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Dear Reader,

The date of 18 April 2002 will be an historic day for aquaculture, as we commence the First Session of the Committee on Fisheries (COFI) Sub-Committee on Aquaculture, the first ever global intergovernmental forum to discuss issues concerning development and management of aquaculture. The Sub-Committee came to light in an era when aquaculture's potential for economic growth, poverty alleviation, food security and rural livelihoods has been fully realized. However, the sector now faces strong debate on the negative social and environmental repercussions of certain mismanaged and poorly planned developments. With this backdrop, I believe that the Sub-Committee has a responsibility to play a significant role in addressing both the positive and negative aspects of the sector and providing guidance and recommendations for better management of aquaculture, which is currently the fastest growing food-producing sector in the world.

The Sub-Committee did not hatch overnight. There have been discussions on the establishment of an Aquaculture Sub-Committee for almost a decade. At the last sessions of COFI and the FAO Council in 2001, the decision to establish the Sub-Committee was finally taken, and we now face the challenge of making the best use of this opportunity to effectively and wisely assure sustainable development of this important sector. The question that immediately arises is "What can the COFI Sub-Committee do to realistically help sustainable development of aquaculture at all levels?" Do we have an answer?

As mentioned earlier, the Sub-Committee is the only global inter-governmental forum mandated to discuss issues specific to aquaculture. From many years of experience, it is clear that, although sectoral development takes place at the national level, sectoral sustainability remains the focus of national, regional, and global levels. Aquaculture produces fish that are consumed at farm sites, sold locally and exported to overseas markets. Aquaculture produces fish in shared waterbodies, a fact that has multi-jurisdictional implications and impacts. Wherever produced and wherever sold, the final product is primarily for human consumption and must, therefore, provide quality nutrition and be hygienic and safe to eat.

In an era of globalization and trade liberalization, we need to discuss aquaculture at a global level, as there are many issues which have both international implications and interest.

We have a great opportunity ahead of us with this new vehicle, the Sub-Committee on Aquaculture. The challenge will be to use the opportunity to discuss "real issues", and to develop recommendations and to bring consensus between governments and other stakeholders that make a real impact on the sustainable development of the sector, in support of alleviating poverty, providing food security, improving rural livelihoods and boosting national economies. In undertaking this challenge, we cannot forget the fact that aquaculture is not an isolated farming activity. It is uniquely blended into many aquatic environments that provide the life-blood of aquatic production. We must, therefore, ensure that any recommendations and guidance from the Sub-Committee takes into serious consideration environmental sustainability, social equity and economic feasibility. I am confident that the COFI Sub-Committee on Aquaculture can and will help us in achieving these challenging but essential goals.

Rohana Subasinghe
Chief Editor

Cover photos courtesy of NACA (Network of Aquaculture Centres in Asia Pacific) and FAO
Some aquaculture facilities in Asia

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CONTENTS

Sustainable aquaculture for poverty alleviation (SAPA): a new rural development strategy for Viet Nam - Part II Implementation of the SAPA strategy <i>Le Thanh Luu</i>	4
Fish marketing in the Northern Mountains of Viet Nam <i>Raymon van Anrooy</i>	8
Can scallop farming expand in the Caribbean region? <i>Alessandro Lovatelli</i>	11
FAO/Government of Australia Expert Consultation on Good Management Practices and Good Legal and Institutional Arrangements for Sustainable Shrimp	12
Sustainable commercial aquaculture development South of the Sahara	15
Projects News <i>Manuel Martinez</i>	18
News from the regional offices <i>Simon Funge-Smith and John Moehl</i>	20
New faces in FAO aquaculture group	25
New publications	27
Information brochure on the Second International Symposium on the Management of Large Rivers for Fisheries	30

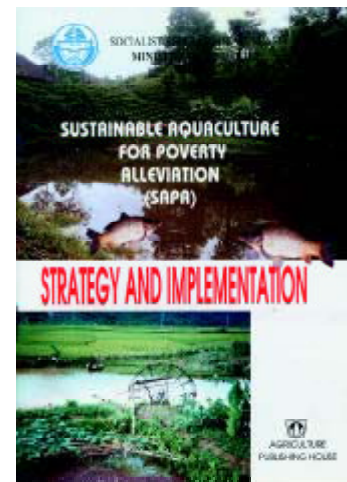
Sustainable aquaculture for poverty alleviation (SAPA): a new rural development strategy for Viet Nam - Part II

Implementation of the SAPA strategy

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The first part of this article, which dealt with the background, recognition, justification and emphasis of SAPA, was published in *FAW 27*. Part II discusses the objectives, emphasis, mechanisms and implementation processors of SAPA. FAO has been actively involved in the process of developing SAPA, the interesting strategy of "sustainable aquaculture for poverty alleviation".



THE GOAL, PURPOSE AND OUTPUTS OF SAPA

The Viet Nam Development Report 2000 "Attacking Poverty" emphasizes that each sector should design a programme that contributes to poverty alleviation, through contributing to three key pillars of poverty alleviation: (1) creating opportunity, (2) ensuring equity and (3) reducing vulnerability.

The SAPA strategy is formulated by the Ministry of Fisheries (MOFI) to contribute to the goal of poverty alleviation as part of the Government's overall "Hunger Eradication and Poverty Alleviation" (HEPA) strategy. The purpose of the SAPA strategy is to enhance the livelihoods of poor and vulnerable people through aquaculture with the following outputs:

- Capacity of institutions strengthened, particularly local institutions and communities, to understand and support the livelihood objectives of poor and vulnerable people who depend on, or who could benefit from aquaculture;
- Access improved for poor people, to materials, information, financial and extension services and markets; and
- Communication improved among stakeholders (at all levels within and outside the sector), through awareness raising and knowledge sharing; networking; inter-sectoral/sectoral and donor coordination; introduction of participatory planning, implementation, monitoring and evaluation approaches; and informing policy development; and
- Environmentally friendly, low-risk, low-cost aquaculture technologies and management practices developed and adopted.

SAPA APPROACH

The SAPA strategy recognizes that a step-wise approach is needed to gradually build knowledge and activities based on analyses of livelihoods and local pilots. It makes the aquaculture sector part of the Government umbrella "Hunger Eradication and Poverty Reduction" (HEPR) Strategy coordinated by MOLISA (Ministry of Labour, Invalids, and Social Affairs). The following indicative activities will support the achievement of the above outputs.

Building capacity for poverty alleviation

The SAPA strategy emphasizes the need for strengthening of capacity among institutions, particularly local institutions, to understand and support the livelihood objectives of people in inland and coastal communities who depend on or who could benefit from aquaculture. The capacity of local institutions to understand poor people's needs and participatory skills is the basis for guiding interventions that support and are based on poor people's needs. The capacity for livelihood analyses will therefore be given a high priority during the early stages of implementation of SAPA. At the beginning of the implementation period, local institutions will be identified and their training needs for livelihood analyses clarified. SAPA will support capacity building based on these needs for the staff of these institutions, so that they can take responsibility to implement SAPA activities. Capacity building will progress through workshops, training and other relevant programmes and practical fieldwork on livelihood analyses in selected pilot communes.

Improving access of poor people to services

The SAPA strategy recognizes that better support for materials, information, financial and extension services and markets is required to serve the needs of poor people. The Strategy will therefore seek to establish more effective mechanisms for poor people to access the inputs and services required. Based on livelihood analyses, coalitions of partners will be established for support in selected locations. Consultations and partnerships will be established with agencies, such as the Bank for the Poor, to explore and develop means to improve access to financial and other services. The SAPA strategy will support pilot projects to develop new ideas and approaches that improve access of poor people to services. Such pilots would describe and recommend ways to improve access to resources, innovative extension tools and methods, and better access to markets, credit and other services to support poor people, and experiences will be widely shared.

Improving communications and networking

The SAPA strategy recognizes the need for much more effective networking and communication on poverty alleviation and aquaculture at all levels. Communication will be improved among relevant stakeholders through awareness raising and knowledge sharing, networking, sectoral and inter-sectoral and donor coordination, and the introduction of participatory planning, implementation, monitoring and evaluation approaches. SAPA will collate and share existing and new experiences, and the lesson's learnt will be used to inform government policy development. Initially, the SAPA document will be published and widely disseminated among concerned agencies and other stakeholders, and the document will be adapted to and circulated among farmers. To promote effective communication among existing projects, an information system will be established, building on existing systems and resources in Viet Nam. Links will also be promoted between Viet Nam and regional initiatives.

Environmentally sound, low-cost, low-risk and easily copied systems, based on identified livelihood objectives of poor and markets will be identified and disseminated through appropriate channels and in response to local needs. New ideas and approaches emerging from pilot projects will be communicated and widely shared. Communication and coordination among donors will be encouraged through formal and informal meetings to promote effective cooperation in support of the government objectives for poverty alleviation.

Technology and management

The SAPA strategy supports the development of environmentally friendly, low-risk, low-cost aquaculture technologies and management practices relevant to poor people. The technologies for small-scale freshwater aquaculture appropriate for poverty alleviation are now largely in place. Rather than technical research, the need now is for responsive government institutions, effective targeting of poor people and support to overcome the constraints to entry. In coastal areas, where there are significant numbers of poor people, such environmentally friendly, low-risk, low-cost technologies are not readily available, and a major concern in Viet Nam is to develop the technologies and management systems that are appropriate for poor people. In support of the development of aquaculture techniques, better social and environmental impact assessment methodologies and aquatic animal health management strategies for small-scale farmers are required. SAPA will support development of appropriate hatchery, nursery and grow-out technology and management practices, as required, through participatory research agendas. Capacity building and other support may be required to orient research institutes towards such new participatory-driven agendas. In open access resources in inland and coastal areas, SAPA will support the development and implementation of co-management approaches that help secure the livelihoods of poor people.

Target groups and areas

The ultimate target group of SAPA is poor people in rural areas where opportunities exist to diversify and improve livelihoods through aquaculture. Special attention will be given to the most vulnerable groups, and thus the geographical focus will be on the Northern Mountains, Central Highlands, North Central Coastal provinces and the Mekong Delta. The initial activities of SAPA will then be towards identifying the poor and more vulnerable groups, as a basis for more targeted follow-up activities within these selected geographical areas. The immediate target of SAPA is the supporting institutional and policy framework, and SAPA will establish links with district, provincial, national and regional institutions, and with donor/development agencies with responsibilities for poverty alleviation and sustainable rural development.

Integration with other poverty programmes

The SAPA strategy is to work alongside other projects and programmes, raising the profile of the role of small-scale aquaculture among external and Government resource providers within the emerging operational framework for decentralized rural development (whether these follow a broad rural development strategy or concentrate on a particular development sector, be it agriculture,

health or education). If this takes the form of the current "1715 Communes Project", then local government (communes) will be able to propose projects in small-scale aquaculture in much the same way as presently takes place in rural infrastructure projects. As such, the SAPA strategy will help to widen the Government resources available for implementing this concept, as is already proposed in Decision No. 135. Aquaculture options for poverty alleviation should be emphasized within the development arena, through linking to rural development projects such as the World Bank pipeline Project on Poverty Reduction for the Northern Mountains and the Asian Development Bank (ADB) project for poverty reduction for the Central Region. Already such a relationship is developing with the European Union-funded Rural Development Project in Cao Bang under the Asian Institute for Technology – Swedish International Development Agency (AIT-SIDA) Project.

It is therefore intended to move forward through implementing a series of "pilots" (pilot projects) in which both the approach itself and technical and management options for aquaculture could be tested. In some cases, such projects already exist, and would form the basis for this experimentation. In other areas, it may be necessary to develop new pilot projects.

Responding to poor people

The accountability and responsiveness of the MOFI to poor people will be key to the success of SAPA. The development of mechanisms for broad participation and the delivery of services, involving poor people in planning (identifying strengths and objectives using in a livelihood approach), identifying and developing partnerships, implementation, monitoring and evaluation is necessary. SAPA will aim to forge ties within communities and facilitate local collective action, by initiating programmes that build assets of poor people or make services more readily available. These might include intensive dissemination of information, facilitating networks to make available to communes the support they need to implement programmes. Where the management of an aquatic resource involves or is affected by other stakeholders, especially in coastal areas, wider public involvement will be encouraged. It is recognized that human resource constraints preclude the development of a dedicated extension service for the aquaculture sector. Instead, links would be made with non-specialist agencies (Agricultural Extension Services), social organizations and mass media, and unconventional means of extension explored. Materials developed with farmer participation and based on the information derived from pilot projects and success stories will be produced to assist these non-specialist groups in dissemination of information.

Awareness creation and capacity building among the institutions supporting the poor (e.g. local government/administrations, mass organizations,

such as Departments of Fisheries (DoFI), Departments of Agriculture and Rural Development (DARD) and Departments of Science, Technology and Environment (DOSTE), and social organizations, such as the Farmers' Association, Women's Union (WU) and Youth Association) to better understand and facilitate their objectives will be the key, to build capacity among poor people in support of their objectives. The emphasis will be on understanding the place of small-scale aquaculture in poor people's livelihoods and the objectives and strengths of the poor. This will require creation of a training capacity, initially in pilot areas. It should be noted that some institutes, universities and projects have already developed some capacity in a participatory process, e.g. the United Nations Development Programme (UNDP)/FAO "Aquaculture Development in Northern Uplands" project is proving to be a focus of communicating skills in participatory assessment.

IMPLEMENTATION OF THE SAPA STRATEGY

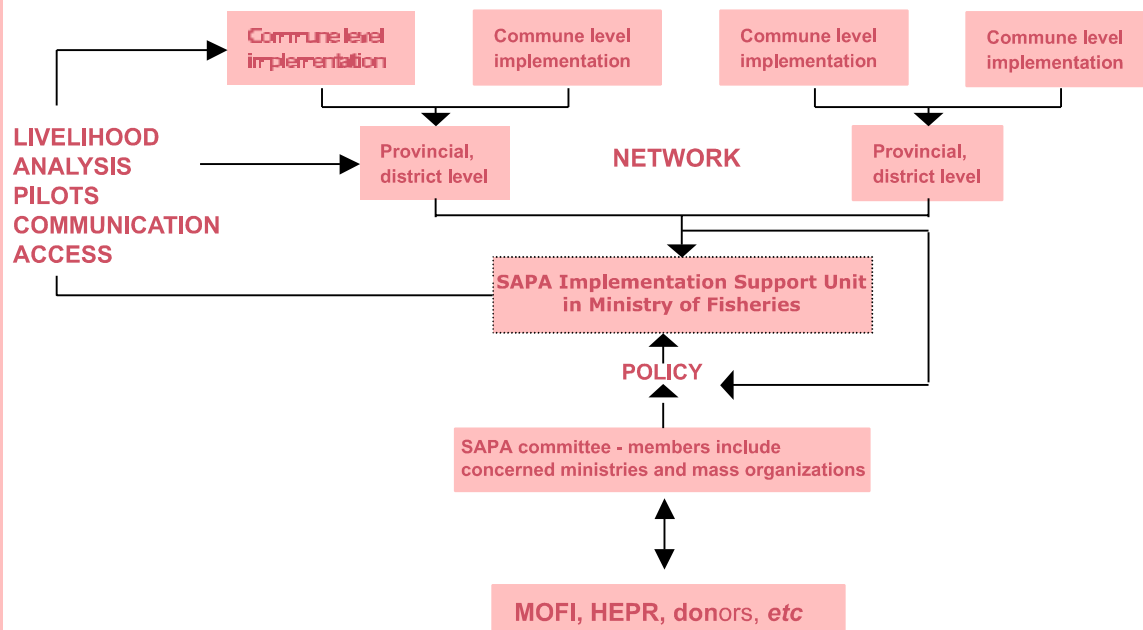
SAPA will be implemented gradually. It begins with capacity building in livelihood analysis that will be used to better understand the livelihoods of poor people in selected social and environmental contexts. This understanding and participatory process will provide the basis for development of a detailed workplan and implementation of activities required to support poor people. The Strategy itself is dynamic and has the capacity to adapt to changes as required during the long-term process of implementation. The Strategy targets 20 selected areas for the main activities during the first five-year period from 2001 – 2005. This time frame is in line with the first phase of the HEPR Strategy.

After 2005, a second five-year phase is planned that would aim to expand and duplicate the experiences of the first five years to a wider target audience throughout the country. The activities and the implementation plan of the Strategy are given in this Section II – Implementation of the SAPA strategy. The activities required are outlined in a logframe that will form the basis for development of detailed workplans for SAPA.

Institutional arrangements for implementation

Further development and implementation of SAPA is the responsibility of a committee that will consist of members from concerned ministries and mass organizations (e.g. MPI [Ministry of Planning and Investment] MARD, MOLISA, MOET, MOFI, WU and Bank for Poor). Ministerial Leadership within MOFI will chair it. The SAPA Committee will regularly communicate with the HEPR Strategy, approve annual workplans and reports, and promote the Strategy within the state machinery. The Chair of the SAPA Committee (or a person designated by the Chair) will represent MOFI in the Government HEPR

Figure 1. Institutional Char. of SAPA Implementation Support Structure



Strategy Committee. An Implementation Support Unit (ISU), to be established within MOFI, will be responsible for the coordination of the day-to-day implementation of the Strategy among the stakeholders (e.g. DOSTE, International Cooperation Department, Extension Centre, Department of Fishery Resource Management, the Research Institutes for Aquaculture [RIAs], provincial DOFIs and DARDs, and other relevant organizations). The ISU will have one full-time administrator and several support staff.

The ISU will be the national focal point for linkage with other regional activities, such as the Asia regional "Support to Regional Aquatic Resources Management" (STREAM) initiative. As an implementation mechanism, appropriate focal points at provincial, district and commune levels will be selected for communications and information exchanges, and the communications network will be gradually expanded during implementation of the SAPA strategy. The focal points at the commune level will implement the day-to-day activities, assisted by the provincial and national networks. The implementation of SAPA will be decentralized, with support as needed from the ISU (see Figure 1).

ACTION PLAN

The implementation will follow in accordance with the Government HEPR schedule for the period 2001-2010. There is a need for more detailed planning to be done on an annual basis. The MOFI will provide in-kind and cash contributions to support implementation of SAPA. The in-kind contributions will include an office for the Implementation Support Unit (ISU). The cash contribution will include an annual allocation of about VND300 million (US\$20 000) for staff, for daily operation activities as contributions for the SAPA. Donor assistance will be requested to support the holding of workshops, training activities, office equipment and start-up operational costs for SAPA and the field activities. Some personnel and *ad hoc* international expert assistance will also be required, based on detailed needs to be elaborated. The local interventions in target areas will be formulated through a participatory process and submitted to government and donor agencies for funding support. The Government will undertake further discussions and negotiations to explore funding mechanisms for supporting poor people through SAPA during 2002.

Fish marketing in the northern mountains of Viet Nam

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INTRODUCTION

The Food and Agriculture Organization of the United Nations (FAO) and the United Nations Development Programme (UNDP) are jointly supporting the Viet Namese Government to achieve food security and alleviate poverty in three Northern Mountain provinces (Hoa Binh, Lai Chau and Son La) in Viet Nam through aquaculture development. Since 1999, the project VIE/98/009/NEX "Aquaculture Development in the Northern Uplands" has promoted aquaculture among the poor and vulnerable ethnic minority population in the three provinces. The project, which makes use of various participatory extension methods, has trained more than 5 000 farmers over the last few years in simple aquaculture techniques.

It can be said that the aquaculture development approach taken has resulted in a real success story. Many of the poor farmers who started aquaculture produce more than enough fish to cover household consumption needs, guaranteeing a large share of the total protein intake of the household members. Most of the farmers are now even able to market part of their production. In general, they market between 30 and 70 percent of their total fish production. The species most often cultivated are the following, in order of importance: grass carp, common carp, Indian major carps, bighead carp, silver carp, tilapia and *Colossoma* spp. Aquaculture development is continuing steadily, with more farmers starting to produce fish, and those farmers who are already established producing more fish each year. Thus, it was considered necessary to assess the local market for fish. This paper provides a summary of some findings of a fish marketing study carried out in the last quarter of 2001.

AGRICULTURE - AQUACULTURE PRODUCTION CHARACTERISTICS

A large majority of the farmers in the northern mountain provinces are poor and have only limited suitable land available for their farming activities. In their struggle for survival, they often grow various crops, of which rice, cassava and maize are the most important. In addition they generally have various small farm animals (chicken, ducks and pigs) and if better off, also one or more buffaloes. Fish was cultivated traditionally in the rice-fields in a very extensive way, by preventing the escape of indigerous fish that have entered the rice fields as small fingerlings with the water flow. Although this type of fish culture contributed to the diversification of farming activities and the risk-spreading behaviour of the farmers, fish production was very low and fish were not considered very important for the household diet. The active promotion of fish culture, including a focus on the opportunities for fish culture under the specific mountain conditions and on simple production methods, caused many farmers to dig ponds next to their homesteads and to purchase fingerlings to stock in these ponds and in the rice-fields. Initially, the purchase of fingerlings was difficult for the farmers, as they needed to travel large distances to the few hatcheries located in their or neighbouring provinces, and arranging transport was often expensive. However, a number of local people saw good business opportunities in fingerling trade, and now middlepersons and some hatchery operators make sure that, even in the most remote areas, fingerlings can be purchased at lower rates each year.

Among all suitable fish species, grass carp was, and still is, most preferred by fish farmers in the mountain areas, as the overall input costs, apart from the purchase of fingerlings, are very low. All



The market in Lai Chau town on a rainy day

Feed for the fish is grown at their own farm, and often all family members are involved in cutting grass and feeding the fish, making it a joint activity that does not require too much time from each individual household member. However, in general, farmers stock a mix of species in their ponds and rice-fields to use the available water resource better and spread the risks involved in fish culture. Grass carp cultivation, especially, has encountered various disease problems (e.g. red spot) in the last years, resulting in a more cautious approach towards this species among farmers.

Apart from the fingerlings, the level of purchased inputs used in the production process of fish is very low, both for ponds and rice-fields. Hardly any chemicals or drugs are used, and feed is generally derived from the farmer's own land. For the purchase of fingerlings, credit is sometimes obtained at an interest rate of between 0.5 - 0.8 percent per month. The main sources of credit are the Viet Nam Woman's Union, which works largely with funds from the project, and the Viet Nam Bank for Agriculture and Rural Development (VBARD).

MARKETING CHARACTERISTICS

All fish farming households interviewed during the study consume part of the fish production within the household. The decision of which fish should be marketed and which should be consumed at home is generally based on the market price of the fish and/or the ease of catching. Fish species with a high market value (e.g. common carp, grass carp) are primarily sold, while species such as tilapia and silver carp are commonly consumed at home and are therefore, not seen very much at the market. Indian major carps, such as mrigal and rohu, are generally considered very tasty and are sometimes consumed at home, although the prices at the market are comparable to those of grass carp for the larger-sized fish.

Fish farmers in the northern mountains use various harvesting schemes. Pond-culture farmers generally use multiple harvest systems (often between four and seven harvests), with relatively larger harvests towards the end of the culture cycle. Rice-fish culture and cage-culture (grass carp) farmers commonly harvest once per year, and they often make use of middlepersons for the marketing of their product. The reasons for not doing the marketing by themselves are many:

- ✓ **Time** - Time is generally a constraint, as the farmer has to carry out much work at the farm around harvest time, especially if he or she is a rice-fish farmer. In addition, feed collection, pond and rice-field preparation and pond management are, all together, very time demanding. Fish are collected at the farm-gate by the middlepersons, limiting the time needed for marketing. In this respect, it should be noted that any time that is used for marketing itself is considered a waste by many of the farmers.
- ✓ **Labour** - Household labour is lacking; the size of the households' workforce is often too small to be able to dedicate one or more person's labour for a longer period to marketing activities. In addition, most farmers do not consider it safe to employ non-relatives to carry out the marketing for them, as they expect their employees will cheat them.
- ✓ **Local market prices and marketing margins** - Once in a while, the farmers check the price at the local market for the products they produce. The market prices for grass carp and common carp generally range between 1.00 and 1.30 US\$/kg, while tilapia costs between 0.70 and 0.80 US\$/kg. Moreover, the farmers are aware that price of fish increases by around 0.12 US\$/kg in the days before local and traditional festivals and holidays. With this information and the information they get from neighbouring farmers, they negotiate the marketing margin for the middleperson/market trader. This marketing margin is generally between 0.08 and 0.20 US\$/kg, which is between 10 and 20 percent of the final consumer price. As prices locally do not show much fluctuation over the year, agreements

between the farmers and middlepersons about margins are easily made.

- ✓ **Knowledge about keeping fish alive** - Farmers generally do not know how to keep the fish alive during transport and sale at the market.
- ✓ **Transport means** - As the local (commune) market sometimes cannot absorb larger quantities of fish, transport means are needed. However, not many farmers have access to their own transportation (e.g. a bike, motorbike or car) and public transport is limited (and thus scarce and expensive) or non-existent in the remote mountain areas.
- ✓ **Credit and direct payments** - Middlepersons always pay the amount agreed upon to the farmers directly after the sale of the fish to market traders or consumers, which generally implies that the farmers get cash for their product one day after the harvest. In contrast, between 20 and 70 percent of the customers at the market buy the fish on credit and pay generally at the end of the month after having received their monthly salary, thus increasing the time between delivery of the product and receiving payments. Moreover, some customers at the market want to re-negotiate the price at the end of the month and thus, the middlepersons/market traders often encounter difficulties in getting the complete sum of debts.
- ✓ **Marketing skills** - Farmers often consider themselves as not experienced in marketing. They lack marketing skills, such as negotiation and communication skills, and fear that they will get a much lower price for their product if they would market it themselves.
- ✓ **Fingerlings** - Middlepersons sometimes provide fingerlings at (hatchery/nursery) cost price to farmers with whom they have a good relationship. In this way, they guarantee that the respective farmer later sells his production to him or her. The cost of the fingerlings is often deducted from the payment for the harvest.
- ✓ **Uncertainty** - Many of the fish farmers are of ethnic minority origin (Mung, Mhuong or Tai), while the trade at the markets in the district and provincial centres is mainly in hands of the Kinh majority. Thus, uncertainty about the language, rules and regulations at the market is widely felt among the fish farmers.

Fish are generally brought alive to the market, kept in buckets and basins of different materials with water. The market traders (who are generally women) keep the fish at the market alive by providing oxygen through pouring water with plastic bags or just by hand movements. The latter often causes skin problems (weak skin and infections) for these women, but neither electricity nor oxygen or water pumps are available at the markets to solve these problems. Market facilities necessary for selling live fish, such as clean fresh water and shelter against sun and rain, are often not available, and the space assigned to them for carrying out their business is never as clean and hygienic as desired. In addition, there is no sewage system to get

rid of the fish waste produced; therefore, blood and scales are dirtying the space continuously. The market tax/fee, which is generally between 0.10 and 0.20 US\$ per day, is not directly used by the authorities to improve the market conditions and facilities.

CONSUMER DEMANDS AND TRENDS

The consumption of freshwater fish in the three northern mountain provinces has increased more rapidly in comparison to any other protein-containing product, such as pork and chicken. This in contrast to dried marine fish products (and to a lesser extent, also frozen fishery products), which have slowly gained a share in the local consumption patterns, and for which the demand now seems to have stabilized. The mountain population sees the increased access to fresh fish products as an opportunity to bring more variation in its diet, in which pork and chicken were the largest protein sources. In addition, foot and mouth disease scared many people away from meat, and the idea that fish is much healthier than pork is gaining ground rapidly under mass-media influence.

The current increase in availability of fresh (live) products that are guaranteed to be of good quality is very much appreciated by the consumers, who care more about freshness than about, respectively, the fish species, price or size of the product. At present, live grass carp of 1.5 – 2.0 kg is most preferred. Customers at the market generally demand chunks of decapitated and gutted large fish, while smaller fish are scaled and gutted to facilitate the customers. The weekend is the best period to sell fish, indicating that Saturday and Sunday are the days that most fish is consumed.

It is generally expected that the current increase in livelihoods will directly affect the demand for fresh aquaculture products in a positive way, and that the construction of a hydropower plant and a related dam covering parts of two of the three provinces will boost the demand even further in the next five years. The latter is expected to be caused by an inflow of more than 30 000 labourers who will work on the dam construction.

Considering the above, it can be concluded that aquaculture has a bright future in the northern mountains in Viet Nam. Freshwater fish has become an established product among a traditionally meat-consuming population. The increased livelihoods situation of the urban mountain population and the related increase in spending power leads to a boost in fish sales of between 20 to 100 percent per year. The fish farmers in the rural areas are the direct beneficiaries of this trend and are showing, in their turn, an important improvement in their livelihoods situation.



Can scallop farming expand in the Caribbean Region?

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Last February 2002, Mr Alessandro Lovatelli, Fishery Resources Officer (FAO, FIRI), visited the Bermuda Biological Station for Research (BBSR) to investigate the possibility for FAO and BBSR to collaborate in the transfer of farming technology developed for two scallop species in the Caribbean Region. The BBSR has successfully developed and commercially tested the culture techniques for all stages of the Bermuda sand scallop (*Pecten ziczac*) and the Calico scallop (*Argopecten gibbus*). These two species are native to the Caribbean Sea, but the natural fisheries have been heavily exploited and are currently depleted. Both species are considered suitable aquaculture candidates from both the farming and marketing prospective. The Calico scallop supports a fishery off the east coast of Florida (Cape Canaveral) and has a northernmost distribution off Cape Hatteras (North Carolina) and Bermuda. This scallop species is also found in the Gulf of Mexico and in the Caribbean along the coasts from Cuba to Puerto Rico.

The BBSR has designed and developed a low-cost hatchery for larval and postlarval production. This facility is housed in 2' x 20' second-hand insulated fibreglass containers; an independent seawater system allows for the continuous supply of filtered seawater; a temperature control system for seawater further allows for broodstock conditioning and optimal larval rearing. Insulated 1000 L tanks are used for larval rearing, while postlarval rearing is conducted in 450 L round tanks and raceways. Phytoplankton culture is carried out in a separate container, which is fitted with an independent filtration and UV disinfection system. The output of 100 L per day is sufficient for the hatchery requirements. The current set-up allow for the production of 250 000 5 mm spat.

Spawning of the Calico scallop is induced during the natural reproductive cycle (January to May in Bermuda), while larvae and postlarvae are reared under controlled conditions in the hatchery/nursery facility. The length of larval life is 12 days, and approximately 30 percent pediveligers are obtained from 2-day larvae. Settlement is performed either by the use of polyethylene mesh or on 150 µm sieves. The 10-15 mm juveniles are then grown in pearl nets suspended on long-lines. Shell growth rate off Bermuda is rapid, averaging 5-7 mm/month, while the recorded survival rates from 15 mm to 65 mm shell height have also been high, ranging between 70 and 90 per cent. Reproductively mature and market-size individuals are obtained 12 months after fertilization.

The farming techniques for the two scallop species, and in particular those for the Calico scallop, can be transferred to the Caribbean Region; however, the BBSR does not have a mechanism in place for extending the technology to neighbouring countries. One possible role envisaged for FAO is to inform the Caribbean countries on these recent developments and provide them with technical assistance, if requested. In this respect, the BBSR favourably expressed its interest in collaborating in the transfer of the farming technology developed through technical cooperation projects in the region.



Scallop served in a restaurant in Bermuda



Fully mature Calico scallop



FAO/Government of Australia Expert Consultation on Good management practices and good legal and institutional arrangements for sustainable shrimp

In December 1997, FAO convened the Technical Consultation on Policies for Sustainable Shrimp Culture in Bangkok, Thailand. This "Bangkok Consultation" brought together government delegates and observers from 12 countries of Asia and the Americas accounting for about 90percent of the global production of cultured shrimp and including major consuming countries. Observers from five inter-governmental organizations and from four international non-governmental organizations (NGOs) also attended. The Consultation noted that the achievement of sustainable shrimp culture is dependent on effective government policy and regulatory actions, as well as the cooperation of the shrimp farming sector in utilizing sound technology in its planning, development and operations. In this regard, the Consultation recommended that FAO convene expert meetings to elaborate best practices (the Report of the Bangkok FAO Technical Consultation refers to "best practices". The term "Good Management Practice" (GMP) was adopted by FAO for this Expert Consultation) for shrimp culture and desirable elements of the legal and other regulatory instruments for coastal aquaculture.

The Network of Aquaculture Centres in Asia-Pacific (NACA), in partnership with the World Bank (WB), the Worldwide Fund for Nature (WWF) and FAO, is implementing a Consortium Programme on Shrimp Farming and the Environment. Central objectives of the Consortium are to identify better management practices for shrimp farming under various environmental, economic and social conditions and to assess the cost-benefits for farmers to adopt these practices individually and in co-ordination with other farmers. This information is expected to help governments and the private sector develop support strategies and specific assistance measures to aid farmers in overcoming the constraints that currently prevent them from adopting better management practices. These strategies may encompass the adoption of codes of practices, improved extension services, economic incentives and others. The Consortium Programme is undertaken primarily through a series of case studies covering all major regions producing cultured shrimp.

Shrimp farming guidelines and codes of practices have been developed, or are under development, in a number of countries (e.g. Australia, Belize, Ecuador, India, Malaysia, Sri Lanka and Thailand). At the international level, a code has also been elaborated by an industry organization, the Global Aquaculture Alliance (GAA), that is intended to provide the basis for a future eco-labelling programme. Guidelines are also under development for the production of organically grown shrimp.

One area of special concern is the management of shrimp disease. FAO has been providing assistance to several member countries on health management in shrimp culture and has taken the lead in conducting the review on management strategies for major diseases in shrimp farming, one of the thematic reviews under the Consortium Programme.

In cooperation with several other agencies and organizations, FAO is currently conducting a number of programmes aimed at developing Good Management Practices (GMPs) for shrimp health management in both Asia and the Americas.

The Legal Office of FAO is currently working on a comparative survey of national laws and regulations governing shrimp culture. The purpose of the survey is to examine and compare relevant national legislation, particularly the legal requirements concerning the environmental impacts of shrimp culture and the measures applicable to the development of shrimp farming installations, the continuing operational controls, and the legal requirements that apply upon the cessation of activities, and aspects related to enforcement of the relevant legislation. This information is expected to help identify good legal and institutional arrangements and the current constraints for countries to adopt them.

As a follow up to the recommendations from the Bangkok Consultation and in support of the above activities, an Expert Consultation was convened by FAO and the Government of Australia on 4-7 December 2000. The objectives of the Expert Consultation were to:

- Provide a recognized international forum for discussion on the major aspects related to the promotion of sustainable shrimp culture practices, as well as of related institutional and legal instruments.
- Continue facilitating the process of consensus building among major stakeholders concerned with shrimp culture development and management.
- Identify/determine avenues, as well as specific benefits and limitations, for the development and implementation of Good Management Practices (GMPs) and Good Legal and Institutional Arrangements (GLIAs) leading to improvements in shrimp culture management practices at the farm and institutional levels.

The Expert Consultation was expected to produce the following outputs:

- A set of "generic" farm-level GMPs that are widely applicable in shrimp culture throughout the world.
- Guidelines for the development and implementation of situation-specific GMPs at the national or sub-national level; these guidelines would relate to, inter alia, the identification of situation-specific issues, the methodology for cost-benefit analysis of GMPs, stakeholder participation, etc.
- Constraints analysis for the adoption of GMPs and how to overcome them, including strategies to support farmers and farmer organizations in implementing better management practices.

- A set of "generic" GLIAs that are widely applicable in shrimp culture throughout the world.
- Guidelines for the development and implementation of country-specific GLIAs that take into account a country's specific legal and institutional conditions.
- Constraints analysis for the adoption of GLIAs and how to overcome them, including strategies to support implementation of good institutional and legal arrangements.

Three working papers were prepared by FAO for the Consultation: (i) a Working Paper on Operating Principles for Sustainable Shrimp Culture; (ii) a Working Paper on Draft Guidelines for the Development and Implementation of Situation-specific GMPs at the National or Sub-national Level; and (iii) a Working Paper on Good Legal and Institutional Arrangements for Shrimp Culture. These working papers served as reference documents for Consultation Working Groups, and were subsequently discussed and further developed by participants during each Working Group session. Additional documents were submitted by delegates.

One of the expected outputs of the Expert Consultation was a set of "generic" farm-level GMPs that are widely applicable throughout the world. However, during the course of preparation and the conduct of the Consultation, the participants felt that the term "Operating Principles" for sustainable shrimp culture was preferred, because GMPs carried with them the connotation of precisely defined farm-level practices. As GMPs would always be highly specific to a particular environment, location and farming system, the use of the generic term "Operating Principles" was considered to be more appropriate.

The Expert Consultation adopted the following recommendations:

- There is a need for a consultative follow-up process after the Expert Consultation.
- This process should initially involve finalizing the report of the Expert Consultation, including revision of the Working Group reports, taking account of the issues raised during plenary discussions and particularly, ensuring conformity and links between objectives, on- and off-farm operating principles and GLIAs.
- The process should then bring together practical examples on GMPs and identify mechanisms to support their implementation. The following was recommended:
 - ⇒ further identification of GMPs and GLIAs to implement operating principles based on case studies and other material by the WB/NACA/WWF/FAO Consortium;
 - ⇒ estimation of the qualitative and quantitative costs and benefits of implementation of GMPs/operating principles. Financial and economic analyses of best compared to worst practices were recommended; the analyses

would take into account the applicability of GMPs at different levels from generic to farm levels;

- ⇒ identification of performance criteria to monitor the effectiveness of operating principles, GMPs and GLIAs, taking into account the need for cost-effective monitoring based on a limited number of key indicators; and
- ⇒ special attention to identification of GMPs and GLIAs for "retrofitting" of large numbers of existing farms and mobilization of required technical and financial support

- FAO and other agencies should produce and share information on development and implementation of GMPs and GLIAs.
- The World Bank/NACA/WWF/FAO Consortium is requested to take responsibility for collating information on management practices as identified above, making further extensive use of the existing case materials from the Consortium's work and other relevant sources.
- In the process of developing the GMPs, documentation recommended by the Expert Consultation, linkage and exchange of experiences with farmers' associations, governments, academic and research institutions, professional associations, NGOs and other organizations with experience and insight is strongly encouraged.
- The Expert Consultation recommends that a document on the objectives and operating principles, and the legal and institutional arrangements to support implementation, be prepared for presentation to an inter-governmental forum for formal adoption. The Expert Consultation requests FAO to facilitate this process.
- The Expert Consultation considered that two issues in particular have to be addressed in the process of further development and implementation of GMPs: (a) that farmers' associations have a particularly important role in development and implementation of GMPs, particularly for small-scale farmers; and (b) dialogue and cooperation between farmers' associations, government organizations, seafood export associations and other stakeholders is required in the development and implementation of GMPs. In this regard, the Expert Consultation made the following recommendations:

- ⇒ preparation of a review of farmers' associations, identifying the factors for success, to provide practical guidance on development and operation of successful farmers' associations;
- ⇒ promotion of meetings of farmers' associations to review and develop GMPs in cooperation with relevant government agencies, where desirable;
- ⇒ promotion of dialogue and cooperation between farmers' associations, government organizations, seafood export associations

and other stakeholders in the development and implementation of GMPs;

- ⇒ more effective networking among shrimp farmers' associations is required, and a regional shrimp farmers' network may be particularly useful in Asia. The Expert Consultation requested NACA to facilitate a meeting of shrimp farmers' associations in Asia. The agenda should be driven by the farmers' associations;
- The Expert Consultation recommended that the following additional measures be promoted to facilitate the development and implementation of GMPs and GLIAs in shrimp culture:
 - ⇒ preparation of a review that will bring together experiences in success and failure in management of farm clusters and nucleus estates. Such a document can provide guidelines on how such nucleus estates might work best;
 - ⇒ preparation of an evaluation of the potential use of the operating principles as basis for investment and buyer screens, providing an incentive for investments in farms operating according to good management practices;
 - ⇒ elaboration of best practices for government-farmer consultation and cooperation at various levels (i.e. central, provincial and local levels) in the development and implementation of GMPs and GLIAs;
 - ⇒ that financial and technical assistance should be directed to support development and implementation of GMPs and GLIAs, with special attention to small-scale farmers and farmers associations; and
 - ⇒ further evaluation of existing Codes of Conduct and implementation plans be carried out to assess their universal application.

The full report of this consultation is now published as "FAO/Department of Agriculture, Fisheries and Forestry Australia. Report of the FAO/Government Australia Expert Consultation on Good Management Practices and Good Legal and Institutional Arrangements for Sustainable Shrimp Culture. Brisbane, Australia, 4-7 December 2000. *FAO Fisheries Report*. No. 659. Rome, FAO. 2001. 70 p." For a copy, please write to: Rohana.Subasinghe@fao.org



Sustainable commercial aquaculture development South of the Sahara¹

¹ A summary of the FAO Technical Consultation on legal frameworks and economic policy instruments for sustainable commercial aquaculture in Africa South of the Sahara, Arusha, United Republic of Tanzania, 4-7 December 2001.

Responding to the issues discussed at the Eleventh Session of the FAO Committee for Inland Fisheries of Africa (CIFA), held in Nigeria in October 2000, with respect to sustainable commercial aquaculture development in Africa and its important role in achieving food security and reducing rural poverty, a Technical Consultation on legal frameworks and economic policy instruments for sustainable commercial aquaculture in Africa South of the Sahara was held on invitation of the Tanzanian Government in December 2001.

At this technical consultation, delegates from 16 countries in sub-Saharan Africa reviewed a number of papers presented by FAO and various observers on the status and potential of commercial aquaculture, markets and trade, policy frameworks, legal frameworks, investment, mitigating strategies, and how to proceed with the development of sustainable commercial aquaculture in sub-Saharan Africa.

STATUS AND POTENTIAL OF COMMERCIAL AQUACULTURE IN SUB-SAHARAN AFRICA

Reliable supplies of feed, capital and seed are generally considered the principal limiting inputs for the development of commercial aquaculture. Capacity building in fish feed technology and fish nutrition is necessary, and development of commercial aquaculture enterprises appears to be intrinsically linked to the health of the overall commercial agricultural sector.

The following are some identified strategies that could be adopted by governments to overcome the major constraints presently encountered by the sector:

- a. undertake capacity building at all levels;
- b. conduct research and development on the commercial aquaculture sector;
- c. concentrate on few species with marketing potential and well-established markets (especially tilapia, catfish, Nile perch and shrimp);

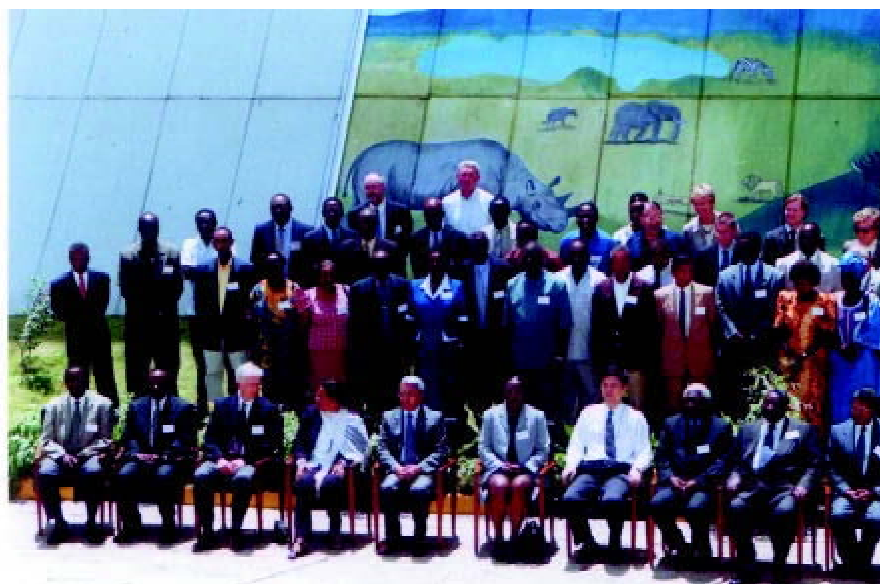
- d. define conducive legal frameworks and an investor-friendly climate, including streamlining of regulatory procedures, establishment of Export Promotion Zones and the use of other economic incentives such as tax exemptions and tax holidays;
- e. promote a balanced approach to environmental impact assessment;
- f. ensure the complementary interrelationships between the development of smallholder/subsistence and commercial aquaculture;
- g. promote the formation of aquaculture farmers' associations;
- h. establish regional collaboration and information exchange; and
- i. link strategic aquaculture development planning to the other sectors of the economy.

MARKETS AND TRADE OF COMMERCIALY FARMED AQUACULTURE PRODUCTS

Markets in the region are generally considered important, although import duties could pose a considerable constraint. The negative perception and associated low acceptance in foreign markets of fish originating from Africa is a constraint to commercial aquaculture development in the region. Therefore, it is of overriding importance that food safety and quality issues are properly addressed, and that the food safety standards of importing countries are achieved. Moreover, the development of internationally recognized commodity/brand names is seen as necessary for success in commercial aquaculture.

POLICIES FOR THE PROMOTION OF SUSTAINABLE COMMERCIAL AQUACULTURE

Enabling policies are considered the most critical factor in the promotion and expansion of commercial aquaculture. They are a means of increasing trust among investors by reducing risks and reducing costs, and can be general, or specific and oriented to



Delegates of the participating countries in the Technical Consultation with Her Excellency, Ms Zakia Hamdani Meghji, Minister of Natural Resources and Tourism of the United Republic of Tanzania

the aquaculture sector. General policies include, for example, improved governance, measures to ensure political and policy stability, secure property rights and reduced corruption. Sectoral policies include the development of appropriate legal, regulatory and administrative frameworks, marketing strategies and encouraging pioneer associations. It was noted that effective extension services, the role of the Government to put in place appropriate aquaculture-specific policies, legislation and regulations, institutional support and appropriate land laws are necessary for the emergence and/or development of commercial aquaculture.

MITIGATING STRATEGIES TO MAJOR CONSTRAINTS

Difficult access to capital and related problems, such as the frequent lack of collateral, high interest rates, the perception that investments in aquaculture are highly risky, and the lack of knowledge on the part of potential borrowers on how to apply for loans, are recognized as major constraints to the development of commercial aquaculture in sub-Saharan Africa.

LEGAL FRAMEWORKS

Practical, workable legal regimes, including a specific aquaculture law dealing with factors crucial for enabling sustainable commercial aquaculture operations, such as permits to conduct aquaculture, land and water rights, and environmental issues, are considered necessary. However, a blueprint for the development and implementation of suitable legislation is not available, as the conditions and experiences in the region vary widely.

The Technical Consultation concluded that:

- ① There is much potential for economically viable and sustainable aquaculture in sub-Saharan Africa. Nevertheless, commercial aquaculture is slowly taking root in sub-Saharan Africa.
- ② Most countries in sub-Saharan Africa have the will to develop policies to enable commercial aquaculture to take off or expand; a few countries have or are developing such policies.
- ③ Currently, most viable commercial aquaculture operations produce shrimp, tilapia or catfish, these three species should be the focus for commercial aquaculture, at least for the time being.
- ④ Economic and environmental viability requires the careful adaptation of technology to local conditions and can be achieved only in favourable circumstances.
- ⑤ Both small- and large-scale commercial aquaculture contributes to food security and economic growth.
- ⑥ It is urgent that commercial aquaculture expands in sub-Saharan Africa.
- ⑦ Expansion of commercial aquaculture is hindered by:
 - ⇒ lack of capital;
 - ⇒ shortage of skilled human resources;
 - ⇒ unstable supplies of inputs, such as high quality feeds and seed; and
 - ⇒ lack of strategic planning linking aquaculture to other sectors of the economy.
- ⑧ Enabling policies are essential to start and/or expand commercial aquaculture in sub-Saharan Africa.
- ⑨ Enabling policies for commercial aquaculture are often hindered by restrictions on government support imposed by structural adjustment agreements entered into by several sub-Saharan

governments and by international financial institutions, such as the International Monetary Fund (IMF).

RECOMMENDATIONS

The consultation proposed the following recommendations to be implemented at the national, regional and international levels:

- At the national level, countries should investigate the technical and economic potential for commercial aquaculture, if this has not been done yet. If potential exists, enabling policies should be developed and implemented, and their policy framework should include a legal framework, a strategy for capacity building, and a strategy to increase access to capital sources.
- At the regional level, countries should promote joint capacity building, facilitate regional trade in aquaculture products, promote African aquaculture products in international markets and protect in international forums the rights of sub-Saharan African governments to stimulate the emergence and growth of commercial aquaculture.
- At the international level, it was recommended that FAO, in collaboration with other intergovernmental organizations, appropriate non-governmental organizations (NGOs) and interested governments should conduct studies that aim to:

- ⇒ establish the contribution that small- and large-scale commercial aquaculture will make to food security and economic growth in sub-Saharan Africa;
- ⇒ identify the contribution that an enabling public policy framework will make to the development of commercial aquaculture; and
- ⇒ specify the extent to which such an enabling policy framework is compatible with general macro-economic policies, in particular, the IMF and the World Bank (WB)'s policy conditions.

Moreover, a two-level conference on commercial aquaculture in sub-Saharan Africa should be organized. The first part of this conference would follow-up on the present consultation, while the second part would be a high-level political meeting to confirm a sub-Saharan Africa understanding on the importance and role of commercial aquaculture in sub-Saharan Africa and to seek international donor support for policy development, capacity building and increased access of aquaculture entrepreneurs to financial services

Note: The report of the Technical Consultation on legal frameworks and economic policy instruments for sustainable commercial aquaculture in Africa South of the Sahara, Arusha, United Republic of Tanzania, 4-7 December 2001, will be published on the FAO website www.fao.org and can be obtained as hardcopy from the Fisheries Policy and Planning Division (FIPP) of FAO, Rome, Italy. For further information, please contact:
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A project to improve the livelihoods of poor fishers on the Brazilian coast

To improve the situation of poor coastal fishing communities of Brazil, in June 2000 an FAO Technical Cooperation Project was started with the objective of assisting the establishment of a sustainable seaweed farming sector that could benefit poor coastal communities in the north-east states. In addition to the Department of Fisheries and Agriculture, several other institutions are also involved in the project implementation through the promotion of marginalized groups.

The strategy proposed by this project is based on the testing of different technical options, which are being compared to select the most promising packages. The technical and economic feasibility of the farming techniques must be proven prior to promoting a large-scale expansion, and this will be one of the main goals of the project. The integrated approach that is required also involves intensive training programmes, which are implemented in the coastal communities involved in the project to fully achieve the social and economic benefits offered by this activity. Domestic and international markets for seaweed and seaweed-derived products, in particular colloids, must be studied to avoid the present situation of complete national dependence on imports of these products from abroad and eventually, to create a possibility for export products. Finally, an evaluation of the potential for expansion of this approach to other sites in the three states selected and to other states should be carried out to create a proper framework for follow-up.

This project follows the path of mussel culture as practised by a small-scale producers development project that was started in the State of Santa Catarina in 1990 and which reached a total production of more than 9 000 MT in 1999. FAO was responsible for assisting this development through this project, which launched this sector in the southern states. The success of the project derived from the testing at a pilot scale of a new technical package in various coastal communities. It showed that although expertise in mollusc farming existed previously in Brazil, the catalytic role of FAO in creating a proper package, and its testing and dissemination was crucial to the success of the operation.

Assistance to reservoir fisheries in Peru

Peru, with only five percent of its 261 reservoirs exploited from the fisheries point of view, has requested the assistance of FAO through a Technical Cooperation Programme Project (TCP). Started in October 2001, the project aims at creating appropriate technologies to identify and exploit those water bodies where fisheries can be enhanced or pond-based aquaculture can be developed. The main expertise in this case derives from the application of current policies on Technical Cooperation among Developing Countries (TCDC), and a consultant from Cuba, a country in the Region with wide proven experience in this area, is providing the assistance required.

Diversification of aquaculture in Mexico

The State of Campeche, in Mexico, has excellent natural conditions for the development of aquaculture. In order to express this potential, the local government has supported several related initiatives. In 1997, the Fisheries Secretary funded the creation of a hatchery for the production of marine fingerlings. FAO has been asked to provide assistance in the experimental culture of shrimp (*Penaeus duorarum*) and red drum (*Sciaenops ocellatus*) as a follow up to a FAO-Mexico Unilateral Trust Fund (UTF) that in 1995 identified development models for integrated coastal lagoon planning.

Started in April 2001, this project's main objectives are the diversification of aquaculture production through the use of existing coastal resources and the consolidation of mariculture through the application of suitable biotechnology. The project aims not only to develop the necessary technology, but also to transfer it to low-income social groups. Therefore, the project has experimental, extension and training components.

Fish feed development support to Cuba

From 1998 to 1999, a TCP project was implemented by FAO in Cuba to develop alternative technologies to produce feed for cultured fish. The achievements of this joint work with Cuban experts from the Ministry of Fisheries Industry exceeded the expectations. As a follow up, the United Nations Development Programme (UNDP) has funded a new project to be implemented by FAO addressed to the industrialization of the newly developed technologies. The main component of the project is the construction, equipping and setting up of a processing plant at the Center of Aquaculture Training in Mamposton (CEPAM). Experimental results obtained so far indicate a significant reduction in the cost of the feed. The new plant will allow for further experimentation, and for distribution and supply to existing aquaculture farms all over the country in order to validate the results at an industrial scale. A consultant from Colombia has been engaged under the TCDC scheme.

The FAO TCP project was implemented in four phases to allow for financial adjustments. The first phase started in January 2000. The final size of the farm will be smaller than originally planned, but will permit the development of the main objectives of the station and will achieve the total aim in stages.

Management of fisheries and aquaculture in Colombia/Peru

In March 2002, a TCP project was approved to support the management of fisheries and aquaculture in the Putumayo River in the Amazonian border area of Colombia and Peru. The project aims at increasing the technical capacity of both countries to formulate a sustainable development plan for the management of the inland fisheries and aquaculture resource. The study will include the techno-biological aspects of fisheries and aquaculture, as well as the socio-economic environment and the legal and institutional framework.

Demonstration fish farm in Guyana

The Government of Guyana has allocated funds for the construction and operation of a freshwater demonstration farm and asked FAO for assistance for that purpose. Farmers currently operating in sugar and rice production are interested in diversifying their operations and would like to allocate portions of their land to the culture of freshwater fish for sale in the local and export markets. The local demand for freshwater fish is high. The main purpose of the aquaculture station will be to stimulate and promote growth in the aquaculture industry. Human resource development will form one of the principal objectives of the Freshwater Aquaculture Demonstration Farm and Training Center, providing skills to the private sector. The Government intends to provide the private sector with incentives to encourage their involvement and investment in the development of aquaculture in Guyana.



From the Regional Office for Asia-Pacific (RAP)

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STREAM launch

STREAM (Support to Regional Aquatic Resources Management) is a new initiative launched this month. Its objectives are to obtain a better understanding of poor peoples' livelihoods and how to use relevant existing and emerging information more effectively, in order to enable people to exert greater influence over the policies and processes that impact on their lives. It is explained in a STREAM brochure, and memorandum summary that are now available (contact ereby@enaca.org). The development of country-specific implementation strategies for two pilot countries (Cambodia and Viet Nam) is a priority action over the coming months.

A diverse coalition of partners supporting the start-up of STREAM has worked together over the last 18 months to negotiate a shared vision, input different experiences and expertise into the planning process, and implement pilot activities in Cambodia and Viet Nam. This coalition will increase in size and diversity as STREAM expands into other countries, and awareness and understanding of the initiative increases among other stakeholders. The founding partners are: the Network of Aquaculture Centres in Asia-Pacific (NACA), the Department for International Development of the United Kingdom (DFID), the Food and Agriculture Organization of the United Nations (FAO) and the INGO Voluntary Service Overseas (VSO). STREAM is designed within NACA's 5-year Work Programme cycle to support stakeholders to achieve the long-term objectives. It is a regional initiative that will:

- Support capacity building among local government institutions, non-governmental agencies (NGOs), and community groups involved in aquatic resources management, including the provision of training and long-term practical support in livelihoods analyses and participatory approaches, support to poor aquatic resource users to participate more effectively in policy-making processes, and encouraging the development of more responsive government institutions.
- Support a number of new community-based learning initiatives, the practical experiences from which will combine with lessons learned from existing case studies and feed into STREAM's communication strategy to influence policy and practice in the region.
- Develop a regional communications and learning strategy to realize the considerable potential that exists to facilitate lesson-learning and improved coordination between current aquatic resource initiatives in the region, increase the participation of poor aquatic resource users in decision-making processes (through the use of innovative communication approaches), and ensure policy-making is informed by lesson learning.
- Support on-going policy and institutional changes in the region, by facilitating policy development at the national level, increasing exposure to lessons and experience at the community level, maximizing utilization of the existing regional knowledge base, and providing capacity-building support to the change process.





FAO/NACA Expert Consultation - "Focusing Aquaculture and Small-scale Aquatic Resource Management on Poverty Alleviation"

The FAO/NACA Expert Consultation on "Focusing Aquaculture and Small-scale Aquatic Resource Management on Poverty Alleviation" was held in Bangkok, on February 12-14 2002. With the collaboration of NACA, this expert consultation was supported by FAO as a contribution to the regional communications role of the FAO/NACA/DFID/VSO initiative "Support to Regional Aquatic Resource Management" (STREAM). There has been a growing awareness within the aquatic resource sector of the need to address poverty more specifically and more strategically. The Expert Consultation was organized in order to provide field-level professionals in Asia with a unique opportunity to come together to share experience on working in the field of poverty alleviation and aquaculture, and to prepare a platform for future networking. The 22 participants in the consultation came from a range of field backgrounds in eight regional countries and are currently working with NGOs, donors, government departments and regional organizations (Mekong River Commission (MRC), NACA) and regional offices of international organizations (FAO, International Union for the Conservation of Nature, IUCN; International Center for Living Aquatic Resources Management, ICLARM). The consultation report and full versions of the participants' contributed papers will be published serially in the NACA newsmagazine "Aquaculture Asia", and made available via the NACA/STREAM website. The Expert Consultation concluded that living aquatic resources play a fundamental role in sustaining the livelihoods of many of the rural poor in Asia, providing crucial buffers to shock, food security and opportunities for diverse and flexible forms of income generation. In many cases, the poorer people are, the more dependent they are upon aquatic resources, particularly low-value fish and non-fish aquatic resources. Women often play important roles in aquatic resource use and management, and aquaculture interventions may have particular benefits for women.

Small-scale aquaculture and aquatic resource management hold considerable potential to contribute to poverty alleviation. In order to realize this potential, poverty alleviation should be taken as the strategic starting point for aquaculture interventions. This has significant implications for

how interventions are conceptualized, planned and executed, and the institutional arrangements. Distinctions between aquaculture and the management of living aquatic resources are often artificial and devalue the flexible and often complex relationships between aquatic resources and the livelihoods of the rural poor. As with any production-based intervention, the poorest groups face significant constraints to entry into aquaculture. Opportunities do exist to overcome these constraints, and aquaculture offers many opportunities for livelihood benefits that other sectors do not offer. Aquaculture technologies appropriate for poor people are now largely in place. The greater emphasis is on more effective extension of low-cost technologies, appropriate management practices to poor people and securing rights of access and control, rather than technical research.

Understanding the context of poor people's livelihoods is essential. Effective poverty alleviation requires assessment of poor people's needs and identification of opportunities that allow for entry by poor people into aquaculture production and related activities. This in turn requires more sophisticated yet workable understandings of poor people's livelihoods, the causes and characteristics of poverty, and the socio-economic worlds in which poor people operate. A prerequisite for this approach is greater participation by poor people. Poor people's livelihoods often depend on a range of resources and livelihood activities, of which aquaculture may be an important component. In these cases, aquaculture needs to fit with and complement other activities, rather than attempt to replace such activities. Effective management of small-scale fisheries (including rice-fields, backwater swamps, and irrigation canals) by local resource users holds considerable potential for poor people. Small-scale aquaculture is often an important component of management of wild fisheries. Placing poverty alleviation first requires innovative institutional arrangements and partnerships between governments, NGOs, civil society groups, poor people and donors. Fisheries institutions are traditionally oriented to technical issues, and face serious budget and personnel constraints. They often have limited experience in training and extension methods appropriate for poor people. It is important to create new learning opportunities for these institutions so that they are able to provide more appropriate services to poor people. It is also important that the skills required to do so are valued and respected within the institutions.

For further information on this consultation and related issues, please visit the following websites:

FAO: www.fao.or.th/
NACA: www.enaca.org
STREAM: www.enaca.org/stream/

Expert Consultation on "New Approaches for the Improvement of Inland Fishery Statistics in the Mekong Basin"

The FAO/MRC Expert Consultation on "New Approaches for the Improvement of Inland Fishery Statistics in the Mekong Basin" will be held in Udon Thani, Thailand in September 2002 and hosted by the Thai Department of Fisheries (DOF). The Consultation will provide advice on ways to improve the state of knowledge on inland fisheries in the sub-region. Specifically, the Consultation will help to establish minimum data requirements for inland fishery management, assess and develop methodology for rapid data collection, raise awareness of the value of inland fisheries, and provide guidance on collection of appropriate information on inland fisheries.

Second Large Rivers Symposium (LARS2)

Rivers and their social, cultural, economic and ecological importance remain grossly neglected or under-valued. Production from inland fisheries is thought to be two to five times higher than the officially reported value. River fish and fisheries only came under serious scrutiny in the 1970s, and the knowledge then available was summarized at the International Large River Symposium (LARS) held in Canada in 1985. Since then, considerable new information has been gathered on the ecology and values of rivers. In view of the importance of large rivers for food production and the current emphasis on the protection of biological diversity worldwide, it is timely that a second international symposium focussing specifically on large rivers be organized. The Symposium is being convened by the Mekong River Commission (MRC) and the Cambodian Department of Fisheries (DOF), in collaboration with the Food and Agricultural Organization of the United Nations (FAO), the World Wide Fund for Nature (WWF), and the International Union for the Conservation of Nature (IUCN).

The Symposium will focus on the management (i.e. conservation and sustainable use) of living aquatic resources of large rivers, including the impacts of human activities on these. The objectives of the Symposium are to:

- provide people working on the management and development of rivers with a forum to review and synthesize the current status of large river systems, including topics such as ecology, fisheries, environmental impact assessments, multiple uses of resources and associated socio-economic considerations;
- raise the political, public and scientific awareness of the importance of river systems, the living aquatic resources they support and the people that depend upon them; and
- contribute to better management, conservation and restoration of the living aquatic resources of large rivers.

Aquaculture Country Profiles

FAO, through the Subregional Office for the Pacific (SAPA) in Samoa, in cooperation with the Secretariat of the Pacific Community (SPC) based in New Caledonia, is compiling Aquaculture Country Profiles from 22 Pacific Island countries and territories that comprise FAO member countries (Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Is., Tonga & Vanuatu) and non-member countries/territories (American Samoa, Federated States of Micronesia, Guam, Northern Marianas, French Polynesia, New Caledonia, Pitcairn, Tokelau, Tuvalu, & Wallis and Futuna). The objectives of collecting the aquaculture information are:

- to provide information of the status of aquaculture in the Pacific for input to FAO global databases and reviews such as 'State of the World Fisheries and Aquaculture (SOFIA)'; and
- to provide general reference material that would help organizations, donors and other stakeholders in planning future directions for aquaculture development in the Pacific

FIJI – TCP/FIJ/0167 (A): Enhancement of Customary Marine Fishery Tenure

The Director-General of FAO approved in August 2001 the technical assistance for the project "Enhancement of Customary Marine Fishery Tenure" for the Government of Fiji. The project is funded from TCP resources in the amount of US\$60 000.

The conservation and management of fisheries in Fiji poses major challenges for the Government. Government policy seeks to strengthen this management in the interests of:

- securing rational and sustainable use of inshore fishery resources,
- improving the management and utilization of inshore fishery resources that are habitually targeted by artisanal and small-scale fishermen, and
- ensuring that inshore fisheries in Fiji continue to contribute in a substantial and sustained manner to national food security. Of particular concern are issues related to over-exploitation of inshore fishery resources

The objective of this technical assistance is to enable the Ministry of Fisheries and Forests to strengthen inshore fisheries management in Fiji by enhancing the role of the traditional customary rights ("qoliqoli") system. The assistance will enhance the national capacity of Fiji to better conserve and manage its inshore fisheries resources, facilitate the greater participation of fishing communities in the management of their adjacent resources and the sustainable development of the country's fisheries sector.

Tonga - TCP/TON/0166: Development of Seaweed Farming in Tonga

A TCP project on "Development of Seaweed Farming in Tonga (TCP/TON/0166)" has been approved and will commence in April 2002. The objective of the technical assistance is to strengthen the capability of the Government of Tonga in the sustainable use of resources through the culture of the edible seaweed *Cladosiphon* sp. ("mozuku") for commercial/export purposes, thereby increasing opportunities for socio-economic development in aquatic farming communities. Over a period of 12 months, the project will provide for the services of an international and a national consultant and technical and administrative support from FAO HQ, FIRI, RAP and SAPA.

For any information relating to the activities of the Regional Office Asia-Pacific, please contact the Simon Funge-Smith (simon.fungesmith@fao.org).

From the Africa Regional Office (RAFI) African aquaculture: how to handle the harvest

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Background

Many African farmers have hopes to benefit from aquaculture; getting food for the family as well as income. They have worked hard to build ponds and now await plentiful harvests. In spite of its apparent simplicity, however, results from campaigns aimed at promoting aquaculture have frequently been less than anticipated and are rarely long lasting.

Difficulties in implementing viable aquaculture enterprises have been the subject of many fora. Most recently, the Africa Regional Aquaculture Review (CIFA/OP24, 2000 -- FAN No. 23) noted: "Nearly every country in the Region [has] developed some form of aquaculture. Aquaculture seems to fit naturally within African farming systems. Yet, in spite of the Region's apparent under-utilized resources of land and water, available labour and high demand for fish, aquaculture has not fulfilled its expectations and the Africa Region remains the lowest aquaculture producer in the world."

Today, as development efforts focus on poverty alleviation, food security and economic growth, aquaculture is mentioned as one of the possible tools to achieve these goals. Moreover, today we can profess a solid foundation for aquaculture development based on lessons learnt over past decades. Yet today this development is confronted with challenges that bring into question the practicability of numerous aquaculture programmes.

These challenges are principally on economic and social fronts. While appropriate aquaculture technologies are known (although there is certainly room for improvement), the challenges lie in the ability of governments to extend and monitor these technologies and the suitability of these technologies for the intended target group. As agencies stagger under the burden of Structural Adjustment Policies, with their ubiquitous downsizing, decentralization and generalization, the central question arising is "how much support can governments realistically supply?"

Within this scenario, there are perceptible trends to address these new realities, which include the inter-related issues of participation, privatization and group formation.

Participation

Participation is the key to a bottom-up approach to development and the way to ensure that technologies do indeed fit within the intended socio-cultural environment. Participation is fostered through a variety of mechanisms and processes; the crosscutting factor being that the end-user has a voice in decision-making. This implies the concept of "ownership" of the activity by users, as well as a high degree of accountability, users taking responsibility for their aquaculture enterprises.

Pragmatically, participation has underscored the fact that there is more than one way to practice aquaculture. Although numerous early development efforts focused on comprehensive "packages" with rigid recipes for how to raise fish, it is now generally acknowledged that aquaculture represents a spectrum of activities ranging from technically and financially extensive to intensive. All the various systems that exist along this spectrum contribute to the overall aquaculture programme and should be recognized, each with its particular technology and target group.

Privatization

There is ever-growing support for an increased contribution by the private sector. This applies first and foremost to the supply of inputs (feed and seed), many countries in the region agreeing to the principle of divestment of government hatcheries as producers are supplied with seed from private sources. In some areas, there is also interest in the privatization of extension, either using these same private seed suppliers as the purveyors of extension messages or by envisioning private businesses that transmit production technologies to farming communities.

Private-sector involvement touches on a wide variety of interventions, from vertically integrated agri-businesses raising fish to increased involvement of civil society and non-governmental organizations (NGOs). In general, there is a transfer of responsibilities foreseen that will increase efficiency. Increased efficiency will encompass the efficiency of information exchange; networking and electronic communications are vital instruments in the new development paradigm.

Groups are strategic parts of most development efforts, if not by design then by default. Groups are a common denominator for participation and can be partners in privatization, but most essentially, they are now seen as the building blocks of extension services in the Third Millennium. On-going adjustment policies frequently make it impractical to support dedicated aquaculture extension services, and the interface at the farmer level is more often a generalist who does not have the resources to assist individual farmers but must obligatorily deal with clusters of producers.

This new reality brings with it all the uncertainties of past efforts at establishing sustainable producer organizations/groups; fish farmers are often notorious among these for their individualism. Like it or not, groups are the way to go - but how do developmentalists facilitate workable groups?

Conclusions

The African aquaculture harvest is applauded for its high potential, albeit its present performance may not adequately reflect the promises of harvests to come. These harvests are, to a large extent, the results of prevailing economic and socio-cultural phenomena and not limited by available technology. Moreover, this composite of phenomena has many regional similarities, as countries are embarking on the paths of economic adjustment.

These commonalities form the basis of the aquaculture programme of the FAO Regional Office for Africa. This is founded on the premise that aquaculture development region-wide is facing a comparable set of challenges to advance a comparable set of aquaculture systems. Thus generic methodologies can be applied, revised and results compared.

This iterative framework builds synergy through an intra-regional approach to problem solving. This tactic attempts to concentrate effort on a topic of regional importance in one country or set of countries. Results can then be conveyed throughout the Region, expanding the multiplier effect. For example, integrated irrigation/aquaculture technologies are the focal point of efforts underway in the Sahelian zone. However, these technologies, when refined, are applicable to a wide range of countries, especially those where water resources are limited.



Alessandro Lovatelli



From left to right: Mr Bisessar Chakalall, Senior Fisheries Officer, FAOSLAC, Barbados; Dr Samia Sarius, Aquaculture Programme Manager, Bermuda Biological Station for Research; Mr Alessandro Lovatelli, Fisheries Resources Officer (Aquaculture), FAO FIRI, Rome, Italy

In October 2001, Mr Alessandro Lovatelli once again joined the FAO, taking up the professional post of Fisheries Resources Officer (Aquaculture) at the Inland Water Resources and Aquaculture Service (FIRI), one of the two services attached to the Fishery Resources Division. Mr Lovatelli, a trained marine biologist and aquaculturist, obtained his Bachelor (BSc) and Master of Science (MSc) degrees at the universities of Southampton and Plymouth (UK), respectively. His first experience with FAO dates back to 1987 when he worked as the bivalve expert attached to the FAO/UNDP Regional Seafarming Development and Demonstration Project. The project was then under the Network of Aquaculture Centres in Asia-Pacific (NACA) before it became an independent inter-governmental organization. His next FAO assignment took him to Mexico, where he worked on a regional aquaculture development project (AQUILA) which was funded by the Government of Italy. From 1993 to 1997, Mr Lovatelli worked in Viet Nam, Somalia and then again in Southeast Asia. In Viet Nam, he headed the aquaculture and fisheries component of a large European Union (EU) project developing, among other activities, 10

regional aquaculture demonstration, training and extension centres. Following this, he moved to Somalia, working as the lead aquaculture and fisheries consultant for the European Commission (EC). During the one-year consultancy, Mr Lovatelli provided the Commission with technical advice towards assisting the fisheries sector through the EC Rehabilitation Programme for Somalia. Following an additional year in Viet Nam as one of the Team Leaders under the Danish-funded Fisheries Master Plan Project, Mr Lovatelli was recruited by FAO as the Aquaculture Advisor attached to the FAO-EASTFISH project based in Copenhagen. His next 'jump' was not too long, i.e. from Denmark to Italy. His main activities currently focus on marine aquaculture development, transfer of farming technologies, coastal resources management and development of human resources. These activities have a global span and will benefit from his extensive working experience in numerous Southeast Asian, Caribbean, Central American, East African, and Central and Eastern European countries. With regards to the Mediterranean region in particular, Mr Lovatelli was recently nominated as the new Technical Secretary of the Committee on Aquaculture under the General Fisheries Commission for the Mediterranean (GFCM). His direct telephone number is +39 06 57056448, and his email address is alessandro.lovatelli@fao.org

Raymon van Anrooy

Since February 2002, Mr Raymon van Anrooy is working at the Fisheries Policy and Planning Division (FIPP) as Aquaculture Economist. Mr van Anrooy has been FAO Associate Professional Officer (APO) for the last two years at the FAO Representation in Hanoi, Viet Nam, where he assisted in the coordination, formulation, implementation and monitoring of FAO fisheries and aquaculture activities in the country. During his assignment in Viet Nam, he became heavily involved in the organization and coordination of



emergency assistance to the fisheries sector; this as a result of the floods in the Mekong Delta during the year 2000, which affected the livelihoods of thousands of poor fish farmers. From 1998 to 2000, he was assigned by the Dutch Government as an associate expert, socio-economist, to the artisanal fisheries project "Desarrollo Integral de Pesca Artesanal en Laguna de Perlas" (DIPAL), located on the Atlantic coast of Nicaragua. Within the team of this bilateral Nicaraguan-Dutch project, he

was responsible for fisher folk organization, credit and marketing. In 1997, he started his professional career as a research assistant in the field of the commercialization of agriculture products at the Wageningen Agricultural University, the Netherlands, where he also obtained his Master of Science (MSc) degree in rural development economics with specialization in aquaculture, marketing and agricultural development. His current main activities focus on conducting economic analyses of various aquaculture systems to facilitate the development of sustainable aquaculture policies, providing follow up to the "Technical Consultation on Legal Frameworks

and Economic Policy Instruments for Sustainable Commercial Aquaculture Development in Africa South of the Sahara" (Arusha, Tanzania, December 2001), assisting in the preparation of guidelines on how to apply economic analysis of aquaculture technologies, and participating in the monitoring and assessment of the implications on aquaculture of global economic change. His direct telephone number is +39 0657053031, and his e-mail address is raymon.vananrooy@fao.org

Jose Aguilar-Manjarrez



Dr José Aguilar-Manjarrez has been appointed Fishery Resources Officer (Inland Fisheries GIS) in the Inland Water Resources and Aquaculture Service (FIRI) at FAO HQ, effective 1 August 2001.

Dr Aguilar-Manjarrez brings with him many years of experience on aquaculture planning and management using Geographical Information Systems (GIS). His experience with GIS began with the use of GIS for aquaculture site selection in Tabasco State, Mexico as the basis of his MSc dissertation from 1991 to 1992 at the Institute of Aquaculture (IOA) in Scotland. He then carried out a PhD dissertation from 1992 to 1996 at the IOA by developing GIS-based models for planning and management of coastal aquaculture in Sinaloa State, Mexico.

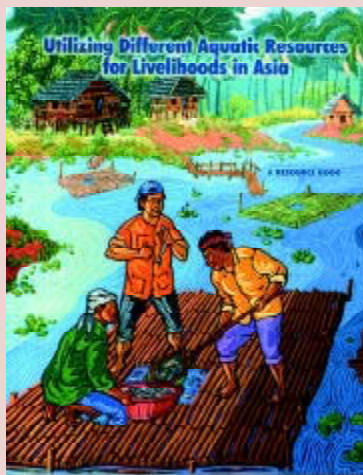
From 1996 to 1998, he worked with FIRI, first as a visiting scientist with focus on the use of GIS for estimating fish farming potential in Africa, and later as a consultant on spatial modelling of inland fishery potential. From November 1998 to July 2001, he worked with WAICENT, designing and developing FAO's GIS map repository and carrying out a GIS study to assess locations that have potential for the production of bambara groundnut across the world.

Prior to joining FAO, from 1990 to 1991 he worked in Mexico City as an aquaculture consultant at a private consulting company with focus on environmental impact studies of navigation ports and shrimp farming site selection for the states of Sinaloa, Chiapas and Veracruz. He then worked at the Bank of Mexico (FIRA), also as an aquaculture consultant developing feasibility study reports for shrimp farming in Sinaloa.

Dr Aguilar's technical responsibilities in FIRI will focus largely on developing methodologies, technical guidelines and draft technical papers, reviews and training materials on inland fishery management and GIS applications to inland fisheries and aquaculture. Readers can contact Dr Aguilar at: Jose.AguilarManjarrez@fao.org



IIRR, IDRC, FAO, NACA and ICLARM 2001.
Utilizing different aquatic resources for livelihoods in Asia: a resource book. International Institute of Rural Reconstruction, International Development Research Centre, Food and Agriculture Organization of the United Nations, Network of Aquaculture Centers in Asia-Pacific and International Center for Living Aquatic Resources Management. 416 pp.



This resource book which is complementary to the FAO/ICLARM/IIRR Integrated Agriculture Aquaculture: a primer consists of a compilation of reviews and proven experiences from Asia that are totally field-derived. It contains 67 contributions in 5 sections covering general issues and principles, participatory approaches and

extension strategies and community-managed aquatic resources, and providing a wide range of lessons and experiences from freshwater, brackish water and marine systems.

FAO/ICLARM/IIRR. **Integrated agriculture-aquaculture: a primer.** FAO Fisheries Technical Paper No. 407. Rome, FAO. 2001. 149 pp.

This document is an edited and slightly revised version of a previously published integrated agriculture-aquaculture (IAA) technology information kit. It contains 38 contributions in seven sections, outlining the basic issues and characteristics of IAA systems and making generous use of pictorial drawings and visual representations.

Socio-cultural, economic and environmental considerations in introducing IAA technologies are presented in the first four contributions. This section is followed by an overview of integrated farming systems, with six examples provided, ranging from integrated grass-fish and embankment-fish systems in the People's Republic of China, over the VAC system in northern Viet Nam to short-cycle methods

in seasonal ponds and ditches in Bangladesh. The next section has four papers dealing with livestock-fish integration of chicken-, duck- and pig-based systems. Two sections with a total of 16 presentations tackle several aspects of rice-fish systems, starting with eight technical examples from five countries, including irrigation systems, and in coastal areas with shrimp and in freshwater areas with prawn. Eight more presentations give recommendations on site selection, ricefield preparation, fish stocking, feeding, rice management and integrated pest management issues within rice-fish culture. Another section with four papers deals with aspects of fish feeding and management in IAA, such as the use of animal manure, domestic sewage and bio-gas slurry in ponds, as well as plant sources as fish feed. The last section contains four contributions on fish breeding and nursing, focusing on fry and fingerling production and emphasizing carp species. This includes a description of carp spawning in wheat fields and fry nursing in rice fields as off-season activities, as well as fry-to-fingerling rearing in rice fields.

This primer aims to give decision-makers in governmental and non-governmental organizations and in other organizations concerned with agriculture and rural development an overview and a basis for understanding the principles of IAA, and to help them decide whether to embark on IAA activities and include these in their program portfolio. For those who work directly with farmers, this primer aims at providing good examples of IAA, but it is *not* intended to be a compilation of procedures that should be strictly followed. Rather, this primer should help convince its readers/users that farmers can improve their livelihoods by either introducing IAA, or by further developing and improving the many IAA opportunities on their existing farms within their communities.



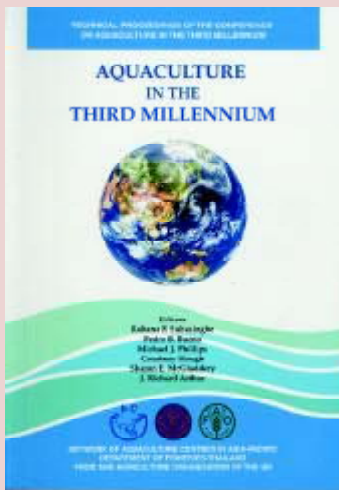
Subasinghe, R.P., Bueno, P., Phillips, M.J., Hough, C., McGladdery, S.E. & Arthur, J.E. (Eds.) *Aquaculture in the Third Millennium - Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand. 20-25 February 2000.* NACA, Bangkok and FAO, Rome. 471 pp.

FAO and the Network of Aquaculture Centres in Asia-Pacific (NACA) are pleased to announce *Aquaculture in the Third Millennium*, the Technical Proceedings of the Conference on Aquaculture in the Third Millennium. The *Technical Proceedings* represents the most comprehensive and authoritative review of the status of aquaculture development in the world assembled to date.

Over the past three decades aquaculture has expanded, diversified, intensified and advanced technologically and, as a result, its contribution to aquatic food production has also increased significantly. Aquaculture is highly diverse but a large proportion of production comes from small-scale producers in developing countries and Low Income Food Deficit Countries (LIFDCs). It significantly contribute to food security, poverty alleviation and social well-being in many countries. The contributions of aquaculture to trade, both local and international, have also increased over the past decades, and its share in the generation of income and employment for national economic development has also increased globally. The two landmark events in the recent history of aquaculture are the holding of the *FAO Technical Conference on Aquaculture* in Kyoto, Japan in 1976 and the *Conference on Aquaculture in the Third Millennium* held in Bangkok, Thailand, in February 2000.

The *Conference on Aquaculture in the Third Millennium*, which attended by 540 people from 66 countries, focused on the issues pertaining to the development of aquaculture and allied industries, and was conceived as a futuristic exercise to envision the state of aquaculture in the third millennium and to formulate strategies for national, regional and inter-regional actions. The *Technical Proceedings* of the Conference, "Aquaculture in the Third Millennium" represents the most comprehensive

and authoritative review of the status of aquaculture development in the world assembled to date. The *Technical Proceedings* reflect this unity of effort. It also emphasize the openness of communication, oneness of purpose, and wisdom to adapt to the dynamic aquatic systems and social conditions. It will be this flexibility, guided by principles founded on the common good, that will allow us to make optimal and sustained use of the aquatic environment, to which we are linked and on which we, and all who follow us, depend.

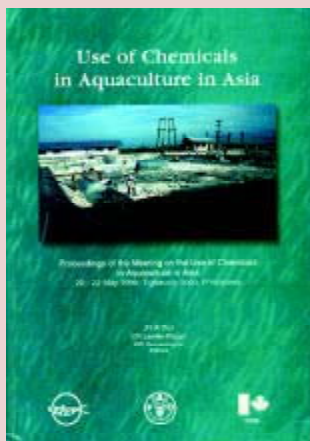


FAO Fisheries Department. *Aquaculture development. 1. Good aquaculture feed manufacturing practice. FAO Technical Guidelines for Responsible Fisheries. No. 5, Suppl. 1.* Rome, FAO. 2001. 47 pp.

The paper presents technical guidelines for good aquaculture feed manufacturing practice. The guidelines were compiled for FAO in support of Article 9 of the code of conduct for Responsible Fisheries (CCRF) concerning Aquaculture Development (FAO, 1997), and in particular in support of Article 9.4.3 of the CCRF concerning the selection and use of feeds and additives. The guidelines cover a number of issues, ranging from ingredient purchasing, processing, bulk storage, handling, monitoring, and documentation, to issues such as employee training and safety, customer relations, and the delivery of finished goods to the farmer. However, issues relating to the handling and management of manufactured aquaculture feeds by farmers on the farm are not covered here, as these will be considered within separate guidelines to be produced at a later date concerning good on-farm feed management practices.

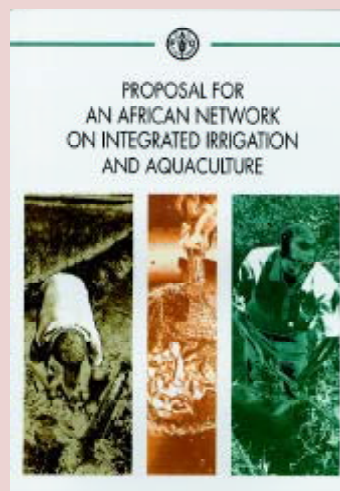
Arthur, J.R., Lavilla-Pitogo, C.R. & Subasinghe, R.P. 2001. Use of Chemicals in Aquaculture in Asia. Proceedings of the Meeting on the Use of Chemicals in Aquaculture in Asia. 20-22 May 1996. Tigbauan, Iloilo, Philippines. SEAFDEC, Philippines. 235 pp.

The use of chemicals in aquaculture systems for various purposes is widely recognized. While aquaculturists acknowledge that some operations are reliant on chemical usage, they also realize the potential danger associated with chemical misuse. An Expert Meeting on the Use of Chemicals in Aquaculture in Asia was convened at the Aquaculture Department of SEAFDEC (South East Asian Fisheries Development Centre) in May 20-22, 1996. More than a hundred participants and observers composed of scientists and aquaculturists, both from the private and government sectors, from 20 countries attended. The meeting synthesized all information on the use of chemicals in aquaculture in Asia with emphasis on the various aquaculture systems and species to which they were applied, and the country regulations regarding their distribution and usage, which are given in this proceedings. The discussions and workshops came up with recommendations on how to mitigate the impact of chemical use on the environment and consumers. Experts estimate that there may be no less than 50 veterinary drug products in each country that have found their way to fish farms. The meeting was opportune because the sustainability of the aquaculture industry has been increasingly linked to the integrity of the environment. The recommendations made in this volume were discussed by the Working Group on Environmental Impacts on Coastal Aquaculture of GESAMP (IMO/FAO/UNESCO/IOC/WMO/WHO/IAEA/UN/UNEP Joint Group of Experts on the Scientific Aspects of Marine Environment Protection) during its meeting from 24 to 28 May 1996 also held at the SEAFDEC Aquaculture Department. The proceedings of that meeting are contained in GESAMP Reports and Studies No. 65 entitled "Towards safe and effective use of chemicals in coastal aquaculture (GESAMP, 1997).



Moehl, J.F.; Beernaerts, I.; Coche, A.G.; Halwart, M. & Sagua, V.O. Proposal for an African Network on integrated irrigation and aquaculture. Proceedings of a Workshop held in Accra, Ghana, 20-21 September 1999. Rome, FAO. 2001. 75 pp.

This publication represents the proceedings of the Integrated Irrigation and Aquaculture Workshop held in Accra, 20-21 September 1999. There is great potential for integrated irrigation and aquaculture (IIA) in sub-Saharan Africa and this type of integration fits well into the water control and diversification components of the FAO Special Programme for Food Security (SPFS). Networking activities of three international institutions interested in IIA were reviewed: the Regional Association for Irrigation and Drainage (ARID), the Eco-regional Programme for Humid and Sub-Humid Tropics of the International Institute of Tropical Agriculture (IITA), and the two regional research consortia, i.e. the Inland Valley Consortium and the Regional Rice Research Network, of the West Africa Rice Development Association (WARDA). IIA field activities in Mali and Zambia were presented and IIA-related research was reported from Burkina Faso and Ghana. All countries indicated a high potential for IIA. Possible actors involved in IIA activities represent a wide variety of research and development agencies in each country. Information to facilitate IIA development is frequently lacking; joining national networks into a regional network would expedite access to and exchange of information. The workshop proposed the establishment of a regional IIA network and elaborated on the potential network's goal, objectives, themes, context of operation, structure and linkages.



TOC

FAN

FAO Aquaculture Newsletter

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It is also available on the FAO Web site:

<http://www.fao.org/aquaculture/naq/naqindex.html>

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