Food and Agriculture Organization of the United Nations

FAN

July 2001 - No. 27

FAO Aquaculture Newsletter

FAO AQUACULTURE NEWSLETTER FAO AQU
FAO AQUACULTURE NEWSLETTER

EDITORIAL

Dear Reader

Welcome to FAN-27. This is the first issue of the year 2001. Beginning with this issue, FAN will be published twice a year, in July and in December. Although we have reduced the number of issues per year from three to two, we have increased the number of pages substantially, so that you may even receive more information than before. FAN will continue to publish in its usual format as a printed Newsletter in English, however, from this issue you will have the opportunity to enjoy reading a web-based version of FAN in all FAO official languages - Arabic, Chinese, English, French and Spanish. This is in keeping with FAO's efforts to provide information to all our member governments and clients in there official and preferred languages. Please visit our website at http://www.fao.org/fi/newslet/newslet.asp to view and download FAN-27 in any of the FAO official languages.

Perhaps you may be aware that the FAO Council, which met in July this year, approved the recommendation made by the Committee on Fisheries (COFI) on establishing a Sub-Committee on Aquaculture (SCA). This is the second Sub-Committee of COFI, the first being the Sub Committee on Fish Trade. Establishment of COFI/SCA is a major milestone in our efforts to assist the development of sustainable aquaculture throughout the world. The first meeting of the COFI/SCA will be held in Beijing, China P.R., in April 2002. Delegates from our member states, relevant NGO and private-sector representatives, and other interested stakeholders will meet in Beijing to discuss the issues on global aquaculture and to decide on courses of action for sustainable development and management of the sector. Keep an eye on our website - http://www.fao.org/fi - for further information.

We are happy to announce the addition of several new faces to the FAO Fisheries Department. Dr. Simon Funge-Smith, a British national, was appointed as the Regional Aquaculture Officer at the FAO Regional Office for Asia Pacific (RAP) in early July of this year. A profile of Dr. Funge-Smith is given in this issue. We also have appointed two new aquaculture officers to the Inland Water and Aquaculture Service (FIRI): Drs. Jose Aguilar-Manjarrez, a national of Mexico, and Dr. Alessandro Lovatelli, a national of Italy. While Dr. Aguilar-Manjares will work on Inland Fisheries and Geographical Information Systems (GIS), Dr. Lovatelli will extend his expertise for coastal and marine aquaculture development. Their profiles will be published in the next issue of FAN.

That's all from us. Sit back, relax and enjoy reading FAN-27.

The Editorial Board

Cover Photo courtesy of Felix Marttin
People from Tangail district in Bangladesh, making use of the receding flood to catch some fish (1998)

CONTENTS

FAO AQUACULTURE ACTIVITIES: AN EXAMPLE FROM VIET NAM

[1]Raymon van Anrooy and [2]Bede Evans

[1]Fisheries and Aquaculture Economist, FAO Representation, Hanoi, Viet Nam. raymon@un.org.vn or FAO-VNM@fao.org
[2]FAO Fish Health Consultant, Research Institute for Aquaculture No. 1, Bac Ninh, Viet Nam. bede_evans@hotmail.com

Introduction

Viet Nam is endowed with an abundant supply of water resources that are ideal for fisheries and aquaculture. It has a 3 260 km long coastline, 112 estuaries, 1 million km^2 of Exclusive Economic Zone (EEZ) and more than 4 000 islands which form many bays, straits and lagoons. The total annual allowable sustainable marine fisheries catch is estimated at 1.4 million tonnes (mt) per year. There are an additional 1.4 million ha of freshwater, brackishwater and marine water-surface available for aquaculture purposes. However, the productivity of aquaculture is rather low (250-300 kg/ha) compared to other countries in the region.

The total fisheries production for 2000 was estimated at 1 969 000 mt, an increase of 15 percent compared to 1999. This increase occurred despite the serious floods that affected the Mekong River Delta in 2000 and caused considerable losses to the aquaculture sector. This production level was reached with 73 600 motorized fishing vessels and an estimated 640 000 ha of water-surface area for aquaculture of fish and shrimp. However, the Ministry of Fisheries (MOF) believes that the figures are underestimated because in some areas up to 70 percent of ricefarmers cultivate fish in their ricefields that are mainly used for domestic consumption.

The number of motorized fishing vessels has increased to 5 578 since 1995. The capacity of fishing vessels increased over the same period to 1 252 728 CV. The number of fishing ports and landing places currently exceeds 700. There were also more than 250 fishery products processing enterprises in 2000, with a total processing capacity of more than 1 000 mt per day.

The total export earnings from the fisheries and aquaculture sector in 2000 was over US$ 1.3 billion, an increase from US$ 1 billion in 1999 (i.e., 38 percent). The fishery sector export figures for the first quarter of 2001 show a continued increase in volume of products and export earnings (12 percent and 25 percent, respectively) compared to the same period in 2000.

The continued increase in export earnings is due to a number of reasons: high demand from foreign countries for shrimp, catfish and cuttlefish; improved quality in production processes (including major renovations in processing facilities to obtain Hazard Analysis Critical Control Point (HACCP) and ISO 9000 series certification); and the introduction of value-adding processing techniques. In July 2001, 61 exporting companies were allowed to export to the European Union. Figures from the first six months of 2001 showed that Japan, the United States and P.R. China are still the major export markets for Vietnamese fisheries products, values of US$225 million, US$210 million and US$107 million, respectively. A significant amount of fisheries export earnings is derived from shrimp (mainly the black tiger shrimp, *Penaeus monodon*). Although the price of shrimp was under pressure on the world market in the first semester of 2001, exports of this product still valued over US$328 million in this period.

It is estimated that there are 3.4 million labourers working in the fishery sector, of which more than 700 000 are involved in aquaculture. The number of labourers involved in the aquaculture sector

Counting catfish fingerlings

has grown sharply in recent years and is expected to continue to grow as many ricefarmers in coastal areas in central Viet Nam change to shrimp culture due to poor soil conditions for cultivating rice.

FAO support to the fisheries sector in Viet Nam

FAO has lent its expertise and knowledge to Viet Nam over the last two decades to utilize existing water resources and further development of the fisheries sector (including aquaculture). In the 1980s, the focus was primarily on the promotion of large-scale shrimp culture to increase food production and foreign exchange earnings through exports. The scope has since widened to encompass policy advice, research, extension and training, breeding techniques, production and processing techniques, quality control, management support, and food security and poverty alleviation issues.

Taking catfish fingerlings for stocking

Fish farming in the northern uplands

FAO and the Vietnamese Government strongly acknowledge that aquaculture is a tool that can be used to attain food security and alleviate poverty. Thus, FAO initiated in 1999 the Sustainable Aquaculture for Poverty Alleviation (SAPA) strategy. After many participatory workshops and working groups with bilateral donors (the Department for International Development of the United Kingdom, DFID; the Norwegian Agency for Development Cooperation, NORAD; the Danish International Development Agency, DANIDA; the Australian Centre for International Agriculture Research, ACIAR; and the Japanese International Cooperation Agency, JICA), multilateral donors (the United Nations Development Programme, UNDP; the Asian Development Bank, ADB, and the World Bank, WB) and specialized agencies (the Network of Aquaculture Centres in Asia-Pacific, NACA), a national strategy was developed to integrate aquaculture into the government's national Hunger Eradication and Poverty Reduction (HEPR) programme. The primary target group of SAPA will be poor people in rural areas where opportunities exist to diversify and improve livelihoods through aquaculture. In terms of spatial attention, the first focus will be on the Northern Mountains, Central Highlands, North Central Coastal Provinces and the Mekong Delta. (see L.T. Luu in this issue). An implementation strategy for the SAPA programme has been developed which facilitates the support of various donor agencies to the aquaculture sector via multi-donor coordination.

Aquaculture development in Viet Nam has been restricted by a number of factors. In many areas, there is limited access to extension services, financial services and markets. FAO and UNDP have sought to address some of these constraints and empower remote rural communities to sustainably exploit the available aquaculture potential and thus improve their livelihoods. The UNDP/FAO project VIE/98/009 in the Northern Uplands has shown that aquaculture in mountainous and remote areas can support poor people's livelihoods. Ethnic minorities living in isolated upland areas have particularly benefited, in terms of food security and income generation. The extension approach used by the project was based on a combination of demonstration farms and Commune Action Groups of fish farmers. It proved very successful, with increased numbers of farmers adopting or re-adopting traditional and new aquaculture techniques.

FAO has strongly supported the fisheries sector in Viet Nam in the fields of policy development and capacity building. The FAO-funded fishery sector policy review completed in 1993 was important in identifying new opportunities for the sector during the period of economic transition. In 2000, FAO

Women in aquaculture in northern uplands

initiated a Cooperation and Partnership Group (CPG) comprised of the MOF and the main donors in the sector. It provides a platform to support policy development, increase cooperation and avoid duplication of efforts. In addition, FAO is currently providing assistance to the development of a new Vietnamese Fisheries Law and has supported the Vietnamese Government in the formulating a "National Strategy for Aquatic Animal Quarantine and Health Certification," together with UNDP and NACA (see related article in FAN 26).

Technical assistance has been provided to upgrade the research and training capacity of the Research Institutes for Aquaculture (RIAs) in Ha Bac and Khanh Hoa provinces and the Research Institute for Marine Products in Hai Phong Province. This technical assistance has substantially contributed to an increase in the institutional capacity and efficiency of these institutes. This is now reflected in the rapid development of inland and coastal aquaculture and marine fisheries in Viet Nam.

The Vietnamese Government has several requests for FAO assistance under its Technical Cooperation Programme (TCP). However, reaction to these important requests has been delayed. This is because FAO assistance was urgently needed in the Mekong River Delta following the severe floods in 2000. These floods affected the livelihoods of more than five million people and claimed more than 370 lives.

Poor fish-farming households were particularly affected, with most households losing their fish stock just prior to harvest. This meant that their investment in fingerlings, labor and feeds was completely lost in many cases. In addition, many bought nets to encircle their ponds, but the flood waters rose higher than the nets and thus, most of the fish escaped, leaving the poor fish-farming households without income and with decreased food security.

In response to the UN Inter-Agency Appeal for Emergency Relief and Initial Rehabilitation, FAO (in collaboration with the governments of Norway and Switzerland) provided fingerlings and nets free of charge to more than 2 500 of the poorest and most flood-affected fish-farming households in the provinces of An Giang, Dong Thap and Can Tho. High quality fingerlings of sutchi catfish (*Pangasius*

Green mussel culture near Cat Ba island

Fish trading in Ha Tinh Province

hypophthalmus), common carp (*Cyprinus carpio*), kissing gourami (*Helostoma temminickii*), climbing perch *(Annabas testudineus*) and snakeskin gourami *(Trichogaster pectoralis*) were distributed to farmers with support from the Aquaculture and Fisheries Sciences Institute of Can Tho University. This made it possible for farmers to restart their aquaculture activities at a time when many of the ricefields were still submerged and rice cultivation was not possible. The fingerlings could be sold at any time during the production season to provide direct cash, or could be used for domestic consumption to support food security. The assistance will also provide information to farmers and extension officers on water quality and fish health monitoring and will assist disease-affected farmers by providing appropriate chemicals and drugs.

Small-scale initiatives in the fisheries sector have been supported in previous years under the FAO Telefood campaign. These include the construction of an ice machine for a group of artisanal coastal fishermen, improvement of fish ponds for groups of women fishfarmers, construction of a shrimp hatchery for farmers affected by the severe storms and floods in Central Viet Nam in 1999, and the construction of fish ponds for a group of leprosy-affected persons to support their livelihood and improve their food security situation.

Future directions of support

The activities of FAO in the Vietnamese fisheries sector will continue under its Technical Cooperation Programme (TCP) and Telefood project modality. The continued collaboration with the Vietnamese Government, national institutes and other donor agencies is expected to strengthen the sector even further. Areas of focus for the near future include:

- The development of technical standards for shrimp hatcheries for producing quality nauplii and postlarvae to provide a basis for decreasing the distribution and severity of disease outbreaks, which are considered as being associated with the movement of life shrimp and the rapid transition from extensive to semi-intensive production systems.
- A coastal fisheries study to contribute to the Vietnamese Government's efforts with respect to policies related to the transition to sustainable coastal fisheries.
- A fisheries marketing and credit study to improve the livelihoods of the people working in the Vietnamese fisheries sector by the collection and analyses of fishery products marketing information and the dissemination of the information obtained to all stakeholders in the sector.
- Continued FAO support to the SAPA programme, the CPG and the MOF.

Poverty alleviation through fish culture:

Homestead catfish culture in Bangladesh

Felix Marttin[1] and Gertjan de Graaf[2]

[1]Inland Water Resources and Aquaculture Service (FIRI)
FAO. Felix.Marttin@fao.org
[2]Nefisco foundation,
Lijnbaansgracht 14C, 1015GN Amsterdam
The Netherlands, degraaf@nefisco.org,
http://www.nefisco.org

Introduction

A large part of the population of Bangladesh is poor. The poorest of these poor find themselves in a vicious circle, because they don't have collateral to prime income-generating activities. Many attempts have been made to break this circle. The micro credit schemes, operated by several NGOs (non-governmental organizations) are a good example of such attempts. The main idea is to give people access to resources with which they can generate an income, with which they then can acquire more resources to generate more income. Instead of providing money or other means to acquire resources to generate income, another approach to the poverty-problem is to try to find a way to generate income with resources available to these poorest people. In Bangladesh, most poor people can work, have access to land on which their shack is built, what the area (or fields) around it can provide, and water.

An income-generating activity making optimal use of these resources is homestead catfish culture, as was practised locally in the project area of the Compartmentalization Pilot Project (CPP) in the central region of Bangladesh. This practice was taken up by the CPP, and further refined into a homestead fish-culture programme. Requirements for this activity are; food for fish, a small pit, water, and catfish fry.

The fish food can be collected from the surroundings of the homestead (snails, bivalves, termites, ants, slaughter waste, etc.). The pit does not have to be large, 1m^2 is enough for 50 fry, so it can be dug by the participants themselves. Catfish fry is widely available in Bangladesh, for reasonable prices (between 10 to 50 Taka [= US$0.2 to US$1] (1US$ is equal to about 50 bangladesh Taka) for 50 pieces). After a rearing period of four months the production will be five to six kg of African catfish, which is equal to approximately 400 Taka (=US$8).

A proud participant showing her fish and the pit in which she breeds them

The concept of homestead catfish culture

The basic concept of a homestead catfish culture programme is that the poorest people in an area are introduced to an easy method to culture fish in small holes or pits in the ground on the homestead. The African catfish (*Clarias gariepinus*) is used because this fish is known to take up oxygen from air, has a high growth rate, and is very disease resistant. Experience shows that as soon as people are introduced to this method, they adapt it to the possibilities around their homesteads. During and after successfully raising a first batch of fish, the people on and around the involved homesteads develop initiatives for continuation of the activity, such as contacting local fry traders and trying out different food sources locally available. In the programme, initiatives like these are stimulated and form the core of the success of it.

All training of participants was done on site, at the homestead. Field staff worked with around 50 participants per staff member at a time. The first interaction between participants and field staff was during the identification of participants. To ensure selection of the poorest of the poor, a general review of the participants' situation was made. To be selected for the programme the potential participants had to comply with few criteria. They had to be (a) landless (people owning less then 0.02 ha of land are considered landless in Bangladesh), (b) their general situation had to be poor/desperate, and (c) their house needed to have mud, bamboo or jute walls.

If potential participants fitted all criteria they were asked about their interest in partaking in the programme, which involved them buying fry for a reduced price (10 Taka, 20 US cents) from the field officer. The price was reduced to facilitate cooperation between the field officers and the participants, so that it was possible to visit the participants at certain intervals, and ask questions about their experiences.

During the sale of the fry, four basic rules for catfish culture, which would provide an easy method to grow the fish, were explained to the participants:

- The fish need to be fed every day, preferably until they do not want to eat anymore.
- The food can be anything, except grass and plastic. The best food being protein rich food.
- As soon as the water in the pit starts smelling bad it needs to be changed.
- During the change of water special attention needs to be paid to the sizes of the fish; these need to be in the same range, to prevent cannibalism.

Two to three days after the sale of fry, the involved field officer paid the participant a visit. This proved to be crucial to the success or failure of the participating household; a number of participants not visited within these three days failed to rear their fish successfully. After the first two contacts, the household was visited every three to four weeks, to monitor progress and to answer any questions concerning fish culture in each pit.

Participating households

Two hundred households participated in the homestead catfish culture programme. The average size of these households was around five. Most male household members (84 percent) had an income-earning job with which they earned on average 49 Taka per day. On the other hand, most of the women in the selected households stayed on the homestead (90 percent) and were not earning money. The women who did earn an income brought home less then men, the average daily income for women was 15 Taka. A small number of children (2 percent) generated an income, on average 22 Taka per day per child. Sixty percent of the children went to school, primary school in most cases being the highest education of these children. On the whole the daily income per household was around 60 Taka.

An example of the pit used to grow catfish

The size of the fry with which the pits were started

The participating household members had two to three meals per day, mainly consisting of rice and vegetables. Three times per week the vegetables included pulses (dhal), containing high levels of protein. Twice a week the meals were supplemented with fish, once every two weeks with meat, and once a month chicken was added to the meal. Eggs and milk were consumed less then three times per week.

Care

Women took care of most of the pits (80 percent), men (15 percent) and children (5 percent). Care for the fish consisted mainly of collection of fish-food. This food could be collected from around the homestead, because the catfish eats almost anything. Children from nearby assisted caretakers in the collection of food, because of the interaction children had with the fish while feeding. It turned out that feeding was like a fun game to them. The food supply costs can be considered zero, taking into account that mainly women and children (who do not

Alternatives for homestead catfish culture: biri production (15 Tk/day, 30 US cents) or brick breaking 40 Tk/day

earn any income) collected the food. The supplied food consisted mainly of snails (46 percent), rice (18 percent), wheat bran (9 percent), rice bran (9 percent), bivalves (5 percent), or slaughter waste (5 percent). In other cases termites, earthworms, wheat powder, cow dung, fish, bread and duckweed were used. On average the water in the pit was replaced every 10 to 12 days. The average time spent on the fish was one hour per day. The caretakers themselves took decisions concerning management of the pits and, more importantly, decided what happened with the fish produced.

Twenty households were not able to grow their fish to marketable size (>75g), due to several reasons:

- Insufficient guidance by the project staff (not visiting the household within three days after distribution of the fish, not visiting the household every three to four weeks).
- Not enough time spent on the management of the pit by the responsible person in the household (less then one hour per day).
- Escaping of fish (after flood, or heavy rain).

Over a six-month period 158 new households took up this method of fish farming, without intervention of the regular programme, a diffusion ratio of 158/200 = 0.79.

Season

African catfish will grow when the temperature of water in which they are kept is higher then 20^{0}C. Therefor, for the programme to be successful, a minimum water temperature needs to be guaranteed. This can be done by either having a growth season during summer, or to ensure a supply of water with a minimum temperature of 20^{0}C. Some of the participants used to replace the water from their pit daily with tube-well water of 21^{0}C.

Impact

One can describe the situation of the involved women (80 percent of the participants) as being extremely dependent on their husbands, or desperate if a husband is not present. Only a small number of women (10 percent) earned a meagre income (15.2 Tk/day, 30 US cents). The rest had to rely solely on what their husbands supplied them, or some income from the occasional job and barter trade. An example of one these occasional jobs is 'biri' stick production. Biri is the local cigarette, biri sticks are the paper holders of the tobacco. The sticks are produced on the homestead, resulting in an income of 2.5 Taka per thousand sticks. On average an adult can produce that amount in three hours. Which means the income from this activity is 0.75 Taka (= 0.015 US$) per hour. Catfish culture takes on average one hour per day, four months for the production of five kg of fish (400 Taka), meaning a return of 3.33 Taka per hour.

Evidently the Homestead Fish Culture Programme has had an enormous impact on people in the above situation. Five kg of catfish (400 Tk, US$8) in four months are in terms of the developed world not much, but for participants they can mean the difference between food on the plate and nothing to eat at all.

Environmental aspects

In the homestead fishculture programme the African catfish is being used, because of its earlier mentioned features. These features are unique to the African catfish. The main reason for the preference for the African catfish over the local catfish (*Clarias batrachus*) is its growth rate. The growth rate of the African catfish is much higher then that of its local relative. Some reservations about the use of this exotic species exist, because of the apparent possible dangers of the use of it. It is popularly believed in Bangladesh that the African catfish is a ferocious predator, capable even of eating small goats. The fear exists therefor that the African catfish will wipe out local fish populations. However, during the approximately 20 years the African catfish is being used in South Asia (and 15 years in Bangladesh), no scientific reports are made concerning possible negative impacts the species might have. Also during the implementation of the homestead fish-culture programme in Bangladesh no evidence was found concerning the ferociousness of this fish, on the contrary, it was perceived as a lazy omnivore, eating whatever comes in front of its mouth.

Supply

At present there is a thriving industry in Jessore (southwest Bangladesh) where millions of catfish fry are produced per month. This industry produces for (illegal) export to India, and for the local market. Fry traders all over the country sell the African catfish. Up till now the demand for catfish fry within the project area was low, so the market for these fry traders was of no importance. However, now, with the homestead fish culture programme running, demand is rising and fry traders are moving in to sell their fish. The traders distribute also to homesteads directly, making it possible for women to buy fry at their homesteads.

Sustainability

The sustainability of the programme depends completely on the availability of fry of the species involved. As long as the fry is available the programme has an opportunity to be successful.

FAO promotes, through their regular aquaculture programme, the integration of aquaculture into rural livelihoods. The described programme is an excellent example of this integration, with as an additional benefit the mobilization of a group of people which is very difficult to reach with 'normal' aquaculture programmes. The 'ownership', the possibility to make decisions concerning the application of the method, lies completely with the participants of the programme, giving them responsibility, resulting in a successful application of aquaculture by people from the poorest segment of society. All these factors make for a succesfull grass-root programme which could be followed in any rural development programme. Editors.

Recommendations

The programme used an, for the Indian sub-continent, exotic species. To prevent any problems associated with the use of an exotic species this method should be tried with local species. These species should fulfil the following requirements:

- Be able to survive in anoxic water
- Be easy to keep, the fish should be able to eat what is available around the homestead
- Be fast growing
- Fry cheap and available
- Species used must be accepted by participants and the market.

To make sure the African catfish does not become an environmental disaster, research has to be done concerning the ferociousness of the species, before a large-scale programme is set up to spread this method regionally and inter-regionally.

Because participants will use the common resources around their homestead, an impact assessment has to be made on the effect of homestead fish culture on the environment surrounding the homestead.

Although it was not an objective, the programme turned out to have a contribution to the improvement of the situation of women. It seems that it can be a useful tool in projects dealing with gender issues.

The described method turned out to be a highly successful way to reach the poorest segment in the project area concerned. The participants turned out to be highly motivated and very innovative. If the potentially negative aspects of the method after proper research show not to be negative this method should be propagated nationally in Bangladesh, and beyond the Bangladeshi borders.

The result of the efforts of the participants: African catfish ready to be eaten or sold

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

Le Than Luu
Research Institute for Aquaculture[1] (RIA1)
Hanoi, Viet Nam

There is general agreement among Government of Viet Nam and many donors and development agencies that improved aquaculture can make a significant and direct impact on poverty reduction and hunger eradication in Viet Nam and will depend on the sharing of effective and sustainable systems for aquaculture. The key policy issue is to better support poor and vulnerable groups who depend on or could make use of aquatic resources through the use of the livelihoods perspective. To address this issue MOFI has developed a Strategy of "Sustainable Aquaculture for Poverty Alleviation" - SAPA.

The SAPA Strategy recognizes that there is a need for: awareness raising and better communication of the role of aquaculture in sustaining poor people's livelihoods in Viet Nam, for improved understanding of participatory approaches, improved institutional capacity with a pro-poor focus; addressing the gap between farmers/fishers needs and the services offered by extension institutions; appreciating the wide range of stakeholders involved in aquatic resource management, and addressing the issues of access to markets and financial services by the rural poor. In response to these issues, the SAPA Strategy is formulated with the following objectives: 1) Enhancing capacities of poor people in rural areas to improve livelihoods through awareness raising and improved aquatic resources management and aquaculture; 2) Strengthening the capabilities of institutions, and particularly local institutions, to understand and support the objectives of poor people in inland and coastal communities who depend on, or could benefit from, aquaculture; 3) Developing and sharing environmentally sound, low-risk, low-cost aquaculture technologies and aquatic resources management practices, and 4) Developing national policy based on lessons and experience from local pilots and through effective information exchange, and improving inter-sectoral collaboration on strategies for addressing poverty.

The primary 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. In terms of spatial attention, the first focus will be on the Northern Mountains, Central Highlands, North Central Coastal provinces and the Mekong Delta. Moreover, links will be pursued with district, provincial, national and regional institutions and donor agencies with responsibilities for poverty alleviation and sustainable rural development. The SAPA Strategy emphasizes a process approach and will build further on the understanding derived from sustainable livelihood analyses and local pilots. For the implementation, SAPA will be part of the MOFI and use a Sector Committee to guide the overall development of the Strategy and an Implementation Support Unit for the execution of the Strategy. The SAPA Strategy will form part of the Government umbrella "Hunger Eradication and Poverty Reduction" programme.

The background, recognition, justification, emphasis, and implementation process of SAP are detailed in this two-part article. The Part I deals with the background which lead to the formation of SAPA Strategy and in the next issue of FAN, Part II will discuss 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".

Background

The Sustainable Aquaculture for Poverty Alleviation (SAPA) Strategy addresses an issue of global and regional significance, as well as of national importance to Viet Nam poverty alleviation and improvement of the livelihoods of people living in rural areas and the fundamental role of aquatic resources management in sustaining poor people's livelihoods. Fish and other aquatic resources constitute a major source of animal protein and of micro-nutrients (e.g. calcium, iodine) in the diet and an important source of income and employment. Experience gained during the last decade in Viet Nam shows that development of aquaculture can make a significant contribution to better livelihoods and alleviate poverty, both as specific interventions and as a component of integrated rural development.

The significance of aquaculture to rural development was emphasized by the NACA/FAO "Conference on Aquaculture in the Third Millennium". The resulting Bangkok Declaration and Strategy on Aquaculture Development Beyond 2000 (NACA/FAO, 2000) recognized that:

- "The practice of aquaculture should be pursued as an integral component of development, contributing towards sustainable livelihoods for poor sectors of the community, promoting human development and enhancing social well-being, and
- "Aquaculture can be an entry point for improving livelihoods, planning natural resource use and contributing to environmental enhancement."

The Conference on Aquaculture in the Third Millennium also emphasized that: to increase the contribution of aquaculture to rural development and poverty alleviation, strategies are required to put people as the focal point for planning and development and to integrate aquaculture into overall rural development programmes. This reflects the strategic direction of many current Asia regional initiatives, such as the NACA/FAO regional programme on aquaculture for sustainable rural livelihoods development, the DFID Aquatic Resources Management Programme, the AIT-Outreach and others.

Viet Nam has gained successful experiences in using aquaculture for poverty alleviation. The SAPA Strategy seeks to increase the positive impact of aquaculture on poverty alleviation and rural development in Viet Nam, taking into account the opportunities to link and learn from global and regional initiatives and strategies that may be applicable to the country.

Fast growing economy

Viet Nam has made remarkable progress in economic growth and development since the beginning of economic reforms in the early 1980s. Since 1988, aggregate GDP has increased on an annual basis by an impressive 8-10 percent in real terms (Poverty Working Group 2000) putting Viet Nam among the ten fastest growing economies. Industrial sector growth has been rapid (13 percent per annum), while the well-established agriculture sector, has grown at an annual rate of 4.5 percent during 1992-1998. Wild and cultured fish contributes about 40 percent of the total animal protein intake of the population. The per capita availability of fish has increased from 11.8 kg in 1993 to 13.5 kg in 1995 and is expected to reach a level of 15.0 kg by year 2000. During the last few years (1994-1997) the contribution of the fisheries sector (including aquaculture) to national GDP was about 3 percent. The sector has performed well attaining a rapid growth in production from 890 590 tonnes in 1990 to 1 969 100 tonnes in 2000 (MOFI, 2000). While the potential for capture fisheries is estimated to be limited (up to 1.5 million tonnes per year), the aquaculture production increased to 727 140 tonnes in the year 2000. According to recent statistics, more than 3.4 million of people are engaged in the fisheries sector. Among these about 600 000 are involved in the aquaculture subsector and although production has increased dramatically in Viet Nam opportunities in the sector have often not been open to poorer rural people. There is some indication that in the more intensive aquaculture production systems such as coastal shrimp production has intensified inequality, with wealth from shrimp production being concentrated in a few hands and competition over finite coastal resources leading to displacement of poor people (DFID, 2000; OXFAM, 1999). The Government has identified about 1.8 million ha of water surface suitable for aquaculture; however, in many contexts (fresh water fisheries as well as coastal) aquatic resources are under threat from environmental degradation, overexploitation and poor management practices (DFID 2000, MPI/UNDP, 1999).

It is in the context of access by the poor, agricultural diversification and the threat of environmental degradation that the focus on increasing effective and sustainable use of the aquatic resources becomes particularly relevant.

Poverty situation

Economic growth and especially the performance of the agricultural sector have had a major impact upon levels of poverty in Viet Nam over the past decade. This has been measured by the Viet Nam Living Standards Surveys carried out in 1993 and 1998. The survey in 1993 showed that the population under the 'overall poverty line' (annual per capita expenditure of VND 1 160 000) was as high as 58 percent, while as many as 25 percent were below the so-called 'food poverty line' of VND 750 000. By 1998, the situation had improved dramatically. A significant but much decreased 37 percent of the population were then classified as poor in relation to the adjusted overall poverty line (VND 1 790 000 or US$128) and just 15 percent below the food poverty line (VND 1,287,000 or US$92).

Eighty percent of the total population and 90 percent of the poor people live in the rural areas in Viet Nam. Among the regions, poverty incidence is higher and deeper in the Northern Mountain and Central Highlands, where 59 percent and 52 percent remained in poverty in 1998, and where the poverty gap index (measuring the depth of poverty, through the average shortfall of expenditure) was 16.8 and 19.1 respectively. In coastal areas, 48 percent of the population along the North Central Coast remain below the poverty line, but the depth of poverty was rather lower with an index of 11.8. These macro-regional figures, while providing an overall picture of poverty, hide considerable concentrations of poor people. For example, in the Mekong River Delta, although the poverty incidence 37 percent is relatively low the area still holds 21 percent of the total number of people living in poverty in Viet Nam. While the Mekong Delta has one of the lowest percent of households classified as hungry it has the second highest number of very poor households categorized as "starving" and is ranked by the General Statistics Office as 3rd poorest.

The causes of poverty are diverse depending on geographical locations. For example, the Northern Mountain population is suffering poverty as a result of geographical isolation, limitations in land area for rice cultivation, poor communications and transportation infrastructure, poor public and extension services including health and education, difficult access to market and credit services. The supporting policies and assistance from the Government also have difficulties to reach to grassroots levels in these areas. The people in

Northern Central coastal areas have very little arable land, and aquatic resources that are an important part of people's livelihoods in this area are overexploited. Moreover, a harsh climate with high risk of natural calamities such as typhoons and flooding makes the livelihoods of people in this area particularly vulnerable.

Government policy

As the development gap between urban and rural areas has increased during the transition towards a market economy, rural development has been given first priority in the Government's current development strategy.

More recently a Comprehensive Poverty Reduction Programme has been prepared which the Government will approve around mid-2001. MPI will be the directorate and MOLISA the secretariat coordinating the established National Multi-ministerial coordination committee. The goal is to put poverty reduction at the centre of most policies and programmes in Viet Nam, as recently affirmed by President Tran Duc Luong at the UN summit in New York. To implement this Programme different sector ministries, mass organizations and NGOs have been requested to prepare specific sector policies of which the following can be listed: i) credit access for the rural population and poor sector; ii) public health care/assistance; iii) supports for education/training for the poor; iv) material support for extremely poor groups; v) legal and educational services; vi) material support for vulnerable and disadvantage groups; vii) support in housing for the poor and homeless; and viii) providing land and water surface for the landless.

Fishery and aquaculture sector

Although the coastal and inland fisheries sector, involves many of the poorest and most vulnerable groups whose livelihoods depend in various ways on aquatic resources, and many of the donor-co-financed interventions within the fisheries sector have had an overall poverty alleviation development objective, MOFI has played so far only a minor role in the HEPR programme or other national efforts towards poverty reduction. The exception is Programme 773, and some research and development projects supporting rural households. Since 1994 the Government has promoted Programme 773, which aims to support rural people in using potential area (flooding fields, swamps, tidal flats) for aquaculture. To date, the programme has approved 100 countrywide projects allocating a total of VND 1 130 billion for infrastructure construction and reclamation of "under-used" water surface for aquaculture.

Research institutes under MOFI, especially RIA-1 have also been involved in a number of research and development projects attempting to disseminate small-scale aquaculture technology to farmers. Table 2 shows recent relevant initiatives.

Aquaculture, aquatic resources and the livelihoods of poor people

Full-time fishers are often among the poorest, and fishing is a supplementary/seasonal activity for many poor and vulnerable groups. Aquatic resources, including non-fish resources, often provide poor people with an important source of nutrients, which are not easily substituted (particularly in times of hardship) and an important economic activity, if only seasonally. There is evidence that poor people in mountain areas are able to maintain kinship connections, by using small-scale aquaculture ponds as a means of receiving guests for funerals and weddings, which otherwise would represent significant shocks to their livelihoods. There is also evidence that landless and land-short people depend heavily on swamp and mangrove fisheries, often capturing small non-fish aquatic resources. There is evidence that community management of water bodies, and dry season refuges or other forms of rehabilitation of fishery habitats and enhancement can improve poor people's livelihoods (DFID, 2000). The capacity of poor people to engage in aquaculture depends upon their asset base including human assets (labour, education, skills), natural assets (land, water, wild fish, forest), social assets (kinship, connections, status), physical assets (roads, tools, equipment) and financial assets (credit, savings, income, insurance). The outcomes that people chose and their capacity to convert their assets into those outcomes is influenced by the wider social arena in which people live, and the policies, institutions and processes (mediated through markets, communities, governments and households) which affect their lives. Therefore interventions, which aim to support poor people to manage their aquatic resources, need to be identified based on an understanding of poor people's livelihoods (DFID, 2000).

Table 1. Indicative figures reflecting poverty situation of typical geographical regions

Indicative figures	N. Mountain	N. Central	Mekong Delta
Per capita of rice (kg/month)	14.38	13.41	13.37
Per capita of fish (kg/month)	0.4	1.11	2.44
Per capita of meat(kg/month)	0.97	0.71	0.98
Income (VND)	173,760	174,050	242,310
Living expenditures (VND)	149,800	137,920	194,290
Malnutrition rate (%)	41.25	41.58	42.19

Table 2. Recent fisheries sector/donor initiatives

Date	Donor	Objective
From 1986-1997	UNDP/FAO	Strengthen research capacity, develop an extension network for the promotion of low-cost aquaculture to small-scale farmers
From 1995	Asian Institute of Technology (AIT), funded by SIDA	Extend on-farm research to integrated agriculture-aquaculture systems in Red River Delta
From 1997	Asian Institute of Technology (AIT), funded by SIDA	Support a dialogue with the Northern Mountain provinces to introduce the potentials of such technologies for poverty alleviation
From 1999	UNDP/FAO	Follow a more participatory approach in three Northwest Highland provinces
2000	Asian Institute of Technology (AIT), funded by SIDA	
1998		Capacity building to support poverty issues in rural and coastal areas
From 2000	DANIDA	Provide broad support to the fisheries sector, with poverty alleviation as one core objective
From 2000	NACA, DFID, FAO	Aquaculture for Sustainable Livelihood Development, regional networking
	ACIAR, IDRC and other donors	Small-scale research projects to support small-scale aquaculture

Poverty alleviation

Commonly 80 percent of the households in coastal communities get their income from fishing, while almost all livelihoods rely on fish capture and associated activities, as coastal communes commonly have little agricultural land. Poor coastal fishers livelihoods are vulnerable to seasonal weather, destructive typhoons and migration, for 3 to 4 months annually fishers rely on savings or credit to buy food. Recently natural capital has declined (due to overfishing, introduction of other gears fishing the same stock, destruction of mangroves, construction of large shrimp ponds). Negative impacts of high-risk (shrimp) aquaculture has contributed to landlessness of some poor people, e.g. in Tra vinh, due to indebtedness provoked by failed harvests ~~due to~~ shrimp disease. Such risks can be recognized and reduced through adoption of low-risk aquaculture techniques (simple fish culture, mollusc farming), and by providing appropriate extension and resource management, which support the needs of poor people. Social capital in the form of fishing cooperatives promotes collective action, provides safety nets, etc. though their resources are linked to the productivity of the fish resource. People's organizations provide connections, information and access to extension, assets and asset building opportunities.

In coastal areas such as Nghe an, Nam dinh, Nha trang, Quang binh and Hai phong (Do son), aquaculture interventions have offered entry points for improving people's livelihoods and reduced the vulnerability of low-income families and landless fishers, forced in large numbers to leave inshore fisheries due to declining stocks and habitat destruction. In Nghe an and Nam dinh hard clam farming in shallow inshore waters has provided a low-cost alternative to poor, landless fisher families. With effective management of aquatic resources, there is an opportunity to improve livelihoods of coastal people, as in the case of using bivalve resources in Ba tri district, Ben tre province. In Nha trang landless fishing families have been shown to benefit from involvement in small-scale sea farming of fish and lobsters in cages. There are proposals now to integrate small-scale marine aquaculture as an alternative livelihood option within a Biodiversity and Marine Protected Area Management Project in this coastal region. Incomes from agriculture on less fertile land in coastal areas are extremely low. Experiences in the Central Coastal provinces (e.g. Thua Thien-Hue) demonstrate the potential of fish/shrimp/crab culture in areas where agriculture is less suitable.

The Mekong Delta comprises a range of agro-ecosystems some of which are fragile. Over the last 20 years the Government and farmers have transformed the 4 million ha Delta and their farming systems through canal excavation, settlement and reclamation of land and intensification of rice farming. Seventy percent of mangroves and 95 percent of malaleuca forests have been destroyed. Poor Delta dwellers are especially vulnerable to seasonal flooding, in Long an, Tien giang, Dong thap and An giang the flood is regularly 0.3-3m, during flooding rice farmers rely on fishing. In the dry season the river flow can reduce by 95 percent and saline intrusion occurs, the farmers will use saline paddies for aquaculture purpose.

The wild fishery has declined due to overfishing and habitat loss, the use of pesticides and in early rainy season low pH in canals from acid sulphate soils. Many poor people who depend on aquatic resources have lost out. However, improvements in management and farming systems of mixed shrimp-mangrove farms in the Mekong Delta have led to improvements in livelihoods, providing an alternative for poor people to cutting of mangrove forests.

Frequent flooding in the Delta makes it necessary for farmers to elevate land for housing and crops, giving rise to physical assets such as ponds, canals and rice fields. Limited aquaculture is now practised by 60-70 percent of households. In rain-fed areas of Long An and Binh Phuoc province where water quality is difficult to manage ponds operated by poor

people commonly grow catfish, tilapia and kissing gourami. In the irrigated areas of for instance. Tay Ninh province some year round access to sub-canal water has provided opportunities to develop specialized aquaculture systems (to grow tilapia, pangasius, common carp and kissing gourami).

In the mountain regions where wild fish stocks have declined but water is stored in reservoirs, poor people stocking fish are reducing their vulnerability to crises and improving their food or financial security. For example, fish in ponds of ethnic people in the Northern Highland areas, are being used as a 'food/income bank' for times of crisis, seasonal food shortages or even social events.

Poverty assessments in Viet Nam emphasize the importance of interventions, which increase and diversify agricultural incomes and reduce vulnerability, and aquaculture appears to be one of the most effective options available in upland, Delta and coastal areas.

Government support for aquaculture

The Government has taken a number of decision and measures to support aquaculture development as it increasingly recognizes the contribution of aquaculture to poverty alleviation and rural development.

In the annual review of the fishery sector in 1998, the Prime Minister emphasized the important role of aquaculture for sustaining fish production. He considered aquaculture as an underdeveloped sub-sector with significant potential for alleviation of poverty. This high-level support resulted in Government approval of a development plan for aquaculture for 2000-2010 prepared by MOFI in late 1999. The objective of the development plan is to ensure food security for Vietnamese people and production of export commodities including raw materials for export targeting processing. The programme expects aquaculture to contribute 60-65 percent of total production of aquatic products by the year 2010.

On 15 June 2000 Government again made a policy statement in decision No. 09 about measures to economical restructure the trade of agro-commodities in which it was clearly instructed that sustainable aquaculture should be developed, by converting flood plains and coastal land for aquaculture. Diversification of crustacean species in different intensification systems and polyculture with various fish species was promoted as appropriate approaches for aquaculture. The measures included decisions on land lease and specific priority to credit access for poor and farmers in remote areas.

Still this support and the different ongoing programmes and project activities have not been brought together in a way which addresses the livelihood objectives of the poor. Until the initiation of the discussions on the SAPA Strategy, the aquaculture sector was not included in the sectoral programmes proposed during the planning of the Government's Comprehensive Programme " Hunger Eradication Poverty Reduction ".

Appropriate systems

The recent DFID e-conference on aquatic resources and poor people noted that the livelihoods of poor people could be improved through a stepwise and flexible process, building basic husbandry and management skills through a participatory and adaptive approach. The building of institutional capacity and incentive structures of responsible local support agencies should be similarly incremental, e.g. incentive mechanisms whereby operational budgets could be increased in line with the work done. Promoting networking among sectors of fishers, small-scale producers, processors, etc. was also identified as a key issue to support local, national and regional learning.

Vietnamese aquaculture, in contrast to many countries, is mainly performed as family-scale operations. In freshwater aquaculture the most popular farming systems are integrated gardening-fish pond-livestock pen system (VAC), rice-fish culture and fish culture in very small reservoirs through polyculture practices. The systems are characterized by low-input use and requirements, including land resources with rather low productivity, but environmentally benign and providing a relative high economic efficiency. For example, while environmental neutral integrated farming systems commonly use 10-30 percent of available land area, they generate from 30 to more than 70 percent of on-farm income. Another example from rice-fish culture systems shows that when fish is stocked in rice fields, the use pesticides can be reduced by 70-100 percent without influencing rice productivity. The farmers at demonstration farms gained an extra 3-5 percent in rice production and another 230-300 kg of fish without additional inputs. As a result, the system provides a net profit 1.5 times higher than single rice cultivation, and with reduced risks from pesticides. This indicates that appropriate farming systems can contribute to social, economic and environmental improvements.

In coastal aquaculture improved systems have been introduced with rotation cropping of different species such as crabs, fish, shrimps, bivalves and seaweed in small ponds, but this still needs more attention. Within marine aquaculture so far no focus has been given to the development of appropriate systems and much of the resource potential still rests un-exploited. With regard to planning of marine aquaculture this is just being started up in selected areas through national initiatives, with support from NORAD and the SUMA component of the DANIDA Fisheries SPS.

The generation of income and employment, nutritional components and livelihood stability through aquaculture or improved aquatic resources management results from direct production related activities as well as indirect participation in the form of support to fishing crews or inland fishing teams, employment in or benefit from environmental or habitat restoration or through provision of inputs (feed, seed, nets etc.) or in post-harvest activities (e.g. peeling shrimps, marketing and industrial and traditional fish processing) in aquaculture.

The challenge

While having considerable potential, there are a number of essential issues to be addressed for pro-poor strategies and policies for aquaculture to be of sustained benefit. The challenge is to address them effectively. They include:

- The need for planning in a rural development framework (such as a comprehensive poverty reduction strategy) focussed on poverty reduction and reflecting the local resource base and priorities. Learning lessons, e.g. not developing aquaculture in lagoons in ways that cause displacement of poor and vulnerable boat families, while benefiting the better-off; not supporting shrimp farming in poor coastal provinces in ways that limit access by the poorest people to credit and land, and exclusion from extension services due to language difficulties e.g. among Khmer people (OXFAM, 1999).
- The need for capacity building among service providers to identify and support poor people's livelihood objectives through analysis of the diversity and dynamics of their livelihoods, and the role of aquatic resources management; to support formulation of policy and interventions that build on the objectives and strengths of poor people and allow their participation in planning, implementation, monitoring and evaluation of the initiatives.
- The need for awareness raising and better communication of experiences of the role of aquaculture in poor people's livelihoods, and in certain cases as potential entry points to improve rural livelihoods. Linking with the regional learning platform being established by the NACA "Aquaculture for Sustainable Rural Livelihoods Development " programme, and more exposure of successful case studies in Viet Nam should inform, in appropriate ways, stakeholders, decision-makers in different sectoral departments and ministries, and donors to strengthen support within rural development initiatives.
- The need for networking among large numbers of widely scattered poor people who manage aquatic resources, taking account of their differences in skills, knowledge and education, and focusing on equity and inclusion; as well as other stakeholders include service and equipment suppliers, processors and/or marketing intermediaries and agencies involved in supporting foundation services such as credit, extension and research, training and education from Government and non-government agencies and donor agencies.
- The need for improved access for poor people to materials, financial services (credit, insurance, savings), information (including via unconventional extension approaches) and markets.
- The need to develop environmentally sound technologies for coastal aquaculture (brackish water and marine). Since there is very limited tradition in coastal aquaculture, appropriate technologies and planning of development is limiting, which could lead to environmental degradation (e.g. impacts of nutrients and disease causing agents; the strong dependency on wild captured fry) and low and constrained production.
- The need to limit degradation or unsustainable exploitation of the natural resource base, including habitats, biodiversity and fish resources in coastal and inland areas through proper planning for aquaculture (and other) activities as part of the broader resource management and rural development initiatives of which aquatic resource management is a component.
- The need for improved coordination of (donor) support, both among Government agencies and donors.

References

DFID, 2000. *Poverty and Aquatic Resources in Vietnam: an assessment of the role and potential of aquatic resource management in poor people's livelihoods*, Bangkok, DFID, Thailand, 36 pp.

DFID 2000. Aquatic Resources Management for sustainable livelihoods of poor people: Proceedings of the DFID-SE Asia Aquatic resources management programme E-mail conference, June 2000, DFID, Bangkok, Thailand, 148 pp.

MOFI, 2000. Report on the fisheries development status and activities relating to the CPG since the 2nd CPG meeting. Ministry of Fisheries, Hanoi, Vietnam, 6 pp.

MPI/UNDP, 1999. Looking ahead: a common country assessment. UNDP, Hanoi, Vietnam, 124 pp.

NACA/FAO. 2000. Aquaculture development Beyond 2000: the Bangkok Declaration and Strategy. Conference on Aquaculture in the Third Millennium, 20-25 February 2000, Bangkok, Thailand. NACA, Bangkok and FAO, Rome. 27 pp.

OXFAM, 1999. Tra Vinh: a participatory poverty assessment. OXFAM-GB in partnership with Tra Vinh province, the World Bank and DFID. Hanoi, Vietnam, 60 pp.

UNDP/UNICEF, 1996. Catching up: capacity development for poverty elimination in Vietnam, UN, Hanoi, Vietnam, 132 pp.

Aquaculture and Inland Fisheries: Fact Sheet

by FAO Fisheries Department staff

This paper provides a short, preliminary overview of the state of world aquaculture and inland fisheries based on the 1998 data available in FAO's Aquaculture and Inland Fisheries Statistics; FishStat Plus Version 2.3 (www.fao.org/fi/statist/FISOFT/FISHPLUS.asp). This is a continuing biannual exercise that the FAO Fisheries Department undertakes to provide the most up-to-date information on aquaculture and inland fisheries production, issues and trends to member countries. More detailed analysis are made available to the FAO member countries through regular publications such as the Review of the State of World Aquaculture (www.fao.org/fi/publ/circular/c886.1/c886-1.asp) and the Review of the State of World Fishery Resources: Inland Fisheries (www.fao.org/fi/publ/circular/ficirc.asp). Most of the aquaculture production data analyses given in this paper were derived from the information generated during the recent Conference on Aquaculture in the Third Millennium, held in Bangkok, Thailand, from 20 to 25 February 2000; in particular the review on "Increasing the Contribution of Aquaculture for Food Security and Poverty Alleviation" (Tacon, 2001). Technical Proceedings of the Conference on Aquaculture in the Third Millennium (NACA/FAO, 2001) containing detailed analysis and review of the entire aquaculture sector is being finalized and will be available by October 2001.

Aquaculture production

Aquaculture continues to be the world's fastest growing food production sector, exhibiting an overall growth rate of over 11.0 percent per year since 1984 (Figure 1), compared with 3.1 percent for terrestrial farm animal meat production, and 0.8 percent for production from capture fisheries. By economic country grouping, approximately 90.0 percent and 82.2 percent of total world aquaculture production in 1998 was produced within developing countries (35.49 mt) and in particular within LIFDCs (Low-Income Food Deficit Countries) (32.41 mt). The developing country contribution to global aquaculture production has increased from 72.6 percent (7.37 mt) in 1984 to 90 percent (35.49 mt) in 1998, while the share of production from developed countries has decreased from 27.4 percent (2.78 mt) in 1984 to 10 percent (3.93 mt) in 1998 (Figure 2). Aquaculture production within LIFDCs has been growing over 5 times faster (13.7 percent per year since 1984) than within developed countries (2.7 percent per year since 1984), with aquaculture production within developing countries displaying an average growth rate of 12.8 percent per year between 1984 and 1998.

By region, Asia produced over 90.8 percent of total global aquaculture production by weight in 1998 (35.81 mt). Production in China represents 68.6 percent of the total global aquaculture production amounting to 27.1 mt in 1998. Apart from China, all of the world's top ten aquaculture producing nations were found in Asia in 1998. These top ten producing countries represent 89.1 percent of total global aquaculture production by weight (Table 1). Second major region in terms of production by weight was Europe (4.97 percent or 1.96 mt).

Interestingly, analysis of global aquaculture production excluding China, showed a moderate growth rate, with production doubling from 6.32 mt in 1984 to 12.36 mt in 1998, and the sector growing at an average rate of 5.3 percent per year since 1984 (Figure 3). In general terms, aquaculture's contribution towards total world fisheries production has increased threefold since 1984; aquaculture production increasing from 10.15 mt or 11.4 percent

Figure 1. Contribution of aquaculture to total world fisheries production 1984-1998

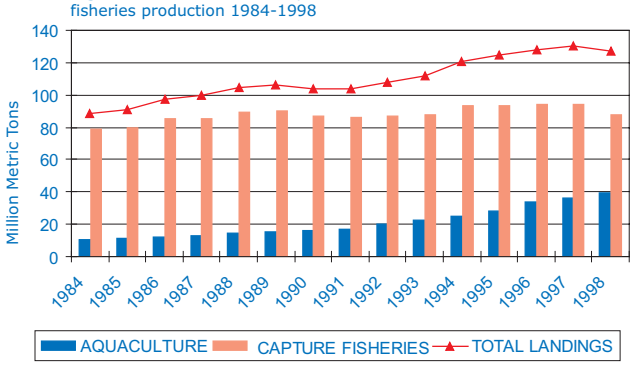


Figure 2. Aquaculture production in developed and developing countries 1984-1998

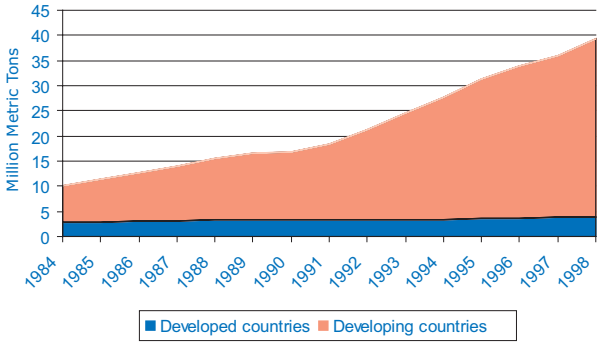
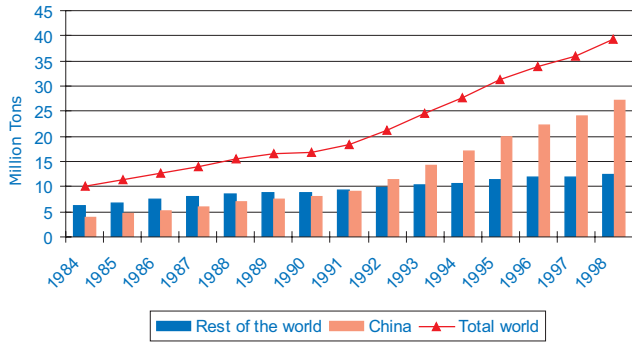


Figure 3. Aquaculture production in China and the world 1984-1998



of total fisheries production in 1984 to 39.43 mt or 31.1 percent of total fisheries production in 1998 (Figure 1).

By continent, in 1998, aquaculture supplied 45.3 percent of total fisheries production in Asia (up from 21.1 percent in 1984), 10.9 percent of total production in Oceania (up from 3.7 percent in 1984), 10.2 percent in Europe (up from 6.9 percent in 1984), 8.0 percent in North America (up from 4.5 percent in 1984), 5.7 percent in South America (up from 0.5 percent in 1984) and 3.2 percent in Africa (up from 0.9 percent in 1984).

At the species group level, finfish contributed over half of total aquaculture production by weight in 1998 (20 mt or 50.8 percent), followed by molluscs (9.1 mt or 23.2 percent) and aquatic plants (8.5 mt or 21.7 percent) (Figure 4). The growth of the different major specific groups over the past decade has been rapid, with most groups exhibiting double digit growth rates over the period 1984 to 1998, including finfish (12.3 percent year, with production up by 6.7 percent since 1997), molluscs (11.5 percent per year, with production up by 6.5 percent since 1997), aquatic plants (7.7 percent per year, with production up by 18.9 percent since 1997), and crustaceans (16.0 percent per year, with production up by 13.9 percent since 1997).

Global food fish supply

In terms of per capita availability of `food fish' from aquaculture (i.e. the production of farmed aquatic finfish and shellfish on a whole live weight basis, and excluding farmed aquatic plants; 30.86 mt in 1998), there was an increase by 261 percent from 1.45 kg in 1984 to 5.23 kg in 1998, with supply growing at an average rate of 10.4 percent per year. In contrast, per capita availability of `food fish' from capture fisheries (i.e. 62.45 mt, excludes captured fish destined for reduction into fishmeal) has remained static,

Figure 4. Total world aquaculture production in 1998

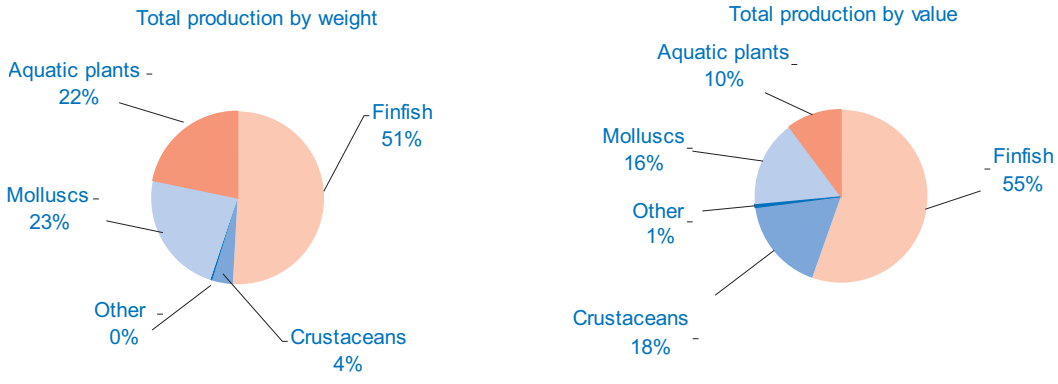


Table 1. Top producers in 1998: Total aquaculture production (FAO FishStat Plus 2000)

Country	Production[1] tonnes	Production[2] % total world	Growth APR[3] 84-98, %.yr^{-1}	Growth[4] 97-98, %	Total value US $1,000	Unit value US $/kg
China	27 071 942	68.6	+ 16.2	+ 12.7	25 499 016	0.94
India	2 029 619	73.8	+ 11.2	+ 9.0	2 222 789	1.09
Japan	1 290 486	77.1	+ 0.5	- 3.7	4 126 039	3.20
Philippines	954 512	79.5	+ 5.5	- 0.3	639 080	0.67
Indonesia	814 090	81.6	+ 7.2	+ 4.7	2 149 508	2.64
Korea, RO	796 632	83.6	+ 1.2	- 23.4	766 268	0.96
Bangladesh	583 877	85.1	+ 12.7	+ 13.9	1 493 670	2.56
Thailand	569 577	86.5	+ 13.0	+ 3.1	1 806 795	3.17
Vietnam	537 870	87.9	+ 12.3	+ 5.7	1 356 724	2.52
Korea, DPR	481 500	89.1	- 2.9	- 1.6	302 950	0.63
Total world	39 430 834	100.0	+ 11.0	+ 9.4	52 458 185	1.33

[1]Total aquaculture production (includes finfish, crustaceans, molluscs, miscellaneous aquatic animals/products
[2]Cumulative total as % of total world aquaculture production
[3]Annual Percent Growth Rate in production by weight between 1984 and 1998
[4] Percent change in production by weight between 1997 and 1998

decreasing from 10.88 kg in 1984 to 10.58 kg in 1998. On the basis of the above data, over 33.1 percent of total global `food fish' supplies were originated from aquaculture in 1998. Globally, more `food fish' is consumed on a per capita basis than any other type of meat or animal protein (FAOSTAT, 2000) (http://apps.fao.org/page/collections?subset=agriculture). Although developing countries produced over two thirds of total food fish supply in 1998, per capita supply was highest in developed countries (23.2 kg in 1998, down from 25.6 kg in 1984), followed by developing countries (14.0 kg, up from 8.0 kg) and LIFDCs (13.6 kg, up from 6.9 kg). By region, per capita supply was highest in Oceania (20.2 kg, down from 21.3 kg), followed by Europe (19.7 kg, up from 17.8 kg), Asia (17.6 kg, up from 10.5 kg), North & Central America (16.8 kg, up from 16.6 kg), South America (9.8 kg, up from 7.9 kg), and Africa (7.0 kg in 1998, down from 8.1 kg in 1984) (FAOSTAT, 2000).

Outlook

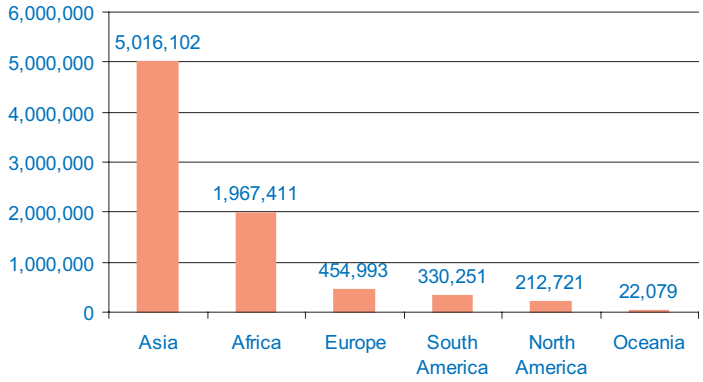
As the bulk of aquaculture is rural and subsistence, it plays a major role as a provider of direct and indirect employment to the rural poor and thereby contributing towards alleviating poverty. In many developing countries, aquaculture provides opportunities for diversification of farming systems, risk reduction and integration with agriculture. In terms of production, all regions, except Africa, have recorded a significant increase in per capita production between 1984 and 1998. While Asia continues to dominate world aquaculture in overall tonnage as well as in every major commodity, Latin America has registered a very high average annual growth between 1984 and 1998. In the following years, aquaculture will continue to be a major supplier of aquatic food. The primary aim of increasing aquaculture production should be pursued towards alleviating poverty and contributing to food security of the masses. This can only be achieved if further developments in aquaculture are environmentally sustainable, economically viable and socially responsible.

Inland fisheries

Reported inland fisheries production was 8 million tonnes in 1998 (Figure 5), being 9 percent of the reported total capture fisheries production. However, actual catches may be at least twice the reported figure (see Box 1). The contribution of inland fishery resources to food security is, as a result of this under-reporting, greatly underestimated.

Inland capture fisheries are complex in nature, involving a wide variety of activities undertaken by people from diverse socio-economic backgrounds. Recreational fisheries, well established in many developed countries, are also becoming an important source of income and even food in some developing countries. Catch of freshwater fish is used with practically no discards and minimal wastage. Fishing methods, in many areas, are dominated by labour intensive gears used on an individual basis, or by small groups. This, coupled with the high level of artisanal, subsistence and other informal activities (e.g. local bartering of fisheries products), leads to a high degree of participation, including a significant number of women and children. For example, on the

Figure 5. Inland fisheries production in 1998 (tonnes). (FAO, 2000b)



Polyculture harvest

central Bangladeshi floodplains more than 65 percent of the rural population is involved in subsistence fishing (CPP, 1992, 2000). This level of participation, particularly among the low income and/or resource poor groups, is an important aspect of inland fisheries in relation to food security.

Threats

Threats to inland fisheries:

- Over-exploitation;
- Competition from other sectors (agriculture, industry, etc.) for water;
- Environmental degradation and loss of aquatic habitats;
- Pollution;
- Reduced fishing area or reduced access;
- Loss of biodiversity;
- Introduced species;
- Inappropriate fisheries management;

Environmental impacts arising from other sectors are the major constraints to sustaining, or increasing, production. Along with a growing human population, the rapid economic development in the world and of some of the Asian countries in particular, will likely impact freshwaters, especially through industrial effluents entering rivers and habitat loss and degradation. Demand for fresh water is also increasing, and will continue to increase (Figure 6), most likely resulting in adverse impact on fisheries, because of the weak position fishers have in influencing decision making in many countries. With an increasing human population using more fish and freshwater, pressure on inland fisheries may result in overfishing, loss of biodiversity and a failure to satisfy demand for inland fishery products. The introduction of alien species has helped improve production from inland fisheries, but has also caused harmful environmental and economic impacts (see following section).

Way forward

Considerable potential exists for increased catches by rehabilitating freshwater habitats and the fisheries these habitats support. This has already led to improved fisheries in many countries, and is being considered as a serious option in many others. Another useful tool for increasing catches from inland waters is by applying and/or improving fishery enhancement techniques such as:

- Stocking natural waters to improve recruitment, bias fish assemblage structure to favoured species or maintain productive species that would not breed naturally in the system;
- Introducing new species to exploit under-utilised parts of the food chain or habitats not colonized by the resident fauna;
- Fertilizing to raise the general level of productivity and hence growth of the fish;

Box 1. The contribution of inland fishery resources to food security is certainly greatly under-reported because of the dispersed and informal nature of many fisheries. (FAO, 1999), For example:

- Brazil reported an inland capture of about 193 000 mt from all of its waters for 1991, but an independent estimate for the same year based on human population and fish consumption rates suggests about 319 000 mt for the Amazon basin portion of Brazil alone (Bayley, 1998)
- Ghana's inland waters are dominated by Lake Volta (8 000 km2). Ghana reported a capture from all of its inland waters from 55 000 to 74 000 mt in recent years, but based on a partial frame survey, total production of Lake Volta alone is likely to be around 150 000 to 200 000 mt/year (de Graaf and Ofori-Danson, 1997)
- Cambodia has reported inland capture ranging from about 50 000 mt to 75 000 mt for the years 1984 - 1997; However, the actual range for the years 1994 to 1997 has been estimated at from 290 000 to 430 000 mt (van Zalinghe et al., 1998).
- Similarly, the largest annual catches reported to FAO by Thailand and Viet Nam in the period 1984-1997 were, respectively, 229 000 mt and 136 000 mt while estimates made by MRC (1992) and Jensen (1996) indicated catches of 303 000 mt and 190 000 mt, respectively.

- Engineering of the environment to improve levels of reproduction, shelter, food resources and vital habitat;
- Reducing unwanted species that either compete with or prey upon target species;
- Constituting an artificial fauna of selected species to increase the degree of control and yield.

A current debate: managing species introductions

Introduced aquatic species have contributed to an improvement of everyday life of humans in many areas throughout the world. In Asia the African cichlid tilapias account for more then 700 000 tonnes of aquaculture production. Introduced salmonids support a thriving industry in Chile that is responsible for approximately 20 percent of the world's farmed salmon. Globally the contribution of introduced species to total production ranges from 10 percent to about 17 percent, depending on taxon. However, introduced species are also recognized as a significant threat to indigenous species (Table 2).

The re-introduction of European flat oysters from Western North America to Western Europe infected native oysters with the protozoan parasite Bonamia, leading to the decimation of European flat oyster populations. Widespread movement of cultured tilapia in Africa has resulted in interbreeding with wild species or strains to the extent that natural populations are now extremely difficult, sometimes impossible, to find. Introduced Indian major carp in Bangladesh have lead to restricted access to fishing areas by rural fishermen.

Species have been moved around the world for a variety of reasons, with aquaculture development being the primary motivation (Figure 7). Many impacts of introduced species are unknown, therefore FAO has established DIAS (Database on Introductions of Aquatic Species, http://www.fao.org/fi/statist/fisoft/dias/index.htm) to keep track of introductions globally.

It is expected that introductions and transfers of aquatic organisms will continue, especially due to the expansion and development of aquaculture, culture based fisheries, environment and fishery rehabilitation, and the advent of new technologies making it easier to move organisms, or their genetic material from place to place.

The way forward on introduced species

To prevent possible negative impacts of the introduction of an alien species, domestication of indigenous species is being considered and promoted in many areas. The environmental advantages of this are less disturbance of the environment and reduced risk of pathogen introduction. Often markets are already established and people are accustomed to local species. Domesticated species may also pose a risk (e.g. genetic erosion of local stocks), and may not meet the desired specifications/requirements. In such cases introduction of an alien species may be considered, as described in the Code of Conduct for Responsible Fisheries (Figure 8). FAO calls on governments, non-governmental organizations, and other stakeholders to report introductions to FAO for inclusion in the FAO Database on Introductions of Aquatic Species (DIAS). Improved information will be critical in this debate and in efforts to promote the responsible use of introduced species.

Fishers showing their catch after a morning of fishing (Tangail district, Bangladesh)

Table 2. Major effects of introduced species

Benefits	Problems
Income generation	Reduction or elimination of indigenous species
Production increase	Alteration of habitat
Biological control	Import of pathogens (diseases)
	Change in access to land and resources

Table 3. Most commonly introduced species (source: DIAS)

Fish	Crustacean	Mollusc
Common carp	Giant river prawn	Pacific cupped oyster
Rainbow trout	Red swamp crawfish	Top shell
Mozambique tilapia	Giant tiger prawn	American slipper-limpet
Grass carp	Kuruma prawn	Golden apple snail
Nile tilapia	White leg prawn	Smooth giant clam

Figure 6. Estimated and projected global water use (km3/year) (FAO, 2000c)

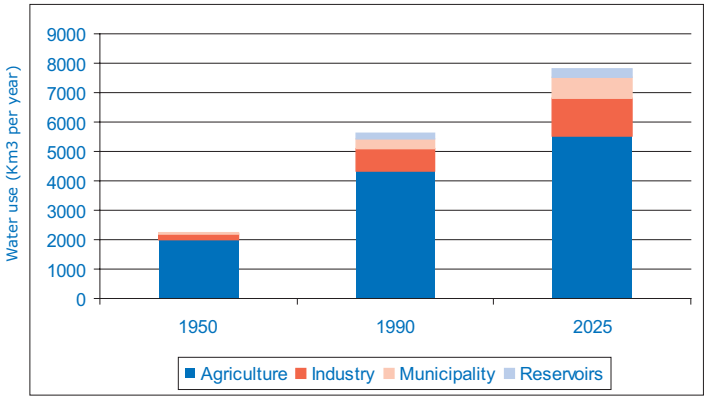
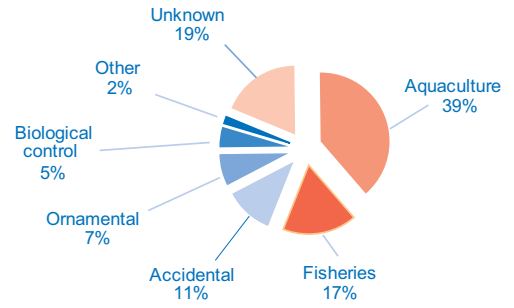


Figure 7. Reasons for introduction of aquatic species
Source : FAO Database on Introduction of Aquatic Species (DIAS)



References

Bayley, P, 1998. Aquatic biodiversity and fisheries management in the Amazon. Draft report prepared for FAO.

CPP, 2000. Compartmentalization Pilot Project. Final report, Annex F-Fisheries. Government of the People's Republic of Bangladesh, Ministry of Water Resources, Bangladesh Water Development Board, Water Resources Planning Organization, Dhaka, Bangladesh. 58pp.

CPP, 1992. Compartmentalization Pilot Project (FAP-20). Interim report, results of the CPP household study.

FAO, 2000a. Low-income food-deficit countries. In: Special Programme for Food Security. (http://www.fao.org/spfs).

FAO, 2000b. Fishstat plus: Universal software for statistical time series. Version 2.3.2000. FAO Fisheries department, Fishery information, data and statistics unit, Rome.

FAO, 2000c. Crops and Drops, making the best use of water. FAO Land and water development division, Rome. 27pp. ftp://ftp.fao.org/agl/aglw/docs/cropdrop.pdf. http://www.fao.org/ag/agl.

FAO, 1997. Review of the state of world aquaculture. FAO Fisheries Circular no 886, Rev. 1: 163pp. Rome. http://www.fao.org/fi/publ/circular/c886.1/c886-1.asp.

FAO, 1999. Review of the state of world fishery resources: inland fisheries. FAO Fisheries Circular. No. 942. 53 pp. Rome. ftp://ftp.fao.org/fi/document/circular/all-16a.pdf.

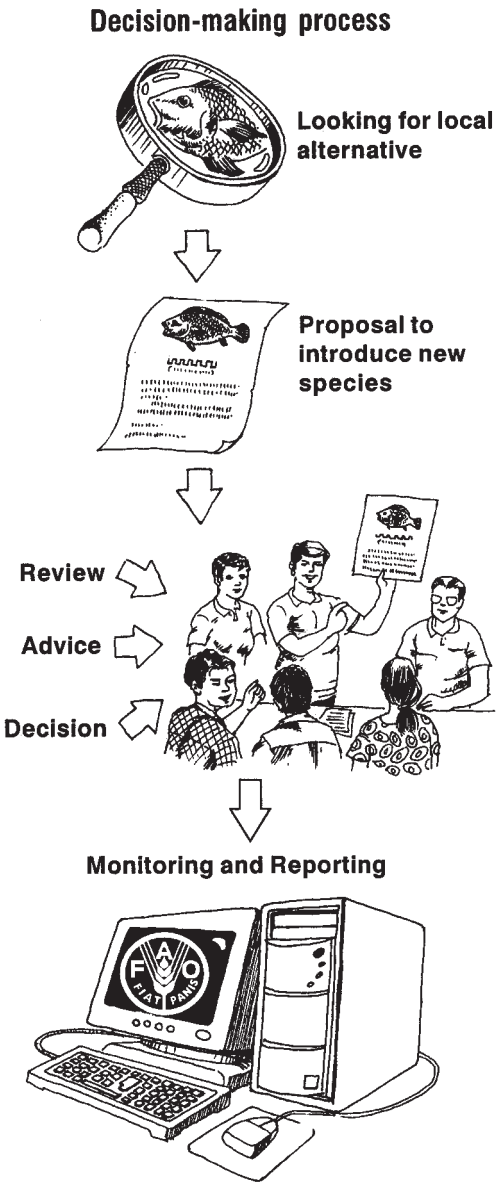
FAO Database on Introduction of Aquatic Species, http://www.fao.org/fi/statist/fisoft/dias/index.htm).

FAOSTAT, 2000. FAOSTAT Database. Agriculture data; Food balance sheets; 1 June 2000. http://apps.fao.org/page/collections?subset=agriculture.

Graaf, G.J. de and P.K. Ofori-Danson, 1997. Catch and fish stock assessment in stratum VII of Lake Volta. Integrated Development of Artisanal Fisheries (IDAF) (GHA/93/008). IDAF/Technical Report/97/I. FAO, Rome.

Jensen, J.G., 1996. 1,000,000 tonnes of fish from the Mekong? Mekong FishCatch and Culture. Vol. 2 (1).

Figure 8. The decision making process for considering the introduction of an alien species



MRC, 1992. Mekong River Commission. Mekong Secretariat. Fisheries in the lower Mekong Basin. Basin 4 and 5. Mekong Committee, Bangkok.

NACA/FAO, 2001. *Aquaculture in the Third Millennium*. Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. In R.P. Subasinghe, P. Bueno, M.J. Phillips, C. Hough, S.E. McGladdery, & J.R. Arthur (Eds.) 471pp.(in press).

Tacon, A.G.J. 2001. Increasing the contribution of aquaculture for food security and poverty alleviation. In R.P. Subasinghe, P. Bueno, M.J. Phillips, C. Hough, S.E. McGladdery, & J.R. Arthur (Eds.) *Aquaculture in the Third Millennium*. Technical Proceedings of the Conference on Aquaculture in the Third Millennium, Bangkok, Thailand, 20-25 February 2000. (in press)

Zalinghe, N. van, et al, 1998. It's big, unique and important: Fisheries in the lower Mekong Basin, as seen from a Cambodian perspective. Mekong Fish Catch and Culture 4 (1): 1-5.

RECENT AND UP-COMING ACTIVITIES

Bernardo Basurco[1] and Hadj Ali[2]
[1] Instituto Agronomico Mediterraneo de Zaragoza, Apartado 202
50080 Zaragoza, Spain
basurco@iamz.ciheam.org
[2]System of Information for the Promotion of
Aquaculture in the Mediterranean (SIPAM)
30, Rue Alain Savary 1002 TUNIS, TUNISIA
e-mail: sipam.med@sipam.intl.tn

THE MEDITERRANEAN REGION - TECAM, SELAM AND SIPAM ACTIVITIES

Three international networks involving partnerships between the Food and Agriculture Organization of the United Nations (FAO), the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) and national institutions are now operational. The TECAM (Technology of Aquaculture in the Mediterranean), SELAM (Socio-economic and Legal Aspects of Aquaculture in the Mediterranean) and SIPAM (System of Information for the Promotion of Aquaculture in the Mediterranean) networks are placed under the aegis of the Committee on Aquaculture of the General Fisheries Commission for the Mediterranean (GFCM).

The TECAM and SELAM networks are coordinated by CIHEAM, which has, since 1995, organized and implemented the activities through the Mediterranean Agronomic Institute of Zaragoza (IAMZ), in collaboration with the FAO and other Mediterranean institutions.

TECAM SURVEY ON

MEDITERRANEAN AQUACULTURE DIAGNISTIC LABORATORIES CONDUCTED BY THE THE CIHEAM-IAMZ AND THE FAO

As regards the field of aquaculture health management, several activities have been organized in recent years under the TECAM network i.e., a Seminar on Disease Diagnosis and Control of Mediterranean Cultured Fishes (Malta, 20-24 March 1995) and a Short Practical Course on Fish Health Management (Udine, Italy, 27 January - 7 February 1997). During the discussions held during the above mentioned activities, it was pointed out, that in order to make aquaculture health management more effective, it is necessary to acquire greater knowledge on the pathogens and diseases that are affecting Mediterranean aquaculture, as well as on the main diagnostic procedures that are in use in the region.

Now, as an important step, the TECAM network is launching a project study aimed to acquire greater knowledge about the Mediterranean laboratories working on the diagnosis of diseases of fish and shellfish. The survey is being organized by CIHEAM through the IAMZ (CIHEAM-IAMZ) and the FAO, through the Fisheries Department.

With the collaboration of some experts, Dr. Frank Berthe (IFREMER, France) and Prof. Alicia Toranzo and Prof. Juan Barja (University of Santiago de Compostela, Spain), three survey questionnaires were prepared and distributed to previously identified laboratories, and about 50 survey replies have already been received from key public and private laboratories in different Mediterranean countries (i.e., Croatia, France, Greece, Israel, Italy, Malta, Morocco, Portugal, Romania, Spain, Tunisia and Turkey).

Following the analysis of the survey replies, a directory of Mediterranean laboratories working on the diagnosis of fish and shellfish diseases will be prepared and published in a special volume of the CIHEAM journal "Options Mediterranéennes." The publication will also include a reference report about existing diseases and pathogens and their prevalences and distributions in Mediterranean aquaculture.

TECAM ADVANCED COURSE ON AQUACULTURE FISH BREEDING PROGRAMMES ZARAGOZA, SPAIN, 2 - 6 APRIL 2001

The course took place from 2 to 6 April 2001, at the IAMZ, Zaragoza, Spain. The course, which is included within the activities of TECAM, was organized by the CIHEAM, through the IAMZ, with the collaboration of the FAO, through the Fisheries Department. The participants included 32 experts from 11 countries (Albania, Egypt, France, Greece, Italy, Malta, Morocco, Spain, Tunisia, Turkey and the United Kingdom) belonging to private hatcheries, research institutions, universities, and administration. Among the guest speakers were: B. Basurco (CIHEAM), C. Batargias (Greece), H.B. Bentsen (Norway), D. Mylonas (Greece), L. Colombo (Italy), B. Gjerde, (Norway), P. Haffray (France), A. Riaza (Spain), M. Toro (Spain) and B. Villanueva (UK).

The main objective of the course was to acquaint participants with the principles and elements underlying genetic improvement programs. Through the different lectures, the requirements to establish and develop such programs were reviewed. To this end, the course covered aspects about the reproductive biology of fish and its implications in breeding programs. Basic quantitative genetics, genetic improvement tools and strategies, design of genetic improvement programs and the role of innovative biotechniques in fish breeding were also addressed. The course was specially focused on the two main Mediterranean cultured finfish species, namely European sea bass and gilthead sea bream.

TECAM ADVANCED COURSE ON MEDITERRANEAN OFFSHORE MARICULTURE ZARAGOZA, SPAIN, 28 MAY - 2 JUNE 2001

The course was organized by the CIHEAM, through the IAMZ, with the collaboration of the FAO, through the Fisheries Department and took place at the IAMZ in Zaragoza. The course was given by well-qualified lecturers from research centers, universities and private companies in different countries.

The course was held over a period of one week, from 28 May to 2 June 2001, in morning and afternoon sessions. The aim was to provide participants with the most recent knowledge available on offshore mariculture, with special emphasis on the Mediterranean, and the course included sessions on the status of offshore farming, site evaluation, systems review, net technology, management and economics. The course caters to a maximum of 25 professionals with a university degree who are already directly involved in the subject matter. Preference is given to farm managers with technical and financial responsibilities and other professionals involved in the development of offshore farming.

SEMINAR ON SEAFOOD MARKET STUDIES FOR THE INTRODUCTION OF NEW AQUACULTURE PRODUCTS ZARAGOZA, SPAIN, 21 - 22 JUNE 2001

This seminar was planned as a joint activity between the EU-Concerted (European Union) Action MASMANAP (Methodology for Seafood Market Studies with the Aim of Introducing New Aquaculture Products) and the SELAM Network. It was organized at the end of MASMANAP (a 30-month project), with the aim of disseminating its results, and it is also the continuation of previous activities of the SELAM network in this field. It was jointly organized by the EU-Concerted Action MASMANAP, the CIHEAM-IAMZ and the Fisheries Department of the FAO.

The seminar reviewed the evolution of the main European seafood markets. The main lines of what could be relevant market studies were discussed, and the common work was used to identify the most important seafood consumption data that have to be collected as a support to the market studies. Research priorities were underlined in order to obtain relevant data, to learn how to analyze them and to propose recommendations for a seafood market study with the aim of introducing new aquaculture products. The seminar addressed professionals with a university degree who already have experience and a deep knowledge of the aquaculture sector.

5TH ANNUAL SIPAM MEETING, ISTANBUL, TURKEY 8-12, NOVEMBER 2000

The 5th annual SIPAM meeting took place in Istanbul, Turkey from 8-12 November, 2000. Fourteen countries already SIPAM members and two new SIPAM member countries (Lebanon and Romania) were represented by their National Co-ordinators. FAO was represented by Manuel Martinez, Coppola Rino (Fisheries Department) and Mario Pedini (FAO, Secretary of the GFCM Committee of Aquaculture). The main issues discussed were how to:

- Profit from the available data (more than 10 000 entries);
- Improve data quality;
- Improve the visibility of SIPAM; and
- Establish and organize national networks in order to expand SIPAM within the member countries and to reach more end-users.

During the meeting, a new release (more advanced) of SIPAM for Windows software (Version 2.3) was distributed, as well as a brochure and a CD-Rom (for SIPAM presentation and demonstration).

OTHER RECENT SIPAM ACTIVITIES

SIPAM expansion

Algeria and Libya are now officially linked to SIPAM, and the network was already been demonstrated and set up within the premises of the Marine Resources Wealth Centre in Tajura, Libya. The two new countries expected to join SIPAM during 2001 are Lebanon and Romania. SIPAM was installed in Romania last March, 2001 during the visit of the SIPAM Regional Co-ordinator.

Lebanon will be visited soon, and SIPAM will be also set up within the Ministry of Agriculture in Beyrouth.

SIPAM for Windows 2.3

The version 2.2 was improved by the SIPAM Regional Centre in Tunis according to the requirements expressed by the SIPAM National Co-ordinators during a meeting held in Malta from 24-28 November 1999). The new version is likely to allow the National Co-ordinators to set up locations (up to nine) within their own countries in order to enhance the data flow among the SIPAM end-users. It also includes other improvements making the software closer to the specific needs of its end-users.

Regional Database New Release

The first issue of the SIPAM Regional Database for 2001 was prepared using the new software (Version 2.3) and released in early April, 2001. It includes more than 10 000 records shared by 13 specialized databases: Statistics (3), Directories (4), Laws and Regulations (2), Pathology (1),Bibliography (1), Research/ Development Programmes (1) and National Reports (1).

SIPAM Brochure

The SIPAM Brochure exists in four languages: English, French, Portuguese and Spanish. Additionally, Morocco is expected to finance the design and editing of an Arabic version, whose wording has already been made available by the SIPAM Regional Centre in Tunis.

SIPAM Reports

Reports on production statistics (for 1995 to 1999), suppliers, experts and aquaculture research institutes in the Mediterranean countries are made available by the SIPAM Regional Centre.

2001 Program of Activities

The main issues included within the 2001/ early 2002 program are as follows:

- Creating and maintaining a SIPAM web page;
- Improving SIPAM outputs by data analysis and editing of reports;
- Strengthening linkages with similar networks and other specialized bodies;
- Progressing within the framework of SIPAM legal agreement issues;
- Furthering the two specialized databases on aquatic animal pathology and aquaculture products marketing, jointly with CIHEAM, which is in charge of TECAM and SELAM.

New Asia Regional Aquaculture Officer at RAPI

Dr. Simon Funge-Smith has been appointed Regional Aquaculture Officer in FAO's Regional Asia-Pacific Office in Bangkok, effective 1 July 2001.

Dr. Funge-Smith has lived and worked in the Asian Region for the past 10 years and brings with him extensive experience of both brackish and freshwater aquaculture. From 1991-1995, he conducted field studies researching the environmental and management issues relating to sustainability in brackishwater shrimp farms in Thailand, as part of an Overseas Development Agency (ODA)/University of Stirling field project. During 1996-1997, Dr. Funge-Smith was engaged in technical consultancies for FAO in PR China, Bangladesh and Sri Lanka. He was also engaged in commercial aquaculture consultancy in Indonesia, Malaysia and Thailand. As a Chief Technical Advisor, Dr. Funge-Smith spent three years working in Lao PDR on an FAO/United Nations Development Programme (UNDP) Rural Aquaculture Extension Project, focussing on mechanisms for appropriate aquaculture development for subsistence farmers. Dr. Funge-Smith has also worked in Cambodia, Vietnam and Lao PDR as a consultant for the Mekong River Commission's (MRC) Aquaculture of Indigenous Mekong Species (AIMS) component.

Although officially designated Regional Aquaculture Officer, Dr. Funge-Smith also has responsibility for inland fisheries in the region, which is a natural linkage, since much of the Asia-Pacific Region's aquaculture activities are related to inland fisheries issues. There is a wealth of regional institutions and organizations already closely involved with aquaculture and inland fisheries, and part of Dr. Funge-Smith's role is to develop or strengthen linkages with these organizations. In this capacity, he will be a focal point for FAO activities in aquaculture and inland fisheries and welcomes any communication that FAN readers might wish to have regarding coordination or collaboration with FAO in these subsectors.

Dr. Funge-Smith can be contacted at:
FAO Asia-Pacific Regional Office (RAP)
39 Phra Atit Road
Bangkok 10200, Thailand

e-mail:Simon.FungeSmith@fao.org