarding nutrition. Men are more involved and aware about nutrition because of the training they have received. This is in line with the findings of the FGDs with farmers.

“ Which food should be consumed, how to manage it, how much should be consumed—these decisions were taken by me and my wife together. After receiving nutrition training, we could take better decisions about these issues.

— male LSP from Amtoli ”

Women have more control over productive assets and resources. Most men LSPs are in charge of making decisions regarding land and ownership, though seven of them, including the five women

LSPs, said that they have increased decision-making power when it comes to land and other productive assets. According to them, this is also true in other households.

“ My husband mainly took the decisions about my household property and equipment. But before taking any decision, he discusses with me, and my participation in decision-making has increased significantly in the past 2 years. Women in my community also have more influence over decision-making about their household and properties.

— female LSP from Batiaghata ”

Nonparticipant farmers

Farmers who have not participated in LSP activities were overwhelmingly unaware of any project taking place. They had not heard of the term “local service provider” nor of any technical assistance being received. The main reason for this seems to be the relative distance of farmers to the nearest LSP, which is on average 3 km, or about a 45-minute walk. Although distance may limit farmers to access advice from LSPs, all 30 nonparticipants said they could go if they wanted to. Women cited age and their responsibilities for other work as additional restrictions preventing them from reaching LSPs. Social norms about mobility most likely also play a role in these limitations for women.

5.2.6 Governance goals

Farmers

According to the survey data, the LSP model was not successful in terms of improving links between farmers and public institutions, but farmers are moderately positive about the content and methods of the training and the reliability and timeliness of services (Figure 16).

From the FGDs, half of the groups (three for men and two for women) said they go to public extension agents if the LSP is unable to solve their problem. In the other groups, farmers agreed that they do not need to go to public extension officers from the DOF because their LSP is able to provide them with sufficient support. A few groups said they feel that DOF officers do not take them seriously.

“ Once I went to the DOF for water test, but it's very time consuming. We think they give more priority to rich farmer.

— male farmer from Nalchity ”

Interestingly, the training from LSPs has also resulted in farmers feeling more confident to ask for advice or more aware of where to go for advice. Three groups said they now seek more support and advice from other sources of extension than before, and other groups said they also saw an improvement in the responsiveness of public extension agents.

With respect to the future sustainability of the LSP model, the FGDs confirm that current farmers do not pay for LSP services, though several groups said they occasionally give an in-kind contributions, such as fish or other food, as a token of appreciation.

“ If we have huge production with the help of LSPs, we feel we should benefit him by paying some money.

— male farmer from Batiaghata ”

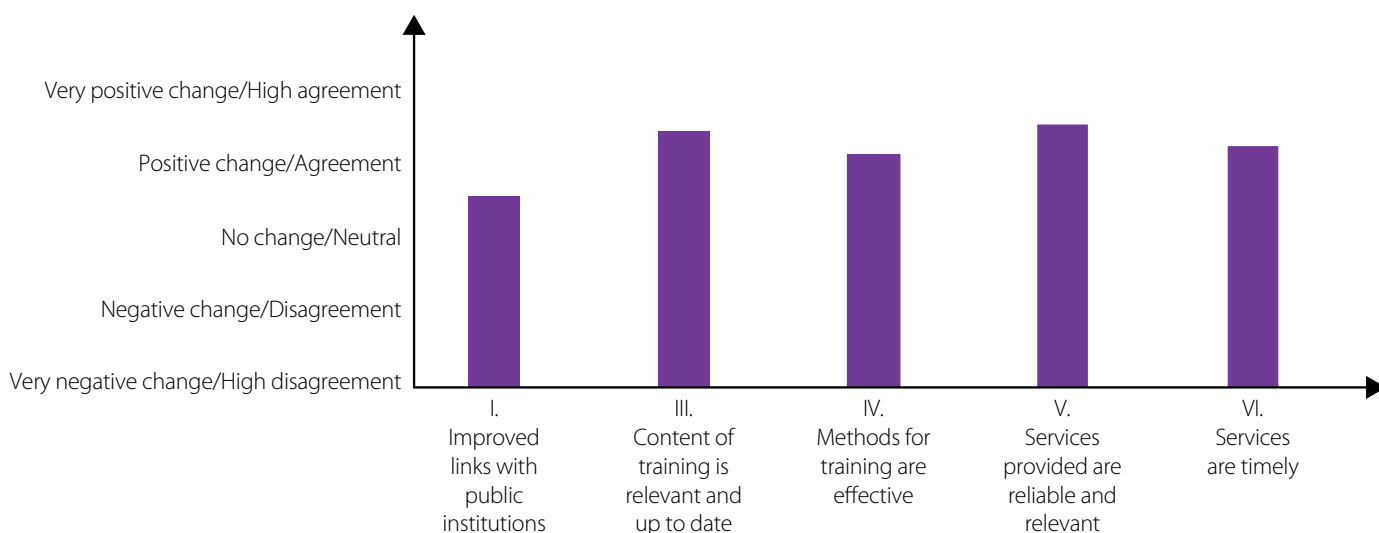


Figure 16. Governance indicators for farmers.

Box 10. Governance indicators.

- Farmers have improved links with public institutions.
- Governance structures, such as producer groups, for service provision are sustainable in the long term.
- Training content or capacity development is relevant and up to date.
- Methods for training, dissemination or capacity development used are effective.
- Services provided are considered reliable and relevant.
- Services are provided when required.

Some farmers are willing to pay for specific services, such as water and soil testing, though not all LSPs have the equipment to do so.

“ In future, if we need to pay for our services, we are willing to pay. In that case, he needs equipment to test the water and soil quality.

— female farmer from Amtoli ”

Farmers also said that if they were to pay, LSPs should continue to learn new technologies themselves so that their knowledge stays up to date.

“ In future, when the project ends, if we feel our LSP Mojibar can teach us useful and up-to-date things, we are willing to pay.

— male farmer from Nalchity ”

Not all groups were willing to pay for services, though. There was some disagreement within the groups, and some participants even refrained from answering the question.

“ We are not willing to pay for services when the project ends. The knowledge we get from those trainings will always be with us. We help each other and also nontrained farmers.

— male farmer from Mollahat ”

Farmers said they appreciate the content of the training. They also said they would like more of it, and on different topics as well, such as new technologies and species, including pabda farming. They would also appreciate more written materials, such as small booklets, to help them better remember the content. While farmers say they liked the method used for the training, some said they would prefer to receive more practical training and demonstrations. They also appreciated the fact that the training was organized to accommodate other responsibilities and mobility restrictions, especially for women.

“ Our training has always occurred after noon. That’s why my wife also participated in those trainings. This was very helpful.

— male farmer from Amtoli ”

“ He always arranges the training at a suitable time for us.

— female farmer from Amtoli ”

“ They always set the venue in a nearby location for us, so we could participate in those training easily.

— female farmer from Mollahat ”

All farmers in the FGDs seem to find the information provided by LSPs reliable, as they had good production results after following the advice. In cases when farmers did not follow the advice, they said this was because of other reasons, such as a lack of financing. The fact that LSPs are located in their own communities ensures that farmers receive timely information and have regular contact with LSPs.

“ We always get all kind of information and inputs in time, as the LSP is living close to us. Almost every day we meet the LSPs at the village tea shop in the evening.

— male farmer from Morrelgonj ”

Local service providers

LSPs are more positive about their own improved links with public institutions, but this clearly has not translated into more direct access for farmers. LSPs are also moderately positive about their ability to continue delivering services when the supporting projects end. For the other indicators on training and services, farmers and LSPs are in agreement (Figure 17).

In the IDIs, almost all 20 LSPs said they have more frequent contact with government staff officials. One woman LSP said it was difficult to contact government bodies in person on a regular basis because of her household chores and her teaching. While LSPs often contact government officials for advice, a few LSPs said that these officials actually contact them because, for example, they want to attend training.

None of the LSPs charge for their services, though some said they would like to offer some specific paid services, such as water tests. Some accept in-kind payments, such as fish and other products, and some said they do not to accept financial payments. Most were positive about maintaining their services since farmers are more aware of improved techniques and will keep requesting them. Many LSPs, though, said they would like to receive more support from external parties to keep their knowledge up to date.

All of the LSPs find the content of the training relevant and up to date. Twelve of them said they make use of books, pictures and leaflets as provided. They found them useful and effective, though more pictures would be helpful. Six also said they take farmers to ponds to put their knowledge into practice.

All of the LSPs said that most farmers trust their services and advice. Only one said that some farmers do not trust him and do not follow his advice. Other LSPs said that some farmers do not always follow their advice, but these were because of financial constraints. All of the LSPs feel they provide their services in a timely manner, though they said there are occasional delays in delivering inputs when there are a large number of requests. One LSP said transportation costs limited his ability to meet farmers in person.

5.2.7 Nutrition

Farmers

The survey results show a positive change in improved knowledge and use of nutritious fish at home (Figure 18). While there are no significant differences in the indicators between men and women, differences in two indicators exist between poor and non-poor. The non-poor have slightly higher scores on whether they have adopted production practices for improved nutrition, as well as for higher home consumption of nutrient-rich fish.

In the FGDs, farmers said they have all adopted practices such as growing mola and other small fish in their ponds, through a three-layer stocking system, and have also started growing vegetables on pond dikes. They also have improved knowledge on nutrition practices. They are also more aware of nutrition, especially the vitamin and micronutrient contents of fish and vegetables, and are now trying to eat more nutritious food. Almost all of the groups cited the benefits of eating mola and other small fish, as well as fruits and vegetables.

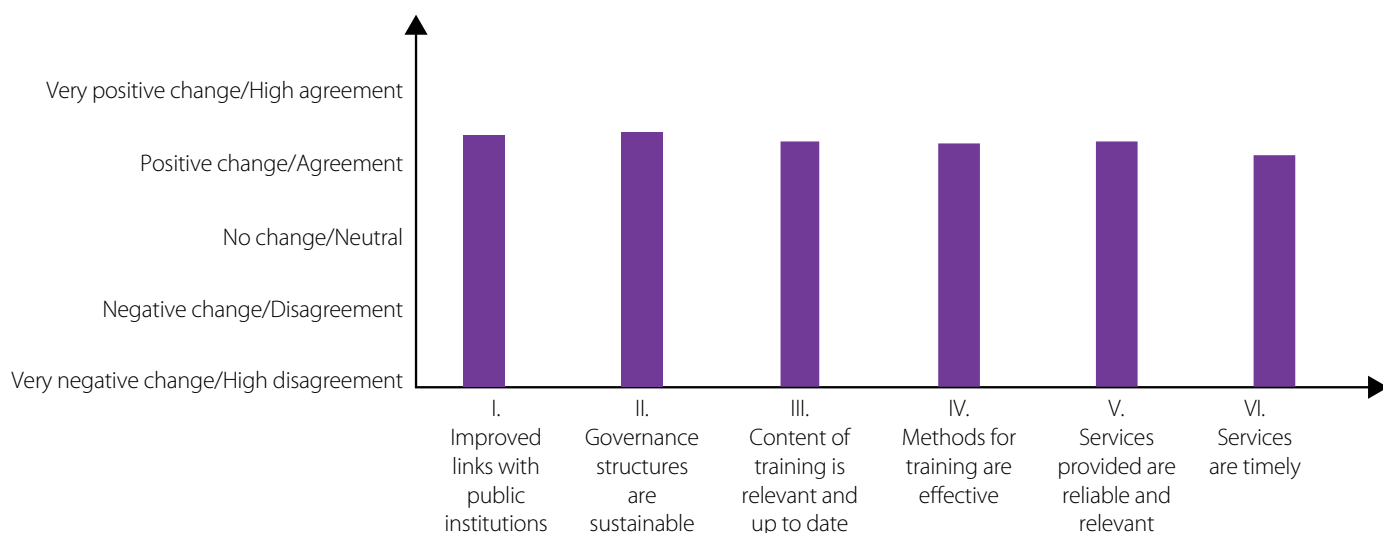


Figure 17. Governance indicators for LSPs.

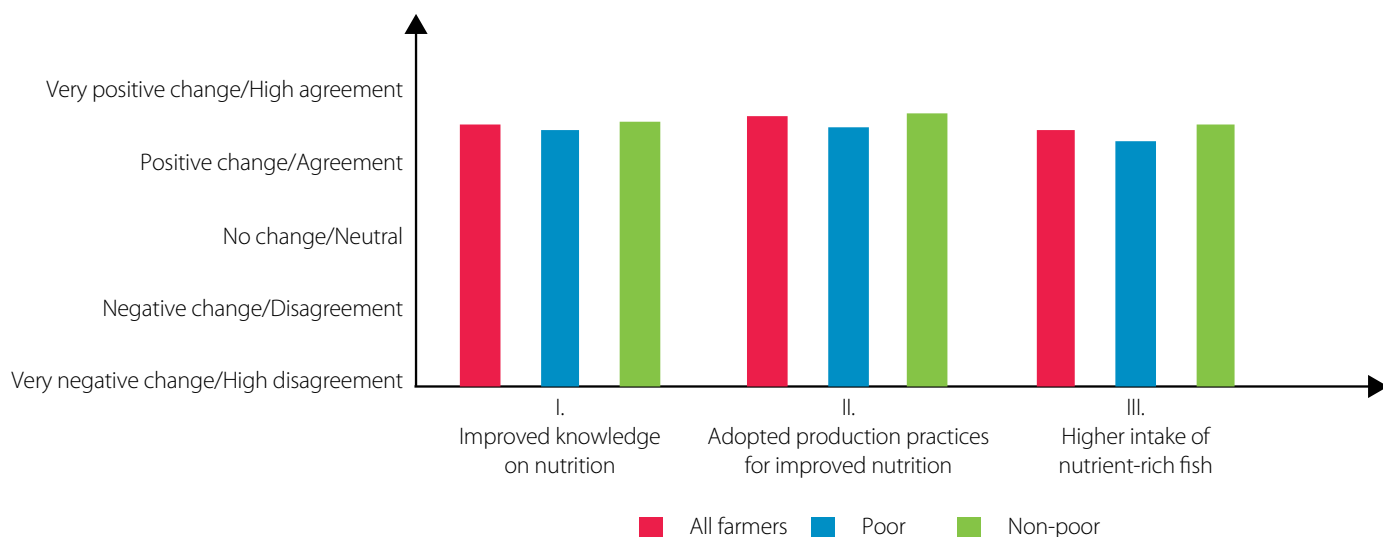


Figure 18. Nutrition indicators for all poor and non-poor farmers.

Box 11. Nutrition indicators.

- Farmers have improved knowledge on nutrition practices.
- Farmers have adopted production practices for improved nutrition.
- Farmers use more nutritious fish for home consumption.

“ *In earlier days, personally I didn't like any kind of small fish. But after knowing the advantage of small fish, I started consuming small fish in my household.*

— *female farmer from Mollahat* ”

Some groups also said they have changed their food preparation practices, as they have now learned that mola heads are especially nutritious.

“ *Previously, we did not know how to cook mola fish, but after getting training we learned we should not cut the head of mola. The head contains maximum nutrition.*

— *female farmer from Morrelgonj* ”

Again, this improved knowledge on nutrition cannot be attributed solely to the LSP model, as farmers have also received information from other sources. Two groups also refer to better intrahousehold distribution of food and providing the same foods to both male and female children as additional reasons.

5.3 Comparing the AIN and IFSL projects

Comparing the results from farmers who were supported through the two projects, we found that there are significant differences in two of the six domains (technical and governance) between the two projects, with AIN farmers scoring higher in the technical domain and IFSL farmers in the governance domain. AIN farmers in particular score higher on the indicators for increased efficiency and lower incidence or impacts of fish disease. IFSL farmers score higher on almost all governance indicators, such as improved links with public institutions, relevant and up-to-date training content, effective training methods and reliable and relevant services provided. Other indicators that IFSL farmers score higher than AIN farmers relate to the economic or market domain: improved market links, more competitive farmers, and economically sustainable businesses among LSPs. Given that the two LSP models had different objectives (Table 10) with AIN being an aquaculture project focused on adopting improved technologies and practices, while IFSL included more commodities and had more emphasis on market links, this finding is not surprising and illustrates the difference in focus.

There were, however, no differences between the two projects in outcomes related to gender awareness among farmers.

5.4 Summary on effectiveness of the LSP models

Overall profiles show a moderate change for all domains, with LSP perceptions more positive than those of farmers, except for the technical domain.

Survey results show that farmers see moderate changes on all indicators for the technical domain, with the exception of increased efficiency. However, the FGDs show that farmers have become more efficient in terms of labor for certain activities, and lower costs per unit of fish, because of higher yields. The fact that they may not experience this as overall efficiency gains may be because they now effectively spend more time on their farms. At the same time, there have also been increases in input prices, which have partially diminished the economic benefits from increases in input efficiencies. Some improved practices are proving more difficult to implement than others, and this may be an entry point for further support in the future.

There are some differences between the reasons for improved yields that men and women provide. Men attribute this to adopting improved technology, while women point to their improved knowledge and ability to identify high quality inputs and use them appropriately. This could be a result of the difference in starting points between men and women, since men have had more technical assistance. Farmers also perceive an increase in their experimental skills and problem-solving ability as a result of more confidence, both in their own abilities and to request assistance from an LSP or another source.

In the economic domain, farmers see moderate to highly positive changes related to most indicators, with the exception of reduced production costs. As explained above, this is partly because of rising input costs, and likely stagnant overall production costs as well, while yields have increased. Fish farmers have slightly higher scores on this indicator than shrimp farmers. Farmers experience increased access to inputs, either through LSPs directly or because LSPs have linked them to input suppliers. As a result of social norms, women are

still less likely to go to the market for inputs, but they are increasingly aware of where to buy them. In addition, some LSPs support farmers with short-term credit to buy inputs.

Although farmers do want to become more entrepreneurial in the future, the majority of them are not operating their farms as a business, because fish are to a large degree for home consumption. Shrimp, however, are not. This difference between fish and shrimp is also visible in the higher scores among shrimp farmers on indicators related to business skills, competitiveness and level of income, compared to fish farmers. Those farmers that do sell fish have experienced some degree of improved market links through LSPs. They believe that they are now better able to compete, and they produce better quality fish than untrained farmers. There is also a sense that aquaculture is spreading as a result of perceived success and that young farmers and women are becoming more involved.

Whether the LSP model is entirely inclusive is still questionable, as poor farmers score lower than non-poor farmers on six of the 10 economic indicators. Poor farmers are often unable to adopt all the practices being taught, because they cannot afford the necessary inputs. As a result, the outcomes are not the same as for non-poor farmers.

Although there are a limited number of formal groups, as one of the indicators under the social

domain shows, farmers have experienced an improvement in how they communicate with other value chain actors, particularly from increased self-confidence and especially for women. LSPs now have many more interactions with farmers in different settings, though there is more interaction with farmers who are close by. Proximity to the LSP is an important factor for interactions, even though mobile phones are also used to request advice.

Indicators in the gender and inclusion domain point to this as well. There is a perception that there are insufficient LSPs to service all farmers, and access is restricted for those located in more rural areas. There is some indication that women's access to LSPs is restricted because of social norms about their mobility, but a large number of LSPs said they try to overcome this by going to them. As already shown, poor farmers are less likely to be able to follow up on advice provided.

Gender awareness among farmers has also improved, though it is likely from the increased influence of other activities from WorldFish and other NGOs in the region. Husbands are now consulting their wives more often when making decisions about aquaculture. Women LSPs are generally accepted and recognized, and in theory men farmers said they do not differentiate based on sex. In practice, however, barriers for women LSPs still restrict their interactions with men.



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In the governance domain, the indicator related to improved links with public institutions shows limited change. Farmers and LSPs are generally satisfied with the content and delivery of the training and technical extension, though they would like to see LSPs continuously update their knowledge. For the most part, farmers also consider the information reliable, and LSPs generally feel that farmers trust them. With respect to the long-term sustainability of the LSP model, 61 percent of farmers said they would be willing to pay for services, though few currently do. LSPs said they had sustainable businesses and have been able to expand them. Some also said that their role has improved their social status and reputation, which positively affects their business.

Finally, in the nutrition domain farmers said they have improved knowledge of nutrition practices and that they eat more small nutritious fish.

5.5 Recommendations from respondents

In the FGDs with farmers and the IDIs with LSPs, we collected perceptions on how to improve the LSP model. These recommendations are summarized below.

Training: Farmers would like more training, including topics such as new species and small ponds, as well as more training on gender and fish diseases. LSPs agree. This would require more support for LSPs in the form of training and technical expertise so that they can stay up to date with the latest technologies. More written and visual materials, such as videos and pictures, would help farmers retain more of what they are taught. In addition, LSPs would like to do more practical training, such as demonstrations, rather than theoretical training.

Number and types of LSPs: Farmers would like to have more LSPs who also operate as feed traders, input traders or fish buyers so that they can have direct links to such services. In general, farmers would like to have a higher number of LSPs. Women farmers in particular would like more women LSPs. One suggestion is to have men and women LSPs work side-by-side. These additional LSPs should also be located in areas where there are few or none at present, such as in rural areas.

Services: Farmers would also like more practical technical support, such as soil and water testing. To provide better services, LSPs could use more support in terms of receiving tangible items from external projects, such as a bicycle, telephone, ID card and technical instruments.

Inputs: According to the LSPs, improved links to certified hatcheries and nurseries are needed to ensure that farmers have access to high quality seed.

Inclusiveness of women: To make their services more inclusive of women, LSPs suggest raising public awareness about women's participation in aquaculture and the LSP model. They also suggest conducting activities that improve recognition of women's role in aquaculture and as LSPs. To overcome the mobility barriers women face, LSPs suggest providing more inputs and services directly in women's homes. More women LSPs are also needed.

Inclusiveness of the poor: The most significant barrier to the poor is the affordability of inputs to put advice into practice. LSPs suggest finding solutions to provide access to more affordable inputs, such as through group deals with input or feed companies, as well as more credit provisions for poor farmers.

Sustainability: LSPs suggest formalizing the service provision associations and registering them with the GOB. They also suggest setting up a service center for LSPs to help them access continuous up-to-date information and technical instruments.

6. Conclusions

This working paper presented the findings of a study evaluating the implementation of the LSP model for the AIN and IFSL projects in Bangladesh. The following are the main conclusions.

Effectiveness of the LSP in delivering services and development impact among farmers

The results of the assessment suggest many positive, emerging outcomes of the LSP models, both in adopting improved practices as well as the outcomes of these practices, such as improved yields. There have also been some more intangible benefits related to increased awareness and self-confidence of farmers to interact with service providers, and also in their problem-solving abilities, notably among women. However, the findings also highlight many challenges in relation to its inclusiveness, especially in regards to the ability of poor farmers to implement recommendations and the ability of rural or remote farmers to access to services, as well as some limitations for women related to social norms and mobility. The AIN and IFSL projects had a different focus in their implementation, and this is visible from the results. It is recommended that both elements (technical support or practices, and improved market links) are more strongly developed in a follow-up phase of the LSP model.

Effectiveness and sustainability of the LSP approach

LSPs believe that their role has helped them expand their businesses. In the IFSL model, LSPs earn a small commission from helping farmers acquire the inputs they need, which seems a more likely model for payment than having farmers pay for services. There is some scope to introduce a model where farmers pay for specific services, such as for soil and water quality testing and disease analysis.

It is still unclear how SPAs play a role in the sustainability of the LSP model. LSPs would like to see these formalized and registered with the government, which suggests they see value in them. This could then be linked to the suggestion of service centers. This would provide an entry point for organizations such as WorldFish to continue to provide up-to-date information to LSPs. The need to keep LSPs up to date on knowledge and skills is an obvious prerequisite for their services to continue to be of use to farmers.

Notes

- ¹ Agreement: 1. Strongly disagree, 2. Somewhat disagree, 3. Don't agree or disagree, 4. Somewhat agree, 5. Strongly agree, 88. Don't know, 99. Not applicable; Increase: 1. Much lower, 2. A little lower, 3. The same, 4. A little higher, 5. Much higher, 88. Don't know, 99. Not applicable; Decrease: 1. Much higher, 2. A little higher, 3. The same, 4. A little lower, 5. Much lower, 88. Don't know, 99. Not applicable; Frequency: 1. Never, 2. Occasionally, 3. About half of the time, 4. Most of the time, 5. Always, 88. Don't know, 99. Not applicable; Number: 1. No farmers, 2. A few farmers, 3. About half of farmers, 4. The majority of farmers, 5. All farmers, 88. Don't know, 99. Not applicable.
- ² A sample size of 120 would result in a margin of error of 9% for a population above 20,000 and a confidence level of 95%.
- ³ While this has been the project's approach, in practice few farmers are a member of a formal group. The group formation seems to be more ad hoc, for the purpose of receiving training only.
- ⁴ At the time of writing this paper we had no information on the outcomes of these experiments.
- ⁵ PCR refers to polymerase chain reaction, and is a method which provides a rapid, sensitive and specific test to detect pathogens that cause disease in shrimp.

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Annex 1a. Impact pathway with IDOs and SLOs

Project activities	Project outputs	Immediate impact (outcome level)			Long-term impact
		Domain	Immediate impact	Link to sub-IDOs	
<ul style="list-style-type: none"> LSPs selected and trained Training materials distributed and used Farmers trained, including on gender and nutrition On-farm trials and field days organized Matchmaker events organized Technical services provided 	<ul style="list-style-type: none"> LSPs enabled to provide services to farmers Farmers collaborating in functioning producer groups Farmers trained or services received 	Technical	<ul style="list-style-type: none"> Farmers have adopted improved aquaculture production practices and technologies. Farmers have increased fish yields. Farmers experience lower incidence and/or impacts of fish disease. Farmers have increased efficiency in production or reduced use of inputs. Farmers have enhanced experimental or problem-solving skills. 	1.4.2/2.1.2 1.4.2/2.1.2 2.4.2 3.3.3 XC 3.1.1	<ul style="list-style-type: none"> Poverty reduced (SLO1) Nutrition status improved (SLO2) Natural resources more efficiently used (SLO3) Gender equity enhanced (crosscutting)
		Economic/market	<ul style="list-style-type: none"> Farmers have enhanced business and entrepreneurial skills. Farmers have reduced costs of production. Farmers have improved market links (downstream). Farmers have become more commercialized (sell a larger percentage of the fish they grow). Farmers receive a higher market price . Farmers are more competitive. Farmers have a higher level of income from fish or shrimp farming. LSPs are involved in economically sustainable businesses and have expanded their business. Farmers have improved access to (quality) inputs for aquaculture. Farmers have improved access to (quality) information and services for aquaculture. Commercial aquaculture is spreading (leading to increased overall production). 	1.3.2 1.3.2 1.3.2 1.3.2 1.3.2 1.3.2 1.3.2 1.3.4 - - -	
		Social	<ul style="list-style-type: none"> Farmers have enhanced social capital (i.e. improved social networks) through producer groups, improved farmer collaboration and/or innovation platforms. Farmers have improved communication skills. LSPs have enhanced social capital through farmers and market links. 	XC 3.1.1 XC 3.1.1 XC 3.1.1	
		Gender/inclusion	<ul style="list-style-type: none"> There are sufficient LSPs to reach all farmers in a particular geographic area. LSP services are accessible to farmers of all wealth levels. LSP services are affordable for farmers of all wealth levels. LSP services are accessible for women farmers. Farmers and LSPs have improved gender awareness. Women LSPs are accepted and recognized in their roles by their community. Women (farmers and LSPs) have increased decision-making power in the areas of aquaculture, income and nutrition. Women (farmers and LSPs) have more control over productive assets and resources. 	- - - - - - XC 2.1.1/XC 2.1.3 XC 2.1.3	
		Political/governance	<ul style="list-style-type: none"> Farmers and LSPs have improved links with public institutions. Governance structures for service provision are sustainable in the long term. Methods for training, dissemination or capacity development used by LSPs to train farmers are effective, efficient and sufficient. Content of training or capacity development is relevant and up to date. Services provided are reliable and relevant. Services are provided when they are required (are timely). 	XC 3.1.1 XC 3.1.1 - - -	
		Nutrition	<ul style="list-style-type: none"> Farmers have improved knowledge on nutrition practices. Farmers have adopted nutrition-related production practices. Farmers use more nutritious fish for home consumption. 	- - 2.1.2	

Annex 1b. Most relevant sub-IDOs and indicators

IDO	Sub-IDO	Indicator
SLO 1: Reduced poverty		
IDO 1.3: Increased income and employment	1.3.2: Increased livelihood opportunities	Increased income in women and men farmers and value chain actors (disaggregated by age and wealth group)
	1.3.4: More efficient use of inputs	Feed conversion, water and nutrient use efficiency
IDO 1.4: Increased productivity	1.4.2/2.1.2: Closed yield gaps through improved agronomic and animal husbandry practices	Increase in yield (kg/ha/year) in target aquaculture systems from adoption of better management practices as a result of FISH research
SLO 2: Improved food and nutrition security		
IDO 2.1: Improved diets for poor and vulnerable people	2.1.2: Increased access to nutrient-rich foods	Number of new smallholders adopting nutrient-rich food (including fish), technology packages and management practices resulting from FISH research
IDO 2.4: Improved human and animal health for better agricultural practices	2.4.2: Reduced livestock and fish disease risks associated with intensification and climate change	Percentage reduction in fish disease prevalence in target aquaculture systems associated with improved breeds and FISH technologies
SLO 3: Improved natural resources and ecosystems		
IDO 3.3: More sustainably managed agro-ecosystems	3.3.3: Reduced net greenhouse gas emissions from agriculture, forests and other forms of land use	Greenhouse gas emissions per kilogram of fish produced in target aquaculture systems
Crosscutting		
Gender and youths	XC 2.1.1: Gender-equitable control of productive assets and resources	Number of women with increased control of productive assets and resources (disaggregated by age and wealth)
	XC 2.1.3 Improved capacity of women and young people to participate in decision-making	Number of women and young people with increased influence in aquaculture and small-scale fisheries-related decision-making (disaggregated by age and wealth)
Policies and institutions	XC 3.1.1 Increased capacity of beneficiaries to adopt research outputs	Number of innovation platforms, learning alliances and other multistakeholder platforms operating with FISH engagement

Annex 2a. Indicators, survey and FGD questions for farmers

Domain	Indicator	Farmer survey statements	Farmer FGD questions
Technical goals	I. Farmers have adopted improved aquaculture production practices and technologies	<p>For all farmers:</p> <p>a. The water color of my pond/gher/pocket nursery is sufficiently green:</p> <p>b. I remove weeds, black soil and or tree leaves from pond/gher whenever they are present:</p> <p>c. I use supplementary feeds in the pond/gher on a daily basis:</p> <p>For fish farmers only:</p> <p>d. I practice sunlight management for my pond (remove excess branches of trees, shade for vegetables, etc.) so that around 70% of water gets sunlight at noon:</p> <p>e. I maintain three layers of stocking in the pond:</p> <p>For shrimp farmers only:</p> <p>f. I have set up a permanent or temporary nursery/nursery pocket:</p> <p>g. Water depth in my gher and nursery is 3 feet above the mud level:</p> <p>h. I have made a shelter for shrimp in my gher.</p> <p>i. In the last stocking I have stocked SPF/PCR shrimp PL in my gher:</p>	<p>What has changed in terms of production practices that you are using on your farm in the past two years? Why has this happened? (Probe about pond size, stocking density, feeding, fertilizing, weeding and other management practices; see also list of recommended practices below.) Who has supported this change? (Probe about the role of LSPs if any, if it doesn't come up.)</p> <p>(Recommended practices: All: Water color of pond/gher/pocket nursery is sufficiently green; remove weeds, black soil and or tree leaves from pond/gher regularly; use supplementary feeds in the pond/gher regularly. Fish only: Practice sunlight management for my pond (remove excess branches of trees, shade for vegetables, etc.) so that around 70% of water gets sunlight at noon; maintain three layers of stocking in the pond. Shrimp only: Set up a permanent or temporary nursery/nursery pocket; maintain proper water depth in my gher and nursery; make a shelter for shrimp in my gher; stocked SPF/PCR shrimp PL in gher.)</p>
	II. Farmers have increased efficiency in production/reduced use of inputs	<p>a. Compared to 2 years ago my use of feed per kg of fish/shrimp I harvest now is:</p> <p>b. Compared to 2 years ago my use of fertilizer per kg of fish/shrimp I harvest now is:</p> <p>c. Compared to 2 years ago my use of other inputs per kg of fish/shrimp I harvest now is:</p>	<p>Have the changes in production practices (discussed above) had any effect on how much inputs you use to produce the same volume of fish? Has it had any effect on how much labor you need for your fish/shrimp farming? Please describe and give examples.</p>
	III. Farmers have increased fish yields	<p>a. Compared to 2 years ago the total volume of fish I harvest per year has:</p>	<p>What has happened to fish/shrimp yields of farmers in your community/village over the past 2 years? Why has this happened? Is it the same for everyone? (Probe for men, women, poor, rich.)</p>
	IV. Farmers experience lower incidence and/or impacts of fish disease	<p>a. Compared to 2 years ago the frequency that my farm experiences fish disease has become:</p> <p>b. Compared to 2 years ago the impact of fish disease in terms of early harvest and death of fish is:</p>	<p>Do you experience fish disease in your ponds? Has this become more or less over recent years? Why has this happened? Is this the same for everyone in the community? (Probe for men/women, poor/rich, old/young.)</p>
	V. Farmers have enhanced experimental/problem-solving skills	<p>a. Compared to 2 years ago my ability to deal with problems when they come up is:</p> <p>b. I feel capable of handling problems related to fish/shrimp farming when they come up:</p>	<p>When you have a problem with your fish farming what do you do? Has this changed over the past 2–3 years? Give examples. (Probe for their problem solving skills. Are they able to deal with sudden changes in the external environment?)</p>

Domain	Indicator	Farmer survey statements	Farmer FGD questions
Economic/ market goals	I. Farmers have improved access to (quality) inputs for aquaculture	a. Compared to 2 years ago the level of access to the inputs I need for aquaculture is: b. Compared to 2 years ago the quality of the inputs I use for aquaculture is:	Where do you access inputs for fish/shrimp farming? Why do you access it there? Has this changed over the past 2–3 years? Describe how and the effect on your fish farming.
	II. Farmers have improved access to (quality) information and services for aquaculture	a. Compared to 2 years ago the frequency I receive technical information for aquaculture: b. Compared to 2 years ago the quality of technical information for aquaculture: c. I have access to reliable technical information for aquaculture when I need it:	Where do you access market and technical information and services for fish/shrimp farming? Why do you access it there? Has this changed over the past 2–3 years? Describe how and the effect on your fish farming.
	III. Farmers have reduced costs of production	a. Compared to 2 years ago my costs for the production of 1 kg of fish/shrimp are:	What are your main costs of production for fish/shrimp farming? How have your costs changed over the past 2 years? Why has this happened? Is this the same for everyone in the community? (Probe for men/women, poor/rich, old/young.)
	IV. Farmers have enhanced business and entrepreneurial skills	a. Compared to 2 years ago the level of my skills to run my fish farm as a business have become: b. I feel I have strong business and entrepreneurial skills for aquaculture:	Do you feel you are able to run your fish farming as a business? Has this changed over the past 2–3 years? Please describe how.
	V. Farmers have improved market links (downstream)	a. Compared to 2 years ago my options to sell my fish when I want to have become: b. I feel certain that when I want to sell my fish there are enough people that are willing to buy it at a good price:	To whom do you sell your fish/shrimp? Do you have a choice who you sell your fish/shrimp to? What restricts this choice? Has anything changed about the degree of choice you have who you sell your fish/shrimp to? Why has this happened?
	VI. Farmers receive a higher market price	a. Compared to 2 years ago the average price I receive for my fish is:	What has happened to the price that you receive when you sell your fish/shrimp (has it increased/decreased)? Explain. Why has this happened?
	VII. Farmers are more competitive	a. Compared to 2 years ago the level of my capability to compete with other farmers has become:	Do you feel you are able to compete well with other farmers within and outside your community and region in selling your fish/shrimp? Has this changed over the past 2–3 years? Explain.
	VIII. Farmers have a higher level of income from fish/shrimp farming	a. Compared to 2 years ago, the level of profit I get from my fish/shrimp farming has:	Has the profit that you get from fish farming changed over the past 2–3 years? How? Explain why this has happened. Is this the same for all fish farmers in the community? (Probe for men/women, poor/rich, old/young.)
	IX. LSPs are involved in economically sustainable businesses	a. When I access information and services (not inputs) from the LSP I pay for these services: b. I am willing to pay for the services provided by the LSP:	-
	X. Commercial aquaculture is spreading (increased overall production)	a. Compared to 2 years ago, the number of people farming fish/shrimp in my community has: b. Compared to 2 years ago the proportion of fish that I sell (versus what I consume at home) has:	Compared to two years ago what has happened to the number of people farming fish/shrimp? Who are the types of people that have dropped out/have started? (Probe for men/women, poor/rich, old/young.) What has happened to overall volumes of fish/shrimp being farmed in the community? Why has this happened? In the community, are fish farmers selling a larger or smaller proportion of the fish they grow? Why has this happened? Is this the same for everyone? (Probe for men/women, poor/rich, old/young.)
Social goals	I. Farmers have enhanced social capital through producer groups, improved farmer collaboration, and/or innovation platforms	a. I am a member of a farmer group or organization for fish/shrimp farming: b. The farmer group I am a member of for fish/shrimp farming functions well and brings me benefits:	How do you collaborate with other farmers for fish farming? For what activities? How often does it happen? Are there any formal groups? Can everyone be a member? Who cannot? (Probe for men/women, poor/rich, old/young.)
	II. Farmers have improved communication skills	a. Compared to 2 years ago, the level of my skills to communicate well with traders has become: b. Compared to 2 years ago, the level of my skills to communicate well with people that sell inputs or provide technical services for aquaculture has become:	Has anything changed in the past 2–3 years in how you communicate with other fish farmers? And how about with input and service providers? And how about with public extension agents (DOF)? And how about with your buyers of fish/shrimp? Please describe what has changed and why and how this has affected you.

Domain	Indicator	Farmer survey statements	Farmer FGD questions
Gender/inclusion goals	I. There are sufficient LSPs to reach all farmers in a particular geographic area	a. In my community/area there are sufficient people that provide inputs and technical services for aquaculture:	Are there sufficient LSPs to service all farmers in the area? Explain. If there are insufficient LSPs, who are the farmers that have most difficulty to get access to services? Explain.
	II. LSP services are accessible to all farmers	a. I am able to physically access the LSP for information, technical services, and inputs for my fish/shrimp farming:	Can all fish/shrimp farmers in the community get physical access to inputs and services? Can all farmers go the LSP? And can LSPs work with all farmers in the community? Explain why, why not. (Probe for men/women, poor/rich, old/young. Probe also for social norms limiting particular people to access these services.) Have there been any efforts to overcome constraints to physical access?
	III. LSP services are affordable for farmers of all wealth levels	a. I can afford to pay for technical and market information and services for my fish/ shrimp farming when I need them: b. I can afford to buy the inputs I need for my fish/shrimp farming when I need them:	Is everyone able to afford the inputs/services from the LSP? Explain who isn't. (Probe for men/women, poor/rich, old/young.)
	IV. Farmers have improved gender awareness	a. Compared to 2 years ago, the frequency that women farmers are directly accessing market and technical information on fish/ shrimp farming from LSPs has become:	Is there anything that you have learned in the past few years about the relationships between men and women (gender relations) when it comes to fish farming and daily lives, and roles and responsibilities? Please describe. Has this changed anything in your household? And in the community? Explain. Do LSPs treat men and women farmers equally? Explain. (Probe also for the difference between men and women LSPs.)
	V. LSPs have improved gender awareness	b. I do not feel restricted to interact with a service provider of the opposite sex: c. Compared to 2 years ago, it has become more acceptable for me to interact with a service provider of the opposite sex: d. Compared to 2 years ago, when I interact with a service provider of the opposite sex, I feel he/she better understands my need	
	VI. Women LSPs are accepted and recognized in their roles by their community	a. This community accepts women to work in the role of LSP: b. I feel that the women LSPs I have interacted with are doing their job well: c. I trust the advice given by a man or a woman LSP equally:	Do you interact with an LSP of the opposite sex (as yourself)? What are the advantages and disadvantages of doing so? Do you feel restricted to do so? Explain. Do you interact with LSPs of the same sex (as yourself)? If so, what are the advantages and disadvantages of doing so? Explain. Do you feel men and women are equally capable of fulfilling the role of LSP? Explain why, why not. Are there any circumstances that enable or hinder a woman from being an LSP?
	VII. Women have increased decision-making power in the area of aquaculture	a. Compared to 2 years ago, the influence I personally have on decisions related to fish/shrimp farming has become: b. Compared to 2 years ago, the influence women in the community have on decisions related to fish/shrimp farming has become:	Who makes the decisions in the household about fish/shrimp farming? (Probe about pond preparation, feeding, management, harvesting, sales, home consumption). Who influences these decisions? (Probe about joint decision-making). Has this changed over time? How and why?
	VIII. Women have increased decision-making power over income	a. Compared to 2 years ago, the influence I personally have on decisions related to how income from fish/shrimp farming is being spent has become: b. Compared to 2 years ago, the influence women in the community have on decisions related to how income from fish/shrimp farming is being spent has become:	Who makes the decisions in the household about how money is spent in the household? (Please probe about food, other small household purchases, and large assets.) And how about money earned from fish farming? Who influences these decisions? (Probe about joint decision-making.) Has this changed over the past 2–3 years? How and why? What is the impact on the household of this change (if any)?
	IX. Women have increased decision-making power over household nutrition	a. Compared to 2 years ago, the influence I personally have on decisions related to household nutrition become: b. Compared to 2 years ago, the influence women in the community have on decisions related to household nutrition has become:	In your household, who decides what food is consumed, and how food is allocated among the household members? And how about fish being consumed? Who influences these decisions? (Probe about joint decision-making). Has this changed over the past 2–3 years? How and why?
	X. Women have more control over productive assets and resources	a. Compared to 2 years ago, the control I personally have over how my household uses land and equipment has become: b. Compared to 2 years ago, the control women in the community have on how their household uses land and equipment has become:	Who in your household makes the decisions about how land and equipment is being used? And how about equipment and land for fish farming specifically? Who influences these decisions? (Probe about joint decision-making.) Has this changed over the past 2–3 years? How and why?

Domain	Indicator	Farmer survey statements	Farmer FGD questions
Political/ governance goals	I. Farmers have improved links with public institutions	a. Compared to 2 years ago, the level of my access to extension services provided by the government has:	How often do you interact with technical officers from the DOF? Has this changed over the past 2–3 years? How and why?
	II. The governance structures for service provision are sustainable in the long term (producer groups, etc.)	-	Are you paying for services provided by the LSP? Please explain what you pay for. If not, would you be willing to pay for services when the project ends? Do you think the producer groups and networks will continue to work the future? Please explain why, why not.
	III. Content of training/ capacity development is relevant and up to date	a. The content of the training/capacity development provided by the LSP is relevant: b. The content of the training/capacity development provided by the LSP is up to date:	Did you find the content of the training/capacity development provided by LSPs relevant for the issues that you have in fish/ shrimp farming? Did you feel it was up to date? Please explain.
	IV. Methods for training/ dissemination/ capacity development used are effective	a. The way the training was delivered was the most effective way:	What did you think about the training/capacity building events organized by the LSP that you participated in? What was useful about the way that the training was delivered? What was not so useful? Is there a different way in which you would have liked to receive this information? (Probe about how the training was delivered, e.g. venue, number of people, type of people, time of day organized, method of delivery (theory or practice) etc.). How could it be improved to better deliver the information? How could it be improved to reach more and different types of farmers (e.g. women)?
	V. Services provided are considered reliable and relevant	a. The services and/or information I receive from the LSP is reliable: b. The services and/or information I receive from the LSP is relevant and addresses the issues I have on my farm: c. When I follow the advice given to me by the LSP about my fish/shrimp farming this gives me good results:	When you interact with the LSP in a group or as individual, do you find the information that the LSP provides to you reliable? (Do you trust the LSPs?) Do you put in practice all his/her advice? Why/why not?
	VI. Services are provided when they are required (timely)	a. When I try to access technical or market information for my fish/shrimp farming I get the information and services I need on time:	When you need information, services or inputs for your fish/ shrimp farming are you always able to get it on time? If not, please describe what hinders it.
Nutrition	I. Farmers have improved knowledge on nutrition practices	a. Compared to 2 years ago the level of my knowledge on healthy food and nutrition needs for my entire family have become:	Have you changed any practices in your household related to the food that is consumed in your household? Explain. Why have you changed these practices? How has this change affected your family?
	II. Farmers use more nutrient fish for home consumption	a. Compared to 2 years ago the quality of my own dietary intake of healthy and diverse foods has become: b. Compared to 2 years ago the quality of my male children's intake of healthy and diverse foods has: c. Compared to 2 years ago the quality of my female children's intake of healthy and diverse foods has: d. I grow vegetables on my pond/gher dike: Fish only: a. I have stocked small fish in the pond this season: b. I harvest small fish at least once a week for household consumption:	Have you changed anything about your production practices both in and outside the pond in the past 2 years? Please explain how and why (see also below for recommended practices). Have you changed your consumption patterns of fish (volumes, species, own or bought, distribution in the household)? How have you changed them (describe). Why have you done this? How has this change affected your family? (Recommended practices: All: Grow vegetables on pond/gher dike. Fish only: Stock small fish in the pond; harvest small fish at least once a week for household consumption.)

Annex 2b. Indicators and linked survey and IDI questions for LSPs

Domain	Indicator	LSP survey statements	LSP IDI questions
Technical goals	I. Farmers have adopted improved aquaculture production practices and technologies	<ul style="list-style-type: none"> a. The water color of farmers' ponds/ghers/pocket nurseries in my community is sufficiently green: b. Farmers in my community remove weeds, black soil and or tree leaves from pond/gher whenever they are present: c. Farmers in my community regularly use supplementary feeds in the pond/gher: d. Fish farmers in my community practice sunlight management for my pond (remove excess branches of trees, shade for vegetables, etc.) so that around 70% of water gets sunlight at noon: e. Fish farmers in my community maintain three layers of stocking in the pond: f. Shrimp farmers in my community have set up a permanent or temporary nursery/nursery pocket: g. Shrimp farmers in my community maintain proper water depth in their gher and nursery: h. Shrimp farmers in my community have made a shelter for shrimp in their gher: i. Shrimp farmers in my community stock SPF/PCR shrimp PL in their gher: 	<p>What has changed in terms of production practices that farmers that you service are using over the past 2 years (see also below the list of recommended practices)? Why has this happened? In general are farmers adopting what you recommend them to do? Why or why not?</p> <p>(Recommended practices: All: Water color of pond/gher/pocket nursery is sufficiently green; remove weeds, black soil and or tree leaves from pond/gher regularly; use supplementary feeds in the pond/gher regularly. Fish only: Practice sunlight management for my pond (remove excess branches of trees, shade for vegetables, etc.) so that around 70% of water gets sunlight at noon; maintain three layers of stocking in the pond. Shrimp only: Set up a permanent or temporary nursery/nursery pocket; maintain proper water depth in my gher and nursery; make a shelter for shrimp in my gher; stock SPF/PCR shrimp PL in gher.)</p>
Economic/ market goals	I. Farmers have improved access to (quality) inputs for aquaculture	a. Over the past 2 years, the number of farmers that come to me for fish/shrimp farming inputs has:	How has access to quality inputs for fish/shrimp farming for farmers in your community changed in the past few years? How has this change happened? What has been the effect on their farms?
	II. Farmers have improved access to (quality) information and services for aquaculture	a. Over the past 2 years, the number of farmers that come to me for fish/shrimp farming services has:	How has access to information and services for fish/shrimp farming for farmers in your community changed in the past few years? How has this change happened? What has been the effect on their farms?
	III. LSPs are involved in economically sustainable businesses	a. The provision of inputs and services as an LSP is economically sustainable for me:	Do you consider being an LSP an economically sustainable business for the future? Also after the project stops it support? Please explain.
	IV. LSPs have expanded their business	a. Involvement as an LSP has resulted in my business becoming:	How has getting involved as an LSP affected your other business? Please describe the positive and negative aspects.
	V. Commercial aquaculture is spreading (increased overall production)	a. Compared to 2 years ago, the number of people farming fish/shrimp in my community has:	Compared to 2 years ago what has happened to the number of people farming fish? Who are the types of people that have dropped out/started? (Probe for men/women, poor/rich, old/young) What has happened to overall volumes of fish/shrimp being farmed in the community? Why has this happened? In the community, have fish farmers become more commercialized? (e.g. are they selling a larger or smaller proportion of the fish they grow?) Why has this happened? Is this the same for everyone? (Probe for men/women, poor/rich, old/young.)

Domain	Indicator	LSP survey statements	LSP IDI questions
Social goals	I. LSPs have enhanced social capital through farmers and market links	<ul style="list-style-type: none"> a. Compared to 2 years ago, the number of farmers I interact with has: b. Compared to 2 years ago, the number of interactions I have with any individual farmer has: c. Compared to 2 years ago the number of different types of farmers (in terms of men/women, poor/rich, farming systems) has: d. Compared to 2 years ago, the number of other actors in the fish/shrimp value chain has: e. Compared to 2 years ago, the number of interactions I have with any individual fish/shrimp value chain actor has: f. Compared to 2 years ago the number of different types of value chain actors (in terms of type of actor) has: 	<p>Has anything changed in the past 2 years in the your interactions with farmers? For example the numbers of farmers you deal with, the types of farmers, the ways in which you interact, and the numbers of interactions you have with each farmer? Please explain. How has this affected your business?</p> <p>Has anything changed in the past 2 years in the your interactions with other value chain actors? For example the numbers of farmers you deal with, the types of farmers, the ways in which you interact, and the numbers of interactions you have with each value chain actor? Please explain. How has this affected your business?</p>
	II. Farmers have improved communication skills	<ul style="list-style-type: none"> a. Compared to 2 years ago, the way that farmers communicate with me and ask me questions has changed: 	<p>Has anything changed in the past 2–3 years in farmers communicate with you? For example in how they ask for your help and services? Please describe what has changed and why.</p>
Gender/inclusion goals	I. There are sufficient LSPs to reach all farmers in a particular geographic area	<ul style="list-style-type: none"> a. Together with other LSPs I am able to reach all farmers that need fish/shrimp farming services in our area: 	<p>Are there sufficient LSPs to service all farmers in the area? Explain.</p> <p>If there are insufficient LSPs, who are the farmers that have most difficulty to get access to services? Explain.</p>
	II. LSP services are accessible to all farmers	<ul style="list-style-type: none"> a. Men and women farmers are equally able to (physically) access the services I deliver: b. Rich and poor farmers are equally able to (physically) access the services I deliver: c. Commercial and smallholder/homestead farmers are equally able to (physically) access the services I deliver: d. Farmers located in central locations and in remote areas are equally able to (physically) access services from myself or another LSP: 	<p>Can all fish/shrimp farmers in the community get physical access to inputs and services? Can all farmers go the LSP? Explain why, why not. (Probe for men/women, poor/rich, old/young. Probe also for social norms limiting particular people to access these services.)</p>
	III. LSP services are affordable for farmers of all wealth levels	<ul style="list-style-type: none"> a. Rich and poor farmers are equally able to pay for services I deliver: b. Commercial and homestead farmers are equally able to pay for the services I deliver: c. All farmers that require services for their farm are able to receive it from me or another LSP: 	<p>Is everyone able to afford the inputs/services from the LSP? Explain who isn't. (Probe for men/women, poor/rich, old/young.)</p>
	IV. LSPs have improved gender awareness	<ul style="list-style-type: none"> a. Compared to 2 years ago, I have improved my understanding of the different needs of men and women farmers: b. Compared to 2 years ago, it has become more acceptable for me to interact with farmers of the opposite sex: c. Compared to 2 years ago I interact with more farmers of the opposite sex: 	<p>Do you interact with farmers of the opposite sex (as yourself)? What are the advantages and disadvantages of doing so? Do you feel restricted to do so? Explain.</p> <p>Do you interact with farmers of the same sex (as yourself)? If so, what are the advantages and disadvantages of doing so? Explain</p> <p>Is it the same for you to provide services and interact with men and women farmers? Explain.</p>
	V. Women LSPs are accepted and recognized in their roles by their community	<ul style="list-style-type: none"> a. I feel accepted in my role as LSP by the community: b. I feel respected in my role as LSP by farmers: 	<p>Do you feel respected and accepted in your role as LSP by farmers and the community in general? Explain.</p> <p>Are there any negative aspects about being an LSP? Please explain. (see also below on trust)</p>
	VI. Women have increased decision-making power in the area of aquaculture	<ul style="list-style-type: none"> a. Compared to 2 years ago, the influence I personally have on decisions related to my aquaculture business has become: b. Compared to 2 years ago, the influence women in the community have on decisions related to fish/shrimp farming has become: 	<p>Who makes the decisions in the household about your aquaculture business and the LSP activities? Who influences these decisions? (Probe about joint decision-making.) Has this changed over time? How and why?</p>
	VII. Women have increased decision-making power over income	<ul style="list-style-type: none"> a. Compared to 2 years ago, the influence I personally have on decisions related to how income from my aquaculture business is being spent has become: b. Compared to 2 years ago, the influence women in the community have on decisions related to how income from fish/shrimp farming is being spent has become: 	<p>Who makes the decisions about how money is spent in the household? (Please probe about food, other small household purchases, and large assets.) And how about money earned from the aquaculture and LSP business? Who influences these decisions? (Probe about joint decision-making.) Has this changed over the past 2–3 years? How and why? What is the impact on the household of this change (if any)?</p>

Domain	Indicator	LSP survey statements	LSP IDI questions
Gender/ inclusion goals	VIII. Women have increased decision-making power over household nutrition	<ul style="list-style-type: none"> a. Compared to 2 years ago, the influence I personally have on decisions related to household nutrition has become: b. Compared to 2 years ago, the influence women in the community have on decisions related to household nutrition has become: 	In your household, who decides what food is consumed, and how food is allocated among the household members? And how about fish being consumed? Who influences these decisions? (Probe about joint decision-making.) Has this changed over the past 2–3 years? How and why?
	IX. Women have more control over productive assets and resources	<ul style="list-style-type: none"> a. Compared to 2 years ago, the control I personally have over how my household uses land, equipment, and other assets has become: b. Compared to 2 years ago, the control women in the community have on how their household uses land and equipment has become: 	Who in your household makes the decisions about how land, equipment and other assets are being used? And how about for your aquaculture and LSP business specifically? Who influences these decisions? (Probe about joint decision-making.) Has this changed over the past 2–3 years? How and why?
Political/ governance goals	I. LSPs have improved links with public institutions	<ul style="list-style-type: none"> a. Over the past 2 years my contact and interactions with government staff and institutions has: 	How often do you interact with technical officers from the DOF? Has this changed over the past 2–3 years? How and why?
	II. The governance structures for service provision are sustainable in the long term (producer groups, etc.)	<ul style="list-style-type: none"> a. I am capable of continuing to deliver services to farmers at the same or higher level when the support from the AIN/IFSL project ends: b. I plan to continue to deliver services to farmers at the same or higher level when the support from the AIN/IFSL project ends: c. I know where to get the latest information on fish/shrimp farming and have access to it without the support of the AIN and IFSL projects: 	<p>Are farmers paying for the services they receive from you? Please explain what they pay for. If not, do you think there is scope to develop options for paid services and would farmers be willing to pay?</p> <p>How do you think your business as an LSP will develop in the future after the project has ended? Will you be able to continue delivering services? What will change and why?</p> <p>Do you think the producer groups and other structures will continue to work the future? Please explain why, why not.</p>
	III. Content of training/ capacity development is relevant and up to date	<ul style="list-style-type: none"> a. I feel that the content of trainings and capacity development I deliver to farmers is relevant to the problems and needs that farmers have: b. I feel that the content of trainings and capacity development I deliver to farmers has the latest and most up to date information: 	<p>Do you feel that the content of the training/capacity development that you provide to farmers is relevant for the issues that you have in fish/shrimp farming? Please explain why, why not and what could be done to improve it.</p> <p>Do you feel the information that you are able to provide is up to date? Please explain why, why not and what could be done to improve it.</p>
	IV. Methods for training/ dissemination/ capacity development used are effective	<ul style="list-style-type: none"> a. The ways I deliver training and capacity development suit the needs of all types of farmers: 	Please describe how you deliver your training and capacity development. What is useful about doing it in this way? What is not so useful? (Probe about how the training was delivered, e.g. venue, number of people, type of people, time of day organized, method of delivery (theory or practice) etc.) How could it be improved to better deliver the information? How could it be improved to reach more and different types of farmers (e.g. women)?
	V. Services provided are considered reliable and relevant	<ul style="list-style-type: none"> a. I feel that farmers trust the information I provide to them: b. When farmers come to me with a problem or question I know what to advise them: 	Do you feel farmers trust the advice that you give them? Do they normally follow your advice? Please explain.
	VI. Services are provided when they are required (timely)	<ul style="list-style-type: none"> a. I am able to provide farmers with the services they need, at the time they need it: 	When farmers come you with a request for information or services are you always able to provide it on time? If not, please describe what hinders it.

Annex 3. Results for all indicators, disaggregated by sex, age, poverty level, species, project and farm size

	all	men	women	youths	non-youths	poor	non-poor	shrimp	fish	AIN	IFSL	small	large
Technical													
I. Adoption of improved practices	3.24	3.27	3.18	3.25	3.23	3.17	3.27	3.31	3.21	3.25	3.26	3.17	3.33
II. Increased efficiency	2.27	2.31	2.19	2.23	2.30	2.37	2.23	1.94	2.41	2.47	1.99	2.24	2.30
III. Increased fish yields	3.48	3.49	3.46	3.49	3.47	3.41	3.51	3.44	3.50	3.45	3.49	3.49	3.47
IV. Lower incidence/impacts of fish disease	3.23	3.27	3.16	3.29	3.19	3.42	3.15	3.04	3.32	3.60	2.91	3.19	3.28
V. Enhanced experimental skills	3.19	3.22	3.12	3.13	3.23	3.22	3.18	3.21	3.18	3.25	3.15	3.18	3.20
Economic/market													
I. Improved access to inputs	3.37	3.40	3.30	3.36	3.37	3.24	3.43	3.46	3.33	3.31	3.43	3.31	3.43
II. Improved access to information	3.39	3.40	3.35	3.46	3.33	3.35	3.40	3.42	3.37	3.36	3.42	3.34	3.45
III. Reduced costs of production	2.48	2.44	2.57	2.55	2.43	2.53	2.46	2.20	2.60	2.51	2.36	2.53	2.42
IV. Enhanced business skills	3.16	3.26	2.95	3.22	3.11	3.03	3.22	3.29	3.10	3.11	3.18	3.08	3.25
V. Improved market links	3.45	3.49	3.35	3.53	3.38	3.38	3.48	3.54	3.41	3.37	3.53	3.42	3.48
VI. Higher market price	3.21	3.17	3.28	3.35	3.10	3.22	3.20	3.14	3.24	3.23	3.16	3.23	3.18
VII. Farmers are more competitive	3.35	3.39	3.27	3.40	3.32	3.15	3.44	3.46	3.30	3.22	3.52	3.30	3.41
VIII. Higher income from fish/shrimp	3.38	3.39	3.34	3.44	3.33	3.20	3.46	3.51	3.32	3.33	3.46	3.39	3.35
IX. LSPs have economically sustainable businesses	1.43	1.46	1.36	1.48	1.38	1.26	1.50	1.47	1.41	1.13	1.71	1.36	1.50
XI. Commercial aquaculture is spreading	3.58	3.62	3.49	3.60	3.56	3.48	3.63	3.55	3.59	3.57	3.60	3.54	3.63
Social													
I. Enhanced social capital	2.22	2.23	2.19	2.24	2.20	2.23	2.21	2.36	2.16	2.12	2.33	2.19	2.25
II. Improved communication skills	3.40	3.48	3.23	3.38	3.41	3.29	3.45	3.47	3.37	3.39	3.43	3.32	3.49

	all	men	women	youths	non-youths	poor	non-poor	shrimp	fish	AIN	IFSL	small	large
Gender/inclusion													
I. Sufficient LSPs to reach all farmers	2.64	2.66	2.60	2.57	2.70	2.59	2.66	2.43	2.73	2.61	2.68	2.62	2.66
II. LSP services are accessible to all farmers	3.32	3.43	3.11	3.27	3.36	3.28	3.34	3.39	3.30	3.29	3.40	3.22	3.45
III. LSP services are affordable for all farmers	2.67	2.77	2.45	2.66	2.67	2.59	2.70	2.64	2.68	2.52	2.85	2.58	2.77
IV. Farmers/LSPs have improved gender awareness	3.05	3.06	3.02	3.01	3.08	3.04	3.05	3.06	3.04	3.00	3.12	3.07	3.02
VI. Women LSPs are accepted and recognized	3.40	3.34	3.53	3.45	3.36	3.49	3.36	3.44	3.38	3.37	3.41	3.45	3.34
VII. Increased decision-making power over aquaculture	3.17	3.18	3.15	3.21	3.14	3.04	3.23	3.22	3.15	3.16	3.19	3.13	3.21
VIII. Increased decision-making power over income	3.06	3.08	3.02	3.02	3.09	3.01	3.08	3.06	3.06	3.03	3.10	3.07	3.05
IX. Increased decision-making power over nutrition	3.38	3.34	3.46	3.37	3.39	3.26	3.44	3.40	3.37	3.30	3.46	3.39	3.37
X. More control over productive assets and resources	3.14	3.18	3.06	3.14	3.15	3.00	3.21	3.23	3.11	3.06	3.24	3.15	3.13
Political/governance													
I. Improved links with public institutions	2.60	2.63	2.52	2.71	2.51	2.51	2.63	2.79	2.51	2.37	2.89	2.57	2.63
III. Content of training is relevant and up to date	3.49	3.51	3.45	3.45	3.51	3.43	3.51	3.61	3.44	3.36	3.63	3.44	3.54
IV. Methods for training are effective	3.19	3.18	3.20	3.13	3.24	3.36	3.11	3.27	3.15	3.10	3.27	3.14	3.25
V. Services provided are reliable and relevant	3.57	3.60	3.51	3.55	3.59	3.56	3.58	3.65	3.54	3.49	3.67	3.51	3.65
VI. Services are timely	3.29	3.33	3.22	3.23	3.35	3.43	3.23	3.24	3.32	3.37	3.22	3.23	3.38
Nutrition													
I. Improved knowledge on nutrition	3.56	3.58	3.51	3.55	3.57	3.48	3.59	3.58	3.55	3.51	3.62	3.54	3.58
II. Adopted production practices for improved nutrition	3.65	3.65	3.66			3.52	3.71	3.76	3.61			3.60	3.72
III. Higher intake of nutrient-rich fish	3.48	3.52	3.38			3.32	3.55	3.53	3.46			3.44	3.53



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The CGIAR Research Program on Fish Agri-Food Systems (FISH) is a multidisciplinary research program. Designed in collaboration with research partners, beneficiaries and stakeholders, FISH develops and implements research innovations that optimize the individual and joint contributions of aquaculture and small-scale fisheries to reducing poverty, improving food and nutrition security and sustaining the underlying natural resources and ecosystems services upon which both depend. The program is led by WorldFish, a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

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