TCP/ RAS/ 3203 (D)
(LOA/RAP/2008/30)

FAO/NACA

Technical Cooperation Programme Project

"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

ANNUAL PROGRESS REPORT

(LOA/RAP/2008/30)
Submitted by the Director General, NACA
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Executive Summary

The TCP/ RAS/ 3203 (D),"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region" was developed through a collaborative effort of the Network of Aquaculture Centres in Asia- Pacific (NACA), and the participating countries, PR China, Indonesia, Thailand and Vietnam and the Aquaculture Management and Conservation Services (FIMA) of the Department of Fisheries and Aquaculture of FAO, at the request of the relevant Ministries of the participating countries and on a recommendation of the Governing Council of NACA at its 1 at its 18th Meeting held in Bali, Indonesia. On approval of the TCP FAO and NACA entered into a LoA, LOA/RAP/2008/30, which included seven main deliverables to facilitate the project. This report entails the progress in respect of the above deriverables from NACA in the first year of operation (August 2008 to July 2009) of the project. The major activities for which funds are provided under the LoA are:

1. Organization of Regional Inception Planning Workshop,
2. Organization of National Stakeholders Workshop/Training,
3. Assisting in organization of National Workshop II by providing a trainer/facilitator ,
4. Livelihood analysis and environmental impact assessment of marine finfish farming,
5. Organization of Regional TCP Terminal Workshop,
6. Implementation, supervision and monitoring of field activities, and
7. Analysis of data and preliminary interpretation of results.

Included in the above activities are other logistical inputs from NACA that were to help facilitate each of the above activities, and included for example arranging travel, workshop venues and the like.

As per the LoA NACA has successfully facilitated the completion of activities 1 and 2, the details of which have are included in the report. Completion of these activities has enabled the selection of participatory farmers in the proposed trials from each of the countries, provided guidelines on trial design and monitoring aspects thereof, and also managed to facilitate the provision of feeds (compounded feeds) for the trials from different suppliers, free of charge for trials in Thailand and Viet Nam, and at a significantly discounted rate in Indonesia and PR China.

NACA expertise has through regular contact with the country coordinators and visits to sites has ensured the commencement of the field trials as decided upon at each of the in-country meetings. Indeed, it is heartening to note that all farmers who agreed to participate are continuing to do so and thus far the trials in all the countries have proceeded as planned. NACA expertise has undertaken monitoring visits to all the country sites over the period March to August 2009, and have interacted with the participating farmers and also continued to interact with the national coordinators on a regular basis.

The livelihood analysis component has commenced in all the countries, based on suitable modifications of the structured questionnaire(s) to suit the country situations. It is expected that the overall results of the livelihood surveys will be available for scrutiny and further evaluation and consideration for necessary adaptive measures towards the end of the project term.

Activities 5 and 7 will be undertaken in the second year of the project.

NACA has also maintained regular contact with Dr. Mohammad R. Hasan, FIMA, FAO and Mr. Weimin Miao, RAP, Bangkok, on project activities on a regular basis, and have worked in a very amicable manner which has helped the project progress satisfactorily and on schedule, as much as that could be expected from a regional

1 Background

1.1 Project rationale, objectives and deliverables

The administrative details pertaining to the current regional project under the Technical Cooperation Programme of the Food and Agriculture Organization (FAO) and the Network of Aquaculture Centres in Asia-Pacific (NACA) were finalized in August 2008, with the signing off of the agreement between the above two organizations, and the approval of the TCP by the Director General of FAO.

Marine finfish aquaculture in Asia has been developing rapidly at around 10 percent per annum valued at 4 percent per annum of the global finfish production over the last decade, and is the fastest growing sub-sector in Asia. Much of this increasing production is attributable to the expanding culture of high-value marine carnivorous species such as groupers. The countries that lead in marine finfish aquaculture currently are PR China, Indonesia, Viet Nam and Thailand, as well Korea and Japan, with India planning major expansion. However, the sub-sector is by and large dependent on trash fish/low-value fish, almost always as the only food source of the cultured stocks. The use of trash fish/low value fish is a contentious issue both from a resource use view point and an environmental integrity perspective; the latter being reflected in the very high conversion rates (therefore poor efficiency).

The long term sustenance, economic viability and environmental integrity of marine finfish aquaculture practices in the region will essentially depend on the shift from direct use of trash fish/low-value fish to formulated feeds, It is expected that this will reduce the overall dependence on trash fish/low-value fish as a direct food source, improve the environmental integrity of the practices and bring about better economic viability. The problems outlined are common to all nations involved in marine finfish farming in Asia and therefore it is logical to have a regional approach that incorporates farmers and furthermore a regional approach will also generate significant synergies.

The project is expected to address this issue through direct involvement of farmers in reducing the perception that trash fish/ low value fish perform better than pellet feeds and thereby introduce a transition from the use of one feed form to the other, and consequently contribute to overall sustainability of the sector in Asia, and the livelihoods of the many thousands of farmers involved. The overall outcome of the project will be a reduced dependence on trash fish (and marine resources) for marine finfish farming in Asia. The outcome will be achieved through a combination of improved feed practices and a shift in the sector towards better diets, and particularly the use of formulated diets. This outcome will increase the long term viability of marine fish farm operations and improve the livelihood of practitioners and contribute to poverty alleviation.

The proposal was developed in close collaboration between NACA, FIMA, FIEP and RAPI and has gone through extensive consultation among stakeholders including the participating countries. The proposal has received the letter of support from Minister of Marine Affairs and Fisheries, Republic of Indonesia and Vice Minister of Ministry of Agriculture and Rural Development, Government of Viet

Nam. The proposal has been given top priority among the regional TCP proposals in RAP and received preliminary operational clearance by RAPR. The proposal has been technically cleared by FIMA. NACA is responsible for overall coordination and implementation and is being executed by the four participating countries (viz., China, Indonesia, Thailand and Viet Nam). The project is being operated from the FAORAP in Bangkok and the Aquaculture Management and Conservation Service (FIMA) is providing the lead technical supervision, support and advice for its implementation, with the involvement of Fisheries and Aquaculture Development Planning Service (FIEP) and of the FAO Country Offices as required.

1.2 LOA between FAO and NACA

In view of NACA's involvement throughout the development of the project a LOA was drawn up between NACA and FAO to facilitate some of the key components. The key components of the above LoA and the expected deliverables from NACA are summarised in Table 1.

Table 1. The activities and the related deliverables under the LOA between NACA and FAAo and

Activities	Related Deliverables
Organization of Regional Inception Planning Workshop	• Inception Report including final operational work plan of the TCP ; • Report of National Workshop I; • Progress Report and annual report as appropriate: and • Report of Terminal Workshop: within two months of the completion of the TCP terminal workshop.
Organization of National Stakeholders Workshop/Training I	
Participation of NACA staff in National Workshop II as a trainer/facilitator	
Organization of Regional TCP Terminal Workshop	
Livelihood analysis and environmental impact assessment of marine finfish farming	• Report of livelihood analysis and environmental impact assessment of marine finfish farming;
Implementation, supervision and monitoring of field activities	• Report of implementation, supervision and monitoring of field activities. To be delivered by NACA over the project implementation phase of two years
Analysis of data and preliminary interpretation of results	• Report of field trial data analysis and preparation of interpretation of results. To be delivered by NACA over the project implementation phase of two years

Apart from the major activities and outputs/deliverables as mentioned above, NACA undertook and accomplished the following:

- Ensuring the preparation of the necessary documents, which will be used for the workshops/trainings
- Prospectus and Programme/ Tentative Agenda of all workshops/training programme organized,
- Liaise with the workshop participants (country participants and resource persons) to ensure that all country participants and resource persons are adequately prepared with their presentation in the workshop,
- Liaise on all organizational and administrative matters concerning the preparation, organization and conduct of the workshop, with the participants attending the workshop and if necessary with the institutions they are representing

- Serve as Rapporteurs for the workshop, providing detailed and accurate written proceedings of all exchanges and discussions taking place during workshop sessions, working groups, training sessions etc.
- Arrange necessary workshop logistics including stationeries, workshop facility, audio-visual, etc.
- Organize all travel and accommodation for all those attending the workshops/training programs, with due consideration of identifying the most convenient and cost-effective travel and accommodation arrangements, paying travel and accommodation fees

2 Progress/ accomplishments

2.1 Organization of country teams

NACA was successful in finalizing the country coordinators for conducting study in conjunction with the respective governments. Accordingly the Institutes and the Personnel that have been nominated for the facilitation of the TCP activities by the respective governments are as follows:

PR China: **Wayne Chen**
Director, Guandong Provincial Aquaculture Disease Control Center, No. 10, Nancum Road, Gaunzhou, China (e mail: cwen@gdftec.com)

Indonesia: **Muhammad Murdjani**
Director, Main Centre for Mariculture Development, Lampung, Jalan Yos Surdos, Des Haruno, Lampung 35454 (e mail: anna_murdjani@yahoo.co.id)

Thailand: **Paiboon Bunliptanon**
Director, Coastal Fisheries Research and Development Centre, Phuket

Viet Nam: **Thai Ngoc Chien**
Senior Research Scientist, Research Institute for Aquaculture No.3, 33- Dang Tat Street, NhaTrang City, Khanh Hoa (e mail: thaichienfish@yahoo.com)

NACA has proceeded to liaise with the country coordinators successfully, and accordingly have been able to conduct the successfully the activities entailed in this report.

2.2 Inaugural Inception Planning Workshop

The Inaugural Planning Workshop was held in Krabi, Thailand, on 08th to 10th September 2008, and brought together all the nominated country coordinators, except from PR China. The workshop was very successful and the report of the workshop has been circulated widely and accepted buy all concerned parties **(Annex I).**

The inaugural planning workshop made certain recommendations that were to facilitate the follow-up activities, amongst which were that the procurement of equipment be made through NACA to expedite the overall process. This could not be done as the recommendation was contrary to the existing procurement rule of FAO. However, there has been some delay in delivery of the equipment to the countries owing to the local custom regulation of the respective county. Similarly, the inaugural planning workshop recommended to make necessary budgetary adjustments for effective implementation of the livelihood studies as the financial provisions made in the original budget is not adequate to accomplish the tasks, as some necessary components such as translation of the responses from stakeholders, preparing a customized database for data inputting were not included in the original project document. Such lapses cannot be totally avoided in formulation of complex

project document; however, the key would be to find plausible solution to such problems as they are unearthed so that the overall progress of the project is not hampered as a result. However, it is understood that the provision of additional fund for livelihood study for incorporation in the existing FAO-NACA LOA would require revision of the LOA and that may be time consuming. So NACA has requested FAO to make such fund available through other means by making necessary budget revision of the project that may not require the revision of LOA but fund is available.

It has to be appreciated that the original budgeting of a project at the planning stage could deviate significantly when the implementation comes into being, more so as there is generally a gap of 12 to 18 months between planning, approval and implementation. It is imperative that such inevitable changes need to be recognized otherwise timely and effective implementation of many of the project activities cannot be ensured and may eventually be counter-productive.

2.3 National workshops

As envisaged in the project proposal and the time table of activities NACA was successful in organising and conducting national workshops in each of the participating countries on schedule and as detailed below.

Viet Nam: Research Institute for Aquaculture No 3 (RIA 3), Nha Trang, **24th to 27th November, 2008**
Indonesia: Main Centre for Mariculture Development, Lampung, **02nd to 04th of February 2009**
Thailand: Phuket Coastal Fisheries Research and Development Centre, **12th to 14th February 2009**
PR China: Zhanjiang Jinhai Hotel, Zhanjiang, China, **24-26 March, 2009**

As indicated in the LOA NACA was responsible for all organisational activities, bringing the participants and ensuring all the logistical support was provided for successfully conducting each of the workshops. NACA personnel were responsible and duly carried out and provided all the background material for each of the workshops, and the reports pertaining to these workshops, which have been made available previously and accepted by all concerned parties, are reproduced in **Annex II.**

It is important to place on record that all of the above workshops were held at the respective institutions of the Country Coordinators, or the nominated Institution in the case of China, which enabled to be within budget, in spite of the number of participant farmers exceeded the original estimates. NACA is thankful to the Country Coordinators for making this possible, and indeed the holding of the workshops in the respective institutions also had the indirect impact in that farmers could interact with R & D staff of each of the institutions.

2.3.1 Summary of highlights of the national workshops

The above workshops held in each of the participating countries were a crucial element of the project. These brought together prospective farmers who would participate in the proposed trials and also enabled a testing of the livelihood analysis questionnaire in respect of each country, in accordance with the needs of each.

It was extremely satisfying that the number of farmers who attended each of the workshops far exceeded the expectations, and indeed the numbers who could be involved in the participatory trials. During the national workshops and negotiations previous to these enabled NACA to ensure that the private sector feed companies provided the feed requirements for the trials in full for Thailand and Viet Nam, whilst in PR China and Indonesia the project as able to negotiate a significant discounts for the commercial feeds, and the latter was acceptable and welcome by all farmer participants in the trial

The national workshops also enabled the establishment of much more intimate contact with the coordinators from the NACA side and those from the national institutions and the participating farmers. At all the workshops there was considerable dialogue between all participants indicative of farmer interest and determination to take an active part in the trials. Most of all the national workshops provided the opportunity to "fine tune" the nature of the farmer participatory trials, in relation to species to be used, the nature of the culture practice, record keeping and so forth. The details of these decisions are entailed in the individual reports of Annex II.

The information sought by the countries on the prospective farmer participants, however, varied between countries. This was a necessary element and was in compliance to the country needs in conducting such trials. For example, the information sought in Indonesia was very different to that sought in Thailand. These details are entailed in the respective reports of the meetings annexed here.

At these stakeholder meetings NACA had major inputs, apart from the organizational aspects. At all the workshops NACA made presentation on feed storage, preparation and feed management and on record keeping and environmental monitoring, thereby bringing about a degree of uniformity in the way the field trials are conducted and reported in each of the participating countries.

2.3.2 Deviations from the original proposal

It is heartening that there had not been significant deviations from the original proposal nor from any of the recommendations that were made at the inaugural Planning Workshop held in Krabi, Thailand in September 2008. The deviations, if any, were in respect of detail on the number of participatory farmers in the trials and originally proposed species and so forth, none of which are expected to impact on addressing the original concepts of the project at the time of conception.

Equally, deviations from the deliberations at the Inception Workshop and follow-up country workshops/ stakeholder meetings had to be accommodated. The most significant of such deviations were the changes in the species used in Vietnam for the trials, opting for pompano and snapper in place of other potential species such as grouper, Asian seabass and cobia. These changes were unavoidable, and indeed inevitable, in view of the relatively dynamic and unpredictable situations that occur in each country in respect of seed stock supplies in the main. In the case of cobia, a preferred species in Vietnam the decision was taken not to use this species because of the very high feed requirement and also the fact that it is not a preferred species in most other countries in the region. In spite of these unpredictable and inevitable changes the trials will still be able to address the underlying issue on the efficacy of use of compounded feeds versus trash fish in coastal

mariculture in the region, and provide findings that will help develop useful strategies for future directions and development of the sector.

2.4 Livelihood surveys

The first round of livelihood surveys, covering the 'trash fish suppliers' has been conducted. However, provision has to be made to (a) translate the responses to English (b) develop a suitable, dedicated database for entry and analysis of the survey results. Preparation of dedicated database will be initiated as soon as the additional funding is available. Also, the finalization of the survey questionnaire for farmers' perception study who have participated in the trials is still being awaited, to be finalized by FAO backstopping officer (in this case from FIEP) in consultation with TCDC Consultant (Livelihood) of the project. However, in the latter case responses will be only sought after the trials are concluded as it is primarily in respect of the farmer perceptions on the use of trash fish versus compounded feeds.

The number of trash fish suppliers survey in each country was, 20 (to be transmitted to NACA), 08, 05, and, 23 (including one middleman) for China, Indonesia, Thailand and Vietnam, respectively. In the above regard NACA has made recommendation to that the latter two assignments, translation of responses, preparation of a customised data base, data inputting and analysis, be made through an Author's Contract. An early action is requested in this regard so that the related activities of this component can be effectively accomplished.

2.5 Monitoring

NACA has continued its monitoring activities through site visits through regular communication with the national project coordinators, electronically and otherwise.

The NACA monitoring visits were done by Mr. Hassanai Kongkeo (HK) and the details are as follows:

PR China: Pending (to be undertaken in August)
Indonesia: ***Lampung; 13-17 July 2009*** (HK)
Thailand: ***Phuket, Krabi and Phang-nga; 16-20 June 2009*** (HK + Sena De Silva)
Vietnam: ***NhaTrang; 26-29 May 2009*** (HK)

Report of implementation, supervision and monitoring of field activities detailing the visits will be provided after completion of all field activities as foreseen in the prodoc and LOA between NACA and FAO. The aspects of monitoring covered a number of grounds and entailed visits to all sites, extensive discussion with the national coordinators and participatory farmers. First hand observations were made on the on-going activities, and participated in the regular sampling programs at each of the sites, ensured that record keeping was being done properly as instructed and agreed upon, and the responses (quantitative) to the livelihood questionnaires checked and the gaps requested to be fulfilled. All the responses thus far received were brought to NACA, pending preparation of database and subsequent data analysis.

The dates of commencement of the trials in the participating countries are as follows:

PR China: 10th to 17th April 2009

Indonesia: 6-8th April 2009

Thailand: 7-10th April 2009

Vietnam: 20-30th April 2009

All in all, the trials are progressing well. As an example the ongoing trial details for Vietnam and China PR, Indonesia and Thailand are given in **Tables 2**,**3**, **4** and **5**, respectively. The early indications appear to point to the fact that the absolute growth of fish maintained on trash fish to be performing better than those maintained on commercial feeds in China on red snapper (**Table 3)**, Indonesia on tiger grouper (**Table 4)** and Thailand on tiger grouper and seabass (**Table 5**) while pellet performed better on grouper in China (**Table 3**) and on both red snapper and pompano in Vietnam (**Table 2**). It is however to be noted that the environmental monitoring aspect in the trials has not progressed as expected in a uniform manner (for example the water quality monitoring equipment is yet to be received for the trials in China at the time of writing of this report) in all the participating countries; this being result of the delays in the delivery of equipment owing to the local custom regulation of the respective counties.

NACA in consultation and collaboration with FAO expects to compile the information collected over the monitoring period to prepare a semi-technical article for publication in *Aquaculture Asia*, in due course. It is believed the information available is vast and will be useful to marine fish farmers and technicians, and will focus on the comparisons of the farming practices in the four participating countries.

Table 2. The ongoing trial details in Vietnam as at 28 July 2009

Farm	Species	Stocking size	Age (days)	Ave BW + (growth rate/day)	
				Pellet fed	Trash fish fed
Quyen	Red snapper	68.7 + 67.6 g	78	200.0 g (2.45%)	190.0 g (2.32%)
Tai	Pompano	5.5 g	97	287.5 g (52.85%)	262.5 g (48.17%)
Cuong	Pompano	5.5 g	97	190.0 g (34.58%)	160.0 g (28.96%)
Quyen	Pompano	5.5 g	97	240.0 g (43.96%)	210.0 g (38.33%)
Toan	Pompano	5.5 g	97	200.0 g (36.46%)	170.0 g (30.83%)
Hoang	Pompano	5.5 g	97	209.0 g (38.14%)	190.0 g (34.58%)
Khai	Pompano	5.5 g	97	246.2 g (45.12%)	242.9 g (44.50%)
Lem	Pompano	5.5 g	97	156.3 g (28.27%)	121.4 g (21.72%)
Sinh	Pompano	5.5 g	97	166.7 g (30.22%)	155.6 g (28.13%)
Thanh	Pompano	5.5 g	97	190.0 g (34.58%)	160.0 g (28.96%)
Van Tai	Pompano	5.5 g	97	200.0 g	160.0 g

				(36.46%)	(28.96%)
Ave.	Pompano	5.5 g	97	208.6 g (38.07%)	183.2 g (33.31%)

Table 3. The ongoing trial details for China PR as at 1 June 2009 (50 days)

Name	Farm site	Species	Fingerlings stocked	Stocking size	Ave. BW + (growth rate/day)	
					Pellet fed	Trash fish fed
Mr. Liang Zhong	Liusha Port, Leizhou City	Green grouper	4,500	20.0 g	127.3 g (10.73%)	100.0 g (8.00%)
Mr. Liang Lin	Liusha Port, Leizhou City	Red snapper	4,000	12.0 g	25.0 g (2.17%)	38.4 g (4.40%)
Mr. Chen Wuhan	Techeng Island, Zhanjiang City	Red snapper	4,000	6.0 g	7.6 g (0.53%)	9.1 g (1.03%)
Mr. Chen Meiguang	Techeng Island, Zhanjiang City	Red snapper	4,000	6.0 g	9.6 g (1.20%)	8.7 g (0.90%)
Mr. Lai Rigui	Techeng Island, Zhanjiang City	Green grouper	2,000	20.0 g	60.8 g (4.08%)	53.3 g (3.33%)
Average		Green grouper		20.0 g	94.1 g (7.41%)	76.7 g (5.67%)
Average		Red snapper		8.0 g	14.1 g (1.53%)	18.7 g (2.68%)

Table 4. Preliminary monitoring data on tiger grouper trials in Lampung, Indonesia, over a 99 day period.

Farm/ location	Stocking size (g)	Avg. BW (+ % growth rate/day)		Remarks
		Pellet fed	Trash fish fed	
Parmanto/ **Puhawang**	17.02 g	66.32 g (2.93 %)	75.50 g (3.47 %)	Mortality still continue due to freshwater runoff from river
Booby/ **Tegal Arum**	17.02 g	65.00 g (2.85%)	70.01 g (3.14 %)	Mortality still occurs
Robby/ **Maitem**	17.02 g	70.82 g (3.19 %)	62.32 g (2.69 %)	none
Alung/ **Ringgung**	17.02 g	66.41 g (2.93 %)	66.19 g (2.92 %)	none
Sitepu/ **Tanjung Putus**	17.02 g	74.83 g (3.43 %)	62.17 g (2.68 %)	none
Koo Atik/ **Pancur**	17.02 g	47.00 g (1.78 %)	80.50 g (3.77 %)	Slow growth may be caused by feed loss through net cage in strong current area
Average	**17.02 g**	**65.06 g (2.85 %)**	**69.45 g (3.11%)**	none

Table 5. Growth monitoring after 70 days (7-10 Apr to17-20 Jun 09), Thailand					
Farm	**Fish**	**BW at stocking**	**Ave. BW + (growth rate/day)**		**Remarks**
			Pellet fed	**Trashfish fed**	
Theerapat, **Krabi**	Tiger grouper	40.0 g	80.0 g (1.43%)	75.0 g (1.25%)	Good water circulation and high salinity but turbid as located at the mouth of canal
Sarapong, **Krabi**	Tiger grouper	40.0 g	79.0 g (1.39%)	81.0 g (1.46%)	Same as Theerapat farm
Sen, **Krabi**	Tiger Grouper	40.0 g	64.0 gm (0.86%)	77.0 gm (1.32%)	Mainly operated by worker because owner who just bought a trawler, was busy with repairing an engine
Rewat, **Krabi**	Tiger grouper	40.0 g	81.0 g (1.46%)	84.0 g (1.57%)	Good water, management and trashfish sources
Sawai, **Phang-nga**	Seabass	33.0 g	178.0 g (6.28%)	192.0 g (6.88%)	Good water circulation and low salinity as located in the canal of heavy rain area; Fed with trashfish once a day; Fed with pellet twice a day
Amnuey, **Phang-nga**	Seabass	33.0 g	173.0 g (6.06%)	181.0 g (6.41%)	Same as Sawai farm
Wichai, **Phang-nga**	Seabass	33 g	210 g (7.66%)	238 g (8.87)	Better water circulation due to smaller cage size (2.5m X 2.5m) which is easy for cleaning.; Fed twice a day for both pellet and trashfish
Yawa/Suree, **Phang-nga**	Seabass	33.0 g	232.0 g (8.61%)	276.0 g (10.52%)	Same as Wichai farm but owner has longer experience over 20 years
Somporn, **Phuket**	Tiger grouper	40.0 g	70.0 g (1.07%)	87.0 g (1.68%)	Good water circulation but shallow.; Rancid pellet caused by heavy rain
Samut, **Phuket**	Tiger grouper	40.0 g	92.0 g (1.86%)	147.0 g (3.82%)	Best water circulation as located in open sea
Ahmad, **Phuket**	Tiger grouper	40.0 g	100.0 g (2.14%)	78.0 g (1.36%)	Clear water as located in newly dredged coast; Less growth in cages fed with trashfish due to more seaweed (fertilized by waste of trashfish)
Samrit, **Phuket**	Seabass	33.0 g	157.0 g (5.37%)	146.0 g (4.89%)	Shallow, turbid and high salinity water.; More fouling in cages fed with trashfish
Average	**Tiger grouper**	**40.0 g**	**81.0 g (1.46%)**	**90.0 g (1.78%)**	
Average	**Seabass**	**33.0 g**	**190.0 g (6.80%)**	**207.0 g (7.53%)**	

3 Other issues

There were some pertinent recommendations made at the Inaugural Planning Workshop held in Krabi, Thailand, September 2008, collectively arrived by in order to further facilitate project execution/ implementation, and increase the efficacies thereof. These recommendations were of two facets – technical and financial.

In respect of the technical matters the recommendations were easily adopted, in concurrence with all the participating countries. On the other hand, financial matters such as the need to increase the budgetary provisions for completing the livelihood surveys, wherein an increased provision was sought to compensate for translation of the responses to English, database development and consequent analysis (aspects which were not foreseen at the project formulation stage), approximately amounting to US$ 2,500 per country is pending.

The analysis of the feeds (compounded pelleted feed and trash fish) are to be done. In this regard arrangements have to be made to collect the relevant field samples and subsequent analysis to be conducted. It needs to be pointed out that the fund for feed quality analysis is available under the General Operating Expenses (GOE) of Prodoc and is not included in the LoA between NACA and FAO. The above information will be crucial to the final analysis of the outcome of the project. NACA, with its experience in dealing on matters such as this, and with expertise in finfish nutrition, is willing to take up this through a separate contract. NACA is consulting Mohammad Hasan (LTO of the project) to expedite this so that this important task can done as quickly as possible.

From left to right (a) trial site Vung Ngan, Vietnam (b) Feed provided by Thai Feed Mills for Thai trials, free of charge, (c) site in China, and (d) monitoring weight of stocked fish in a trial in Lampung, Indonesia

4 Annex I. Report of the Inaugural Planning Workshop

TCP/ RAS/ 3203 (D)

FAO/NACA

Report of the Inception Planning Workshop

"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

Golden Beach Resort, Krabi, Thailand, 8th to 10th September 2008




Background

Appropriate planning is an important prerequisite for successful implementation/execution of any activity.

The inception planning workshop was convened to discuss the follow up project activities and finalize their modus operandi with primary focus on the following to:

- discuss the project concept, rationale, envisaged outputs and broad outline of activities and the feasibilities of carrying out the different activities,
- discuss and finalize the draft questionnaires outlines that were prepared in respect of the livelihood analysis of trash fish/low-value fish supplier and the environmental impact assessment components,
- discuss and finalize the methodology to study the farmers' perception on the use of trash fish/low-value fish and formulated feed,
- determine the in-country logistics of conducting different project components including the farmers participatory trial and livelihood analysis of trash fish/low-value fish supplier, and to finalize the survey plans for each country,
- finalize TORs of international and TCDC consultants and to discuss the initiation their recruitment process,
- finalize TORs of all training programs/workshops, and
- reach agreement on and to finalize the overall work plan including time frame of implementation and responsibilities of all project holders.

The workshop:

a) As a result of an unforeseen "State of Emergency", declared by the Royal Government of Thailand some of the participants (PR China, Indonesia) were unable to arrive in Krabi, Thailand, as scheduled. Accordingly, the draft agenda had to be changed slightly but this did not, however, impact on the workshop objectives being achieved.

b) The revised agenda and the participants list are given in Annex I and Annex II, respectively.

c) The workshop elected Dr. Juadee Pongmaneerat, Department of Fisheries, Government of Thailand as the Chairperson, for the 8th and thereafter Mr. Paiboon Bunliptanon, Director, Krabi Coastal Fisheries Research and Development Center, Krabi.

d) The purpose of the workshop was introduced by Dr. Mohammad Hasan, FAO FIMA, Rome in which he addressed the scope of the FAO-TCP program, the origin and the scope of the current TCP (Annex III). Mr. Miao Wiemin, FAO RAPI, Bangkok also addressed the workshop and indicated that the current TCP he was very pleased to be involved in this TCP which happens to be the first program activity he is involved as taking up his position as the Aquaculture Officer, RAP, Bangkok, and assured his fullest cooperation for this activity.

e) Prof. Sena De Silva outlined the issues associated with the project and the questions to which the project is expected to provide answers (Annex IV).

f) Country presentation on the mariculture sectors were presented by (Annex V):

i. China: ***Wang Lixin, National Fisheries Technical Extension Center, Ministry of Agriculture, Beijing***

ii. Thailand: ***Paiboon Bunliptanon, Krabi Coastal Fisheries***

		Research and Development Center, Krabi
iii.	Indonesia:	**Muhammad *Murdjani, Main Center for Mariculture Development, Lampung***
iv.	Vietnam:	***Thai Ngoc Chien, Research Institute for Aquaculture No. 3 (***RIA 3), ***Nha Trang and Nguyen Van Lung***

Summary of key points from Discussions on the Country Presentations:

a) In all countries the mariculture output of marine finfish in particular is increasing and in all participating countries the respective governments recognise the need for increased R & D inputs into the sector.

b) In all counties low-value fish/ trash fish still remains the main food type used in marine fin fish culture, but the channels of supply differ from country to country and region to region. The reasons for the use of low-value fish/ trash fish in marine fin fish culture appeared to be rather uniform throughout the region, amongst the main reasons being:

   a. Cost of compounded feeds as opposed to low-value fish/ trash fish
   b. Availability and accessibility of compounded in feeds in remote areas
   c. Perception that stock performs better on low-value fish/ trash fish
   d. Many marine fin fish farmers are engaged in fishing and so the use of low-value fish/ trash fish as feed require only the labour cost.
   e. Lack of species specific feeds for groupers for example (grouper species in particular have significantly different requirements, and the nature of the pellet is also important)

c) All governments recognise the need to reduce the dependence on low-value fish/ trash fish as a direct feed in marine fin fish culture practices, primarily for environmental reasons.

d) It was agreed that the project should endeavour to provide useful information with regard to the efficacy of use of compound feed as opposed to low-value fish/trash fish, despite the fact that the former also uses significant quantities of fish meal in the feeds. Moving from one feed type to the other without significant savings on the primary resource base (in this instance low-value fish/ trash fish used wither directly or processed into fishmeal would not be meaningful.

e) In Indonesia some private sector feed providers are encouraging the farmers to move on to compounded feeds. In this instance they work with the hatcheries and subsidise the difference on survival rate between low-value fish/ trash fish and compounded feed fed fish at weaning. The logic here being that the more fingerlings are weaned onto compounded feeds the farmers who procure such fish for grow-out would have fish ready weaned on compounded feeds, and the grow-out farmers will continue to use compounded feeds for the stock.

f) Farmers prefer to use compound feeds when there a short supply of low-value fish/trash fish and its use is also impacted on by the convenience in culture practices to avoid difficulties involved in weaning fish from trash/low-value fish to compound feed.

Workshop discussions/ recommendations:

Livelihood analysis and methodology for RRA:

Dr. Mohammad R. Hasan of FAO (Aquaculture Management and Conservation Service, FIMA) made a presentation on the review of questionnaire on livelihood analysis and methodology for Rapid Rural Appraisal as the responsible focal point of this component Dr. Cecile Brugere of FAO (Fisheries Policy and Planning Division, FIEP) was unable to participate in the workshop due to the personal reason (see Annex VI for presentation). During the working group discussion, detail methodologies for livelihood analysis and farmer's perception study were discussed and the following were agreed.

Surveys for livelihood analysis

It was suggested that the questionnaire for the livelihood study should be limited to information directly relevant to the TCP to facilitate efficient and effective collation of information.
Accordingly, Dr. Cecile Brugere of FAO will suitably modify the questionnaire and make it available to NACA for translation into national languages and initiate livelihood surveys.

Trash fish/ low-value fish suppliers for the mariculture sector in the region are basically of four categories, but all the categories may not necessarily be providing supplies to the mariculture sector, and can be summarized as follows:

Supplier type	**China**	**Indonesia**	**Thailand**	**Vietnam**
Large/ industrial trawler fishery landings	Not used	Not used	Not used	Yes
Middle persons*	Yes	Yes	Yes	Yes
Small fishers	Yes	Yes	(Yes)	Yes
Farmer/ fisher	Yes	Yes	Yes	Yes

**** Middle person being defined as those that purchase from landing sites and or small fishers and distribute to farmers. There may be more than one middle person involved.***

The workshop having considered the scope of the study/survey and the number of trash fish/low-value fish supplier available in the area was of the view that the suggested number to be surveyed may not be available in the specified location and the realistic number to be sampled for each country was agreed upon as indicated below. It was agreed that focal point in each study area will be the institutes/centers responsible for Farmers Participatory Trial (FTP). Locations, contact person and other details are given below:

- China: Zhanjiang city, Guangdong: 20 plus (to be decided)
- Indonesia: Lampung: 10 (contact person: Suci Antoro***,*** Main Center for Mariculture Development, Lampung).
- Thailand: Pang Nga Bay, Krabi: 15 (contact person: ***Paiboon Bunliptanon,*** Krabi Coastal Fisheries Research and Development Center, Krabi).
- Vietnam: Nha Trang: 20 (contact person: ***Khanh Nguyen Huu,*** RIA 3, and Ha Long Bay: 20 (to be conducted under \the ongoing national program on trash fish; contact person: ***Nguyen Van Lung,*** Hanoi)

In addition to proposed survey in Pang Nga Bay in Krabi, Thailand, NACA will conduct a survey of 5-10 small-scale middle persons in Chanthanburi area using its own resources.

Rapid Rural Appraisal of Farmers' Perception

It was agreed that the farmers' perception study will be carried out with all farmers (see Table 1) participating in FTP and will take place concurrently with livelihood survey and the contact person and focal point will remain the same for each country as above.

It was agreed that the time-frame of survey and RRA will closely follow the time-frame provided in the work plan of the project subject to the timely availability of fund and considering that inception workshop was delayed by about 1.5 months from that was originally planned.

It was also suggested that the budgetary allocation currently made for the above survey and RRA may not be sufficient. The workshop therefore recommended that the part of the fund allocated for a TCDC consultant for this component may be reallocated for the country surveys (currently US$12,000 is available, US$4,000 for each country provided through LOA with NACA). The workshop requested that Dr. Mohammad R. Hasan, Lead Technical Officer (LTO) of the TCP take up the matter with Budget Holder of the project so that the necessary budget revision may be made to this effect.

Environmental assessment

General observations

a) Dr. Michael Phillips of NACA made a presentation on Environmental Assessment from both national and regional view points (Annex VII).

b) It was also pointed out that collation of environmental quality(water) data has to be carefully managed realising that a huge effort expended on many parameters, frequently may not be productive and nor meaningful; the number of relatively easily measurable and environmentally indicative criteria, such as for example, dissolved oxygen, ammonia, Secchi disc depth and the like.

c) The need for simple record keeping formats to be developed was also emphasised.

Recommendations

a) The workshop agreed that the water quality parameters that needs to be monitored include dissolved oxygen, ammonia, Secchi disc depth, and preferably be measured once a fortnight, two hours post-feeding, and that sampling be carried out for at least 50 percent of the sites, and preferably at sites that are not close to each other.

b) The workshop also recommended that farmers be encouraged to maintain proper records that include unusual observations on the colour of the water, mortalities and appearance of any diseases, unusual behaviour of the stock, etc.

c) The workshop recommended that the funds allocated for expendable materials/supplies and non-expendable equipment (e.g. desk top computers, printers, water quality monitor) be combined and utilised for the procurement of the required water quality monitoring

equipment, either suitable probes and or Hach Kit, and all participating countries opted to give priority for the procurement of water quality equipment.

d) The workshop recommended that Prof. De Silva, NACA and Mr. Miao Weimin, FAO RAPI will kindly explore the availability of these equipments and the cost and accordingly advise the national counterparts for their opinion/comment.

Farmer trials

The workshop agreed on the following general guidelines farmer's partipatory trial/ growth trials on the use of compound feed vs. trash fish /low value fish

General Guidelines

a) The trial in each country should, as far as possible, incorporate farms from as many clusters as possible, but also ensure that logistically management and coordination is not impaired

b) The workshop arrived at a general consensus for each country that would from the broad framework for the trials (Table 1), and the fine tuning of the trials will be done at the first national stakeholders' workshop in each country.

c) Ir. Widyatmoko, Manager, Technical Service, JAPFA, Indonesia expressed willingness of JAPFA to be involved in the project, through the provision of feeds for the Indonesian trial, and if possible to other countries, on consultation with the management.

d) It was agreed that the extent of participation of JAPFA in the trials will be included in all the relevant reports and posted on the web site, and on completion of the trials all information will be made available to JAPFA to be used in any form they wish, in consultation with NACA.

Table 1. Broad framework for farmer trials to be conducted in each country

Country	Area	Species	Farms (cages)	Commencement/ details
China	Zhanjiang City, Guangdong	Grouper (to be decided)	04 (x08)	April- May; 2 sites; cage size 4 x 4 x 2.5 m; seven month growth cycle; 50 g at stocking
Indonesia	Lampung Bay, Lampung	Tiger grouper	04 (x 08)	February- March; Four cages each for Tf/ Cf; 10 cm; cage size 3 x 3x 3 m; 1000 fish/ cage; one year growth cycle
Thailand	Pang Nga Bay, Krabi	Asian seabass Orange spotted grouper	04 (x06) 04 (x06)	May- June; cage size 4 x 4 m cages; 150 fish per cage; avg. stocking size 12.5 cm; 7-month growth cycle
Vietnam	Nha Trang Vun Ro Bay, Phu Yen Province	Green grouper/orange spotted grouper Asian seabass	04 (x02) 02 (x02)	April- May; cage size 3x 3 x 2.5 m; Stocking size 8-10 cm; SD- 20 m^3 ; 10-12 months growth cycle

Orange spotted grouper- *Epinephelus coioides,* Green grouper/greasy grouper - *E. tauvina;* tiger grouper/brown-marbled grouper- *E. fuscoguttatus;* Asian seabass- *Lates calcarifer*

National Stakeholders Workshop/Training

a) The tentative time frame for the first in-country national workshop/training are:

    a. China- December;
    b. Indonesia- January;
    c. Thailand- January;
    d. Vietnam- November.

On behalf of NACA, it is expected that Hassanai Kongkeo will coordinate and conduct these workshops in each country in conjunction with the respective national coordinators.

b) NACA will liaise with the national coordinators and FAO with regard to the preparation of the national workshop (time, venue and workshop) and selection of farming clusters/farmers in each country.

c) The workshop will finalize the selection of farmers for farmers' participatory trial (FPT), prepare the time-frame of livelihood analysis, finalize record keeping format for environment data collection, prepare a preliminary design of FPT and work out a time table for FPT including preparation of format for data collection in consultation with participatory farmers and other stakeholders.

d) Timing and venue of 2nd national stakeholders' workshop will be decided at a later date preferably immediately after the first farmers' field trial is completed.

Selection and recruitment of International and TCDC Consultants

FIMA (Lead Technical Unit of TCP) will take necessary action to initiate the selection and recruitment process of International and TCDC consultants as soon as possible.

General matters including budgets

a) The workshop discussed the mechanisms of transfer of funds to national institutions and requested the FAO to expedite this matter to enable the project work to commence without delay.

b) FAO FIMA (in consultation FAORAPI and NACA) will take necessary action to prepare LOA between FAO and national coordinating institutes of the participating countries so that funds can be fund allocated (US$19,100 for each country) for farmers' field trial (FTP) can be transferred and the field activities can be initiated soonest.

c) The workshop also recommended that it may be desirable to channel the equipment procurement through NACA, and requested the LTO to take up this matter with the budget holder of the project.

d) There is urgent need to identify and negotiate with potential feed companies that may provide free or at discounted rates compound feeds which can meet the requirements of the field trial in respective countries.

e) NACA in consultation with FAO FIMA LTO and FAORAPI backstopping officer will prepare a tentative plan of field visit (total 36 days of travel in three missions in four countries) (indicating duration, time and by whom) for supervision and monitoring of field activities. The field visit should preferably take place after completion of the first in-country national workshop until the completion of FPT or as appropriate. Tentative plan of field visit will assist FAO Backstopping Officers (LTO, FIEP and FAORAPI) to plan their backstopping missions in conjunction with NACA field visit.

Workshop closing

In concluding the workshop Sena S De Silva, DG, NACA thanked all the participants for their cooperation for making the workshop a success, and expected further cooperation to making the TCP a success. He also expressed his appreciation to the Department of Fisheries, Royal Government of Thailand for agreeing to host this workshop, and to Mr. Paiboon Bunliptanon, Director, Krabi Coastal Fisheries Research & Development Centre, Coastal Fisheries Research and Development Bureau, and his staff, in particular Ms. Patcharee Soonson and Mr. Samart Detsathit for the excellent local arrangements and hospitality.

Dr. Mohammad R. Hasan on behalf of the FAO expressed his appreciation and thanked all the participants, The Government of Thailand and the local hosts for the excellent cooperation extended in making this inception workshop a success.

Annex I

FAO/NACA

Inception Planning Workshop

Technical Cooperation Programme Project

"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

Golden Beach Resort, Krabi, Thailand, 8th to 10th September 2008

ADOPTED AGENDA

Day 1		
0900-1230 : Visit Krabi Mariculture Development Research Centre		
Opening, introduction and country status		
13.30-14.00	Getting to know each other Election of Chairperson Adoption of Provisional Agenda	
14.00-14.30	Introductory Remarks	Mohammad R Hassan (fao)
14.30-14.45	Remarks FAO, RAPA	Weimin Miao (faorap)
14.45-15.00	The Project Concepts, rationale, envisaged outputs and broad outline of activities	Sena s de silva (naca)/ Mohammad R hasan (FAO)
15.00-15.30	*Coffee/ Tea Break*	
15.30-16.00	Finfish Mariculture, Thailand	PAIBOON BUNLIPTANON
16.00-16.30	Finfish Mariculture, Viet nam	THAI NGOC CHIEN
16.30-17.00	NATIONL PROJECT on TRASH FISH, VIETNAM	NGUYEN VAN LUNG
17.00-18.00	Discussion on Environmental Impact Assessment Questionnaire	MIchael Phillips
Presentation of project work plan and livelihood and environmental analysis		
13.30-14.30	presentation of the draft project work plan	Sena s de silva
14.30-15.00	Views of Feed manufacturers & Farmer Associations	
15.15-15.45	Discussion on Project Work Plan	
15.45-16.00	*Coffee/ Tea Break*	
16.00-16.30	Continue Discussion on Project Work Plan	
16.30-17.45	Review of questionnaire on Environmental impact assessment	Michael J Phillips (naca)
17.00-17.45		
Workshop Dinner		
Day 2		
project work plan and livelihood and environmental analysis		

08.30-09.00	Finfish Mariculture, Indonesia	M. MURDJANI
09.00-09.30	Review of questionnaire on livelihood analysis and methodology of rra	HASSAN MOHAMMAD (fao)
09.30-10.30	Discussion	
10.30-11.00	*Coffee/ Tea Break*	
11.00-11.30	Finfish Mariculture, China	Wang Lixin
11.30-12.30	Continue Review of questionnaire on livelihood analysis and methodology of rra; arrive at preliminary decisions on survey details	
12.30-14.00	*Lunch Break*	
14.00-15.00	Environmental impact assessment; arrive at preliminary decisions on survey details	
15.00-15.30	*Coffee/ Tea Break*	
15.30-16.30	Finalization of Environmental Impact Assessment; finalization of tentative work program to be considered at the National workshops	
Day 3		
08.30-10.30	Discussion on growth trials; logistics for each country; address feed needs	
10.30-11.00	*Coffee/ Tea Break*	
11.00-12.00	Finalization of framework for growth trials; setting of dates for national workshops;	
12.00-12.30	Workshop Summary/ Wrap up and closure	
12.30-14.00	*Lunch*	
14.00-17.00		
15.00-16.00	Field trip to abalone farm; shrimp farm	
	Departures	

Annex II

PARTICIPANT LIST

INAUGURAL PLANNING WORKSHOP

8th to 10th September, Krabi, Thailand, September

"REDUCING THE DEPENDENCE ON THE UTILIZATION OF TRASH FISH/ LOW VALUE FISH AS FEED FOR AQUACULTURE OF MARINE FINFISH IN THE ASIAN REGION"

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Annex III

Introductory Remarks

(Dr. Mohammad Hasan)

Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region

Prof. Sena S. De Silva, DG, NACA, Paiboon Buniptanon, Krabi Coastal Fisheries Research and Development Centre, and the local host, Mr. Miao Weimin, FAORAP, Michael Philips, NACA and representatives from countries. I, (on behalf of Mr. Ichiro Nomura, ADG, FAO Fisheries and Aquaculture Department and Mr. Jiansan Jia, Chief, Aquaculture Management and Conservation Service, FAO HQ) welcome you all. I am pleased to note we are able to gather here to address with one of the most important issues faced by the aquaculture in Asia, particularly Asian mariculture.

An approximate 5 to 6 million tonnes of trash fish/ low-value fish are used in aquaculture world-wide as direct feed or as mixture with other feed ingredients. Asian use of trash fish as fish feed is about 1.6-2.8 million tonnes per year. The predictions for year 2010 are between 2.2 and 3.9 million tonnes in Asia alone.

The issue of use of trash fish in Asian aquaculture and how to move away/reduce the dependence of aquaculture on trash fish has been in the forefront for quite some time. As we are very much aware that it cannot go as it is considering:

- Environmental perspectives of use of trash fish in aquaculture
- long-term sustenance, economic viability
- the impact of the trash fish utilization on overall wider ecosystem
- Availability of resources to meet the demand

Reducing the dependence of aquaculture on trash fish through the use of formulated feed and the alternate use of trash fish has been discussed in several forums by FAO, NACA and other regional and international development organizations:

- It was identified as a regional priority by the Asia-Pacific Fishery Commission (APFIC) which endorsed a regional plan of action at its 29th Session
- The FAO Committee on Fisheries (COFI) in its 27th Session held in Rome, 2007, also recognized the importance of this issue and recommended further work by FAO on the use of low-value trash fish in aquafeeds.
- FAO Expert Workshop held in Kochi, India, in November 2007 strongly recommended that the work on encouraging farmers to use compounded feeds in mariculture is urgently needed.

Considering the importance of this issue NACA Governing Council at its Meeting in Bali, Indonesia, recommended the need to initiate a regional project on this.

Director General of FAO has kindly agreed to fund this project from FAO's Technical Cooperation Fund.

- FAO is not a funding organization. It provides fund only in the form of TCP when there a critical need to address the issues of utmost importance to its member governments
- It is expected that TCP will be an initiation of a major activity eventually to be taken up by other funding organization or member government itself.
- TCP is considered more of a triggering mechanism for future activities/actions to ensure the sustainable development in the sector
- The project has a limited fund and a limited duration of 24 months, but we have enormous tasks to accomplish
- To accomplish these tasks we need to have focused objectives and clearly defined strategies to achieve these objectives
- We also need to have effective coordination among ourselves so that we are aware of our defined responsibilities and know clearly
    - WHAT (we have to do)
    - WHEN (it has to be done)
    - WHOM (who will do it)
- The responsibilities have to be shared among partners
    - FAO
    - NACA
    - Countries/Governments
    - Others (e.g., NGOs, Consultants)
- But we must remember that the project is (owned) by the countries and for the countries

I understand that all of us have project document with us and the cover page of the document clearly indicates the Government Ministry/agencies responsible for the project **EXECUTION**:

- **Indonesia**: Directorate General of Aquaculture.
- **China**: Guangdong Provincial Government,
- **Thailand**: Department of Fisheries, and
- **Viet Nam**: Research Institute for Aquaculture No 3 (RIA 3), NhaTrang.

So this is your project

- NACA will provide overall coordination (between countries, FAO and other agencies)
- FAO
    - Rome HQ Aquaculture Management and Conservation Service (FIMA) and Fisheries and Aquaculture Economics and Policy Division (FIEP) will provide technical support services

    - FAO Regional Office for Asia-Pacific in Bangkok (FAORAP) will provide you support service and assist you in implementation (we are fortunate that our regional officer is a Chinese and has immense knowledge on aquaculture of China and of the region)
- International/TCDC consultants will provide you with necessary assistance that you may require in project implementation/execution

Thank you.

Annex IV

NACA POWER POINT PRESENTATION

Regional TCP
Inaugural Planning Meeting: September 8th to 10th 2008
Krabi, Thailand

Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region

Sena S De Silva
Network of Aquaculture in Asia-Pacific
Bangkok, Thailand

www.enaca.org

Organization

- **What is a TCP**
  - National
  - Regional
- **Funding**
  - FAO
- **What the problem is**
- **How we are going to address it**
- **Expected outcomes**

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Technical Cooperation Program- TCP

- **Addresses specific, focused ,major issues in R & in agriculture**
- **Highly competitive, within a country, between different sectors**
- **Regional TCPs; as above**

www.enaca.org

Regional TCP:
Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region

- **Recommendation of the NACA Governing Council at its 18th Meeting, Bali, May 2007**
- **Four countries:**
  - China
  - Indonesia
  - Thailand
  - Vietnam
- **US487,000**
- **Two years**

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Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region:
the problem(s)

- **Trash fish commonly used in marine finfish culture**
  - Usage estimates vary from 1 to 5 million t per year
    - Environmental concerns
    - Resource sustainability issues
- **The quality of trash fish used variable too**
  - At times suitable for human consumption
  - A bone of contention on ethical grounds
    - lobby groups targeting the reduction industries

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Terminology

- **Trash fish**
- **Low valued fish**
  - Value and usage different
  - Not explicit
- **Primary literature**
  - Forage fish
    - For reduction industry raw material

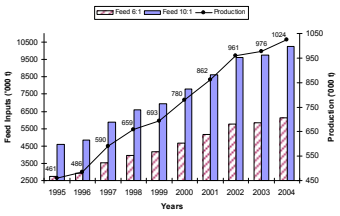
Which is trash fish?

Use of fish as feeds: finfish mariculture

- **Unavailability of suitable pellet feeds**
  - High cost?
  - Difficulties in procurement
- **Farmer/ fisher**
  - Daily supply of trash fish
  - Misconceptions
    - Stock performs better
- **Ways of breaking the deadlock?**

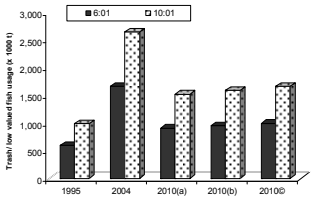
Generalized feed; all species??

Use of fish as feeds: finfish mariculture



Marine and brackish water carnivorous finfish production in Asia and estimated trash fish/ low value fish usages as feed based on 6:1 and 10:1 conversion efficiencies

Use of fish as feeds: finfish mariculture



Changes in the estimated trash/ low value fish usage in marine and brackish water finfish culture in Asia, at two conversion efficiencies. The 2010 values are based on increases in production

The problem in a nut shell

- **The farmers continue to use trash fish**
  - Why?
    - The perception that trash fish give better returns
    - less costly
      - And or both of the above
- **Compounded feeds**
  - Not easy to access
  - Costly

The TCP

- Will attempt to address these issues
- Utilize famer based and farmer managed trials
  - Side by side
  - Try to avoid other variables
    - Differences between stocks
    - Differences in management
  - Come up with a cost-benefit analysis

The TCP

- Address issues on;
  - What alternative livelihoods are available for fishers/ suppliers of trash fish
  - Can the supplies of compounded feeds be streamlined?
    - Evolve micro-credit schemes
    - Better farmer organizations
      - Aqua-clubs
      - Also has a impact on certification

The TCP:
How do we propose to do it?

- We have the broad framework
- This meeting is to work out the details

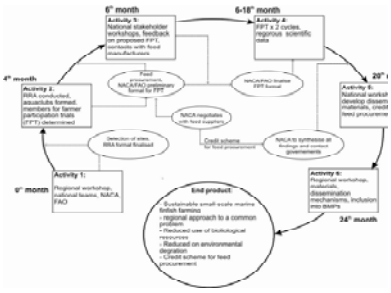


Figure 1. Schematic diagram showing the activities to be undertaken by the TCP with end products (outcomes)

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The TCP: How do we propose to do it?
The work ahead of us over next three days

- **Determine the places of work in each country**
  - Where
  - Monitoring details
- **Finalize questionnaires on RRA**
- **Environmental assessment check list**
- **Work out the logistics for conducting the trials:**
  - When to start
  - The farmer profiles and so on

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The TCP: How do we propose to do it?
The work ahead of us over next three days

- **Although the TCP will attempt to address one specific aspect on trash fish**
  - Global issues to be concerned and aware of
    - Efficacy of use of fish meal and fish oil
    - Other users for fish meal???
      - Non-food producing sectors

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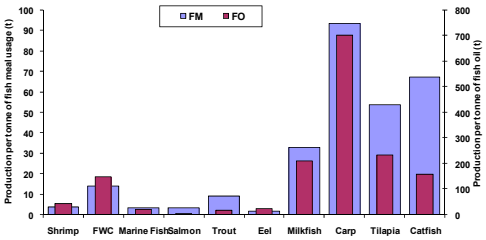
Efficacy of use of fish meal & fish oil y cultured species (from De Silva & Soto, 2008)



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Thank You All

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Annex Va (Indonesia)

FINFISH MARICULTURE IN INDONESIA:

Potential and Problems of Trash Fish Replacement

MUHAMMAD MURDJANI, SUCI ANTORO AND ANTIK ERLINA

Introduction

- Development of aquaculture in Indonesia
  - Three main objectives:
    - (a) to enhance exports;
    - (b) to enhance domestic consumption; and
    - (c) aquatic resources conservation.
  - Three strategic approaches for mariculture development:
    - (a) develop mariculture in some potential provinces,
    - (b) diversification of species target, and
    - (c) develop fisheries enterprises.

Recent Development of Finfish Mariculture

- Aquaculture production
  - quantity 1995 – 2004: 0.74 - 1.47 million tones;
  - value 2003 – 2004 : 1.72 - 2.16 billion US $
- Mariculture was dominated by grouper and seaweeds
  - production of grouper culture 2000 – 2004: 9.65 %/year (difficult to find accurate data due to transhipment)
  - Finfish mariculture area: growth: 19.97 %/year

Recent development .....contd.

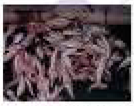
Main area for marine finfish culture (circle markers)

Recent development .....contd.

- Species cultured:
  - Humpback grouper, tiger grouper, greasy grouper, sea bass, snapper and milk fish
  - Recently, coral trout, giant grouper, and pompano fish seed are being cultured
  - Mainly by floating net cage and the lesser method by pen culture and pond culture systems.
- Seed or fingerlings from hatcheries since 1995.
  - 6 belong to DGA, several belong to Provincial and District Fisheries Offices as well as medium and backyard hatcheries.
  - Most of fingerlings production was distributed for domestic need, and the rest was exported

Recent development ....contd.

- GROWTH PROJECTION:
  - Aquaculture: 44.15 %/year, production quantity at over 7.3 million tones by 2009.
  - Finfish mariculture: 25.66 %/year, production quantity at 30,000 tones by 2009 from 19,000 tones in 2007.
  - Seed production capacity increase by new hatcheries development or seed production technology improvement.
  - Longterm period → breeding program, started since 2001 for Humpback grouper.
    - Breeding program expected to produce superior broodstock which is able to produce seed superior fast growth.



Feed and Feeding Practices

- Larvae, juvenile and fingerlings were feed by aquafeed
  - Change over from natural feed (Rotifer, Artemia) to formulated feed were done on D15 to D17.
- Aquafeed for all stages were available, but grow out culture still have high dependence on trash fish. Fish farmer feel more convenient with trash fish.
  - Slowing growth rate, 2 times more expensive and difficult to find due to transportation problem.
  - Formulated feed have generally used only for substitution [illegible] when trash fish was not available.
  - Alternative farm made (by local sources)
- Trash fish limitations: inconsistent supply, variable nutrient content, difficult to handle store and the potential for diseases transmission.

Feed and Feeding Practices

Table 2 [illegible]

Growth Parameters	[illegible][1]		[illegible][2]		[illegible][3]	
	Aquafeed	Trash Fish	Aquafeed	Trash Fish	Aquafeed	Trash Fish
Initial weight (g)	1.99	1.70	13.51	14.51	1.41	1.52
Final weight (g)	98.9	100.4	95.21	96.3	22.53	27.81
Initial Total Length (cm)	4.1	4.0	8.4	8.4	4.7	4.7
Final Total Length (cm)	16.5	16.4	17.5	18.2	11.1	14.0
Survival rate (%)	88.8	87	78.7	72.4	67.8	55.5
Growth rate (%/day)	0.92	0.96	3.62	3.11	5.11	5.44
FCR	0.861	5.77	2.1	9.7	1.31	5.49

[1] [illegible] [2] [illegible]
[3] [illegible]

Table 3 Survival rate (SR, percent), daily growth rate (DGR, g/day) and feed conversion ratio (FCR) of [illegible]

Feed Type	SR	DGR	FCR
Aquafeed-1	98.7	2.25	1.5
Aquafeed-2	98.0	1.10	1.6
Trash fish	95.1	1.71	6.0

Source: Aman (2004)

Development of aquafeed industry

- Aquafeed industry was developed since 8 years ago from moist to dry pellet
- 2005 was produced 7 million tones of animal feed, by which 565 000 tones are aquafeeds
- Currently 18 commercial feed manufacturer been operated with totally production aquafeeds 600,000 - 650,000 tones/year
- Projection growth and shifting trashfish to aquafeeds → giving a huge opportunity for aquafeed industry
  - need to increasing use of locally available feedstuffs supplemented by imports

Problems and Constraints

- Why fish farmer feel more convenient with trash fish:
  - Price about 2 X more expensive →based on the amount of ingredients, aquafeed is less expensive than trash fish;
  - Transportation problem: most of location on remote area,
  - On certain location and season trash fish is cheaper
  - Grow out stages feed by aquafeed encountered slowing growth rate
- Aquafeed has high dependence on imported feed ingredients
- Competing use of ingredients from the poultry sector & human use
- Increasing demand, escalating price and the shortage of imported feed ingredients makes inconsistent quality of aquafeed
  - FCR & DGR was not as good as expected
  - Improperly storage: possible decreasing quality due to high protein ingredient (47 % - 52 %)

Suggestions and Recommendations

- In order to replace trash fish, balancing the demand and the aquafeed industry is very important.
- Need several measures:
  - Find alternatives to minimize the fishmeal content without sacrificing nutrition value,
  - Aquafeed industry should be processes local sources →more cost effective & improving value added
  - Further study the nutrients composition for grow out stages & nutrient budgets to optimize feeding & minimize waste discharge
  - Need to better define the use and benefits of additives (immunostimulants, attractants and probiotics)
  - Traceability attention of feed materials & feed processing technology for consumer awareness of food safety issues.

According to Sorgeloos (2004) problems & solutions of fish meal/fish oil replacement in aquafeeds, are:

PROBLEMS

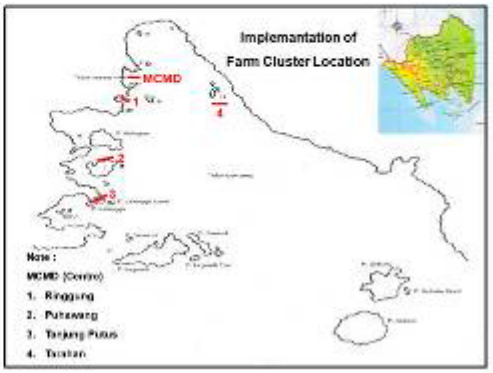
1. Nutritional imbalance
2. Low palatability/attractiveness
3. Alternative protein/fat sources
   - Low nutrient density
   - Anti-nutritional factors
   - Cost
   - End user/legal acceptance
4. Final product quality ?

SOLUTIONS

1. Supplementation of critical nutrients
2. Blend of selected attractants
3. Balanced formulation
   - Selected fat/protein sources
   - Raw material knowledge
   - Formulation know-how
4. Finishing (feed, feeding regime)

AQUALITY


Thank's


Implemantation of
Farm Cluster Location
MCMD
Note :
MCMD (Centre)
1. Ringgung
2. Punaweng
3. Tanjung Putus
4. Tarahan

Annex Vb (Thailand)

1

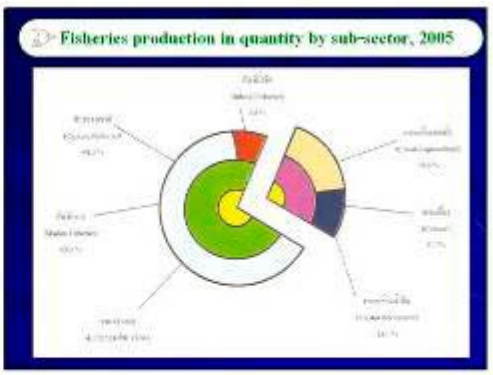

Sea bass, L. calcarifer, pole cages at Songkhla, Thailand

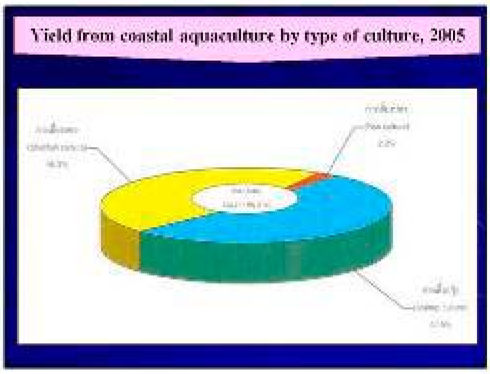

Culture system
Floating cage

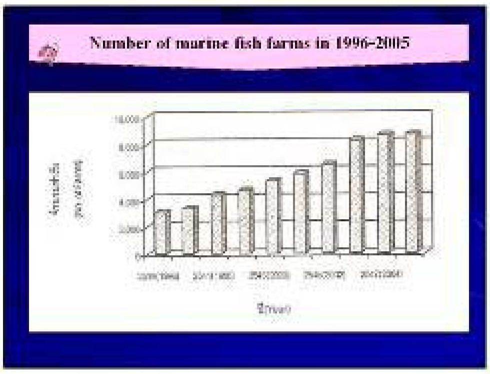

Culture system : Cage


Culture system
Big cage culture


Culture system : Earthen pond

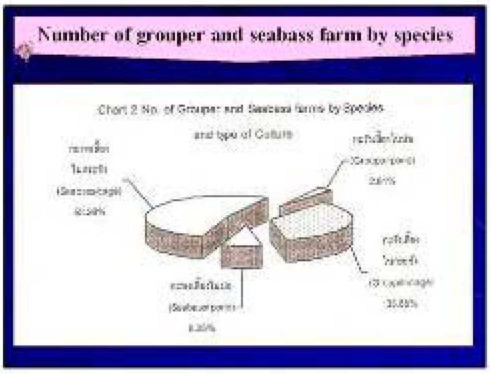

Fisheries production in quantity by sub-sector, 2005

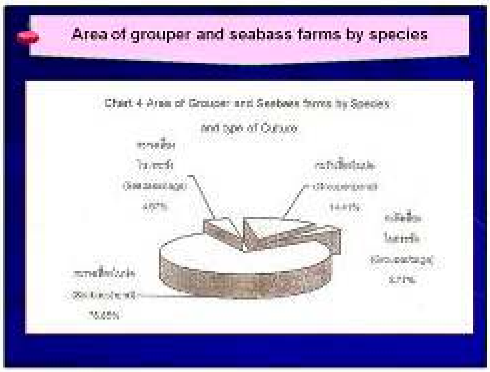




No. of marine fish farms by species and type of culture in 1998-2005

Species	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Grouper	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
pond	33	44	57	66	154	135	110	267	292	244
cage	1,218	1,272	1,795	1,790	1,983	2,221	1,802	2,349	3,060	3,096
Seabass	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
pond	310	238	259	326	378	486	481	806	742	716
cage	1,493	1,783	2,199	2,448	2,805	2,996	4,089	4,804	4,512	4,622
Total	3,054	3,337	4,310	4,630	5,320	5,838	6,482	8,226	8,606	8,678

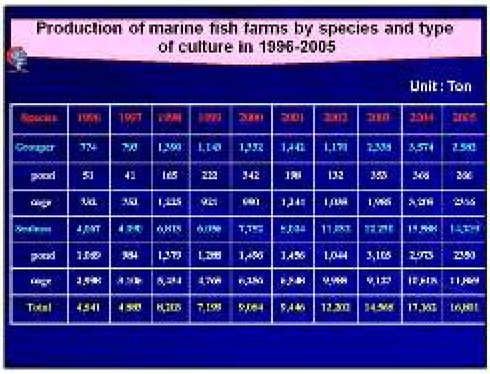


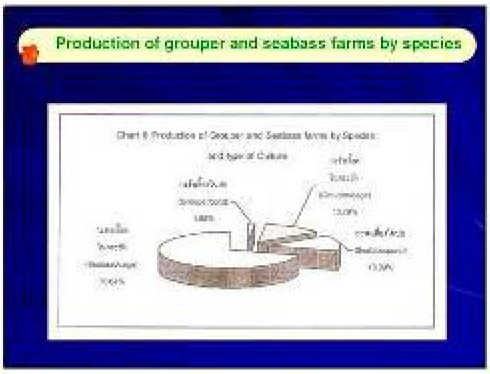


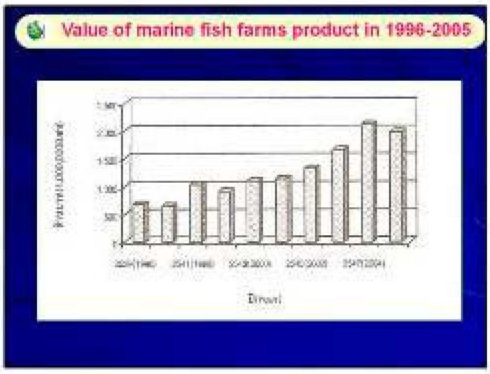
Numbers and area of marine fish farms, 2001-2005

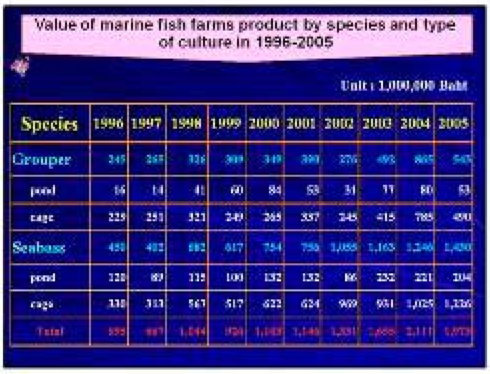
Year	Total		Grouper		Seabass	
	Number	Area(rai)	Number	Area(rai)	Number	Area(rai)
2001	5,838	4,516.72	2,356	6,32.61	3,482	3,884.11
2002	6,482	4,491.81	1,912	6,13.93	4,570	3,877.88
2003	8,226	6,625.33	2,616	1,156.96	5,610	5,468.37
2004	8,606	5,506.76	3,352	1,254.40	5,254	4,252.36
2005	8,678	5,016.04	3,340	912	5,338	4,104.04

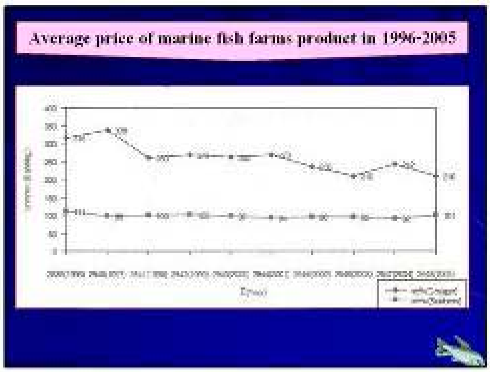
3

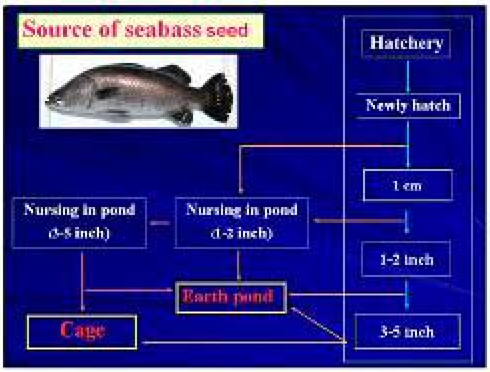

Production of marine fish farms by species and type of culture in 1996-2005
Unit : Ton
Total


Production of grouper and seabass farms by species


Value of marine fish farms product in 1996-2005


Value of marine fish farms product by species and type of culture in 1996-2005
Species
Grouper
pond
cage
Seabass
pond
cage


Average price of marine fish farms product in 1996-2005

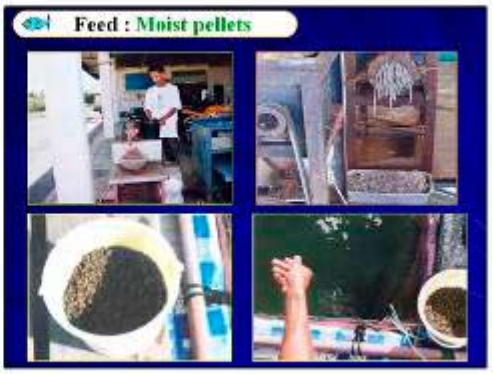

Source of seabass seed
Hatchery
Newly hatch
1 cm
1-2 inch
3-5 inch
Nursing in pond (3-5 inch)
Nursing in pond (1-2 inch)
Earth pond
Cage

4


Source of orange-spotted grouper seed
Wild
Hatchery
Fish trap
1-2 cm
1-2 cm
Cage/Pond 3-5 inch
1-2 inch
Cage/Pond
3-5 inch


Stocking density
Sea bass
Stocking density : Size 4 inch (15g) ; 100-300 ind./m2
Grouper
Stocking density : Size 4 inch (20g) ; 15-20 ind./m2
Cobia
Stocking density : Size 7-8 inch (70-80g) ; 10-12 ind./m2


Feed : Trash fish
Chopped fish
Feeding


Feed : Moist pellets


Feed
Feed : Pellets

5


Production
Sea bass
Production : 35-105 kg/m² (SR 70 % ; 500 g/fish)
Grouper
Production : 1.2-1.6 kg/m² (SR 80 % ; 500 g/fish)
Cobia
Production : 35-42 kg/m² (SR 70 % ; 5 kg/fish)


Problem
Trash fish
Seed
High cost
Disease control
Market


Thank you

Annex Vc (Vietnam 1)

9/11/2008

FINFISH MARINCULTURE IN VIETNAM

By Thai Ngoc Chien

Research Institute for Aquaculture No.3
E-mail: thaichienfish@yahoo.com

INTRODUCTION

- The fisheries sector plays an important role in the national economy, accounting for about 6 % of Gross Domestic Product (GDP) in 2006 and earning almost $3.7 billion in export revenues in 2007.
- Fish Production grew at an average rate of 12 % from 2001 to 2005.
- Much of this growth in production can be contributed from aquaculture, which increased from a 26 % share of the sector in 2000 to 46% in 2006.
- A strong export market is the driving force behind the growth in aquaculture, but there is also a growing domestic market as incomes improve and local demand increases.

- Aquaculture development can be attributed to a concerted effort to not only expand the production area but also improve production techniques, improve the efficiency of growing methods, and expand areas for intensive aquaculture farming.
- In 2006, the total area of water surface used for aquaculture was 1,050,000 ha, which increased 64% compared to this in 2000. A variety of species are cultivated in these waters, but shrimp and catfish are by far the most prevalent.

- Vietnam's primary finfish marinculture species are grouper, cobia, snapper, sea bream, sea bass, milk fish, and red drum fish.
- In Vietnam, marine aquaculture is farmed mainly in cages, submerged rafts, and ponds along the coastline and in tidal areas. The growth potential for this faming method is enormous.
- Total fisheries production in 2007 was 4.14 million tones, in which capture production was 2.06 million tones and aquaculture production was 2.08 million tones, while finfish aquaculture production was only 3,500 tones (2003).

- Quang Ninh
- Hai Phong
- Phu Yen
- Khanh Hoa
- Binh Thuan
- Ba Ria – Vung Tau

SEED PRODUCTION

- *Cobia (R. canadum).*
- ✓ Matured ratio of Brood stock varies from 65-78%,
- ✓ Over 70 % of total Brood stock animals can spawn
- ✓ Fertilized ratio is over 60%, and hatching ratio is over 70%
- ✓ Survival rate from fry to fingerling stages (5-6 cm in length) gains 5%.
- ✓ This technology has been transferred to Hai Phong, Nghe An and Quang Ninh provinces.

1

❖ *Grouper (E. coloides) :*
✓ Survival rate from fries to juveniles (60 days old) is 13-15%; and up to 90 days old fingerlings is (8-10cm in length) 6- 8%.

❖ *Red Drum (S. ocellatus):*
✓ Over 72% of brood stock animals can spawn
✓ Eggs can be fertilized more than 75%,
✓ Hatching ratio is over 80%, and survival rate from fries to fingerlings is more than 22%.

❖ *Sea Bass (Lates calcarifer* and *Psammopersa weigensis):*

✓ Survival rate from fries to fingerlings (60 days old) is 20-30%.

✓ Over 72% of brood stock animals can spawn

✓ Eggs can be fertilized more than 80%

✓ Hatching ratio is over 80%.

GROWTH-OUT PRODUCTION

Table 1. Aquaculture production of some main marine finfish in Vietnam

Species and culture methods	Production and survival rate
Grouper's cage culture	- 10-15kg/m³, - Survival rate is over 50%
Grouper's pond culture	- 6-10 kg/m³, - Survival rate is over 50%
Cobia's cage culture	-15 kg/m³, - Survival rate is over 60%
Red drum's cage culture	- 6-10 kg/m³, Survival rate is over 70%
Sea bass's pond culture	- 6-10 kg/m³, - Survival rate is over 60%

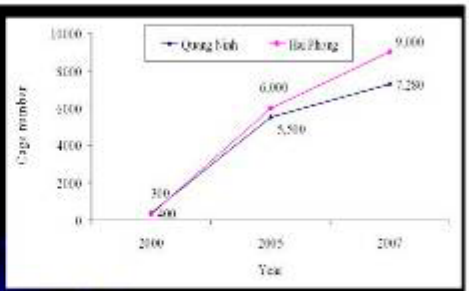


Figure 1. Cage numbers from 2000-2007 in Quang Ninh and Hai Phong provinces

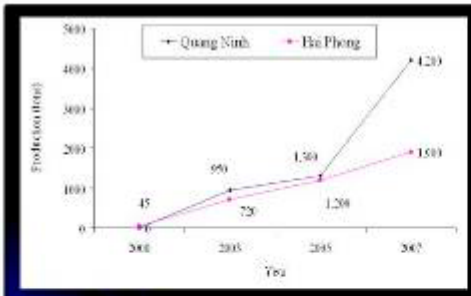


Figure 2. Finfish production from 2000-2007 in Quang Ninh and Hai Phong provinces

MARINE CAGE AQUACULTURE

Table 2. Marine Finfish production from aquaculture (2003).

Provinces	Culture methods	Production (tons)
Quang Ninh	Cage farmings	950
Hai Phong	Cage farmings	720
Khanh Hoa	Cage farmings	70
Binh Thuan	Cage farmings	50
Phu Yen	Cage farmings	40
Ba Ria – Vung Tau	Cage farmings	200
Quang Ninh	Earthen ponds	550
Khanh Hoa	Earthen ponds	100
Total		3,500

Source: Ministry of Fisheries

CONSUMPTION

The results of surveys on Vietnamese households' living standards (VHLS) conducted by Vietnam's General Statistics Office in 2002 and 2004 support the claim of increased consumption of seafood per capita. Consumption of fish and seafood increased much more than any of the other sources of protein.

Table 3: Protein Source Foods, Consumption per capita

Protein Sources	Unit	2002	2004	% Change
Meat (all kinds)	Kg	15.36	16.56	7.81
Animal fat, vegetable	Kg	2.76	3.24	17.39
Shrimps and fish	Kg	13.58	17.04	25.66
Eggs (all kinds)	Piece	26.64	28.92	8.56
Tofu	Kg	4.32	4.80	11.11

Source: GSO Surveys on Vietnamese household living standard in 2002 &2004

CONSUMPTION

The results of surveys on Vietnamese households' living standards (VHLS) conducted by Vietnam's General Statistics Office in 2002 and 2004 support the claim of increased consumption of seafood per capita. Consumption of fish and seafood increased much more than any of the other sources of protein.

Table 3: Protein Source Foods, Consumption per capita

Source: GSO Surveys on Vietnamese household living standard in 2002 &2004

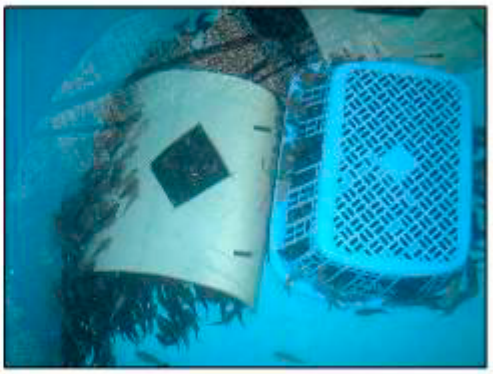
FUTURE MARINE FINFISH AQUACULTRE DEVELOPMENT

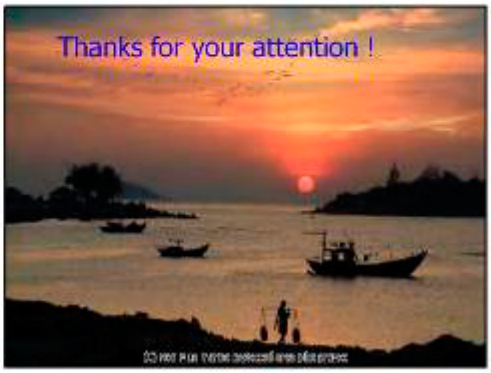
- ❑ *Seed production research*
  - Research on seed production technologies.
  - Improve the seed quality, brood stocks
  - Control disease
  - Manage the water environment.

- ❑ *Growth-out production*
  - Diversify fish species for aquaculture
  - Give high priority for marine finfish in off-shore and islands.
  - Use shrimp culture ponds for marine finfish culture in order to replace the new species to increase the fish production.
  - Polyculture finfish with shrimp to minimize water pollutions (e.g. milk fish)
  - Research on environmental capacity for re-planning.
  - Research and apply the advanced technologies to increase fish production and improve food security.
  - Research on pellet feeds in order to replace trash fish as food for marine finfish aquaculture.


Fish Trade Wars
Fish War


there is real potential for investment in marine finfish aquaculture !




Thanks for your attention !

Annex Vc (Vietnam 2)

FINFISH MARICULTURE IN VIETNAM

Nguyen Van Lung

Vietnam has over 3.260 kilometers of coast line, and 112 estuaries and inlets have formed areas for developing coastal mariculture in the whole country with more than 1.130.000 hectares, 660.000 hectares of tidal region are delimited into 6 ecological regions.

- Vietnam's aquiculture has a long history of development with cultivation methods in coastal ponds and lakes, in recent years, science and technology development, especially artificial producing technology of some economic fish varieties has promoted aquiculture in general and mariculture in particular.

- Output of aquiculture in 2008 is estimated over 2.1 millions of tons, in which output of Suchi Catfish cultivation is over one million ton, mariculture output is estimated over 3.600 tons.
- Main objects of mariculture include:

1) Grouper
2) Snapper
3) Yellowfin seabream
4) Milkfish (Chanos chanos)
6) Orange-spotted spinefoot
7) Cobia sergeant fish
8) Flathead mullet, bully mullet
9) Talang queen fish
10) Barranmundi, giant seaperch
11) Sientist name: *Bostrichthys siensis* (Cá bống bớp)

12) Scientist name: *Lutjanus johnii* (cá hồng đỏ)
13) Scientist name: *sciaenops ocellatus* (Cá đù đỏ)
14) Scientist name: *Nibea diacanthus* (Cá sủ đất)
15) Scientist name: *Pseudapocrypter lanceolatus* (cá kèo)

- Aquicultures which use many foods of trash fish include: Objects of mariculture, coastal ponds and lakes and Suchi catfish cultivation.

Trash fishes mean to be early fishes, premature fishes, low-quality fishes and fishes of low economic value, in which Suchi catfish cultivation uses the biggest amount of this kind of food. Besides, trash fishes are used to be fish paste in order to produce cattle – feed and fish sauce.

- Productivity of some aquicultures in Vietnam:
- Productivity of cultivating fishes in marine cages is 15-20kg/m3

- Productivity of cultivating fishes in ponds is 5-8tons/ha
- Productivity of cultivating catfish is 200 – 500 tons/ha.

The strong development of aquiculture is promoting trash fishes catching situation. Industries of trash fishes exploitation in Vietnam include:

- Bottom otter trawl net
- Pair trawl net
- Stow net
- Push net
- Surrounding net
- Lift net
- Stick-held falling net

These are industries which have high rate of trash fish as follows:

- One Boat Trawl net: 53.6%

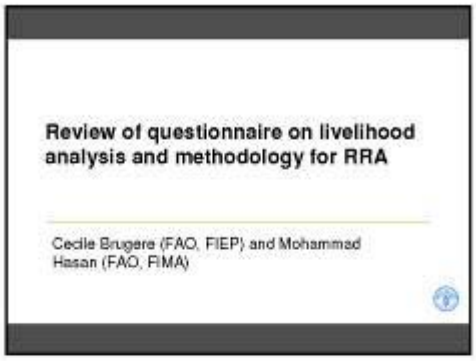
- - Pair trawl net: 43.9%
- - Stow net: 57.8 %
- - Push net: 42.1 %
- - Pure net: 42.1%
- - Pure seine net: 60%
- - Stick falling net: 60.1%
- The main kinds of trash fishes are Juveniles fishes and some fishes which have low economic value. Components of some kinds of trash fishes:

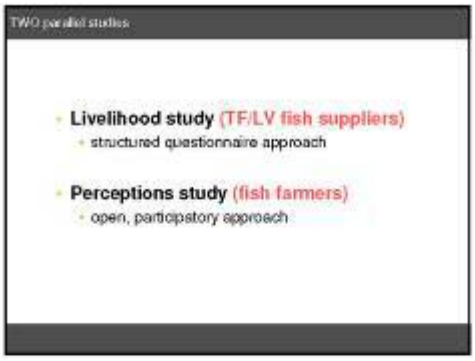
- Annual output of marine capture is about 2 millions of tons per year, average rate of trash fishes account for 51,37%, so output of trash fishes which is caught annually is 1.027 tons. In this output, there is a big rate of Juvenile fishes, this can affect fisheries resources.

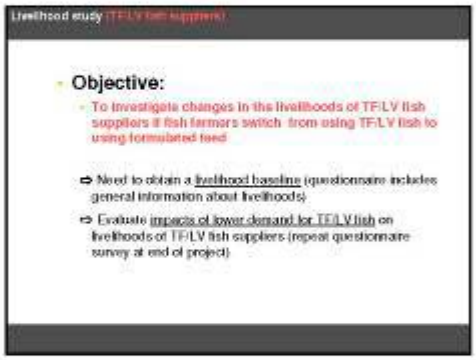
- To reduce the amount of trash fishes used as aquiculture foods, we must find replaced protein resources, developing earthworm cultivation to provide protein is practical solution. Besides, the State must have some policies on changing some exploitation industries which harm aquiculture resources into aquatic cultivating, processing or other industries.

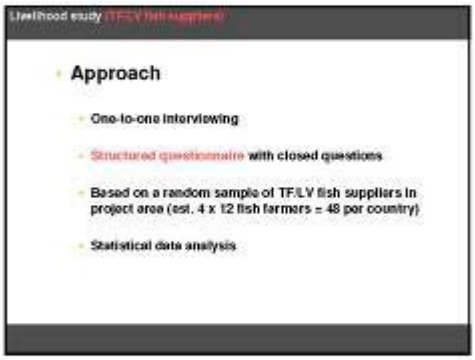
THANK YOU ALL

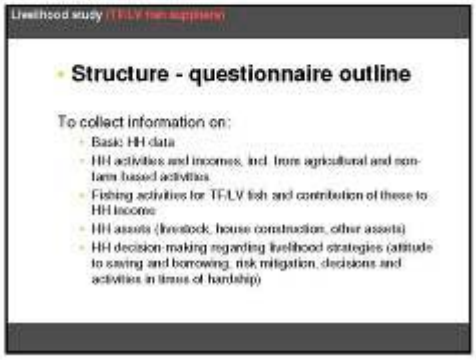
Annex VI (Livelihood analyses)

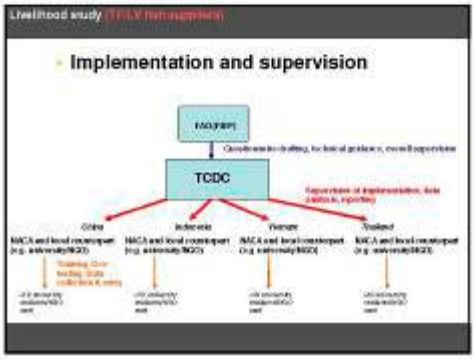












Perceptions study (fish farmers)

- **Objective:**
  - To assess fish farmers' perceptions regarding the use of formulated feed compared to TF/LV fish and their acceptability of a switch towards using formulated feed.

⇨ Need to obtain perceptions at the start of the project (perception baseline)

⇨ Evaluate the evolution of these perceptions and opinions about the use of formulated feed compared to TF/LV fish throughout the project (repeat exercises at various stages of the project)

Livelihood study (TF/LV fish suppliers)

- **Approach**
  - **Group-based elicitation**
  - **Participatory exercises, based on RRA and Participatory Learning and Action (PLA) with open questions**
  - **Collecting perceptions from the 12 fish farmers targeted by the project in each country, PLUS others from aqua-clubs (not directly involved in the trials).**
  - **Qualitative data analysis**

Livelihood study (TF/LV fish suppliers)

- **Structure - Possible PLA exercises:**

1. Trend analysis
   - To understand how long fish farmers have been using TF/LV fish in aquaculture.
   - To enquire if this pattern of use changed at any time in the past and why.
   - To enquire if fish farmers would be happy to continue using TF/LV fish in the future ('business as usual') and why (or why not).

Livelihood study (TF/LV fish suppliers)

- **Structure - Possible PLA exercises:**

2. Causal diagrams
   - To understand the causes of the preference of fish farmers to use TF/LV fish in aquaculture.
   - To start raising their awareness about the fact that using TF/LV fish in aquaculture is problematic and unsustainable.
   - To start evaluating the benefits of formulated feed use in aquaculture operations.

Livelihood study (TF/LV fish suppliers)

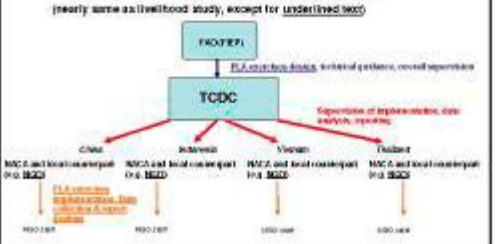
- **Structure - Possible PLA exercises:**

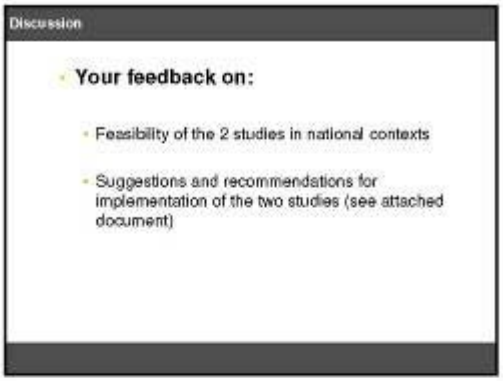
3. Ranking or scoring
   - To cross-check with information collected in causal diagrams.
   - To assess fish farmers' opinions (individually and as part of a group)
   - To assess the potential of fish farmers adopting formulated feed in the long-term

Perceptions study (fish farmers)

- **Implementation and supervision**

(nearly same as livelihood study, except for underlined text)




Discussion
Your feedback on:
Feasibility of the 2 studies in national contexts
Suggestions and recommendations for implementation of the two studies (see attached document)

Annex VII (Environmental Assessment)

FAO/NACA

Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region

Environmental Assessment

Purpose of presentation:

Brief overview of environmental aspects of marine fish farming

Introduction to TCP environmental assessment guidelines

Environmental interactions of aquaculture are multidimensional

- Impacts of environment on aquaculture
- Impacts of aquaculture on environment
- Impacts of aquaculture on aquaculture
- Impacts positive and negative!
- Aquaculture success relies on a healthy aquatic environment
- Increasingly a problem in many nearshore areas
- Global attention to environmental issues increasing – climate change

Key environmental issues

- Environmental concerns
  - Coastal habitats (e.g. corals) & system level impacts
  - Water quality, sediments and carrying capacity
  - Efficient resource use (eg energy)
  - Aquatic seed quality, biodiversity/genetics and trans-boundary movement
  - Aquatic animal disease control
  - Feeds and feed resources
  - Chemicals, anti-bacterials and resistance
- Related social issues
  - Local conflicts for space/resources
  - Small-scale farmers
  - Livelihoods & development through

Related factors

- Importance of trade
  - Asia leading producer
  - Special problems of small-scale farmers and trade which typify the sector in Asia
  - Environmental sensitivity of trade
- Food safety and quality:
  - Increasingly stringent quality and safety standards in all markets
  - Trade barriers
- Economics and business:
  - Economic viability and efficiency
  - Competitiveness and costs of compliance with certification, trade standards, monitoring

Aquaculture systems

- Aquaculture is very diverse sector
  - Technology and systems applied
  - Economics
  - Environment
  - Social participation and impacts
- Project phases have different impacts
  - Siting, construction and operations
- Environmental interactions and impacts vary
- Different management solutions - no "one size fits all"

Environmental management principles and standards in Asia

- Many countries in Asia-Pacific developing environmental "standards" for mariculture
  - Thailand "Good Aquaculture Practice"
  - International Standard for the Trade in Live Reef Fish
  - Philippines
  - Hong Kong
  - Viet Nam
- Codes of Conduct, Codes of Practice, voluntary, mandatory – becoming confusing!
- NACA "BMP" initiative
- No widely adopted "standard"
- Project can assist in development of feed management recommendations fitting into ongoing "BMP initiatives

The 8 management principles for responsible marine fish farming

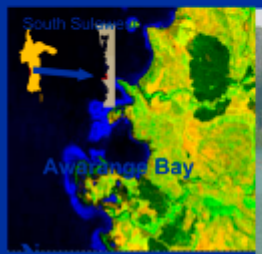
1. Farm Siting
2. Farm Design
3. Water and Sediment
4. Broodstock and seed
5. Feed Management
6. Health Management
7. Food Safety
8. Social Responsibility

Principles provide a basis for action

- Government
  - Policy, legislation, extension, national shrimp programs
- Private sector
  - Investment screens
  - Buyer screens
  - Business development
  - Development of certification programs
- Civil society
  - Cross check emerging certification schemes
  - Basis for monitoring
  - Can report obvious infringements of principles
- Educational programs
  - Awareness/training of farmers
  - Orientation of consumers

Environmental assessment:

To assess environmental implications of project, and particularly shifts in dependence on the utilization of trash/low value fish to pellets or other feed sources

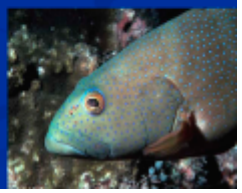


Environmental assessment – two levels

1. Farm level
2. National/regional level

PROJECT IMPACT – FARM LEVEL

1) Assess changes in nutrient (C, N and P) loads to environment from pellets *vs* trash fish.
   - Data collection requirements:
     - Inputs (dry weight of feed, wet weight of trash fish)
     - Outputs (total biomass of fish – less weight at stocking)



2) Assess changes in utilization of fish protein from pellets *vs* trash fish.

- Data collection requirements:
  - Inputs (dry weight of feed, wet weight of trash fish)
  - Outputs (total biomass of fish – less weight at stocking)

3) Assess environmental quality in and around cages using pellets *vs* trash fish.

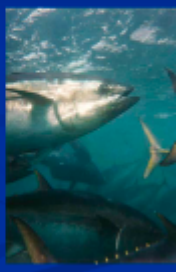
- Data collection requirements:
  - Occurrence of fish disease (frequency, number of fish affected, mortality)
  - Weekly fish mortalities and survival
  - Qualitative assessment of cage environment – to be conducted weekly
  - Water quality measurements should be made weekly if equipment is available
  - Qualitative assessment of any changes in management, and implications for overall resource use on farms

4) Assess ecosystem dependence of cages/farms using pellets *vs* trash fish.

- Data collection requirements:
  - Weekly records of sources of trash fish fed *vs* fish pellets
  - Species and amounts of trash fish
- Origin of fish protein and other ingredients for pelleted diets

PROJECT IMPACT – REGIONAL LEVEL

Conduct an assessment of project >> national >> regional level on implications of reducing dependence on trash fish



1) Changes in nutrient (C, N and P) loads to environment from pellets *vs* trash fish, including net carbon loading from trash fish *vs* pellets
2) Utilization of fish protein in pellets *vs* trash fish.
3) Implications for environmental quality
4) Biodiversity and carbon impacts of pellets *vs* trash fish.

Thankyou

5 Annex II: (Approved Reports of the In-country/ Stakeholder Workshops)

5.1 Annex II a: Vietnam

National Stakeholder Workshops:

TCP/RAS/3203(D)

"Reducing the dependency on the utilization of trashfish/low value fish as feed for aquaculture of marine finfish in the Asian region"

Report of the National Stakeholder Workshop/Training

Nha Trang, Vietnam

24-27 November 2008

Prepared by

Thai Ngoc Chien

Research Institute for Aquaculture No.3 (RIA-3), Nha Trang

&

Hassanai Kongkeo

Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok

Background:

At the Inception Planning Workshop held in Krabi, 8-10 September 2008, it was recommended that the national stakeholder workshop/training in each country should aim at:

- Finalization of farmers for farmers' participatory trials (FPT)
- Preparation of a time-frame for livelihood analysis
- Finalization of record keeping format for environmental data
- Preparation of a preliminary design of FPT and a time table for FPT
- Preparation of a format for data collection in consultation with participating farmers and other stakeholders

The workshop/training:

The worksop was convened at Research Institute for Aquaculture No. 3 (RIA-3), and was opened by the Director, Dr. Nguyen Thi Xuan Thu, The tentative agenda/program was revised (Annex 1) due to the changes in arrival dates to Nha Trang of Dr. Dave Robb, Chief Representative Officer, EWOS feed company based in Ho Chi Minh City. This feed company has committed to NACA to provide marine finfish feed for trials in Vietnam. The workshop was attended by 41 participants including 20 marine fish farmers, 3 trash fish suppliers, 15 RIA-3 staff, 1 each from University of Nha Trang, EWOS and NACA as in Annex 2.

The training on the application of dry pellet for marine finfish and BMP for feeding (Annex 5) was also distributed.

Workshop discussions/recommendations:

1. **Target species for the trials:**

All fish farmers agreed to select 4 species including cobia, grouper, pompano and snapper based on seed availability during the commencement period of the proposed trial as well as on farmer experiences.

2. **Design of farmer participatory trial:**

Participants were divided into 4 working groups to discuss and design the trials based on experiences as follows:

- Group 1: Cobia
- Group 2: Grouper
- Group 3: Pompano
- Group 4: Snapper.

The results of the decisions arrived at by each group were as follows:

Parameter	**Cobia**	**Grouper**	**Pompano**	**Snapper**
Commencement period	Early Feb. 2009	Early Jan-Feb. 2009	Early Feb. 2009	Early 2009
No. of participating farms	5	3	2	4
No. of cages/ farmer	Start with 2 (1 pellet+1 trash fish) and expand double within 2 months	Start with 2 (1 pellet+1 trash fish) and expand double within 1.5 months	Start with 2 (1pellet+1 trash fish) and expand double within 1.5 months	2 (1pellet+1 trash fish)
Cage size (m^3)	4 x 4 x 5	3 x 3 x 4	4 x 4 x 4	4 x 4 x 5
Stocking density (pcs/m^3)	2.5	13.8	15.6	6.3
No. fish stocked/cage	200	500	1,000	500
Stocking size (cm)	10-12	14	6-8	10
Sources of seed	Joint Taiwan or RIA-1 hatchery	Wild from Cat Loi area/RIA-3 or Indonesia hatchery	Overseas/ Nha Trang University in Vietnam	Oversea/Nha Trang University
Culture period (months)	12-14	15	10-14	14
Survival rate (%)	80	60-80	80	80
Size of fish harvested (kg)	8-10	0.5-0.8	0.8-1.2	0.8–1.0
Max. fish production (kg)	1,600	320	960	400
Trash fish used/farm (kg)	8,400	2,240	8,400	3,360
Max. pellet used/farm (kg)	4,800	960	2,880	1,200
Total pellet used (kg)	**24,000**	**2,880**	**5,760**	**4,800**
Tidal range (m)	0.3 -1.0	0.3 -1.0	0.3 -10	0.2 -1.0
Water depth (m)	20-25	18	14-20	15
Seed price (VND/pcs)	20,000 -25,000	10,000 -14,000	7,000 -9,000	12,000
Fish exfarm price (VND/kg)	60,000	120,000 -150,000	60,000	70,000

Due to the availability of EWOS feed in February-March 2009, farmers should feed the seed stock with trash fish if the seeds arrive before arrival of pellet feed. Then the trial will actually start as soon as pellet feed is applied. If amount of seeds could not reach the above expected trial stocking density, the available seeds should be equally shared between trash fish and pellet trials.

Mr. Chien requested FAO for the urgent transfer of funds for this trial, purchase of equipment for water analysis and cost of livelihood survey and trial monitoring as the fish stocking will start soon in January 2009.

3. **Finalization of the trial farmers:**

Twenty fish farmers returned the registration forms for trials, out of which 6 farmers do not have experience in the targeted species, but still were eager to be involved in the trial . However, due to the shortage of fund as well as the feed supply, the total 14 fish farmers in Vung Ngan, Nha Trang were short-listed and would be conducting trials on the species as given below (details shown in Annex 3):

- Cobia group : 5 farmers
- Grouper group : 3 farmers
- Pompano group : 2 farmers
- Snapper group : 4 farmers

Species of grouper may probably vary from tiger, malabar, orange spotted depending on seed availability of at the commencement of trials.

The 5 farms which were recommended by Mr. Pham Quoc Hung, Nha Trang University to join this project, were not able to conduct trials because their trials may not pass the typhoon season next year. Their cages are located in exposed sea areas and having limited experiences only to fattening of lobster for a short period in the dry season. These farmers also required funding support for fingerlings and trash fish.

The farmers were requested to sign the contract for trial with RIA-3 for their commitment. Mr. Chien will arrange this when he holds a small training for the selected farmers before the beginning of the trial. To ensure the proper use of feed for the trial only, feed will be stored and delivered by RIA-3 periodically to farmers. The amount of feed required by farmers will be confirmed by monitoring the fish growth during RIA-3's regular farm visits.

4. **Record keeping:**

The proposed formats for record of feed and farm management, farm performance, economic performance, and for monitoring of fish growth and water quality (Annex 4) were accepted by all stakeholders. RIA-3 would also like to measure nitrate, nitrite, phosphate and hydrogen sulfide if equipments are available.

5. **Project workplan and schedule**:

It was agreed that the time-frames for project activities in Vietnam should be as follows:

- Livelihood survey for trash fish suppliers
    1. Survey (20 in Nha Trang) by RIA-3……..(early 09)
    2. Survey (20 in Ha Long Bay) by Nguyen Van Lung, Min. of Agri……(early 09)
    3. Analysis of results by FAO expert……..(mid 09)
- Farmers' participatory trials
    1. Delivery of commercial feed by feed manufacturer……..(Mar –Sep 09)
    2. Operation of trials by farmers……(Mar 09-May 10)
    3. Data collection by RIA-3……..(Apr 09-May 10)
    4. Analysis of data by NACA+FAO……(Jun 10)
- Environmental impact assessment
    1. Purchase of required water quality monitoring equipment by FAO……(Jan 09)

2. Collection of environmental parameters from trials by RIA-3..(Mar 09-May 10)
3. Feed quality analysis for environmental impact assessment by independent lab ……(Jun-Aug 09)

4. Analysis by FAO +NACA experts……..(May-Jun 10)

- Feed perception + livelihood survey for farmers participating in trials
  1. Survey by RIA-3……..…(Apr-May 10)
  2. Analysis of results by FAO expert……(Jun 10)
- Second national workshop by NACA+RIA-3……(Jul 10)
  1. Dissemination of trial results and findings from various surveys
  2. Recommendation for follow up action
  3. Establishment of aquaclubs for dealing with feed manufacturers
  4. Finalization of results for presentation in final regional workshop
  5. Preparation of workshop report for submission to FAO ……(Jul 10)

6. **Livelihood survey for trash fish suppliers:**

The livelihood questionnaire form in Vietnamese was presented for discussion with trash fish supplying participants and fish farming participants. Apart from the comment that it being too details, they all accepted to comply with the survey. Due to storm hitting Nha Trang, it was not possible to visit the trial sites for testing livelihood questionnaire with trash fish suppliers at the site. Therefore only three questionnaires were tested with the trash fish supplying participants in the workshop. The tested questionnaires were immediately translated back to English and will be brought back to NACA Bangkok.

7. Commercial feed:

The introduction of EWOS feed was given by Dr. Dave Robb, Representative of EWOS in Vietnam, as in Annex 6. At this stage, the company is looking for possible site for their aqua feed factory, probably in Ho Chi Minh City which will target mainly on hugh volume of Pangasius catfish feed and some marine finfish feed. Therefore feed using in trial should be produced in Canada plant (for Cobia) and in Norway (for other marine fish) and ship to Vietnam. Their Cobia feed has been used in commercial farms in Vietnam (eg. offshore cages in Van Phong Bay, Khanh Hoa Province, 60 km north of Nha Trang). He also offered the assistance of staff in Van Phong Farm to demonstrate the application of Cobia feed for project trials. EWOS Representative promised to supply feed without charge maximally 50 tones for these trials. ***He needs paper works from RIA-3, NACA and FAO to help importation of feed with minimum or duty free tax*** as well as the room to store the feed in Nha Trang. Dr. Thu finally agreed to help project to find out. NACA and FAO are also able to provide documents for this tax exemption process.

There will be 2 shipments of feed. First batch should arrive Vietnam by February 2009 and it is able to store in Vietnam for 6 months after 2 month-shipment. Its life-span is around 8 months after manufacturing if kept in dry and ventilated conditions. Its proper packing and high quality ingredients cause longer life span than other local feeds.

Annex 1:

NATIONAL STAKEHOLDERS WORKSHOP ON

"REDUCING THE DEPENDENCE ON THE UTILISATION OF TRASH FISH/LOW VALUE FISH AS FEED FOR AQUACULTURE OF MARINE FINFISH IN THE ASIAN REGION"

Nha Trang, 24-27 November 2008

REVISED PROGRAM

	24TH NOVEMBER	
08.00-08.30	*REGISTRATION*	
08.30-08.45	OPENING REMARKS	NGUYEN THI XUAN THU (RIA-3)
08.45-10.00	INTRODUCTORY REMARKS AND PROJECT CONCEPTS	HASSNAI KONGKEO (NACA)
10.00-10.30	*COFFEE/ TEA BREAK*	
10.30-12.00	TRAINING ON DRY PELLET FEEDING	HASSANAI KONGKEO (NACA)
12.00-13.30	*LUNCH*	
13.30-14.30	PROPOSED FARMERS' PARTICIPATORY TRIALS	HASSANAI KONGKEO (NACA)
14.30-15.30	PROPOSED PROJECT WORK PLAN AND SCHEDULE	HASSANAI KONGKEO (NACA)
15.30-15.45	*COFFEE/ TEA BREAK*	
15.45-16.15	DISCUSSION ON TARGET SPECIES	ALL PARTICIPANTS
16.15-17.00	DISCUSSION ON PROJECT OUTPUTS AND PROVIDING REGISTRATION FORMS TO FARMERS	ALL PARTICIPANTS
17.00-19.00	*DINNER*	
	25TH NOVEMBER	
08.30-10.00	INTRODUCTION OF EWOS FEED	DAVE ROBB (EWOS)
10.00-10.30	*COFFEE/ TEA BREAK*	
10.30-12.00	REVIEW OF QUESTIONNAIRE ON LIVELIHOOD ANALYSIS AND METHODOLOGY OF RRA	THAI NGOC CHIEN (RIA-3) HASSANAI KONGKEO (NACA)
12.00-13.30	*LUNCH BREAK*	

13.30-14.00	GUIDELINES OF BOOK RECORDING FOR FARMERS	THAI NGOC CHIEN (RIA-3)
14.00-15.30	GROUP DISCUSSIONS ON SELECTED SPECIES AND TRIAL DESIGN	ALL PARTICIPANTS
15.30-15.45	*COFFEE/TEA BREAK*	
15.45-16.15	PRESENTATION OF EACH GROUP	ALL PARTICIPANTS
16.15-17.00	RESULT OF SELECTED FARMS FOR TRIALS	THAI NGOC CHIEN (RIA-3)
17.30-19.00	*DINNER*	
	26TH NOVEMBER	
WHOLE DAY	VISIT TO SELECTED CAGE FARMS IN NHA TRANG	
	27TH NOVEMBER	
WHOLE DAY	TEST OF QUESTIONNAIRES ON LIVELIHOOD OF TRASH FISH SUPPLIERS	

Annex 2:

LIST OF PARTICIPANTS

No	Name	Address	Occupation
	RIA-3		
1	Nguyen Thi Xuan Thu	RIA 3	Director
2	Thai Ngoc Chien	RIA 3	Hd/ Fish Exploitation and Aquatic Resource Management
3	Do Tinh Loi	RIA 3	Dty Hd/ Fish Exploitation and Aquatic Resource Management
4	Nguyen Thi Ngoan	RIA 3	Researcher
5	Tran Van Hao	RIA 3	Researcher
6	Ly Bao Thanh	RIA 3	Researcher
7	Le Manh Linh	RIA 3	Researcher
8	Tran Tri Dung	RIA 3	Researcher
9	Tran Tan Tien	RIA 3	Researcher
10	Tran Thi Kim Cuc	RIA 3	DtyHd/ International Relation
11	Le Vinh	RIA 3	Hd/ Post-harvest and Processing
12	Nguyen Minh Huong	RIA 3	Researcher
13	Tran Thi Bich Thuy	RIA 3	Researcher
14	Le Quoc Tuan	RIA 3	Service
15	Nguyen Thi Loan	RIA 3	Service

16	Pham Quoc Hung	Nha Trang University	Lecturer
	Marine fish farmers		
17	Nguyen Minh Tam	136 KB Son Phuoc, Nha Trang	Fish Farmer
18	Nguyen Dinh Lam	136 KB Son Phuoc, Nha Trang	Fish Farmer
19	Nguyen Dinh Tan	136 KB Son Phuoc, Nha Trang	Fish Farmer
20	Le Thanh Sang	03 Duc Chinh, Vinh Hoa	Fish Farmer
21	Luong Minh Quoc	32/1 Tran Phu, Vinh Nguyen	Fish Farmer
22	Lu Phuc Tai	33 Sinh Trung	Fish Farmer
23	Ngo Gia Cuong	39 B Cu Chi, Nha Trang	Fish Farmer
24	Ho Van Thanh	23 Block 11 C7 Hon Ro	Fish Farmer
25	Trinh Khac Son	15 Tan Trao, Vinh Nguyen	Fish Farmer
26	Vo Thi Cuc	Vinh Nguyen	Fish Farmer
27	Duong Son	Vung Ngan, Vinh Nguyen	Fish Farmer
28	Pham Huu Toan	94 A Le Hong Phong, Nha Trang	Fish Farmer
29	Le Minh Quyen	28/1 Tran Phu, Nha Trang	Fish Farmer
30	Ho Ngoc Lai	Tri Nguyen	Fish Farmer
31	Le Van Muoi	29/6/34 Vinh Nguyen	Fish Farmer
32	Ngo Van Dung	Group 14 – Duong De – Nha Trang	Fish Farmer
33	Mai Van Tai	25 – Group 14 – Ha Ra	Fish Farmer
34	Dinh Van Hoang	132 Cu Lao Trung	Fish Farmer
35	Huynh Van Khai	01 H3 – Cu Lao Ha – Vinh Tho – Nha Trang	Fish Farmer
	Trash fish suppliers		
36	Le Viet Tan	13 Duong De – Vinh Hoa	Fish Farmer
37	Pham Van Lem	34 Vinh Tho – Nha Trang	Trash fish supplier
38	Duong Van So	Vung Ngan, Nha Trang	Trash fish supplier
39	Duong Trung	Vung Ngan, Nha Trang	Trash fish supplier
	Feed manufacturer		
40	Dave Robb	EWOS	Chief Representative Officer
	NACA		
41	Hassanai Kongkeo	NACA, Thailand	Technical Assistant to D-G

Annex 3: List and details of selected farmers for farmers participatory trials

No.	Name	Experienced species	Trial species	Feed used before	Credit	Cage size (m^3)	No. of cages available	No. of trial fish	Growth period (month)	Stocking size (cm)	
	Cobia group										
1	Mai Văn Tài	Cobia and Lobster	Cobia	Trash fish	Owned	4x4x6	10		12		100
2	Ngô Gia Cương	Cobia and Lobster	Cobia	Trash fish	Borrowed	3,5x3,5	6	400	12	13	

3	Hồ Văn Thành	Cobia and Lobster	Cobia	Trash fish	Borrowed	4x4x5	6			1 2	500
4	Lữ Phúc Tài	Cobia and Lobster	Cobia	Trash fish	Borrowed	4x4x6	4	400	14	10-12	
5	Dinh Văn Hoàng	Cobia and Lobster	Cobia	Trash fish	Owned	3x3x5	5	1000	15	10-12	
	Grouper group										
6	Hoàng Ngọc Lại	Grouper	Grouper	Trash fish	Borrowed	3x3x3	4	600	12		150 fi
7	Lê Văn Mười	Grouper	Grouper	Trash fish	Owned	3x3x5	20				
8	Phạm Văm Lem	Cobia, Grouper, snapper,	Grouper	Trash fish	Borrowed	4x4x4	2	200	15	10	
	Pompano group										
9	Dương Sỏi	Pompano	Pompano	Trash fish	Owned	4x4x5	10		12-15	'8-12	100-5
10	Phan Sinh	Pompano	Pompano	Trash fish	Owned	4x4x5	15			8-12	100-4
	Snapper group										
11	Huỳnh Văn Khải	Grouper, snapper and Cobia	Snapper	Trash fish	Owned	3,5x4	4		14	10	250
12	Lê Minh Quyền	Cobia and Grouper, Snapper	Snapper and Seabass and Cobia	Trash fish	Owned	3,5x3,5x4,5	30				300
13	Lê Việt Tân	Seabass and snapper	Seabass (Snapper)	Trash fish	Borrowed	4x4x5	2	200	15	10	
14	Phạm Hữu Toàn	Snapper	Snapper	Pellet	Borrowed	4x4	2				
	Reserved group										
15	Nguyễn Đình Lãm	Lobster	Grouper	Trash fish	Owned		4	500	15		
16	Nguyễn Đình Tân	Seabass	Grouper								
17	Nguyễn Minh Tâm	Seabass	Grouper								
18	Ngô Văn Dũng	Seabass	Grouper								
19	Trịnh Khắc Sơn	Abalone	Pompano	Trash fish	Owned	4x4x5	12				100-5
20	Lương Minh Quốc	Grouper and seabass	Seabass and Cobia	Trash fish	Borrowed	4x4x2.5		400			200

Annex 4: Trial records:

Proposed Daily Record of Feed Management using pellet *for farmer*

(need to agree on)

Cage size :....X….X…..m, No. of fish fry stocked :…pcs, Size of fry stocked :……..cm
Stocking date :……, Time :……., Fry source :……, Fry condition :……
Arrival date of pellet size 1:……., Arrival date of pellet size 2 :……
Trial no…..Arrival date of pellet size 3 :……..., Arrival date of pellet size 4 :……

			Feed weight (kg)				% feed remaining in trays**		
Date	Size of pellet	1st feeding	2nd feeding	3rd feeding	Total feed/day	1st feeding	2nd feeding	3rd feeding	Remarks*

*= including fish disease symptom, no. of dead fish, drug administration, water color, weather conditions, special feed supplement, net cleaning/changing
** = if feeding trays are used

Proposed Daily Record of Feed Management using trash fish *for farmer*

(need to agree on)

Cage size :....X….X…..m, No. of fish fry stocked :……pcs, Size of fish stocked :…...cm,
Stocking date :……, Time :……., Fry source :……, Fry condition :……
Trash fish supplier :……Origin of trash fish :……..
Trial no :…Species of trash fish :……Ratio :……

Date	Major species of trash fish	Trash fish purchased (kg)	Trash fish cost (Dong)	1st feeding (kg)	2nd feeding (kg)	Total feed/day (kg)	Remark*

*= including fish disease symptom, no. of dead fish, drug administration, water color, weather conditions, special feed supplement, net cleaning/changing

Proposed Farm Performance Record
for farmer
(need to agree on)

Trial no.	:……
Farmer's name	:……
Fish species stocked	:……
Cage size……	:…..X…..X……m
Stocking rate	:……pcs/m^2 *(by RIA-3)*
Culture period	:……days
No. of fish stocked	:……pcs
No. of fish harvested	:……pcs
Survival rate	:……% *(by RIA-3)*
Type of feed used	:……
Weight of fish harvested	:……Kg
Total feed used	:……Kg
FCR	:…… *(by RIA-3)*
Feed cost per kg fish production	:……Dong *(by RIA-3)*

Proposed Economic Performance Data
for farmer
(need to agree on)

Trial no……Farmer's name……

Total cost of fry	:……..Dong
Total feed cost	:……Dong (excluding pellet)
Total labor cost	:……Dong
Total fuel cost	:……Dong
Total chemicals & drugs cost	:……Dong
Total maintenance & supplies cost	:……Dong
Contingency	:……Dong
Total production cost	:……Dong *(by RIA-3)*
Income from selling fish	:……Dong
Primary profit	:……..Dong *(by RIA-3)*
Cage construction cost + net	:……Dong
Life span of cage	:……years
Life span of net	:……years
Depreciation	:……..Dong *(by RIA-3)*
Bank interests (if borrow)	:……..Dong
Net profit	:……..Dong *(by RIA-3)*
Net profit per kg fish	:……..Dong *(by RIA-3)*

Proposed growth monitoring data *for RIA-3*

(need to agree on)

Trial no……Farmer's name……Measured by……..

Date of site visit	:……
Time of sampling	:……
Total fish weight sampled	:……gm
Total no. of fish sampled	:……pcs
Average body weight (ABW)	:……gm
Estimated fish stock	:……pcs
Total biomass	:……kg
Recommended daily feeding rate	:……%ABW (from feeding regimen table)
Estimated feed required per day	:……kg
Recommended feeding frequency	:……times/day (from feeding regimen)
Estimated feed required per time	**:……..kg (given to farmer)**

Proposed water quality parameters data *for RIA-3* (measure 2 hrs after feeding)

(need to agree on)

Trial no……Farmer's name……Measured by……..

Date of site visit	:……..
Secchi disc depth	:……cm
DO of surface water inside cage	:……ppm
DO of bottom water inside cage	:……ppm
DO of water outside cage	:……ppm
Ammonia inside cage	:……mg/l
Ammonia outside cage	:……mg/l
Salinity	:……ppt
Water color	:……
Condition of fouling	:……
Other observations	:(eg. disease infection, mortality, unusual behavior, uneaten food, bubbles from bottom)

Annex 5: Training on the use of dry pellet feed

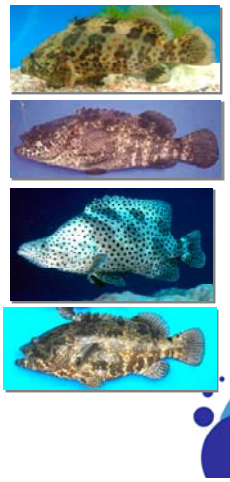
FAO/NACA National Stakeholders Workshop: November 24th to 25th 2008
Nha Trang, Vietnam
TCP Project on "Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

DRY PELLET FEEDING

Hassanai Kongkeo
Network of Aquaculture Centres in Asia-Pacific (NACA)
Department of Fisheries Compound, Kasetsart University Campus
Ladyao, Jatujak, Bangkok 10900, Thailand
E-mail : hassanai.kongkeo@enaca.org

Dietary protein requirements

- Orange spotted grouper *(Epinephelus coioides)* = 50 %
- Malabar grouper *(E. malabaricus)* = 47.8 %
- Humpback grouper *(Cromileptes altivelis)* = 54.2 %
- *Tiger grouper (E. fuscoguttatus)* = 51 %



Dietary protein requirement (cont.)

- Coral trout = 53.5 %
  (Plectropomus leopardus)

- Seabass = 45.0 %
  (Lates calcarifer)

- Red snapper = 47.0 %
  *(Lutjanus argentimac*ulatus)

- High protein requirements due to their carnivorous behavior

Dry pellets

Advantages :

- Available whole year-round (no shortage in storm season)
- Continuous growth and healthy due to regular feeding (no interruption by shortage of trash fish)
- Can be stored longer than trash fish or moist feeds
- More environmentally sound :
  - High water stabilty (less nutrient dissolved)
  - Less amount of feed use and feed waste to pollute water (then less diseases)
- Less amount of trash fish (as fish meal) required (more plant protein is used)
- Less food conversion ratio (FCR)
- Minimize introduction of fish diseases contaminated through trash fish
- Can add more nutrients (vitamins, minerals, oils, additives, etc.) to accelerate growth and disease prevention
- Culture areas can be expanded to remote area (deeper sea) where daily trashfish supplies are difficult

Disadvantages :

- Less attractive to fish (therefore it always requires weaning)
- Transportation cost from factory is higher

Economic benefits of using pellet

- **Though pelleted feeds are more expensive than trash fish but:**
  - Trash fish contains 75% moisture (water) while pellet contains less than 10%
  - Pellet has almost four times more nutrition ingredient than trash fish
  - Pellet (FCR = 1.5-2.0) also has 4-5 times less Food Conversion Ratio (FCR) than trash fish (FCR = 6-10)
  - This means using 4-5 times less feed quantity than trash fish
- **The only way to compare feed performance of both feeds is to calculate the total feed cost per kg of fish produced**
- **In long term, cost of pellet is expected to decrease due to:**
  - Competition among manufacturers in both feed development and production
  - More demand from farmers thus reduces overhead cost and feed damage from over-due storage in feed production
  - Price of trash fish becomes higher due to lack of fishing sources and increase in oil price
- **Fish grow faster and are healthier due to its higher nutritional value**

Criteria for selection of good pellet

- **Buy from reliable manufacturer (good image, history and certified by nutrition institute)**
- **Select feed formulated specifically for cultured species and size/age**
- **Select by nutrient contents, ingredient instead of simply by price**
- **Check freshness by production & expiry dates**
- **Pellet should be fed within 2 months after manufacturing**
- **Reject pellets that are crumbled or clushed (high ash or cracked)**
- **Reject feed that shows signs of water/rain damage;**
  - discolored bags
  - clumping of pellets
  - rancid (off flavor) smells

Feed storage

- **Deterioration of feed quality in storage causes:**
  - loss of critical nutrients (vitamins, fatty acids, anti-oxidants)
  - poor growth
  - malnutrition
  - poor fish health
  - mass mortality by poisoning afla-toxin (mouldy feed)

- **Characteristics for good storage facilities:**
  - shelter from direct sunlight and rain
  - properly ventilated and cool
  - dry and low humidity
  - protect from rats/mice and insect pests
  - store off the ground to prevent ground condensation and mould formation
  - store away from chemicals and drugs
  - good estimation on feed use of each feed size for proper storage without shortage or over-storage

Feed management

Feeding regimen:

•Use a feeding regimen (from manufacturers or researchers) as a guide to develop our own practices
•Feeding regimen may vary due to different fish species, location, water quality, weather, farming systems
•Adjust actual feeding until fish are slow in feeding (satiation)
•Don't dump feed into cage without observing fish feeding response
•Gradually distribute feed by hand
•Pellet can be fed more frequent than trash fish because feed ingredients are quick for fish digestion

Recommended feeding regimen of dry pellets

Fish size (g)	Daily feeding rate (% of average body weight)	Feeding frequency (no. of feeds/day)
1-5	4.0-10.0	3-5
5-20	2.0-4.0	2-3
20-100	1.5-2.0	2
100-200	1.2-1.5	1-2
200-300	1.0-1.2	1
>300	0.8-1.0	1

Timing of feeding

- **Fish fingerlings require feeding more frequent due to its quick digestion for rapid growth**
- **If feeding once per day, better feed in late afternoon**
- **If more than once, feeding should usually start after sunrise and finish before sunset**

Factors for changing of feeding time or reducing feed amount:

1. **Temperature**
   - Best water temperature for feeding = 28-30ºC
   - In cold season, feeding should start in late morning and finish before late afternoon
   - In hot season, try to avoid feeding at noon and early afternoon as surface water is warm (fish tend to rest on the bottom)
2. **Dissolved oxygen**
   - Should avoid feeding during low (< 4 mg/l) water DO (before sunrise or during cloudy sky and raining)
   - DO of running water in cage has less problem than still water in pond
3. **Water current**
   - To prevent feed loss through cage net, avoid feeding during strong current
   - Fish also reduce feeding if they have to swim against strong current
4. **Water quality and fish health**
   - Fish reduce feeding when stress under poor water quality (high ammonia, nitrite, sulfide, red tide, insecticide, etc), sudden change of water and sick

Methods of feeding

- **Suitable types of commercial dry pellets:**
  - slow sinking pellet for slow feeding grouper in cage
  - floating pellet for fast feeding grouper and seabass in cage
  - floating pellet for pond culture of all species

Methods of feeding:

1. **Spreading**
   - Spread feed slowly to allow all fish receive feed and to avoid feed waste
   - Fish quickly become accustomed to feeding time by aggregation at feeding area
   - Stop feeding as satiation has been reached
2. **Feeding tray**
   - Sinkable 1X1x1 m^2 tray with opening top for fish entering
   - Prevent loss of feed through cage net
   - Reduce labor in feeding
   - Adjust amount of feed in next meal by checking feed left in tray after 15 minutes

Weaning from raw feed to pellet

Hatchery-produced fingerlings:

- Usually accept pellet because they have been tamed for formulated diet since the beginning
- Weaning in hatchery and nursery is conducted by slowly and individually feeding in small quantity by hand
- The process is relatively labor-intensive

Wild fingerlings:

- Difficulty in converting to pellet
- Feed them with a mix of trash fish and pellet
- Delay feeding time by 1-2 hours to make fish hungry
- Firstly start with a large proportion of trash fish in the mixed feed
- Gradually reduce proportion of trash fish until totally eliminated at the end
- This process may take 1-3 weeks depending on fish species and culture practices
- Some farmers wean by starving fish for 2-3 days and then feed only pellet
- But this will cause fish losing condition and lead to health problems

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- But this will cause fish losing condition and lead to health problems

Better Feed Management Practices

Check list:

- Stop feeding when fish stop taking feed (satiation) to reduce feed waste and pollution
- Feeding should be based on fish biomass and feeding regimen table as a guide
- Should not dump feed but rather add slowly and distribute to where fish are present
- Avoid using antibiotic in feeds for disease treatment
- Consult fisheries authorities for proper dosage and direction of drugs used
- Stop the use of medicated feeds as soon as fish has been recovered
- Feed size should be selected according to the size of fish indicated by manufacturers

Thank You

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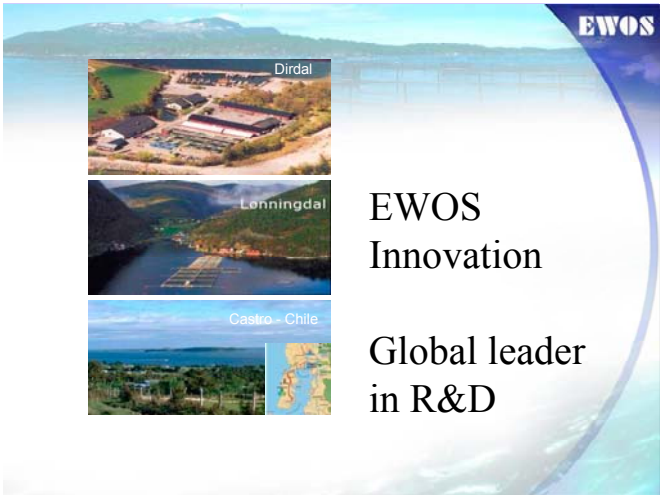
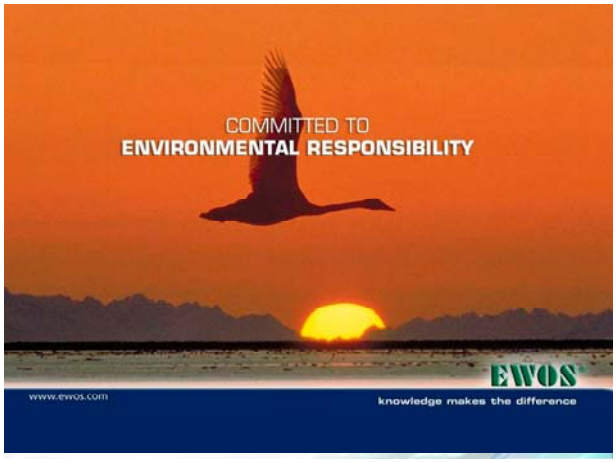
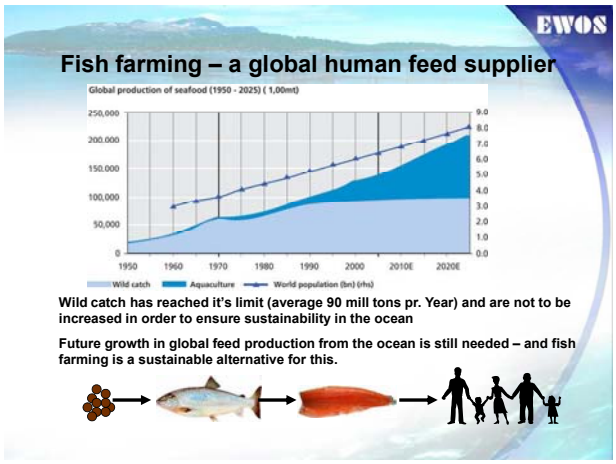
Annex 6: Introduction of EWOS Feed

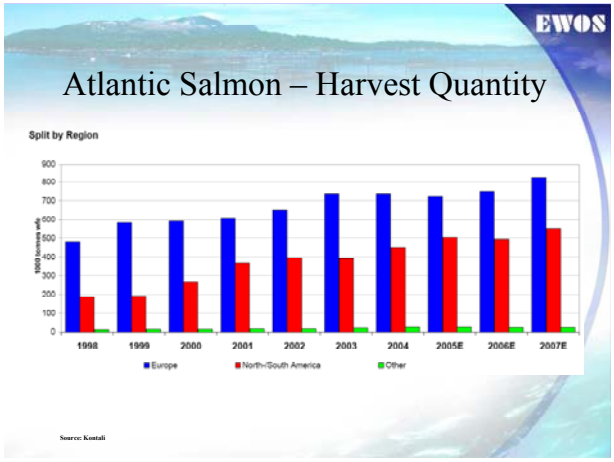

EWOS
Dirdal
Lonningdal
Castro - Chile
EWOS Innovation
Global leader in R&D


EWOS
EWOS Innovation
• Budget NOKm 70 (approx US$10 million)
• 65 employees – 17 scientists
• R&D focus areas:
– Product development
– Knowledge dissemination
• Successful R&D
– Many feed products
– Reduced inclusion of marine raw materials
– Improved nutrition and food safety


EWOS
EWOS Goals in Vietnam
1. Can we make a business here?
2. Market leader in fish feed production
3. Help to develop Vietnamese aquaculture
4. Improve fish nutrition and health
5. Improve food safety


COMMITTED TO
ENVIRONMENTAL RESPONSIBILITY
EWOS
www.ewos.com
knowledge makes the difference


EWOS
Fish farming – a global human feed supplier
Global production of seafood (1950 - 2025) (1,00mt)
250,000
200,000
150,000
100,000
50,000
0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1950
1960
1970
1980
1990
2000
2010E
2020E
Wild catch
Aquaculture
World population (bn) (rhs)
Wild catch has reached it's limit (average 90 mill tons pr. Year) and are not to be increased in order to ensure sustainability in the ocean
Future growth in global feed production from the ocean is still needed – and fish farming is a sustainable alternative for this.


EWOS
Atlantic Salmon – Harvest Quantity
Split by Region
900
800
700
600
500
400
300
200
100
0
1998
1999
2000
2001
2002
2003
2004
2005E
2006E
2007E
Europe
North/South America
Other
Source: Kontali

Healthy fish without use of antibiotic

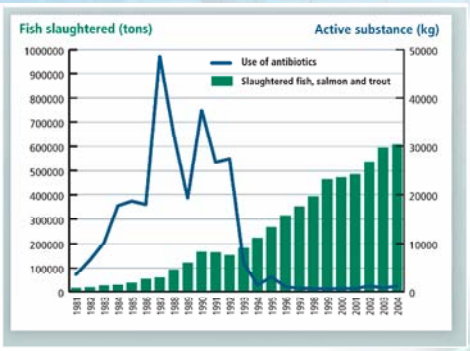
There has been a 98 per cent reduction in the use of antibiotics between 1987 and 2006. At the same time, salmon and trout production has risen more than tenfold.

The industry has achieved this through effective vaccination, improved production methods and preventive work

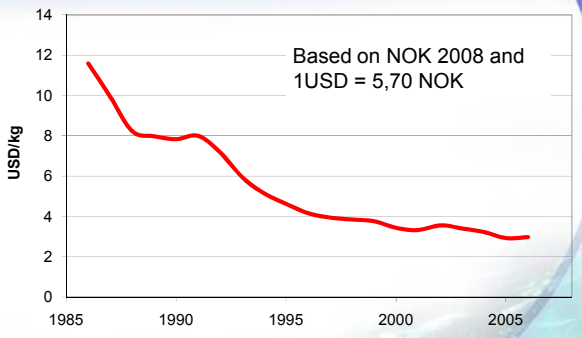
Since 1993, no harmful traces of medicine have been found in harvested farm salmon

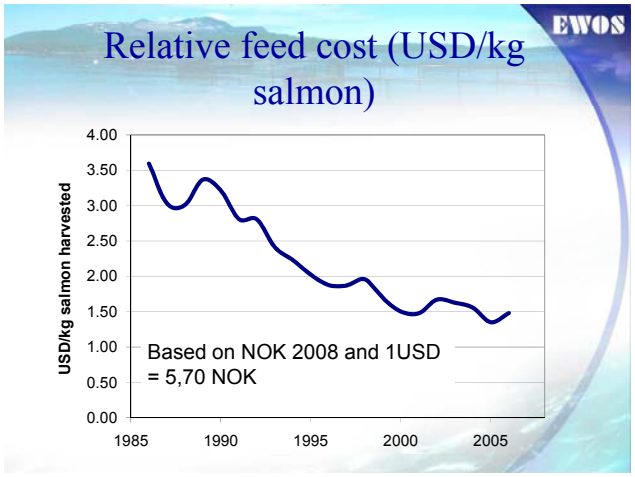
All farms are obliged to have their own fish welfare service, which is inspected at least 6 times a year

Healthy fish without use of antibiotic



Average production costs of Norwegian Atlantic salmon




Relative feed cost (USD/kg salmon)
EWOS
USD/kg salmon harvested
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1985
1990
1995
2000
2005
Based on NOK 2008 and 1USD = 5,70 NOK

5.2 Annex II b: (Indonesia)

(National Stakeholder Workshop Reports, contd.)

TCP/RAS/3203(D)

"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

DRAFT REPORT

National Stakeholder Workshop/Training

Bandar Lampung, Indonesia, 2nd to 4th February 2009

Prepared by:

Main Centre for Mariculture Development (MCMD), Lampung,
and
Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok

I. Introduction

Marine finfish aquaculture in Asia has been developing rapidly at around 10 percent per annum valued at 4 percent per annum of the global finfish production over the last decade, and is the fastest growing sub sector in Asia. Much of this increasing production is attributable to the expanding culture of high value marine carnivorous species such as groupers. The countries that lead in marine finfish aquaculture currently are PR China, Indonesia, Viet Nam and Thailand as well as Korea and Japan, with India planning major expansion. However, the sub sector is by and large dependent on trash fish/low value fish, almost always as the only food source of the cultured stocks.

The use of trash fish/low value fish is a contentious issue both from a resources use point of view and an environmental integrity perspective; the latter being reflected in the very high conversion rates (therefore poor efficiency), ranging from 7 to 15 on average grouper farming practices. The long term sustenance, economic viability and environment integrity of marine finfish aquaculture practices in the region will essentially depend on the shift from direct use of trash fish/low value fish as a direct food source, improve environmental integrity of the practices and bring about better economic viability.

Based on the 18th Meeting of the Governing Council of the Network of Aquaculture Centers in Asia Pacific (NACA) held in Bali, that unanimously recommended the need to initiate a regional project to reduce the dependence on trash fish/low value fish in marine fish farming in Asia amongst small scale farmers. The inception workshop of TCP/RAS/3203(D) held in Krabi on 8th to 10th September 2008 for finalization of the project work plan and TORs as well as finalization of planning of a livelihoods analysis based on a Rapid Rural Appraisal (RRA) in each country ~~been~~ decided to conduct National Stakeholders Workshop/Training in each country in conjunction with the respective national coordinators.

II. Objectives

The objectives of the National Stakeholders Workshop/Training are:

- To select farmers for farmers participatory trial (FPT),
- To prepare the time frame of livelihood analysis,
- To finalize record keeping format for environmental data collection,
- To prepare a preliminary design of FPT and work out a time table for FPT including preparation of format data collection,
- To finalized record keeping format for monitoring growth and environmental data collection.

III. Venue and Time

Workshop has been conducted from 2nd to 4th February 2009 at Indrapuri Hotel, Bandar Lampung, Indonesia.

IV. Organizing Committee

The workshop is a coordination activity between the Main Center for Mariculture Development (MCMD) Lampung, Food and Agriculture Organization and Network of

Aquaculture Centres for Asia-Pacific (NACA). The project was funded by Food and Agricultural Organization of the United Nations and is coordinated by NACA.

V. Instructors (Speakers)

Instructors or speakers are:

1. Dr. Mohammad R. Hasan, Fisheries Resources Officer (Aquaculture), Aquaculture Management and Conservation Service, FAO, Rome.
2. Mr. Hassanai Kongkeo, Network of Aquaculture Centers for Asia-Pacific (NACA).
3. Mr. Widyatmoko, Research and Development Division PT. Japfa Comfeed.
4. Mr. Budi Kurnia, Technical Staff of MCMD Lampung
5. Mr. Suci Antoro, Technical Staff of MCMD Lampung
6. Dr. Muhammad Murdjani, Director of MCMD Lampung

VI. Subject

The three day workshop was divided in two parts. Part one to survey the fish suppliers and stakeholders (fish farmer) was conducted on 1st and 3rd days. The part two of the workshop/training was conducted in Indrapuri Hotel on the 2nd day with entire subjects of the workshop include the explanation of the project are as follows:

1. Opening Remarks by Mr. Iskandar Ismanaji, on behalf of Director General of Aquaculture. He welcomed all participant, especially Dr. Mohammad Hassan and Mr. Hassanai Kongkeo as FAO and NACA representatives, respectively. He also gave great appreciation and praised the workshop which could be fruitful for marine fish aquaculture specifically in Indonesia and generally in the Asian region.

2. FAO Remarks by Dr. Mohammad Hassan
3. Introductory Remarks and Project Concepts by Mr. Hassanai Kongkeo. Mr. Hassanai explained the background and concepts of the project since 18th Meeting of the Governing Council of the Network of Aquaculture Centers in Asia Pacific (NACA) held in Bali and Inception Workshop held in Krabi 8th to 10th September 2008.
4. Introduction of Commercial Feed by Mr. Widyatmoko, JAPFA Comfeed. Mr. Widyatmoko presented the role of commercial feed for grouper aquaculture development especially in Indonesia, including weaknesses and strengths of commercial feed utilization.
5. Pellet Feed Management by Mr. Budi Kurnia, MCMD Lampung. He presented feeding methods of either trash fish or commercial feed utilization in conjunction with planned FPT project.
6. Monitoring of growth and water quality by Mr. Suci Antoro, MCMD Lampung. In this session Mr. Suci Antoro explained the plan of growth and water quality monitoring during FPT project.
7. FPT and format for record keeping was dealt with by Mr. Hassanai Kongkeo. In this session Mr. Hassanai Kongkeo presented the design of FPT project as well as the proposed format for record keeping. Then it was continued by Finalization of FPT Design and Record Formats as well as Review of Questionnaires on Livelihood Analysis and Methodology of RRA led by Dr. Muhammad Murdjani.
8. Selection of farmers for trials was led by Dr. Muhammad Murdjani and continued with finalization of time tables for project activities by Mr. Hassanai Kongkeo. The workshop successfully selected 4 grouper farmers namely Mr. Rudy Teng, Mr. Bangun Sitepu, Mr.

Koo Ati, and Mr. Alung. Furthermore, Mr.Bobby was also selected to join the trial during the field visit. There is a possibility to increase one more additional farm for the trial if fingerling supplies from MCMD are sufficient. All floating net cage farmers are located i~~n~~ Lampung Bay, Lampung Province. Species target for FPT project implementation will be focusing on tiger grouper (*Epinephelus fuscoguttatus*).

9. Workshop was and close~~d led~~ by Dr. Mohammad Hasan.

VII. Workshop Schedule

Schedule of the workshop are arranged as shown on Table 1.

Table 1. Workshop Schedule
National Stakeholders Workshop on
"Reducing the dependence on the utilization of trash fish/low value fish as feed for aquaculture of marine finfish in the Asian region"

Indrapuri Hotel, Bandar Lampung, Indonesia 2nd to 4th February 2009

DAY 1 (Monday 2nd February 2009)		
08.00 – 16.00	Survey to the fish suppliers for questionnaires on livelihood analysis and methodology of RRA and visit fish farmers	
DAY 2 (Tuesday 3rd February 2009) Opening, Introduction and Presentation		
08.00- 08.30	*Registration*	
08.30 – 08.45	Opening Remarks	Mr. Iskandar Ismanaji, DGA
08.45 – 09.00	FAO Remarks	Dr. Mohammad Hasan, FAO
09.00 – 09.15	Introductory Remarks and Project Concepts	Mr. Hassanai Kongkeo, NACA
09.15 – 09.45	*Coffee/Tea break*	
09.45 – 10.30	Introduction of commercial feed	Mr. Widyatmoko, JAPFA Comfeed
10.30 – 11.30	Pellet Feed Management	Mr. Budi Kurnia, MCMD Lampung
11.30 – 12.00	Monitoring of growth and water quality	Mr. Suciantoro, MCMD Lampung
12.00 – 13.00	*Lunch break*	
13.00 – 13.30	Farmer's Participatory Trials (FPT) and format for record keeping	Mr. Hassanai Kongkeo, NACA
13.30 – 14.30	Finalization of FPT design and record formats	Dr. Muhammad Murdjani, MCMD Lampung
14.30 – 15.00	Review of questionnaires on livelihood analysis and methodology of RRA	Dr. Muhammad Murdjani, MCMD Lampung
15.00 – 15.30	*Coffee/Tea break*	
15.30 – 16.00	Selection of farmers for trials	Dr. Muhammad Murdjani, MCMD

		Lampung
16.00 – 16.30	Finalization of time tables for project activities	Mr. Hassanai Kongkeo, NACA
16.30 – 17.00	Workshop summary, wrap up and closure	Dr.Mohammad Hasan, FAO
DAY 3 (Wednesday 4th February 2009)		
08.00 – 16.00	Continue survey to the trash fish suppliers for questionnaires on livelihood analysis and methodology of RRA and visit to trial farms	
18.00	Departures	

VIII. Participants

Participants of the workshop were at least has background on finfish aquaculture as shown on Table 2.

Table 2. PARTICIPANT LIST
National Stakeholders Workshop on
"Reducing the dependence on the utilization of trash fish/low value fish as feed for aquaculture of marine finfish in the Asia region"
Bandar Lampung, Indonesia, 2nd to 4th February 2009

No.	Name	Affiliation
1.	Dr. Mohammad Hasan	FAO
2.	Mr. Hassanai Kongkeo	NACA
3.	Mr. Iskandar Ismanaji	Director of Production, DGA
4.	Dr. Muhammad Murdjani	MCMD Lampung
5.	Mrs. Antik Erlina	MCBAD Jepara
6.	Mr. Widyatmoko	JAFFA Comfeed, Feed Factory
7.	Mr. Untung Sugianto	Lampung Provincial Fisheries Service
8.	Mr. Ismail Said	Shrimp Club Lampung
9.	Mr. Affrudin	Pesawaran Regency Fisheries Service
10.	Mr. AM. Sinaga	Lampung Selatan Regency Fisheries Service
11.	Mr. Bangun Sitepu	Stakeholder (Fish farmer), Tjg. Putus
12.	Mr. Rudy Teng Cobra	Stakeholder (Fish farmer), Tarahan
13.	Mr. Alung	Stakeholder (Fish farmer), Ringgung
14.	Mr. Koo Ati	Stakeholder (Fish farmer), Pancur
15.	Mr. Jemmy	Trash Fish Supplier of Alung
16.	Mr. Madi	Trash Fish Supplier of Rudy Teng Cobra
17.	Mr. Warnen	Trash Fish Supplier of Bangun Sitepu
18.	Mr. Jaenudin	Trash Fish Supplier of Koo Ati
19.	Mr. Suciantoro	MCMD Lampung
20.	Mr. Budi Kurnia	MCMD Lampung

21.	Mr. Herno Minjoyo	MCMD Lampung
22.	Mr. Hidayat Adi Sarwono	MCMD Lampung
23.	Mrs. Muawanah	MCMD Lampung
24.	Mrs. Evalawati	MCMD Lampung
25.	Mr. Syarifudin	MCMD Lampung
26.	Mr. Daroni	MCMD Lampung
27.	Mr. Hartono	MCMD, Lampung
28.	Mr. Nur Rausin	MCMD, Lampung
29.	Mr. Wahyu Widodo	MCMD, Lampung
30.	Mrs. Pintauli	Head of Aquaculture Div, PFS Lampung
31.	Norman Syah	Staff of Pesawaran FSR
32.	Guntur	Technical Service PT. Matahari Sakti, FF

IX. Committee for project implementation

National Coordinator : Dr. Muhammad Murdjani
Secretary : Mrs. Antik Erlina
Treasurer : Muawanah
Transportation : Sarifudin
Material : Wahyu Widodo and Evalawati

X. Discussion

The workshop successfully implemented the schedule. Participants were very enthusiastic and active following the explanation of the project and paper presentation in view of the expected valuable trial results for grouper floating net cages culture in Lampung and generally in Indonesia. All delivered material were of interest and are importance for supporting the implementation of the FPT project.

Species target for FPT project implementation will focus on tiger grouper (*Epinephelus fuscoguttatus*). The workshop chose 4 farm/farmers all farm located at Lampung Bay. The number of cage per farms is 2 units consisting of 4 net cages/unit of 3 x 3 x 3 m, respectively except Mr.Koo Ati floating cages of 6 x 3 x 3 m. Each farm is divided by one unit cage for commercial feed trial and one unit cage for trash fish trial. Initial stocking density is 500 of fingerling (8 – 10 cm of TL) per cage and later expanded to another cage. The expected project commencement will be in April 2009 and the project completion will be in April 2010. All seed/fingerlings are compensated ~~provided~~ by FAO budget through MCMD Lampung where as the labour, the floating net cages and feed (trash fish and commercial feed) are provided by the farmers. Commercial feed (pellet) will be supplied by Feed Company (PT. Japfa Comfeed) at a discounted price to the farmers. As proposed by Mr. Hassanai Kongkeo, the detailed project design are as follows:

- Pellet provided at a discounted price and transported directly to the farmers *by feed manufacturer*.
- Culture trial using farmer's own experience run *by farmer (supervised by MCMD every month.*
- Regular sampling and monitoring such as sampling fish for average body weight (ABW) for estimation of feed requirement, observation of fish health and unusual signs, and monitoring of water quality parameters (DO, ammonia, Secchi disc depth, salinity, others) by MCMD every month.
- Harvesting by farmer and the yield is belong to the farmer *(witnessed by MCMD)*
- Compilation of relevant records and information *by MCMD.*
- During the 1st and 3rd day's workshop, Survey of trash fish suppliers ~~and~~ for questionnaires on livelihood analysis and methodology of RRA and visit to trial farms were conducted at 4 locations of potentially farmers participant including Rudy Teng Farm at Tarahan South Lampung Regency, Alung Farm at Ringgung, Bangun Sitepu and Koo Ati Farm at Tanjung Putus. The last three farms are administratively located at Pesawaran Regency. After the visit of MCMD Lampung and floating net cage farm for conducting the implementation the FPT project, Dr. Mohammad Hassan and Mr. Hassanai were of the view that the trial will be successful. Based on the visits it was possible to add further two farmers to participate in the project. Within the next two days Dr. Mohammad Hasan and Budi Kurnia, staff of MCMD surveyed additional farm locations as proposed by Dr. Murdjani. Among two locations Dr. Mohammad Hasan recommended only one farm belong to Mr. Bobby, the other farm was not selected due to multi owner and the limited availability of seed/fingerling.

All surveyed farms (and one additional participatory farm belong to Mr. Bobby) are located at Lampung Bay (Figure 1).

Figure 1. Lampung Bay Map.

Main Center For Marine Development as National

☐ Potentially Participatory Farmers Field Trial

1. Alung Farm, 2. Rudy Teng Farm, 3. Sitepu Farm, 4. Koo Ati Farm, 5. Bobby Farm.

XI. PROJECT WORKPLAN AND SCHEDULE

It was agreed on the time-frames of project activities in Lampung as follows:

1.Livelihood survey for trash fish suppliers

- Survey (10) *by MCMD*……..(Mar-May 09)
- Analysis of results *by FAO expert*……..(mid 09)

2.Farmers' participatory trials

- Delivery of commercial feed *by feed manufacturer*……(Mar 09-Jan 10)
- Operation of trials *by farmers*……(Mar 09-Mar 10)
- Data collection *by MCMD*……(Mar 09-Mar 10)
- Report to NACA *by MCMD*……*(*Apr 10)
- Analysis of results *by NACA+FAO expert*…….(Apr-May 10)

3.Feed perception + livelihood survey for farmers participating in trials

- Survey *by MCMD*……(Apr 10)
- Analysis of results *by FAO expert*……..(May 10)

4.Environmental impact assessment

- Purchase of required water quality monitoring equipment *by FAO*……(Feb 09)
- Collection of environmental parameters from trials *by MCMD*….(Mar 09-Mar 10)
- Feed quality analysis for environmental impact assessment *by independent lab*
- ……..(Jun-Aug 09)
- Analysis *by FAO expert*……(Jan-May 10)

5.Second national workshop *by NACA+MCMD*…….(Jun 10)

- Dissemination of trial results and findings from various surveys
- Recommendation for follow up action
- Establishment of aquaclubs for dealing with feed manufacturers
- Finalization of results for presentation in final regional workshop
- Preparation of workshop report for submission to FAO

XII. TABULATION OF QUESTIONNAIRES ON LIVELIHOOD ANALYSIS

Respondent Identity

No.	Name	Trash fish supplier for	Supplier type
1.	Madi	Rudy Teng farm	Small fisherman
2.	Jemmy	Alung farm	Middle man trader

3.	Warnen	Bangun Sitepu farm	Small fisherman
4.	Jainudin	Koo Ati farm	Company or fishing industry
5.	Suhadi	Booby farm	Small fisherman

Part A. Basic information of respondent livelihoods

No.	Name	Family member information					
		name	Age (year)	Sex (M/F)	Relation type	Education level	Main occupancy
1.	Madi	Samit	42	F	wife	Elementary	housewife
		Soleh	27	M	son	Vocational High School	fisherman
		Emi	25	F	daughter	Yunior High School	housewife
		Ciam	21	F	Daughter in law	Yunior High School	-
		Fauzan	2	M	grandson	-	-
2.	Jemmy	Heni D.	34	F	wife	University (under graduate)	housewife
		Kevin K.	2.7	M	son	-	-
3.	Warnen	Hartatik	50	F	Wife	Elementary	housewife
		Yudi	28	M	Son	Elementary	labour
		Ari	26	M	Son	Elementary	labour
		Apri	24	M	Son	Elementary	labour
		Ita	20	F	daughter	Yunior high school	-
4.	Zainudin	-	-	-	-	-	-
5.	Suhadi	Paini	30	F	wife	elementery	housewife
		Rian	7	M	son	elementery	student
		Siti	5	F	daughter	-	-

Part B. Economic activity of respondent livelihoods of Fishers (trash fish/ low valued fish)

No.	Question	Respondent				
		Madi	Jemmy	Warnen	Zainudin	Suhadi
1.	Is it main activity ?	yes	no	yes	yes	yes
	1.1. Contribution ?	100 %	40 %	100 %	100 %	100 %
2.	Are you catching for trash/low value fish	yes	yes	yes	yes	yes
	2.1.1. How much for consumption fish/day	40 %	55 %	25 %	30 %	10 %
	2.1.2. income per day (Rp)	120.000	220.000	90.000	96.000	24.000
	Income per year (Rp)	28.800.000,-	31.680.000	16.200.000	23.040.000	7.200.000
	2.1.3. How much for trash fish/day	60 %	45 %	75 %	70 %	90 %
	2.1.4. Income per day (Rp)	180.000	180.000	177.500	224.000	216.000
	Income per year (Rp)	43.200.000	25.920.000	48.600.000	53.760.000	64.800.000
	2.1.5. Is that any influence from	no	Yes (full moon)	Yes (full moon)	Yes (full moon)	yes

	weather					
	2.2.1. How long in this activity	10 years	2 years	10 years	1 year	6 years
	2.2.2. Boat size	12 x 2 m	12 m	15 m	10 m	8 m
	2.2.3. Boat maintenance cost per year (Rp)	12.500.000,-	12.500.000	15.000.000	11.000.000,-	10.000.000
	2.2.4. Number of days catching per month	20	12	15	20	25
	2.2.5. Average catching result per day	100 kg	80 kg	120 kg	80 kg	80 kg
	2.2.6. Catching revenue per day (Rp)	300.000,-	400.000	360.000	320.000	240.000
3	Are you directly sold to the culturist ?	yes	yes	yes	yes	yes
	3.1.1. Always to the same culturist (regular)	yes	no	Yes	yes	yes
	3.1.2. Is price given by culturist	no	no	No	yes	no
	3.2.2. Price per kg (Rp)	3.000,-	5.000	3000	4000	3000
	3.2.3. Flat price all year long ?	no	no	no	no	no
	3.2.3.1. Highest	march	october	3500 (full moon)	4.000 (full moon)	-
	3.2.3.2. Lowest	July	march	2500 (dark moon)	2.500 (dark moorn)	-
4.	Highest price species	*Lutjanus sp.*	*Caranx sp*	Upeneus sp	Upeneus sp	Upeneus sp
	Lowest price species	Leiognathus sp	Leiognathus sp	Leiognathus sp	Leiognathus sp	Leiognathus sp
5.	Compare with other activity in your area	better	better	better	better	better
6.	Do you have agriculture land?	no	no	no	no	no
7.	Do you or your family member have culture activity?	no	no	no	no	no
8.	Do you have other economic activity?	no	have	no	no	no
	8.1.1. Kind of economic activity	-	Automotive workshop	-	-	-
	8.1.2. % contribution of total economic household in year	-	60	-	-	-

Part C. Household Asset

No.	Question	Responden				
		Madi	Jemmy	Warnen	Zainudin	Suhadi
1.	How many livestock do you have	-	-	Chicken (20 tails)	-	Chicken (5 tails)
2.	Do you have livestock	no	no	no	no	no

	farm					
3.	Do you have home	Yes, roof tile	Yes, permanen	Yes, bric	Yes, permanen	Yes, wood
4.	What kind of your productif asset	Telephone, television/radio, refrigerator, boat and fishing gear	Motor cycle, telephone, television/radio, refrigerator	Motor cycle, telephone, television/radio, refrigerator, boat and fishing gear	Motor cycle, telephone, television/radio, refrigerator, boat and fishing gear	Boat, fishing gear
5.	Is that any organizaton	no	no	no	no	No.

Part D. The level of take decision in household regarding to economic activity

No.	Question	responden				
		Madi	Jemmy	Warnen	Zainudin	Suhadi
1.	Do you save your money	no	yes	yes	yes	no
	1.1. Bank		V	V	V	
	1,2, Jewelry					
	1,3,others					
2.	Do you have debt money	no	no	yes	no	yes
	2.1. bank			V (rare)		Individual (rare)
	2,2, individual					
	2.3. family					
	2.4. others					
3.	If trash fish your main economic activity, what factors were motivate you					
	3.1. easy access	1		1	1	
	3.2. market demand			2	2	1
	3.3. easy of activity	2		3	3	2
	3.4. feasibility compare than other activity	3		4	4	
	3.5. availability household asset	5			5	3
	3.6. feasibility for taking capital debt			5		
	3.7. neighbourhood have same activity	4			6	
	3.8. gain prospect for household					
	3.9. all family member participate					
	3.10. others					
4	Why not the main activity?					
	4.1. do not have access to fishery resources and fishing gear					
	4.2. too risky		3			
	4.3. unstable demand					
	4.4. high dependency to the outside factor					
	4.5. unstable yield					
	4.6. problem for taking capital debt					
	4.7. too much competitor		1			
	4.8. too much technical know how		2			
	4.9. too much labour					
	4.10. others					
5	When you have financial problem, what will you do ?					
	5.1. borrow money	1	2	1	1	1

	5.2. sale asset					
	5.3. intensive catching (such as use smaller net size)	3			3	
	5.4. come into farer fishing ground	2		2	2	
	5.5. stop fishing		1			
	5.6. shift to non fishery activity		3			
	5.7. reducing labour from other economic activity					
	5.8. seeking help from family for running other activity					3
	5.9. taking out children from current education					
	5.10. reducing household expenditure					2
	5.11. others					
6.	Over all, how you prepare your future ?					
	6.1. Pay attention to the children education	2	1	1	1	
	6.2. Saving	1	2	2	2	
	6.3. Doing other economic activity as diversification	3	3		3	1
	6.4. Doing other subsystem activity for household consumption	4	4			2

ANNEX:

1. Welcome Remark

OPENING REMARK

On "National Stakeholders Workshop on

Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region",

Indrapuri Hotel,Lampung, Indonesia

3 February 2009

Distinguished

- **Director General of NACA**
- **Representative from NACA**
- **Representative from FAO**
- **Representative from JAPFA Feed**
- **Head Of The main Centre of Mariculture Development (MCMD)**
- **Participants of Workshop**
- **Ladies and gentlemen**

Assalamuala'ikum Warahmatullahi Wabarakatuh. Selamat pagi dan Salam Sejahtera bagi Kita Semua; Good morning and may we all be blessed

Its a great pleasure and honor to deliver my opening remarks at this workshop **"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"** collaborating with NACA, FAO and Directorate General for Aquaculture - Ministry of Marine Affairs and Fisheries - Republic of Indonesia. May I take this opportunity to express my sincere appreciation to the NACA and FAO for their strong support to aquaculture development in Indonesia, and also my gratitude and appreciation to all participants for attending this workshop.

Ladies and Gentlemen,

Fish product at this time mostly comes from capture fisheries, however, the marine resources of many countries, including Indonesia, are over exploited. The Indonesian Commission on Stock Assessment in 2002, had reported that Maximum Sustainable Yield (MSY) for capture fisheries in Indonesian territorial waters has decreased, calling into question the sustainability of current capture fisheries. Moreover, in the past few years, there has been growing competition among many types of fishing activities so that it is now more difficult for small-scale fishers to fulfill their basic needs, further increasing pressure on marine resources, especially in near-shore waters. In this situation, we have adopted a precautionary approach to capture fisheries management.

There is clearly an increasing need for an alternative source of fish supply. Therefore the general policy for Indonesian fisheries development is to control capture fisheries and develop aquaculture. We are still having a huge potential areas for aquaculture development. However, to fulfill the increasing demand for aquaculture products, many concerns need to be addressed in order to ensure the sustainability and social acceptability of the aquaculture sector. We would like to accelerate aquaculture development so that it can better contribute to poverty alleviation, provide more job opportunities and stimulate economic growth especially in the rural areas.

Ladies and gentlemen

Regarding to 4th Session Sub Committee On Aquaculture, Chile 6 - 10 October 2008, Some members of FAO described their national activities towards strengthening governance in aquaculture. These include risk management frameworks, aquatic animal health management programmes, aquaculture certification and assistance to small-scale aquaculture. Some countries stressed the need for capacity building in areas such as strengthening governance schemes, aquaculture regulation and legislation, certification and traceability, food safety, the use of aquaculture insurance and appropriate governance for offshore farming. Technical assistance must take into consideration the different characteristics of each country or region.

Distinguished Guest, Ladies and Gentlemen

Talking about marine aquaculture, most of the sea cage farmer in Indonesia uses trash fish as a main feed for growing the fish. We are still finding another ways in reducing trash fish as an main fish feed. Several problems are found that using trash fish in some place are still more profitable than artificial feeds. We hope that we could help fish farmer to improve their activities without reducing their income and more environmentally friendly.

Nevertheless, implementing Best Management Practices (BMP) is also a key factor to achieve the maximum marine culture production. The BMP should be implemented in every activities related to hatchery and grow-out production, such as brood stock handling; feed management; fish health treatment; sanitation and hygiene; and environmental management.

Ladies and Gentlemen

I personally believed that this workshop will develop our skill and knowledge on how to implement Best Management Practices for marine finfish aquaculture and in general this workshop will be able to help us to have a better mariculture development plans to ensure the food security in the world.

In this occasion, I also would like to encourage NACA and FAO to collaborate with regional or international organization and to re-enforce information networks to enhance and disseminate aquaculture technology knowledge. I also believe, NACA & FAO will continue to facilitate the sharing of technical experiences in supporting mariculture development.

I wish this workshop will be fruitful and bring us benefits. And for all the participants, please enjoy your visit in Lampung, since this province has many beautiful places and traditional clothes.

Finally, again I would like to extend my sincere gratitude to all participants, as well as to the staff of the MCMD Lampung, whose contributions have made this event possible. I sincerely hope that the cooperation, communication and good relationships between MMAF, NACA and FAO will continue and prosper in the future.

And with the name of God, I formally open this workshop, may God give us prosperity and welfare to our fish farmers in Asia Pacific region.

Thank you for your kind attention.

Wassalamu'alaikum Warahmatullahi Wabarakatuh

Lampung, 3 February 2009

Director General for Aquaculture,

Ministry of Marine Affairs and Fisheries

The Republic of Indonesia

MADE L NURDJANA

2. FAO Remark

National Stakeholders Workshop on

"Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

[TCP/RAS/3203(D)]

Indrapuri Hotel, Bandar Lampung, Indonesia 3rd February 2009

FAO Remark by Dr. Mohammad R. Hasan, Fisheries Resources Officer (Aquaculture), Aquacultre Management and Conservation Service, FAO, Rome

Distinguised Mr. Iskandar Ismanaji, Director of Production, Director General of Aquaculture, Jakarta, Indonesia; Mr. Untung Sugianto, Head of Provincial Fisheries Service, Lampung; Mr. Muhammad Murdjani, Director of Main Center for Mariculture Development (MCMD), Lampung; Mr. Hassanai Kongkeo, Network of Aquaculture Centers for Asia-Pacific (NACA); Staff members of MCMD, Fish farmer, Trashfish collector/supplier, Ladies and Gentlement.

I, on behalf of Mr. Ichiro Nomura, Assistant Director General, FAO Fisheries and Aquaculture Department and Mr. Jiansan Jia, Aquaculture Management and Conservation Service, FAO HQ, Rome, wellcome you all.

I am pleased to note that Mr. Iskandar Ismanaji, Director of Production, Director General of Aquaculture has graced this workshop.

The project has funded by Food and Agricultural Organization of the United Nations and is coordinated by NACA. We have had a Project Planning Inception Workshop in Krabi, Thailand, 8-10 September 2008 where representatives from four participating countries (China, Indonesia, Thailand and Viet Nam) participated including Mr. Muhammad Murdjani from your centre and Mrs. Antik Erlina from Main Centre for Brackhiswater Aquaculture Development, Jepara. Nevertheless, I feel that this is more important for Indonesia than the inception workshop as all stakeholders (Directorate General of Aquaculture of Indonesia, fish farmers and trash fish supplier) are participating in this workshop.

Although in inception workshop, broad framework for farmers participatory trial, water quality monitoring programme and livelihood assessment analysis of trash fish supplier were agreed, this workshop is going to prepare an implementation plan of the project activities over next one and half years of the project duration.

We have had the first National Stakeholders Workshop in Nha Trang, Viet Nam and Mr. Hassanai Kongkeo from NACA was present there. I expect Mr. Kongkeo will be able to provide you some guidelines that he has obtained from Viet Nam workshop.

Yesterday we visited the Main Centre (MCMD), facilities of the centre and cage farms of some of the progressive farmers of Lampung. Having seen the facilities, visiting the farms, meeting the farmers and staff member, I have no hesitation to let you know that the project will be successfully implemented here and we will have a very successful workshop today.

I, on behalf of FAO, can assure you that we will try to provide the maximum assistance we will be able to. I am very pleased that we all are able to present in this workshop.

With these comments, I would like to thank you all and wish a very successful workshop so that we can prepare an effective implementation plan for project activities leading to its successful execution.

3. PRESENTATION

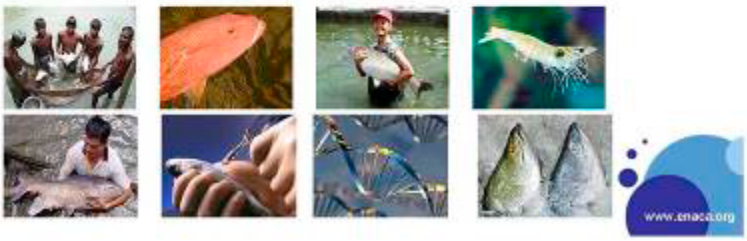
3.1. INTRODUCTORY REMARKS AND PROJECT CONCEPTS by Mr. HASSANAI KONGKEO, NACA

FAO/NACA National Stakeholders Workshop: 3rd February 2009
Indrapuri Hotel, Lampung, Indonesia

TCP Project: "Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

INTRODUCTORY REMARKS & PROJECT CONCEPT

Hassanai Kongkeo
Network of Aquaculture Centres in Asia-Pacific (NACA)
Bangkok, Thailand



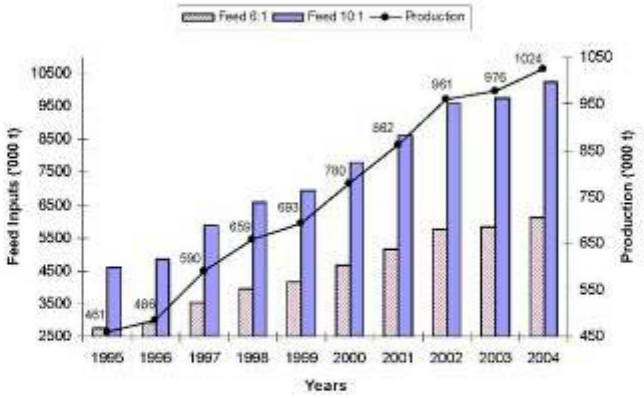
Regional TCP:
Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region

- **Recommended by:** NACA Governing Council at its 18th Meeting, Bali, May 2007
- **Approved by FAO** : June 2008
- **Participated by:**
  - Guangzhou Marine Fish Centre, China
  - Lampung Mariculture Development Centre, Indonesia
  - Phuket, Coastal Fisheries R&D Centre,Thailand
  - Research Institute of Aquaculture 3, Nha Trang, Vietnam
- **FAO budget:** US487,000
- **Two years project:** Jul 2008-Jun 2010
- **Inception/planning workshop:** Sep 08, Krabi, Thailand

PROBLEMS OF TRASH FISH

- Marine finfish aquaculture is the fastest growing sub-sector (>10%per yr) in last decade
- Trash fish used in marine finfish culture (5 million ton per year in official records) causes problems:
  - Environmental/ecological concerns
  - Fuel consumption for fishing boats
  - Resource sustainability issues
  - Competing with other users :
    - Human consumption (low value fish)
    - Other aquaculture feed
    - Poultry feed
    - Pet feed (cat)

Use of fish as feeds in finfish mariculture was estimated over *10 million ton now



Marine and brackish water carnivorous finfish production in Asia and estimated trash fish/ low value fish usages as feed based on 6:1 and *10:1 conversion efficiencies

Dry pellets

Advantages :

- **Available whole year-round** (no shortage during storm/full moon period)
- **Continuous growth and healthy due to regular feeding** (no interruption by shortage of trash fish)
- **Can be stored longer than trash fish or moist feeds**
- **Less pollution** (less decay and feed waste thus less diseases)
- **Less labor-intensive in feed preparation and feeding**
- **Less amount of trash fish** (as fish meal) **required** (more plant protein is used)
- **Less food conversion ratio** (FCR)
- **Minimize introduction of fish diseases contaminated through trash fish**
- **Can add more nutrients** (vitamins, minerals, oils, additives, etc.) **to accelerate growth and disease prevention**
- **Culture areas can be expanded to remote area** (deeper sea) **where daily trash fish supplies are difficult**

Disadvantages :

- **Less attractive to fish** (therefore it always requires weaning/better formula)
- **Transportation cost from factory is higher**

Economic benefits of using pellet

- **Though pelleted feeds are more expensive than trash fish but:**
  - Trash fish contains 75% moisture (water) while pellet contains less than 10%
  - Pellet has almost four times more nutrition ingredient than trash fish
  - Pellet (FCR = 1.5-2.0) also has 4-5 times less Food Conversion Ratio (FCR) than trash fish (FCR = 6-10)
  - This means using 4-5 times less feed quantity than trash fish
- **The only way to compare feed performance of both feeds is to calculate the total feed cost per kg of fish produced**
- **In long term, cost of pellet is expected to decrease** (similar to shrimp, salmon) **due to:**
  - Competition among manufacturers in both feed development and production
  - More demand from farmers thus reduces overhead cost and feed damage from over-due storage in feed production
  - Price of trash fish becomes higher due to lack of fishing sources and increase in oil price
- **Fish grow faster and are healthier due to its higher nutritional value.**

Use of trash fish as feeds for finfish mariculture

- **Unavailability of suitable pellet feeds**
  - High cost
  - Species specific (differences in protein requirement, feeding behavior, fish selling price)
  - Difficulties in procurement + high transportation cost from factories
- **Farmer/ fisher**
  - Daily supply of trash fish
  - Misconceptions
    - Stock performs better
- **Ways of breaking the deadlock?**
  - Participatory trials by farmers +government centres + feed manufacturers
  - accepted by all stakeholders

Generalized feed: all species??

The problem in a nut shell

- **Why do the farmers continue to use trash fish?**
  - the perception that trash fish are more effective
  - less costly (better returns)
  - still get cheap supplies from their own fishing
- **Compounded feeds**
  - not easy to access
  - costly at initial development of feed
  - cost should decrease if sale volume increases
  - though fish prefer testy trash fish but they will take compound feed if no choice
  - interruption in use of compound feed causes poor feed acceptance in fish
- **To break a nut shell**
  - farmer should have open mind for acceptance of compound feed
  - feed manufacturers should reduce feed cost to attract farmers

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The TCP Project

- Will attempt to address these issues
- Utilize farmer based and farmer managed trials
  - Side by side
  - Try to avoid other variables
    - differences between stocks
    - differences in management
  - Come up with a cost-benefit analysis

- Address issues on;
  - What alternative livelihoods are available for fishers/ suppliers of trash fish
  - Can the supplies of compounded feeds be streamlined?
    - Evolve micro-credit schemes
    - Better farmer organizations
      - Aqua-clubs
      - Also has a impact on certification

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The work ahead of us in this workshop

- **Select trial farms, trash fish suppliers, compound feed**
- **Design experimental trials**
- **Agree on terms and conditions and obligations of farmers in trials**
- **Prepare time table for trials, data collection, livelihood surveys, reporting to NACA**
- **Finalize format of book-keeping record, environmental (water quality) data, equipment required, livelihood survey form**
- **Train on use of compound feed, monitoring of growth, water quality, record keeping.**

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Thank You

3.2. INTRODUCTION OF COMMERCIAL FEED

by Mr. Widyatmoko, PT. Japfa Comfeed

STATUS BUDIDAYA IKAN LAUT

- Budidaya ikan laut di Indonesia berkembang cukup pesat dalam 5 tahun terakhir.
- Jenis-jenis ikan yang dibudidayakan antara lain :
  - Berbagai jenis kerapu
  - Kakap (*Lates calcarifer*)
  - Bawal bintang
  - Bandeng (*Chanos chanos*)
- Berbagai jenis ikan laut lain yang didapat dari hasil tangkapan untuk kemudian dibesarkan dalam KJA

- Indonesia merupakan salah satu produsen utama kerapu, terutama kerapu macan (*Epinephelus fuscoguttatus*) dan tikus (*Cromileptes altivelis*)
- Sentra produksi kerapu budidaya di kepulauan Riau, Lampung, Bali dan Lombok.
- Daerah penangkapan kerapu terutama di Sulawesi, Riau dan Maluku.

- Keberhasilan penggembangan budidaya ikan laut terutama didukung oleh keberhasilan dalam pembenihan.
- Nilai ekonomis ikan laut yang tinggi mendorong para pembudidaya untuk menggeluti usaha ini.

- Salah satu faktor utama yang mendorong perkembangan usaha budidaya adalah ketersediaan pakan.
- Pakan buatan untuk ikan laut telah diproduksi pada awal tahun 2000-an
- Tetapi pakan buatan sulit bersaing dengan ikan segar, baik dalam hal harga maupun "mutu".
- Petani kecil akan lebih mudah menggunakan ikan segar, pengusaha akan lebih aman menggunakan pakan buatan.

ARTIFICIAL FEED FOR MARINE FISH

- Nutrition :
  - Complete nutrition value
  - High energy and high protein ! Do all marine fish require the similar nutritional value ?
- Physical properties :
  - Floating, sinking, slow sinking. Which one suite all species ?
  - Hardness : Moist feed / soft feed – is it necessary ? Is it better ?
  - Different pellet size for different size of mouth opening (fish size)

- Chemical properties :
  - Flexibility to include feed additive (additional vitamin, growth promotor, immune enhancer, etc.)
  - Less attractive than fresh fish
- Hygienic :
  - The use of fresh fish will polute the water
  - Non-biosecure

MAKANAN DAN NUTRISI

- Feed is the source of energy for survival and growth of fish.
- Makanan (rucah/peler) sangat menentukan biaya produksi
- Feed efficiency affected by :
  - Biology of fish,
  - Quality of feed,
  - Feeding techniques,
  - Water quality.

- *Kelemahan* pakan buatan :
  - Perlu masa adaptasi selama beberapa hari agar ikan mau mengkonsumsi pakan buatan,
  - Lebih keras dibandingkan ikan segar, sehingga kurang palatable.

- Teknik pemberian pakan menjadi kunci keberhasilan penggunaan pakan budidaya ikan laut.
- Teknik pemberian pakan bergantung jenis ikan dan sistem budidaya (karamba laut, karamba sungai, tambak).
- Mixed feed, antara ikan segar dengan pakan buatan merupakan alternatif terbaik saat ini.
- Full pelleted feed sudah dibuktikan berhasil untuk ikan kakap skala industri.

- Dalam beberapa tahun terakhir ekspor kerapu Indonesia menurun diduga karena:
  - Hasil tangkapan menurun,
  - **Perkembangan usaha budidaya kurang cepat,**
  - Kompetisi dengan negara eksportir lain
- Percepatan perkembangan budidaya ikan laut di Indonesia mengalami beberapa hambatan.

HAMBATAN PENGEMBANGAN BUDIDAYA IKAN LAUT

- Teknis :
  - Jenis-jenis ikan laut yang dapat dibenihkan secara masal dan komersial masih terbatas.
  - Laju sintasan yang rendah akibat serangan penyakit,
  - Ketersediaan pakan yang bermutu dan distribusi pakan ke daerah-daerah budidaya
  - Pengetahuan teknis / teknologi budidaya yang belum dikuasai sepenuhnya.

- Non-Teknis :
  - Harga jual cenderung turun, sangat bergantung pada pembeli dari luar negri
  - Akses langsung ke jalur pemasaran masih sangat sedikit,
  - Permintaan pasar tidak sesuai dengan jenis yang tersedia,
  - Sediaan (supply) benih tidak sesuai dengan permintaan (demand)
  - Distribusi pakan buatan ke daerah terpencil belum berjalan dengan baik. Ikan rucah menjadi pilihan utama.

Likely Impacts of Financial Crisis

- Direct Impacts
  - Market contraction
  - Decline in prices
  - Financial stress
- Indirect impacts
  - Penekanan biaya produksi dpt mengorbankan mutu
  - Dampak terhadap food safety, health dan lingkungan
- Needs
  - Penerapan standard mutu secara konsisten.

- Standar mutu (Quality !!!) :
  - Berlaku untuk local and international market
  - Bersifat wajib (obligation)
  - Perlu untuk meyakinkan konsumen akan komitmen kita terhadap kualitas
  - Jaminan kontinuitas supply dan demand

Main drivers of increasing costs

- Rising energy prices: 2007-2008
- Rising feed cost: fishmeal, fish oil and grains: 2007-2008
- Finance and credit: 2008-2009
- Dollar exchange rate: fluctuation
- And 2008-2009: weaker demand

- Single market – many suppliers = dangerous
- Local market :
  - Penduduk Indonesia ± 240 juta jiwa
  - Umumnya senang makan ikan,
  - Multi species : pasar lokal tidak terlalu membedakan jenis kerapu (kecuali chinese seafood restaurant)
  - Harga lokal < harga ekspor, tapi pasar stabil
  - Ukuran ikan tidak terlalu besar = masa budidaya lebih singkat.

EMERGING ISSUES

- Pengembangan pasar non-tradisional (diluar EU, USA dan Japan)
- Penggantian species bukan solusi, sb species baru = penyakit baru. Penganan penyakit dg cara :
  - prevention
  - more research: govt. support
  - pathogen free broodstock
  - better farming practices
  - certification & traceability
- Pengembangan kerjasama petambak kelas kecil-menengah dlm penerapan standard produksi, sertifikasi dan access market.

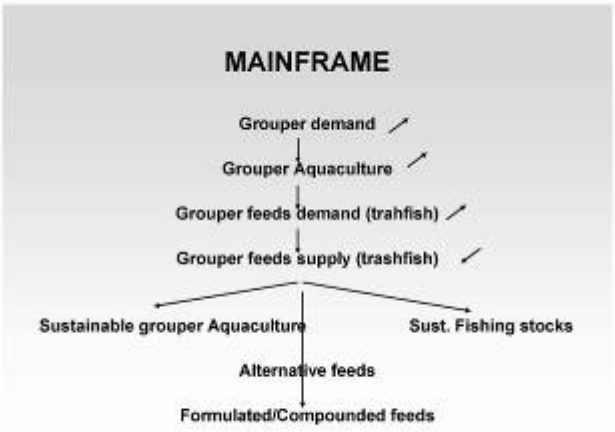
Impor seafood USA

FURTHER RESEARCH

- Penyebab dan pencegahan deformities,
- Pembenihan jenis-jenis kerapu lain secara komersial,
- Feeding techniques untuk nursery dan grow-out,
- Amino acid dan Fatty acid requirement.
- Bahan baku sumber protein alternatif.
- Pencegahan penyakit,

TERIMA KASIH

3.3. PELLET FEED MANAGEMENT by Mr. Budi Kurnia, MCMD



GROUPER FEEDS

- Grouper is carnivorous fish with trash fish feeding dominantly
- Grouper Feeds

1. Trashfish (>70%)
2. Commercial Feeds(<30%)

GROUPER PELLET FEEDS

- Pellet feeds price market (1-1.5 USD/kg) > trashfish (0.3-0.5 USD/kg).
- Perception of the farmers that the pellet feeds had less growth performance than trash fish.

So…

The grouper farmers tend to use pellet feeds less than trash fish, They used pellet feeds as :

1. fish adaptation feeds in first stocking (nursery)
2. Treatment feeds to minimize or avoid diseases attack
3. Substitution feeds in monsoon season when trash fish supply is limited

Growth Performance for Grouper Aquaculture Feeding Management

Parameters	Tiger Grouper		Humpback Grouper	
	Pellet	*Trash Fish*	*Pellet*	*Trash Fish*
ADG (%)	1.0 – 1.3	1.25 – 1.55	0.45 – 0.65	0.6 – 0.85
FCR	2 - 3	6 - 8	1.5 – 2.5	3 - 4
SR (%)	70 - 80	75 - 85	55 - 75	60-75

Source : MCMD, 2005

Standard for Pellet Feeding management in Grouper Aquaculture

Shape and size (mm)	Fish Size (gr)	Feed dosage (%/BW)	Feed frequency (times/day)
Crumble (1.6)	1-5	4-10	3-5
Pelet (3)	5-25	2-4	2-3
Pelet (5)	25-100	1.5 - 2.0	2-3
Pelet (7)	*100-200*	*1.2 – 1.5*	*1-2*
Pelet (10)	*200-300*	*1.0 – 1.2*	*1*
Pelet (12)	*>300*	*0.8 – 1.0*	*1*

PELLET FEEDS MANAGEMENT FOR TIGER GROUPER (*Epinephelus fuscoguttatus*) FLOATING NETCAGE CULTURE

PROPOSED PROJECT DESCRIPTION

Implementation on floating netcages with participant stakeholders at Lampung Bay area

↓

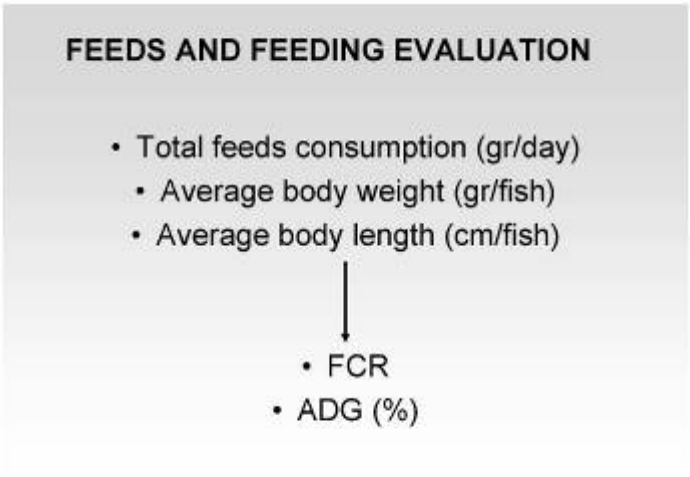
Application on feeding with 2 different feeds (commercial pellet feeds and trashfish)

PROPOSED PROJECT DESCRIPTION

	Main Concept	Alternative concept
Tot. body Length (cm/fish)	10-12	10-12
Body weight (gr/fish)	10-15	10-15
Total number of fish	32,000	16,000
Culture periods (month)	10-12	10-12
Culture Media	Floating netcage	Floating netcage
Total Cage (netcage)	8	4
Culture Net (mesh size)	PE Net 0.75-1.5"	PE Net 0.75-1.5"
Feeds	Pellet Trashfish	Pellet Trashfish

FEEDS AND FEEDING PRACTICES

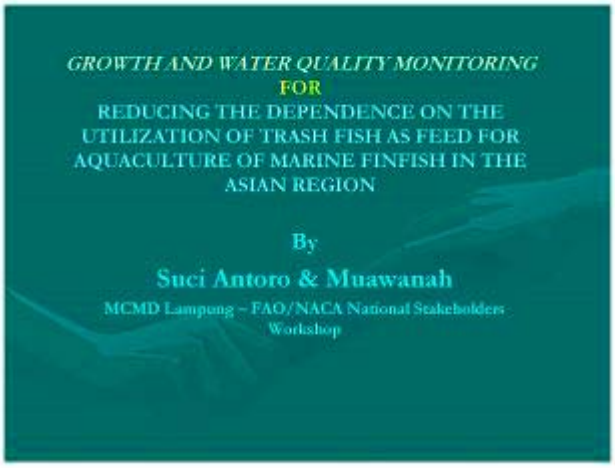
NO	PARAMETERS	TIGER GROUPER FEEDS WITH			
		COMMERCIAL FEEDS		TRASH FISH	
		NURSERY	GROWER	NURSERY	GROWER
1.	FEED TYPE	DRY PELLET	DRY PELLET	HEADLESS AND UN-GUTS TRASH FISH	UN-GUTS TRASH FISH
2.	FEED SIZE	1.6 – 5 mm	7-12 mm	OPENED MOUTH SIZE	
3.	FREQUENCY (/DAY)	3-5	1-2	3-5	1-2
4	FEEDING METHODS	*AD LIBITUM*		*AD LIBITUM*	
5	FEED CONSUMPTION RECORD	EVERYDAY		EVERYDAY	

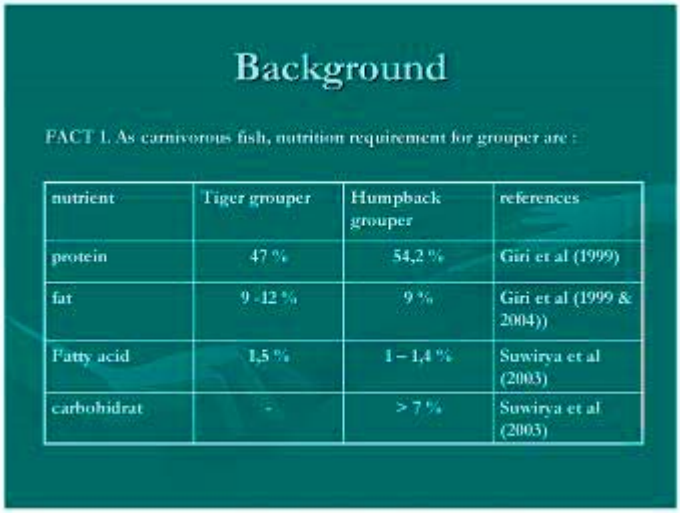

FEEDS AND FEEDING EVALUATION
• Total feeds consumption (gr/day)
• Average body weight (gr/fish)
• Average body length (cm/fish)
• FCR
• ADG (%)


THANK YOU….

3.4. MONITORING OF GROWTH AND WATER QUALITY

By Mr. Suci Antoro and Mrs.Muawanah, MCMD





- FACT 2. Nutrient composition of commercial feed & trash fish (small anchovy)

No.	Nutrient	Trash Fish (%)	Commercial feed (%)
1	Crude protein	60,78	50,13
2	fat	10,23	9,15
3	carbohydrate	19,12	17,81
4	fiber	3,72	1,06
5	Ash	12,41	15,36
6	Moisture	7,55	6,49

(MCMD, ……2)

- Fact 3
  - nutrient composition level of commercial feed less than trash fish,
  - Most of farmers feel that growing fish fed commercial feed had less growth performance than fed trash fish

Growth parameter	Tiger grouper		humpback grouper	
	pellet	Trash fish	pellet	Trash fish
ADG (% BW/d/fish)	0,7 - 1,0	0,9 - 1,4	0,4 - 0,6	0,6 - 0,8
FCR	4 - 5	6 - 8	2,5 – 3,5	4 - 6
SR (%)	70 - 85	75 - 85	55 - 75	70 -75

(source : MCMD, 2007)

- Fact 4. The effect of using trash fish for grouper feeds (FAO, 2004)
  - Placing trash fish out of economic reach of the poor who still consume the fish
  - Increasing cost of trash fish
  - Increasing pressure on available fish stocks
  - Decreasing economic value of fish, which are the juvenile being capture

- Based on the fact no 4 above →

REDUCING THE DEPENDENCE ON THE UTILIZATION OF TRASH FISH BY COMMERCIAL FEED need to be done ?

Growth & water quality monitoring method

- Growth monitoring
  - Sampling 10 % of fish/cage, every 1 month
  - Weighing fish for every 10 fish
  - Average body weigh = ? Kg/ 10

- Proposed growth monitoring data sheet

Trial no. :……. farmers name:……. measured by:……

Date of visit	:……
Time of sampling	:……
Total fish weight sampled	:……gm
Total no. of fish sampled	:……pcs
Average body weight	:……gm
Estimated fish stock	:……pcs
Total biomass	:……kg
Recommended daily feeding rate	:……% av. BW
Estimated feed required per day	:……kg
Recommended feeding frequency	:……times/day
Estimated feed required per time for farmer	:……kg

- Final data of growth rate were needed :
  - Average initial TBW
  - Average final TBW
  - Average initial TL
  - Average final TL
  - Average daily growth rate
  - Survival rate
  - Total feed requirement, both trash fish & pellet
  - FCR

- Proposed water quality monitoring data sheet

Trial no. ……, farmers name:……., measured by:……

Date of visit/sampling	:……
Date of analysis	:……
Secchi disc depth	:……cm
DO of surface water inside cage	:……ppm
DO of bottom water inside cage	:……ppm
DO of water outside cage	:……ppm
Ammonia inside cage	:……mg/l
Ammonia outside cage	:……mg/l
salinity	:……ppm
Water color	:……
Fouling condition	:……
Weather condition	:……
Other observations	: disease infection, mortality, unusual behavior, uneaten food etc.

THANKS

3.5. FARMER'S PARTICIPATORY TRIALS (FPT)

AND FORMAT FOR RECORD KEEPING

By Mr. Hassanai Kongkeo, NACA

(the ppt is similar to that in the previous report for Vietnam and as such has been deleted from this version)

5.3 Annex II c: Thailand

National Stakeholder Workshop Reports, contd

TCP/RAS/3203(D)

"Reducing the dependency on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

DRAFT REPORT
The National Stakeholder Workshop/ Training
Phuket, Thailand
12-13 February 2009

Prepared by
Phuket Coastal Fisheries Research and Development Centre (PCFRDC), Phuket
and
Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok

Background

The 18th Governing Council Meeting of the Network of aquaculture Centres in Asia-Pacific (NACA) held in Bali in May 2007 recommended the need for establishment of a regional project to reduce the use of trash fish/ low value fish in marine fish farming. The TCP project was approved by FAO in June 2008. The Inception Planning Workshop was subsequently organized in Krabi on 8-10 September 2008 to finalize project workplan, TORs of consultants, the draft outlines of livelihood questionnaires, methodology to study the farmers' perception on formulated feed and plans for organizing in-country workshops, farmers' participatory trials and survey.

The Inception Planning Workshop recommended that the national stakeholder workshop/ training in each country should aim at:

- finalization of farmers for farmers' participatory trials (FPT)
- preparation of a time-frame for livelihood analysis
- finalization of record keeping format for environmental data
- preparation of a preliminary design of FPT and a time table for FPT
- preparation of a format for data collection in consultation with participating farmers and other stakeholders

The national stakeholders workshop/training in Phuket

The workshop held at Phuket Coastal Fisheries Research and Development Centre, was opened by Dr. Jiraporn Kesornchan, Senior Fish Disease Specialist. The detailed program is shown in ANNEX 1. There were totally 48 participants attending the workshop including 31 marine fish cage farmers from Phuket, Phang-nga and Krabi provinces, 2 trash fish suppliers from Phuket, 2 staff from Thai Union Feedmill Co., Ltd, 6 DOF officers, 3 Chinese counterparts from Guangdong Province, 2 FAO officers and 2 NACA staff as in ANNEX 2. The Chinese counterparts who were invited mainly for discussion on the organization of workshop and trials in China, also took this opportunity to observe the Phuket workshop as a model for their workshop.

It was a successful workshop at which all 31 farmers showed their interests in participating in the project trial. For most, this was the first sign of their perception on artificial diets use in marine fish farming. Thai Union Feedmill which has committed to provide 8 tons of pellet feed, free of charge for the trials, is also willing to provide further support by sending their staff to give specific advice to the trial farmers. Farmers paid much attention to the training on the use of compound feeds, monitoring of growth, water quality and fish disease prevention and treatment which was conducted by DOF staff. They also expected to receive more on-farm training and advice from PCFRDC during their regular visits to trial farms.

Discussions/recommendations

1. **Design of farmer participatory trial:**

NACA's proposals on experimental trial design, terms & conditions and obligations were subsequently modified and agreed upon by all stakeholders at the workshop as follows:

Tiger grouper (*Epinephelus fuscoguttatus*)

Area	: Phuket, Phang-nga, Krabi provinces
No. of farms	: 7
No. of cages/farm	: 6 (3 for pellet + 3 for trash fish)
Total cages	: 42 (21 for pellet + 21 for trash fish)
Cage size	: 3 X 3 X 3 m^3
Stocking size	: 12.5 cm length
Stocking density	: 150-200 fish/cage (5-7/ m^3)
Total fingerlings	: 6,300-8,400
Commencement	: Mar-Jun 2009
Growth cycle	: 10 months
Completion	: Jan – Apr 2010
Max. pellet required	: 2.0 x 2.5= 5.0 tons (provided by feed company)
Other trial cost	: to be borne by farmers, except fingerling (subsidized by FAO)

Asian seabass (*Lates calcarifer*)

Area	: Phuket, Phang-nga, Krabi provinces
No. of farms	: 5
No. of cages/farm	: 6 (3 for pellet + 3 for trash fish)
Total cages	: 30 (15 for pellet + 15 for trash fish)
Cage size	: 3 X 3 X 3 m^3
Stocking size	: 12.5 cm length
Stocking density	: 150-200 fish/cage (5-7/ m^3)
Total fingerlings	: 4,500-6,000
Commencement	: Mar-Jul 2009
Growth cycle	: 8 months
Completion	: Nov 2009 – Mar 2010
Max. pellet required	: 1.7 x 2.0= 3.4 tons (provided by feed company)
Other trial costs	: to be borne by farmers, except fingerling (subsidized by FAO)

Finally, it was agreed on the responsibilities of each stakeholder in these trials as follows:

- Estimating quantity of pellet required for each size :
  - Pellet provided free of charge *by feed manufacturer* (> 60% production cost)
  - Transportation of pelleted feed *by FAO TCP (through PCFRDC)*
- Culture trial using farmer's own experience run *by farmer (supervised by PCFRDC every two weeks)*
  - Regular sampling and monitoring *by PCFRDC* (every two weeks) :
  - Sampling fish for average body weight (ABW) for estimation of feed requirement
  - Observation of fish health and unusual signs of behaviour
  - Monitoring and record of water quality parameters (DO, ammonia, Secchi disc depth, salinity, others)
- Daily record of feed management *by farmer (supervised by MCMD)*

- Farm performance record to be maintained *by farmer (supervised by MCMD)*
- Economic performance data to be provided by farmer *(supervised by MCMD)*
- Growth monitoring data *by PCFRDC*
- Water quality parameters data *by PCFRDC*
- Harvesting by farmer *(witnessed by PCFRDC)*
- Compilation of relevant records and information *by PCFRDC*

2. Selection of the trial farmers:

As all of farmers were interested to join the project trials, selection was carried out under a voluntary basis and also giving priority to female farmers. Finally, 12 farms (7 for tiger grouper and 5 for seabass) 4 of which represent each province, were finalized as follows:

List of selected farmers for trials

	Name	**Farm site**	**Fish species**	**Fingerlings required**	**Trial cages**	**Feed required (kg)**
1	Mr. Sawai Kunsanao	Kuraburi District, Phang-nga	seabass	1,200	6	680
2	Mr. Wichai Salam	Kuraburi District, Phang-nga	seabass	1,200	6	680
3	Mr. Amnuey Sa-ingthong	Kuraburi District, Phang-nga	seabass	1,200	6	680
4	Mrs. Suree Jongruk	Kuraburi District, Phang-nga	seabass	1,200	6	680
5	Mr.Theerapat Wangsuk	Muang District, Krabi	tiger grouper	1,200	6	714
6	Mr.Sorapong Wangsuk	Muang District, Krabi	tiger grouper	1,200	6	714
7	Mr. Rewat Boonsop	Muang District, Krabi	tiger grouper	1,200	6	714
8	Mr. Sen Boonsop	Muang District, Krabi	tiger grouper	1,200	6	714
9	Mr. Somporn	Thalang	tiger	1,200	6	714

	Cholaket	District, Phuket	grouper			
10	Mr. Ahmad Singkara	Thalang District, Phuket	tiger grouper	1,200	6	715
11	Mr. Samut Siemsorn	Muang District, Phuket	tiger grouper	1,200	6	715
12	Mr. Somrit Krongyut	Muang District, Phuket	seabass	1,200	6	680
Total				**14,400**	**72**	**8,400**

It was observed that many of selected farms were damaged by the tsunami in 2004. Therefore, it is a good opportunity that the TCP project will also assist them in rehabilitation and livelihood improvement.

3. Record keeping:

The proposed formats for book-keeping such as daily feed and farm management, growth monitoring, farm performance, economic performance and environment (water quality parameters) by NACA were finalized as in ANNEX 3.

4. Project workplan and schedule:

The detailed schedule of project activities in Thailand was finalized as follows:

Livelihood survey for trash fish suppliers

- Survey (15) *by PCFRDC*……..(Mar-May 09)
- Survey (5-10) in east coast *by NACA*……...(mid 09)
- Analysis of results *by FAO expert*……..(mid 09)

Farmer participatory trials

- Delivery of commercial feed *by Thai Union Feed* ……..(Mar 09-Jan 10)
- Operation of trials *by farmers*……(Mar 09-Mar 10)
- Data collection *by PCFRDC*……..(Mar 09-Mar 10)
- Report to NACA *by PCFRDC*…….*(*Apr 10)
- Analysis of results *by NACA+FAO expert*…….(Apr-May 10)

Feed perception + livelihood survey for farmers participating in trials

- Survey *by PCFRDC*……(Apr 10)
- Analysis of results *by FAO expert*……(May 10)

Environmental impact assessment

- Purchase of required water quality monitoring equipment *by FAO*……...(Feb 09)
- Collection of environmental parameters from trials *by PCFRDC*.(Mar 09-Mar 10)
- Feed quality analysis for environmental impact assessment *by independent lab*

…….(Jun-Aug 09)

- Analysis *by FAO expert*……(Jan-May 10)

Second national workshop *by NACA+PCFRDC*……(Jun 10)

- Dissemination of trial results and findings from various surveys
- Recommendation for follow up action
- Establishment of aquaclubs for dealing with feed manufacturers
- Finalization of results for presentation in final regional workshop

Preparation of workshop report for submission to FAO

5. Livelihood survey for trash fish/ low value fish suppliers:

Livelihood questionnaire was briefed by PCFRDC at the workshop and tested with 5 trash fish suppliers both during the workshop and on field visits. Some of farmers in the workshop who collect trash fish/low value fish from their own fishing, also completed the survey forms. The only problem in this form is the annual income which they were afraid to provide in view of potential/ possible implications of tax payment. Apart from this, all of them accepted the survey form. The tested questionnaires were collected and brought back to NACA for translation and compilation.

ANNEX 1: Program of National Stakeholders Workshop, Phuket

12 Feb 09		
08.30-09.00	*Registration*	
09.00-09.15	FAO Remark	Dr. Mohammad Hasan, FAO
09.15-09.30	Opening Remark	Dr. Jiraporn Kesornchan, Senior Fish Disease Specialist, DOF
09.30-10.00	Introductory remarks and project concepts	Dr. Sena De Silva and Hassanai Kongkeo, NACA
10.00-10.30	*Coffee/tea break*	
10.30-12.00	Introduction and demonstration of commercial feed	Dr. Supis Thongrod, Thai Union Feed
12.00-13.00	*Lunch*	
13.00-14.00	Pellet feed management	Mr. Samart Detsatit,Krabi CFRDC
14.00-14.30	Monitoring of growth and water quality	Mr. Samart Detsatit, Krabi CFRDC
14.30-15.00	*Coffee break*	
15.00-16.00	Prevention and treatment of fish diseases	Mrs. Chantana Kaewtapee, Phuket, CFRDC
13 Feb 09		
08.30-09.00	Review of questionnaires on livelihood analysis and methodology of RRA	Paiboon Bunliptanon, Phuket CFRDC
09.00-09.30	Farmers' participatory trials (FPT) and format for record keeping	Hassanai Kongkeo, NACA
09.30-10.00	Finalization of FPT design and record formats	Paiboon/Hassanai
10.00-10.30	*Coffee/tea break*	
10.30-11.00	Selection of farmers for trials	Paiboon Bunliptanon, Phuket CFRDC
11.00-11.30	Finalization of time tables for project activities	Hassanai Kongkeo, NACA
11.30-12.00	Workshop summary, wrap up and closure	Paiboon/Hassanai
12.00-13.00	*Lunch*	
13.00-16.00	Visit to NORAD cobia cages and large-scale grouper cages in Phuket	

	Name	Address	Tel. no./email
	Farmers		
1	Mr. Niyom Jongruk	69/1 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	089-2903745
2	Mr. Amnuey Sa-ingthong	182 Moo 4, Tambol Kura, Kuraburi District, Phang-nga	084-9233247
3	Mr. Sawai Kunsanao	166 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	-
4	Mr. Yawa Jongruk	3/16 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	089-2920309
5	Mr. Ouen Sa-ingthong	161 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	081-0840354
6	Mrs. Suree Jongruk	69/1 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	084-1418621
7	Mrs. Patamaporn Sa-ingthong	166/1 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	086-6845791
8	Mr. Wichai Salam	149 Moo 4, Tambol Kura, Kuraburi District, Phang-nga	087-2736317
9	Mrs. Rungsub Bampenpol	52 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	084-3462480
10	Mr. Anant Sa-ingthong	166/1 Moo 9, Tambol Kura, Kuraburi District, Phang-nga	081-0840354
11	Mr.Theerapat Wangsuk	226/5 Moo 7, Tambol Saithai, Muang District, Krabi	081-9788354
12	Mr.Sorapong Wangsuk	226/5 Moo 7, Tambol Saithai, Muang District, Krabi	081-7872443
13	Mr. Sen Boonsop	26 Moo 7, Tambol Aonang, Muang District, Krabi	081-6794749
14	Mr. Rewat Boonsop	26 Moo 7, Tambol Aonang, Muang District, Krabi	089-8745323
15	Mr. Somsak Pradit	28/1 Tambol Paknam, Muang District, Krabi	-
16	Mr. Pompetch Sriraksa	140/13 Tambol Krabiyai, Muang District, Krabi	-
17	Mr. Komaruddin Minwang	198/38 Moo 7, Tambol Saithai, Muang District, Krabi	089-6500227
18	Mr. Ajaree Baga	468 Moo 2, Tambol Paknam, Muang District, Krabi	089-4681975
19	Mr. Amarin Hapolkra	150 Moo 7, Tambol Aonang, Muang District, Krabi	081-8947456
20	Mr.Mad Ngankaeng	66 Moo 7, Tambol Aonang, Muang District, Krabi	086-2806204
21	Mr. Somboon Varee	26 Tambol Taladyai, Muang District, Phuket	084-7455921
22	Mr. Somrit Krongyut	31/3 Tambol Taladyai, Muang District, Phuket	086- 9459235
23	Mr. Samut Siemsorn	63/7 Moo 6, Tambol Wichit, Muang District, Phuket	086-9445303
24	Mr. Yaya Kebsub	29/3 Moo 6, Tambol Wichit,	087-7908824

		Muang District, Phuket	
25	Mr. Jumnong Yukolthorn	63/3 Moo 4, Tambol Rawai, Muang District, Phuket	089-8679242
26	Mr. Somporn Cholaket	57 Moo 2, Tambol Maikhao, Thalang District, Phuket	081-3965429
27	Mr. Amporn Thinko-en	27/2 Moo 2, Tambol Maikhao, Thalang District, Phuket	086-9535095
28	Mr. Ahmad Singkara	114/8 Moo 1, Tambol Maikhao, Thalang District, Phuket	084-5071025
29	Mr. Piboon Kochsawas	127/2 Moo 1, Tambol Maikhao, Thalang District, Phuket	087-4187529
30	Mr.Reed Kontham	133 Moo 1, Tambol Maikhao, Thalang District, Phuket	089-5876674
31	Mr. Mayed Lanhad	62/1 Moo 2, Tambol Maikhao, Thalang District, Phuket	-
	Trashfish suppliers	(including farmers no. 14, 26 and 30)	
32	Mr. Silerd Mitrwong	76/1 Moo 8, Tambol Tebkasattree, Thalang District, Phuket	-
33	Mrs. Noochom Plookmaidee	56 Moo 6, Tambol Kohkaew, Muang District, Phuket	081-8940064
	Feed Manufacturer		
34	Dr. Supis Thongrod Director of R&D	Thai Union Feedmill, Co.Ltd., 89/1 Moo 2, Tambol Kalong, Muang District, Samutsakorn	081-9422493
35	Mr. Preecha Bangnokkhwaek Formula Manager	Thai Union Feedmill, Co.Ltd., 89/1 Moo 2, Tambol Kalong, Muang District, Samutsakorn	081-9860431
	DOF		
36	Dr. Jiraporn Kesornchan Senior Fish Disease Specialist	Department of Fisheries, Kasetsart, Ladyao, Jatujak, Bangkok	085-0706582
37	Mr. Paiboon Bunliptanon Director	Phuket Coastal Fisheries R&D Centre, 100 Moo 4, Tambol Pahklok, Thalang District, Phuket	081-7978922
38	Mrs. Chantana Kaewtapee Biologist	Phuket Coastal Fisheries R&D Centre, 100 Moo 4, Tambol Pahklok, Thalang District, Phuket	081-9688247
39	Mr. Narin Songsrichan Biologist	Phuket Coastal Fisheries R&D Centre, 100 Moo 4, Tambol Pahklok, Thalang District, Phuket	084-0513636
40	Miss Tasanee Nopnob Biologist	Phuket Coastal Fisheries R&D Centre, 100 Moo 4, Tambol Pahklok, Thalang District, Phuket	-
41	Mr. Samat Dejsatit	Krabi Coastal Fisheries R&D Centre, 141 Moo 6, Tambol Saithai, Muang District, Krabi	086-6891711

	China		
42	Dr. Wayne Chen Director	Guangdong Provincial Aquaculture Disease Control Centre, 10 Nancun Rd., Guangzhou	cwen@gdftec.com
43	Mr. Zhang Zhi Engineer	Guangdong Provincial Aquaculture Disease Control Centre, 10 Nancun Rd., Guangzhou	
44	Mr. Huang Tianwen Senior Engineer	Zhanjiang Fisheries Technology Extension Centre, Guangdong Province	
	FAO		
45	Dr.Mohammad Hasan Fishery Resources Officer	FAO Fisheries Department, Viale delle Terme di Caracalla, Rome	mohammad.hasan@fao.org
46	Mr. Miao Weimin Aquaculture Officer	FAO Regional Office for Asia and the Pacific, Maliwan Masion, 39 Phra Atit Rd., Bangkok	weimin.miao@fao.org
	NACA		
47	Dr. Sena De Silva Director General	NACA, PO Box 1040, Kasetsart, Bangkok 10903	sena.desilva@enaca.org
48	Mr. Hassanai Kongkeo Technical assistant to DG	NACA, PO Box 1040, Kasetsart, Bangkok 10903	hassanai.kongkeo@enaca.org

Proposed Daily Record of Feed Management using pellet *for farmer*

(need to agree on)

Cage size :....X….X…..m, No. of fish fry stocked :…pcs, Size of fry stocked :……..cm
Stocking date :……, Time :…...., Fry source :……, Fry condition :……
Arrival date of pellet size 1:……, Arrival date of pellet size 2 :……
Trial no.….Arrival date of pellet size 3 :……..., Arrival date of pellet size 4 :……

			Feed weight (kg)				% feed remaining in trays**		
Date	Size of pellet	1st feeding	2nd feeding	3rd feeding	Total feed/day	1st feeding	2nd feeding	3rd feeding	Remarks*

*= including fish disease symptom, no. of dead fish, drug administration, water color, weather conditions, special feed supplement, net cleaning/changing
** = if feeding trays are used

Proposed Daily Record of Feed Management using trash fish *for farmer*

(need to agree on)

Cage size :....X….X…..m, No. of fish fry stocked :……pcs, Size of fish stocked :……cm,
Stocking date :……, Time :…...., Fry source :……, Fry condition :……
Trash fish supplier :……Origin of trash fish :……...
Trial no :…Species of trash fish :……Ratio :……

Date	Major species of trash fish	Trash fish purchased (kg)	Trash fish cost (Baht)	1st feeding (kg)	2nd feeding (kg)	Total feed/day (kg)	Remark*

*= including fish disease symptom, no. of dead fish, drug administration, water color, weather conditions, special feed supplement, net cleaning/changing

Proposed growth monitoring data *for PCFRDC*

(need to agree on)

Trial no……Farmer's name……Measured by……..

Date of site visit	**:……**
Time of sampling	**:……**
Total fish weight sampled	**:…….gm**
Total no. of fish sampled	**:…….pcs**
Average body weight (ABW)	**:…….gm**
Estimated fish stock	**:…….pcs**
Total biomass	**:…….kg**
Recommended daily feeding rate	**:……%ABW** (from feeding regimen table)
Estimated feed required per day	**:…….kg**
Recommended feeding frequency	**:……times/day** (from feeding regimen)
Estimated feed required per time	**:……..kg (given to farmer)**

Proposed Farm Performance Record *for farmer*

(need to agree on)

Trial no.	**:……**
Farmer's name	**:……**
Fish species stocked	**:……**
Cage size……	**:…..X…..X……m**
Stocking rate	**:…….pcs/m² *(by PCFRDC)***
Culture period	**:…….days**
No. of fish stocked	**:…….pcs**
No. of fish harvested	**:…….pcs**
Survival rate	**:……..% *(by PCFRDC)***
Type of feed used	**:……**
Weight of fish harvested	**:……..Kg**
Total feed used	**:……..Kg**
FCR	**:…… *(by PCFRDC)***
Feed cost per kg fish production	**:……Baht *(by PCFRDC)***

Proposed Economic Performance Data *for farmer*

(need to agree on)

Trial no……Farmer's name……

Total cost of fry	:……...Baht
Total feed cost	:……Baht (excluding pellet)
Total labor cost	:……Baht
Total fuel cost	:……Baht
Total chemicals & drugs cost	:……Baht
Total maintenance & supplies cost	:……Baht
Contingency	:……Baht
Total production cost	:……Baht *(by PCFRDC)*
Income from selling fish	:……Baht
Primary profit	:……...Baht *(by PCFRDC)*
Cage construction cost + net	:……Baht
Life span of cage	:……years
Life span of net	:……years
Depreciation	:……..Baht *(by PCFRDC)*
Bank interests (if borrow)	:……..Baht
Net profit	:……..Baht *(by PCFRDC)*
Net profit per kg fish	:……..Baht *(by PCFRDC)*

Proposed water quality parameters data *for PCFRDC* (measure 2 hrs after feeding)

(need to agree on)

Trial no……Farmer's name……Measured by……

Date of site visit	:……..
Secchi disc depth	:……cm
DO of surface water inside cage	:……ppm
DO of bottom water inside cage	:……ppm
DO of water outside cage	:……ppm
Ammonia inside cage	:……mg/l
Ammonia outside cage	:……mg/l
Salinity	:……ppt
Water color	:……
Condition of fouling	:……
Other observations	:(eg. disease infection, mortality, unusual behavior, uneaten food, bubbles from bottom)

5.4 Annex II d: PR China

National Stakeholder Workshop Reports, contd.

TCP/RAS/3203 (D)

"Reducing the dependency on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region"

DRAFT REPORT
The National Stakeholder Workshop/ Training
Zhanjiang, China
24-26 March, 2009

Prepared by
Guangdong Provincial Aquatic Animal Epidemic Disease Prevention and Control Center (GADCC),
Guangzhou, China

Background

In 2008, the Food and Agriculture Organization of United Nations (FAO) and the Network of Aquaculture Centres in Asia-Pacific (NACA) launched a regional TCP project entitled "Reducing the dependency on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region," which invited the participation of four countries including China, Thailand, Vietnam, and Indonesia. The project aims to promote the utilization of pellet feed for marine finfish aquaculture in medium- and small-sized cage farms so as to reduce environmental pollution in the ocean, to protect marine (near shore) ecology, to promote harmony between the cage area and the outside environment, and to facilitate sustainable development of marine aquaculture.

The National stakeholders workshop/training in Zhanjiang

On March 24-26, 2009, the China stakeholder workshop/training was held at Zhanjiang Jinhai Hotel. The detailed program is shown in ANNEX 1. There were 57 participants attending the workshop, including Miao Weimin, Aquaculture Officer of FAO, Hassanai Kongkeo, NACA technical consultant, Yang Wei, Researcher of Zhanjiang Marine and Fishery Bureau, project staff, officials from local aquatic animal epidemic disease prevention and control centers in Zhanjiang, and representatives of marine finfish cage farmers as well as Hengxing Feedmill. The workshop introduced project background and farmers' participatory trials; problems with finfish mariculture, cage farm management, disease control, and feed ~~switch~~ weaning technology; fish feed research, development, and existing problems.

At the same time, Miao Weimin, Hassanai Kongkeo, and the project staff finalized the trial farms and feed supplier and paid field trips to relevant sites. Trash fish/low value fish suppliers were also interviewed. Workshop participants discussed potential problems with the project, developed a contingency plan, and decided on details of the work plan and its implementation.

Discussions/recommendations

1. Design of farmer participatory trial:

NACA's proposals on experimental trial design, terms & conditions and obligations were subsequently modified and agreed upon by all stakeholders at the workshop to include 5 farms with 20 cages for aquaculture of green grouper and red snapper. There are 3 farms located in Techeng Island, Haitou Town, Xiashan District of Zhanjiang City, and 2 farms in Liusha Port, Tandou Town, Leizhou, Zhanjiang City. Two farms will conduct green grouper aquaculture and 3 will do red snapper aquaculture. Details are as follows:

Green grouper/orange spotted grouper *(Epinephelus coioides)*

Area	: Techng Island, Haitou Town, Xiashan District, Zhanjiang City; Liusha Port, Tandou Town, Leizhou, Zhanjiang City
No. of farms	: 2
No. of cages/farm	: 4 (2 for pellet + 2 for trash fish)
Total cages	: 8 (4 for pellet + 4 for trash fish)
Cage size	: 3 X 3 X 3 m^3

Stocking size : 8-10 cm length
Stocking density : 1,080 fish/cage (40/ m^3)
Total fingerlings : 8,640
Commencement : April, 2009
Growth cycle : 8 months
Completion : November, 2009
Max. pellet required: 1.6 x 2.5= 4.0 tons
Other trial cost : to be borne by farmers, except fingerling (subsidized by FAO)

Red snapper (*Lutjanus enythropterus*)

Area : Techng Island, Haitou Town, Xiashan District, Zhanjiang City; Liusha Port, Tandou Town, Leizhou, Zhanjiang City
No. of farms : 3
No. of cages/farm : 4 (2 for pellet + 2 for trash fish)
Total cages :12 (6 for pellet + 6 for trash fish)
Cage size : 3 X 3 X 3 m^3
Stocking size : 5-6 cm length
Stocking density : 1,080 fish/cage (40/ m^3)
Total fingerlings : 12,960
Commencement : April, 2009
Growth cycle : 8 months
Completion : November, 2009
Max. pellet required : 2.4 x 2.0= 6 tons
Other trial cost : to be borne by farmers, except fingerling (subsidized by FAO)

Finally, it was agreed on the responsibilities of each stakeholder in these trials as follows:

- Estimating quantity of pellet required for each size :
  - Pellet provided *by Hengxing Feed Mill* (30% discount)
  - Transportation of pelleted feed *by FAO TCP (through GADCC)*
- Culture trial using farmer's own experience run *by farmer (supervised by GADCC every two weeks)*
  - Regular sampling and monitoring *by GADCC* (every two weeks) :
  - Sampling fish for average body weight (ABW) for estimation of feed requirement
  - Observation of fish health and unusual signs
  - Monitoring and record of water quality parameters (DO, ammonia, Secchi disc depth, salinity, others)
- Daily record of feed management *by farmer (supervised by GADCC)*
- Farm performance record *by farmer (supervised by GADCC)*
- Economic performance data by farmer *(supervised by GADCC)*
- Growth monitoring data *by GADCC*
- Water quality parameters data *by GADCC*
- Harvesting by farmer *(witnessed by GADCC)*
- Compilation of relevant records and information *by GADCC*

2. Selection of the trial farmers:

As all of farmers were interested to join the project trials, selection was carried out under a voluntary basis. Finally, 5 farms (2 for green grouper and 3 for red snapper) were finalized as follows:

List of selected farmers for trials

	Name	Farm site	Fish species	Fingerlings required	Trial cages	Feed required (kg)
1	Mr. Liang Zhong	Liusha Port, Leizhou City	green grouper	4,320	4	2,000
2	Mr. Liang Lin	Liusha Port, Leizhou City	Red snapper	4,320	4	2,000
3	Mr. Chen Wuhan	Techeng Island, Zhanjiang City	Red snapper	4,320	4	2,000
4	Mr. Chen Meiguang	Techeng Island, Zhanjiang City	Red snapper	4,320	4	2,000
5	Mr. Lai Rigui	Techeng Island, Zhanjiang City	Green grouper	4,320	4	2,000
Total				**21,600**	**20**	**10,000**

3. Book-keeping records and other data :

The stakeholders finalized the formats of book-keeping records including daily feed & farm management, farm performance, economic performance, growth monitoring and water quality parameters which were proposed by NACA.

4. Project workplan and schedule:

The detailed schedule of project activities in Zhanjiang was finalized as follows:

Livelihood survey for trash fish suppliers

- Survey (20) *by GADCC*……(April -May 09)
- Analysis of results *by FAO expert*……(mid 09)

Farmer participatory trials

1) Preparation of trial cages……..(Apr. 1-5, 2009)

- Farmers will do cage maintenance and cage sterilization

2) Fingerlings stocking……..(Apr. 10, 2009)

- Fingerlings will be stocked in all trial cages.
- Trials begin.

3) Fingerlings weaning…….(Apr. 11-14, 2009)

- On Apr. 11, the cage that uses pellet will suspend feeding for one day.
- On Apr. 12-14, fingerlings will be weaned by a transition from feeding with a small amount of pellet to normal feeding.

4) Fish Growth Monitoring……..……(Apr. – Nov. 09)

- Fish will be sampled on the 10th of each month by Liu Hongliang from Zhanjiang Aquatic Animal Epidemic Disease Prevention and Control Center and He Qing from the Sun Yat-sen University.

5) Water quality monitoring……..(Apr. 09 – Jan. 10)

- Water sample inside and outside of the cage will be monitored every 15 days (on the 10th and 20th of each month) by Liu Hongliang from Zhanjiang Aquatic Animal Epidemic Disease Prevention and Control Center and He Qing from the Sun Yat-sen University.

6) Record keeping

- Record keeping such as daily feed management of both pellet and trash fish, disease outbreak information, and mortality information will be conducted by trial farmers.

7) Project Evaluation

- Project evaluation will be conducted on Nov. 10-15, 2009.
- Evaluation team will consist of members from the FAO, NACA, China National Fishery Technical Extension Center, GADCC, Zhanjiang and Leizhou Fishery Bureaus, university professors, as well as project staff.

8) Contingency Plan

- A contingency plan will be developed in response to potential epidemic disease outbreaks and hurricane attacks.

5. Livelihood Survey

Livelihood survey was translated by Huang Yu, a Ph.D. student of environmental anthropology in the University of Washington, Seattle, U.S.A. and was approved by the FAO representative during the workshop. GADCC at first tried to invite fishermen who catch trash fish/low value fish to attend the workshop, but the fishermen could not come because they did not have time. On the field trip to visit a trial fish farm in Liusha Town, Leizhou, GADCC met with some fish farmers who were also fish suppliers. Huang Yu conducted one survey test with a supplier. However, it seemed that the survey questions mostly targeted small fishermen, but not so much on either middle person or fish farmers. Therefore, only a small percentage of questions were relevant and thus answered. After the workshop, Huang Yu conducted another survey test with a small fisherman and it worked well. The only problems lie in:

1. It is difficult for the fisherman to calculate daily and yearly earnings from fishing because of the seasonal variations;
2. The ranking tables in Part D contain a lot of items and seem a little bit inconvenient for the fishermen to fill out.

3. Huang Yu wrote to both Miao and Kongkeo on whether it was ok to ask trash fish supplier to give their opinions on the change from use of trash fish to pellet feed and the answer was yes.

The survey will be conducted in April to May, 2009 on 20 trash fish/low value fish suppliers.

6. Second national workshop

by NACA+GADCC……..(Dec. 2009)

- Dissemination of trial results and findings from various surveys
- Recommendation for follow up action
- Finalization of results for presentation in final regional workshop
- Preparation of workshop report for submission to FAO

Annex 1. Program of National Stakeholders Workshop, Zhanjiang

Workshop Agenda
China Stakeholder Workshop for FAO TCP/RAS/3203 (D)
Mar 24-26, 2009

Jianhai Hotel
Zhanjiang, Guangdong Province, China

Date	Day	Time	Activities
23 Mar	Mon	PM	Arrival of NACA, FAO and project staff
24 Mar	Tue	8:30-10:00	Opening remarks by FAO and official of local fisheries authority Introduction to the project concepts, major project activities and expected output (by NACA)
		10:00-10.30	Tea break
		10.30-12.00	Introduction to the participatory farm trial (PPT) on substitute trash fish with pellet in marine fish culture (by NACA)
		12:00-13:30	Lunch break
		13.30-15.00	Introduction of "Hengxing" commercial feed Training on culture marine fish with pellet feed
		15.00-15.30	Tea break
		15.30-17.00	Daily management of marine fish farm Introduction and discussion on daily record keeping
25 Mar	Wed	09.00-10.00	Field trip to Hengxing Feedmill.
		10.00-10.30	Tea break
		10.30-12.00	Field trip to cage farm in Techeng Island cancelled due to the adverse weather
		12.00-13.30	Lunch break
		14.00-15.00	Discussion of project workplan details
26 Mar	Thu	9.00-12.00AM	Field trip to cage farm trial site in Leizhou city and test trash fish supplier livelihood survey
		14.00-16.00	Finalization of China workplan of the project between GADCC, NACA and FAO
27 Mar	Fri	Morning	checking out

ANNEX 2: List of Participants

No.	Name	Area/Affiliation	Title	Tel no.
1	Lai Rigui	Haitou Town, Xiashan District, Zhanjiang City	Trial farmer	13702870312
2	Chen Meiguang	Haitou Town, Xiashan District, Zhanjiang City	Trial farmer	15975967883
3	Chen Wuhan	Haitou Town, Xiashan District, Zhanjiang City	Trial farmer	13828277796
4	Chen Qing	Haitou Town, Xiashan District, Zhanjiang City	Fish farmer	
5	Lai Changming	Haitou Town, Xiashan District, Zhanjiang City	Fish farmer	
6	Wu Borong	Caotan Town, Shuixi County, Zhanjiang City	Fish farmer	13336519288
7	Yin Wei	Liusha Town, Leizhou, Zhanjiang City	Fish farmer	
8	Liang Zhong	Liusha Town, Leizhou, Zhanjiang City	Trial farmer	13822562026
9	Liang Lin	Liusha Town, Leizhou, Zhanjiang City	Trial farmer	15975966892
10	Yin Rong	Liusha Town, Leizhou, Zhanjiang City	Fish Farmer	
11	Liang Xiaowu	Liusha Town, Leizhou, Zhanjiang City	Fish Farmer	
12	Zhou Ji	Liusha Town, Leizhou, Zhanjiang City	Fish Farmer	
13	Li Tianfa	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
14	Ling Feng	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
15	Li Feng	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
16	Li Baoxing	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
17	Li Tianfu	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
18	Li Luolin	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
19	Li Yaquan	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
20	Li Guanyong	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
21	Li Yaqiang	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
22	Li Kanglin	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
23	Li Yazhong	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
24	Li Yamin	Sanbo Disctrict, Potou District, Zhanjiang City	Fish Farmer	
25	Wen Zuolan	Lianjiang Fishery Bureau	Official	13318026199
26	Miao Weimin	FAO	Aquaculture Officer	
27	Hassanai Kongkeo	NACA	Technical Consultant	
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