

QUANG NGAI RURAL DEVELOPMENT
PROGRAM (RUDEP)-PHASE 2

Technical Report on Potential of Aquaculture
Development to Support Income Generation of
the Poor in Quang Ngai



VIETNAM-AUSTRALIA

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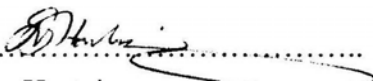
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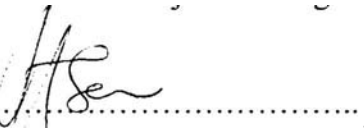
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1 Introduction

In August 2003, a mission to identify potential of aquaculture development to support income generation for poor farmers under the Quang Ngai Rural Development Program was undertaken by one aquaculture specialist in Quang Ngai Province. Recommendations for the development of different aquaculture systems (ponds, rice-fish and dams and reservoirs) were produced aiming to support income-generation for poor households. The recommendations of the first mission were as follows:

The potential system of fish culture development for income generation of the poor in Quang Ngai Province is diversified. In the future, the following demonstrations could be established under the QNRDP activities for further expansion as follows:

- Small-scale fish culture in VAC system in Hanh Phuoc Commune of Nghia Hanh District and Tinh Tho Commune of Son Tinh District. The recommendations should be considered:
 - Polyculture of Chinese carp, common carp and GIFT
 - Utilise of on-farm agriculture by-products as main inputs
 - Suitable culture period from January to September
- Integrated rice-fish system in Duc Phong Commune of Mo Duc District. The recommendations should be considered:
 - Site selected with non-polluted water source and convenient water exchange
 - Polyculture of Chinese carp, common carp and GIFT
 - Utilise of on-farm agriculture by-products as main inputs
 - Suitable culture period from January to September

This mission was considered as a follow up activity of the first one for giving specific technical inputs.

2 Potentials for Aquaculture Development in New Communes

During this mission, the specialist was arranged to visit three new communes to identify potential for small-scale fish culture development. The findings from the visit to these communes were as follows:

2.1 Binh Minh Commune – Binh Son District

Two fish culture systems were found in Binh Minh commune. The first system is fish culture in a small dam built by the cooperative of Loc Thanh hamlet. The area of the pond is 3000 m² during the dry season and 8000 m² during the rainy season. This is the first fish culture trial of the farmer, Mr. Dang Van Trung. He has obtained knowledge of fish culture from his friends and extension booklets. The pond was stocked with grass carp (1000 fish), common carp (1000 fish), silver carp (1000 fish) and rohu (1000 fish). The farmer made a bamboo cage to nurse the fingerlings for one month before releasing into the pond. The fish was fed with groundnut cake, rice bran and cassava leaf. Due to high evaporation the farmer had to add new water to the pond by pumping from a small stream. Based on observation, the grass carp grew quite well but the others quite poorly due to lack of natural feed. He is facing problem of selling. There will be poor economic efficiency of the trial because the farmer has invested a lot of capital for cage making and



Fish culture in small reservoir in Binh Minh



Catfish culture in cement tank in Binh Minh

water pumping. It is better to invest in cheap nursing hapa in the beginning and to apply multiple harvests at the end of the trial. The second system is catfish culture in a cement tank. This operation seems a hobby of the farmer, Mr. Le Hong Thai. He stocked a 200 fish in 6-m² tank and fed the fish with cooked rice and rice bran. Due to the low quality of the feed, the fish grew very slowly and reached more than 10 fish per kg after 6 months. The product is mainly used for household consumption.

Even though the irrigation system is distributed well and on-farm agricultural by-products are available in some hamlets of Binh Minh commune, the potential for fish culture development in this commune is low due to following reasons:

- flooding and unstable supply of irrigated water;
- lack of technical know-how; and
- problems of selling and poaching.

According to the local staff, Mr. Phan Van Trang, there is potential for fish culture in cages in Sau river due to slow water flow year round. Some trials of fish culture in cages in the river with grass carp have failed due to fish disease and difficulties of cage management during rainy season.



Water source and on-farm by-products available in Binh Minh

2.2 Son Trung Commune – Son Ha District

The specialist was guided to visit four households practicing fish culture in ponds. Unfortunately, the specialist could not meet any household heads who were attending a meeting at the commune People’s Committee office. The ponds could be divided into two groups based on water sources, stream and rain fall.

The first 200-m² grow-out pond is supplied with water continuously from a small stream. To ensure stable water supply, the farmer, Mr. Dinh Hong Kim, has built a small pond as a water storage about 100m above and a small ditch to direct water to the grow-out pond. The pond is stocked with grass carp (500 fish) and common carp (500 fish). The fish is fed with cassava leaf and cooked rice bran and cassava root. According to the farmer’s son, the fish seems to reach marketable size but the farmer has not decided the time of harvesting. There are two other ponds located in the same place and using the same water source from a small stream in Ta Mau hamlet. The ponds have been converted from low-yield paddy fields. The first pond is about 100m². Last harvest from this pond was about 300kg of grass carp and tilapia. The other one is about 150m². The yield was not known, but lower than the first one.



Grow-out fish pond of Mr. Kim in Son Trung



Water storage for grow-out pond of Mr. Kim



Fish pond of Mr. Dung in Ta Mau hamlet

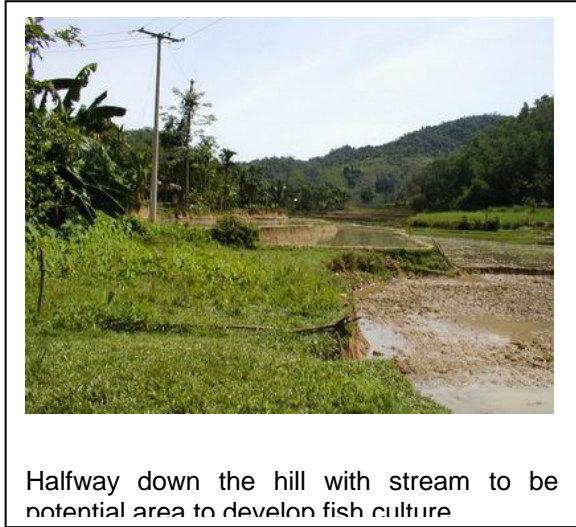


Fish pond of Mr. Phong in Ta Mau hamlet

A typical rain fed pond was seen in Gia Ry hamlet. The pond has just been upgraded by deepening. Last year, the farmer, Mr. Dinh Nua, stocked grass carp and tilapia but got poor harvest due to the death of grass carp and poor growth of tilapia since the pond water was shallow. He planned to stock fingerlings soon.



Rain fed fish pond of Mr. Dinh Nua in Gia Ry hamlet



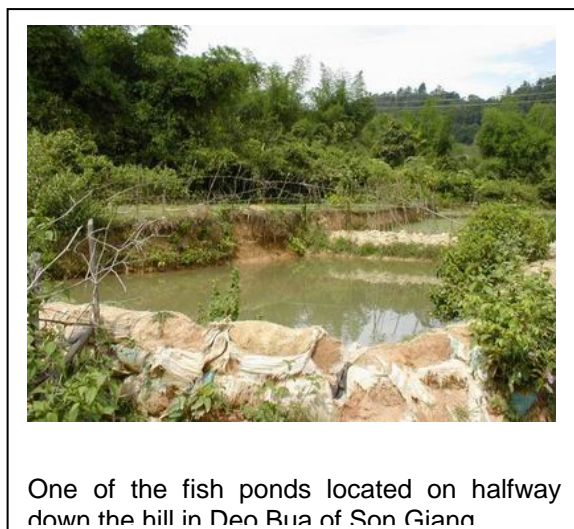
Halfway down the hill with stream to be potential area to develop fish culture

There is more potential to develop fish culture in Son Trung commune compared to Son Hai and Son Giang. According to the DDO, Mr. Cuong, there are many areas with small streams similar to the places visited. These might be suitable sites for fish culture development. To ensure for fish culture success the location of pond

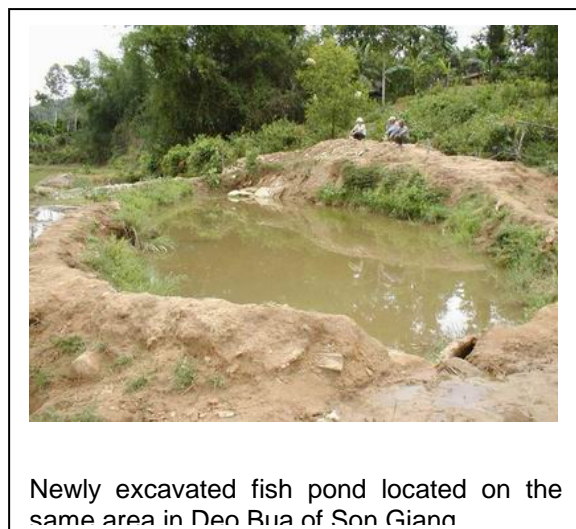
should be half way down the hill to avoid unpredictable quick floods after rain. The structure of soil with less large rocks allows people to dig ponds by hand or by machine with cheaper cost.

In ponds with water sources from streams, grass carp should be the main cultured species combined with small amount of tilapia (GIFT strain) and common carp. In rain fed ponds, the main cultured species should be tilapia combined with grass carp and rohu. Multiple harvesting should be applied for these kinds of ponds.

2.3 Son Giang Commune – Son Ha District



One of the fish ponds located on halfway down the hill in Deo Rua of Son Giang



Newly excavated fish pond located on the same area in Deo Rua of Son Giang

According to Mr. Nguyen Thanh Hung, the President of the Farmers Association of Son Giang commune, there were 8 households practising fish culture in ponds in two areas; namely Deo Bua and Deo Dinh. The farmers have attended training on fish culture organised by the district Agriculture Extension Station and provided with fingerlings under the Program of fingerling price support of the province. The specialist was guided to visit the fish ponds in Deo Bua. These ponds are completely rain fed ones. However, three ponds located halfway down the hill were full with water. They are ready for stocking fingerlings. The other five ponds located halfway up the hill were completely dry, and one of them has been planted with cassava. Unluckily, these ponds were far from the households so the specialist could not hear about result of last fish culture crop and plan for future. There were no fingerlings provided from the Program of fingerling price support. Mr. Hung informed that he will collect money from the fish pond owners to order fingerlings from the provincial Fisheries Seed Center.



One of rain fed fish ponds in Deo Bua has been planted with cassava



A series of rain fed fish ponds located on halfway up the hill in Deo Bua of Son Giang

Even though the owners of these ponds have been trained on fish culture techniques, understanding and applying recommendations from the training is still a problem. It is worth a lot to have a demonstration of fish culture in Son Giang commune because most of existing fish ponds are owned by H're people. The QNRDP should encourage the establishment of an activity group of fish culture including all owners of existing fish ponds. A training applied Farmer Field School approach is provided before any demonstrations of fish culture are to be

started. Polyculture, with the main species of grass carp, and one stocking - multiple harvesting method should be introduced for rain fed fish pond in the commune.

3 Demonstration of Fish Culture in Last Visited Communes

3.1 Nghia Tho Commune – Tu Nghia District



A pond (left side) proposed for demonstration of fish culture in Nghia Tho



The pond located at hill base can be overflowed by run-off water from inner area

This is one of the hilly and rain fed communes of Tu Nghia district. Most households are H're people. Aquaculture has not been practiced so far. Local authorities expect to have a demonstration of fish culture in pond due to natural fish resources being depleted by electric fishing. A demonstration of fish culture will create awareness among people to mobilise them develop this activity in Nghia Tho commune. One farmer has excavated a pond for fish culture but it has not become operational. To apply fish culture, the pond needs to be upgraded by deepening at least 1 m and strengthening dykes to prevent overflow during heavy rain, as the pond is located in a hill base. The pond can be supplied with water from a small ditch running water from a small stream. However, some risks need to be taken into account such as pesticide contamination from paddy fields nearby and poaching. However, the areas along the canal upgraded by the program can be converted into fish ponds if a small ditch is provided.

3.2 Hanh Phuoc Commune – Nghia Hanh District



Pond of Mr. Binh proposed for demonstration of improved fish culture technique

The specialist attended a farmer meeting to review the study tour undertaken in the morning. The farmers were very excited with the study tour. They confirmed that they had learned a lot from visiting fish culture systems but they could not identify which lessons learned and appropriate techniques to be applied. They expressed the need for technical support through farmer training on fish culture. It needs more consideration on technical recommendations and methods of the training.



Pond of Mr. Chi proposed as control for the demonstration of fish culture in Hanh Phuoc.

to poor growth rate. The reason is understandable. There is no natural feed developed with such a running-water system which is common in Hanh Phuoc commune. The integrated farming system, namely VAC, was not practiced sufficiently even though its three components exist since there is a poor relationship among them. One household (Mr. Binh) has 1 sow and 12 piglets. Waste materials from the piggery are not used for the fish pond and garden. Inputs for the ponds are mainly grass and banana leaf. A mixture of ground maize and rice bran was fed to the fish with powder form. Groundnut cake was also used for nursing stage.

The specialist spent time visiting the site proposed for the demonstration of fish culture in the near future. There are two households located next to each other. Each household has a flowthrough fish pond system including one nursing pond and two connected grow-out ponds. The ponds are supplied with water from a main canal of the Thach Nham irrigation system. The stocked fish are grass carp and common carp. The farmers could not buy Indian carp (Rohu) fingerlings as expected. They have stopped raising silver carp due



Home-made fish feed with powder form of Mr. Binh's household

Loss from uneaten feed was unavoidable.



Waste materials from piggery of Mr. Binh's household has not been used for fish pond

Technical comments:

- Stop running water to let natural feed developed and exchange water when the pond becomes polluted;
- Add more fish species such as tilapia and bighead carp;
- Apply compost of pig manure and wash water from the piggery to the pond to develop natural feed;
- Use home-made feed cooked with on-farm by-products (rice bran, maize) instead of powder form and feeding tray to control feeding rate of the fish.

3.3 Duc Phong Commune – Mo Duc District

The rice-fish system was started in April. The total area is about 7000 m². The system was stocked with 5000 GIFT tilapia, 2000 rohu and 3000 common carp. The rice was transplanted for one month. Manure was applied for rice. The fish were fed with pelleted feed mixed with rice bran. Adding rice bran to pelleted feed was explained as means to stimulate fish growth and to be able to harvest the fish before flooding. Based on the observation, the fish were growing well. However, the rice was get 'sau duc than' due to late transplantation compared to cropping calendar when other rice has been harvested. According to the farmers, pesticide has not been applied since the rice is still in growth stage.

Technical comments:

- Increase water level in rice fields so the fish can enter the paddy to search for natural feed;
- Give feed at many places around the canal so all the fish can take it;
- Use more home-made feed with available agricultural by-products with cooked form instead of powder form. Home-made feed should be provided in the morning and pelleted feed in the afternoon.



Water level in paddy field needs to be increased for natural feed searching of fish



Feed with powder form should be cooked and provided separately from pelleted one

According to Mr. Long, Vice President of the commune People's Committee, farmers in Duc Phong own several small pieces of paddy fields scattered in many places. From the success of this demonstration, local authorities have plans to encourage the farmers to exchange their land so they can apply the system in the future.

4 Exchange Experience of Extension Method with Staff of the FEC and FSC

The specialist spent Friday afternoon presenting the experience of the application of Farmer Field School approach in fish farming (FFSFF) being used by the AIT-Aqua Outreach Programme in Southern Vietnam to staff of the Quang Ngai Fisheries Extension Center (Mr. Tai, Ms. Than and Ms. Bao). The specialist also explained how to conduct FFS training in fish culture and how to carry out small experiments (see Appendix of FFSFF curriculum) under this kind of training. The FEC staff were very interested in applying the approach for technical support under the QNRDP.

During the field visit, many farmers raised the difficulty of obtaining fish fingerlings from the provincial Fisheries Seed Center (FSC). The specialist spent Sunday morning visiting the hatchery of the FSC in Duc Pho district. Due to lack of necessary facilities, the hatchery has been able to purchase fry to do nursing and ordered fingerlings from other hatcheries to re-distribute in the province. This explains why the farmers cannot obtain fingerlings of preferred fish species on time. The FSC has been provided funds to upgrade facilities and equipment of the hatchery, including breeding systems to produce fry of Chinese carp, common carp and sex-reversed male tilapia in the near future. It hopes that with upgraded facilities, the hatchery can actively produce fingerlings of required species and thereby contribute to development of fish culture in Quang Ngai province.

5. Conclusions

Even though fish culture development has not been raised as a priority by stakeholders during activity planning of target communes, the potential of fish culture development for income generation of the poor in Quang Ngai Province is a reality. In addition to unfavourable weather conditions and water sources in some communes, a difficulty faced by the farmers to practise fish culture includes the lack of efficient technical support and stable fingerling supply. This seems to be improving in the near future. The establishment of fish culture demonstrations with appropriate techniques could help to develop small-scale fish culture very soon.

- The demonstration of integrated fish culture in VAC system in Hanh Phuoc Commune of Nghia Hanh District should be sped up this year.
- The demonstration of rice-fish system in Duc Phong Commune of Mo Duc District should provide more technical inputs, particularly on feed and feeding, and water regime management to ensure economic efficiency for further expansion.
- The demonstration of fish culture in the communes of Son Trung and Son Giang could be started whenever an activity group is established and a training course on fish culture with appropriate training method, e.g., FFS approach, is provided.
- The demonstration of fish culture in Nghia Tho commune should be revised for better site selection and availability of technical inputs.
- For sustainable development of small-scale fish culture, a full-time staff with aquaculture background should be recruited.

Annex 1

Fish Culture in Ponds

Annex 1: Fish Culture in Ponds

There are five sections of ‘Fish Culture in Ponds’ of FFS training on fish culture implemented by the AIT-Aqua Outreach Programme in Southern Vietnam as follows:

Section 1: Pond ecosystem

Section 2: Biological characteristics of cultured fish

Section 3: Pond construction and preparation

Section 4: Fingerling stocking

Section 5: Pond management

1. Training topic	Fish culture in ponds Section 1. Pond ecosystem
2. Objectives	At the end of the session farmers will be able <ul style="list-style-type: none"> to describe pond water quality parameters affecting fish life to describe the fluctuation law of pond water quality parameters
3. Trainees	Aquaculture group farmers
4. Duration, venue	Duration: 1 meetings (150 minutes) Venue: In a group member’s house, near pond dykes
5. Training content summary	1. Pond water quality parameters: physical, chemical and bio factors 2. Relationship between these factors
6. Materials needed	filter papers, scoop nets to collect zoo-benthos, sieve with fine mesh size, pH papers, black nylon bags, 500 mL and 2000mL bottles, buckets, glass <ul style="list-style-type: none"> vinegar, lime, inorganic fertilizer, boiled water, ice fingerlings A0-size papers, colour pencils, markers pH paper, DO kit green pond water and bottom mud
7. Method	Introduce the training topic and split the group into three sub-groups Begin the discussion by asking farmers questions such as: <ul style="list-style-type: none"> How do fish survive and grow? We will carry out small experiments to find out answers and to understand a pond ecosystem <p>Bio-factors</p> <ul style="list-style-type: none"> Phytoplankton: dilute pond water at different levels then filter these water samples through filter papers, observe filtered water and colour of filter papers Zooplankton: observe pond water contained in glass under sunlight; record moving small organisms Zoobenthos: take pond mud with scoop net then filter through a sieve; collect and describe found organisms <p>Physical factors</p> <ul style="list-style-type: none"> Temperature: prepare two plastic containers containing some fingerlings; add hot water into one container and ice water into the other; observe performance of the fish

	<ul style="list-style-type: none"> • Transparency/turbidity: prepare two plastic containers containing some fingerlings; add some mud into one container; observe performance of the fish in two containers <p>Chemical factors</p> <ul style="list-style-type: none"> • pH: prepare two plastic containers containing some fingerlings; add vinegar into one container and lime into the other; observe performance of the fish in two containers • Oxygen: stock same amount of fingerlings in two small and two big containers, close one small and one big containers; observe performance of the fish in these containers <p>Relationship between these factors</p> <ul style="list-style-type: none"> • Phytoplankton – oxygen: take four 1000 mL containers of which the two with pond water and the two with clean water; add same amount of fingerlings into these containers then close all of them; use black nylon bags to cover one with pond water and one with clean water. Ask the farmers put all containers under indirect sunlight. After 1 hour, observe performance of the fish in two containers • Sunlight - phytoplankton: take four 500 mL containers with diluted pond water; add few urea particles into the two containers. Cover the two containers with and without fertilizer with black nylon bags. Ask one farmer to bring these containers back to his house and put under indirect sunlight. Shake the containers several times during the day. Observe the colour of water after three days and report the result during next meeting • pH - phytoplankton: take three 500 mL containers with diluted pond water. Add vinegar into the first, vinegar and lime into the second and add few urea particles into all containers. Ask one farmer to bring these containers back to his house and put under indirect sunlight. Shake the containers several times during the day. Observe the colour of water after three days and report the result during next meeting <p>Ask all sub-groups to present results of their experiments on A0-size paper and to explain for the results they got. Draw a pond ecosystem</p> <p>Discussion</p> <ul style="list-style-type: none"> • What are the water parameters affecting the fish life and their fluctuation during day and night time, and under different weather conditions • What is the role of phytoplankton, zooplankton, zoobenthos? What are the impacts of water parameters on the fish life?
<p>8. Review – evaluate trainees’ participation</p>	<ol style="list-style-type: none"> 1. Review water quality parameters 2. Review relationship among these parameters 3. Introduce the topic for next meeting 4. Agree on time and venue of the next meeting

Annex 2

Time Schedule

Annex 2: Time schedule

Day	Morning Activity	Afternoon Activity	Overnight Location
17 May		Arrival at the Quang Ngai Province	Hung Vuong Hotel
18 May	Visit to Nghia Tho commune of Tu Nghia district to search for potential of small-scale fish culture	- Visit to Nghia Hanh district to participate Farmer Meeting to review results of the study tour on fish culture systems in Tinh Tho commune - Visit the site proposed for demonstration of small-scale fish culture in Hanh Phuoc commune	Hung Vuong Hotel
19 May	Visit to Binh Minh commune of Binh Son district to identify potential of fish culture	Visit to the Quang Ngai Fisheries Extension Center (FSC) to discuss technical issues of the demonstration of fish culture in Hanh Phuoc commune	Hung Vuong Hotel
20 May	Visit to Son Trung commune of Son Ha district to identify potential of fish culture	Visit to demonstration of rice-fish system in Duc Phong commune of Mo Duc district	Hung Vuong Hotel
21 May	Visit to Son Giang commune of Son Ha district to identify potential of fish culture	Work at Quang Ngai FEC to share experience on application of FFS on fish culture	Hung Vuong Hotel
22 May	Working at the hotel	Working at the hotel	Hung Vuong Hotel
23 May	Visit to Quang Ngai FSC to identify potential of seed supply	Working at the hotel	Hung Vuong Hotel
24 May	Working at the hotel	Present findings of the mission	Hung Vuong Hotel
25 May	Leave for HCMC		

Limitations

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