TCP/RAS/3203 (D)

FAO/NACA
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




This dossier contains the following items

1. Project summary and workshop objectives
2. Tentative Agenda
3. Tentative list of participants
4. Abstracts of country presentations
5. Power point presentation from NACA
6. Environmental assessment check list
7. Questionnaire on livelihoods
8. Project document
9. Copy of paper on “Fish meal” usage in pet foods (for information)

Inception Planning Workshop

PROJECT SUMMARY & WORKSHOP OBJECTIVES

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

PARICIPATING COUNTRIES:
China, Indonesia, Thailand, Vietnam

COORDINATING AGENCY:
Network of Aquaculture Centres in Asia-Pacific (NACA)

VENUE: **Krabi, Thailand**
DATES: **8th, 9th & 10th September 2008**

Background:

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. It has been estimated that the marine aquaculture sector in China in 2000 consumed about 4 million tonnes of 'trash fish/low-value fish'[1] and demand for trash fish/low-value fish is likely to increase unless viable alternatives to trash fish/low-value fish are made available and used, and also the efficacy of use of these feed sources is improved. For example, Edwards *et al.* (2004)[2] estimated that the total use of `trash fish/low-value fish' by the aquaculture industry in Viet Nam was between 176,420 and 323,440

[1] *D'Abramo, L.R., Mai, K. , Deng, D.-F. 2002. Aquaculture feeds and production in the People's Republic of China – progress and concerns. World Aquaculture 33 (1): 25–27.*

[2] *Edwards P., Tuan, L.A., Allan, G.L. 2004. A survey of marine trash fish and fish meal as aquaculture feed ingredients in Viet Nam. ACIAR Working Paper 57, 56 pp*

tonnes in 2001 and it is further projected that by the year 2013, the requirement for Viet Nam would be about one million tonnes (De Silva and Hasan, 2007[3]).

The problem:

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), ranging from 7 to 15: 1 in average grouper farming practices, 4:1 to 6:1 in crab fattening practices and so forth[4]. In the Asian region one of the fastest growing mariculture commodities is grouper, about six species in all, and currently (2005) accounting for about 65,362 tonnes and growing. Grouper farming however, almost exclusively is still dependent on trash fish as the major food source. 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 small scale marine finfish farmers are of the perception that trash fish/low-value fish are more effective and results in better performance of the stock, relatively easily procured (a significant quantum of farmers sourcing their daily needs) and cost effective. On the other hand, usage of trash fish/low-value fish results in the discharge of higher nitrogen and phosphorous levels into the environment, and overall the very limited information available indicate that it is not as cost effective as commonly perceived by farmers. All of these factors will lead to problems of sustainability of the practices and will adversely impact on the livelihoods in the long term.

This matter has been identified as a regional priority by the Asia-Pacific Fishery Commission (APFIC) which endorsed a regional plan of action sat its 29th Session[5] for reduction of dependence upon trash fish as aquaculture feeds. One of the priority actions was the widespread conversion of aquaculture systems dependent upon fresh fish to the use of compounded aquaculture feeds. The FAO Committee on Fisheries (COFI) in its 27th Session held in Rome, 5-9 March 2007 also recognized the importance of this issue and recommended further work by FAO on the use of low-value trash fish in aquafeeds.

Objectives:

Taking into account the importance of the issue the Governing Council of the Network of Aquaculture Centers in Asia-Pacific (NACA) at its 18th Meeting held in Bali, Indonesia 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 back bone of the sector. This issue was also taken up at the recently held FAO Expert Workshop on "Use of wild fish and/or

[3] *De Silva, S.S., Hasan, M.R.2007. Feeds and fertilizers: the key to long term sustainability of Asian aquaculture. pp. XX-XY In M.R. Hasan (ed.) Study and analysis of feeds and fertilizers for sustainable aquaculture development. FAO Fisheries Technical Paper No. 497, Rome, FAO.*

[4] *De Silva, S.S., Sim, S.Y., Turchini, G.M, 2007. Review on Usage of Fish, Directly and Indirectly, as Feed Sources and Feeds in Asian- Pacific Aquaculture. FAO Technical Paper - (in preparation)*

[5] *FAO (2006) Asia-Pacific fisheries Commission, report of the 29th Session, RAP Publication 2006/19, FAORAP, Bangkok, Thailand. 39 pp.*

other aquatic species to feed cultured fish and its implications to food security and poverty alleviation", held in Kochi, India in November 2007, and the workshop strongly recommended that work on encouraging farmers to use compounded feeds in mariculture is urgently needed.

The present 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.

Expected project outcomes:

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 project outputs include establishing a scientifically vigorous database on the advantages of using pellet feeds, development of better management practices for improving efficiency of marine finfish feeding and building capacity amongst practitioners on improved feed management, and dissemination through farmer organizations such as "aquaclubs" on the procedures involved and using such organizations to develop a credit scheme for procuring feeds.

The project will contribute to national programs of marine finfish culture in the immediate participating countries, viz., China, Indonesia, Thailand and Viet Nam, and through NACA's networking mechanisms will have a widespread impact on marine finfish farming nations throughout the Asian region.

Project Inception Workshop

This Project Inception Workshop is convened by NACA in consultation with FAO FIMA[6], FAO RAPI and expects to bring together NACA expertise and project teams from each of the participating countries and the FAO Lead Technical Officer, and private sector contributors/ participants.

The objectives of this workshop are in conformity with Activity 1, and will entail finalization of the follow-up project activities and the *modus operandi* thereof and where needed documentation of the required questionnaires etc. for conducting initial RRA.

Specifically, the workshop will include the following major activities:

- ***Finalization of project work plan and TORs of the consultants***
- ***Finalization of planning of a livelihoods analysis based on a RRA[7] (including detailed time-scale and by whom) in each country including preliminary site selection. Livelihoods analyses are planned to assess the livelihoods involved in the supplying of trash fish/low-value fish, to study***

[6] *Aquaculture Management & Conservation Service (FIMA), Fisheries and Aquaculture Department, Food and Agriculture Organization of the UN*
[7] *RRA- Rapid Rural Assessment*

the marketing channels involved thereof, to assess the details on farmer perceptions in the use of trash fish/low-value fish and the constraints thereof in adopting new feed as a food source for the cultured stocks and to identify suitable clusters to form aquaclubs

- ***Finalization of planning of the environmental impact assessment baseline.***

- ***Preparation of an uniform RRA format including preliminary questionnaire preparation and training materials to support conduct of RRA (for the livelihoods analysis***

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PROVISIONAL AGENDA

DAY 1		
SESSION 1: OPENING, INTRODUCTION AND COUNTRY STATUS		
08.30-09.00	REGISTRATION	
08.00-08.30	GETTING TO KNOW EACH OTHER ELECTION OF CHAIRPERSON ADOPTION OF PROVISIONAL AGENDA	
08.30-08.45	INTRODUCTORY REMARKS	MOHAMMAD R HASAN (FAO)
08.45-09.00	REMARKS FAO, RAPA	WEIMIN MIAO (FAORAP)
09.30-10.00	THE PROJECT CONCEPTS, RATIONALE, ENVISAGED OUTPUTS AND BROAD OUTLINE OF ACTIVITIES	SENA S DE SILVA (NACA)/ MOHAMMAD R HASAN (FAO)
10-00-10.30	*COFFEE/ TEA BREAK*	
10.30-10.45	FINFISH MARICULTURE, CHINA	TBD
10.45-11.00	FINFISH MARICULTURE, INDONESIA	M. MURDJANI
11.00-11.15	FINFISH MARICULTURE, THAILAND	PAIBOON BUNLIPTANON

11.15-11.30	FINFISH MARICULTURE, VIET NAM	THAI NGOC CHIEN
11.30-12.00	DISCUSSION	
12.00-13.30	*LUNCH*	
SESSION 2: 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
14.30-15.1500	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	DISCUSSION ON ENVIRONMENTAL IMPACT ASSESSMENT QUESTIONNAIRE	
WORKSHOP DINNER		
DAY 2		
SESSION 2 (CONTD.): PROJECT WORK PLAN AND LIVELIHOOD AND ENVIRONMENTAL ANALYSIS		
08.30-09.30	REVIEW OF QUESTIONNAIRE ON LIVELIHOOD ANALYSIS AND METHODOLOGY OF RRA	CÉCILE BRUGÈRE (FAO)
09.30-10.30	DISCUSSION	
10.30-11.00	*COFFEE/ TEA BREAK*	
SESSION 3: WORKING GROUP DISCUSSIONS		
11.00-12.30	WORKING GROUP BREAK UP FOR DISCUSSIONS ON PROJECT WORK PLAN INCLUDING IMPLEMENTATION PLAN FOR LIVELIHOOD ANALYSIS AND ENVIRONMENTAL IMPACT ANALYSIS	
12.30-14.00	*LUNCH BREAK*	

14.00-15.00	WORKING GROUP DISCUSSION CONTINUE	
15.00-15.30	*COFFEE/ TEA BREAK*	
15. 30-17.30	PRESENTATION AND DISCUSSION OF FINDINGS OF WORKING GROUP DISCUSSION IN THE PLENARY	
DAY 3		
SESSION 4: PLENARY DISCUSSIONS		
08.30-09.30	DISCUSSION CONTINUES TO IDENTIFY GAPS	
09.30-10.30	PRESENTATION TO PLENARY-REVISED WORK PLAN	SENA S DE SILVA
10.30-11.00	*COFFEE/ TEA BREAK*	
11.00-12.30	DISCUSSION ON REVISED WORK PLAN AND INCORPORATION OF RECOMMENDATIONS OF THE PLENARY	
12.30-14.00	*LUNCH*	
14.00-15.00	PRESENTATION OF FINAL WORKSHOP RECOMMENDATION	
15.00-16.00	WORKSHOP SUMMARY/WRAP UP AND CLOSURE	MOHAMMAD R HASAN
	DEPARTURES	

POTENTIAL PARTICIPANT LIST

INAUGURAL PLANNING WORKSHOP

Krabi, Thailand, September

TCP ON,

"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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*Self funded

FAO/NACA

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SUMMARIES OF COUNTRY PRESENTATIONS

FINFISH MARICULTURE IN INDONESIA

Muhammad Murdjani and **Antik Erlina**
Balai Besar Pengembangan Budidaya Laut (BBPBL) Lampung (Centre for Mariculture Development Lampung), PO Box 74, Teluk Betung, Bandar Lampung 35401, Lampung, Indonesia

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Development of aquaculture in Indonesia has three main objectives. To: (a) enhance exports; (b) enhance domestic consumption; and (c) aquatic resources conservation. There are a number of aquatic species cultured in a wide range of farming systems such as *Cromileptes altivelis* (humpback grouper), *Epinephelus fuscoguttatus* (tiger grouper), *Lates calcarifer* (sea bass) and *Chanos chanos* (milk fish).

Production of the above species makes a significant contribution to export earnings, domestic food supply and aquatic resources conservation in Indonesia. Over the last ten years aquaculture production has almost doubled increasing from 0.74 million tonnes in 1995, and reached 1.22 million tonnes valued at US$1.72 billion in 2003 and 1.47 million tonnes valued at US$ 2.16 billion in 2004. In 2003 around 60 percent of total aquaculture production was from finfish culture, followed by seaweed (18.9 percent), crustaceans (16.2 percent), mollusks (0.3 percent) and others (4.7 percent) (FAO, 2006). Mariculture, brackish-water pond, freshwater pond, cage culture, floating net cages and paddy field culture accounted for 20.0, 41.0, 22.9, 3.3, 4.7 and 7.7 percent, respectively of the total aquaculture production. Marine aquaculture itself is dominated by grouper and seaweeds, which accounted for 0.7 percent and 18.9 percent.

Groupers species and other high-value marine carnivorous species contributed to much of the increasing in aquaculture production. The development trend for grouper farming in Indonesia has been driven by the availability of hatchery produced grouper fingerlings, mainly *Cromileptes altivelis* (humpback grouper) and *Epinephelus fuscoguttatus* (tiger grouper). Recently, *Plectropomus*

leopardus (coral trout), *E. lanceolatus (*giant grouper), *Tachinotus blochii* (pompano fish) are being produced in hatcheries and grow-out trials for these two species are also being conducted by Indonesian fish farmers.

Indonesia as one of the lead countries in marine finfish culture plan major expansion. However, in line with the fast growing extensification as well as intensification the sub-sector has been facing some problems such as disease outbreaks, conflicts with other sectors and high dependence on trash fish as the major food source. The availability of trash fish is decreasing and this is a major constraint facing small scale aquaculture sector, as well as intensive cage and pond culture of grouper. The other problems using trash fish are in accordance with a resource and environmental perspective as well as poor culture efficiency.

Concerning improvements to culture efficiency, and better culture environment, marine finfish aquaculture practices in the region will essentially depend on the shift from direct use of trash fish to formulated feeds. It is expected that the shift from trash fish to formulated feeds will reduce the overall dependence on trash fish as a direct food source, improve the environmental quality and bring about better economic viability.

Over the last 8 years formulated feed for grouper aquaculture has been developed in dried or moist pellet forms. Of seven million tonnes of animal feed produced in 2005, in Indonesia 595,000 tonnes were aquafeeds. Currently, there are at least 18 commercial feed manufacturers operating in Indonesia with a total production of 600,000 to 650,000 tonnes per annum of aquafeeds.

Regarding the potential culture area, Indonesia uses only a relatively small proportion of the suitable and or available area and is combined with the intensification of culture practices. Aquaculture is expected to grow at over 17 percent per annum and it is projected that aquaculture production will increase to over 4 million tonnes by 2009, so that in the near future there will be a higher dependency on commercial aquafeeds.

To balance the demand the aquafeed industry needs to adapt several measures, such as find alternatives to minimize the fishmeal content in aquafeeds without sacrificing nutritional value so that a more cost effective feed could be developed to improve efficiency and reducing environmental impacts. There is a need to further study the nutrient composition especially for grow out stages, utilising information from fish farmers and trial data from government institutions and address issues such as the perception on performance on trash fish versus compounded feeds. Currently, because of the uncertainties on the comparative efficacy of trash fish as opposed to compounded feeds, a significant proportion of farmers use a combination of the two feed types. Also, there is a need to further study the nutrient budgets within the captive environment to optimize feeding and minimize waste discharge into the surrounding environment, as well as need to better define the use and benefits of feed additives (immune-stimulants, attractants and probiotics) in feeds. Last but not least, greater attention to traceability of feed materials and feed processing technology must be paid for consumer awareness on food safety issues.

FinFish Mariculture: Thailand

Paiboon Bunlipatanon

Krabi Coastal Fisheries Research & Development Centre, Coastal Fisheries Research and Development Bureau, Krabi, Thailand

Marine finfish culture in Thailand has developed since 1970 by adopting fish cage culture technology from Singapore and Hong Kong. The most popular species for culture are seabass (*Lates calcarifer*), red spotted grouper (*Epinepphelus coioides*), tiger grouper (*E. fuscoguttatus*), coral trout grouper (*Plectropomus maculatus*), red snapper (*Lutjanus argentimaculatus*) and cobia (*Rachycentron canadum*).

In general hatchery produced see is used for seabass and wild caught seed for grouper farming. In Thailand marine fish farming occurs the coastal areas of the southern, central and eastern part. Cage culture is the most popular followed by pond culture and in general trash fish is used as feed. The total number of farms and culture area is given in Table 1 and the production of marine finfish in Thailand in Table 2.

Table1. 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	632.61	3,482	3,884.11
2002	6,482	4,491.81	1,912	613.93	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

***I Rai=0.16 ha=0.4 acres**

Table 2. Marine finfish production in 2001-2005

Year	Total (t)	Grouper (t)	Seabass (t)
2001	9,446	1,442	8,004
2002	12,202	1,170	11,032
2003	14,568	2,338	12,230
2004	17,162	3,574	13,588
2005	16,802	2,582	14,219

Seabass is mostly for local consumption but live grouper is mainly exported to Hong Kong and China. There are many problems in marine finfish culture for instance: lack of seed, disease outbreak, high investment and lack of trash fish.

FINFISH MARINCULTURE IN VIETNAM

Thai Ngoc Chien

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The fisheries sector plays an important role in the national economy of Vietnam, contributing about 6.1 % of the Gross Domestic Production (GDP) in 2006, and earning almost US$ 3.4 billion in export revenue. Production in the fisheries sector grew at an average rate of 12.1 % from 2001 to 2005. Much of this growth in production can be attributed to continued expansion in aquaculture, which increased from a 26 % share of the sector in 2000 to 46% in 2006. Total fisheries production in 2007 was 4.14 million tones, in which capture fisheries and aquaculture accounted for 2.06 and 2.08 million tonnes respectively. The total finfish aquaculture production was 3,500 tones (2003). 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 has made significant progress in Vietnam in recent years, increasing in market share from 26.2 % of total fisheries production in 2000 to an estimated 46 % in 2006. This development can be attributed to a concerted effort to not only expand the production area but also improve production techniques. Specifically, focus was given to developing cultures of local species, improving the efficiency of growing methods, and developing areas for intensive aquaculture farming.

Vietnam's aquaculture uses marine, brackish and fresh waters, all of which are widely available throughout much of the country. In 2006, the total area of water surface used for aquaculture in Vietnam was 1,050,000 ha, which increased by 64 % compared to 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 mariculture species are grouper, cobia, snapper, sea bream, sea bass, milk fish, and red drum. In Vietnam, marine aquaculture is conducted mainly in cages, submerged rafts, and ponds along the coastline and in tidal areas. The growth potential for this faming method is enormous, given Vietnam's extensive coastline.

The production for sea bass in cages is 10-15 kg m^3, while it is only 6-10 tones $ha^{-1}year^{-1}$. Red drum and cobia productions in cages also amount to on average 15 kg m^3.

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

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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**

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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

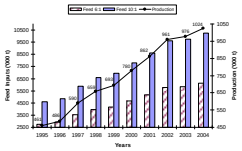
Which is trash fish?

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?**

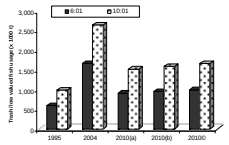
Generalized feed; all species??

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

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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

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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

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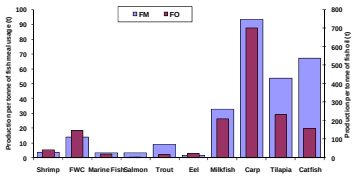
Efficacy of use of fish meal & fish oil y cultured species (from De Silva & Soto, 2008)



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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

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)

ENVIRONMENTAL ASSESSMENT – DATA CHECK LIST

Overall goal:

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

FARM LEVEL

- **Purpose 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)
  - Notes
    - Carbon, nitrogen and phosphorus content of inputs and fish outputs should be collected, although secondary data will be used if primary data is not available
    - Fish meal and fish oil content of feeds and fish should be provided if available.
    - Fish protein content of feeds should be provided

- **Purpose 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)
    - Notes
        - Fish meal and fish oil content of feeds and fish should be provided if available.
        - Fish protein content of feeds should be provided

- **Purpose 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
            - Number of dead fish floating
            - Water turbidity (Secchi disc)
            - Water colour (visual assessment)
            - Occurrence of plankton blooms
            - Visual assessment of waste, uneaten food, oil films, bubbles from bottom *etc* (1-5 on qualitative basis)
        - Water quality measurements should be made weekly if equipment is available
            - Dissolved oxygen profiles form top to bottom – collected outside and inside representative cages and control site
            - Ammonia – inside and outside cages and control site
        - Qualitative assessment of any changes in management, and implications for overall resource use on farms
            - Fuel used
            - Labour
            - Others?

- **Purpose 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
            - Purchase site for trash fish
            - Origin of trash fish used (i.e. where caught, method of capture)
        - Species and amounts of trash fish
            - Species of trash fish
            - Amounts of different species used
    - Origin of fish protein and other ingredients for pelleted diets
            - Type of ingredient and amount
            - Origin of ingredient

PROJECT IMPACT – REGIONAL LEVEL

- **Purpose 1**:
  Assess changes in nutrient (C, N and P) loads to environment from pellets vs trash fish, including net carbon loading from trash fish vs pellets

    - Data collection requirements:
        - Data on net nutrient (C,N and P) loads from farm trials
        - Present and projected production of marine fish at national level by species and feed types

- **Purpose 2**:
  Assess utilization of fish protein in pellets vs trash fish

    - Data collection requirements:
        - Data on net fish protein utilization from farm trials
        - Present and projected production of marine fish at national level by species and feed types

- **Purpose 3:**
  Assess implications for environmental quality in and around cages using pellets vs trash fish

    - Data collection requirements:
        - Impacts on resource/environmental "efficiency" of farm operations through reduced fish disease (frequency, number of fish affected, mortality) and mortalities
        - Present and projected production of marine fish at national level by species and feed types to determine like regional impacts on efficiency of utilization of resources

- ***Purpose 4***:
  Assess biodiversity and carbon impacts of pellets vs trash fish

    - Data collected during trials will be combined with national fish production data for a qualitative assessment of:
        - "biodiversity impacts" – diversity and type of trash fish species
        - Carbon footprint associated with sources and use of feeds (including exploring "food miles" concepts??)

(Prepared by Dr. M.J. Phillips, NACA)

TCP/RAS/3203 (D)

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

Inception Planning Workshop

8-10th September, Krabi, Thailand

Draft livelihood questionnaire outline

Pointers:

- **Overall objective**:
  To investigate livelihood changes TF/LV fish suppliers before and after the (anticipated) switch of aquaculture operators from using TF/LV fish to using formulated feed.

- **Immediate objectives and implications for design**:

- obtain a livelihood baseline ⇨ questionnaire comprises some general information about current household composition, activities and assets in addition to the *current* role of TF/LV fish supply in the livelihoods of suppliers.

- evaluate impacts of lower demand for TF/LV fish on suppliers' livelihoods ⇨ repeat the questionnaire towards the end of the project and compare findings with baseline.

- if negatively impacted, make recommendations on means and measures to develop/strengthen alternative income streams to maintain or improve the livelihood outcomes of TF/LV fish suppliers ⇨ questionnaire gathers broad livelihood information which can be used to establish the potential for alternative income generating activities.

~~~~~~

Part A. Basic household data

Date of interview	Name of interviewer	Country
Location	Name of respondent	
~~~~~~

How many members of the household are currently living here (as of September 2008)?

ID	Name	Age	Sex (M/F)	Relationship to HH head	Education level reached	Main occupation
1						
2						
3						
etc						

Part B. Household activities

Is fishing the main source of income for your household? Y/N

What contribution does it make to your overall household income compared to other activities? (yearly? seasonally?)

Activity (all HH members)	% of total HH income

Do you catch only trash fish/low value fish for aquaculture farms? Y/N

If no, how much of the daily catch is used as food (sale + home consumption)? (%)

How much do you earn from this daily?

How much is sold as feed for aquaculture farms? (%)

How much do you earn from this daily?

Are there any seasonal variations? Pls describe.

Do you currently own land? (Y/N).

If yes, what acreage? (ha or ac).

What do you do with it?

Do you or a HH member practice any aquaculture? (Y/N)

If yes, please describe your activity.

How much do you earn from it? (yearly? seasonally?)

Section B1. Agricultural (farm[8]) activities, as of August 2008

NB – pond areas and aquaculture activities should not be included here (subject of Part C).

What is the total agricultural land area owned? (ha or local unit)

What proportion of this total area is usually under cultivation (yearly average[9])? (%)

What are the main crops cultivated? (list, if possible cite yearly average % or ha)

To what extent does income from this land contribute to the total household income? (%)

What proportion of the harvest(s) is kept for home consumption (yearly average)? (%)

Do livestock products (e.g. milk, eggs, *excluding aquatic products*) contribute to the total household income? Y/N.

If yes, to what extent (yearly average)? (%)

Does your household also engage in non-farm and/or off-farm activities? (Y/N)

Cross-check with answers re. main occupation in Part A.

If yes, go to section B2. If no but aquaculture is practiced, go to Part C. If no and no aquaculture is practiced, go directly to Part D (household assets).

Section B2. Non-farm[10] and off-farm[11] income generating activities done in the HH, as of August 2008

What is the overall contribution of non-farm income to the total household income? (%)

For each HH member cited in Part A:

Wage (yearly or monthly or daily as appropriate) paid for main job (described in Part A)?

Secondary/occasional occupation(s)? (list, if possible indicate wage).

[8] Farm income refers to income generated from own-account farming whether on owner-occupied land or land accessed through cash or share tenancy. Usually includes livestock (when used for its products, and not as an asset) and crops. For the purpose of the present study, aquaculture is not included here but the subject of a specific line of enquiry in Part C, which is dedicated to it.

[9] This can be split into seasons if more adapted to agricultural practices.

[10] Non-farm income refers to non-agricultural (and non-aquatic) income sources. E.g. non-farm rural wage or salary employment, non-farm rural self-employment (business income), rental income from leased land or property, remittances.

[11] Off-farm income typically refers to wage or exchange labour on other farms (i.e. within agriculture or aquaculture).

Source of the definitions of farm, non-farm and off-farm income: Ellis, F. (1998) *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press, Oxford.

Part C. Fishing activities (for trash fish/low value fish)

a) Length of time involved in fishing? .....

b) Size of boat: .....

c) Gear used: Gill nets/ push nets/ traps/ .....

d) Average cost per year for maintaining boat and gear? .....

e) How many days of fishing per month?

f) Daily average catch: .....

g) Daily average income from the catch: .....

For TF/LV fish sold to fish farms:

h) Sell direct to farm? Yes/ No

i) Always sell to same farm: Yes/ No

j) Is the price fixed with the farm beforehand? Yes/ No

k) If not sold directly to farm how do you sell? Market/ wholesaler/ Middleman

l) Average sale price: .....

m) Is the price stable through the year? Yes/ No

n) If no, how much does the price vary in the year?

Highest price:.... (month?) Lowest price: (month?)

Average annual price?.....

o) Which species fetch the highest price? The lowest price?

How do you think TF/LV fish supply compares as an income generating activity to other income generating activities available around here? (do pair-wise comparisons listing all alternative activities).

Part D. Household assets (as of September 2008)

A. Livestock assets

How many do you currently possess?

No. of cattle heads (if necessary disaggregate between bullocks, cows, buffalos, goats, sheep, or large/small livestock)

Do you also have poultry (Y/N)?

B. House construction

Do you own the house you are living in (Y/N)?

Was it part of the post-tsunami assistance received (post-tsunami rebuilt)? Y/N

If yes, is it (circle): concrete, brick, tiled roof, corrugated iron

wood, bamboo, thatched roof, other?

What is the value of the house? (currency)

Inside the house, is there mains water (private tap) Y/N? mains electricity Y/N?

C. Selected farm and HH assets owned (as of August 2008)

For each, indicate the number owned:

Car/jeep, pickup or truck, motorbike, bicycle, television, telephone (incl. mobile), radio, refrigerator, sewing machine.

Tractor, hoes, boat, fishing nets, aquaculture equipment (*to detail*).

Part E. Household decision-making regarding livelihood strategies

A. Attitude to saving and borrowing

Do you save for the future? (Y/N)

If yes, is it in the form of bank savings (Y/N), jewels (Y/N), other (specify)?

Do you borrow money? (Y/N)

If yes, how frequently? (number of times per year, on average)

From whom? bank loan? (Y/N), private money lenders? (Y/N), relatives/friends? (Y/N)

B. Risk mitigation, ex-ante and ex-post decision-making re. households' livelihood strategies

[Open-ended questions are usually more useful for this kind of information. Thus this section should be refined (i.e. list of suggested factors should be checked) if a more structured approach is to be adopted.]

If TF/LV fish supply is the main activity (*from previous questions*):

Which factors influenced you when deciding to engage in it? Rank by decreasing order of importance/preference.

- Easy access to fisheries resources

- Good market for it (high demand)

- The easiness of the activity

- Its compatibility with other income generating activities (flexibility of the activity)

- Level of HH assets (e.g. boat ownership, savings)

- Possibility to obtain credit (e.g. to purchase a boat, nets etc.)

- Neighbour doing it.

- Promised benefits ($$) for the household.

- Whole family can contribute.

- Other (specify)

If it is not the main activity (*from previous questions*):

Why? Rank by decreasing order of importance/preference.

- No access to fisheries resources and boat

- It is perceived as too risky (i.e. too high a variability of income compared to the 'effort' put in).

- Too sensitive to market demand (determined by the aquaculture operators)

- Too dependent on external forces, e.g. market prices and middlemen

- Irregularity of catch

- Difficulty to obtain/unavailability of credit or HH assets to start or expand operations.

- Too many people doing it (high competition)

- Too high qualifications/technical know-how required to perform tasks and manage ponds

- Too demanding physically

- Others (specify)

When you and your HH are found yourselves crossing an unforeseen period of (financial) difficulty, what do you do? Rank by decreasing order of importance/preference.

- Borrow money

- Sell household assets, starting with...

- Look for work elsewhere

- Reduce hired staff on aquaculture operations

- Ask family to help on aquaculture operation

What do you think are the constraints to engage in a new income generating activity, aquaculture or else, should you decide to do so? (list).

How do you think they should be overcome?

What local support and institutions/organisations/groups are available in the community?

Are they useful? Who can participate in them?

In general, how do you prepare for the future and its uncertainties to ensure your wellbeing and that of your household?

Examples (they could be ranked): emphasis on children's education, continuous saving incl. contribution to pension/old-age scheme, simultaneous pursuit of several income generating activities as part of a diversification strategy ('not putting one's eggs in the same basket'-type strategy), emphasis on subsistence activities for direct home use/consumption, etc.

PARTICIPATORY LEARNING AND ACTION (PLA)

Background, principles and application

PLA is an effective, low-cost, empowering, participatory method of gathering qualitative & semi-structured info (beliefs, behaviors). It can discuss controversial/sensitive topics in a non-threatening way.

PLA characteristics:

- Heterogeneous—in age, gender, income, religion, ethnicity, social class, etc or homogenous if a specific group is targeted
- Flexible: people come and go--anything goes
- No pre-set, leading questions
- Who? What? Where? When? Where? How?
- What else?
-

It is useful when:

- a radical paradigm shift is needed, i.e. a reversal of attitude, to learning from the community, of where they are at.
- an understanding of the community/ target group is needed, from its world view, all its diverse complexity, of the restraints and limitations and the adverse environment which cumulatively result in poverty.

It involves:

- frequent triangulation needed to cross-verify info
- the use of a sequence of exercises to understand the community/ target group and its survival strategy.
- the writing of the 'story' (concise if possible)
- feeding it back to the community/target group for validation and triangulation.

It can start only:

--after rapport established with the community/ target group

--after clearly explaining to community/ target group that we 'outsiders' are there to learn from them

It is effective because it seeks to understand the survival strategy(ies) of the community/target group, appraise it and show ways to enhance the capability of that effort to ensure sustainability.

Common PLA exercises

Some common PLA exercises are listed below. Those that could be used during the study of the perceptions of users of trash fish/low value fish for aquaculture are highlighted and detailed further, in general terms and with an explanation of their relevance for the study.

- TIME LINE

- TREND ANALYSIS
- SEASONALITY DIAGRAMS
- WEALTH (OR WELL-BEING) RANKING
- CAUSAL DIAGRAMS
- MATRIX RANKING
- CHAPPATI DIAGRAM
- PROFILE OF WOMEN' WORK DAY
- TRANSECTS
- CONFLICT ANALYSIS
- LIVELIHOOD ANALYSIS
- PATTERNS OF LAND USE

The present study

Objective: investigation of fish farmers' perceptions about the use of trash fish/low value fish (TF/LV) in their aquaculture operations and the acceptability of a switch towards formulated feed.

PLA exercise	Application to the study/objectives
TREND ANALYSIS AIM: understand how agriculture, forests, health etc. have changed over the years. METHOD: ask respondents to draw changes in patterns or on a line from a fixed point in time until now. OUTPUT: Recallable trends indicate changes in attitudes and actions.	- 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).
CAUSAL DIAGRAMS AIM: understand • how things are linked to each other and what they lead to • what are the changes needed to reverse the process METHOD: • Identify the most important problem: put it in the center of the diagram • List causes of identified problem and place them around the problem. Draw causal arrows among problem and causes and causes themselves. • Show the degree of importance of the cause (large/small circle for ex.) • Ask for details of what happened and what solutions could be brought in.	- 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 identifying alternative options to TF/LV fish.

• Result is a maze of circles and arrows. OUTPUT: Use to discuss how to overcome the causes of the problem.	
MATRIX RANKING OR SCORING AIM: • Understand the rationale of the various choices of the community/target group • Identify reasons for this choice. METHOD: Use 10-seed/stone method to score choices (after they have been identified through open discussions) OUTPUT: Pie chart or ranked list of choices	- To cross-check with information collected in causal diagrams. - To understand (and rank) the reasons for the choice to use TF/LV fish in aquaculture.

NB: through the exchanges, facilitation and questioning happening during the exercises, more information than initially envisaged will come out. It is important to capture *all* this information.

Cecile Brugere

12 August 2008

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

TECHNICAL COOPERATION PROGRAMME

Countries:	**Indonesia, China, Thailand, Viet Nam**
Project title:	**Reducing the dependence on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region**
Project symbol:	**TCP/RAS/3203 (D)**
Starting date:	**June 2008**
Completion date:	**June 2010**
Budget covering FAO contribution:	**US$480,175**
Institution responsible overall coordination and implementation:	**The Network of Aquaculture Centres in Asia-Pacific (NACA)**
Government Ministry responsible for project execution:	**Indonesia**: Ministry of Marine Affairs and Fisheries, Coordinating Organization/Institution: Directorate General of Aquaculture: **China**: Guangdong/Hainan Provincial Government, through the Ministry of Agriculture, Central Government; **Thailand**: Ministry of Agriculture and Cooperatives Coordinating Organization/Institution: Department of Fisheries; **Viet Nam**: Ministry of Agriculture and Rural Development, Coordinating Organization/Institution: Research Institute for Aquaculture No 3, NhaTrang.

Signed:_____ Signed: _____

Sena S De Silva Jacques Diouf

Director General Director General

NACA

(on behalf of the government)

(on behalf of the Food and Agriculture Organization of the United Nations - FAO)

Date of signature_____

Date of signature: _____

EXECUTIVE SUMMARY

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. It has been estimated that the marine aquaculture sector in China in 2000 consumed about 4 million tonnes of 'trash fish/low-value fish'[12] and demand for trash fish/low-value fish is likely to increase unless viable alternatives to trash fish/low-value fish are made available and used, and also the efficacy of use of these feed sources is improved. For example, Edwards *et al.* (2004)[13] estimated that the total use of `trash fish/low-value fish' by the aquaculture industry in Viet Nam was between 176,420 and 323,440 tonnes in 2001 and it is further projected that by the year 2013, the requirement for Viet Nam would be about one million tonnes (De Silva and Hasan, 2007[14]).

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), ranging from 7 to 15: 1 in average grouper farming practices, 4:1 to 6:1 in crab fattening practices and so forth[15]. In the Asian region one of the fastest growing mariculture commodities is grouper, about six species in all, and currently (2005) accounting for about 65,362 tonnes and growing. Grouper farming however, almost exclusively is still dependent on trash fish as the major food source. 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 small scale marine finfish farmers are of the perception that trash fish/low-value fish are more effective and results in better performance of the stock, relatively easily procured (a significant quantum of farmers sourcing their daily needs) and cost effective. On the other hand, usage of trash fish/low-value fish results in the discharge of higher nitrogen and phosphorous levels into the environment, and overall the very limited information available indicate that it is not as cost

[12] D'Abramo, L.R., Mai, K. & Deng, D.-F. 2002. Aquaculture feeds and production in the People's Republic of China – progress and concerns. *World Aquaculture* 33 (1): 25–27.

[13] Edwards P., Tuan, L.A. & Allan, G.L. 2004. *A survey of marine trash fish and fish meal as aquaculture feed ingredients in Viet Nam*. ACIAR Working Paper 57, 56 pp

[14] De Silva, S.S. and Hasan, M.R. 2007. Feeds and fertilizers: the key to long term sustainability of Asian aquaculture. pp. XX-XY *In* M.R. Hasan (ed.) *Study and analysis of feeds and fertilizers for sustainable aquaculture development*. FAO Fisheries Technical Paper No. 497, Rome, FAO.

[15] De Silva, S.S., Sim, S.Y. Turchini, G.M, 2007. Review on Usage of Fish, Directly and Indirectly, as Feed Sources and Feeds in Asian- Pacific Aquaculture. FAO Technical Paper - (in preparation)

effective as commonly perceived by farmers. All of these factors will lead to problems of sustainability of the practices and will adversely impact on the livelihoods in the long term.

This matter has been identified as a regional priority by the Asia-Pacific Fishery Commission (APFIC) which endorsed a regional plan of action sat its 29th Session[16] for reduction of dependence upon trash fish as aquaculture feeds. One of the priority actions was the widespread conversion of aquaculture systems dependent upon fresh fish to the use of compounded aquaculture feeds. The FAO Committee on Fisheries (COFI) in its 27th Session held in Rome, 5-9 March 2007 also recognized the importance of this issue and recommended further work by FAO on the use of low-value trash fish in aquafeeds.

Taking into account the importance of the issue the Governing Council of the Network of Aquaculture Centers in Asia-Pacific (NACA) at its 18th Meeting held in Bali, Indonesia 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 back bone of the sector. This issue was also taken up at the recently held FAO Expert Workshop on "Use of wild fish and/or other aquatic species to feed cultured fish and its implications to food security and poverty alleviation", held in Kochi, India in November 2007, and the workshop strongly recommended that work on encouraging farmers to use compounded feeds in mariculture is urgently needed.

The present 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 project outputs include establishing a scientifically vigorous database on the advantages of using pellet feeds, development of better management practices for improving efficiency of marine finfish feeding and building capacity amongst practitioners on improved feed management, and dissemination through farmer organisations such as "aquaclubs" on the procedures involved and using such organisations to develop a credit scheme for procuring feeds.

The project will contribute to national programs of marine finfish culture in the immediate participating countries, viz., China, Indonesia, Thailand and Viet Nam, and through NACA's networking mechanisms will have a widespread impact on marine finfish farming nations throughout the Asian region.

[16] FAO (2006) Asia-Pacific fisheries Commission, report of the 29th Session, RAP Publication 2006/19, FAORAP, Bangkok, Thailand. 39 p.

SECTION 1. BACKGROUND

1.1 General Context

Marine finfish farming sector is currently the fastest growing aquaculture sub-sector in Asia, and the developments follow the same pattern in that it consists of clusters of small scale farmers in areas suited for mariculture, primarily inshore, sheltered areas. The sector primarily caters to the export earnings of the countries, and also delivers to the "live fish restaurant trade" particularly to lucrative markets such as Hong Kong and Singapore and selected centres in PR China. The sector however, by and large, depends primarily on the use of trash fish/ low value fish, directly and or indirectly (farmer made feeds) as the main feed source. This dependence impacts on the long sustainability of the sector as well as its growth potential with the resource declining and having a greater negative influence on water quality unlike in the use of suitable pellet feeds.

The cultured grouper production in 2005 was 65,362 tonnes, and over the last five year period has grown at an annual rate of 18 percent, compared to 14 percent to all finfish mariculture, is the fastest growing cultured marine finfish group in the region. About six species of grouper are cultured and all of them command a high price, catering mostly to the live fish restaurant trade for lucrative markets in Asia. Over 95 percent of grouper farming practiced on a small scale, farms being clustered in a given locality. Almost all grouper culture, however, is dependent on trash fish as the major feed source, and consequently account for over 50 percent of all trash fish usage in mariculture in the region, and it is growing.

The current proposal is in conformity with the recommendations of the 29th Session of APFIC (21-23 August 2006, Kuala Lumpur, Malaysia) and the FAO Committee on Fisheries in its 27th Session (Rome, 5-9 March 2007) recommending action to address the issues relating to the use of low-value trash fish in aquafeeds. The proposal is also a response to a major recommendation of the Governing Council of the Network of Aquaculture Centres in Asia-Pacific (NACA), at its 18th meeting in May 2007, Bali, Indonesia, which recognised the urgent need to wean marine finfish farmers from the predominant use of trash fish/ low value fish as a major feed resource through a regional project that involves a participatory approach of farmers in selected nations in the region, such as China, Indonesia, Thailand and Viet Nam. Issues pertaining to the use of fish feed was also taken up at the recently held FAO Expert Workshop on "Use of wild fish and/or other aquatic species to feed cultured fish and its implications to food security and poverty alleviation", held in Kochi, India in November 2007, and the workshop strongly recommended that work on encouraging farmers to use compounded feeds in mariculture is urgently needed.

The project will work in conjunction with farmers directly, randomly chosen from a minimum of two "farming clusters" in each of the countries (a total of 12 farmers per country x 4 countries = 48). The number of farmers and locations to be selected for feeding trial will be decided upon at the inception workshop. The initial choice will be based on farmer group meetings convened for the purpose of conducting the project, their willingness to participate and cooperate in the activities, and an undertaking that they are willing to change/adopt the findings of the project in future operations. The project will ensure sustainability of the small scale marine fish farming in the region and thereby ensuring that many thousands of livelihoods are not threatened and are indeed improved socio-economically.

1.2 Sectoral Context

Development and improvement to small scale marine finfish farming is a part and parcel of aquaculture development plans and strategies of most maritime Asian nations. The project will contribute significantly to ensuring sustainability of this growth sector and thereby ensure the livelihoods of many of the small scale marine finfish farmers and contribute to improving their income generation and hence indirectly to poverty alleviation. The project is also in conformity with the FAO Code of Conduct for Responsible Fisheries, Aquaculture Development, "CCRF Article 9.2.5.

The main recommendation of APFIC (Asia-Pacific Fishery Commission) regional consultation forum meeting, Kuala Lumpur, Malaysia, 16-19 august 2006 was to address the issues associated with the increasing trend in the production of low value/trash fish taken from the APFIC region, members should improve the management of fisheries, improve the utilization of low value/trash fish for human food, and improve feeds for aquaculture. Noting that aquaculture was growing at a rapid rate in the region and that feed for this growing industry continued, in large part, to be sourced (either directly or indirectly) from wild fish stocks, the region should fast-track the change-over from direct feeding to pellet feeding and invest in feed research for inland/marine species.

1.2.1 Development priorities, World Food Summit objectives and MDGs

As presently conceived and designed, emphasizing both environmental and livelihood dimensions in the use of aquatic resources for sustainable fish production, the project will make a direct contribution to key objectives of the World Food Summit Plan of Actions[17]:

- The project will foster local economic conditions and provide a development strategy encouraging the full potential of all initiatives for sustainable, equitably, economic and social development which also integrate environmental concerns (objective 1.2);

- An outcome of the project will be poverty eradication and maximisation of the income of the poor (objective 2.1);

- The project will contribute to meet food and nutritional requirements of involved farming households (objective 2.2) as well as of those in surrounding communities;

- The project will enable the production of safe food supplies (objective 2.3);

- The project will be implemented through participatory approaches that pursue sustainable, intensified and diversified food production, increase productivity, efficiency, safety gains, pest control, reduced wastes and losses, whilst taking fully into account the need to sustain natural resources (objective 3.1);

- The project will contribute to combat environmental threats to food security and degradation of aquatic-based natural resources to achieve greater production (objective 3.2);

- By working directly with fish farmers, the project will promote sound transfer and use of technology, skills development and training appropriate to food security needs (objective 3.3).

The project will also contribute indirectly to the achievement of many of the other objectives of the Plan of Action.

[17] http://www.fao.org/docrep/003/w3613e/w3613e00.htm

Furthermore, the project will make a contribution to the following Millennium Development Goals:

MDG 1 -Reduce by half the proportion of people who suffer from hunger.

MDG 7 - Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources; Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss.

MDG 8 - In cooperation with the private sector, make available the benefits of new technologies— especially information and communications technologies

The regional approach adopted by the project will ensure consistency in the implementation of the project throughout the target region.

1.2.2 NMTPF and UNDAF

The project will be addressing a number of issues those have been recognized as very important in the National Medium-Term Priority Frameworks devised by the participating countries and FAO. In particular:

- Thailand and FAO have jointly formulated a national medium-term priority framework (NMTPF) - a planning and management tool which outlines how FAO can best assist the country in meeting its development priorities. Aiming largely at helping Thailand to achieving its millennium development goals, FAO assistance would be effectively complementary to other programmes carried out under parallel mechanisms such as the United Nations Partnership Framework (UNPAF), activities of other UN agencies, and those of other development partners. Taken together, these external efforts will contribute to the implementation of Thailand's national plans and/or frameworks for development. In Thailand, the NMTPF identified a growing concern for food safety and quality by domestic consumers as well as for export markets. In line with increasing exports, Thailand has initiated various legislation and quality control measures to meet the increasingly high food safety and related standard required to maintain competitiveness in international trade. These measures include "Good Aquaculture Practice" (GAP) and a "Code of Conduct" (CoC) for shrimp farming. GAP emphasizes product freshness, cleanliness, freedom from drugs and chemicals and freedom from disease. CoC guidelines have been developed based on the philosophy of sustainable and environmentally responsible shrimp culture, hygiene and food safety and are expected to be developed for other fish and crustaceans. It is expected that the project will contribute to the development of GAP and CoC for marine aquaculture species as this will ensure the sustainable and environmentally friendly feeding.
- Improving the quality of fishery and aquaculture products has been given priority status in the National Medium-Term Priority agricultural strategy of Viet Nam after the country joined the World Trade Organization (WTO). By reducing the use of trash fish for fresh and marine aquaculture, the project will assist Viet Nam to ensure GAP and increase the competitiveness of Vietnamese aquaculture products in the international market. The project will also be complementary to the on-going TCP "Capacity building to enhance positive impacts of WTO accession on the fisheries sector and alleviate coastal poverty (TCP/VIE/3012)"

SECTION 2. RATIONALE

2.1 Problems/Issues to be addressed

The project will address the basic problem of the continued dependence of small scale marine finfish farmers in Asia on trash fish/ low value fish as a primary feed resource. The dependence on this feed resource, often of varying quality and unstable supply, and a dwindling resource in the region, and its overly negative environmental impacts on water quality threaten the farming systems and the livelihoods thereof. The impact of extraction of perhaps 4 million tonnes of "trash fish" on marine biodiversity, whilst poorly understood, are also likely to be highly significant. The continued use of this feed resource is mostly driven by farmer perceptions that stock maintained on trash fish/ low value fish performs better, and is economically more viable. These supposedly erroneous perceptions continue to be perpetrated as there is no significant technical information to the contrary. Further drivers to current unsustainable practices include lack of access to suitable feeds, poor communication and extension systems, convenience of "trash fish" compared to formulated feeds, lack of market signals to drive more sustainable practices, and lack of credit availability and financing arrangements for purchase of such feeds, amongst others.

The project will set out to generate technical information on the comparative performance of trash fish/ low value fish as opposed to formulated feeds as a viable option, economically, environmentally and socially, in small scale marine finfish farming in Asia, and will have a regional bearing.

2.2 Stakeholders and Target Beneficiaries

The target beneficiaries of this project are small- to medium- scale marine finfish farmers (in terms of the unit size and quantity produced) in the Asian region, who constitute the great bulk of all forms of aquaculture farming in Asia. The project envisages working with the stakeholders from its very inception and doing so in a manner through consultation with farmers in selected clusters in each of the countries. The field trials will be conducted by the farmers and will be coordinated in each country through national coordinators, and the trials will essentially involve "blind testing" of trash fish/ low value fish as opposed to commercial feeds. The commercial feeds will be provided free of charge by reputed feed manufacturers (three in all) and the test results analysed for performance of the stock, economic gains of each feed type and farmer willingness to adopt changes. Three reputed feed manufacturers (Skretting, Ewos and Charoen Pokphand have agreed in principle to provide feeds, nutritionally suitable for groupers, for the trials free of charge). Care will be taken to not to provide "commercial" information to any of the feed providers, except to the degree how each feed performed as opposed to trash fish/ low value fish. The results will be disseminated through simple easy to understand print material and series of workshop of stakeholders.

2.3 Project Justification

The project is of importance and relevance to many Asian countries that have significant marine finfish farming. The problems that are to be addressed in this project are common to all countries with ongoing or planned marine fish farming, and hence a regional approach will be the most logical, cost-effective and also has the potential to generate useful synergies.

The problem of utilisation of trash fish/low value fish as feed resource in small scale marine fish farming in Asia is encountering immediate problems. Foremost amongst these is the increasing irregularity in trash fish/ low value fish supplies, variability in quality and increasing costs of the feed

resource; a problem common to all countries, and growing concerns about the impacts on aquatic biodiversity and unsustainability of such practices. The project will endeavour to remove misconceptions amongst farmers on the use of alternative feed resources and demonstrate the economic viability of and environmental gains from such uses, with out this transformation in the culture practices the marine finfish farming sector will gradually fade out and impact on many thousands of livelihoods and foreign exchange earnings for the respective countries. The project will also contribute to the development of better feed management practices (so-called "Better Management Practices" - BMPs) in small scale finfish farming that would contribute to improved efficiency of feeding practices and conformity to market related requirements.

As the project includes the involvement of stakeholders from its inception and the latter are responsible for the generation of the required information of national and regional value and significance it is expected that the recommendations thereof will be easily accepted and adopted by the stakeholders. As the project proceeds there will also be capacity building amongst stakeholders, through their direct involvement, on issues related to record keeping and monitoring all of which will facilitate subsequent marketing of the products.

2.4 Past and Related Work

NACA has successfully conducted many regional projects pertaining to sustainable aquaculture in the Asian region, including successful TCP projects. Amongst ongoing NACA initiatives is a project on the development of Better Management Practices (BMPs) in respect of the shrimp farming sector in India, in conjunction with the Marine Products Export Development Authority of India (MPEDA). Many practices/concepts of this project have a significant bearing on some of those in the current project. The former project has gone from strength to strength and the findings have been successfully adopted by farmers and the activities and dissemination thereof are self sustainable. More over as a consequence of the project legislative changes were brought about and a dedicated institution– The National Centre for Sustainable Aquaculture (NaCSA) established in 2007. These experiences of NACA together with its successful operation of regional activities will be an asset to executing the current proposal.

The project will also complement work, in particular reviews, conducted on the use of trash fish/ low value fish in specific countries such as Viet Nam[18] under the auspices of FAO and the Australian Center for International Agricultural Research (ACIAR). Furthermore, NACA has already commenced negotiations with ACIAR on collaboration in respect of forthcoming marine finfish related R & D programs in Viet Nam and Indonesia, which are expected to commence in 2008/09, and complementarity will be sought between such programs of work and the current TCP. Further more complementarity will be brought about between the project on the development of Better Management Practices in Marine Finfish farming in the region conducted under the banner of the Asian Marine Finfish Network and executed by NACA and funded by ACIAR.

2.5 FAO's Comparative Advantage

FAO Fisheries and Aquaculture Department (more specifically Aquaculture Management and Conservation Service, FIMA) is a leading organization in aquaculture development, has a good track record of successful implementation of field projects in aquaculture, has in-house technical expertise

[18] Edwards P., Tuan, L.A. & Allan, G.L. 2004. *A survey of marine trash fish and fish meal as aquaculture feed ingredients in Viet Nam*. ACIAR Working Paper 57, 56 pp

including a dedicated aquaculture feed specialist, and has access to the best technologies and experts in aquaculture. On the request of members, it provides technical assistance in all aspects of fisheries and aquaculture management and development. Its Regional Office (in Bangkok, Thailand), staffed with multidisciplinary teams, including fisheries and aquaculture specialists, facilitate to address regional needs.

FAO Aquaculture Management and Conservation Service's (FIMA) has major on-going work programme on "Study and analysis on the use of feeds and nutrients in sustainable aquaculture development" under the programme entity "Monitoring, Management and Conservation of Resources for Aquaculture Development". This project activity will be complimentary to the above work programme. Further, the current proposal is directly related to Component 4 of a major initiative, "Towards Sustainable Aquaculture: Selected Issues and Guidelines (GCP/INT/936/JPN)" of the Aquaculture Management & Conservation Service (FIMA) of FAO. The proposal indeed is a logical follow-up related to the findings of Component 4 in which issues related to the use of wild fish and /or other aquatic species to feed cultured fish and its implications to food security and poverty alleviation are dealt with. As such involvement of FAO is most logical in addressing a problem common to the region.

SECTION 3. PROJECT FRAMEWORK

3.1 Impact

The primary development goal of the proposed project is to contribute to sustainability of small scale marine finfish farming in Asia thereby ensure the preservation of the livelihoods and reduce the negative environmental impacts of the farming system. Furthermore the project will also impact on the conservation of already dwindling inshore fish resources by minimising the dependence on the latter as a primary feed resource.

3.2 Outcome and Outputs

Outcome:

The primary project outcome is that better farming practices will be developed through the use of formulated feed in marine finfish aquaculture practices in the Asian region and will thereby increase the long term viability of such operations and improve the livelihood of practitioners and contribute to poverty alleviation.

Output 1: Information on the livelihoods involved in the supplying of trash fish/low-value fish for marine finfish aquaculture purposes, and the marketing channels involved thereof, and details on farmer perceptions in the use of trash fish/low-value fish and the constraints thereof in adopting new feed as a food source for the cultured stocks. This information will be the basis for the development of the strategies in the subsequent activities and in understanding the dissemination needs of the findings of the project.

Output 2: Formation of "aqua clubs" and or equivalent amongst stakeholders and acceptance by these groups on the principles underlying the project activities, and capacity building amongst stakeholders on essential record keeping. Marine fish farmer groups (=aquaclubs) established in a minimum of four locations in each participating country. These

aquaclubs are expected to form nuclei in each country for wider dissemination of the project findings in each country and the region on a wider scale.

Output 3: Statistically rigid technical/ scientific data on the performance and the cost-benefits on the use of trash fish/ low value fish versus compounded pellet feeds in grouper grow out in small scale grouper farming systems. Output should also include understanding of constraints to adoption of better feed management practices as well as notes on farmers' perception changes and evolution throughout trials.

Output 4: Dissemination material, in print and video, in English and corresponding local languages, on the advantages of the use of compounded feeds as opposed to trash fish/ low value fish in small scale mariculture in Asia and how such a usage will positively impact on sustaining the sector and environmental and cost-benefit gains resulting from the transformation and incorporation of the developed feed management practices in the development and improvement of Better Management Practices for marine finfish culture. These will be made available in all aqua-clubs.

Output 5: Options identified for establishing business relationships between aquaclubs/ farmer groups and feed manufacturers/ suppliers resulting in the development and execution of appropriate micro-credit schemes for feed procurement and its incorporation into Better Management Practices (BMP).

Output 6: Improved capacity in governmental personnel in extension related to feed usage and management in small-scale marine finfish farming systems in the region.

Output 7: Comparative environmental assessment of using trash fish and formulated feed

Output 8: Monitoring system of farmers' perceptions and uptake of formulated feed for their aquaculture operations and environmental impacts is developed (to be used post-TCP in the long term).

3.3 Sustainability

At the termination of the project it is expected to have contributed to the capacity building amongst farmer groups/aquaclubs in record keeping procedures and improved capacity in governmental personnel in extension related to feed usage and management in small scale marine finfish farming systems in the region. The availability of a set of robust technical/ scientific data and evidence of in the transformation of the feeds utilised and management thereof at the grass root level will provide a tool for the governments to further the transformation(s) into other areas of non-project activities, effectively and with greater efficacy.

The establishment of aquaclubs and or equivalents in each of the farming clusters, utilising the vast and successful experiences of NACA in this regard, will facilitate the uptake of the envisaged transformation and its sustenance, as had been demonstrated in India through a previous project on shrimp farming. Furthermore bringing about a link- a business type link- between feed manufacturers/ suppliers and farmer groups and the establishment of a micro credit system between the two groups for feed procurement will provide a major boost to the sustenance of the transformation from trash fish/ low value fish to compounded feeds in small scale marine fish farming in Asia, and thereby that of the sector as a whole.

3.4 Risks and Assumptions

Table 1: Risk Matrix

Risk	Impact	Probability	Mitigation
1. Inadequate information from the RRA (Output 1/ 2)	Planning of formation of aquaclubs and farmer trials	Very low	Ensure continued dialogue with national counterparts and sequential accession of data and reappraisal of the information
2. Failure of farmer trials (Output 3)	Inadequate technical / scientific	Very remote	Select very reliable and keen farmers
3.Inefectiveness of national project coordinators	Delay of activities	Remote	Effective consultations with National authorities & make proper choices
4. Physical calamities e.g. typhoons in the region (Output 3)	Delay of activities	Uncertain	Not possible
5 Delay in formation of aquaclubs and or equivalent (Output 2)	Delay of activities; ineffectiveness could lead to sub-standard dissemination	Remote	Ensure aquaclubs are effective; nurture the aquaclub functioning through the project
6. Failure to develop options for micro-credit for feed procurement (Output 6)	Reluctance of farmers to use commercial feeds on a wider scale	Medium	Engaging farmers and commercial feed dealers from the inception of the project; regular consultations including national counterparts

SECTION 4. IMPLEMENTATION AND MANAGEMENT ARRANGEMENTS

4.1 Institutional Framework and Coordination

The project will be implemented in close collaboration with NACA. NACA will assist with the local arrangements and the development and monitoring of the farmer aquaclubs and field trials and organization of the workshops. NACA will be responsible for the participating governments as well as to the FAO for overall coordination. The main collaborating institutions of the participating Governments will be the respective national fisheries departments or administrations or equivalent national agencies (see below).

The respective governmental national focal agencies that will be implementing national activities of the project are as follows:

Indonesia: Responsible Ministry; Ministry of Marine Affairs and Fisheries

Coordinating Organization/Institution: Directorate General of Aquaculture,

China: Guangzhou Provincial Government, through the Ministry of Agriculture, Central Government

Thailand: Responsible Ministry; Ministry of Agriculture and Cooperatives

Coordinating Organization/Institution: Department of Fisheries

Viet Nam: Responsible Ministry; Ministry of Agriculture and Rural Development

Coordinating Organization/Institution: Research Institute for Aquaculture No 3, NhaTrang

Each of the responsible national focal agencies of each country will nominate (i) A person who will be responsible for day to day monitoring of the farmer trials, and (ii) a leading aquaculture extensionist. Besides the national focal agency of each country will provide the services of one of its senior staff for the duration of the project to work as National Project Coordinator. The National Project Coordinator for the project in each country will be the focal person of the project in respective country, will mobilize national resources and facilities as required and will liaise with FAO and NACA in all planning, execution and dissemination of project activities/findings, based on in-country consultations, and subjected to technical supervision/oversight by FAO Aquaculture Management and Conservation Service (FIMA) as Lead Technical Unit (LTU) with Fishery Resources Officer (Aquaculture/Feed Specialist) as lead technical officer (LTO) and FAO RAP Aquaculture Officer.

4.2.1 Strategy/Methodology

The key steps in the project execution and the utilisation of the findings to fulfil the overall outcome/outputs are indicated, inclusive of the expected time scale for each major activity, schematically. Following this schematic representation are details of each of the activities, in order.

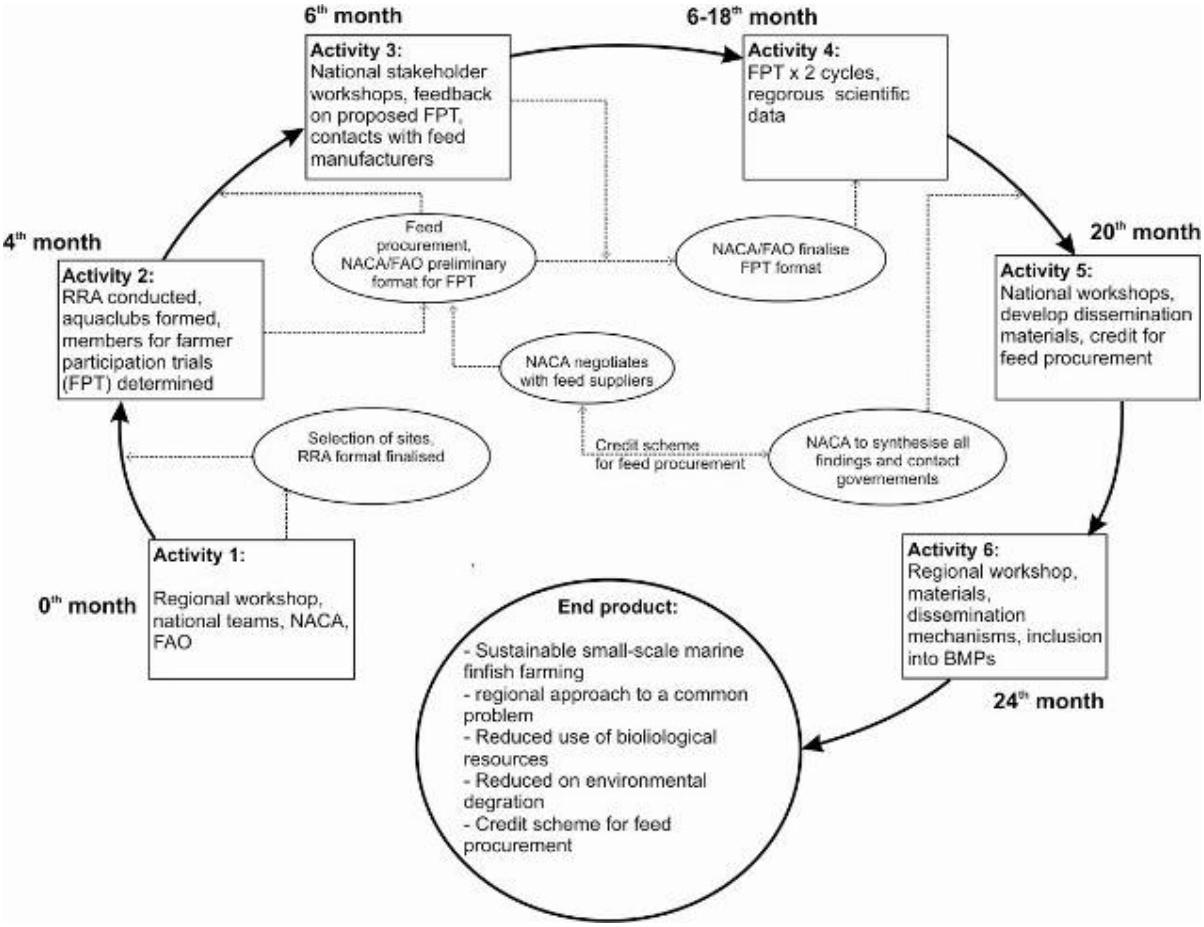

Figure 1. Schematic diagram showing the activities to be undertaken by the TCP with end products (outcomes)

Timing and details of Project Phasing and Activities

Phase 1: 0-3 months

- Selection of national project coordinators in each participating countries
- Recruitment/selection of international and TCDC consultants
- Organization of Inception Workshop. Inception/Planning workshop will bring together three persons from each participating country (see Section 4.2), representatives from NACA and FAO.
- Final site selection
- Field testing of questionnaire in all four countries and finalization of RRA format

Phase 2: 4-6 months

- Conduct and completion of livelihood analysis and baseline environmental impact assessment
- Selection of farming clusters and formation of aquaclubs in each farming clusters
- Organization of two participatory workshops I for national stakeholders in each country
- Recruitment/selection of farmers (in aquaclubs) for conducting farmers participatory trials (FPT) and finalization of trial protocol
- Shipment/transportation and delivery of commercial feed by NACA from selected commercial feed manufacturer to be used for farmers' participatory trials

Phase 3: 7-18 months

- Commencement of farmers' participatory trials (two growth cycles)
- Analysis of results of the growth trial and preparation of synthesis of all findings/results
- Preparation of extension strategy (ies) and commencement of preparation of dissemination materials in consultation with the stakeholders
- Initiation of dialogue between feed suppliers/ manufacturers, farmers and national project coordinators on the potential mechanisms available to developing a micro-credit scheme for feed procurement

Phase 4: 19-23 months

- Redo livelihoods analysis and environmental impact assessment.
- Analysis of farmers' records and perceptions
- Organization of national workshop II.
- Fine tuning of the dissemination/extension materials/packages for wider dissemination and adoption from newly emerging countries
- Finalise the blue prints for potential implementation of micro-credit schemes for feed procurement through dialogue between farmer representatives, representatives of feed suppliers /manufacturers and relevant financial institutions.

Phase 5: 24 month

- Organization of project terminal/regional workshop.
- Preparation of technical report, project terminal statement and printing of dissemination/extension materials/packages

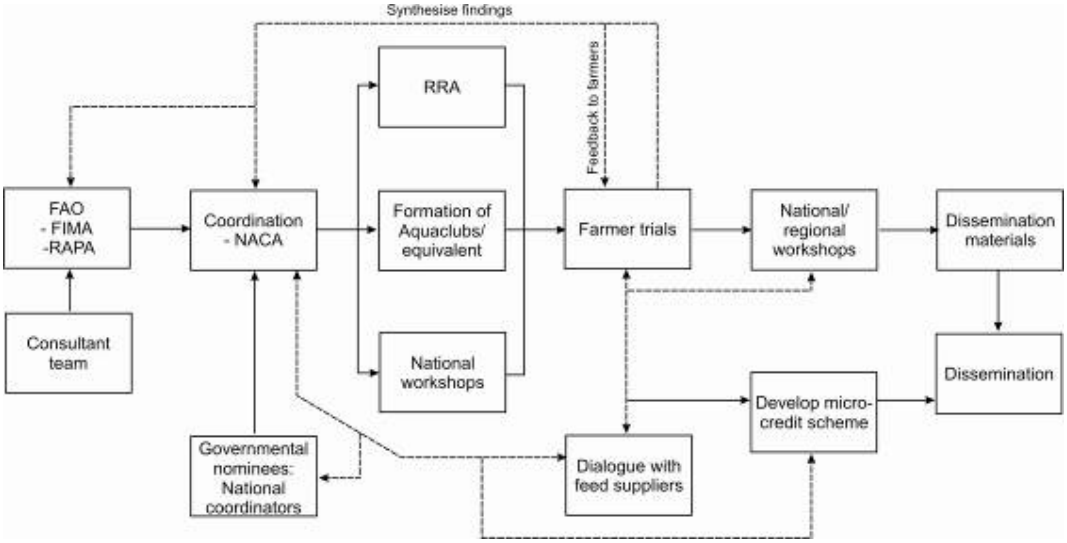

Figure 2. A schematic representation of the operational procedures in the execution of the project

4.2.2 Capacity Building

Capacity building in Farmers in Record Keeping:

The participating farmers will be trained on record keeping pertaining to the individual farming practices. This capacity is becoming an increasing requirement associated with certification procedures and adoption of BMPs and as such will ensure that the produce is easily marketable. The built capacity amongst the participating farmers will be disseminated further a field through the aquaclubs as the project progresses, thereby encompassing whole farming clusters. It is also through capacity building that farmers' misconceptions regarding the use of formulated feed for aquaculture operations will be changed.

The above capacity building will be on an on-going basis through the interactions between farmers, national project coordinators and other national personnel. As such no special budgetary allocation is made for this purpose but will be a part and parcel of on going activities.

Capacity building amongst national aquaculture officers:

The project as it progresses will provide the national aquaculture officers to enhance their capacity in project handling and most of all in the analysis and utilisation of technical/ scientific data on preparing appropriate dissemination material and communicating findings to farmers in simple language. This capacity building will come about with continued dialogue with the personnel through the project activities and the related workshops thereof. Here again the capacity building will be a part and parcel of continued interactions amongst project personnel and at the national and regional workshops when especial attention will be laid on this aspects through a dialogue for this purpose.

Capacity building on Formation and Sustaining Aquaclubs:

Increasingly organisation of small scale farmers in to one or other forms of aquaclubs is becoming a pivotal element in ensuring sustainability of the practices and taking collective responsibility towards sharing a common water body for the well being of all. Aquaclubs and or their equivalent also ensure complying with certification requirements as well as enhancing the saleability of the products at a reasonable price. Capacity building on the formation and sustenance of aquaclubs and or their equivalent will be conducted through the project activities, commencing from project implementation stage, and will be strengthened at each of the national and regional workshops.

4.3 Government Inputs

The Government of each participating country will be expected to give full cooperation through the nomination of a senior officer (NPC, National Project Coordinator) (draft TOR attached in Annex VII) who will act as the focal point in the appropriate institution designated as the National Implementing Agency and mobilize and ensure the active support of the staff in the national fisheries institutions, the timely supply of local services, as well as the provision of national and local data pertinent to the activities to be undertaken by the project. In the above regard the NACA in consultation with FIMA and FAO RAP will negotiate with the participating member countries that suitable personnel with relevant experience and expertise, are provided for implementing the project, and appropriate agreements will be reached with the respective governments to this effect.

Each participating institution will also be expected to nominate/select and then release selected national officers to participate in the projects' activities and in-service or other training programmes as follows:

- a person who will be responsible for day to day monitoring of the farmer trials, and
- a leading aquaculture extensionist.

In light of the magnitude of the problems to be addressed, the implementing Agencies of the participating Governments commit themselves to providing significant budgetary and in-kind contributions to the project activities, in proportion to their respective capacities, so as to cover all types of inputs deemed appropriate to reach project outcomes, which FAO's contribution could not cover. This particularly applies to the availability of relevant professional staff, the ongoing collection and provision of relevant data and general supporting facilities, in each of the participating countries, which are important prerequisites for effective project implementation.

Each participating country will guarantee to:

- provide office space and facilities, computer facilities for the project and software, if appropriate, to develop database management systems on microcomputer, and peripherals; provide vehicle transport as required for by consultants and FAO staff during the conduct of project activities;
- provide sufficient resources for the mobilization of national field staff to assist in the logistical and data-collection aspects, in order to facilitate direct appraisal of catch and effort data, and other institutional data;
- governments will pay for all in-country transport and DSA of government person unless funded by FAO as stated in the project document;

- assist in the organization of project-related workshops and industry–government technical consultations through official sponsorship and arrangement of meeting venues;
- meet the costs arising from the need to translate project reports from English to national languages and vice versa.

4.4 FAO Contribution

The following inputs may be of direct benefit only to the FAO member countries and to the institutions or organizations designated by these countries to participate in the project.

1.Personnel

International Consultants (draft TOR attached in Annex, to be finalized in inception mission/workshop):

- International consultant I – 36 days in 2 missions; aquaculture and fish nutrition specialist (Annex III)
- International consultant II - 18 days in 1 mission; environmental specialist (Annex IV)

Remuneration: US$16,200 (excluding travel)

TCDC consultants (draft TOR attached in Annex, to be finalized in inception mission/workshop):

- TCDC consultant I– 5 weeks in 2 missions; marine finfish farming specialist (Annex V)
- TCDC consultant II – 6 weeks in 2 missions; extension and livelihoods/participation specialist (Annex VI).

Remuneration: US$10,880 (excluding travel)

FAO Technical Support Services (TSS):

- FAO/Aquaculture Management and Conservation Service (FIMA) –Fisheries Resources Officer (Aquaculture/Feed Specialist) – 6 weeks in four missions (Annex VIII)
- FAO/Fisheries and Aquaculture Planning Service (FIEP) – Fishery Planning Analyst (Aquaculture Economics) – 18 days in two missions (Annex IX)
- FAORAP- Regional Aquaculture Officer- 25 days in three missions (Annex X)

Total = US$58,140 (excluding travel)

2. Official Duty travel

Appropriate duty travel expenses for international and TCDC consultants, FAO technical staff (FIMA, FIEP, RAPI) is provided. Travel of NACA technical staff is included under contractual agreement.

International consultants = US$13,170; TCDC consultants = US$18,505; FAO TSS = US$48,975; Duty travel others (FAO staff only) = US$4,500; Total = US$85,150

3 Local Contracts, Letters of Agreement or Contractual Service Agreements

Within the limits of the budget provided, subcontracting arrangements may be made for:

a. Organization of one in-country national stakeholders workshop/training sessions (US$6,480 for each workshop/session): total US$26,020 (NACA to organize under an LOA) (Annex XII);
b. Inception/inaugural planning workshop (US$15,816, NACA to organize under an LOA) (Annex XI)
c. Travel cost for participation of NACA staff in National Workshop II (US$4,620) (Annex XIII and Annex XV)
d. Project Terminal workshop (US$30,836, NACA to organize under an LOA) (Annex XIV);
e. Collection of information and data, in each country and/or from other sources; and other studies as identified (e.g., livelihood analysis and environmental impact assessment of marine finfish farming by RRA in each country, US$3,000 per country) (Total US12,000 for four countries, NACA to organize under an LOA) (Annex XV);
f. Implementation, supervision and monitoring of field activities (US$29,160, NACA to organize under an LOA) (Annex XV);
g. Analysis of data collected from field trial and preliminary interpretation of results (US$3,900, NACA to organize under an LOA) (Annex XV);
h. Implementation of surveys/growth trials (farmer trials over two growth cycles in four countries) (US$76,800 to be contracted to the responsible ministry/coordinating institutions in four participating countries, US$19,200 per country, preliminary estimated cost per trial US$1,600 for two growth cycles, twelve farmers for each country. Details of the estimated budget and design of the growth trial will be finalized at inception workshop); and
i. Publication/printing*:* preparation of dissemination material including production of technical reports (field documents) (US$15,000)

The four activities listed above (a) First in-country national stakeholders' workshop/training sessions, (b) Inception workshop, (c) Travel cost for participation of NACA staff in National Workshop II (c) Project Terminal workshop, (d) Rapid Rural Appraisal of marine fish farming (livelihood and environmental impact), (e) Implementation, supervision and monitoring of field activities, and (f) Data analysis of field trial will be contracted to NACA under a single LOA(US$26,020 + US$15,816 + US$4,620 + US$30,836 + US12,000 + US$29,160 + US$3,900). The total amount of LOA to NACA will be US$122,352. Draft TORs of LOA are given in Annex XIV and final version will be prepared after the project approval.

For projects costs arising from the implementation of the above actions, which could not be met from FAO's budget, additional budgets should be allocated by the respective Governments and national implementing agencies (see section 4.3 above on their expected contributions).

4. Material, Supplies and Equipment

FAO's commitment is limited to the supply of the quantities specified in the project document, up to the budgetary allocation.

Expendable materials and supplies

Water quality sampling reagent, field sampling materials; data log books; software (MS Office and statistical analysis and modeling software), UPS (uninterrupted power supply), small supply items for surveys; stationery and other standard office supplies including printer cartridges.

Non-expendable Equipment

- Procurement of one water quality monitoring equipment and one computer (with printers and peripherals and related furniture) to each country and the coordinating body, adapted for local and international language requirements and capacity for handling data storage and modelling packages. (Annex XVI)

US$25,000 (US$11,400 for expendable supplies and US$13,600 for equipment)

5.General Operating Expenses

To cover miscellaneous expenditures required in the field for project operations in the four countries.

The operating expenses are itemised as follows:

- Freight charges for feed;
- Independent feed quality analysis. In order to make the scientific information gathered more robust and consequently to ensure adoption it will be most desirable to have an independent feed analysis undertaken; and
- Communication, office supplies and processing of the project terminal statement

Total US$22,000

6.Direct Operating Expenses

Direct operating expenses to cover miscellaneous expenses related to the implementation of the project (calculated on the basis of rates established by FAO, 7% of sub-total).

US$31,413

7. Workshop and Training

a. Two regional and one (in each country) national workshops/training of varying duration are detailed in Annexes and are included in the contractual service agreements (See above 3a, b and c and annexes XI, XII and XIV);

b. Organization of an in-country workshop/training session (US$3,810 for each workshop excluding cost of international travel of NACA staff): total US$15,240 (to be organized locally through FAO Representation and funding to be arranged through Field Budget Authorization, FBA) (Annex XIII).

Training

- Local government and support staff (national project coordinator, extensionist and person responsible for monitoring of growth trial) will be closely associated in the implementation of project activities in the design and conduct of surveys, collection and processing of relevant information, data analyses, computer processing, and reporting for use in planning management. As the work progresses these personnel will work closely with the international and TCDC consultants and will be trained in the specific expertise. In addition, the aquaclub members will be trained at record keeping, application of proper feed management practices and data collection and environmental monitoring through the project and at the national and regional workshops.

SECTION 5. OVERSIGHT, MONITORING, MANAGEMENT INFORMATION, AND REPORTING

5.1 Monitoring and Knowledge Sharing

Project Coordination Unit: NACA, FAO FIMA, FAORAP and National Project Coordinator from each country

The monitoring system of the project will be under the joint responsibility of the FAO and NACA. The Project Coordination Unit, lead by the NACA DG and under the technical guidance of FAO FIMA Fishery Resources Officer, will supervise the plan of activities and the implementation stages of the project in order to ensure overall coherence and solution to substantial problems that might occur during the project life. A good part of the PCU work will be via e-mail communication. The PCU, however, will meet at least once a year to review the progress and orientate the project and approve the annual workplan. FAO technical backstopping missions led by FAO FIMA and RAPI will closely monitor the progress of implementation of the project and will advise NACA accordingly.

5.2 Communication and Visibility

Communication and visibility will be a vital part of the implementation. The activities, contributing to its visibility and communication, are essentially:

- Initial database (output 1) to be shared between participating countries
- Meeting minutes
- Inaugural planning and national workshop reports
- Dissemination of project results

5.3 Reporting Schedule

- Inception report: NACA with input from national project coordinators and FAO
- Annual workplan- NACA with input from FAO
- Quarterly progress report: NACA with input from National project coordinators
- National workshop report: National project coordinators with input from NACA
- International consultants' mission report: Consultants
- FAO backstopping mission report: FAO FIMA, FIEP and FAO RAP
- Project terminal workshop report: NACA and FAO
- Project terminal statement: FAO

Annex I

PROJECT BUDGET COVERING FAO INPUTS (IN US$)

Countries: **Indonesia, China, Thailand, Viet Nam**

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

Project symbol: TCP/RAS (8-II-RAS-227)

Budget line	Component Description	Sub/child Comps.	Main/parent Comp.
5013	**Consultants**		**-**
5542	Consultants – International	16,200	**27,080**
5543	Consultants – National		
5544	Consultants - TCDC/TCCT	10,880	
5545	Consultants - Retired Experts	-	
5546	Consultants - South South Cooperation	-	
5547	Consultants - UN Volunteers		
5014	**Contracts**		214,152
5650	Contracts Budget (including training)	214,152	
5020	**Locally Contracted Labour**		**-**
5652	Casual Labour - Temporary Assistance	-	
5021	**Travel**		**85,150**
5661	Duty travel others (FAO staff only)	4,500	
5684	Consultants - International	13,170	
5685	Consultants – National		
5686	Consultants - TCDC/TCCT	18,505	
5687	Consultants - Retired Experts	-	
5688	Consultants - South South Cooperation	-	
5689	Consultants - UN Volunteers	-	
5691	Consultants - Young Professionals	-	
5692	Travel TSS	48,975	
5694	Travel – Training		
5698	Travel non staff (counterparts)		
5023	**Training**		**15,240**
5920	**Training Budget***	**15,240**	
5024	**Expendable Equipment**		11,400
6000	Expendable Equipment	11,400	
5025	**Non Expendable Equipment**		13,600
6100	Non Expendable Equipment Budget	13,600	
5027	**Technical Support Services**		**60,140**
6111	Report Costs	2,000	
6120	Honorarium TSS	58,140	
5028	**General Operating Expenses**		22,000
6300	General Operating Expenses Budget	22,000	
5029	**Support Cost**		**31,117**
6118	Direct Operating Costs	31,117	
	Grand Total		**480,175**

*Some of the training will be carried out under contracts budget.

WORK PLAN – TCP/RAS/ 8-II-RAS0227 Annex II

ACTIVITIES	YEAR 1												YEAR 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Output 1 An assessment of the livelihoods involved in the supplying of trash fish/low-value fish, its marketing channels, and on farmer perceptions in the use of trash fish/low-value fish as aquaculture feed in all four countries																								
Activity 1.1 Planning of rapid rural appraisal (RRA)																								
Activity 1.2 Pre-selection of three villages in all countries (based on national project coordinators and project staff's knowledge) to represent different geographic areas.																								
Activity 1.3 Preparation of a RRA questionnaire																								
Activity 1.4 Field testing of RRA questionnaire in all three countries																								
Activity 1.5 Finalization of RRA questionnaire and final site selection																								
Activity 1.5 RRA data collection																								
Activity 1.6 Compilation and analysis of data to prepare a baseline assessment and database for the assessment of the livelihoods involved in the supplying of trash fish/low-value fish, its marketing channels, and on farmer perceptions in the use of trash fish/low-value fish as aquaculture feed																								
Activity 1.7 Redoing RRA/livelihoods analysis																								
Activity 1.8 Compilation and analysis of data to prepare final assessment of farmers' perception on the use of trash fish/low value fish versus formulated feed																								
Output 2 Formation of "aqua clubs" and their capacity building																								
Activity 2.1 Selection of farming clusters (three clusters from three areas) to represent different geographic areas from each country																								

ACTIVITIES	YEAR 1												YEAR 2											
Activity 2.2 Formation of aquaclubs in each farming cluster, nine from each country (from three clusters from three areas in each country)																								
Activity 2.3 Participation of aquaclub members in national stakeholders workshops/training for capacity building																								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Output 3 Availability of statistically rigid scientific data on the performance and the cost-benefits on the use of trash fish/ low value fish versus compounded pellet feeds																								
Activity 3.1 Recruitment/selection of farmers for conducting farmers participatory trials (FTP)																								
Activity 3.2 Preparation of preliminary format for FTP and circulation for feedback																								
Activity 3.3 Shipment and delivery of commercial feed from the commercial feed manufacture to trial side																								
Activity 3.4 Determination of the details of the farmer participatory trials, with the primary objective being to set up a "blind-test" trial to test the efficacy of compounded feeds as opposed to trash fish																								
Activity 3.5 Finalization of trial protocol based on the feed back from the national project coordinators and other stakeholders																								
Activity 3.6 Training of selected farmers on the use of commercial aquafeed for growth trial, monitoring of fish growth, water quality etc.																								
Activity 3.7 Farmer s' participatory trials (two growth cycles)																								
Activity 3.8 Monitoring of trial activities by the national coordinating team																								
Activity 3.9 Analysis of results of the growth trial																								
Activity 3.10 Preparation of synthesis of all findings/results of growth trial and all other activities																								
Output 4 Preparation and dissemination of extension material on the use of compounded feeds as opposed to																								

ACTIVITIES	YEAR 1												YEAR 2											
trash fish/ low value fish in small scale mariculture in Asia																								
Activity 4.1 Preparation of extension strategy (ies) for the workshop to consider for adoption and wider dissemination																								
Activity 4.2 Commencement of preparation of dissemination materials in consultation with the stakeholders																								
Activity 4.3 Organization of national workshop and development of methods of dissemination mechanism of the available information																								
Activity 4.4 Fine tuning of the dissemination/extension materials/packages for wider dissemination and adoption from newly emerging countries embarking on marine finfish culture																								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Output 5 Identification of options for establishing business relationships between aquaclubs/farmer groups and feed manufacturers/suppliers resulting in the development and execution of appropriate micro-credit schemes for feed procurement and its incorporation into Better Management Practices (BMP).																								
Activity 5.1 Initiation of dialogue between feed suppliers/ manufacturers, farmers and national project coordinators on the potential mechanisms available to developing a micro-credit scheme for feed procurement																								
Activity 5.2 Development of blue-print for the process to each of the participating country governments for scrutiny, and where relevant initiate negotiations with local financial institutions on operational procedures and guidelines for introduction of such a scheme																								
Activity 5.3 Discussion on micro-credit schemes for feed procurement through the aquaclubs in national workshop and prepare necessary recommendation on policy/legislative changes to the respective governments to sustain the strategy for micro-credit scheme																								

ACTIVITIES	YEAR 1												YEAR 2											
Activity 5.4 Finalise the blue prints for implementation of micro-credit schemes for feed procurement through dialogue between farmer representatives, representatives of feed suppliers / manufacturers and relevant financial institutions.																								
Activity 5.5 Organization of regional/terminal workshop to discuss and decide • Development of regional guidelines to sustain the adoption of compounded feeds and facilitate micro-credit scheme • Reach agreement on the fine-tuned micro-credit system(s) for feed procurement and its implementation procedures • Inclusion of guidelines into BMPs																								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Output 6 Improved capacity in governmental personnel in extension related to feed usage and management in small-scale marine fish farming in the region																								
Activity 6.1 Participation governmental personnel (i.e., NPD) in Regional Inception Planning Workshop																								
Activity 6.2 Participation of governmental personnel (i.e., NPD, Aquaculture Extensionist) in formation of aqua clubs																								
Activity 6.3 Participation of governmental personnel (i.e., NPD, Aquaculture Extensionist) in National Stakeholders Workshop/Training I																								
Activity 6.4 Participation of government personal in activities related to farmers participatory trial (i.e., activities 3.1, 3.4, 3.5 and 3.8)																								
Activity 6.5 Participation of government personal in activities related to preparation of extension material (i.e., activity 4.2)																								
Activity 6.6 Participation in National Workshop II																								
Activity 6.7 Participation of governmental personnel (i.e., NPD) in Regional Project Terminal Workshop																								
Output 7 Comparative environmental assessment of using																								

ACTIVITIES	YEAR 1												YEAR 2											
trash fish and formulated feed																								
Activity 7.1: Preparation and implementation of environmental impact assessment (baseline)																								
Activity 7.2: Compilation and analysis of data to prepare a baseline environmental assessment																								
Activity 7.3 Redoing environmental impact assessment																								
Activity 7.4 Comparative analysis of pre- and post-project data to assess the impact of formulated feed on environment																								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Output 8 Monitoring system of farmers' perceptions and uptake of formulated feed for their aquaculture operations and environmental impacts is developed																								
Activity 8.1: Participatory development of a monitoring system including verifiable indicators in collaboration with farmers involved in trials (simple questionnaire format) to evaluate initial perceptions of formulated feed.																								
Activity 8.2: Collection of information at regular intervals to assess the evolution of perception, the uptake and noticed environmental impacts as part of the monitoring system.																								
Activity 8.3: Comparative analysis of pre and post project perceptions, evaluation of uptake of formulated feed and evaluation of changes in environmental impacts (in combination with results from activities 7.1 to 7.4) using verifiable indicators.																								

A log frame for the project (which will include verifiable indicators, responsibilities etc.) will be elaborated during the inception workshop for the project with all stakeholders. This document will draw the project "roadmap" – i.e. a document, agreed by all key stakeholders and it will clearly spell out all activities and steps in the project development and will be used as a reference throughout the project duration.