

Adopting Gender Friendly Fisheries Technology in South West Regions of Bangladesh: Constraints and Potentials

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Over 11% of the total population engages in fisheries and aquaculture and out of them about 10% is women in Bangladesh (DOF, 2013). Thus, women make essential contributions to local food security and in many cases; they take part in the commercially fishing production and trading too. There are pervasive gender gaps in the fisheries sectors; including women limited access to resources such as technology and information. The research in south-west coastal areas of Bangladesh identified the needs, requirements, potential and constraints faced by women in the access to and use of technologies and technical measures for better production and income. A small questionnaire survey was developed for quantitative data collection. The researcher also found participatory tools useful for qualitative data collection, such as Focus Group Discussion (FGD), Key informant interview, Inquiries methods. The field findings were mixed—some women farmers gained a lot using fisheries technology while some felt uncomfortable, costly and unable to use which reduced their production, thus the income. Finally, the report on the study suggests increasing availability and use of gender friendly and climate resilient agriculture production and processing tools and techniques, for example, the adoption of simple technology on efficient water use can help farmers to protect themselves from potential losses, reduce costs and enjoy higher yields, resulting in increased income.

Keywords: Food security, fisheries technology, women farmers, Gender gaps

Introduction:

The Fisheries sector is one of the most productive and active sectors in Bangladesh. Bangladesh is now the 5th largest producer of farmed fish and shrimp in the world, production of fish and fisheries products has increased by over 25 percent in last five years (FAO, 2014). In Aquaculture sector, more than 3 million people are employed, 60% of whom are women (FAO website). Food insecurity is a pressing manifestation of economic and social inequity in Bangladesh, which exists between the poor and the rich, between men and women. Women are lagging behind in all economic and social spheres, due to less accessibility and engagement in the production and supply chain. Women farmers (including women-headed households), formal or informal whose contributions are vital for food production. But their work and contribution in this sector are not recognized much. For increasing productivity and thus achieving food security for the huge population, a profitable, sustainable, and environment-friendly agricultural system is required. Aquaculture, including all its subsectors, faces a lot of challenges such as lack of quality seeds, credit support to the farmers, unfair pricing, insufficient investment in agricultural adoption and dissemination of new tools and technology. The majority of the farmers belong to the categories of small scale and marginal who lack financial resources and cannot afford the high cost of modern technology. The participation of women in aquaculture particularly shrimps farming is hardly found in the southeastern regions rather than in horticulture and livestock rearing. Inventing and importing women-friendly technologies and prohibiting the use of technologies those are against the wellbeing of women farmers are also a big issue.

Technology is an important aspect of the quality and quantity of food production, yet the access to and use of agricultural tools among the farmers is quite low in Bangladesh. Women farmers especially are not very likely to use purchased inputs such as fertilizers and improved seeds or to make use of mechanical tools and equipment (FAO, 2011). Gender gaps exist for a wide range of fisheries technologies, including machines and tools, improved and varied fingerlings, breeds, fertilizers, disease control measures and

management techniques. In fact, when agricultural work done by women farmers gets mechanized, it then is taken over by men.

In fisheries, as in other sectors, tasks are usually strictly divided between men and women. This division of task is prevalent in livestock keeping and dairy, horticulture and homestead gardening, crop cultivation and processing, and aquaculture. Women-friendly tools and technologies can increase their production and decrease the drudgery work which ultimately results in achieving higher social status and political voice raised.

The Sustainable Agriculture, Food Security and Linkages (SaFaL) programme has been working in the five districts of south west in Bangladesh on the three sub-sectors of Agriculture (Aquaculture, Livestock and horticulture) for the last four years. The project aims to improve access and availability to healthy food through fostering sustainable farm production and market chain development with a focus on developing the capacities of the farmers, market accessibility, and access to technologies, and certification to sustainability standards, access to inputs and financial services for a resilient livelihood. Therefore, technical capacity to implement new techniques in agriculture is one of the key approaches of SaFaL programme. SaFaL includes women in specialized training to help strengthen fisheries activities and create employment in the sector for both women and men.

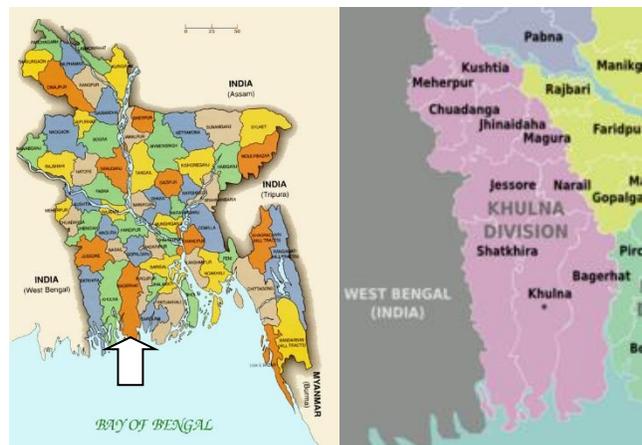
Objectives of the Study:

- To assess the needs, requirements, potentials and constraints faced by women (compared to men) in fisheries especially in the areas of tools and technological development
- to assess women's access and ownership of productive resources (including technology) and services for the means of production, ownership of income, and possible negative side-effects of existing roles of women.
- To identify the gender-friendly aquaculture technologies and technical measures they already use

In addition, the study aimed to identify the options, availability and use of gender-friendly aquaculture production and processing tools and techniques. Lastly, on the basis of the field level data and information, some relevant suggestions for mitigating the sufferings and enhancing empowerment of women farmers will be made.

Location and study area:

The study was carried out in two villages, Rahamatpur village in Dumuria Upazila, and Kalabaria village in Debhata Upazila of two districts (Khulna and Satkhira) of SaFaL program depending on the distances and time needed to travel between the villages. Rahamatpur village is 13 kilometers away from Khulna city while Kalabaria village is 20 kilometers away from Satkhira district town. Both districts are close to the Bay of Bengal while people call them as the coastal region in Bangladesh. In these two villages over half of small farmers earn most of their livelihood from culturing freshwater prawns



(Galda shrimp) and saline shrimp (Bagda or black tiger shrimp). Village Rangpur of Khulna district is famous for freshwater

Prawn while farmers of Kalabaria of Satkhira keen to farm saline Bagda shrimp. Some farmers reported being stocking wild tiger shrimps which are good in saline water; they have still depended on the availability of wild seed from the coastal belt. The majority of the people in this region live on by capture fisheries in the sea and river and inland fisheries. For example: being a saline prone area, Satkhira is good for *Galda* shrimp cultivation. Therefore, the capture fisheries and aquaculture are playing a vital role in these two villages' million tons of fishes as the source of income and livelihood for about 40 thousand people providing food and employment in the local fish ghers.

Although Bangladesh Agriculture Development Cooperation (BADC) has been inventing new saline tolerant seed and technology for producing better paddy in the field, the area is well known for black tiger shrimp (*Bagda*) farming, earn a good amount of national and foreign money and a symbol of local pride. Due to a frequent effect of climatic change event in this reason, many farmers lost their lives and livelihood; migrated to the cities for new options for livings. Considering a prime need for the food security and agricultural development in southwest Bangladesh, SaFaL implements an innovative food security and sustainable agriculture program in five districts of the region.

Methodology:

Nature of the study is descriptive. This study has conducted on two sources of information, Primary data collection, and Secondary data collection and analysis. The required primary data has been collected from targeted two villages of two districts in the southwest coastal areas of Bangladesh. For quantitative data or to collect gender-disaggregated data, a survey has been conducted using a semi-structured questionnaire through interviews among fish farmers. Along with a questionnaire survey, it has used some qualitative tools for collecting in-depth information. The study has developed and used closed-ended questions for sex-disaggregated data while it used open-ended questions for qualitative analysis of the information. Secondary information has included local studies conducted on the subject, an information collected from some published reports, papers and some official documents and reviews on the existing information, annual report and published News Letter. The Proposed sample size for interviews in the two village was 50. A detail of the data collection methodology is as follows:

1. Questionnaire Survey (Household survey) with 35 fish farmer couples in two targeted villages mainly on food security, uses, constraints, and benefits of technical aspects of farmed fish or aquaculture (attach in **Annex 1**)
2. Key Informant interview (KII) with five lead farmers (although there was no women lead farmers in Aquaculture groups) to know about the prospects of different technology and technical aspects of fish farming (attach in annex 2)
3. Focus Group Discussion (FGD) with two farmer groups (mixed men and women groups) in two villages (attach in annex 2)
3. 'Inquiries'¹ and Participatory observation with women farmers

¹Inquiries are a way of interviewing people, in which they themselves can decide which subjects they will talk about. The researcher at best has a checklist with subjects, but no structured questionnaire. The researcher will make the person feel free to talk, and encourage her or him to express positive and negative experiences, as well as interests, wishes, needs, skills, good ideas, etc.

4. for secondary data, review of other relevant data, such as existing local, regional, or national data, or data from similar programs

Literature Review

In order to advance women empowerment, the information about the lives and livelihoods of men and women in the rural areas is important. Women in South Asia generally are not favored for land ownership and land is passed down through the males (Ghosh & Ghosh 2014). Women try to obtain lines of credit in order to gain access to land are discriminated against for not being productive, which is often a cause of not having the land and other input they require in order to build up a credit history.

Although both men and women are marginalized in the rural areas, women are marginalized more. Women are expected to cook and clean and care for the home in addition to helping with the family business, often agriculture. This is referred to as the double burden of women and it affects women in most developing countries (Luke & Kaivan, 2011). Their income is not their own, but shared with their husband and their work is not paid, but rather seen as family or exchange labor.

Earning income also falls under the gender division of labor. Unrecognized labor usually falls to the women while the works with more easily tangible benefits go to the men (Ghosh & Ghosh 2014). It is important to break down who does what in order to note any glaring discrepancies. Any such discrepancies can then be compared to the policies that have been put in place to ensure that women receive the maximum benefits from any projects. There is the risk that men will take over the traditional gender roles once the NGO is physically not present at the site any longer.

Technology is often regarded as a silver bullet in development projects as something that will magically improve lives and make everything better. However, the assumption that technology is capable of transforming lives is not necessarily the case as there will always be some who have access to the technology and some who do not. This pre-study is hoping to make a categorization of women and technology. Beyond this gender division, there may be a class, income, or age classification that further defines access. One of the components of the social construction of technology (SCOT) is that social groups are the embodiments of particular interpretations (Klein & Kleinman, 2002). Groups have different ideas of a working technology and the development of the technology continues until the group decides it works for them.

By addressing the challenges faced by women in production and entrepreneurship activities and streamlining the service delivery mechanism, SaFaL has enhanced their access to critical services and resources. From technology adoption to entrepreneurship development, from capacity building to innovation, SaFaL's initiatives have created an environment where women freely take part in whole range of agriculture and livelihood activities, exercise greater control over income resources and play a proactive role in decision making at various level. Women farmers are actively involved in farm production activities like feeding, harvesting, grading-sorting, and the technology adaptation rate of women (89%) is slightly higher than that of men (85%)(SaFaL Newsletter, 20 August 2016).

Finally, the link between women and climate change must be addressed. Although the use of agricultural technologies in times of heavy rain or high heat is not as drastic, this information shows that there is indeed a gendered aspect to climate change and so there must be gendered policies put in place.

Findings and Discussion

Identified technologies and techniques of the fish farming the women farmers widely use in study area:

The information about the type and use of fisheries technology came from the questionnaire survey with 35 couples in the two villages.

The goal with the introduction of technology to the aquaculture producers groups is also to increase production, mainly through the reduction of the baby shrimp mortality rate. There are several methods that SaFaL has introduced. One is the construction of separate nursing ponds for the baby shrimp so that they can mature on their own. Before, they were in the same ponds as grown shrimp and had to compete for food and space. SaFaL has introduced a Probiotic² powder that can be sprinkled into the water. Several women farmers we spoke to said that they considered this the most important intervention.

Being a part of effort to keep farming as much environment friendly as possible, SaFaL introduced several alternative solutions to keep bacterial and fungal attack out of the fish gher³. *Saponin* tea seed oil is a natural disinfectant native to Vietnam and Malaysia. The tea seed oil is imported and used to reduce fungus and other diseases in the fish gher. It can also be mixed with roti-naan powder to make the cake that kill the eggs of unwanted predatory fish before they grow into full sized. To improve the quality of the water without harming the shrimp inside, limestone powder can be sprinkled in the ponds. This increases the pH of the water if it is too low.

Similarly, salinity that is too high is also a problem for not only for cultivating freshwater fishes and also for other domestic use. A simple solution here is to collect water from the deep tube-wells like pump machine and add the fresh water into the gher. This problem does not occur during the dry season only, the farmers, are saying that the rainfall even in the monsoon is not enough. It makes the use of water pumps more and more and it is getting quite expensive. Of course, this problem is even greater when it is hot and dry and it is difficult to think of other solutions when fresh water for cooking and drinking is also a pressing issue. This is also more difficult for poor and women farmers to manage fresh water for the gher and also for domestic use. Salinity has an equally simple solution. When women farmer has determined that the salinity is too high, crush tamarind leaves and mix with some water to make a paste that naturally decreases saline levels.

SaFaL has also introduced some technological tools to help monitor the saline and pH levels of the water of the gher. The Saline reflectometers⁴ are like small telescopes for water. These machines are about 18,000 BDT, so there are one kept at the project, one is with the lead farmers, and otherwise the farmers can call technicians when they feel that their water quality is low. In addition, each farmer has their own litmus paper to check for pH levels. This paper works by turning different colors based on acidity or alkalinity when it comes into contact with the pond/ gher water.

The traditional form of shrimp farming is in the naturally occurring in the gher, which have been sectioned off with strips of man-made land to make the sizes more manageable. Because these natural

²Probiotics contain a rich blend of enzymes, botanicals and other nutrient that provide optimal nourishment for the useful bacteria which is important for a safe and healthy environment for the fishes in the ponds. <http://www.hardynutritionals.com/products/26-greens-&-probiotics-powder>

³Fish gher is a quite different from a traditional pond. It is created only for fish farming in an open land, separated from the homestead, so that get enough air, sunlight and rain water, also easy to sprinkle fertilizers and pesticide freely in it. Fish gher is a lesser depth of height (6-7 meter) than a pond either.

⁴In a Saline reflectometers, a small amount of pond water is poured into a canister in the top of the reflectometer and then when one looks through the eyepiece, there are different colors reflected in the lens through the water depending on the salinity level. This is also to make sure that the readings are kept consistent,

gher are not available near every village, some have dug ditch that can ditch filled with water and shrimp eggs. SaFaL has introduced canal and pump systems to the ditch in case there is too much or too little water, but they are generally naturally filled by rainwater when the rainy season starts at the end of June.

Another structural addition of SaFaL has been to build the walls of the ditch higher so that water does not overflow into the adjacent canal, because it makes a mixing water, nutrients, and pH and saline levels, all of which could disrupt the proper growth of the shrimp.

Cage for cage culture is constructed from local materials (bamboo, plastic netting, and plastic bottles), floats in small freshwater ponds or gher. Cages have a top cover to prevent fish jumping and escaping from being caught by the birds. Because the cage floats, it can be installed in any depth of water and can be accessed even in times of flood. With a capacity of one cubic meter, the cage can hold up to 300 fish at a time. Fish farmers use cages like this for two growing seasons each year, giving their families a constant supply of fish to eat and sell. The farmers fed on nothing more than scraps and waste – duckweed, oil cake, kitchen waste, rice bran and snails – and in just a few months the fish grow to full size. Cage culture fish farming is one of the best options for women's groups and farmers without land of their own to grow fish using open water or rivers, canals or ponds.

Aton, a locally made fish trap, like a cage of the cage culture, this fish trap is made of bamboo and nets. It is waded into half of the water of a gher when fishes are matured to catch. It is also a handy and durable tool to use in all the season. There were many women farmers were found making *Aton* and selling those in the market as well as from home; they earn money by selling *Aton* and maintain their families depending on this income. Fish farmers and owner of the gher likely to use *Aton* as a cheap and durable fish trap in their *gher* for a long time, thus it was seen widely used and sold in the local markets. The making of this trap for the shrimp and other fish is done solely by women farmers and the shrimp farming in the area renders a constant demand for the traps and thus a steady income.

Women farmers of the groups seemed familiar and skilled in using all the above-mentioned technical apparatus of fish farming. Many of them told they took part in the gher preparation with hired laborer and use the machine for measuring water quality as well as sprinkle food and medicine in the *gher* as needed. All this related work they have to do having finished their household work including child and elderly care. Men as well as women farmers find using of technology and operationalize of modern method of farming increased productivity (quality and quantity). Some of the women farmers reported that the technology and techniques they follow to fish farming are easy to operate as well as have no further harm to the environment. Women farmers get plantation and grow vegetables on the side of their fish gher for family consumptions and further income. One also added they do it on top of the net of the ponds in pond based fish culture too. In addition, the farmers find this increasing of fish production fattening their income as well as the food security of their households. They also reported not starving for any meals in a day like before in this region.

Women farmers in fish farming Group: being dominated even in use of technology by the lead farmers

In a village of Satkhira district, the researchers had a Focus Group Discussion (FGD) with a Bagda (black tiger shrimp) shrimp producer groups, to find out the problems related to adoption of modern aquaculture technologies and the possible solution of those major problems for them women farmers. Fifteen members including project staff, local leaders, and the lead farmer of the group attended the discussion meeting. The group consisted of 63 farmers, of which only 17 were women farmers. All critical positions of the Executive Committee of this group were holding by men farmers such as President, Secretary, and Cashier. The main products of this aquaculture Producer Groups are black tiger shrimp, *Ruhi*, and *Catla* fishes (white fishes); produce in 800 *bighas* (1 *bigha* =1338 Square

Meter) land/gher for shrimp farming, which was the reason for the group is also called as Eight *hundred bigha shrimp Group*. This aquaculture PG aims to increase production, mainly through the reduction young shrimp mortality rate are infected by a viral infection. Total 400 out of 750 shrimp farmers of Debhata Upazila (sub district) received services and quality input directly from the SaFaL shrimp service centre.

In a village of Khulna district, the researchers conducted one more Focus Group Discussion (FGD) with a Galda (freshwater prawn) prawn with some of the women farmers of this group found Galda producers. They prepare their gher (1 gher minimum consist of 50 decimal) by themselves, occasionally hire labor, harvest and take part in catching fishes and also send those to Coloroa collection center. The lead farmer of this group was also a man. The lead farmers deliver the training to other farmers who already trained by the program staff in various technologies and business skills including enterprise management. The technological training focuses on pond preparation, fry selection, and releases, managing water quality through the use of probiotics, identifying and managing fish diseases to help to build attraction of buyers.

How SaFaL capacitated the farmers about fish farming is modern and very much market-oriented, women farmers are also bowed to follow all modern method to fish farming. Women farmers initially tried some traditional techniques that were not enough for optimum production. Women farmers then adopted the appropriate modern aquaculture technologies for better production, better income. To improve the quality of the water of the gher without harming the shrimp inside, women farmers used to sprinkle limestone

Case 1: Rashida Begum, a *galda* (black tiger shrimp) shrimp farmer as well as the aquaculture input shop owner of Debhata Upazila in Khulna district. She was given 50,000 BDT (US\$ 650) to start up the shop, and she now earns 5,000-7,000 BDT (US\$ 90) per month. Rashida sells hormonal and semi-chemical medicine like Rotenone powder, Tea seed cake, Lime, ACI certified fish feed, and probiotics from her input shop. She also sells hand-made fish trap 'Aton' from her home. She received training on 1) Business Management and (2) Business planning from Tala (one of the sub-district of Satkhira) training center arranged by SaFaL program. She is not only an input seller but also a service provider, give advice on good aqua practices to the farmers who come to her shop for aqua input. According to her, 'before the interventions of SaFaL, practices of fish culture were in the traditional way, thus, the rate of disease, infestation, and mortality of fishes was higher than now, production of shrimp was also "inefficient", the training, one of the main thing that SaFaL has given me is confidence.' Now Rashida Begum even feels confident enough to offer advice to new SaFaL farmers. 'People listen to me, because I can show them I did this and look at how I live now, at least my children do not have to go to bed without food.' Hundreds of farmers of this area have been benefitting from this aquaculture input shop while women entrepreneurs are not apart, leading to the strengthening of their roles in aquaculture supply chain.

Case 2: Halima Begum, one of the *Galda prawn* (fresh water shrimp) farmers in Dumuria, Khulna told, she was a poor, vulnerable farmer before involving in the shrimp group by SaFaL program. After she had received training about fish culture, management, and technology from *Uttaran* (a partner organization of SaFaL, she found her production, selling, and thus income gradually increasing. She learned a lot from the lead farmer of the group where she is also a member of it. She knows the shrimps of the *gher* usually get their food from the *algae* (simple plants that can range from the microscopic to large seaweeds, similar to bacteria), still, she finds it not enough nutrient for the shrimps and other fishes. Then she spends some money on buying some pro chemical useful bacteria and medicine for health of water fishes of the *gher*. She was concerned not only about the preparation of the gher, health, and growth of fishes but also the catching fishes and selling fishes to the market. Women members of the group and she make 'Aton' (a locally made fish trap), with the stick of bamboo at leisure time at home. Before joining in this aquaculture group of SaFaL program, Halima used to fish farming, what she finds now is farmed, systematic and profitable. She catches 15-16 Kg of prawns and white fishes from her gher and earns Tk. 20,000- 22,000(US\$ 250-300) per month that is 50% higher than before. She made a semi brick-built house and repaid her loan as well from her income.

powder on it. The farmers who farm Galda prawn also use Probiotics in their gher, sprinkle 100 grams Probiotic in one bigha land. Farmers use one more pro chemical called Uni-Biocare, to sprinkle to four corners of the gher at the time fishes leave skin and beard.

The majority of the respondents (70%) from the both groups belonged to small to medium scale farm size and fish farming and showed medium to a high commercialization of this business with a low use of agricultural credits particularly from intuitional credit program. Out of 30 women farmers in both groups, there were only two farmers who had own fish gher. Rest of the women farmers do work in their husband's or in-laws *gher* considering it is the family property. They also think this is nothing, just to assist in their husband's work to raise family income. Women farmers are recognized simply as farmer's wife too despite gaining all skills and doing lot of related work in the gher.

Only one machine is holding by the lead farmer (women were not found as lead farmers in any of the fisheries farmer groups) who helps the other farmers to measure the pH, and salinity of the gher; he is also not available all the time in the village. One of the team members of the study wondered if they could buy (Tk. 18,000 = US\$ 220) a machine by contributing all the women members to use it in a group. It seemed a clear domination of a lead farmer over the other members of the group including about the use of technology.

Women knowledge and skill in Technology: Could be in vain?

According to the project staff and the lead farmers of the two producers groups in Satkhira and Khulna district, women are attentive in their capacity building sessions and good follower in the use of modern but environment-friendly technology. One lead farmer found women active participation in fish farming cost them a lot of conflicting in household chores. Women farmers also agreed in this that working in the agriculture field is like an extension of their household responsibilities, but feel good when they earn some money from it. In some cases, men farmers or husband of women farmers take control of the use and maintenance of the related technology, especially in the decision of buying and how and who to use it. Some of the women farmers reported they are used to control by their husband regarding the use of technology in fish farming excusing to complete household responsibility first. The women farmers understand well the importance of the use of technology, how it can increase the production of fishes. Women farmers also seemed aware of probiotics, tea seed cake, rotenone powder for predator control, dolomite powder, nursery feed, Osmo saline, and multivitamin. Women farmers have increased knowledge of modern agriculture system as well as agricultural infrastructure.

Women farmers' status is stagnant or changed?

Traditionally, women are not recognized as the farmer in any agriculture sector while they are involved in all related work along with their husbands. Although very few women participated in aquaculture apart from day laborer for preparing the gher and dike of these, village people considered women involvement in the management of agro-technology a real work, and thus they take women opinions into account now in fish farming. It also reveals in the study area that, when technology involves mechanization, much of it tends to be used by men, leaving women out of labor and time-saving developments. Because recognizing women as a farmer by the project staff only is not enough to change women status and position in the agrarian society as long as there is policy enforcement. But women farmers, as well as project staff, found using of technical aspects in aquaculture rescue women farmers from drudgery work. Using of new

fisheries technologies may have an impact on economic and social structures of the lives of people particularly of poor women farmers.

Women, technology and sustainability of the intervention

As much as the technology is cheap, easy to operate, chances of the sustainability of the intervention get higher. SaFaL aquaculture service centers provide five branded quality input through Lead Farmers and drawing more attention to this new approach and made considerable progress by increasing their farm productivity to get more profit. The innovation of new technologies which is easy to operate and cheap to buy, poor farmers particularly women farmers may lead to a long-term and sustainable intervention. The lead farmers and also women farmers of this program are well capacitated and skilled in modern fish farming and equipped with all technology and technical aspects of it now. Women farmers were found keen on advocating the use of quality seed and certified probiotics and authorized drugs for other farmers. The lead farmers in aquaculture groups are expected to be sustainable beyond this program. Sustainability of this program is dependent on the good work and capacity of the lead farmers as well as women farmers and that it is.

Recommendations

- The aquaculture input shops and collection points could stand to incorporate more women, as they are not so physically labor-intensive. Support women entrepreneurs and strengthen their role in the aquaculture input supply chain
- SaFaL should focus on making women farmers in the critical positions in the producer groups along with increasing the number of women in the sector. The situation of women as the lead farmers in the groups can make the women farmers more comfortable and confident to deal with this business.
- Need to consider water is another important input for fish farming, for example, the adoption of simple technologies on efficient water use can help farmers to protect themselves from potential losses, reduce costs and enjoy higher yields, resulting in increased income. SaFaL needs to pay attention to the safe and secure water resources and its management not only for fish farming but also for domestic use.
- SaFaL could have more learning sessions on gender relations and gender equality at the level of Producers Groups (PG). It would be useful to have such progressive thinking incorporated into meeting with the PGs so that they also develop a more innovative mindset toward agricultural technologies.
- The ensuring of accountability within local institutions is important. Women participation in the local institutions, for example in Water Management Group (WVG), Fisheries group and other related private and the public committee is equally important. Provide free soil and water quality test services to the shrimp farmers particularly the poor women farmers can get rid of them from buying expensive machines for this.

Conclusion

The technologies used by women farmers in the study villages of Khulna and Satkhira district seem to be gender-neutral and even women-friendly. Women have not recognized as farmers in the regions as well as their performance not valued in any state-level initiatives of policies despite their full participation in this

sector. On the other hand, differences of use of aquaculture technologies may be due to lack of credit, inefficient and outdated techniques on which commercial success in aquaculture is not possible.

In general, women are most involved in caring, preparing, and storage of crops and fish/shrimps, and are hardly involved in the marketing and transporting work. There was a distinction in the tasks that men and women took on regarding technology, this is likely due to SaFaL focuses on simple yet efficient technologies that are sustainable and easy to maintain. This is not to say that the situation hasn't improved at all. Traditionally, it was thought that women shouldn't work in the ghers because it is intensive and would take away from smaller agricultural work and domestic duties.

Most of the introduced technologies are also climate-smart, that could be performed to make them work in times of rain and heat. The waterlogging did not have a more concrete solution and that it did not seem to be a priority; in fact, further adaption of the technologies did not seem to be on the agenda very much. For example, there were issues with various types of feed depending on if it was the dry or rainy season, but there did not seem to be any research into options.

Women farmers in the study area found skilled, vocal, and keen on getting this work with a poor participation in Executive Committee in the Producer Groups (PG) and less decision-making power even on household expenditures. Women in SaFaL intervention villages were seemed to be rather empowered, but most still reported the transfer of their income to their husbands make them feel disempowered. It is assumed their continued positions as input shop owners, as well as the exposure of them using new technologies, may be slow, but eventual, long-term acceptance. The shrimp farming in the aquaculture PGs admittedly have far less women involved than the dairy groups, but that is due to the nature of the work and it can be seen that gender equality is improving.

Men farmers (all lead farmers are men) take the critical decision on purchasing and operations of the technology. Although SaFaL aims to have about 30% input shops run by women, only one woman input shop owner was out of the 12 input shops in Khulna and Satkhira district. The flow of women participation in aquaculture labor, input shop owner and volunteers of related service centers must give women the confidence to be an agent of change in the aquaculture sector.

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Questionnaire Survey for men and women farmers

Personal Information				
Name				
Age				
Education level				
Address				
No. of children and their ages:				
Assets of household	Please circle one or more as appropriate: 1. Own house 2. Own land/gher 3. Cattle 4. Poultry 5. Vehicle (please specify what) 6. Equipment for IG (tailoring machine, farm machinery) 7. Household goods (Tv, fridge, radio, mobile phone) 8. Other (specify)			
1. What do you eat every day? (put tick on)				
A. Rice/ roti	B. vegetables,	C. meat	D. Fish	E. Other (milk, eggs, etc.)
2. How many meals do you eat per day? (circle appropriate number) 1; 2; 3				
3. Are there some months a year that you less meals or more meals? If so, when (how many months?)				
1. Yes 2. No When..... Duration (no. of months).....				
4. What crops do you produce?	1. Cash crops (please name) 2. subsistence crops (please name)			
5. What specific task do you have in food production?	(Circle one or more) 1. Land preparation; 2. Planting 3. Weeding; 4. Harvesting; 5. Post-harvest processing			
6. How much time do you spend on above activities?				
7. What is the size of the plot of land/ gher that you farm?	1. Paddy field----- 2. Gher/ Pond 3. Vegetable.....			
8. Is the land/gher your own? In whose name is the ownership paper?	1. Yes; 2. No 1. Your name; 2. Wife's and your name; 3. Husband's name 4. Other (please specify)			
9. What problems do you face in agricultural/aquaculture production?	Please circle one or more options: 1. Salinity; 2. Water logging; 3. Erosion; 4. Other (please specify)			
10. What Access to information and services for farming do you have?	1.technology	2.seeds	3.credit	4. extension (specify if this is for dairy, poultry, fisheries)
11. what's the problems dealing with technology and technical apparatus				

for Fish farming				
12. Do you have a Farmer Card?	1. Yes;	2. No;	3. don't know	
13. Are you member of a Farmer Group?	1. Yes;	2. No;	3. don't know	
14. Production capacity of HH (if not able to answer in kilos,	1. Ricekg, 2. Fishkg, 3. Vegetableskg 4. Other.....			
15. Is there a time you face food shortage? When and how long?	1. Yes (when and how long?) 2. No			
16. How do you cope with food shortage or deficit?	1. Loan (from a. money-lenders, b. bank, c. shops, d. micro-credit, e. neighbors, f. other?). Under what conditions – Interest rate- Repayment time-		2. Other (sale of land, assets etc.)	
17. How much do you earn per day? Do the women in the same work earn more? How much?	1. Daily wage (for man respondent) 2. Daily wage for women (for similar work)			
18. Do you decide on what your family eats? Do you buy the food?				
19. Do you use any new varieties of seeds and technology in farming?	Circle the appropriate (more than one is possible) 1. Saline resistant crop/ fish varieties 2. High yielding seeds/fingerlings 3. Mechanized equipment (specify) 4. New farming technique			
20. Do you help your wife to get fresh water for land and gher? How far is this from your home? (How do you fetch it and how much time is spent?)	1. Yes (please explain how you get it – by a. walking, b. bicycle, c. van etc.; and a. how far.....hour b. how long it takes.....km 2.No			
21. Are you satisfied with the water quality?	1. Yes 2. No (please explain)			
22. Do you individually decide on spending your benefits and income?	1. Yes (please give example) 2.No			
23. Do you take loans?	1. Yes (how much? from what source? Interest rate? Who borrows? Who repays?) Amount: Source: Interest rate: Borrows: Repays: 2.No			

Discussion points for the women farmer groups in SaFaL Project areas

1. How women farmers can define their benefits (not only income, but also their status, position, respect and recognition) of using those technologies?
2. What percentage of their work time is devoted to farming? How much time and cost are associated with buying and using tools and technologies for farming?
3. Are men receptive to the possibility of women increasing their economic power and independence by using technical aspects of farming?
4. If women have access and ownership of other productive resources than technology (e.g. land, water, credit) and services (e.g. Agricultural extension, technical information), even ownership of income generated?
5. What stands as obstacles in your access to technical resources? What cultural and practical barriers women farmer face for making use of existing infrastructure and technology and the creation of gender sensitive new infrastructures and technology to be used.
6. Have new technologies or economic and social structures recently been introduced which have changed or are changing women's traditional roles

Key informant interview (KII) with fisheries Officers, project staff

1. What tools, equipment and techniques the women farmers do need and require for better farming
2. What are the technologies and technical aspects of farming women farmers use now?
3. Do women farmers feel comfortable with using the technologies and technical measures of farming
4. Have new technologies/ recently been introduced changed or changing women traditional roles in agro – farming (are these changes positive or negative)
5. What are the potentials and constraints of existing tools and technologies even the varieties of seed they use now?
6. What are the benefits and losses of by using tools and technologies, improved seeds, fertilizers etc.?(from production perspective)
7. What is the recommendation for women farmers to improve their work and recognition?