

Guidebook on Farmer-to-Farmer Extension Approach For Small-Scale Freshwater Aquaculture





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on
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for
Small-Scale Freshwater Aquaculture**

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2015

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Citation:

JICA and NACA, 2015. Guidebook on Farmer-to-Farmer Extension Approach for Small-scale Freshwater Aquaculture. Japan International Cooperation Agency, Tokyo Japan, Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand. 20 pp.

Message (JICA)

At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals to end poverty, fight inequality and injustice, and tackle climate change by 2030 and UN member states will be expected to use to frame their agendas and political policies, especially ODA policy, over the next 15 years.

What should be noted here is that, fisheries is listed as one of 17 Sustainable Development Goals with other major global issues such as poverty, health, education and climate change. It is the Goal 14 entitled “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”.

Responding to the importance of sustainable fisheries in these high level policies, JICA now puts more emphasis on the aquaculture. JICA understands that fish greatly contributes to food security, nutrition and export, and the ongoing increase in its demand can only be covered by aquaculture. At the same time, to increase aquaculture production in sustainable manner, we should reduce the use of natural fish resources for seedlings and feed, control fish diseases and use of medicine, and mitigate environmental impact around aquaculture facilities.

The small-scale freshwater aquaculture has advantages in those points and can supply directly animal protein and micronutrient in rural communities at low price and on daily basis. However, the promotion of small-scale freshwater aquaculture often encounters quite common problems in the beginning. These include: farmers lack of basic knowledge and techniques on fish farming; none readily available fish seed to start grow out production; and extension services are not adequate enough to reach those needy people. Throughout the

countries including Cambodia, Laos, Myanmar, Madagascar and Benin, JICA has been implementing similar technical cooperation projects on small-scale aquaculture extension, in which those problems are properly addressed and solved to a large extent through core farmer development and farmer-to-farmer extension approach. This is the very reason why we developed this guidebook to share our experiences and lessons learned with as many countries and potential partner organizations as possible.

This guidebook is a second product of cooperation between JICA and NACA (Network of Aquaculture Centres in Asia-Pacific), following the successful undertaking of “International symposium on small-scale aquaculture extension” held in December 2013 in Bangkok. It is obvious that without NACA, it would have not been possible to materialize this project, and therefore, on behalf of JICA, I would like to express my sincere gratitude for invaluable assistance and cooperation extended by NACA.

Makoto Kitanaka
Director General
Rural Development Department

Message (NACA)

Small-scale aquaculture has been an important part of several projects implemented by the Network of Aquaculture Centres in Asia Pacific (NACA) in the past years. As stated in the mandate of NACA, an intergovernmental organization, it promotes rural development through sustainable aquaculture and aquatic resources management. NACA seeks to improve the livelihoods of rural people, reduce poverty and increase food security, with fish farmers and rural communities as the ultimate beneficiaries. NACA implements development assistance projects in partnership with research centres, governments, development agencies, farmer associations and other organisations. It also supports technical exchange and capacity building, institutional strengthening and the development of policies for sustainable aquaculture and aquatic resource management.

The development of this Guidebook on farmer-to-farmer approach for small-scale aquaculture extension is then very timely and highly appropriate for the overall work programmes of NACA, especially in the development and promotion of small-scale aquaculture. Results of the initial projects implemented by JICA in Cambodia, Lao PDR and other countries in the region and in Africa showed the efficacy of the farmer-to-farmer approach in extension of simple but practical technology of both fish farming and seed production, especially in the rural communities where information dissemination and technology transfer mechanism are often very limited.

NACA's collaboration with JICA on this small-scale aquaculture extension has been highly successful, and on behalf of NACA, I am looking forward for further collaboration on the implementation of this Guidebook to small-scale aquaculture in the Asia-Pacific region. It is also my sincere

hope that a training course can be developed in the future, which will be solely based on this important Guidebook that has been developed.

Cherdsak Virapat, PhD
Director General

Preface

This Guidebook was prepared as an offshoot of the International Symposium on Small-scale Freshwater Aquaculture Extension, which was held in Bangkok, Thailand in December 2013¹. The success stories of many small-scale farmers in both Asian and African countries have brought insights on the effectiveness and self-sustaining mechanism of the farmer-to-farmer (FTF) approach of aquaculture extension. This is a scheme developed by JICA in the implementation of their Technical Cooperation Projects for rural development in several developing countries in the region.

Information included in this Guidebook were mostly taken from the results of the Freshwater Aquaculture Improvement and Extension projects (phases 1 and 2) that were implemented by JICA in Cambodia. Also included are from the outputs derived from the discussions during the International Symposium, as well as from personal interviews with core and grow-out fish farmers in several provinces in Cambodia.

This document will only serve as a guide on how to implement FTF approach on small-scale freshwater aquaculture extension, which was solely based on successful on-farm experiences mostly in freshwater aquaculture in Cambodia. Every subject in this Guidebook can be modified depending on the existing local situation and condition where the extension programmes will be implemented. It is also hoped that this Guidebook can be adapted to other small-scale aquaculture operations in the region (e.g. brackishwater and coastal aquaculture), especially in rural poor areas.

¹ Proceedings of the symposium is available for free download at NACA (www.enaca.org), JICA Thailand (www.jica.go.jp/thailand/english/office/) and JICA (www.jica.go.jp) websites.

Acknowledgement

Publication of this book was made possible through financial support from JICA. Appreciation is extended to Dr. Eduardo Leñaño, as the main author, for his devotion in the preparation of this Guidebook. The support of the Cambodian Fisheries Administration (FiA) staff and local provincial officers during the field interview is duly acknowledged. Special thanks to Mr. Chin Da for provision of important reports and photos that were used in this Guidebook. Lastly, the full cooperation of core and grow-out farmers in the provinces of Kampot, Takeo, Battambang and Pursat in Cambodia is highly appreciated. All of these contributions have been instrumental in the completion of this Guidebook.

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1. Introduction

Small-scale freshwater aquaculture in the region has long been existing and has provided diverse benefits to rural farmers including income generation, nutrition improvement, and sustainable aquaculture practices through integrated farming system. In Asia, small-scale aquaculture could also be effectively integrated into agrarian economy, with the support of appropriate technologies and the provision of seeds (Yamao, 2013). However, necessary developments and technology improvement has not properly reached nor disseminated to many rural/small-scale farmers. This has resulted in under-utilization of the potential of aquaculture production in many rural communities especially in developing countries. The lack of access by many local farmers in these countries to the developed yet simple technologies on seed production as well as on grow-out culture, has hindered the further development and adaptation available aquaculture technologies.

JICA's initiative on the "farmer-to-farmer" (FTF) approach of technology extension has proven to be a very effective way to transfer technologies to the rural poor farmers. The advantage of this approach is the exposure and training of local small-scale farmers (both men and women) from core farmers through practical application of the technologies developed, which the core farmers have tried and tested. The technology extension, moreover, is transferred to the farmers in their own local dialect, thus resulting to highly efficient process of technology transfer. And most important, the transfer of technology is totally based on the local resources which can be easily accessed by the farmers.

The FTF approach can be initiated by proper training of selected core farmers, who will apply the technology to increase their own aquaculture production. It is noteworthy that this system not only provides economic benefit to the core-farmers but also enhance their social role as local

leaders and/or extension workers. Once the core farmers are trained and established, the technology is then transferred by the core-farmer him/herself to selected local farmers who are willing to try the technology. This process will continue from one farmer to another, thus benefiting many rural farmers and helping them to at least increase their production from their small aquaculture farms. In addition, enhancement of cooperation among core-farmers as seed producers/providers through networking has been proven to be an effective strategy for ensuring sustainable aquaculture development.

From the experiences shared by local farmers from the countries where JICA project was implemented, it is worthwhile to note the success stories by each of the selected core farmers who voluntarily joined the project (JICA, NACA and DOF, 2013). From initially having few tanks and ponds for their culture operations, the farms usually expanded facility- and area-wise producing more fingerlings (from the hatchery and nursery) and more foodfish (from grow-out ponds). These core farmers were able to supply fingerlings to other local farmers (usually to the ones they trained through farmer-to-farmer approach) and sell some of the marketable sized fish to the local market for additional income. Their willingness to train other local farmers in their community and to share their experiences and assistance in helping these farmers also resulted in the overall improvement of the local fish production within the area or even at neighboring communes.

In some cases, local farmers that were trained by core-farmers have become core-farmers themselves, being able to train and extend assistance to other farmers. Despite some problems that have been encountered in the implementation of this approach (e.g. criteria for initial selection of core farmers; willingness of voluntary farmers to join the program), results obtained from the implemented JICA projects in some countries in the region, indicate the effectiveness of the approach in ensuring continuity of technology extension from one farmer to another.

2. The “Farmer-to-Farmer” Approach

In recent years, many of the JICA’s technical cooperation projects have shifted from research and development to delivery of extension services to farmers, resulting in the formulation of a number of projects dealing with small-scale aquaculture extension activities (Chikami, 2013).

Although successful technology transfers were reported, replication or expansion of the effect afterwards was not found easy, as most centers involved in the extension works were not usually responsible for the nationwide extension services. Moreover, government extension system, especially among developing countries, faces a lot of common constraints including inadequate budget allocation, lack of mobility for extension works, and lack of trained personnel (Chikami, 2013). These are coupled with lack of seeds as the main bottleneck for small-scale aquaculture development.

To overcome these problems, the FTF approach for aquaculture extension has been proposed, developed and implemented in key countries of ASEAN where small-scale freshwater aquaculture activities are common. This is for the purpose of supplementing government extension works for better and more sustainable adoption of aquaculture technologies, especially by the rural poor farmers. One key feature of FTF approach is its self-sustaining mechanism to ensure sustainable aquaculture development, with or without government interventions. This is illustrated in Figure 1.

It is likely to have success in the FTF extension approach when ordinary farmers can adapt the technology without or with very minimal financial and/or economic difficulty. For this reason, fish farming techniques to be extended should be low-cost, simple, easy and practical. The experiences shared by fish farmers in countries where this approach was

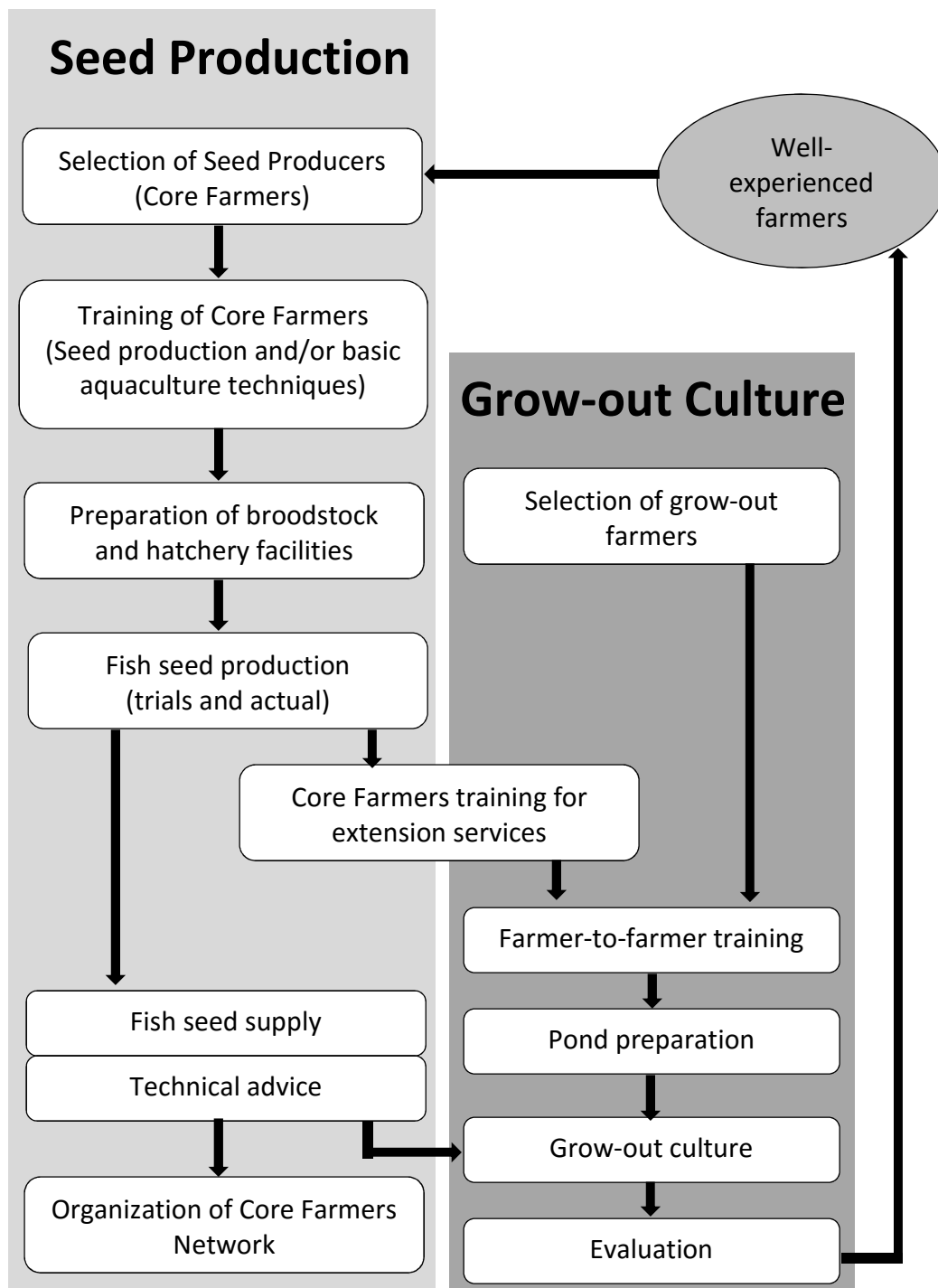


Figure 1. Basic flow-chart of Farmer-to-Farmer extension approach for small-scale freshwater aquaculture (modified from FiA and JICA, 2014).

implemented show that the most appropriate fish species that can be used for technology extension are the herbivores and omnivores, including Nile tilapia, silver carp, common carp, mrigal, rohu and other Chinese/Indian carps. These species are suitable for small earthen ponds (a common characteristic for small scale/family backyard farms) and culture system that requires minimal inputs (e.g. feeds) during culture operations.

In addition, implementation of the approach provided equal opportunities for information access and skill development to both men and women farmers.

By and large, results of the FTF approach of technology extension in small-scale freshwater aquaculture in key ASEAN countries (e.g. Lao PDR and Cambodia) can be potentially be applied to other small-scale aquaculture systems (e.g. brackishwater and marine). The technology can also be implemented to other developing countries in the world where small-scale aquaculture is being practiced.

3. Role of Government and Other Relevant Agencies

The sustainability of small-scale aquaculture in the context of technology-production environment is shown in Figure 2 (JICA, NACA and DOF 2013). It is the government, regardless of the country's development status, which have the mandate to set policy and directions towards small-scale aquaculture development. For aquaculture extension activities, the quality and capacity of government manpower and other relevant agencies is the main key to any technological promotion. Government and development partners can promote the adoption of FTF approach for small-scale aquaculture extension through enabling policies, setting directions, providing critical infrastructure, and investing in human capacity building. These services are generally provided for free,

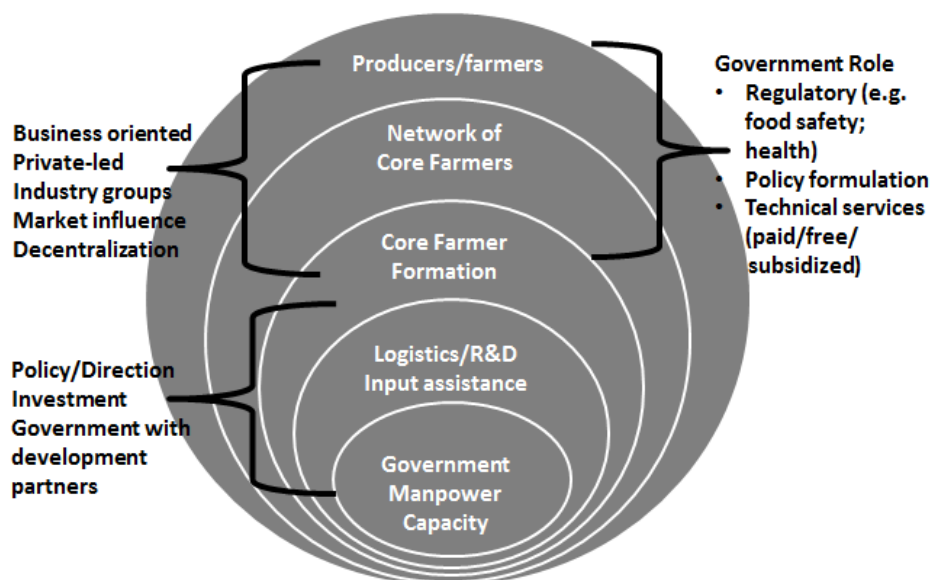


Figure 2. Small-scale aquaculture sustainability under aquaculture technology-production environment (JICA, NACA, DOF, 2013).

especially for human capacity building and in most cases for provision of relevant infrastructure and technical support. The government also has a key role in the regulation of other important issues related to aquaculture production, including health and food safety.

On training and extension, the role of government and development partners is on training and mentoring of Core Farmers (CFs), until they develop the capacity and confidence to reach out to other farmers. The government is also responsible in the development, production and distribution of training materials, which should be in the local dialects. These training materials can be in the form of posters, audio or other visual aids that can be used by extension workers and CFs for their extension services to small-scale farmers (example is in Figure 3, local training posters used by CFs in Cambodia). Selection and development of model farms should also be done for efficient on-site demonstration of good aquaculture management practices towards production of seeds or marketable food fish.



Figure 3. Posters in local dialect (Khmer) that are used for training of local farmers during aquaculture extension activities. Photo courtesy of FiA, Cambodia.

Moreover, the supply chain can also play an important role as service providers. Example of which are the feed and input suppliers which can provide technical advises to farmers through their regular interactions with them. Dissemination of relevant aquaculture technologies can also be promoted at national, local or farm levels through information dissemination using different media that are commonly accessed by farmers (e.g. radio, print).

Tasks of Government Extension Officers

Extension officers in charge of aquaculture development should take responsibilities of the following activities to promote small-scale freshwater aquaculture at the community level (FiA and JICA, 2014), especially in rural poor areas:

1. Technical advices to fish farmers on basic knowledge and skills on small-scale freshwater aquaculture, through short-term training and extension visits. Farmers might not engage to the actual practices immediately, thus follow-up activities for the

participating farmers should be done to encourage them into practicing actual aquaculture operations.

2. Monitoring of aquaculture conditions and farm operations through regular farm visits (preferably once or twice per month). These visits will also stimulate and maintain farmers' motivation to continue aquaculture operations.
3. Information collection and dissemination, especially on recent development or information on aquaculture techniques for improvement of the farmers' aquaculture operation. This is especially important in rural/remote areas where farmers lack access to updated information and other relevant issues on aquaculture.
4. Support fish seed distribution by establishing market linkages between the seed producers and the grow-out farmers. This will also facilitate balance on supply and demand and avoid over-production of fish seeds which might result to wastage.
5. Establish linkages between national/provincial governments and local development partners/local government units (LGUs) to support and facilitate efficient aquaculture extension mechanisms. It is often observed that LGUs have the appropriate information on which communities are in most need of assistance, or the most suitable for the implementation of extension activities.
6. Support the Core Farmers' Network which is responsible for aquaculture extension activities at the grass root level;
7. These tasks mentioned above should be undertaken in cooperation with the Core Farmers' Network, who are considered as the local extension agents, for a more efficient and effective extension works.

4. Core Farmers: Selection and Training

Selection

One of the key issues in FTF or other group approaches of aquaculture extension is selecting individuals who have the right combination of skills and recognition within the community to become an effective Core Farmer (CF) and who is capable of training others. Selection of CFs can be illustrated in Figure 4 (JICA, NACA and DOF 2013). CFs play important and critical roles in the extension of aquaculture technologies and better management practices. They are also responsible for training of local grow-out farmers and other seed producers, which is usually more than what the government extension workers can achieve. It is, therefore, important to properly select CFs using a set of criteria which will ensure efficient dissemination of information, technologies and on-farm practices. Criteria for selection of CFs should be carefully developed to increase the probability of success of any aquaculture extension programs. Below is an example of selection criteria used selection of CFs in Cambodia (Viseth et al., 2013):

- 1) Skills and experience
- 2) Land and facility (for fish seed and/or for grow-out production)
- 3) Water availability
- 4) Economic status (or financial capability) for initial investment
- 5) Willingness (to become CF)/extension experience

The criteria for CF selection should not be limited to the above, depending on the status of the small-scale aquaculture industry of the area or country, and the current capacity of the fish farmers. More developed countries with well-established aquaculture systems, as example, should have more strict criteria for selection of CFs who can disseminate and extend aquaculture technologies to small-scale farmers. The role of government and development partners is in training and mentoring CFs until they develop the capacity and confidence to reach out to other farmers. Selected CFs should, therefore, be willing and

committed to collaborate with and support national and local government agencies in the implementation of aquaculture extension activities.

Training

Training of selected CFs will be the responsibility of trained and experienced government extension workers. The training should prepare the CFs to sustainably manage their respective farms (either for seed or grow-out production) to serve as example to interested small-scale farmers once FTF comes into effect. Since the selected CFs experiences and capacity for extension and training vary, several training programs should be developed to cater their needs, experiences and technical abilities. Below is an example of training programs for beginners and more experienced CFs (modified from the program developed by the Fisheries Administration of Cambodia for both extension workers and CFs under Elementary and Advance levels; FiA and JICA, 2014):

- Elementary level program:
 - Trainee: new CFs (beginners on fish seed production and/or grow-out production)
 - Topics: Basic aquaculture techniques; Seed production techniques; Extension training
 - Methods of training: lectures in local dialect; practical training; farm visits
 - Expected Output: develop ability to properly advise fish farmers on basic aquaculture techniques for both seed and grow-out productions
- Advance level program:
 - Trainee: Experienced core farmers (seed producers; grow-out farmers)
 - Topics: Improved aquaculture techniques; Seed production techniques; Better farm management practices; Contingency planning
 - Methods of training: lectures, hands-on farm management, farm visits

- Expected output: improved extension service capacity including giving advises to fish farmers in both seed and grow-out production systems; expansion of extension services from local to provincial level or beyond; improved ability to encourage other farmers to become core farmers themselves.

Extension for small-scale farmers should focus on simple, practical technology and improvements to management practices, thus training of CFs should also highlight the same. Specifically, training and extension works should address issues including:

- good site/pond selection;
- farm/pond preparation techniques;
- good practices in fry and fingerling production;
- good practices in stocking of fingerlings;
- proper water quality and feeding management (if applicable);
- and,
- turning low-cost inputs to high-value outputs.

Moreover, it was seen that direct FTF exchange (farm) visits were useful way to share experiences, problems and other production issues between and among farmers. It is often easier for farmers to adopt information or technology that they had gained from such interactions with their colleagues, rather than from other sources. Farmers, in general, become more motivated when they observe the success of other farmers and will actively seek to learn from them. With interactions in their own local dialects, transfer of information and technology will also be more efficient.

5. Core Farmers' Network

As suggested above, FTF interactions are generally more effective in transferring information and experiences, particularly in addressing

practical issues on hatchery and/or grow-out pond management. This is an effective business-oriented approach to extension. Thus, it is necessary to establish Core Farmers' Network, so that they can continuously communicate and learn from each other.

Establishment of CF Network can be assisted by trained government extension workers, and help fish seed producers on how to organize and manage their network group (Fig. 4).

The continuous learning process could be conducted in either formal or informal ways, whichever is appropriate to the local situation, through meetings, training courses and information seminars.

The following are some of the expected benefits that CF Network will provide among their members as well as to other small-scale farmers included in their extension works:

- improvement of seed production techniques;
- efficient selling and delivery of fish seeds;
- coordination and request for technical or financial assistance if needed;

Core Farmers' Network in different provinces of Cambodia, where JICA's FAIEX (Freshwater Aquaculture Improvement and Extension) Project 1 and 2 were implemented, have been highly active in the implementation of FTF approach for small-scale freshwater aquaculture. Members of the Network from Kampot, Takeo, Pursat and Battambang provinces have listed the following benefits that each member can access from the Network:

- *Financial loan for hatchery construction and seed/grow-out production (members have to pay back the loan with minimal interest)*
- *Sharing of supply and market channels;*
- *Sharing of resources (e.g. fish hormones used for induced breeding).*

The CF Networks also conduct either regular meetings (every 3-4 months) or keep in contact with each other by phone or SMS



*Mrs. Set Thy, President
CF Network
Kampot Province*

*Mr. Van Po, President
CF Network
Takeo Province*



Figure 4. Government extension workers give advises and facilitate core farmers in organizing their network group. Photo courtesy of FiA, Cambodia.

- sharing of problems and solutions to basic hatchery and pond management;
- improved market access and marketing channels;
- coordinated culture operations;
- more coherent bargaining power;

The Network, once established, should also be fully supported by local or national government agency which is responsible for aquaculture extension services. It should elect its board members (e.g. President, Vice-President, Secretary, Treasurer) and formulate a simple by-laws for the smooth and sustainable functioning of the Network.

6. Farmer-to-Farmer Extension

FTF extension approach allows CFs to train other farmers about fish culture at a community level, using local extension and training materials

CFs in Cambodia have successfully implemented FTF extension and have trained thousands of men and women farmers during the 2 phases of JICA FAIEX project (9 years in total). Ms. Set Thy, CF from Kampot Province, has trained more than 1000 farmers, where majority became successful in their grow-out culture production. Mr. Van Po (Takeo Province) and Mr. Chin Kun Ty (Pursat Province) have trained 600-700 farmers each. Around 70-80% of the trained farmers in Takeo became successful in their grow-out operations, while only 40-45 farmers in Pursat did so due to water source problem. In Battambang Province, CF Mr. Mith Phan has trained around 400 farmers and 25-30 were successful.

It was mentioned that not all participants in the trainings were fish farmers by profession. Some were just members of the community who are interested to gain knowledge on the basics of fish culture. Trainings were mostly done within their local commune, but some CFs have extended their services to other communes and other provinces as well. Sessions were open to both men and women

in their own local dialect. As such, CF has to learn basic teaching skills to manage lecture sessions as trainers during the process (FiA and JICA, 2014). Training of CFs for these skills will be the responsibility of government extension officers, who should also provide necessary training materials/tools (including technical booklets, posters and videos) that can be used by CFs for their extension works. Government extension officers should also prepare the CFs for practical demonstration of basic techniques and operation in seed and grow-out fish production (Fig. 5).

In the FTF trainings, CFs teach basic skills on fish grow-out culture to other farmers who also promotes a close business relationship between the CFs and the grow-out farmers. This improved relationship will facilitate efficient supply and delivery of seeds needed for grow-out operation and on-site guidance to fish farmers.



Figure 5. Practical hands-on training on the basic skills and techniques for seed production is done during extension activities. Photo courtesy of FiA, Cambodia.



Figure 6. Training of local fish farmers (for grow-out production) being handled by a trained core farmer (seed producer). Photo courtesy of FiA, Cambodia.

CFs can also extend training to other farmers who are interested to become CFs themselves. In this case, CFs will train them on the basic skills on fish seed production, and on how to become a CF in the future.

As indicated in Figure 1, trained grow-out farmers and seed-producers should also be encouraged to share their experiences with other farmers within their locale (or even beyond). This is to further extend the technology and encourage other interested community members to get engaged in fish production (Fig. 6).

Farmers' training should include, but not limited to, and depending on their technical needs, the following:

1. Improving seed production of important freshwater species.
 - a. Site selection and water management;
 - b. Breeding technology and induced breeding techniques, including use of spawning agents;
 - c. Proper management of breeding facilities (e.g. broodstock ponds/tanks, hatchery tanks, larval rearing tanks);
 - d. Broodstock management;
 - e. Hatchery and nursery management;
 - f. Feeds and feeding management;
 - g. Harvesting, packing and transport of fingerlings.

In Lao PDR, FTF approach was implemented through the Aquaculture Improvement and Extension Project Phase 2 during 2005-2010. Trained core farmers did not only expanded their culture operations, but also trained fish farmers on the basics of grow-out production.

In Benin, the Project for Extension of Inland Aquaculture supported core farmers who can produce fish seeds and homemade feeds. Through 3.5 years of implementation, 2,200 farmers (men and women) were trained through FTF approach, and was proven to be an effective tool to train new as well as existing fish farmers.

Similar results were obtained in different small-scale aquaculture extension projects in Myanmar (Small-scale Aquaculture Extension for Promotion of Livelihood of Rural Communities; 2009-2013), and Madagascar (Projet D' Aquaculture de Tilapia A Mahajanga, 2002-2004)

2. Improving grow-out production.
 - a. Culture systems, including appropriate application of extensive and polyculture wherever appropriate;
 - b. Integrated farming system suitable for small-scale freshwater aquaculture (e.g. rice-fish culture; livestock-fish culture);
 - c. Source and supply of good quality seeds for stocking;
 - d. Site selection, pond design, and size;
 - e. Pond preparation, fertilization and water quality management;
 - f. Feeds and feeding management;
 - g. Better management practices for disease prevention and control (if necessary).

3. Market-oriented production and value chain.
 - a. Integration of aquaculture production and market access;
 - b. Use of contract farming with pre-agreed price for stocking and harvesting, this is to minimize competition and make income more predictable for the farmers;

4. Technical improvement, innovation and extension.
 - a. Assessment of different management practices;
 - b. Promotion of aquaculture for indigenous/native species, including growth performance trials on their suitability for aquaculture;
 - c. Strengthening of FTF Network and adoption of farm cluster management scheme for small-scale farmers;
 - d. Promotion of better management practices for responsible farming;
 - e. Seeking possible government support for continuity of extension programs and their replicability to other areas or other aquaculture operations (e.g. brackishwater pond culture).

7. Monitoring and Evaluation

The two key issues in aquaculture extension, especially for small-scale farmers, are supervision and monitoring. Supervision can be done through training, giving of technical advises and personal interaction with the farmers, as discussed above. Monitoring and evaluation of the extension activities should be done by government extension officers as well as CFs, and encourage both CFs and local farmers to properly keep records of the following, with gender disaggregated data where necessary:

- Number of farmers trained;
- Number of trained farmers that become successful;
- Quality of inputs (e.g. seeds, feeds)
- Success of fish farming operations over time;
- Measures taken to address immediate problems during culture operations;
- Changes in stock productivity and farmers' income.

Monitoring and evaluation can be undertaken through farm visits and interviews (both formal and informal) with farmers, group of farmers or even the CF Network (Fig. 7). In Cambodia, as example, evaluation of CF and farmers performance on seed and grow-out productions with regard to important issues on small-scale aquaculture extension are done through interviews and farmers' workshop (FiA and JICA, 2014). A "semi-structured" interview is used to collect necessary information through casual or informal talks with fish farmers. This type of interview does not require a complete questionnaires, as extension officers has the freedom to add or change some questions, depending on the flow of the interview and the response of the farmers. Extension officers will then focus on farmers' responses in order to identify the actual issues pertaining to their aquaculture and livelihood activities.



Figure 7. Monitoring and evaluation of both core and grow-out farmers are done by group (top left) or by one-on-one (to right) interviews and regular farm visits (bottom photos).

Analysis of the problems or issues raised should be done after the interview (monitoring and evaluation). Practical and proper measures should be recommended for implementation to address the issues and problems identified. This will be aimed towards improvement of seed/fish production of the small-scale farmers. A gender integrated approach in working with farmers, and in analyzing the issues, is recommended in order for solutions to address the issues to be more gender responsive.

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