

# Aquaculture without borders: Most significant change stories from the Agriculture and Nutrition Extension Project in Bangladesh and Nepal



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**ANEP**  
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# AQUACULTURE WITHOUT BORDERS: MOST SIGNIFICANT CHANGE STORIES FROM THE AGRICULTURE AND NUTRITION EXTENSION PROJECT IN BANGLADESH AND NEPAL

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The most significant change stories in this booklet cover many topics – technology, gender, markets, research partnerships and scaling – illustrating the broad range of outcomes from Agriculture and Nutrition Extension Project (ANEP). We focus here on most significant change stories relating to aquaculture. A prominent theme was the power of international visits where participants learned from each other. We chose the title ‘Aquaculture without borders’ to highlight both the broad range of outcomes of the project, and the power of exchange visits.

Most significant change stories (MSCs) have become a widely accepted way of monitoring and evaluating complex interventions. The technique involves the generation of stories by a number of stakeholders involved in the intervention who recount in their own words what they see as significant changes brought about by the intervention. It is participatory, as project stakeholders are involved both in deciding the changes to be recorded and in analyzing the data. It is a form of monitoring because it occurs throughout the program cycle and provides information to help people manage the program. It contributes to evaluation because it provides data on impact and outcomes that can be used to help assess the performance of the program as a whole (Dart and Davies 2003).

After the initial story generation process, the stories that have the greatest significance are selected by stakeholders and are discussed in-depth. These discussions bring into focus the outcomes and impacts of the intervention that have had the most meaningful effects on the lives of the beneficiaries and other stakeholders. For the ANEP, the stories were collected principally by extension staff and later examined by an independent consultant. The extension staff selected the stories they thought were most significant and gave reasons for why they chose particular stories.

## A brief description of the Agriculture and Nutrition Extension Project (ANEP)

The EU-supported Agriculture and Nutrition Extension Project (ANEP) began in Bangladesh and Nepal in December 2011 and ended in November 2014. The objectives of the project were to: (1) improve the food security and nutrition of smallholders by facilitating the adoption of productive and environmentally sustainable agricultural technologies that improve beneficiaries’ livelihoods; and (2) create and develop market links to improve food and nutritional security of both rural producers and urban consumers in Bangladesh and Nepal. International Development Enterprises (IDE) led the overall management and vegetable subsector activities; the International Maize and Wheat Improvement Center (CIMMYT), the International Rice Research Institute (IRRI), and WorldFish took the lead on transfer of technologies and activities related to cereal and legume crops and fish. Save the Children Nepal and Save the Children Bangladesh were responsible for: the selection and social mobilization of households; and providing health and nutrition training to food-insecure rural and urban households and national partners, including the Community Development Center (CODEC), the Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED), and the Backwardness Eradication Society (BES); and implementing the project in the activity areas in collaboration with international partners.

WorldFish Bangladesh provided technical support to its implementing partners, the Community Development Centre in Bangladesh, and the Center for Environmental and Agricultural Policy Research Extension and Development Department in Nepal for the dissemination of aquaculture technologies to smallholder fish-farming households. The ANEP aquaculture component worked in the Barisal Sadar, Hizla and Mehendiganj upazilas (sub-districts) of Barisal district in Bangladesh (Figure 1) and Nawalparasi and Rupandehi districts in Nepal (Figure 2). The project disseminated integrated aquaculture–agriculture-based technologies for carp polyculture with-and-without nutrient-dense, small, indigenous fish species in ponds. A total of 1909 resource-poor households in Bangladesh and 603 households in Nepal were the direct target beneficiaries of the project.

This component of the ANEP was designed to increase the productive capacities of unused or underused seasonal ponds using affordable technologies to resource-poor households. In Bangladesh, fish farmers were identified within one year of the project start-up. It proved to be more difficult to implement the project in Nepal, where there were only 86 ponds at the beginning of the project ; the aquaculture component also worked on asset development by motivating farmers to construct ponds in Nepal. Farmers were given a small amount of money as a grant for pond construction. By July 2013, the project beneficiaries had successfully constructed more than 517 ponds.

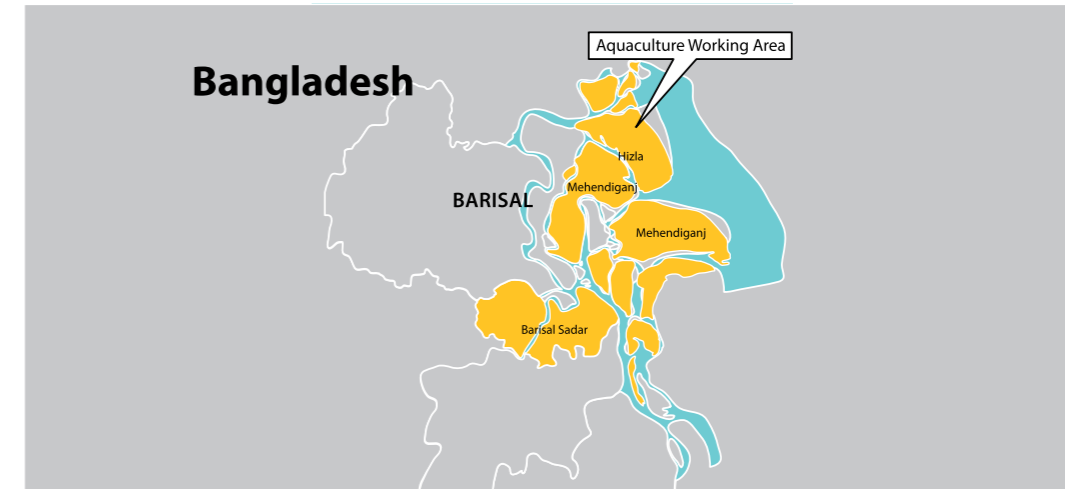


Figure 1. Barisal Sadar, Hizla and Mehendiganj sub-districts, Barisal district in Bangladesh.

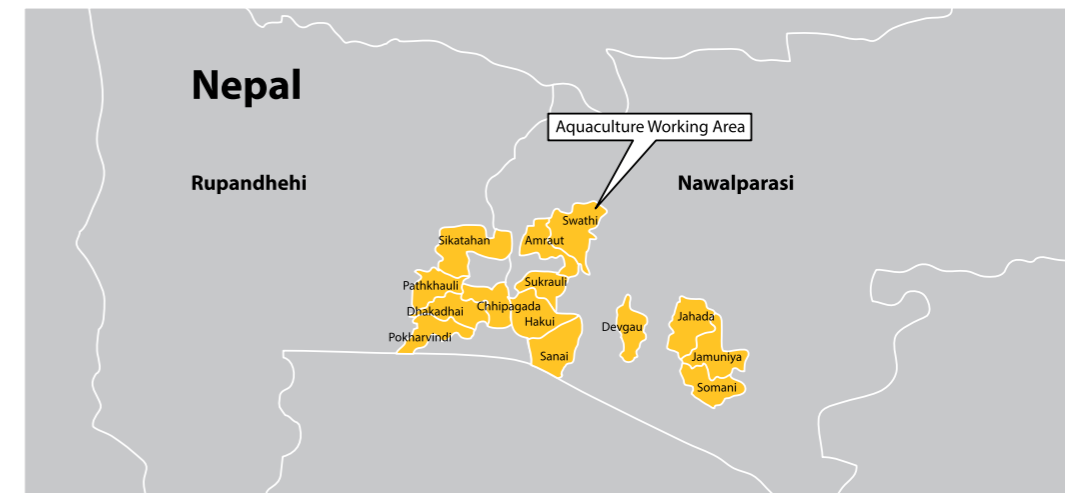


Figure 2. Nawalparasi and Rupandehi districts, Nepal.

## Conceptual background

The ANEP aquaculture component adopted a theory of change approach to monitoring and evaluation, impact assessment and communications. The theory of change process hinges on defining all the necessary and sufficient conditions required to bring about a given long-term outcome or impact. A theory of change uses backward mapping, requiring planners to think back from the long-term goal to the intermediate and then early-term changes that would be required to cause the desired long-term change. This creates a set of connected outcomes known as a pathway of change. A theory of change describes the tactics and strategies, including working through partnerships and networks and thoughts necessary to achieve these desired outcomes among target actors and systems. This process provides a road map illustrating where the project is going and how it assumes it will get there. Monitoring and evaluation tests and refines the road map, while communication contributes to reaching the goals and objectives.

The long-term goal of the ANEP was to improve the food security and nutrition of the poorest and most vulnerable households in Bangladesh and Nepal. WorldFish has focused on achieving three preconditions to bring this goal within reach: (1) increasing productivity and income through improved agricultural technologies; (2) improving gender equity at the household and community level; and (3) improving market access for the resource-poor. As part of the theory of change, these are examined in detail all the way back to the initial conditions to identify the pathway of change for achieving each precondition (Figure 3).

### Increase in productivity and income through adopting improved agricultural technologies

The ANEP organized and mobilized farmers through a group approach to facilitate dissemination of knowledge about aquaculture technologies. Farmers were given technical support for two consecutive years. The project trained more than 100 farmers in Bangladesh and 50 farmers in Nepal

as lead farmers to run the training sessions. Groups were linked with private-sector actors, researchers and extension agency staff to get updated information on the availability of inputs, technologies and aquaculture practices. A number of exchange visits were organized both in and outside the country to expose participants to the benefits of commercial aquaculture practices. The expectation is that farmers will be able to obtain maximum benefits from the technologies through skill development and through linking them with up-to-date information.

### Gender equity at the household and community level

The project also applied gender-sensitive approaches such as a family approach to increase women's participation in project activities. It improved the capacity of the women in technical and nutritional issues, with the expectation that skill and knowledge development would increase women's ability to become important contributors to the local economy and, at the same time, give them a greater role in household decision-making.

### Improved market access for the resource-poor

The project is noteworthy for adopting a participatory market chain approach (PMCA) to disseminating technologies and to improving market access for the resource-poor. The PMC approach aims to foster market access by generating collaboration among the different market chain actors. It is an instrument for facilitating change in market chains that currently lack coordination, creating an environment that fosters interaction among market chain actors, promotes mutual learning and trust, and stimulates shared innovations. The project also aims to increase the capacity of market actors through skill development training, exchange visits and links with researchers and scientists at home and abroad. It is expected that skilled market actors will increase their competitiveness not only in the market chain, but also within communities and among producers, who are increasingly empowered as they benefit from improved access.

### Intermediate outcomes

Farmers have improved understanding of productive and environmentally sustainable agricultural technologies	Gender-sensitive approaches for greater gender equity at the household and community levels established	Local aquaculture service providers and rural producers are better linked and market access to the poor producers improved
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### Strategic changes

Farmers have enhanced technical skills, which they share with other farmers and communities.	Greater gender equity in household decision-making including food decisions	Markets are poor-friendly in terms of participation in buying, selling and negotiating prices
Farmers, scientists and project staff are working together to identify and research aquaculture problems and technological innovations	More control and ownership of monetary and other productive resources by women	Availability of the quality inputs in the local area improved
Participatory capacity building and knowledge-sharing approaches established	Women are respected as important economic actors in the local economy	Farmers and market actors are aware of and linked to key sources of information and science
Small-scale rural producers have organized through producer groups	Women have improved understanding of the technology and are better aware of nutrition	Capacity of the market actors developed on handling technical and business related problems
Capacity of the project staff developed on technical issues and participatory approaches	Gender-sensitive extension approaches adopted to increase effective participation of the women in the program	Market actors and poor farmers have organized group approaches for effective collaboration
		Capacity of the project staff developed in participatory market chain approaches

Figure 3. Theory of change framework of ANEP aquaculture component.

## Monitoring and evaluation tools

WorldFish designed a program for monitoring and evaluation of ANEP activities in both Bangladesh and Nepal. This comprised a quantitative approach, as well as a before-and-after and with-and-without experimental design to assess the impact of aquaculture interventions. Households were sampled from both project and non-project villages to facilitate comparison of differences in fish production and income as a result of the interventions. These surveys were conducted at the end of the production cycles in 2012, 2013 and 2014.

As a supplement to the ongoing indicator-based monitoring, WorldFish adopted other monitoring approaches to provide new information and enrich the quality of the monitoring process. This included the use of SenseMaker® as a tool for assessing qualitative changes in value chains resulting from the initiation of participatory market chain approaches as they are experienced by different value chain actors. SenseMaker® is a powerful, natural and intuitive way to gain access to multiple perspectives on and new insights into complex systems. By using a large number of elements from a diverse range of actors, it allows the identification of patterns around predefined topics of interest. To learn more about SenseMaker® visit <https://www.youtube.com/watch?v=SkRe7Xg7pk4>.

Finally, WorldFish trained the extension staff of the Community Development Centre (CODEC) in Bangladesh and the Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED) in Nepal in the MSC technique, including story collection, selection and editing, as well as production of case studies. MSC was used to reveal how the aquaculture interventions were perceived through the eyes of beneficiaries and important actors linked to the ANEP. The most significant change technique as a form of participatory monitoring and evaluation was introduced into ANEP as a feedback mechanism to focus innovation in explicitly valued directions and away from less-valued ones. The process starts with the collection of significant change stories from the field. Some of the stories were then selected by panels of designated stakeholders or staff for their indication of project impact. Once changes had been captured, various people involved in the project who were familiar with the intervention sat down together, read the stories aloud and had in-depth discussions about the value of these reported changes.

## Collecting the most significant change stories

MSC is a story-based technique that can also make a contribution to summative evaluation through both its process and outputs (Dart and Davies 2003). The following steps were followed to collect most significant change stories from ANEP:

### Introduction of the most significant change technique to the partners

The MSC technique was introduced to the CODEC in Bangladesh and CEAPRED in Nepal, as well as the project participants in both countries, to generate interest and commitment to participate. The extension staff of WorldFish and partner organizations were trained to improve their capabilities in capturing and analyzing the impact of their work.

### Domains of change

Dividing MSC stories into domains can make the story selection process easier to manage. During stakeholder meetings, the areas of possible change were categorized into three domains depending on the ANEP intervention. These three domains are basically the areas identified in the theory of change as the intermediate outcomes. However, during the story selection process, the participants decided to include two more domains: (1) changes in partnership and institutional learning as a result of participatory action research; and (2) scaling-up issues; i.e. the community level changes due to large-scale adoption of the improved aquaculture technologies. The five domains considered were:

- technological advancement and change in productivity, income and food security;
- women's participation and changes in status and recognition in the fish-farming community;
- participatory market chain approach and changes in market access for the poor;
- participatory action research and developing partnerships;
- scaling-up technology and large-scale awareness.

### Defining the reporting period

The reporting period for story collection was based on the aquaculture production cycle in Bangladesh and Nepal. The stories included here mainly report changes during the 2013–2014 aquaculture production cycle from May 2013 to April 2014. Henceforth we refer to this year as 2013 for simplicity.

### Collection of the significant change stories

Several methods were used to collect stories from the field: (1) interviews with farmers and market actors by the extension staff; (2) group discussions; and (3) writing by the farmers or market actors. Stories were collected by framing the same two questions to all participants; these questions were:

- According to you, what has been the most significant change (positive or negative) in relation to the ANEP intervention?
- Please explain why you consider this to be the most significant change.

### Selecting the most significant of the stories

A five-member selection committee was formed to select the most significant change stories in the project's aquaculture component. The selection committee members were representatives of partners who had line management responsibilities (direct or indirect) in relation to the people who forwarded the significant change stories. Selection of each story started at the sub-district (and upazila) level in Bangladesh and village development committee in Nepal. The selection committee members, the participants who wrote the stories, and other important stakeholders participated in a workshop. The stories were presented by the extension staff. After each presentation, discussions were held in which everyone had the opportunity to discuss the stories, but the final selection was done by the selection committee. Similar procedures were followed to select the stories at the district level. A total of 15 MSC stories were selected in Bangladesh and 17 MSC stories were selected in Nepal.

### Feeding back the results of the selection process

Feedback is important in all monitoring, evaluation and learning-oriented systems, and the MSC technique is no exception. The results of the selection were thoroughly discussed with those who provided the stories. This was done verbally. Staff explained to the participants which stories had been selected as most significant and why. Discussions were also held among the monitoring and evaluation staff as to which interventions were working and what needed to be included in future action plans or detailed implementation plans.

### Verification of stories

Verification is useful in identifying changes accurately. There is always a risk, especially in a large, complex project that the

reported changes may not reflect what has actually happened. A verification process gives external parties more confidence in the significance of the findings. In the ANEP, this evaluation was done primarily by senior WorldFish project staff and later by an independent consultant who had wide experience with development outcomes.

### Reviewing and evaluating the system

Another step in the MSC technique is quantifying the emerging change from the overall perspective of the project. These discussions were held in Nepal with Bangladesh project staff. Stories were analyzed using a hierarchy of expected outcomes in an attempt to identify what kind of interventions were really making impacts that will achieve the desired outcomes.

## MOST SIGNIFICANT CHANGE STORIES IN BANGLADESH AND NEPAL

The stories collected in this report come mostly from the extension staff of ANEP's aquaculture component. Some of the stories were written by the scientists who were involved in the project's participatory action research. The researchers reported changes in their knowledge, attitudes and actions as a result of their association with WorldFish in the project. This is exceptional, as often while projects are attempting to document the changes in a community, the changes within the institution go unnoticed. An analysis of the selected stories from the first round indicates that the domains of change are at the individual, communal and institutional levels. The changes reported are in terms of knowledge, awareness and insights gained, growth in self-confidence, and changes in attitudes toward a particular issue.

In Bangladesh and Nepal, fish production faces many challenges, including weak market links between and among the resource-poor with market actors, poor rural communications, weak extension services, and large institutional gaps between research, extension and farmers. The stories reveal that public extension services, research institutes, private-sector actors and a large number of nonprofit organizations and farmers would benefit from better access to information from both in and outside of the country. Bangladesh is in a better situation than Nepal in terms of technological development and aquaculture advancement. ANEP organized a number of exchange visits to Bangladesh for Nepalese extension staff, scientists, market actors and farmers. Technical experts from WorldFish in Bangladesh also visited Nepal to provide hands-on training to the Nepali staff, market actors and farmers. Many of the Nepali farmers and staff recognized the importance these visits for technology transfer and productivity improvement. It became apparent that future research-to-farmer links and communication should be more cohesive. By improving links, technology adoption can be faster and more efficient.

It was also encouraging to see that intervention actions had impacts both at the individual and at the community level. Individual actions were reported in terms of demonstrations

and on-farm technical advice, exchange visits and collective actions in terms of changing the prevalent fish management practices, awareness about small indigenous fish species, and market issues. The stories also bring out other factors that influence these changes, such as the impacts of one-to-one communication; information exchange among farmers, researchers and private-sector actors; flexible timing for women to participate in peer-education training; and continuous monitoring to provide ANEP with the information needed to make adjustments in the ongoing process toward achieving long-term outcomes.

## Most significant change stories by domain

### Domain: Technological advancement and change in productivity, income and food security

Bangladesh	Nepal
Eating fish daily	A boon to farmers
Generating income, satisfying family needs	Confident in my ability
So much more is possible	A big house is not always a measure of success
Market links and improved technology made me successful	Now my business is profitable, less risky, and easy to manage
	Aquaculture is good for me
	Working at home is better than working abroad

### Domain: Women's participation and changes in status and recognition in the fish-farming community

Bangladesh	Nepal
I turned my life around	I gained confidence from seeing what others were doing
No one believed a woman can earn money from aquaculture	We are a happier and healthier family
I am a respected leader	I believe in my strengths
Earning a little respect	

### Domain: Participatory market chain approach and change in market access for the poor

Bangladesh	Nepal
Gaining some independence	My life before and after is as different as day and night
My business has grown rapidly	Using new technology has boosted my customer base
Networking increased my client base	Now I have an identity
I would never be where I am today	I dream of expanding my business
	Opening a new window

### Domain: Technology upscaling and mass scale awareness

Bangladesh	Nepal
Good news travels fast	We will be a major fish-producing village

### Domain: Technology and research partnership

Bangladesh	Nepal
Gaining respect through knowledge sharing	The knowledge I gained from my research made me more confident
Partnerships need collegial relations	I will do more collaborative research



## Rahima Begum

**Age:** 27

**Education:** 4th class

**Lives in:** Kulchor village, Guabaria union, Hizla *upazila*, Barisal district

**Household members:** Husband, two sons

**Pond size:** 0.06 ha

**Main household income sources:** Aquaculture, crop farming and daily labor

**Annual household income in 2013:** USD 770

**Contribution of aquaculture to income:** 35%

Photo Credit: Shahidul Islam/Freelance Consultant

## Eating fish daily

**Eating fish as part of my daily diet is the most significant change that has happened to me because of the ANEP intervention.**

### Before the project

Both my husband and I were born in this village. My family depended on day labor but work was not always available which sometimes left my family hungry. We owned a small piece of land that was sufficient as a homestead area. There was a small ditch of 0.06 ha attached to our homestead, from which we collected a small amount of fish that washed in during the flood season and were left behind after the water receded. We used the dikes to cultivate seasonal vegetables. Like other families in Bangladesh, our family likes to eat fish but it was not a regular part of our diet before 2013.

### Main constraints: Why the change did not happen before

I lacked awareness about improved fish culture. I never imagined that fish production from my small pond could be increased so much.

### After the project

I was approached by CODEC, a nongovernmental partner of WorldFish in the ANEP and asked to join the fish-farmer group in our village. I joined the group in 2013 and participated in a number of training sessions to learn methods to improve pond productivity. Putting the technical training on fish culture into practice, I stocked rohu, catla, silver carp, grass carp, common carp, tilapia and a small fish called mola in my pond. I cultivated orange sweet potato, pumpkin and bitter gourd on the pond dikes.

I attended the ANEP's nutrition awareness training program, where I learned about the nutritional value of fish, especially small species such as mola, dhela and darkina.

### Outcomes

- My success was an eye-opener for many local householders who also have small ponds. Many of them ask for my advice on aquaculture and visit my pond to receive demonstrations.
- My husband and the members of my community now

respect me for the contribution I am making to my family income and the free consultations I give to my neighbors.

- Our household income from the pond more than doubled in the first year in which I used the new methods. In 2013, I produced 195 kg of fish, worth USD 380, which made up 35% of my family income for that year. I also grew vegetables worth an additional USD 140. All the income increases came from an investment of USD 113.
- The orange sweet potato we grow is used for family consumption. We eat the leaves of orange sweet potato as a vegetable at least twice a week for two and half months of the year.
- With my increased income, my family built a new cowshed.

### Most significant change

Our family consumption of fish more than tripled following the project activities. I am especially thankful to the project for informing me about improved fish culture techniques, since it helped my family cope with lean periods and emergencies when we can harvest fish, particularly mola, to sell when necessary.

MSC story domain: Technological advancement and change in productivity, income and food security





## Sultan Hossain

**Age:** 33

**Education:** 6th class

**Lives in:** Purbokandi (*Poshchimpar*) village, Char Ekkoria union, Mehendiganj upazila, Barisal district

**Household members:** Wife, two daughters

**Pond size:** 0.07 ha

**Main household income sources:** Tailoring, aquaculture, agriculture

**Annual household income in 2013:** USD 1970

**Contribution of aquaculture to income:** 36%

Photo: Credit: Harat Ali/WorlDFish Bangladesh

## Generating income, satisfying family needs

**Thanks to the ANEP, my family can eat fish every day. My success has encouraged other farmers within and outside the project group to begin fish culture.**

### Before the project

My main occupation is tailoring. To supplement my income, I farm a 0.23 ha plot of land that I own. I also own a 0.07 ha pond, but before 2012, I had very low fish yields because I didn't know about fish culture and pond management. The fish cultivated from my pond was not even sufficient to meet my household needs. I used to connect the pond to a shallow canal to allow wild fish to swim into my field from a stream. Sometimes, I would buy some fingerlings from mobile fish seed traders to release into the pond.

During the ANEP's field survey, I came into contact with a fieldworker and he encouraged me to join a project group. The project staff gave me the training and confidence to realize that with better knowledge of fish culture techniques, I could turn my pond into a profitable enterprise. The project provided us with training in aquaculture and business skills and connected us to aquaculture support providers, including government extension agencies and research institutes. Because of these changes, I decided to practice integrated carp polyculture and to raise nutrient-dense, small fish in my pond. The ANEP fieldworkers developed a brood pond to help cultivate small, indigenous fish species in our village. In 2012, I collected 1 kg of small indigenous brood from this pond and used these to stock my pond.

### Main constraints: Why the change did not happen before

I lacked practical knowledge about fish farming, which limited my pond's productivity.

### After the project

Applying the knowledge I gained from the project training sessions, I fostered pond conditions that would help small fish to grow and thrive. I had learned from training sessions that maintaining good water quality, especially ensuring the availability of natural food in the pond, is important when rearing small fish. I used mustard oil cake, cow dung and chemical fertilizer regularly to produce natural food. I also used

commercial feed, rice bran, wheat bran and leftovers from the kitchen as supplementary feed for the carp I stocked.

### Outcomes

- Participation in the ANEP fish farmer group taught me how to stock my household pond and to improve its overall productivity.
- My involvement with the project made me feel confident about my own ability to gain financially from aquaculture initiatives. As a result, I prepared my pond for fish culture, and stocked large and good quality carp fingerlings in addition to small, indigenous species.
- My annual income from the pond grew from nothing in 2011 to USD 240 in 2012 and USD 712 in 2013. The bulk of this income came from selling carp and small fish species such as mola. The total amount of small fish I consumed at home through partial harvesting was around 40 kg. I sold almost 40 kg of mola in the market and made an additional USD 90 from selling vegetables cultivated on the dikes.
- Because of my success in producing small indigenous species alongside carp, ANEP staff and members of the farmers group visited my pond in 2013. A number of exchange visits were organized during which I explained small, indigenous species culture techniques to other farmers. All these activities contributed to my growing status among the members of my community.

### Most significant change

Before this project came along, I had to purchase fish from the market and catch them from rivers and canals to meet my household needs. Now, in addition to generating income, my pond satisfies my family's needs, and my children can eat small, nutrient-dense fish on a regular basis.

MSC story domain: Technological advancement and change in productivity, income and food security



## Mohammad Selim Reza

**Age:** 55

**Education:** 10th class

**Lives in:** Chor Aicha village, Saystabad union, Barisal Sadar *upazila*, Barisal district

**Household members:** Wife, two sons, one daughter, mother

**Pond size:** 0.08 ha

**Main household income sources:** Aquaculture, agriculture, retail shop

**Annual household income in 2013:** USD 6340

**Contribution of aquaculture to income:** 44%

Photo Credit: Nurul Ahmmed/ICR Bangladesh

## So much more is possible

**In 2013, I produced the same amount of fish that I had produced in total over the last 25 years. It would not have been possible without the ANEP's intervention.**

### Before the project

My main sources of income were agriculture, livestock and poultry farming, and profits from running a small shop. I sold fertilizer, fish feed ingredients such as mustard oil cake and wheat bran and aqua-medicine in my shop. I learned agricultural technologies and got irrigation equipment from the Department of Agricultural Extension and from a number of NGOs, which allowed me to increase productivity. These organizations also helped me establish a biogas plant to convert livestock waste to fuel and fertilizer. I own a 0.08 ha homestead pond, and was able to sell a few fish after filling my family's needs. I would also release fingerlings into a shallow canal that I dug on the edge of my rice field and this allowed me to produce fish and rice in the same field.

### Main constraints: Why the change did not happen before

My production capacity was limited by: my lack of technical knowledge and understanding of appropriate management systems; the unavailability of good quality fingerlings; and shortages of quality feed and other inputs.

### After the project

I became a participant in the ANEP in 2012 after learning about it from a project fieldworker. I was selected as a lead farmer by the fish-farming group members. I attended and helped to organize training sessions on improved management systems for fish culture; I ensured attendance by other members of the group. The project held training sessions on feed management, which I attended as an aquaculture input seller. I also took part in exchange visits to feed-producing companies to learn more about feed preparation and management. I attended demonstrations at the Bangladesh Agricultural University and Bangladesh Fisheries Research Institute and I took part in exchange visits to learn about nursery management, marketing and how to identify good quality fingerlings.

During the site visits, I learned the importance of using high-quality and locally sourced materials to produce fish feed. I applied what I learned from the training and exchange visit experiences in improving my aquaculture practices. I stocked larger fingerlings in my pond and began to maximize fish cultivation. I applied commercial fertilizers and natural fertilizers produced from my biogas plant to encourage the growth of

natural food in my pond. I used homemade feed twice a day to reduce my feed production costs. The ANEP helped me develop links with feed ingredient suppliers. The project also subsidized my purchase of a manually operated feed machine. In 2014, I began to sell good quality commercially produced pelleted feed in my shop and approached a number of feed companies for dealership agreements.

The ANEP taught me that stocking large fingerlings and using good quality feed is essential to increasing production. However, large fingerlings are not always available. Based on an exchange visit, I started my own nursery business in 2014 to meet my fingerling needs and I sold the surplus to the local community.

At the beginning of 2013, based on the ANEP training sessions and home coaching on improving fish yield, I broadened the canal around my rice field and stocked tilapia, common carp and sarputi fingerlings.

### Outcomes

- As a result of these improvements, income from my pond was USD 844 in 2013, compared to USD 260 in 2012 and USD 104 in 2011.
- My income from cultivating fish in the rice field was USD 1948 in 2013 – four times what it was in 2012.
- After meeting my family's needs, I made a profit of USD 2792 in 2013 from my homestead pond and rice field.
- Encouraged by my success with fish production, some farmers who had not participated in the ANEP began to produce fish commercially in their household ponds. These activities will increase local feed demand and will expand my feed business as well.

### Most significant change

The ANEP helped me learn about improved fish culture techniques, connected me with new market actors and increased my profit substantially. Local farmers now come to me for free consultations on fish farming and have greater respect for me. In 2013, I produced the same amount of fish that I produced over the last 25 years. It would not have been possible without the ANEP.

MSC story domain: Technological advancement and change in productivity, income and food security



## Shamol Debnath

**Age:** 43

**Education:** 5th class

**Lives in:** Dingamanik village, Chormonai union, Barisal Sadar *upazila*, Barisal district

**Household members:** Wife, two sons, one daughter, father, mother

**Pond size:** 0.09 ha

**Main household income sources:** Crop farming, aquaculture and livestock

**Annual household income in 2013:** USD 1670

**Contribution of aquaculture to income:** 33%

## Market links and improved technology made me successful

**Before the project, I lacked knowledge about fish culture and had limited links with market actors. I was unable to profit from my homestead pond. Now, I can earn money from my pond after satisfying my family's needs.**

### Before the project

Before my involvement with the ANEP, I got most of my income from cultivating paddy and betel leaves and rearing livestock. I owned a 0.09 ha homestead pond but I was unable to use it to produce fish commercially since large trees growing on the pond dike blocked the sunlight. I connected one side of the pond's dike to a rice field during the rainy season to capture wild fish that swam into the pond. I also released small, cheap fingerlings that I bought from local fish seed traders into the pond. The resulting fish yield was sufficient to meet my family's needs.

### Main constraints: Why the change did not happen before

I lacked technical knowledge of fish culture and did not have access to quality inputs and no understanding of what sizes, varieties and numbers of fingerlings would optimize fish production.

### After the project

In mid-2012, the ANEP's fieldworkers selected farmers to participate in group work related to aquaculture development and research. From the project, I learned that preparing a pond in the right way could significantly increase fish yield. As a result, I pruned branches from the trees on my pond's periphery to allow more sunlight onto the water's surface, removed pond sludge and raised one side of the dike to better retain fish during periods of high water. Because of my role in organizing group meetings and my active interest in pond aquaculture, the farmer group chose me as a lead farmer; this meant that my pond would be used to demonstrate the integrated carp polyculture system. I monitored pond conditions and added mustard oil cake, chemical fertilizer and cow dung to the water to produce natural food. I added commercially produced pelleted feed to the pond every morning and evening. I participated in an exchange visit to observe demonstrations on techniques to improve fish culture in ponds and to cultivate vegetables on pond dikes.

The project connected me and other farmers to aquaculture support providers, including government extension agencies and research institutes. My fish-farming group selected me as their representative in the fish thematic group. I represented my group in discussion sessions with input suppliers and other lead farmers. The fish thematic group meetings helped me establish

connections with many aquaculture service providers. Quality and timely delivery of the inputs were better ensured as the service providers reached a consensus about pricing, quality and timing with other stakeholders in the meeting. In the last production cycle, my group members expressed our need for large fingerlings. After deciding who would supply fish seed for our ponds, one of my group members and I inspected the nursery pond before delivery. This was probably the first time we received the 6–7" carp fingerlings we required and in a timely manner. I also collected commercial pelleted feed from one of our thematic group fish feed dealers. Some price problems occurred when we were selling our big fish but they were solved easier than before as I had the opportunity to talk with and to collect information from other fish traders beforehand.

### Outcomes

- As a result of the improvements, my family can eat fish more regularly, and my annual income from fish culture increased to USD 546 in 2013.
- My family eats vegetables that I grow on the pond dike, and I sell the surplus for a net profit of USD 156. I also produce more than 50 kg of orange sweet potatoes that my children like to eat.
- My role as lead farmer helped me build relationships with market actors, including fingerling and fish sellers and extension agency officials.
- It became easy to buy quality inputs due to the transparency in communication with market actors developed through ANEP organized meetings.

### Most significant change

Before the project intervention I never understood that technology and market information is so valuable for fish culture. I conveyed information about the demand and use of quality inputs from the input supplier group to the farmer group, and vice versa. As an information broker, I gained respect in the community and was later chosen as an executive member (cashier) in the cooperative society formed by farmers and input sellers.

MSC story domain: Technological advancement and change in productivity, income and food security



## Ale Noor Begum

**Age:** 38  
**Education:** 5th class  
**Lives in:** Sripoor village, Borojalia union, Hizla *upazila*, Barisal district  
**Household members:** Husband, five daughters, one son  
**Pond size:** 0.04 ha  
**Main household income sources:** Daily labor and aquaculture  
**Annual household income in 2013:** USD 987  
**Contribution of aquaculture to income:** 21%

## I turned my life around

**I want to say thank you to the project. With its help, Allah has turned my life around. I have gained respect from my community members, and this newfound respect even comes from my husband.**

### Before the project

Like many other housewives in rural Bangladesh, my main work involved looking after my husband and taking care of our children. My husband worked as a mason's assistant and earned a very low wage. Our family generated some income from cultivating land that my husband inherited from his father. We struggled to meet our day-to-day expenses on this limited income.

Our lives were made more difficult because my husband was not continuously employed. On days he was not working, he occupied himself with singing folk songs, and at his own cost, he organized singing sessions for other musicians at our house. I would attempt to keep him from squandering our family's income on these programs, but he would become verbally and physically abusive, and would chase me away when I tried to intervene. Our financial situation became desperate, so I began to think about ways to earn money. This was not an easy task because of social constraints based on current understandings about the appropriate role of women in Bangladesh. Nonetheless, I invested a small amount of money (which I had saved with great difficulty) to start rearing goats within our homestead. I also began to think about cultivating fish in our pond.

**Main constraints: Why the change did not happen before**  
 Gender and cultural norms in rural Bangladesh, as well as lack of technical knowledge, make it difficult for women to start commercial enterprises such as aquaculture.

### After the project

In 2012, I learned about the ANEP when a fieldworker visited my village to select farmers to participate in a working group. I expressed my interest and joined the group. My husband and I both began attending group meetings. However, my husband soon stopped participating because of his preoccupation with folk music, but I continued going to meetings with his permission. Training sessions were mostly in the afternoon, which gave me time to complete my household tasks and allowed me to attend training sessions regularly.

Based on the insight I gained from the training sessions, I began to farm fish in our pond and grow vegetables on the pond's dikes and within my courtyard. I began to grow fish using the integrated carp polyculture method. I grew sweet gourd, orange sweet potato and papaya on the pond's dikes to meet my family's vegetable needs.

I learned fish culture techniques from the ANEP. I participated in an exchange visit during which the project staff showed me how to develop fish culture into a commercial enterprise. Based on the income generated from my pond, I leased a 0.08 ha ditch from a neighbor to continue fish culture.

### Outcomes

- My husband has given me full control and responsibility of cultivating fish within our pond and has encouraged me to invest more in fish culture.
- My success has contributed to changing my husband's attitude. He recently began entrusting me with a portion of his income for household needs and savings. We are planning to spend a portion of our joint savings to mend our house.
- Due to my advisory role on fish culture, my social status in the community has increased.
- During the 2012–13 production cycle, I earned a net profit of USD 103 from fish and vegetable production on dikes. The profit increased to USD 207 in 2013–14.
- My family's consumption of fish and vegetables has increased several times compared to before the project intervention.

### Most significant change

I have become a pioneer, and my success has inspired my neighbors to engage in modern fish culture. The ANEP selected me as the lead farmer of our village fish farmers group. This increased my social status in the community. People now come to me frequently for technical help and advice and my husband fully supports my efforts. As a lead farmer, I always want to help them. I provide many consultations, even at night!

MSC Story Domain: Women's participation and changes in status and recognition in the fish-farming community



## Fatema Begum

**Age:** 38

**Education:** 6th class

**Lives in:** Kalikapur village, Guabaria union, Hizla *upazila*, Barisal district

**Household members:** Husband, two daughters

**Pond size:** 0.19 ha

**Main household income sources:** Aquaculture, bakery job, poultry farming

**Annual household income in 2013:** USD 3662

**Contribution of aquaculture to income:** 31%

Photo credit: Nurul Alam/Wordfish Bangladesh

## No one believed a woman can earn money from aquaculture

**No one believed that a woman could increase earnings so much through aquaculture and agricultural work. This was possible because of the help I received from the ANEP.**

### Before the project

We lived on the small amount of money my husband sent home from his job in a bakery factory in Dhaka. This income supported seven of our family members, including three married daughters who have since left the house. To supplement my husband's income, I tutored students from the local madrasa in my house and raised and sold livestock and poultry. I used my income to finance my children's education. I shared out my agricultural land, but it was hard to make ends meet. I also shared ownership of a family-owned pond. We sometimes released fingerlings into the pond to cultivate fish but did not do much more to improve production. We ate some fish on special occasions and would harvest and share the remainder among the owners at the end of the season.

### Main constraints: Why the change did not happen before

I lacked knowledge of pond management and aquaculture techniques. My husband did not want me to work outside the home. I felt restricted by traditional views on appropriate behavior for women.

### After the project

My husband was initially against my participation in the ANEP's farmer group, but changed his mind after conversing with field staff members and realizing that participation in the program would not affect my ability to carry out my other household activities. I joined in the program in 2012. The training sessions were generally organized at a convenient time, mostly in the afternoon. I attended training sessions on pond preparation and aquaculture and agricultural techniques. I shared what I learned during the training sessions with my husband and co-owners of the pond, and they agreed to give me responsibility for fish cultivation. After that, I stocked the pond with carp fingerlings with the financial help of all the co-owners.

The fingerlings prospered because of pond management methodologies I learned from the project. My family can now eat fish all year round and I had sufficient fish left over to sell for a small profit. My husband was very happy with these developments and encouraged me to continue with fish culture. The farmer group chose me as a lead farmer, which meant

that my pond was used to demonstrate ideal aquaculture techniques. I participated in exchange visits and shared my experiences with other members of my farmer group.

In 2013, after consulting my husband, I applied for a micro-loan from an NGO, borrowed money from relatives, and used part of my husband's income to lease a 0.43 ha farm consisting of two ponds, a poultry shed and a garden. Using the knowledge I got from the training on poultry rearing from the government agriculture office, I began to rear poultry. In addition, I stocked the pond with large carp and tilapia fingerlings, which I bought from a local nursery owner who is the member of our fish thematic group. I managed the pond and bought fish feed based on what I learned in the training sessions. I also cultivated vegetables on the pond dikes and fallow areas of the farm. In 2014, I pooled my income together with my husband's to purchase a 0.02 ha plot of agricultural land.

### Outcomes

- In the season that started in 2013, I sold my fish to a nearby market with the help of a fish trader in our group and received USD 1130 in net profit.
- My family was able to eat mola, tilapia and carp regularly all year round.
- In addition to consumption benefits throughout the year, I earned USD 195 from vegetable cultivation.
- My earnings in 2013 were twice that of my husband's, and as a result, I was able to better invest in my daughters' education.
- Because of the financial success of my farming initiatives, my husband has now entrusted me with control over our household finances.

### Most significant change

My husband now respects me more than ever, and other farmers come to me for advice on fish farming. In addition to becoming more financially secure, I have gained the trust and respect of my family and community.

MSC story domain: Women's participation and changes in status and recognition in the fish-farming community



Photo Credit: Nazat Ali/Wardfish Bangladesh

## Sokina Begum

**Age:** 40  
**Education:** 5th class  
**Lives in:** Dinar (*Poshchim*) village, Charkawa union, Barisal Sadar *upazila*, Barisal district  
**Household members:** Husband, one son, two daughters, one daughter-in-law, one grandson, two granddaughters  
**Pond size:** 0.04 ha (50% shared)  
**Main household income sources:** Night guard job, rickshaw pulling, aquaculture  
**Annual household income in 2013:** USD 1948  
**Contribution of aquaculture to income:** 4%

## I am a respected leader

**I am grateful to the ANEP for giving me the resources and confidence to contribute financially to my family while also becoming a leader and respected member of my community.**

### Before the project

My husband works as a night guard at the nongovernment clinic, and my son is a local rickshaw puller. Their earnings were the main sources of our family income. My job was to look after the house and cook. We have 50% ownership in a family pond. The fish was shared among the owners according to their proportion of ownership. Because of the joint ownership, none of the owners had a strong sense of stewardship over the pond, so it was not maintained well, and our lack of technical expertise limited the fish yield.

### Main constraints: Why the change did not happen before

My identity was centered on being a housewife; although I wanted to contribute to my household financially, I lacked the necessary confidence, knowledge and skills to do so.

### After the project

My husband gave me permission to participate in the ANEP at the end of 2012, after fieldworkers explained the project's scope to him. My husband and the pond's other co-owners agreed to contribute financially toward preparing the pond for fish cultivation and gave me full responsibility for operations. I participated in training sessions and was chosen as a lead farmer and I monitored participation by other group members. I received training in cultivating carp along with small, nutrient-rich local fish, in growing vegetables on the pond dike and homestead area, and in nutritional intake. During the nutrition training, I learned to identify varieties and species of fish and vegetables that would most benefit my family's health. To gain practical experience on fish and vegetable cultivation, I participated in an exchange visit to Jessore.

Participating farmers also nominated me to be the group's lead farmer to participate in fish thematic group meetings as our farmer group representative. I participated actively in these meetings, which included both farmers and input suppliers.

### Outcomes

- Based on the profits generated to date, in 2014 my husband and my family members supported me to convert a ditch on our land into a 0.04 ha pond to cultivate more fish.
- In 2013, we earned a total profit of USD 156 from selling the fish harvested from our jointly owned pond. Our share was USD 78.
- In addition to the income I earned, my family was able to eat fish throughout the year.
- As the group leader, I conveyed information from the farmer group to the fish thematic group and vice versa, and therefore gained a position of trust in both groups.
- The pond's co-owners were so encouraged by last year's earnings that they gave me part of their returns to purchase quality fingerlings and feed for the coming year.

### Most significant change

When a cooperative society was formed by the farmers and input suppliers, I was selected as the vice chairperson by the group members and was the only woman to hold a position at the executive level. As a result, I gained more confidence and recognition within my community and from my husband.

MSC Story Domain: Women's participation and changes in status and recognition in the fish-farming community



Photo Credit: Baral AlWoridfish Bangladesh

### Tahera Begum

**Age:** 42  
**Education:** 2nd class  
**Lives in:** Purbo Satti village, Ulania union, Mehendiganj upazila, Barisal district  
**Household members:** Husband, two sons  
**Pond size:** 0.12 ha  
**Main household income sources:** Agriculture, aquaculture, fishing  
**Annual household income in 2013:** USD 1558  
**Contribution of aquaculture to income:** 18%

## Earning a little respect

**I am grateful to my husband and other family members and to my community members for the respect they give me as a woman.**

### Before the project

I take care of the children and household. My husband is a fisher and earns enough money for 4 months of the year, but is underemployed the rest of the time. We also earned a small amount from selling produce from a banana grove that we own, and a paddy field that we lease, but we struggled to meet our household expenses. We hold 66% ownership of a 0.12 ha pond, which we own jointly with five of my relatives. We released fingerlings into this pond to cultivate fish, but not regularly. We ate fish sometimes, but not often.

### Main constraints: Why changes did not happen before

It was not considered 'acceptable' in my community for a Muslim woman to work and participate in decisions. Moreover, I lacked technical knowledge about fish culture and since the pond was jointly owned, there was a lack of initiative and investment in managing fish production.

### After the project

Toward the end of 2012, I learned about an opportunity to participate in the ANEP's farmer group. At first, my husband was reluctant to allow me to take part, but he agreed once the project fieldworkers explained the program to him.

The project organized training sessions in aquaculture topics ranging from pond preparation to selling fish. They also provided training in vegetable cultivation on pond dikes and fallow land. I attended training sessions regularly. I discussed what I had learned with the co-owners of my pond, and as a result, we all decided to share the costs of fish culture, and I was given full responsibility for maintaining the pond and managing aquaculture activities.

With help from the group's lead farmer and my husband, I stocked the pond with large carp fingerlings we bought from a local nursery, as well as locally available small fish. I purchased fish feed and inputs from the local market and fed the fingerlings kitchen leftovers.

I cultivated a variety of nutritious vegetables on the pond dike. I received training on the nutritional benefits and cultivation techniques for orange sweet potato and received sweet potato vines for planting from the project team. I began to cultivate sweet potato on my pond dike and on fallow land near my home.

### Outcomes

- My husband gave me his support for the work.
- All the households who co-own the pond were able to eat small fish throughout the year. The fish that remained were sold in the local market for a net profit of USD 390. From this amount, USD 40 was given to me for my labor, and the remainder was divided among the owners according to percentage of ownership.
- My family consumed vegetables throughout the year, and we sold some in the market for a net profit of USD 195. We leased a piece of land on which I cultivated vegetables with my husband's help and we sold these for a net profit of USD 260.
- After household consumption, I was able to earn USD 300 from selling orange sweet potato during the harvesting season.
- I was able to reinvest USD 130 toward cultivating more fish and vegetables. I used USD 130 for my children's education and the rest for household needs.

### Most significant change

I now provide technical advice to other farmers and I earn respect from my family and community members. Because I am contributing financially to the family, my husband now consults me in making household decisions.

MSC story domain: Women's participation and changes in status and recognition in the fish-farming community



**Sukdeb Kirtonia**

**Age:** 43

**Education:** 10th class

**Lives in:** Chunarchar village, Mehendiganj union, Mehendiganj *upazila*, Barisal district

**Household members:** Father, wife, two daughters, one niece

**Pond size:** 1.96 ha

**Main household income sources:** Nursery, aquaculture, electrician work

**Annual household income in 2013:** USD 5195

**Contribution of aquaculture to income:** 75% (nursery – 50% and food fish production – 25%)

Photo Credit: Nazimul Alam/Woodfinfish Bangladesh

## Gaining some independence

**I depended on the *patilwalas* and had to sell my fingerlings on credit. Now I can sell directly to customers and my profits have increased significantly.**

### Before the project

In addition to running a nursery, I carry out fish cultivation and work as an electrician. I received training from the government and NGOs on improving fish cultivation. However, I was not able to run my nursery business at a profit. I sold only small fingerlings through a few unskilled mobile fish seed traders or *patilwalas* on credit, with the understanding that they would pay me back after selling the fingerlings.

### Main constraints: Why the change did not happen before

A lack of technical knowledge on running a nursery and a weak business plan prevented my nursery from being profitable. I found it difficult to collect the full amount of money I was owed from the *patilwalas* at the end of the season. I lacked communication and trusting relationships with farmers, so I was unable to sell fingerlings directly to them.

### After the project

In mid-2012, I joined the ANEP's fish thematic group, which brought together farmers and input providers to discuss methods of improving fish production and to disseminate technologies on fish culture. Participants acknowledged the importance of establishing trusting relationships between farmers and input suppliers to increase business for both parties. If efficiencies and quality control measures were used to enhance business for input providers, business for fish producers would also improve.

I attended a 3-day training session on nursery management. I participated in an exchange visit to gain further insight into nursery management. In addition, the project arranged a training program designed to help input providers prepare business plans that would take demand projections and quality considerations into account. It also arranged for a training session on effective communication techniques to build better relationships between farmers and input providers.

While developing my business plan, I used the group's demand analysis method and consulted with farmers about their preferences. As a result, I found that there was strong demand for large fingerlings. In 2013, I began to sell large fingerlings to farmers and *patilwalas*. I also began to sell fingerlings to *patilwalas* for cash only and therefore reduced the risk of nonpayment.

### Outcomes

- Because of the changes I made in my business model, my profits in 2013 increased 60% over 2012.
- I began to provide advice and help farmers solve their aquaculture-related problems. This improved my relationship with farmers and built trust between me and the farmers.
- I was encouraged by the increase in my business during 2013. As a result, at the end of 2013, I leased eight ponds (total area of 0.97 ha) to cultivate fish fingerlings.
- I produced large fingerlings of different varieties over the winter period. I hope that in 2014 I will be able to increase my earnings two-fold again.

### Most significant change

In 2013–14, I changed my business strategy. I have started selling fish seed directly to fish farmers. Now I am using the *patilwalas* mainly to transport fish seed to my 400 client farmers. This strategy has improved my income significantly. This was possible due to my direct communication with fish farmers through our fish thematic group,

MSC story domain: Participatory market chain approach and change in market access for the poor





## Mohammad Razzak Mal

**Age:** 26  
**Education:** 6th class  
**Lives in:** Purbo Kuralia village, Guabaria union, Hizla *upazila*, Barisal district  
**Household members:** Father, mother, two brothers, one sister  
**Pond size:** 0.16 ha  
**Main household income sources:** Crop farming, nursery, fish seed sales  
**Annual household income in 2013:** USD 3507  
**Contribution of aquaculture to income:** 46% (fish seed retailing: 24% and fish nursery: 22%)

Photo Credit: Nurul AlWardhin Bangladesh

## My business has grown rapidly

**I could not have expanded my business without the project. The ANEP training and networking sessions were the main drivers for the changes that have taken place in my professional life over the last 2 years.**

### Before the project

I was a day laborer in a fish farm and nursery, and during the peak aquaculture season, I sold fingerlings as a mobile fish seed trader or *patilwala*. As a *patilwala*, I carried fingerlings with me as I walked to my customers' ponds. To maximize sales, I took small fingerlings, which were easier to carry in greater volumes. At the end of a working day, I was forced to sell any remaining fingerlings at a discount.

### Main constraints: Why the change did not happen before

I carried only small fingerlings without considering what my customers might want or the best varieties for fish cultivation. I had weak relationships with customers since I did not generally maintain contact with them after I completed a transaction. Because of the lack of communication with customers, I was not aware of the quantity and quality of fingerlings my customers wanted.

### After the project

Toward the end of 2012, the ANEP facilitated a group discussion between aquaculture input suppliers. During this meeting, we discussed ways to improve our businesses through better planning and other methods of improving our trade. The fish thematic group, which included both farmers and input suppliers, was formed. Its main objective was to help farmers develop technological understanding and to ensure quality inputs were available; this would increase fish production by farmers and help input suppliers by increasing demand for their business.

I attended a 2-day training session on how to identify quality fingerlings and appropriately transport fingerlings from the nursery to the farmer's pond. I also attended training sessions on nursery management and basic aquaculture. The demand analysis by the fish thematic group helped me understand that existing demand was for large-sized and mixed varieties of fingerlings. Mixed and large-sized fingerlings, which farmers preferred, were not always available from the nurseries. As a result, in 2013 I leased a pond and began growing different

sizes and varieties of fingerlings to supplement the fingerlings that I continued to buy from nurseries.

As a result of the training sessions, I was able to advise and help my customers. I shared knowledge of appropriate fingerling supply and variety, which I learned from the fish thematic group. I also told farmers about the high-quality, large fingerlings that I was cultivating in my pond.

### Outcomes

- My reputation and business improved through my attendance at the project meetings. The number of my clients has tripled over these last 2 years.
- In 2013, I earned a total of USD 1623 from selling fingerlings – triple the amount I earned in the previous year. Of this, I earned USD 780 from selling fingerlings I raised in my pond.
- I was encouraged by the increase in earnings generated in 2013, so in 2014, I leased another two ponds. In the coming year, I hope to again increase my earnings three times more than last year.

### Most significant change

In the past, I delivered fish seed on foot. Now, with encouragement from the ANEP and a better understanding of customer demand, I bought a *trishaw* and was able to expand my delivery zone from two villages to five.

MSC story domain: Participatory market chain approach and change in market access for the poor



## Kazi Nurul Islam

**Age:** 50  
**Education:** 12th class  
**Lives in:** Norsinghpur village, Guabaria union, Hizla *upazila*, Barisal district  
**Household members:** Wife, one son, one daughter  
**Pond size:** 0.60 ha  
**Main household income sources:** Business, aquaculture, poultry  
**Annual household income in 2013:** USD 7792  
**Contribution of aquaculture to income:** 49% (fish feed selling – 35% and fish farming – 14%)

## Networking increased my client base

The project provided me with the tools I needed to expand sales and helped me understand, connect with and improve my relationships with customers.

### Before the project

I stored products with long shelf lives in my home and waited until prices increased to sell these at local bazaars. I have a small shop at the local market where I sold fertilizers, mustard oil cake, wheat bran, vegetable seeds, pesticides and a small amount of commercial fish feed. In addition, I have a 0.60 ha pond in which I cultivated fish using traditional methods to sell for a small profit. I also sold poultry, which I bought from local chicken farms. Based on orders from individual customers, I procured monosex tilapia fingerlings and resold these for a profit.

### Main constraints: Why the change did not happen before

I did not have much communication with farmers and therefore lacked insight into how I might best meet their needs and increase profitability. Because of my shop's poor performance, I felt that demand for fish feed from local farmers was lacking. I relied on company agents for advice on how to sell commercial aquaculture inputs that I sold in my shop. I also had difficulty transporting fish feed from Barisal to my shop because of poor roads and time limitations. I lacked technical expertise in aquaculture.

### After the project

In the middle of 2012, the ANEP brought farmers and input suppliers together through the fish thematic group to share aquaculture technologies that could help increase input suppliers' business. Input suppliers did some business planning to improve the quality of inputs they supplied to farmers with the aim of improving farmers' businesses.

I participated in a training session on appropriate fish feed management and basic aquaculture techniques to better support farmers. I also attended an exchange visit to observe and understand the use of an electric feed machine and to learn how to build one myself to produce commercial feed. With help from farmers in the fish thematic group, we did a demand analysis on the area's fish feed needs. I attended farmer group meetings to better approximate the demand for inputs among farmers. Based on these demand projections, I developed

a business plan. As part of the business planning process, I attended farmer group meetings. During these visits, I explained the importance of using quality fish feed in improving fish production. I also shared my mobile phone number with farmers during the meeting. Farmers can now order my products over the phone in addition to visiting my store.

### Outcomes

- In 2014, I built an electric feed machine and started making feed from high-quality local inputs. As a result, I expect to double my profits in 2014 over 2013 levels.
- By producing my own feed, I can maintain quality and sell feed for a lower price than commercial feed, while retaining higher profit margins than before. I learned how to do this from an exchange visit.
- The quantity of feed I sold increased four-fold between 2012 and 2013.
- From my discussions within the fish thematic group and the farmer group, I learned that there was a strong and unrecognized local demand for fish medicines, so I have also started selling these in my shop.
- Using techniques that I learned from the ANEP training sessions, I was able to improve fish production in my pond.

### Most significant change

As a result of helping farmers order from my store in person or by phone, the number of repeat customers I have has increased from 40 individuals in 2012 to 250 individuals in 2013. In addition to purchasing aquaculture inputs, these customers buy products from my store for their other agricultural activities. In addition, demand for the fish fingerlings I sell has increased due to better communication and relationships with farmers.

MSC story domain: Participatory market chain approach and change in market access for the poor



## Liton Sordar

**Age:** 35

**Education:** 4th class

**Lives in:** Sripoor village, Borojalia union, Hizla *upazila*, Barisal district

**Household members:** Wife, three sons

**Pond size:** 0.10 ha

**Main household income sources:** Fish retailing, aquaculture, crop farming

**Annual household income in 2013:** USD 2370

**Contribution of aquaculture to income:** 98% (fish retailing: 66% and fish farming: 32%)

Photo Credit: Nazim Ali/Wardfish Bangladesh

## I would never be where I am today

**Without the project I would never be where I am today. I now have a consistent base of about 120 pond owners who regularly sell their fish to me. I can operate my business every day now. All of this has been achieved with the help of the ANEP.**

### Before the project

My main occupation and source of income was selling fish. I would buy fish farmed in local ponds and sell them at various markets. I was only able to sell fish for 15 to 20 days each month because I had contact with only 40 to 45 farmers, who often broke their commitment to supply fish to me. The perishable nature of fish forced me to sell my supply quickly even when the price was low, as there are no appropriate storage facilities at the market. In addition to selling fish, I leased one pond in 2011 to cultivate fish, but the return was unsatisfactory due to my lack of knowledge of management practices.

### Main constraints: Why the change did not happen before

I was constrained by weak relationships with pond owners and lack of knowledge on fish culture and post-harvest handling techniques.

### After the project

Toward the end of 2012, the ANEP gathered fish farmers and input suppliers and formed a working group, known as the fish thematic group, which I joined as a fish retailer. The thematic group was a place for learning aquaculture and business skills, and provided an excellent opportunity to network with more than 400 fish farmers. We began sharing knowledge and plans about selling fish as a group. We even engaged in joint consultations before deciding what and when to harvest. I participated in the training organized by the project on post-harvest handling techniques and fish culture, and participated in an exchange visit to gain insight on improved fish handling techniques.

In the business planning sessions organized by the fish thematic group, traders and representatives from the fish farmer groups worked together to identify the level of fish production in the local area and the demand in local markets. I attended farmer group meetings to provide them with up-to-date information on fish prices and market demand. Based on these communications, I was able to build relationships of trust with farmer group members. As a result, farmers began to contact me when they needed to sell their fish. I would also contact them directly when I needed to purchase fish. This networking increased the number

of farmers regularly supplying me with fish to around 120. Before, I was only able to collect enough fish to sell half the month. Now I can sell fish whenever I want, morning and evening, 30 days a month. I am available to farmers 24 hours a day on my mobile phone, so if farmers are satisfied with the prices I offer, they no longer have to travel to the market to sell their fish.

### Outcomes

- The ANEP provided a demonstration to fish retailers on using low-cost iceboxes. I received an icebox from the project on a cost-sharing basis. This has further increased my capacity to sell fish.
- Using knowledge from the project training sessions and the experience gained from exchange visits, I now follow appropriate techniques to collect fresh fish from farmers and store and transport the fish to maintain the quality. Consumers benefit by getting good quality fish and I can generate more demand from consumers, and thereby command a better price.
- Along with direct support from the project, I have learned techniques for selling fish from the fish farmers I met through the project.
- In 2013–14, I tried new methods to prepare a 0.10 ha pond, which I leased for fish cultivation.
- In 2013–14, I earned about USD 1558 from selling fish bought from farmers and an additional profit of USD 760 from selling fish from my own pond.
- Because of my increased income, in 2014 I have been able to mend my house, and I leased two more ponds to expand fish cultivation.

### Most significant change

By developing a more trusting relationship with farmers through fish thematic groups, my fish suppliers numbers increased from 40–45 to 120 farmers. I now know improved fish culture practices and started fish culture commercially. These developments have almost doubled my income, and for that I am very grateful to the project.

MSC story domain: Participatory market chain approach and change in market access for the poor



Photo Credit: Baral Ali/WorldFish Bangladesh

**Charhogla village, Mehendiganj union, Mehendiganj upazila, Barisal district**

**No. of households:** 1200  
**Major sources of household income:** Agriculture, fishing, aquaculture, other non-farm activities  
**No. of ponds in the village:** 307

**Good news travels fast**

**We learned that small, indigenous fish species can easily be cultivated in ponds without major investments. Small indigenous species are easy to harvest continuously since the supply never runs out. These small, nutritious fish have become a common part of our everyday diet.**

**Before the project**

Charhogla village is in a poor, rural area. Houses are mainly made of bamboo, straw and jute sticks and are thatched with long grasses. The roads are rough and completely impassable by car or motorbike during the rainy season. Agriculture is the main activity. Many households depend on nonfarm sources of income, such as day labor, domestic and international remittances and cottage industries. The main food crops are rice, potato, pepper, onion, mustard and winter vegetables. Other agricultural activities are livestock, poultry and forestry. The village is surrounded by a river so fishing is a natural occupation for many. The ANEP identified 307 small and medium-sized ponds scattered around the village that offered significant aquaculture opportunities. Despite the potential, fish farming had never been promoted in the village by development agencies.

In March 2012, project staff came to the village to select farmers. They found only a limited number of low-value, wild fish were available in the local market and few farmed fish were on sale. During discussions, community members reported that the best-quality wild fish is shipped to cities where traders can get higher prices. They reported that modern fish farming was not practiced in their village. Their fish farming depended mostly on capturing wild fish in their ponds during the rainy season. Although some farmers stocked fish in their ponds, they purchased these from mobile fish seed traders who did not visit the village regularly. During discussions, project staff found that local people were not aware of the nutritious value of small, indigenous fish species.

**Main constraints: Why the change did not happen before**

Lack of knowledge about modern fish-farming techniques, lack of awareness about the nutritious value of fish and limited availability of input suppliers were identified as major constraints to improving fish culture in the village.

**After the project**

In 2012, after the ANEP fieldworkers identified Charhogla village as a potential area in which fish farming could be developed, two fish-farming groups of 34 farmers were formed. Because of increased projections of potential growth, another group was formed in 2013 with 22 farmers. The groups were formed in three different areas of the village to help non-project farmers benefit from the program through contact with participants. A total of 60% of beneficiaries were women. The project staff invited both husbands and wives to participate in the training program.

Project staff linked the fish farmer groups with fish thematic groups at the union level, which gave them the opportunity to discuss different aspects of fish culture with market actors. The project facilitated the development of an effective seasonal business plan for the community. A brood pond for small, indigenous fish was established to make small species seed available. Two farmers were encouraged to establish nurseries to ensure the availability of carp seed in the village. Project fieldworkers linked them with WorldFish supported hatchery owners to ensure they would have supplies of good quality fish fry. The project organized awareness programs in the local primary school and madrasa to educate parents about the nutritional value of fish (particularly small indigenous species) for children and mothers. A field day was organized to raise awareness about modern fish culture techniques among non-project beneficiaries.

**Outcomes**

- Significant changes in productivity and income for the project beneficiaries were observed. Project monitoring shows that pond productivity increased from 1655 kg per ha to 3542 kg per ha after project intervention.
- The consumption of self-cultivated fish among households increased from 15 kg to 41 kg per household per year.

- This success also had an indirect impact on fish production. A survey of households who did not participate in training provided by the project, but received technical messages from project members demonstrated that their production increased from 990 kg per ha to 2066 kg per ha during this time.
- Participants reported that women were mainly responsible for looking after the ponds in the villages due to limited requirement in terms of both time and physical work. Due to technical skills development among these women, they are now obtaining greater benefits from fish culture than in the past.

### Most significant change

Community members report that the availability of small fish in the market has increased, and that fish traders are now exporting surplus fish to other parts of the country. As a result of awareness raising by the project about the nutritional value of small fish species, including mola, all fish farmers are now showing interest in growing mola in their ponds. During focus group discussions, community members reported that mola is now being cultivated in almost all the ponds in the village, irrespective of project or non-project participation.

MSC story domain: Technology up-scaling and mass scale awareness





## Mohammad Kaium Khan

**Age:** 30

**Education:** 11th class

**Lives in:** Dinar village, Charkawa union, Barisal Sadar *upazila*, Barisal district

**Household members:** Mother

**Pond size:** 0.12 ha

**Main household income sources:** Crop farming and aquaculture

**Annual household income in 2013:** USD 1103

**Contribution of aquaculture to income:** 30%

## Gaining respect through knowledge sharing

**I learned about a new technology called an integrated floating cage aquaponics system. Thanks to the ANEP action research team for including me in the project.**

### Before the project

Like many other rural young people, I am educated but unemployed. A few years ago, I was self-employed in a garment business along with my three elder brothers in Sylhet. Unfortunately, due to political and social reasons, we lost our business and suffered a massive financial crisis. Finding an alternative job immediately was a very difficult task for us there, so we had to go back home. Because of the sudden economic crisis in our family, each of my other brothers and their families have had to go in different directions. Being the youngest brother, I had to go back to my mother. To regain a stable economic status, I was trying to find an alternative income source that depended on my own resources, such as crop land, a homestead or a pond.

### Main constraints: Why the change did not happen before

The shaded nature of ponds and lack of technological knowledge made it difficult for unemployed rural youth to develop innovative enterprises such as the integrated floating cage aquaponics system.

### After the project

Possibly due to my positive attitude, I was noticed and selected as a member of an action research group in May 2013. The ANEP action research team came to my house, led by Dr. M. Mahfujul Haque from Bangladesh Agricultural University. The team asked me about the constraints and potential of pond aquaculture in our area. The main point I highlighted was that the dense growth of trees on the pond dike made it difficult to grow vegetables on the dike and fish in the pond. The team discussed the structure of the integrated floating cage aquaponics system and the potential for it in my pond. What I understood about the participation was that the project and I would share knowledge, production inputs and direct involvement. I expressed interest in being part of the research project being carried out with nine households in the village.

The action research team was made up of members from Bangladesh Agricultural University, Patuakhali Science and Technology University, and ANEP staff. The week after their visit, they asked me to organize an introductory meeting about the research at my house. The other eight participating households attended. At that meeting, the members chose me as the group leader of the action research group. As leader, I was given responsibility to organize meetings and to communicate with other members regularly and inform the action research team. Later, after receiving training on the integrated floating cage aquaponics system, I installed the system in my pond, stocked tilapia in the net, planted vegetables in the pit, and stocked carp in the pond. This all made a considerable contribution to my personal life and household.

### Outcomes

- Through the action research group, I have gained new knowledge about the integrated floating cage aquaponics system, which has made a positive change in the shaded ponds in our village. I also learned about modern carp culture technology in ponds.
- Within the 4-month production cycle from July to October 2013, I consumed about 25 kg of cucumber and snake gourd from the floating cage system. During the monsoon season, there were no vegetables produced in the village's homestead areas because of the rain that hindered vegetable production. I also ate 20 kg of tilapia from the system during that period. My household consumption of fish and vegetables has increased several times compared to before the project intervention.
- I have attended a couple of review meetings at the ANEP office in Barisal Sadar, where I shared my ideas with local and Nepalese farmers. I was encouraged by the fact that I was one of the important decision-makers in the research process.

- Initially, the project provided us with major inputs, such as fish seed and fish feed. Once all the nine farmers understood that this intervention was profitable, we decided to invest to provide all the necessary inputs for the ponds. Together we changed our behavior by investing money in aquaculture and getting benefits from underutilized shaded ponds.

**Most significant change**

My role as a lead farmer and opinion leader in the project has further improved my social status. I have even been invited to facilitate the training session for replicating this technology at another ANEP site. I feel I am a highly valued member of the action research group. I am still using the knowledge I got from this interaction and I give advice to my neighbors and visitors.

MSC story domain: Technology and research partnership



Kaium Khan, government fisheries extension officer and local NGO staff checking the growth of tilapia cultured using the IFCAS technology



**Dr. M. Mahfujul Haque, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh**

**Partners in the research:** Bangladesh Agricultural University, Patuakhali Science and Technology University, Bangladesh Fisheries Research Forum, WorldFish, Community Development Centre and other ANEP partners

**Location:** Barisal district

## Partnerships need collegial relations

**Partnership is a process that needs collegial relationships between researchers, developers and farmers to make the action research participatory and successful. I would like to thank WorldFish for giving us this opportunity to develop the integrated floating cage aquageoponics system at the grass-roots level.**

### Before the project

Most of the ponds in Barisal region are shaded by large, timber trees, many of which have financial value. Most farmers are not interested in cutting even the branches of these trees. This has had a negative impact on fish growth due to lack of sunlight reaching the pond surface. Vegetable production on the dikes of these ponds is also limited due to minimum space. This is a major constraint to fish production, but has not previously been addressed by research agencies or by development organizations. ANEP considered issues with shaded ponds as an important piece of research for the fish-farming community in the region. Fish farmers wanted to know what type of fish species and management practices are suitable for this kind of pond. When a call about the action research came from WorldFish, I became interested in taking part in the research process. I was interested because I have ongoing experience of working with integrated multi-trophic aquaculture, where floating vegetable production is one important component. I submitted a proposal in response to the research call to test the integrated floating cage aquageoponics system model in the context of shaded ponds for growing fish and vegetables in a single system, and my proposal was awarded funding by the project.

### Main constraints: Why the change did not happen before

There was a lack of collegial partnership among researchers, development agencies and farmers on fundamental problems.

### After the project

We established a collegial partnership to run the shaded pond research where the researchers, integrated floating cage aquageoponics system developers and farmers could equally contribute to the research process to learn and solve problems through action research. We identified a group of nine households in Dinar village of Barisal Sadar *upazila* in Barisal district for the research. Our action research team, farmers

and ANEP aquaculture team members held discussions and identified the major problems of shaded ponds, highlighting the dense growth of trees on the pond dikes that made growing vegetables and fish difficult. We discussed the possible structure and potential of integrated floating cage aquageoponics systems that were to be installed in areas of the ponds exposed to sunlight. Later, after receiving training on the system, farmers installed it in their ponds, stocked tilapia in the net, planted vegetables in the pit, and stocked carp in the pond. This process made a considerable positive contribution to the research partnership and the various partners.

### Outcomes

All nine integrated floating cage aquageoponics systems were placed in a sunlight-exposed area of the shaded pond by the farmers. Farmers made various changes to the original design. The height and size of the scaffold were elevated and extended, using split bamboo to enlarge the vegetable-growing space and to facilitate growing long vegetables such as gourds, which can reach up to 50 cm in length. The level of participation by women was encouraging. Feeding fish in the cage and pond was a daily activity, and taking care of vegetable plants was a weekly activity. Women took care of the vegetables in the system by crumbling soil in the vegetable pits, removing unwanted weeds, harvesting vegetables and planting new vegetable plants. This did not add significantly to the time spent on their daily activities. A long, spoon-like device was made with a bamboo stick and a small plastic mug so that women could easily provide feed for tilapia in the cage and irrigate the vegetable pit. Women were good at feeding the fish regularly, and their children enjoyed staying with them while they did this.

Within the experimental period, a 4-month production cycle from July to October 2013, the average total production of vegetables was 20–30 kg of cucumber and snake gourd. The



total amount of fish, mainly tilapia, was 25–35 kg. The results of the action research and the growth of tilapia and vegetables in the floating cage system were encouraging for the whole team. The project drew lots of interest from local people. Participants in another WorldFish project also visited the site and asked many questions. These developments encouraged the entire research team in their work.

Having seen the positive impacts of the integrated floating cage aquageoponics system in Bangladesh during their exchange visit, Nepalese farmers wanted to install the device in their country. They wanted to focus primarily on fingerling production in the cages, as fish seed production is centralized in Nepal, and long-distance travel causes huge mortality of seed and increases the cost. They expected that fingerling production in cages would ensure quick returns and at the same time reduce the costs of transportation, helping them to get large-sized, quality fingerlings. Initially, with the help of CEAPRED and the action research team in Bangladesh, seven integrated floating cage aquageoponics system models were established in Nepal to test the suitability of the technology there. This intervention made a significant change at the farmer's level in terms of producing fish fingerlings and vegetables. Among many, the technology exchange between Bangladesh and Nepal is one of the successes of the ANEP's aquaculture component.

#### **Most significant change**

As a team member, I gained a lot of experience working together with various types of partners. We, the university partners at Bangladesh Agricultural University and Patuakhali Science and Technology University, have started to teach the integrated floating cage aquageoponics system to our students. In the partnership process of the action research, I learned that every partner has a distinct role that is critical to making a research intervention productive. The main thing I discovered is that a partnership of researchers, development workers and farmers is the key to the success of action research. I believe, after having these experiences that I am able to carry out such action research, solving real problems of aquaculture for sustaining food security.

MSC story domain: Technology and research partnership



Dr. M. Mahfujul Haque from Bangladesh Agricultural University sharing the findings from IFCAS action research with stakeholders.



## Buddhiman Chaudhary

**Age:** 32

**Education:** Bachelor's degree

**Lives in:** Chhipagad VDC, Ward No. 7, Suilihawa village, Rupandehi district

**Household members:** Wife, father, mother, grandmother, two sons

**Pond size:** 0.07 ha

**Main household income sources:** Service, crop farming and aquaculture

**Annual household income in 2013:** USD 1988

**Contribution of aquaculture to income:** 22%

Photo Credit: Borah Alu/Wardhi/In Bangladesh

## A boon to farmers

**The project was a boon to the farmers. It has done an excellent job. It has ensured a place in the heart of the farmers of this area.**

### Before the project

I am an accountant by profession. I work for the local government school. I also have some agricultural land and a small pond. My only commercial agricultural activities were growing rice and wheat and annually I earned around USD 450. I constructed a pond in 2011. We had some land next to a neighbor's field and there was a rodent infestation, so rice farming there was not possible. The local government were building the highway around that time and they needed the soil, so we decided to dig the pond and sell the soil. We used the pond for subsistence fish farming and I did my best as I had no experience with aquaculture.

### Main constraints: Why the change did not happen before

I had no idea that fish farming and dike cropping was so profitable. That's why I never had any interest in either of them.

### After the project

I joined the ANEP in May 2013. The project facilitators came to my home and invited me to a communal group meeting. In the meeting, they talked about the project and new ways of doing agriculture. They talked about how new technologies can improve production and significantly increase earnings. I was fascinated and wanted to know what new technologies they were talking about and try them out. I am now a member of the thematic group.

Through the project, I received training in aquaculture. I learned about preparing ponds, stocking fingerlings, feeding, applying fertilizer and managing disease. I also learned about integrated agriculture-aquaculture such as dike cropping. After the training, I excavated my pond, made it bigger and strengthened the dike by adding more soil. I stocked small, indigenous species and common carp fingerlings. I used the new technologies I learned from the project, such as feeding with pellet feed and using a feed tray.

I received training in nutrition and the importance of vegetables and small, indigenous fish. I learned how you can make a paste and soup from small fish that reduce malnourishment among young children. I now grow seasonal vegetables such as bitter melon, okra, bottle gourd, beans, cucumber, chili pepper, eggplant and sponge gourd on my pond dike. It has been a significant addition to my income, and my family can have fresh, pesticide-free vegetables all year-round. The project also took me to see farmers using advanced fish farmer techniques in other villages, and I had a chance to see many new technologies and management systems in action.

### Outcomes

- Now I know how to apply technical knowledge to increase profit from aquaculture. I know how to use pellet feed, how to make it using a feed machine, and how to use a feeding tray to reduce waste. I also know how to increase oxygen in the pond by adding fresh water from tube wells, from small fountains or by using aerators. I know how to strengthen dikes with plastic sheets to reduce the damage caused by common carp and how to raise fingerlings and grow vegetables in floating cages. All this technical knowledge has allowed me to farm fish in a very profitable way.
- The income from my day job has been supplemented by additional income from farming. I received an income of USD 487 from my pond, of which USD 450 came from fish and the rest from vegetables on my pond dikes.
- Dike cropping was a completely new experience for me, and it has improved my household diet significantly.
- Now I am really conscious about nutrition. I ensure that small fish and vegetables are now a regular part of our household diet. I now know small fish are a rich source of vitamins, iron, calcium and other minerals.
- No one really knew me before. I have a lot more recognition now, and people come to me for suggestions about fish and vegetable farming.

- I have more self-confidence. My farming work interests and motivates me, and I know it well. This is a source of pride and satisfaction for me.

**Most significant change**

The biggest change for me is the substantial boost in income from fish and vegetables. I have used this additional money to improve the living conditions of my family and give my children access to a brighter future. I pay for my children's education with this money and have also bought a computer for them. I can spend more for food and ensure a nutritious diet for my family. I have also bought a small power tiller and have plastered my house.

MSC story domain: Technological advancement and change in productivity, income and food security



Buddhiman Chaudhary showing carp fishes from his pond.



## Dwarika Prasad Chaudhary

**Age:** 36

**Education:** 10th class

**Lives in:** Devgau VDC, Ward No. 1, Pathkhauri village, Nawalparasi district

**Household members:** Mother, wife, three daughters and one son

**Pond size:** Two fish grow-out ponds of 0.11 ha and one nursery pond of 0.02 ha (constructed in 2014)

**Main household income sources:** Farming rice, fish and vegetables

**Annual household income in 2013:** USD 2100

**Contribution of aquaculture to income:** 30%

## Confident in my ability

**I believe that more farmers in the future will be engaged in commercial farming activities because they are starting to see the benefits. Farmers from my community as well as outside come to my pond to learn more about what I am doing and how I am doing it. As demand of good quality large-size fingerlings is increasing, I hope to become a nursery operator in my community and I am confident in my ability to reach this goal.**

### Before the project

No other projects came to this area before the ANEP. There was and remains a water shortage that makes farming very difficult and the lack of modern technologies and scientific methods has meant low production. Farmers practiced rice and wheat farming only, and we would only purchase vegetables, never produce them, because there was a lack of knowledge about how to do it. One farmer who tried farming vegetables on 0.34 ha of land was unable to even meet the cost of his inputs at the end of the production cycle. It was considered too risky to even try. Moreover, there was no loyalty between community members. If someone had a successful season, he would find that crops would be stolen from his fields and he would have no one to turn to for support.

Before joining the project, I owned a pond of 0.03 ha where I practiced carp polyculture. Production of fish was 46 kg which was worth USD 25 in 2011. My family could eat fish only about twice a month during fish harvesting seasons. I also grew rice, wheat and some sugarcane.

### Main constraints: Why the change did not happen before

There was a lack of awareness and opportunity for us to learn new methods and techniques. Production was primarily for my family consumption. Only the surplus was sold, if there was any. We lacked entrepreneurial spirit in our community.

### After the project

The project began working in my community in 2012. I remember taking my buffalo to graze when I saw a meeting about to take place. As the people gathered they spoke to me, reminding me that I had a pond. I was motivated to join the group and find out more about the project and what it was offering. I was interested in using the technical expertise of the project staff to repair my pond dike and the

various technologies they were discussing to increase my fish production and farm vegetables on the dike. When the training sessions for fish began shortly afterwards, I became a member of these groups as well.

In the first year, I increased production in my pond substantially. Stocking larger-sized fingerlings, protecting the pond with nets, feeding the fish regularly, adding fertilizer on a regular basis and maintaining oxygen levels were all techniques that I had not used before and they brought me success. I learned how to make nutritious feed and protect the fish against disease, as well as hardening techniques. Adopting of these improved practices increased fish production to 183 kg from the 0.03 ha pond and increased to 344 kg in 2013–14 from 0.11 ha of pond. I also practiced rice–fish farming in one of my paddy fields, which produced 25 kg of common carp and improved the growth of the rice crop. I learned about crop nursery management, planting techniques and integrated pest management from the project, which led to the successful growth of my dike vegetables. To improve nutrition, I began stocking small, indigenous species in my pond as well as carp.

Spurred on by my success, I converted my rice fish pond to a second pond in 2013. My neighbors were also motivated by my success, and I tried to support their early efforts in fish farming. More members dug new ponds or renovated their old ones. While we had owned ponds and even bought fingerlings in the past, learning to care for the fish and make sure they were taken care of was something new for us to learn and practice.

### Outcomes

- As a result of the improved technologies, my annual income from fish culture increased to USD 612 in 2013 from USD 21 before the project intervention. I grew vegetables on the pond dike, which generated a net income of USD 302.
- In addition to earning more money and becoming an active member of my community, my family and I are no longer reliant on the market for nutritious foods such as fish and vegetables, but are producing it on our doorstep.
- I have installed a cage technology that I saw during a training visit to Bangladesh as an experimental nursery and am working with my thematic group to address other ways of rearing fingerlings to decentralize the fish market in the community.
- This year, I have dug a third pond, which I intend to use as a nursery, as it is an important resource for community members seeking to start fish farming. I have also stocked catfish in a small, separate pond. As catfish eat other fishes, I encircled the ditch with a net.

### Most significant change

I never played cards, but in the past, I used to spend three to four hours a day watching others gamble. I have no time now. I am either watching my fish or my vegetables. I spend several hours in the morning near my pond. I have to monitor the oxygen level, manage the feed and make sure the vegetables on the dike are secure. I am busy and no longer have time to waste. When my time is not spent on the pond, there are other activities related to the pond that occupy my time. I participate in group activities, training sessions and thematic group meetings, and I interact with other market actors. Both my family and I have become well known in our community because of our efforts and our success. I have found it to be a rewarding experience, one that has been well worth my time.

MSC story domain: Technological advancement and change in productivity, income and food security



Dwarika Prasad Chaudhary using his hand operated fish feed machine.



## Ram Kumar Tharu

**Age:** 43

**Education:** 11th class

**Lives in:** Siktahan VDC, Ward No. 9, Kadamipur village, Rupandehi district

**Household members:** Wife, two sons

**Pond size:** 0.05 ha

**Main household income sources:** Aquaculture and rice farming

**Annual household income in 2013:** USD 1294

**Contribution of aquaculture to income:** 40%

## A big house is not always a measure of success

**If you manage a small house well, it will benefit you more. That is how I manage my pond. My pond is also a garden. It is well managed and beautiful, so everyone appreciates that.**

### Before the project

I was in Delhi for 16 years, doing odd jobs. I came back in 2011 and joined the ANEP in 2012. I didn't really want to stay in Delhi. The work was always temporary and all my family was here in the village. I didn't have any clear idea of how to make a living at home. I didn't really consider agriculture as an option. My legs were weakened by a hereditary disability that has been plaguing my family for three generations, so the hard work required for field cropping was never an option for me. Before joining the project, I only grew rice. I used to earn around USD 700 annually. I didn't have any real knowledge about aquaculture or dike cropping.

I inherited a pond from my father, but it was mostly overgrown with weeds and was unsuitable for growing fish. It was basically a hole that provided the mud for my shed. I sometimes stocked fish in the pond but never thought about culturing fish scientifically. During the rainy season I could catch a few local fish from the pond for home consumption.

### Main constraints: Why the change did not happen before

I had no idea that aquaculture and dike cropping was so profitable, so I never had any interest in these activities.

### After the project

I joined the project in April 2013; I came to know about it when project staff came to the village. I liked the objectives and thought that it would be a good opportunity to gain some new knowledge that could improve my earnings. Later I was selected as a vice president of the fish thematic group which was formed in our pocket area.

Through the project, I received training in different integrated agriculture-aquaculture issues such as pond management, dike cropping, nursery management, feed pellet usage, stocking intensity, feed management, applying compost and fertilizers. I had no experience of dike cropping before, and I learned about it from the project staff. I also saw photos of dike and trellis

cropping from Bangladesh. I was one of the earliest adopters of dike cropping in my area. I also grew orange sweet potato on my dike in the last production cycle.

I began to farm fish in earnest in my pond 6 months after I received the aquaculture training. I learned about vegetable dike cropping and feeding practices for fish. I took part in excursion visits to Chhapiya, where I learned more about the use of aerators and feed management from Mr. Punya Chaudhary's farm; I paid a visit to Chitwan in Nepal, and one to Barisal in Bangladesh. I was particularly struck by the involvement of women in market activities. Seeing their role in fish selling at the local market inspired me to come back and work on establishing a community cooperative. I am the chairperson of the project organized agricultural cooperative of my area.

Along with fish farming, I'm now also carrying out cage culture for fingerlings. I saw the technology in Bangladesh and decided to try it in my pond for large-size fingerling production. I also grow vegetables in the cages. I received nutrition training that taught me the importance of green vegetables, small indigenous species and orange sweet potato.

### Outcomes

- I now know about the importance of nutrition and have the knowledge and the means to ensure a balanced diet for my family. Before the project, our main food item was plain rice, with a bit of salt and oil. Now I can include fish, vegetables and lentils in our diet.
- I have a lot of firsthand knowledge of aquaculture. I know the ideal color of the water, how to apply fertilizers and how to use feed machines. I can demonstrate the use of feed machines to create pellet feed, the use of feeding trays and how to use grass cuttings as feed for grass carp.
- Following my lead, other farmers have started commercial aquaculture. I have also popularized dike cropping in my area.

- As a result of improved management practices, my annual income from fish culture increased to USD 520 in 2013 from USD 28 in 2012. I also earned a net profit of USD 115 from vegetables. This increased income has changed the standard of living of my household and I have started building a semi-brick house for my family.

#### Most significant change

The biggest change for me is that I am more confident. I know I can earn a living from aquaculture. My personality has changed a lot. I can now talk and communicate with people with ease. People know me, and many visitors come to talk to me and learn about my pond.

MSC story domain: Technological advancement and change in productivity, income and food security





Photo Credit: Ahmed Nur Oke/CGIAR/AASt/WorldFish/Bangladesh

## Basu Dev Paudel

**Age:** 66  
**Education:** 12th class  
**Lives in:** Jahada VDC, Ward No. 7, Dhanewa village, Nawalparasi district  
**Household members:** Wife, two sons, three married daughters, two daughters-in-law, three grandchildren  
**Pond size:** 1 pond of 0.03 ha (7 ponds, total area 2.33 ha, newly constructed in 2014)  
**Main household income sources:** Crop farming, aquaculture, pension from government service; support from sons in times of need  
**Annual household income in 2013:** USD 4080  
**Contribution of aquaculture to income:** 7%

## Now my business is profitable, less risky and easy to manage

**Nobody had ever given me money or the kind of learning opportunity that these institutions have. It has filled me with new energy, and I believe that the results of this will show for many days to come. You expect results when you work, and I am seeing results happen. I hope that this project stays in our area because I believe we can make this the center for aquaculture here in Nepal. Chhapiya, a village nearby is already known as a fish-producing village.**

### Before the project

I had retired from my position as a school teacher. My children were all married and living away. We had land and were farming rice and wheat mostly, but subsistence agriculture has few returns. The majority (80%) of the money earned from the sale of the rice crop would go towards paying for the next cycle and there was next to nothing in profit. I tried to farm aloe vera and stevia (sugar plant), but I went into the business with little knowledge and it turned out that the conditions here were unsuitable and I lost a lot of money. Our financial situation was quite bad and there seemed to be no way out; even the banks would not give me loans for new investments.

I had had some experience with aquaculture and knew that there were profits to be made. As a test, I rented a 0.14 ha pond in the village in 2006 to see whether I could make any money. There were many constraints when I started. The availability of fish seed was limited and I had to collect it from a long distance. I found the mortality of the fish seed during stocking was about 50%. I had to use rice bran and mustard oil cake as commercial feed was not easily available. The aquaculture service providers were reluctant to come to this area as there were only five or six ponds in the village. In my first fish culture cycle I made no profit but I was able to recover my initial costs, although that I had had no technical training. I felt that it was going to be a viable option for me and I was keen to learn more.

### Main constraints: Why the change did not happen before

Projects such as this have not come to the area before and I did not know about a lot of the things that I learned simply because I had never been exposed to this kind of knowledge. Apart from this, a lack of networking with market actors stopped me from investing in aquaculture.

### After the project

The ANEP came to the village in 2013. I was familiar with this program and its aims by the time the project started work in our community because it had been implemented in Jamuniya the year before. The project officers persuaded me to invest and I constructed the first pond in 2013. It covered 0.03 ha and the project provided me with USD 55 towards the cost of construction.

The project provided us with training that showed us how to make the most of the technical knowledge. The training sessions on nutrition were important for us because it made quality food consumption a priority, which it never was before. I was motivated by the staff's dedication. They came to my house so many times! They emphasized healthy eating and encouraged us to feed ourselves and our children better by producing vegetables, fish and different varieties of rice. This information woke us up and really made us want to make changes to our diets and livelihoods.

I got involved with the activities of the thematic group, which increased my social network a lot, enabling me to stay in touch with consumers, harvesting teams and fish traders. I learned more about business plan development and was confident that I was offering a product that would sell. In the first year, I was able to sell 100 kg of fish worth USD 272 from my 0.03 ha pond. This was an eye-opener for me. I realized I could make a bigger investment and make a higher profit.

With this in mind, I went on to construct another eight ponds, and converted all my rice fields to fishponds. I put a lot of thought and money into this. I started a fingerling nursery in three ponds to support my grow-out and to sell to community members who need to travel quite far to collect fish seed. I received financial support for pond construction. The project



helped me with my first pond, and because of that the district agricultural development office agreed to support my new ponds with USD 1305. I think back to the life before I became involved in aquaculture and remember one time when the bank refused to give me a loan. The man said, "We need to see the money being put to work. It doesn't matter if you have land." Today, I know that my work is being recognized and that attitudes are beginning to change.

#### Outcomes

- The project has relieved some of my financial difficulties and given me confidence to make a better life for myself. I believe that aquaculture is a viable option for farmers like me because it is affordable and manageable, and hard work and early investments mean great profits at the end.
- I have started fish culture operations for the 2014–15 production cycle. In two and a half months of operation I sold 100 kg of fingerlings worth USD 550 and 600 kg of food fish worth USD 1600. I estimate aquaculture will now contribute about 85% of my income in 2014-15. I have begun selling my produce at the local market and am hoping to expand my current business to other cities such as Pokhara and Kathmandu

#### Most significant change

Because of the ANEP, I am now involved in fish culture that is profitable, less risky, and easy to manage both in terms of time and physical work. To be able to earn a livelihood at my age is not a small thing and I am working hard and doing it successfully.

MSC story domain: Technological advancement and change in productivity, income and food security



Basu Dev Paudel showing carp fishes caught from his pond.



**Indra Bahadur Kunwar**

**Age:** 65

**Education:** 8th class

**Lives in:** Jahada VDC, Ward No. 3, Dhanewa village, Nawalparasi district

**Household members:** Wife, two sons, four daughters, one daughter-in-law and one granddaughter

**Pond size:** Two ponds covering total 0.08 ha

**Main household income sources:** Government pension, rice and fish farming

**Annual household income in 2013:** USD 4735 (USD 4210 is from remittance)

**Contribution of aquaculture to income:** 4%

## Aquaculture is good for me

**Aquaculture is good for me; it is feasible for an old man such as myself, and my wife and I can work and still make profits. Many years ago, my son dug a fishpond near our home and reared catfish, feeding them vegetables from the house. I remember this now and I keep learning about fish culture. I want to create something that my sons can take up later.**

### Before the project

At the time the project began, I had been retired for 3 years and was using traditional methods to grow rice on my land. My sons were working abroad and my daughters were all married, so it was just me and my wife staying together. While there were a number of projects working in the community, these were mostly directed at women and children. None dealt specifically with the technical development or training of farmers.

The first I heard about the ANEP from a fellow member of my community, Mrs. Ranjana Lohani, who called a meeting in the village to introduce the project and its officers. I was interested in the different approaches to agriculture that were discussed, such as rice, vegetables, fish and nutrition, and I decided to learn about new techniques and methods so that I could use them in my own field. After a group was formed, I became an active member. The group has been having monthly meetings ever since.

### Main constraints: Why the change did not happen before

There is poor government investment in rural agriculture, and what little activity is ongoing lacks resources and is understaffed. If we visit government offices, for instance, one man is in charge of huge areas and it is impossible to meet with the officer when you need to. This is also because agriculture is still not seen as a priority, and there are few training and learning opportunities for farmers.

### After the project

My sons initially told me to start with two ponds, but I wanted to see how I could manage before putting in more money. I started with one pond that covered an area of 0.04 ha, while continuing to farm rice on the remaining plot of land. I began farming a variety of vegetables along the dike, which is something I had never done before. The experiment was

successful. Before, the plot would produce a maximum of 200 kg of rice and generate a net income of USD 37. I produced 118 kg of fish, from which I earned USD 170 in that same plot of land. This success encouraged me to do more, and I decided to build a second pond next to the first.

In addition to training sessions organized by the project, I had the opportunity to go on field visits to both Chhapiya in Rupandehi, Nepal and various sites in Barisal, Bangladesh, where I saw both the scale at which aquaculture could happen and new technologies that I had never seen before. Following the visit to Bangladesh and training in nursery management, I decided to use both ponds as nursery and grow-out with the aim of generating higher profits and providing fingerlings to farmers in my area in the years after the project phased out. I am someone who wants to try things that I learn. Even though I don't have the amount of land to replicate everything, I intend to keep trying and learning as I go. I am also keen to stock indigenous species and local varieties, which I feel would be greatly beneficial for nutrition.

### Outcomes

- I have limited education and poor scientific knowledge, so the project improved my knowledge considerably. I have learned that for fish, just like people, feeding and maintenance is crucial for good growth and development.
- I have more visitors at my house now, which I enjoy greatly. We discuss and learn together. My wife is more involved in my comings and goings and we both share my experiences with other aquaculture enthusiasts and learn together.
- Every month, the fish farmers group collect USD 1.05 from each of its members, which the women in the village manage and loan to those in need. The community has also begun a collection center that the project manages and maintains to support fish group members.

- People want to work together more now that there is a common interest, and the rates of sharecropping in the community have gone down significantly.

**Most significant change**

To be able to do this at my age motivates me to keep trying and do more. Now others are seeing me succeed and are trying new things as well. A lot of what we knew was traditional knowledge. Children in the past didn't know about things such as basic nutrition and good eating practices because their parents didn't know about them either. Now people know more and want to know more, so they participate more and try and learn.

MSC story domain: Technological advancement and change in productivity, income and food security



Indra Bahadur with his dike plantation.



## Khem Narayan Tharu

**Age:** 54

**Education:** 8th class

**Lives in:** Jamuniya VDC, Ward No. 2, Parshauni village, Nawalparasi district

**Household members:** Mother, wife, three sons, three daughters-in-law, two grandsons, two granddaughters

**Pond size:** One pond covered an area of 0.06 ha (Another pond was constructed which is 0.27 ha)

**Main household income source:** Aquaculture, sugarcane and vegetable farming

**Annual household income in 2013:** USD 2412

**Contribution of aquaculture to income:** 12%

## Working at home is better than working abroad

**Within three months, I learned so many things about different technologies that it felt like I did a PhD in aquaculture. The other day, my son was telling me, Bua, this year we have all flown in planes, even you to go to Bangladesh. We will come back and help you with your ponds. It is better than working abroad.**

### Before the project

In my youth I was an active politician. I would be out of the house 28 days a month. If I wasn't taking part in political discussions, I would still be outdoors, hanging around the market or chatting with neighbors. I farmed sugarcane commercially and sold rice, but I had sharecroppers to do my farming, and almost all my land was leased out.

I like eating well and I have always liked fish. When I was younger, I would fish out of the canals and have them prepared at home. I remember once I fished for 27 days straight, catching about 2 kg of fish a day. As a child, my father told me that the local fish in our community were nutritious and I took his advice to heart. When I was 14, I wove my own net to catch fish during the right season. However, I had never had any training in aquaculture, nor had I considered it as a professional activity prior to ANEP coming to my community.

The project came to our village development committee in April 2012, and the facilitators gave us details about the fish and vegetables components. They emphasized diet diversity from a nutrition perspective and this reminded me of what my father had told me many years ago. I was eager to learn more.

One of my nephews, Ishwari Chaudhary, had done training at the village development committee and earned a lot of money from his pond, so it seemed more profitable than rice farming.

### Main constraints: Why the change did not happen before

I knew about the profits from aquaculture, but I didn't have any support. I wasn't able to start on my own. None of the government initiatives reached me.

### After the project

I signed up in 2012 and later became the president of the fish thematic group. The project provided training in different

issues ranging from aquaculture to nutrition. These included feed management, stocking, and dike cropping. Dike cropping was entirely new to us. We only grew pulses in this village. No one here used to culture small, indigenous fish species either, and although people ate them, they were unaware of their nutritional value. The project provided the nutrition training that disseminated this knowledge. We were also trained in business development and networking through the participatory market chain approach, which is a group-based approach to identify market problems and to link the farmers with market actors.

The project arranged many exposure visits to fish producing areas in Nepal and Bangladesh. I took part and feel like I learned a great deal. I visited Chhapiya, which is known as mini-Bangladesh because of the successful aquaculture initiatives of the village. There, I met Punya Chaudhary, who started with a 0.03 ha pond and USD 333. Now he has over 4.06 ha of ponds. I saw how they were protecting pond dike slopes by covering them and reducing erosion; using aerators, high-protein floating pellet feeds and the tube wells for oxygenation. I also visited Bangladesh in February for 8 days. I went to Barisal and Patuakhali. I saw the super-intensive *pangasius* culture, mola culture and the use of power-operated feed machines.

### Outcomes

- I didn't know much about the nutritional aspects of vegetables, but now I can tell you how to make soups using small fish for both infants and new mothers.
- In 2013, I produced 228 kg of fish and received an income of USD 285. The amount of small fish I produced in my pond was about 15 kg, which my family ate.
- Now I grow green vegetables. In 2013, I produced 80 kg of vegetables on my pond dike worth USD 30, which was all consumed by my family members.

- I know about formulated feed and technologies such as feeding trays, which save almost 50% of the feed. I also know about stocking density, fertilization and disease management for aquaculture.
- I ordered an automatic feed machine; 40% of the cost was borne by the project and I am in the process of setting up an electricity line to begin a fish feed business. I realized that if this business expands, it will be a good service for my community, and will expand my own business as well. The project beneficiaries already know about my feed machine through the fish group meeting. They started asking me when I will be able to supply them with feed.
- I intend to buy a van to transport my wares around the village and beyond. I think it will be a good investment since fish is highly perishable and I am also getting older.

#### **Most significant change**

The biggest change in my life is the increased income and improved nutrition of my family. The income from aquaculture has allowed me to invest in my sugarcane fields and an automatic feed machine.

MSC story domain: Technological advancement and change in productivity, income and food security



Khem Narayan Tharu with a handful of fish feed prepared by his feed machine.



## Laxmi Tharu

**Age:** 37

**Education:** 8th class

**Lives in:** Patkhauli VDC, Ward No. 1, Dhanchi village, Rupandehi district

**Household members:** Husband, three daughters, one son

**Pond size:** One 0.61 ha grow-out pond; one 0.05 ha nursery pond

**Main household income sources:** Aquaculture, rice, wheat, vegetables (waiting for the first sale from the products)

**Annual household income in 2013:** USD 2800

**Contribution of aquaculture to income:** 11%

Photo Credit: Ahmed Nur Chowdhury/ANV/WorlFish Bangladesh

## I gained confidence from seeing what others were doing

**When the project came, it changed my life and my family's life. I called my husband back from the Gulf and now we can stay together. I am thankful to my husband and I'm thankful for the family we have built together. I give the credit to ANEP.**

### Before the project

My husband was working in the Middle East and I was living with my in-laws together with my four children. With another son and his family of four living in the same household, I had no decision-making power in the family. Every month, my husband sent USD 110 to my father-in-law. Most of the money went to pay for the education of my children. My father-in-law managed the money, and I never questioned him. I always had to blindly obey my father-in-law. I had no experience of any farm-related work. My mother-in-law was in charge of the homestead vegetables. We owned a small pond of about 0.04 ha, but it was covered with weeds and no one took any notice of it.

I love to organize and participate in group activities so I started to volunteer in social development projects in the village. I became a member of the sanitary latrine promotion group. I led a project for pitching a road in the village and another one for digging a drainage channel. I am also the chairperson of the community forestry group.

When the project first came to our village development committee, the project officers approached me because they knew about me through my social work. When they told me about the project, I was really interested because I thought I could get some technical knowledge and skills in agriculture and may be find a way to make a living from it. The project staff asked my father-in-law and mother-in-law to allow me to participate, and they accepted. After discussing the issue with my husband on the telephone, I decided to join the project.

### Main constraints: Why the change did not happen before

I had no knowledge or experience of fish culture, so naturally I never thought of it as a source of earning money. I never thought that it was something that I could do by myself.

### After the project

I communicated with the project staff and then helped them organize a group meeting in my village development committee in May 2012. As the project focuses on aquaculture, all the members were supposed to have a pond. I didn't have a pond of my own, but I started cleaning up the old pond that was never used. My children helped me. I prepared the dike according to project specifications and planted vegetables.

When I started culturing fish and growing vegetables, people started to take notice of my work. They began to realize that I had the technical knowledge and skills to do aquaculture and dike cropping. This made me feel confident and happy. We never kept records before, but that pond had never produced much in the past. We would only harvest fish a few times a year when we had guests. In the last production cycle with new methods and improved practices, we produced 217 kg of fish and we were eating fish at least once a week. As a result of the improvements, income from my pond increased to USD 375 in 2013, compared to USD 36 in 2011 before the project.

I called my husband and told him that I wanted to pursue aquaculture seriously. He supported me fully and agreed to come back and help me. He came home in April 2013 and by November, the family decided to divide the property. My husband and his brothers moved into their own homes and took individual responsibility for different lands. My brother-in-law got the rights over our old pond.

Because of my training and my work in the old pond at my in-laws, I was confident that fish culture was more profitable than rice or wheat. I also took part in several visits organized by the project and learned from the successes of commercial farmers in other districts. I proposed to construct a new pond on our land and my husband fully supported the idea. We dug a 0.61 ha grow-out pond and a 0.03 ha nursery pond and stocked them with fingerlings. I mainly look after the pond but my husband

always helps me when I need it. When I am busy with the pond or attending training, he takes care of the children. This is a great help. He doesn't regularly attending the training sessions, so I always share what I am learning with him. I am now waiting for my first catch to see how much we make from it. My husband and I have decided that we will construct another pond of 0.34 ha next year.

#### Outcomes

- In the extended family, I had no decision-making power. Now I have my own family and make my own decisions; I also have my husband's confidence.
- My in-laws never paid me any attention before, but now they copy anything I do in my pond.
- The local agricultural office has recognized me as a good farmer and has given me 10,000 fish fry to stock in my nursery. I was appointed as a subject matter specialist trainer on fisheries by the village development committee. I am also a member of the project thematic group.
- I am now very conscious about nutrition. I know how to wash, cut and cook vegetables and small fish to maximize their nutritional value. I know the importance of using iodized salt.
- I had no experience of horticulture. Now I know how to grow green vegetables on the dikes and make money by selling them. I also save money by not buying vegetables from the market.

#### Most significant change

For me the most important change was the confidence I gained from visiting the commercial fish farms in other areas. By watching those farmers, I had the confidence to call my husband and ask him to come back and work with me.

MSC Story Domain: Women's participation and changes in status and recognition in the fish-farming community



Laxmi Tharu and her husband with their new fishpond.



## Gomati Tharu

**Age:** 45

**Education:** 3rd class

**Lives in:** Patkhali VDC, Ward No. 1, Dhanchi village, Rupandehi district

**Household members:** Husband, three daughters, one son

**Pond size:** Three ponds totaling 0.25 ha

**Main household income sources:** Rice, wheat and fish farming

**Annual household income in 2013:** USD 1830

**Contribution of aquaculture to income:** 52%

## We are a happier and healthier family

**The project went door-to-door, village to village, created awareness and provided support. For all this hard work and sincerity, I am grateful.**

### Before the project

Before I joined the ANEP, my daily activities were no different from any other typical Nepali housewife. I helped with seasonal rice and wheat farming by preparing the seed bed, transplanting the seedlings, hiring laborers for harvesting and cooking for them. My husband took the crops to the market to sell.

I had two ponds, one of which was constructed with a government subsidy. The district agricultural development office issues a notice when such grants are available. I applied for one and the district committee selected me. They gave me USD 189 to construct a pond of 0.19 ha. Later, I constructed another one by myself. I constructed my third pond after I joined the project. Although I grew fish in my ponds, I did not have a good understanding of the technical aspects. I attended a short aquaculture training course provided by the government, but that wasn't really enough and there was no follow-up. I had no idea about quality fingerlings. I used to collect fish seed from a nearby nursery and stock them in my pond. Applying feed such as rice bran and mustard cake was my main post-stocking management practice. My husband eventually gave all the responsibilities for fish to me, but he was not happy as it wasn't very profitable.

I came to know about the project in May 2012. The social mobilizers from the project came to the village to form a group. When I heard that they would provide aquaculture training, I became interested in joining the project.

### Main constraints: Why the change did not happen before

I had no idea about improved aquaculture technologies. The existing government agricultural services are not very easy to access. They do not come to our houses like this project does. For women it is very difficult to visit government offices frequently because of the demands of household work.

### After the project

After joining the project, I received training in many areas. The training was useful because it was conducted in the village, so I could manage my time better and learn a great deal. The nutrition training by Save the Children was very helpful. They talked about family health care and nutrition. A lot of important information was given about the nutritional needs of infants and pregnant and lactating mothers.

We learned about the importance of vegetables and small fish. The aquaculture training was really helpful, as it talked about fish culture technologies and post-harvest management and marketing. The training sessions helped build my confidence and knowledge about what I was doing. I would share what I learned each day with my husband, who did not have time to attend the training, but this enabled him to learn as well, so we were able to work on the pond and sell our products together.

The project linked me with market actors, which helped me to sell fish from my home for the first time. The project staff gave me a list of all the market actors with their mobile numbers. I can now plan when to harvest fish based on the market price. I can now collect information about where to go to purchase inputs. This helped me to manage my time efficiently and I can now give time to my family and can take care of my children.

I bought a hand-operated feed machine with the help of the project. My husband helps me prepare pelleted feed. I stocked large-size fingerlings and applied pellet feed, and fish production has improved a lot. I got 500 kg of fish from my 0.19 ha pond in 2013-14, compared to 100 kg from 0.09 ha of pond before the project, and a net profit of USD 950 from fish in the previous cycle. I grow green vegetables on my pond dikes. I received a net profit of USD 45 from vegetables. This year I installed a cage model in my pond, which my neighbors saw in Bangladesh. I installed the system to produce large-size fingerlings for my pond and to sell the surplus to the community members.



### Outcomes

- I now have my own source of income.
- With USD 550 from my earnings, I am constructing a two-room farmhouse near the ponds. My house is almost half a kilometer away, so now I can stay near the ponds and manage them better. My husband is supervising the construction of the farmhouse.
- I am receiving more respect from both my family and neighbors.
- Now I know a lot about aquaculture. I know netting teams and buyers who will come to my doorstep and pay me in cash. I know where to go for help and information if there is any disease in my fish stock. I can handle all of this by myself.
- I know the importance of vegetables and small, indigenous fish species for nutrition. Now we have fish three to four times a week. Before, it was less than once per fortnight.
- Pond dike vegetable farming is becoming popular in my area. My neighbors are starting to follow my example and they often ask me about different techniques.
- I am now more confident and have more exposure to the outside world. I talk and interact with more people. Before, my in-laws would not allow me to go out in front of a strange man. Now, I talk to whomever I want without any problem.

### Most significant change

I used to be confined to the house. I had no reason or opportunity to go out and interact with the world. Now my family and society think differently about me. They know that I am working and making money and that I need to talk to people and go to different places for that. Now I can go out, learn, observe and come back to try out the new lessons on my own. We are now a happier and healthier family. My husband is eager to help me with my pond work.

MSC Story Domain: Women's participation and changes in status and recognition in the fish-farming community



Gomati Tharu and her family working together to adopt new aquaculture technologies - dike plantation, IFCAS and an oxygenation pump.



**Shobha Regmi**

**Age:** 44

**Education:** 6th class

**Lives in:** Jahada VDC, Ward No. 9, Bhatauliya village, Nawalparasi district

**Household members:** Husband, two sons

**Pond size:** 0.04 ha

**Main household income sources:** Rice, fish and vegetables farming and nonfarm income

**Annual household income in 2013:** USD 2208

**Contribution of aquaculture to income:** 10%

Photo Credit: Ahmed Nur Orko/CGIAR/IAS/WFP/Fish Bangladesh

## I believe in my strengths

**Fish farming is good for women. They can work on their ponds every morning and evening, without having to do heavy manual work or travel great distances. They have the potential to earn money for themselves and improve their own and their family's nutrition.**

### Before the project

Women in my community are most involved in on-farm activities. A brick kiln nearby means most of the men work there, and many of the young people have left for higher education or to work abroad. There was a goat-rearing project in the past, but I was not involved. My husband was ill, and I had two small children to take care of and buffalo to rear. Eventually, I sold the buffalo and started to rear goats because it was difficult to manage my time once my husband started work in the brick kiln and the children had to go to school. I have always been interested in vegetable farming because my father grew vegetables. We never had to buy them as my father had always produced enough for us to eat.

I learned about the ANEP from Ranjana, the project social mobilizer. She knew about my interest in vegetable farming and encouraged me to take it up so that I could make some profit as well. I discussed the new rice technology with my husband, but he thought it was risky since our fields are scattered.

As a child, we always had fish. My husband fished in the nearby rivers, and so we decided that a fishpond would be a better alternative. Ranjana encouraged us to dig a small pond with support from the project. We spent USD 115 to construct the pond. I have successfully grown orange sweet potato on my pond dike with support from the project.

### Main constraints: Why the change did not happen before

There was a lack of resources for many people who were interested. Farm plots are small and scattered and there is a scarcity of water, so people have a very difficult time managing whatever activities they have begun.

### After the project

Because of the training I received under the project, I am now much better informed about nutrition, and I want to produce vegetables and fish for my family. In the training sessions and

thematic groups, issues such as pesticide use, cooking practices, sanitation and hygiene, and neonatal and postnatal care were discussed. After the initial investment of constructing a pond, it is easier to grow fish than manage livestock. I don't have to lift heavy loads. I can do the activities without the support of my husband, although he is always eager to help. The project has taught us about dike vegetable technology, which has enabled us to diversify our diets even further and increase our profits. I grew the CIP440267 line of orange sweet potato on the pond dike. Although it was attacked by rats I was still able to produce 8 kg of orange sweet potato from about 7 m<sup>2</sup>. I frequently harvest the leaves which are eaten by my family as a green vegetable.

I have the mobile phone numbers of all the vendors. I can easily communicate with them by mobile phone for buying or selling my products. I now get market information from them and can decide when to harvest fish and vegetables for selling. The project staff are very cooperative and supportive. They provide training and come to my house to ask me if I need any support.

Most of the members in my fish farmer group are women. I have taken part in several trips to other communities to learn about fish and vegetable farming. Traveling was a completely new experience for me. I have been able to share my experiences and the things that I have learned with other women farmers. Women are now working together more than they used to, to use what we have learned; our husbands support our initiatives, as they believe us to be more capable because of the skills that we have learned. We often organize informal lesson-sharing sessions to discuss our problems. If the problem is serious, we call project staff to attend our discussion.

**Outcomes**

- I have learned to deal with setbacks and make decisions for myself. After my fish were stolen on several occasions, I added new fingerlings and watched the pond day and night, resulting in a profit of more than USD 207.
- I never leave the home without feeding my fish first, as I know that it is my commitment to my work that brings results in the long-run.
- I have grown fish. I have eaten what I have produced and sold it. I no longer have to ask my husband for money every time I need it, and I know how to keep my family healthy.
- I believe in my strengths and know I can do something. This opportunity has helped build up my self-confidence.

**Most significant change**

I am now engaged in a profitable activity that I can manage myself and benefit from, both financially and in terms of health of my family.

MSC story domain: Women's participation and changes in status and recognition in the fish-farming community





## Amrish Patel Patanawar

**Age:** 42

**Education:** 12th class

**Lives in:** Palhi VDC, Ward No. 1, Palhi village, Nawalparasi district

**Household members:** Wife, one son, one daughter, father

**Pond size:** Two brood ponds (total area 0.20 ha); 12 nursery ponds (total area 0.87 ha)

**Main household income sources:** Hatchery and combined harvesting machine

**Annual household income in 2013:** USD 30,000

**Contribution of aquaculture to income:** 80%

Photo Credit: Ahmed Nur Okor/CGIAR/IAS/WorlFish/Bangladesh

## My life before and after is as different as day and night

**I realized that new knowledge and technologies are a lot more valuable than straight cash. I started thinking about long-term market development, trying to win the hearts of my clients. This is the basis for a sustainable business. The investment is secondary; you can always recover it if your clients are there.**

### Before the project

I started my hatchery business in 1999. In 1997, I had three ponds where I grew fish for my family. There was only one hatchery in the village, and the owner sold fingerlings for USD 0.005 each. He suddenly quadrupled his price, asking USD 0.02 for each fingerlings. I was outraged. I crossed the border to India and bought my fingerlings for USD 0.002 each. I realized that this was a good business opportunity and started thinking about having my own hatchery.

I first tried my hand at raising hatchlings in 1998. I bought a liter of spawn and released it into the pond. But as I know nothing about aquaculture, I put 50 kg of lime and 50 kg of urea in the water and killed all the spawn! The next time I went to India, I met with Dr. Sanjay Shreevastav, an expert. He taught me how to manage a nursery pond. I came back and wanted to start a nursery, but my family members were strongly against it. They thought it was a foolhardy project. By this time, I had gotten married. I used the dowry money to buy hatchlings. I made a profit of USD 450 by selling them later as fingerlings. I convinced my family about the profitability of a nursery business, and they helped me to dig three more ponds. However, importing hatchlings from India was difficult and risky. That's why I wanted to start my own hatchery. I went to Dr. Shreevastav's house and learned how to run a hatchery by watching him. Then in 1999, I constructed a 10,000 liter overhead tank and started my own hatchery.

Before I joined the ANEP, I was earning around USD 16,600 annually from my hatchery and nursery. I joined the project in June 2012. I learned about it from the district agriculture development office. I was already in the business, but I thought that there was still a lot about aquaculture that I did not know and it might help me out with more advanced technologies and knowledge.

### Main constraints: Why the change did not happen before

I did not have the knowledge of modern hatchery management and fish breeding techniques that I saw in Bangladesh.

### After the project

Through the project, I went to Bangladesh twice and learned a lot about hatchery management. On the first visit, I went to the Bangladesh Fisheries Research Institute in Mymensingh where I saw pearl culture for the first time, which was really interesting. Dr. Gulam Hussain, the former director general of the institute, taught me about fertilization of common carp, how to separate eggs using milk, and how to culture monosex tilapia. I also visited a hatchery in Mymensingh, and the owner, Mr. Kadir, taught me a lot of useful techniques for hatchery management. I learned about using small hatching jars to get better production and management of hatchlings rather than using big incubation tanks as we were doing in Nepal. These two people really increased my technical knowledge of hatcheries and fish breeding.

During their visit to Nepal, Dr. Gulam Hussain and Mr. Kadir noticed that inbreeding was a major problem in my hatchery. According to their suggestion, I collected 60 good quality silver carp, bighead carp and common carp brood fish from Janakpur, which is 360 km from my hatchery. I planned to change my brood stock with pure line fish species with support from the Bhairahawa Government Hatchery to maintain quality and increase production. I also learned how common carp spawn naturally in ponds on water hyacinth roots, how to remove the hungry parents after breeding to save the eggs from being eaten, use a hapa net inside the pond, and how to remove harmful gases from the pond bottom with a simple rope and weight design. On my second visit, in Barisal, I saw automatic feed machines and aerators and commercial pangasius culture.

After the Bangladesh visits, I used milk during common carp breeding to improve my hatchling survival rates. I also applied many of the different techniques I had learned. On my return from the Bangladesh trip, I asked a local engineer to make me a feed machine. He was also taken to Bangladesh by the project to see these machines and now he is making them for the farmers in this area. I also ordered an aerator. The project is providing 40% of the funds for the feed machines and the farmers are coming up with the rest.

After seeing all these technologies in action, I was so convinced of their usefulness that I took a USD 22,200 loan and invested another USD 44,400 from my own savings to create a new three-story complex that doubles as a hatchery and my residence. The use of all of this knowledge and these technologies significantly improved my hatchling survival and fingerling quality. Within a year, my annual income jumped from USD 16,000 to USD 24,000.

The project also increased my market by introducing me to many of their farmers. Because of the project, I had a 60% increase in my customer numbers. Whenever the project arranges an event with the local farmers, they call me up and introduce me to them as a supplier of high-quality fish seed. This has helped to increase my market a lot.

I also became a member of the thematic group, and the villagers chose to set up a feed machine at my place so that I can operate a one-stop service station on aquaculture. I am the biggest supplier of hatchlings and fingerlings to all the nursery owners and fish farmers in this area. I always provide them with technical information about fingerling management. I advise them to stock fingerlings that are about 6–8 inches in length. If I don't have fingerlings that are sufficiently mature, I send them to other hatchery owners who do. As mortality is a problem during transportation of large-sized fingerlings, I always try to provide them some extra fingerling to minimize the risk.

I have two dreams for the near future. The first is to try pangasius culture. The difference in temperature between Bangladesh and my area is just 2°C. I feel that there's no reason why I cannot successfully grow pangasius. I also want to try pearl culture.

### Outcomes

- The community exposure provided by the project helped me set up both forward and backward links for my expanding business. At the same time, the project farmers have found a reliable source of hatchlings and fingerlings in my farm.
- The visit to the Bangladesh Fisheries Research Institute and Kadir's hatchery had a significant impact on my plans. The experience of that visit and the firsthand knowledge I gained gave me the courage to invest USD 66,000 in a new hatchery complex.
- The introduction to new technologies such as automated feed-making machines and aerators gave me the idea of adopting these for my hatchery.
- I now have hands-on technical knowledge of fish breeding, hatchery management and fish grow-out, so I can give practical advice to fellow fish farmers to reduce fish mortality and improve production.
- Improved management and breeding techniques have increased my earnings significantly. This has allowed me to expand my business and provide services to a larger number of farmers. My customer base increased to 3500 in 2014 compared to 2200 in 2011.
- I now plan on introducing highly profitable tilapia, pangasius and pearl culture.

### Most significant change

The biggest change in my life was how my thinking changed after the visit to Bangladesh. I started thinking more in terms of creating a market and expanding my services. Instead of being a farmer, I started thinking like a businessman, thinking in more commercial terms. I started thinking about promoting my services, creating new opportunities and adding value to my existing ones.

MSC story domain: Participatory market chain approach and change in market access for the poor



Ambarish Patel standing in front of his hatchling tanks with an oxygenated bag of fish fry.



## Rabindra Kumar Sahani

**Age:** 29

**Education:** Bachelor's degree

**Lives in:** Palhi VDC, Ward No. 2, Mandir Tole village, Nawalparasi district

**Household members:** Father, mother, three brothers, sister-in-law, wife, one son, one nephew

**Pond size:** Three brood ponds (total area 0.33 ha); 10 nursery ponds (total area 2.00 ha); One grow-out pond (total area 2.67 ha)

**Main household income source:** Aquaculture

**Annual household income in 2013:** USD 11,000

**Contribution of aquaculture to income:** 100%

Photo Credit: Ahmed Nur Chowdhury, WorldFish, Bangladesh

## Using new technology has boosted my customer base

**This project has given a lot of assistance to farmers. Project staff taught farmers new techniques for profitable fish culture in very small ponds. A great many new ponds have been constructed, which has increased my customer numbers. I want to thank the project and I hope it will continue in our area.**

### Before the project

Aquaculture is a family business. My father started the hatchery and table fish-farming business 42 years ago. Ours is the oldest hatchery in this region, and everyone knows us by name. I have built on my father's business and expanded it. I ran the hatchery in the traditional way, without any oxygenation techniques. I also raised fingerlings of different species together and sold them to the client as a mixed batch. I always stocked small fingerlings, as I could sell them off quicker without having to wait for them to grow. This reduced their survival rate a lot. Of course, back then I thought that was normal.

I joined the ANEP in the second year in 2013. They were talking about new aquaculture technologies and that was an obvious attraction for me. I'm also a member of the thematic group, which helped link me with farmers and other market actors.

In 2013, I took part in some training sessions offered by the project on fish farming and hatchery and nursery management and business plan development. I received training on stocking size and density of fingerlings to increase survival and growth. I also learned to raise fingerlings of different species separately, which ensures that the client gets exactly what he or she wants.

I also went to Bangladesh twice on tours organized by the project and learned a lot about different technologies that improve fish survival and production rates. I went to see hatchery operations in Mymensingh and Barisal and visited the Bangladesh Fisheries Research Institute.

### Main constraints: Why the change did not happen before

I did not know about modern aquaculture technologies. No one in my area knew about them. Also, I didn't really have a platform where I could interact with large groups of farmers, so I could not increase my client base so rapidly.

### After the project

After the training and visits, I implemented many of the new technologies that I learned. For example, in Bangladesh, I saw aeration towers and how they improve the survival rate of hatchlings. I now have an aeration tower in my hatchery. I also saw how to use a heavy dragnet to release toxic gas from the bottom of the ponds and how to rinse common carp eggs in milk to improve their survival. This was a technique Dr. Gulam Hussain, former director general of the Fisheries Research Institute showed us in Bangladesh. Implementing these technologies has boosted the hatchling survival rate and allowed me to increase the stocking density.

The ANEP has helped me to increase my client base by regularly introducing me as a service provider to its member farmers. Because of this network, my client base has increased by 20%. Now I know how to prepare a business plan. This helped me to plan how I can best use my resources to get maximum benefit. The participation in thematic group meetings gave me a better idea of clients' attitudes and demands. From last year I started producing large-size fingerlings because of project farmer demand. This year, other farmers are also demanding large-size fingerlings. I observed during the last year that farmers' negotiating power has improved, which on many occasions impacted negatively on me as they are not ready to pay the higher prices for the large-size fingerlings. This production cycle, we reached a consensus about pricing large-size fingerlings and discussed with other hatchery owners and farmers in the area. Farmers agreed to pay the new prices, but not the price I wanted.

### Outcomes

- Because of the new technologies, my hatchling survival and stocking density has increased.
- The market links and exposure that I received through the project has increased my client base from 500 customers to 900; there are about 150 project farmers among them.
- I can help the farmers in my area by giving them technical information that I learned from the ANEP.
- Maturing and raising fingerlings of different species separately has improved the quality of my product and increased my reputation and client satisfaction.
- I used to pump fresh water from the tube wells into the ponds to increase the oxygen in the water. The pump required a lot of fuel and was expensive. I spent USD 450 to 550 annually just on fuel. Now I use the dragnet technique of releasing toxic gases and the aeration tower, and my cost of oxygenation has gone down by almost 80%.
- Before the project, my annual income from the hatchery was USD 4450. Because of the improvements, last year I earned USD 7770.
- I have invested the extra income in expanding my business by buying new land and digging a new 0.17 ha pond.
- The big grow-out pond I have is leased from the village development committee. The rent is quite high, and so it was a risky business. All this new knowledge has helped me manage it more effectively and reduce the risk of loss.

### Most significant change

The use of an aeration tower is the biggest change for me. Out of all the technologies, this one has contributed the most in improving the hatchling survival rate and increasing my income. This has positively improved the number of customers, as they observed that I am using improved technologies for better fingerling quality.

MSC story domain: Participatory market chain approach and change in market access for the poor



Rabindra Kumar Sahani standing in front his hatchery with a ready to sell oxygenated bag of fish fry.



## Chitra Rekha Tharu

**Age:** 50

**Education:** 8th class

**Lives in:** Patkhali VDC, Ward No. 5, Sapahi village, Rupandehi district

**Household members:** Husband, one daughter, one son, one married daughter

**Pond size:** Five nursery ponds and total area covered 0.25 ha; One grow-out pond, total area 0.20 ha

**Main household income sources:** Fish nursery, fish culture and mushroom farming

**Annual household income in 2013:** USD 3680

**Contribution of aquaculture to income:** 80%

## Now I have an identity

**We have a proverb in our area that states that the women are not meant to have any identity of their own. They are someone's mother, wife or daughter. But through my nursery, my reputation has grown so much that people now identify my husband and my children through me. I take pride in that.**

### Before the project

Ten years ago, my husband went to the Middle East as a manual laborer. Due to his hard work, we have had a decent income. He would send me USD 315 every month. Other than that, we had some agricultural land where I grew rice and wheat. I earned around USD 580 annually from these crops. We were a happy family. Our only regret was the separation that we had to contend with because of his work. He often talked about coming back and starting up a business together, but we could never decide what to do. We had no knowledge or experience.

I was part of the Manakamana Women's Group, which had 47 members, and we were maintaining a community pond in a neighboring village. I had received some government training in aquaculture in Janakpur through this network, and was discussing with my husband that this might be a business opportunity for us. In 2011, the government fish mission program announced that it wanted to support farmers interested in aquaculture, so with some other farmers in our district, I sent an application and it was selected. With that grant and a USD 4200 loan from the bank, I constructed two ponds: a bigger grow-out pond and a small one as a nursery. By the end of 2012, I had sold about 120 kg of fish from my grow-out pond. The nursery pond was only for fingerlings for the bigger pond. That was all my aquaculture experience before the ANEP.

I joined the project toward the end of 2012. One of the project officers had heard about me from another farmer. He came to my home one day and really liked my nursery. He talked about how there is a crisis in the supply of good fingerlings in our area and how it might be a good business opportunity for me. At first, I wasn't really sure about the idea. I called my husband, we talked about it and we decided to try it. When the project formed a thematic group in our area, I was selected by the members as the chairperson.

I went to Bangladesh in March 2013 and visited successful nurseries and hatcheries. I also saw the highly profitable pangasius and commercial small, indigenous species culture systems. I was really inspired and wanted to start my own aquaculture project. I had good access to water and two existing ponds, and there was a real crisis of fingerling supply in my area, so there was a good opportunity for a nursery business. I also thought about how much the project had invested in me and wanted to show them that I was capable.

### Main constraints: Why the change did not happen before

I had never come across any training or information that tells you how to run a successful nursery business. Even the aquaculture training I had from the government made no mention of setting up a nursery as a business. I had no idea how to go about finding buyers and selling fingerlings on a commercial scale.

### After the project

After I came back from Bangladesh, I invested USD 550 and bought the first batch of hatchlings and equipment, such as an oxygen tank and packaging materials. The project facilitators took me to meet with local agricultural development officers and present my plans. They were really impressed with my project and gave me additional grant money for the nursery.

The thematic group helped me expand my customer base by talking to farmers across the project areas about the nursery and the quality of my fingerlings. Following a meeting decision, the project staff gave my contact number to their farmers and listed me as a service provider. Even now, most of my regular clients are project trained farmers. One of my biggest hatchling suppliers is also a project farmer. The project has helped me develop market links for all the steps of my business. My husband is very supportive and we do things together. There are many challenges in the business such as setting a price, but it is better managed in the thematic group as it is a platform for both farmers and many of the market actors in the area. We try to reach a consensus through discussion.



### Outcomes

- I now provide fingerlings directly, in oxygenated packs, to around 410 regular clients, of which 350 are project farmers. I earn over USD 2880 a year from aquaculture.
- My husband has come back from the Gulf to help me out in the business, and we make a decent living together as a family.
- I have a solid basis of practical knowledge and hands-on experience of growing fingerlings.
- I share this technical knowledge, such as ideal fingerling size and stocking density, with other farmers. They can use this knowledge to reduce fingerling mortality and make more profit.
- I have a lot of networking opportunities through the thematic group meetings and other cross-visits.
- I plan to set up a hatchery alongside my nursery in the future.

### Most significant change

In the beginning, I had to go door-to-door for information and assistance. Now everyone knows me and people visit me frequently so that they can learn from me and my business. This recognition and respect is the most important change in my life. My reputation is also the biggest driving force behind my business. My clients trust me and can depend on me for the best fingerlings. They know that. That is why this is so important. It also makes me very happy.

MSC story domain: Participatory market chain approach and change in market access for the poor





## Kanai Prasad Maurya

**Age:** 42

**Education:** 12th class

**Lives in:** Devgau VDC, Ward No. 9, Piparhaiya village, Nawalparasi district

**Household members:** Wife, three sons, three daughters, one grandson, one daughter-in-law

**Main household income sources:** Agriculture, renting machinery (combine harvester and tractor) and pond construction using an excavator

**Annual household income in 2013:** USD 18,000

**Contribution of aquaculture to income:** 44%

## I dream of expanding my business

**I have been reminded through the project that innovation and hard work are really important. Most salaried workers do not do more than 8 hours of work a day, but over 2 years, I have seen the ANEP staff do training sessions and demonstrations for what felt like 20 hours a day, 7 days a week. This is why they have succeeded in generating such a strong interest in fish farming. Seeing my success, seven other people purchased excavators, and now I have competition. I will continue to study the demands of the market and make the changes that are necessary for my business development.**

### Before the project

Ten years ago, I was a government service holder, but expenses were rising rapidly and I was unable to meet them. I realized that if I wanted to provide my family with a safe and secure future, I needed to earn more, and not be dependent on a salary. I quit my job and left for the Middle East, where I worked for several years, and was able to save USD 20,000. I then returned home and used this money as capital and bought my first combine harvester. This was the beginning and over the years, I went on to make profit, both from renting the machines and from vegetable farming. In 2012, I owned four tractors, two combine harvesters and was involved in commercial scale vegetable production.

I found out about the ANEP in 2012. The project facilitators arrived in the area to look for farmers who had scaled-up and they had identified me through my vegetable farming activities. I joined out of an interest in the development of our community. I had heard about the vegetable and nutrition training they were going to provide and realized that they would add value to the lives of our farmers. I became part of the thematic group and market planning committee, and received training on the participatory market chain approach. As the project was talking about improving aquaculture, I realized that people were going to construct new ponds and that farmers would need someone to excavate these ponds. The project targeted 414 households in 2013. This was a good business opportunity and at the same time I could provide a valuable service to the community. I thought of investing in an excavator and renting it out to the farmers as needed, and made a business decision to invest in my first excavator for USD 39,474.

### Main constraints: Why the change did not happen before

Aquaculture wasn't very interesting for farmers before, so there was no real reason to invest in something as expensive as an excavator.

### After the project

I dug a total of 127 ponds for the ANEP in Nawalparasi in 2013, including one for my own home. News spread rapidly and many more people became more interested in this technology, and an additional 35 households asked me to construct ponds without project support in the same year. In 2014, I constructed another 42 ponds for interested farmers in the district. I earned USD 7900 from the construction of project ponds alone. Business was booming, so much so, that I decided to make another investment. I realized that my excavator was using a lot of fuel and that I was in a position to replace it, and so I sold it for USD 31,580 and with an additional USD 10,000 I bought a more powerful excavator that uses less fuel.

My work through the project made me a recognizable figure in my community, most of which has been possible through my participation in the market chain approach activities and the business networks with different market actors. The project introduced me to fish farmers and different fish and vegetable dealers from Bhairahawa, and made it easier for me to sell my own fish and other agricultural products at a better price. This helped me to get access to a number of farmers who are interested in constructing ponds for fish farming. My knowledge of aquaculture, gained from participation in meetings and training sessions, also helped me to motivate new farmers in carrying out improved fish farming.

The project took me to Bangladesh in 2014. There I saw the original concept behind these ponds I had been constructing, and the advantages of commercial-sized ponds. I was inspired by a farmer with a half-hectare pond that was growing pangasius, generating a USD 55,000 turnover. Even though I had constructed many ponds by this stage, I came to realize how commercial aquaculture could be even more profitable. The construction of an ideal pond is a big issue in commercial farming. Since returning, I have constructed a 0.17 ha commercial pond for myself and continue to do training with the project to learn how to better manage it. I am confident that it will be profitable.

#### Outcomes

- The new business opportunities presented by pond construction was a huge turning point for me. Over the past 2 years, it has become one of my biggest sources of income. I have also been able to significantly expand my network with different service providers and clients.
- I now have a clear understanding of the benefits of a scientific approach to agricultural systems. I know about many effective fish and vegetable farming technologies and management techniques, and these have enabled me to improve my profits substantially. The project provided both technical and practical knowledge, which has boosted both my skills and confidence.

#### Most significant change

The biggest change in my life was the new excavator service business. It boosted my income dramatically. Now I am dreaming of expanding my business beyond agriculture because of this extra income. I am thinking of setting up a petrol pump and sending my children to the city for higher studies to become doctors and engineers. The project became an instrument for change for my family. My success inspired the opening of other excavation businesses.

MSC story domain: Participatory market chain approach and change in market access for the poor



Kanai Prasad Maurya overseeing a pond construction using his excavator machine and its operators.



## Moti Lal Chohan

**Age:** 51

**Education:** Diploma in Mechanical Engineering

**Lives in:** Padasari-4, Padasari, Rupandehi, Nepal

**Household members:** Mother, wife, one daughter and one son

**Main household income sources:** Manufacturing of agriculture machinery and equipment

**Annual household income in 2013:** USD 12,632

Photo Credit: Farha Khan/Woodfinch

## Opening a new window

**I feel proud to be the first engineering workshop owner in Nepal to manufacture fish feed machines, which has directly supported the development of more high tech aquaculture enterprises in my community. My 1-week visit and training in Bangladesh opened up a new dimension for my business.**

### Before the project

I am the proprietor of New Thapa Engineering, a business that I started in September 1990. I have expertise in manufacturing and maintaining agricultural equipment. Our workshop installs and builds rice processing plants, treadle pumps and micro irrigation machinery. I visited Bangladesh in early 2014 to learn more about feed machine installation and operation techniques. I received training in developing electric and manually operated feed machines, and learned to prepare iceboxes for preserving and transporting fresh fish. As part of the training in Bangladesh, I observed feed machines in operation at farmers' ponds.

### Main constraints: Why the change did not happen before

Before attending the training program, I did not know how to build and run electric or manually operated feed machines, or to prepare iceboxes. Some feed dealers from my area have imported feed making machines from China, but these are costly and have not met the expectations of farmers and feed sellers.

### After the project

Upon my return from Bangladesh, I attended thematic and farmer group meetings and presented material I had learned during the training. I also attended meetings with fish food traders on the post-harvest handling of fish using iceboxes. With my consent, the ANEP staff distributed my contact number to their farmers and service providers, and listed me as a service provider. The project has helped me develop connections with farmers and other entrepreneurs, which has supported the growth of my business. There are many challenges in operating my business, such as setting appropriate prices, but these are better managed in the thematic group, which provides a platform for fish farmers and many other related businesses in the area to interact.

After returning to Nepal I was able to put my training into practice. I received some orders, and started building equipment. My first order was for an electric operated fish feed machine. Thereafter, I received orders for five iceboxes and

8 manually operated fish feed machines, as well as future orders for three more manually operated fish feed machines. Rather than just adopting what I learned, I made a few design changes to the equipment to make it better suited to local use. Following demonstrations of my equipment, people from all over the region began submitting orders and calling me to ask questions.

### Outcomes

- Aquaculture is new in Nepal and is growing; there is strong growth potential for my business in future. Already, I have sold 3 electric and 11 manually operated feed machines and 5 iceboxes, and have orders from farmers for additional feed machines. I expect to earn USD 1000 from selling feed machinery and related equipment in 2014.
- Introducing feed machines and iceboxes has changed my business strategy. I now visit farmers' households and contact them to enquire about their equipment and provide maintenance services. I now have regular contact with farmers, and the increase in demand for my services has increased my business' profitability.
- Based on my experience and expertise in manufacturing agricultural equipment and demand from local feed dealers, I have changed the original design of the feed machines to reduce the electrical load (now it is possible to operate machines using a single-phase electric connection rather than a three-phase connection). I exhibited the adapted model at a fair and received several orders for this machine as a result. This has improved my self-confidence.

### Most significant change

I am now a well-known person within the fish-farming community in Nepal. Because of my expertise in fish feed manufacturing, many national aquaculture stakeholders, international development officials, and representatives of donor agencies have visited my workshop and this has contributed to highlighting my expertise within the community.

MSC Story Domain: Participatory market chain approach and change in market access for the poor



## Jahada VDC, Ward 3, Dhanewa village, Nawalparasi district

**Households:** 80 (approx.)

**Main sources of income:** Agriculture, fishing, aquaculture, other non-farm activities

**Number of ponds:** 52

## We will be a major fish-producing village

**Aquaculture has great potential for young people in this community. Some have already gone into the aquaculture business. All are of the same opinion that these young people will transform the community into a major fish-producing village.**

### Before the project

Dhanewa village is home to approximately 80 households. Many people came to this area after a government resettlement program nearly 40 years ago. They came from all over Nepal, and even abroad and sought a new beginning from older forms of political regime and social differentiation. While the village today enjoys many amenities, paved roads, drinking water, electricity and irrigation facilities, these happened following a period of intense lobbying and hard work by the village residents. This area used to be very dry. The villagers had no water. In those days, people who farmed could barely manage to eat two meals a day. It took almost 20 years for the government to organize a water pipeline through the area.

The ANEP was introduced to the village in 2013. The terrain makes it a suitable place for aquaculture. Many farmers in the village chose to construct ponds using 0.02 to 0.03 ha of land. The boundaries were protected by nets and fresh vegetables were planted on the dikes around the ponds. The project encouraged the participation of the community's young people and the elders in all pond-related activities through training sessions, and encouraged them to take positions of responsibility in meetings.

### Main constraints: Why the change did not happen before

While this was a resettled land, many of its older inhabitants had not received an education due to the lack of facilities. Women, in particular, were unable to access information for this reason. There was also a lack of investment by the government to ensure facilities and support to the farmers living here. There were a few ponds in the village. But the productivity of those ponds was very low due to lack of technical knowledge of the fish-farming community members.

### After the project

The ponds showed high productivity of various fish species. Dike cropping led to successful farming of many types of green vegetables. Both of these developments had a positive impact on the community environment and its members. The

knowledge and skills that the project provided has encouraged more people to participate and work together towards results. In the past, the village had three ponds covering 0.17 ha of land; today this has expanded to 52 ponds with a total area of 3.4 ha. Where these old ponds would produce no more than 0.6 t per ha, this new technology has allowed us to produce 3.0–4.0 t per ha. This increased production has meant that villagers eat fish and fresh vegetables far more frequently than in the past. Farmers can try out different kinds of vegetables almost every month. This is a huge change in our community.

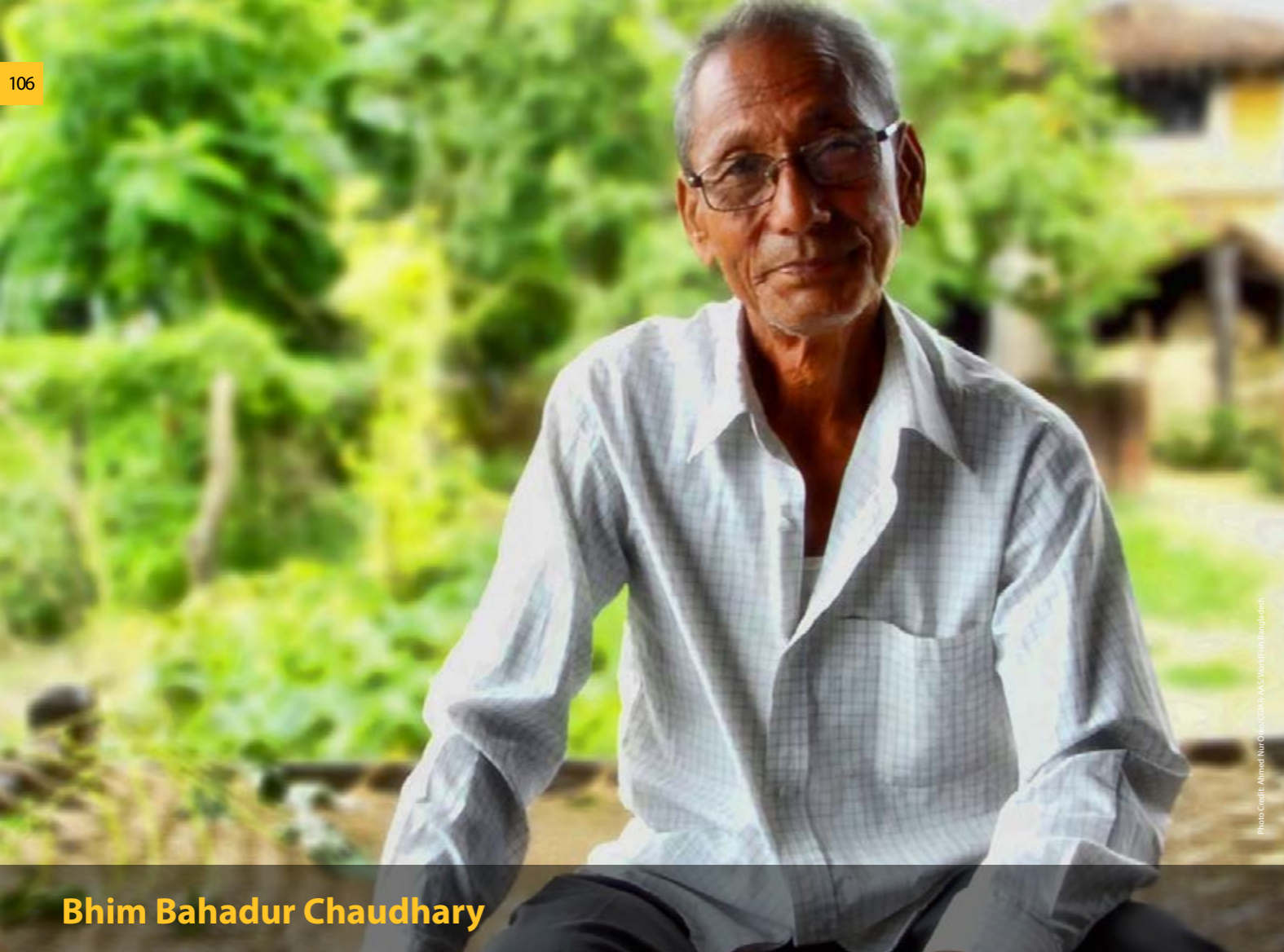
### Outcomes

- The pond number increased from only 3 before the project intervention in 2012 to 52 after its intervention in 2013. Among the pond operators, 49 are also doing dike vegetable cropping.
- Fish and vegetables are now available almost year-round in the local market, compared to a 3–4 month period before project intervention.
- There is increased availability of nutritious fish and vegetables for village households. Among the pond households, 30 are practicing small fish culture and 40 are cultivating orange sweet potatoes. Fish and vegetables are sold and consumed locally, leading to changes in diet diversity among village households.
- There is increased participation by elderly people and women in fish farming and dike cropping activities. Among the pond operators, 50 are managed by people over 50 years of age and 11 are women.

### Most significant change

The project has created a new light in this community. People are now more aware of the technology and nutrition information. Fish is now available most of the year due to the project intervention.

MSC story domain: Technology up-scaling and mass scale awareness



## Bhim Bahadur Chaudhary

**Age:** 64

**Education:** 12th class

**Lives in:** Siktahan VDC, Ward No. 7, Shankarpur village, Rupandehi district

**Household members:** Wife, two sons, two daughters-in-law, one grandson, four granddaughters

**Pond size:** Two ponds covering an area of 0.08 ha, one 0.04 ha pond recently purchased

**Main household income sources:** Crop farming, aquaculture and government pension

**Annual household income in 2013:** USD 2174

**Contribution of aquaculture to income:** 9%

Photo Credit: Ahmed Nur/Oxfam, © 2014, AAS/Worshiping.com

## The knowledge I gained from my research made me more confident

**I am confident that other farmers will like orange sweet potato as much as I do. It's something my grandchildren love to eat. I look forward to continuing with this in the days to come.**

### Before the project

Farming in my community is difficult. The land is dry and water has been a huge problem for everyone. Even with a borehole, it is difficult to manage. Before I became a member of the ANEP, I had constructed a pond and started fish culture, but production was just enough for my household consumption and we never sold any fish. I had no knowledge about managing feed and maintaining the dike.

The village development committee held a meeting in 2012 and I was invited. I was interested in what people would say. During this meeting, project staff explained the project to us and as it focused specifically on work for farmers I decided to take part. The project offered support in different areas, but my wife and I decided on vegetables and fish, as we were more interested in diversifying our diets than focusing on rice. Through the project, I was able to take part in visits to various sites in Nawalparasi, Rupandehi and Chitwan. There I learned about vegetable farming and aquaculture from successful entrepreneurs. This was complemented by the technical training and support provided by the project staff.

### Main constraints: Why the change did not happen before

The main constraints were: lack of technical knowledge of improved agricultural technologies, lack of awareness about nutritious food items, and limited diversification of cropping systems.

### After the project

In 2013, an action research project under the ANEP was looking for four ponds in my village to conduct a study. Since I had taken part in nutrition training sessions, I was keen to take part and learn from this study. I thought that since I was working on my pond every day, it made sense to learn as much as I could and try and diversify my diet even further. Dr. Madhav Shrestha from Agriculture Forestry University appointed Ms. Laxmi Karki to work with us in our village research pond. We worked together in my pond and collected data and recorded growth

of fish and vegetables. I received 80 cuttings of two lines (CIP440021 and CIP440015) of orange sweet potato from the Potato Research Division in Khumaltar, a partner organization in the action research. I cultivated this in two separate areas to compare the growth. In the pond, I stocked 666 Indian and Chinese carp fingerlings and 1 kg brood of small fishes such as mola, *sidra* and *deduwa*.

The action research team provided training on orange sweet potato cultivation and small indigenous species fish farming. I learned that orange sweet potatoes must be planted on relatively dry soil. I took great care to protect the plants from rodents and I was successful. I have also learned how to protect my pond dike by covering it with plastic. I experimented with two lines of sweet potato. I found better production with CIP440021 compared to CIP440015. I harvested 23 kg of CIP440021 from 9 m<sup>2</sup> and 7 kg of CIP440015 from 5.25 m<sup>2</sup> in 2013–14. We harvested more fresh vegetables from CIP440015 than from CIP440021. I learned about dike vegetable farming (which was new to me) and I produced 150 kg tomatoes and other vegetables, such as cauliflower and beans.

In 2012, I harvested 60 kg of carp, which increased to 75 kg after introducing small species in 2013. I kept some brood from the small species in the pond for the next year and still have more after harvesting from last production cycle.

My family has enjoyed eating fish and harvesting it for our friends when they visit, which was a rarity before. For the 6-month season, I ate sweet potato leaves as a vegetable and for preparing *pakodas* at least once every week. I find it to be a very tasty vegetable. I have even developed a nursery for this crop and I have distributed 10,000 cuttings of two lines (CIP 440021 and 440015) to other farmers in Rupandehi and Nawalparasi in 2014 through the project aquaculture officers.

### Outcomes

- I learned a lot from the action research team and project staff about fish culture techniques and vegetable cultivation.
- I sold sweet potato cuttings at a nominal rate of NPR 1 per cutting and believe that it has been a great benefit to many members of the community. I am confident that farmers will come to me for more in the days to come, even after the project phases out. I have plans to expand and set up a fish nursery.
- We have recently set up a cooperative in our community to support the sale of our crops in the future.

### Most significant change:

I worked together with the action research team and learned a lot about modern techniques of fish culture and growing orange sweet potatoes over the last year. My production has increased and diversified. This has greatly increased my sense of self-confidence.

MSC story domain: Technology and research partnership



Bhim Bahadur's granddaughter with freshly dug orange sweet potato.



Photo Credit: Nepjol Bhattachan/Agriculture and Forestry University, Nepal

## Dr. Madhav K. Shrestha, Department of Aquaculture and Fisheries, Agriculture and Forestry University, Rampur, Chitwan, Nepal

**Research partners:** Agriculture and Forestry University, Nepal Agriculture Research Council, Directorate of Fisheries Development, WorldFish and ANEP

**Location:** Nawalparasi and Rupandehi districts

## I will do more collaborative research

**Introduction of the small indigenous species and orange sweet potato was possible within a short time period because of this partnership. We want to express our heartfelt gratitude to WorldFish and the ANEP for assisting us financially to carry out this action research and we look forward to more collaboration in the future.**

### Before the project

Introduction of small indigenous species into a carp polyculture system is not a new concept to me. I was previously involved with a Danida-supported research initiative where we introduced small indigenous species, especially *mara*, *deduwa* and *sidra* into a pond system in Chitwan. It was a successful project, but scaling the technology to the farmers' level was not very impressive. This was mainly due to the lack of availability of small indigenous species seed. Unlike carp or tilapia, it is not readily available in the hatcheries.

The system depends on natural sources such as rivers and canals for seed, which is not always easy to acquire. Huge mortality during transportation of the seed is common. Lack of awareness of the nutritious value of small indigenous species and no real initiative from the research institutes and development agencies are also major reasons for low adoption. Pond dike cropping is also not a new technology in Nepal, but is not widely practiced due to lack of technical knowledge.

The ANEP's aquaculture component offered a research grant to enhance the adoption of small, indigenous species along with carp in pond systems, as well as planting orange sweet potato, which is very nutritious and rich in vitamin A, on pond dikes. The Agriculture and Forestry University, together with the Nepal Agriculture Research Council and the Directorate of Fisheries Development, submitted a proposal to the project, and we were awarded funding. The emphasis was to develop ways to follow through from research to developmental impact, bridging the gap between research and development.

The action research team started work on the basis of a collegial partnership with WorldFish, its partner CEAPRED and other partners. Before the start of the research work, a number of discussions were organized with the farmers to identify the opportunities and risks of small, indigenous species culture and

to gather the traditional knowledge of the community about species management. The lessons were shared among the partners before setting up the experimental ponds. Based on discussions with the farmers and other partners, some revisions were made in the final setup of the experiments.

### Main constraints: Why the change did not happen before

The main constraints were lack of awareness of the nutrition value of small, indigenous fish species and lack of research initiatives by research institutes on indigenous species and dike cropping. We have also not seen any effective initiatives from development agencies to promote these technologies.

### After the project

We decided to work in five clusters: three in Rupandehi (Kadamipur, Shankarpur and Tareni) and two in Nawalparasi (Dhanewa and Bhatauli). Each cluster included four participant farmers, two with seasonal and two with perennial ponds (total 20 farmers). Farmers were excited to have such action research on their farms. They were provided with technical and material inputs, including fingerlings of five carp and three small indigenous species, fertilizers, feeds and fishing nets. In the ten seasonal ponds, five were stocked with carp integrated with small indigenous species, and five with carp without small indigenous species. The same treatments were applied to the ten perennial ponds. The ANEP aquaculture team helped the action research team collect small, indigenous species from their brood ponds, which they established at the village level to reduce the mortality during transportation. The participating farmers were also provided with planting materials for orange sweet potato, which is a completely new variety in Rupandehi and Nawalparasi, in collaboration with the National Potato Research Program and the Nepal Agriculture Research Council. Measurements of samples of carp and small indigenous species were recorded on a monthly basis. Water quality parameters were recorded on a fortnightly basis. This was done primarily by the research staff. Later, the farmers also participated in this kind of record-keeping.



### Outcomes

Results show that culture of small, indigenous fish species is possible along with carp in Nepal. The per capita fish consumption among the participant farmers increased from 2.6 g per person per day to 6.7 g per person per day. The participant households were able to generate an average income of USD 32 from the vegetables cultivated on the pond dike and USD 64 from carp and small indigenous species polyculture. Pond dike vegetable production contributed 13.84% (34.61 g per person per day) to the total *per capita* vegetable requirement for the participant farmers.

The action research team participated in a number of events organized by the project to share important findings of the action research and create awareness about the importance of nutritious foods. The number of farmers practicing culture of small indigenous species increased from 84 in the 2012 production cycle, to 300 in the 2014 production cycle. The action research team distributed orange sweet potato to 20 farmers in 2013. That number increased to 493 farmers in the 2014 production cycle. This huge scaling-up was made possible by the research team and the project team working together to disseminate the technologies.

### Most significant change

We started our research with 25 farmers and now small fish species are stocked in almost all the project ponds. The orange sweet potato technology is disseminated to around 493 farmers, from only 25 research farmers within a year. This change happened through action research and the partnership arrangement among researchers, project staff, and farmers and fostered the process of technology dissemination.

MSC story domain: Technology and research partnership



All development projects want some evidence, some assurance, that the time and money and effort they put into a project was to some degree a contributing factor in the changes observed. If we step back and look at what these stories are telling us, we can discern a number of underlying principles that led to the outcomes we and others have observed as a result of working toward our strategic changes in Figure 3.

### Understand what ‘complex system’ really means

In development, we tend to use the jargon of complex systems, but in fact, few people can actually define what a complex system is. For example, in a complex system, a small change in the initial condition can lead to significant changes in the system (i.e. larger fingerlings, small indigenous species, an exchange visit, a list of phone numbers). In the jargon of complexity theory: interactions are nonlinear: small changes in inputs, physical interactions or stimuli can cause large effects or very significant changes in outputs. Other relevant characteristics of complex systems are outlined below.

- Any interaction can feed back onto itself directly or after a number of intervening stages. Such feedback can vary in quality. This is known as recurrency (e.g. farmers’ own field trials).
- Such systems may be open and it may be difficult or impossible to define system boundaries (e.g. neighboring farmers coming to learn from lead farmers).
- Complex systems operate under far from equilibrium conditions. There has to be a constant flow of energy to maintain the organization of the system (e.g. the ANEP theory of change framework).
- Complex systems have a history. They evolve and their past is co-responsible for their present behavior (e.g. previous projects, farmers’ past experience, past experience of market actors and researchers).
- Elements in the system may be ignorant of the behavior of the system as a whole, responding only to the information or physical stimuli available to them locally (e.g. farmers unaware of local market actors).

Source: Cilliers (1998)

### Practice what participatory agricultural research preaches

Stripped of its jargon, participatory action research (PAR) is not a great mystery. You go to farmers and spend as much time as it takes to understand the realities they live. Go to their homes. Eat their food. Listen. Ask them what they need to raise their standard of living. You address those problems with the most practical solutions you can devise with them as full partners. You look for short-term payoffs and celebrate small victories. This is how you become worthy of their trust. The action research issues addressed by ANEP originated from the project participants in this way, and their opinions were accorded the highest priority the research design. The original model for and use of the integrated floating cage aquageaponics system was modified by farmer participants in action research in Bangladesh. Farmers’ full engagement in the action research team facilitated refining of the technologies in response to local context and needs in both Bangladesh and Nepal, and its adoption by a large number of beneficiaries within a short time period.

### Put the necessary preconditions in place

Without more ponds, nothing would have happened in Nepal, so we invested money in building ponds. Without a list of phone numbers, people would be unable to contact one another. We provided a list. Without family permission and the formality of a group, women would have no ability or motivation to participate. We accommodated local practices and obtained necessary permissions, and set up and nurtured groups. Without new seed varieties, households would not be growing higher yielding orange sweet potatoes. We provided seeds. Some development projects explicitly forbid the “giving” of inputs on the basis that we shouldn’t be giving “handouts” and that farmers must “help themselves”, ignoring the fact that farmers who can help themselves probably don’t need our help. Digging ponds, distributing quality fish seeds, tools and other inputs are not “handouts”; they are, in many cases, “necessary preconditions” without which, little change is likely to take place.

### Keep it simple

Transfer of information has to be in a form that farmers can comprehend and use “right now, right here”. Farmers don’t need to know about the finer details of genetic selection and fish hybridization techniques to improve the survival of fish seed. They need to know: where to go to buy quality fish seed, what the movement of healthy fish seed in a water bowl looks like, how to acclimatize fingerlings before stocking to adapt them to the environment of a new pond, and to stock them in the morning or afternoon to reduce stress. ‘Information transfer’ means telling people enough to ensure a good chance of success, in their native language, in their village or homestead garden or standing on the edge of the pond. In ANEP, we provided special training in each community to lead farmers and market actors on technical issues and extension message delivery. We shifted our role from trainer to advisor and created the scope for these leaders to play the major role in community training, thereby creating a more congenial and effective environment for information transfer to occur.

### Change the context; change gender relations

Changes in women’s status and recognition within a household or a community are very often a secondary outcome of programs seeking to improve productivity and food security through women’s enhanced economic participation. In the case of ANEP, ‘secondary’ in no way implies ‘less important’. Through the local and thematic groups, ANEP created situations that opened up a space for women to participate in activities that contribute to family livelihoods, and then left that decision to family authority figures. Economic incentives are key – in these and many other stories from around the world, we hear and read variations of, “At first my husband/father-in-law/mother would not allow me...and then when they saw the benefits others were getting they changed their mind.” Accommodating the need for family authority figures to be gatekeepers avoids one source of resistance to change, often opening the door to women’s participation. In future, engaging more with women *and men* about the consequences of gender constraints for livelihoods may provide even more space for change.

**Connect technologies and farmers to markets** There is little chance of that technology taking root and flourishing if what the technology produces cannot be linked to a local market chain. To do that, you must include market actors and some

of the better-off farmers. Although our aim is to improve the lives of “poor” farmers, we cannot do that by isolating them from others in the community with more resources. Very often the poor and the “poorest-of-the-poor” are marginalized. To include them, we must include others. However, linking farmers to the market may not always bring the desired result. A well capacitated market actor is required to see the expected change. The aquaculture component of ANEP, not only linked our farmers and technologies with multiple market actors, but also worked for the capacity development of these private sector service providers through training and exchange visits at home and abroad to support the provision of better quality services and products.

**From the independent assessment conducted by an external reviewer:**

The stories of significant changes clearly show that productivity gains were achieved by ANEP. At the farmers' level this is reflected in a transition from homestead-based, subsistence pond production to a more modern, feed-based, market-oriented aquaculture. This involved changes in fish farmed; from wild or low-valued fishes to carps, tilapia and small indigenous species. Grow-out ponds were often supplemented by nursery ponds. This has been achieved through supply of capital goods (e.g. manual and mechanical feed-making machines); and training that also involved exchange visits for sharing knowledge and linking the different agents such as fish farmers and input suppliers. At the input supplier level, it involved modern techniques used in nurseries and hatcheries. This productivity gain has been reflected in improved food security and nutrition. The participants learned about the importance of vegetables (now grown also on dikes) and nutrient-rich, small, indigenous species and orange sweet potatoes. This resulted in increase in consumption and frequency of fish and vegetables.

Grass-roots institutions were developed at village level (farmers' groups), at the intermediate level (thematic groups) as well as at a higher community level in the form of cooperatives. The effectiveness of these institutions is less observed at the highest level. The degree to which this affect sustainability of the project depends on how well the farmer and thematic groups function and how well the market improves its coordinating role as aquaculture evolves. The farmers, particularly in Nepal, have heavily invested in aquaculture. Since fish farming is more profitable than cereal crop farming, aquaculture is likely to continue for some time in the future and will help sustain these institutions.

Behind the significant stories some positive and not so positive elements are either missing or underemphasized. From a positive perspective, the project increased livelihoods diversification of households as they increasingly undertook

new activities. The return of family members from working abroad is mentioned but not emphasized. This is a big change. Similarly, the role of the Nepal Government is underemphasized. They played a commendable role in these significant changes.

Gender issues are not adequately represented, particularly in the case of Nepal. The additional labor required for adopting new techniques was supplied more by women with their husbands playing mainly a managerial role. The impact of this at the household level (e.g. less attention to household work, child care etc.) has to be further investigated. Some farmers, particularly in Nepal, are medium to large farmers and cannot be considered "poor and socially excluded" as required by the project. Some of them, such as Khem Narayan Tharu and Basu Dev Paudel played the role of community motivators. Developing aquaculture in Nepal where households had to incur a higher start-up cost of digging a pond required investment in awareness-raising at the local level.

The consultant's full report is in Annex 1.

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### An independent evaluation of most significant changes case studies of the ANEP

Kazi Ali Toufique, Research Director, Bangladesh Institute of Development Studies

Despite some caveats, some of which can still be addressed, the case studies and field visits strongly vindicate the stories of significant change.

#### Domains of significant change

The case studies are classified into five domains: technology (10), market access (9), gender (7), technology scaling (2) and research and partnership (4). These domains cannot be clearly separated as one domain (e.g. technology) affects another (market or gender) but in each story a dominant theme can be identified. However, the following discussion is categorized into three domains to make it consistent with trajectory of changes as shown in theory of change (TOC) of aquaculture component (Figure 3).

#### Technology

The most significant change that happened to the participants is the increase in fish production brought about by acquiring new knowledge on pond culture. For example, growing small indigenous species (SIS) is a new technology in Nepal and the participants in Bangladesh were not familiar with the benefits of SIS. Most farmers used small fingerlings and learned from ANEP to use larger fingerlings for higher income. The Nepalese farmers were least knowledgeable about modern fish farming and some did not even own ponds. ANEP in Nepal had to construct more than 450 ponds. The participants lacked knowledge in fish farming and pond management techniques. In most cases they grew wild fish in the ponds or stocked them with small fingerlings collected from mobile fingerlings suppliers who sold door-to-door. These mobile vendors were also trained by ANEP. The fish were raised without much care and as a result productivity was low and the fish were mainly consumed by the household. The ANEP technological intervention initiated a transition from home-based subsistence fish farming to more market-based commercial fish farming. The visit programs made significant changes to the lives of the participants. In particular, the visits by the Nepalese farmers to Jessore, Mymensingh, Barisal and other places in Bangladesh exposed them to the benefits of aquaculture and helped them adopt similar techniques. In some cases, an increase in household income resulted in return migration of family members from working abroad. Hatchery owners also upgraded their technological base from using aerators to using dragnets to remove toxic gases from the water, which substantially reduced their production costs.

Technology was transferred in terms of supplying new capital goods such as manual and automatic feed-making machines to farmers. These technologies are now available at the local level as the project developed the capacity of the local engineering workshop owners. The significant change stories and visits made to the villages validate wider adoption of improved aquaculture techniques (particularly in Nepal) and increase in productivity triggered by ANEP. Another component of the project involved action research in partnership with the academics, national research institutes and farmers. The project also promoted speedy adoption of certain new technologies such as small indigenous species and orange sweet potato in Nepal and integrated floating cage aquaculture system (IFCAS) in Bangladesh. These technologies were also transferred from one country to another. These technologies made a significant contribution to food and nutrition security of the project beneficiaries.

#### Market access

In a community where aquaculture is underdeveloped and not widely adopted, markets are either missing or small, or function inefficiently or are poorly linked. This affects any project that introduces new technology to increase production because a system has to develop to integrate various actors in the value chain so that products and services can flow to various actors. This was done by ANEP by forming thematic groups that integrated fish farmers, fingerling suppliers, traders (small and large) and fish-feed producers to develop and network to help each other improve and expand their businesses. Training was provided to group members so they could improve their knowledge and increase their supply of quality inputs. Demand analysis was carried out by the group and business plans were developed through a consultative process.

A case of a 'missing market' was observed in Nawalparasi. The project had to dig more than 400 ponds but no excavator was available. Kanai Prasad Maurya of Piparahiya, Nepal invested about USD 40,000 in purchasing an excavator and made profits from excavating ponds for project participants. This prompted five excavators to subsequently join the monopolized market, resulting in reduction of fees charged for digging from USD 32 per hour to USD 26.

Through interactions with the members of his thematic group, Sukdeb Kirtonia of Mehendiganj, Barisal discovered a potential market for larger fingerlings and increased his income by increasing the supply of large fingerlings. Razzak Mal of Hizla, Barisal expanded his business and had to buy a van to serve his customers. Before ANEP, he used to travel on foot to serve his customers. Ram Kumar Tharu, a fish farmer from Rupandehi, developed a list of input and output sellers with their mobile phone numbers. This list was provided by ANEP to the farmers and input dealers. Liton Sordar of Hizla, Barisal shared business information such as the conditions of the market, trends in prices to his fellow members in the thematic group. This helped him increase his client base from a few to 120 and almost doubled the period he could do business in a month. Kazi Nurul Islam of Hizla, Barisal increased his repeat farmers from 40 to 250 between 2012 and 2013 as a result of his involvement in the project.

Improved access to the market increased the span of the value chain, increased the number of actors and quality of their products and services besides building trust amongst them, which improved through regular interactions and transactions.

#### Gender

One key link translating increasing agricultural production to increased nutrition is empowerment of women (Gillespie et al. 2012; Meinen-Dick et al. 2012). Empowerment of women is complex and multidimensional and it takes a long time to achieve it. Nevertheless, some improvement in gender relations and empowerment can be observed in a number of the most significant change stories.

Women's empowerment in Bangladesh is much lower than that in Nepal (Ahmed 2014). One factor underlying this difference is the influence of purdah norms in Bangladesh that still restrict movement of some women outside the home; this is not the case in most of Nepal. Women's role in farming is relatively well established in Nepal and there is less restriction of women's movement. During the field visits, women riding bicycles and working in the paddy yields was a common scenario. This was not observed in Bangladesh. Women in Bangladesh, and particularly those who are less poor, still continue to confine their economic activities inside the home or homestead gardening, although this is changing.

The success stories picked up these aspects of gender dimensions of project interventions. Thus, while in Bangladesh movement out of the domestic domain led some women to report increased confidence and recognition, in Nepal it is more about achieving a new identity and reputation through participation in aquaculture. After the project intervention, the view of some Bangladeshi women comes close to those expressed by their Nepali counterparts. For example, Fatema Begum of Hizla, Barisal said that, "My husband now respects me more than ever and other farmers' come to me for advice on fish farming. In addition to becoming more financially secure, I have gained the trust and respect of my family and community".

Our fieldwork experience and the significant changes stories validate progress in improvement in gender relations and women's empowerment. This is likely to contribute to nutritional security.



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