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IMPROVEMENT OF TILAPIA SEED PRODUCTION AND GROW-OUT CULTURE MANAGEMENT IN MYANMAR

November 2019

SDGs:



Countries:

Myanmar

Project Codes:

TCP/MYA/3606

FAO Contribution:

USD 204 000

Duration:

1 February 2017 – 31 July 2019

Contact Info:

FAO Representation in Myanmar

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Implementing Partners

Department of Fisheries (DoF), Ministry of Agriculture, Livestock and Irrigation.

Beneficiaries

Primary beneficiaries are small- to medium-scale aquaculture farmers and hatchery operators. Secondary beneficiaries include DoF staff, policy-makers and planners, manufacturers of aquaculture products, aquaculture service providers and other stakeholders involved in the value chain.

Country Programming Framework

The project contributes to the National Medium-term Priority Framework Priority Outcome 1: Increasing production to ensure food security, particularly the outputs: vii) To ensure food security by increasing fish production through providing essential support services, development of rural infrastructure, intensive peri-urban food production system; and x) To develop freshwater aquaculture by taking genetic management and improvement of broodstock of farmed rohu through utilization of good quality broodstock, selection for better food conversion ratio.



BACKGROUND

Myanmar's economy is chiefly based on agriculture, including fisheries and forestry. The sector accounts for almost half of the economic output of the country, employing over 60 percent of the total labour force. Of all the various food-producing systems, aquaculture is considered the main animal protein source at an affordable price for rural people and is an important provider of employment opportunities. Aquaculture in Myanmar began in 1953 with the farming of imported species, including the Mozambique tilapia (*Oreochromis mossambicus*) introduced from China. In the past, tilapia species were cultured in shallow, narrow and temporary water bodies and were targeted only for rural populations. Nowadays tilapia, particularly hybrid and mono-sex species, is increasingly cultured in semi-intensive farms as a result of the high demand from local consumers and an increasing demand from restaurants and barbecue shops. However, tilapia culture in Myanmar is constrained by inadequate seed production and seed quality, as well as by other management problems. In 2012–2013, for example, tilapia seed production represented only 1.65 percent of total seed production. The current project was designed to improve tilapia aquaculture in Myanmar by addressing problems in seed production and grow-out culture.



IMPACT

The project has significantly contributed to the sustainable development of tilapia aquaculture in Myanmar. It will further improve the supply of fish for Myanmar people and improve the livelihood of fish farmers, with improved fish production through better quality fish seed and improved management practices in culture operations.

ACHIEVEMENT OF RESULTS

The project provided technical assistance in tilapia seed production and intensive culture management by training government officials, breeding/extension centre staff members, hatchery technicians and farmers in tilapia broodstock management, the optimization and standardization of seed production techniques, a perfected seed dissemination system and enhanced aquaculture techniques. An improved strain of tilapia was introduced from overseas to renew the broodstock and the capacity of pilot government and private tilapia seed production centres (hatcheries) was enhanced. Optimized and standardized seed production procedures were conducted to produce high-quality fish seed for dissemination to trained farmers for intensive culture demonstrations, using an intensive culture model, appropriate technology and good management practices for grow-out culture, including stocking density control, feeding regime management, water quality regulation, fish disease control and harvesting. The target farmers used the techniques learned during training activities to culture the fish. Standard operational guidelines on tilapia broodstock management, seed production and culture were developed, as a result of which fish seed quality was improved and farmers increased fish production and the economic return derived from the high-quality seed produced.

IMPLEMENTATION OF WORK PLAN

The project had a scheduled duration of two years, extended by six months with no increase in budget. All envisaged activities were successfully completed, apart from the farm demonstration activity, which could not be concluded during the project following delays in implementation.

FOLLOW-UP FOR GOVERNMENT ATTENTION

It is recommended that the rearing of introduced juvenile tilapia into broodstock at the two DoF fishery stations carefully follow the guidelines provided by the project. In line with the technical guidelines developed, the two pilot fishery stations also need to further improve tilapia hatchery practices and demonstrate these to other government and private hatchery operators.

DoF technical staff should continue to support tilapia farmers to conduct good practices in the farming.

The farm demonstration on good practices of intensive tilapia grow-out farming, which had not been completed by the end of the project, should be completed.



SUSTAINABILITY

1. Capacity development

To ensure sustainability, DoF should continue to support the improvement of human capacity at DoF fishery stations and among private stakeholders at small-scale and commercial farmer levels. It should manage and maintain the facilities of indoor tilapia hatcheries in order to guarantee a sufficiently high population of introduced genetically improved farmed tilapia (GIFT), the proper management of different families of broodstock and the increased dissemination of good-quality GIFT to other DoF fishery stations in order to meet the requirements of local farmers. The Government has shown keen interest in scaling up project activities to other fish farming areas and can use the comprehensive technical training materials developed and improved national capacity for this purpose. In this context, a secure budget allocation and technicians trained specifically in GIFT tilapia production by DoF will be required.

2. Gender equality

During implementation, at least 30 percent of the project beneficiaries were female. One of the main objectives of this project was to empower women by providing them with opportunities to gain an understanding of the technology of tilapia seed production and intensive tilapia culture. The outcomes and outputs of this project were shared by both men and women in Myanmar.



3. Environmental sustainability

The project was in line with one of the main policies of the Ministry of Agriculture, Livestock and Irrigation with regard to environmental conservation and climate change resilience. Project activities were also in line with the Government's priority plan for the fisheries sector, i.e. to promote community fisheries organizations for improved fisheries resource management and rural development; to allow the import of high-quality fish/shrimp seed and broodstock and to produce genetically improved fish species; and to conserve indigenous fish species and conduct research in the breeding and culture of these species. The GIFT introduced from this project should be properly managed to avoid any negative impact, including aquatic animal disease, on indigenous fish species and their habitats.

4. Human Rights-based Approach (HRBA) – in particular Right to Food and Decent Work

The technology supported by the project was basic and available in rural areas, and the GIFT introduced will help to ensure food security for local people at affordable prices. The technology provided by the project was beneficial not only for commercial fish farmers but also for small-scale farmers. All activities implemented by the project recognized the importance of the labour force and encouraged the participation of all stakeholders.

5. Technological sustainability

The improved technology and practices introduced by the project strengthened government and private organizational structures and encouraged fish farmers to adopt improved culture methods with cost-effective practices, as well as promoting effective GIFT tilapia broodstock quality maintenance and management to ensure sustainability. The manual of good practices produced by the project can be used to disseminate reliable technology to local people.

6. Economic sustainability

The sustainability and the continued viability of operations after the end of the project should be ensured by providing support to the long-term management plan and continuous self-financing provisions of DoF.

DOCUMENTS AND OUTREACH PRODUCTS

- ❑ Mission report. Dong Zaijie. May 2017.
- ❑ Good practices of tilapia seed production (project operational guideline). Dong Zaijie. July 2017. FAO, Myanmar. 7 pp.
- ❑ Good practices of intensive tilapia farming (farm operational guideline). Dong Zaijie. October 2017. FAO, Myanmar. 15 pp.
- ❑ Mission report. Dong Zaijie. March 2018.
- ❑ Interim report of project TCP/MYA/3606: Improvement of tilapia seed production and grow-out culture management in Myanmar. Aung Naing Oo. August 2018. DoF, Myanmar.
- ❑ Good practices of tilapia seed production and tilapia intensive culture (in English and Myanmar language). Dong Zaijie and Aung Naing Oo. June 2019. DoF/FAO, Myanmar. 129 pp.



ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	The project will significantly contribute to sustainable development of tilapia aquaculture in Myanmar. It will further improve the supply of fish for Myanmar people and improve the livelihood of fish farmers and their income with improved performance of fish production through better quality fish seed and improved management practices in culture operations.	
Outcome	Establishment of capacity in Myanmar for efficient production of high-quality tilapia that can meet the requirements of international and domestic markets through quality seed production and good tilapia farming practices	
	Indicator	<ol style="list-style-type: none"> 1. Number of tilapia hatchery operators trained in good seed production practices. 2. Number of tilapia grow-out farmers trained in good tilapia grow-out farming. 3. Number of GIFT strains introduced. 4. Number of operational guidelines for good tilapia seed production and grow-out farming practices developed. 5. Number of key government technical officers exposed to good tilapia seed production and grow-out farming practices in the foreign country. 6. Number of tilapia hatchery demonstrated good tilapia seed production practices. 7. Number of tilapia farmers demonstrated good grow-out farming practices.
	Baseline	<ol style="list-style-type: none"> 1. 1-2 2. Unknown 3. 0 4. 0 5. 0 6. 0 7. 0
	End Target	<ol style="list-style-type: none"> 1. 15-20 2. 40-50 3. 1-2 4. 2 5. 3 6. 2 7. 40-50
Comments and follow-up action to be taken	All indicator targets, with the exception of the number of tilapia farmers demonstrated good grow-out farming practices, were achieved.	

Output 1	Human capacity of different stakeholders for tilapia broodstock management, quality seed production and applying appropriate culture technologies and good management practices for production of high-quality tilapia is strengthened through appropriate training and study tour		
	Indicators	Target	Achieved
	Number of training activities and study tour conducted on good practices and number of participants to receive training.	Two training activities with 80-100 participants. One study tour with three participants.	Yes
Baseline	0		
Comments	<p>All activities were implemented effectively and delivered in line with the indicator targets.</p> <p>Three technical staff members from DoF fishery stations completed a week-long study tour to China, which enhanced their knowledge and exposure to good tilapia farming development.</p> <p>Forty technical staff members from DoF fishery stations and private hatcheries were trained in good practices of tilapia seed production and intensive grow-out culture practices.</p> <p>Twenty private small-scale farmers received training in good intensive tilapia grow-out culture practices.</p>		
Activity 1.1	Organize project inception and planning workshop		
	Achieved	Yes	
	Comments	The inception workshop was effectively organized. The workshop raised overall awareness among stakeholders of the good potential of tilapia farming and the improvements needed in the country, and finalized the project implementation work plan.	
Activity 1.2	Conduct survey on existing broodstock status and culture technique		
	Achieved	Yes	
	Comments	The international consultant (IC) and national consultant (NC) conducted an assessment on the status of tilapia farming and related seed production in the country, and a field survey to the project sites.	
Activity 1.3	Organize study tour to nuclear hatcheries and demonstration farms in a foreign country		
	Achieved	Yes	
	Comments	Three DoF technical staff members completed a week-long study tour to China (Jiangsu and Guangdong) and gained good knowledge of, and exposure to, tilapia culture in China from seed production, food fish production to marketing.	
Activity 1.4	Conduct national training in stock management and seed production		
	Achieved	Yes	
	Comments	Forty-two technical persons from DoF and private hatcheries participated in the training provided by the project IC.	
Activity 1.5	Conduct national training in good intensive tilapia farming technology and management practices		
	Achieved	Yes	
	Comments	Forty-two technical persons from DoF and private hatcheries participated in the training provided by the project IC.	
Activity 1.6	Conduct training for demonstration farmers in good intensive tilapia farming technology and management practices		
	Achieved	Yes	
	Comments	Twenty selected private small-scale farmers received technical guidance of good intensive tilapia farming technology and management practices.	

Output 2	Tilapia broodstock is significantly improved through successful introduction of advantaged tilapia strains/breeds supported with good broodstock management practices		
	Indicators	Target	Achieved
	Number of improved tilapia strains introduced to Myanmar and used for improved genetic quality of tilapia broodstock.	One or two strains.	Yes
Baseline	0		
Comments	This output was delivered successfully, with the indicator targets fully achieved. Two families of GIFT strains (10 000 juveniles each) were successfully introduced to Myanmar and raised and used to produce seed at two DoF fishery stations after quarantine.		
Activity 2.1	Introduction of improve tilapia strain from foreign country		
	Achieved	Yes	
	Comments	Two families of GIFT strains (10 000 juveniles each family) were successfully introduced from China with very satisfactory survival.	
Activity 2.2	Conduct quarantine of introduced tilapia population		
	Achieved	Yes	
	Comments	The introduced superior strains of GIFT were quarantined in the hapas installed in earthen ponds in Lay Daung Khan fishery station of DoF according to government regulations. The fish were nursed with intense care and monitored in line with quarantine requirements.	
Activity 2.3	Maintain the introduced GIFT population		
	Achieved	Yes	
	Comments	After the completion of quarantine, the introduced advantaged tilapia juveniles were divided into two equal portions. One portion of the introduced tilapia juveniles was raised at the Lay Daung Khan station as broodstock for seed production. The other portion of introduced tilapia juveniles was dispersed to Kume fishery station of DoF in Mandalay for rearing as broodstock for seed production in Mandalay Region. The rearing of introduced juvenile tilapia into broodstock at the two DoF fishery stations did not follow the exact guidance given by the IC, which resulted in slow growth and low maturation rate of the fish. The rearing of broodstock of introduced tilapia should exactly follow the good practices for good maturation and high fecundity in seed production in the future. The two families of introduced tilapia should be carefully maintained to avoid genetic contamination.	
Activity 2.4	Multiplication of introduced GIFT population		
	Achieved	Partially	
	Comments	Each DoF fishery station successfully produced 50 000 juveniles through cross-breeding between the two families for the farm demonstration of good tilapia grow-out farming practices in Yangon and Mandalay areas. The nursing of the juveniles did not exactly follow the good practices recommended, which resulted in non-uniform size and slow growth. This needs to be improved in future hatchery operations. The in-family multiplication of the introduced tilapia needs to be carried out following the guidance provided by the ICs at the two DoF fishery stations for enlargement of the broodstock population and supply to other government and private tilapia hatcheries.	

Output 3	Capacity of pilot government and private tilapia seed production centres (hatcheries) is enhanced		
	Indicators	Target	Achieved
	Number of government/private hatcheries demonstrated good tilapia hatchery practices with capacity enhanced by the project.	Two	Yes
Baseline	0		
Comments	<p>The project generally achieved the output indicators.</p> <p>Two DoF fishery stations in Yangon and Mandalay Regions received technical guidance from the IC on good tilapia hatchery practices through training and on-site supervision. The project supported the establishment of two small indoor tilapia hatchery units, at Lay Daung Khan fishery station and Kume fishery station, respectively. The two DoF fishery stations successfully conducted hatchery operations with introduced tilapia, under the technical supervision of the IC.</p> <p>The two fishery stations need to further improve their tilapia hatchery practices, following the technical guidelines developed by the IC, and to demonstrate these to other government and private hatchery operators.</p>		
Activity 3.1	Rear tilapia broodstock with improved practices		
	Achieved	Yes	
	Comments	<p>The introduced superior strains of tilapia were successfully raised to broodstock size with improved management practices in six months at the two DoF fishery stations.</p> <p>The two DoF stations should further improve the rearing technique and management practices, following the good practices, for a better quality of tilapia broodstock.</p>	
Activity 3.2	Improve tilapia seed production facility		
	Achieved	Yes	
	Comments	<p>The project supported the improvement of tilapia seed production facilities at the two DoF fishery stations, which included the indoor tilapia hatchery, hapas for outdoor spawning and other equipment.</p> <p>The two DoF stations need to effectively utilize the indoor tilapia hatchery to produce high-quality tilapia seed of good genetic background and potentially all male tilapia.</p>	
Activity 3.3	Breed tilapia with improved practices and hatchery operation		
	Achieved	Yes	
	Comments	<p>The two DoF fishery stations successfully produced 100 000 juveniles through cross-breeding between the two introduced families.</p> <p>The two DoF stations need to carry out in-family breeding for expansion of the population of the two pure families following the established protocol.</p> <p>The two DoF stations need to improve practices in tilapia breeding following the good practices in the future.</p>	
Activity 3.4	Rearing tilapia fingerling with improved practices and dissemination		
	Achieved	Yes	
	Comments	<p>The two DoF fishery stations successfully produced 100 000 tilapia fingerlings (around 5 cm in size), generally following the good practices for tilapia seed production.</p> <p>The two fishery stations need to further improve the management practices in tilapia fingerling rearing, following the technical guidelines for better growth and uniform size of fingerling in scheduled production.</p>	
Activity 3.5	Documentation of broodstock management and seed production		
	Achieved	Yes	
	Comments	Objective achieved	

Output 4	Appropriate technology and good management practices for grow-out culture are successfully demonstrated through implementation at selected farms		
	Indicators	Target	Achieved
	Number of farmers demonstrated good culture practices in tilapia grow-out farming.	40	Yes
Baseline	0		
Comments	<p>The output indicator targets were partially achieved. Twenty selected small-scale fish farmers received 5 000 fingerlings produced from introduced fine tilapia strains by Lay Daung Khan fishery station and Kume fishery station. The 20 selected small-scale fish farmers carried out semi-intensive farming with tilapia as the major species, under the guidance of local DoF technical staff and the training received. Much better growth performance of the tilapia seed provided by the project compared with tilapia seed of poor genetic quality in the culture period was observed before the end of the project. Because of the delay in the project implementation, the farm demonstration could not be completed during the project period, which could fully demonstrate the merits of fine strain tilapia seed and good culture practices. The DoF technical staff need to support tilapia farmers continuously to conduct good practices in the farming.</p>		
Activity 4.1	Preparation of grow-out culture facility (pond/cage)		
	Achieved	Yes	
	Comments	Twenty selected fish farmers prepared their pond to conduct the semi-intensive farming of tilapia as the major species.	
Activity 4.2	Stock quality tilapia fingerlings		
	Achieved	Yes	
	Comments	<p>The two DoF fishery stations supplied 5 000 tilapia fingerlings produced with the introduced fine strains of tilapia to each of the 20 selected fish farmers for grow-out culture. The stocking of tilapia for grow-out culture should follow the good practices more exactly. The fingerlings stocked should be more uniform in size.</p>	
Activity 4.3	Manage intensive culture of tilapia		
	Achieved	Partially	
	Comments	Management practices in intensive tilapia farming need to be more in line with good practices in terms of stocking, feeding and daily management.	
Activity 4.4	Documentation of demonstration of improved intensive tilapia culture practices		
	Achieved	Partially	
	Comments	Farm demonstrations of intensive farming with fingerlings of good genetic quality could not be completed during the project. It is suggested that the national team document and analyse the results and practices of the demonstration for further improvement in the future.	

Output 5	Standard operational guidelines on tilapia broodstock management, seed production and culture are developed		
	Indicators	Target	Achieved
		2	Yes
Baseline	0		
Comments	The output indicator target is achieved. Operational guidelines to good practices of tilapia broodstock management and seed production and good practices of intensive tilapia grow-out farming were prepared by the IC and used in training for government and private tilapia hatchery operators and tilapia grow-out farmers.		
Activity 5.1	Prepare operational guidelines on tilapia broodstock management, seed production and culture		
	Achieved	Yes	
	Comments	Operational guidelines on tilapia broodstock management, seed production and intensive grow-out culture were prepared by the IC and translated into Myanmar language.	
Activity 5.2	Review and finalize the operational guidelines on tilapia broodstock management, seed production and culture based on the results of demonstration of good tilapia seed production and grow-out farming practices		
	Achieved	Partially	
	Comments	The farm demonstration on good practices of intensive tilapia grow-out farming could not be completed before project closure. Effort by the national project team is needed to refine the operational guidelines based on the process and results from the demonstration activities.	
Activity 5.3	Organize project concluding workshop		
	Achieved	Yes	
	Comments	A national workshop for the evaluation and dissemination of the results of project TCP/MYA/3606 was successfully conducted.	

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