



Environmental sustainability of brackish water aquaculture in the Mekong delta, Vietnam
Project implemented with the financial support of the European Commission *

The project -The field trips	p. 1
Preliminary results	p. 2
The training program	
Workshops	p. 3

Challenges to sustainability of shrimp aquaculture in the Mekong Delta

The Vietnamese government is actively carrying out economic reform and structural transfer and strongly mobilizing all resources to reach an economic growth objective of about 7.5% in the year 2001. It focuses on regulating the agricultural field area from 2 harvests/year to 1 harvest/year and 1 harvest from shrimp or fish farming. From May 2000 to July 2001, the total shrimp culture area in the Mekong delta has increased to 260,000 ha, particularly in Camau with 80,000 ha. The total area is expected to reach 400,000 ha by the end of 2001. This increase is inducing the expansion of the saline intrusion area in wetlands (salinity from 5 to 25 ‰), even in normally desalinated areas. Thus, mangrove ecosystems are deeply affected. The geochemical characteristics of the sediment and the water environment are changing. So are the socio-economic features of the region. This raises a vital question: how much of the area can be safely transferred from rice to shrimp culture, while ensuring its environmental and economic sustainability?



The Mekong delta, with studied areas of Ca Mau and Tra Vinh

The project

The Gambas project, running over the period 2000-2003, has been designed to address this issue. An EC-funded Franco-Vietnamese project, it is coordinated by Ifremer, the French oceanographic research institute and the oceanographic institute of Nha Trang. Its main objective is to determine the relationships between the shrimp production and environmental characteristics, in order to establish the best sustainable shrimp development plan for two representative areas of the Mekong delta. Gambas has now reached its mid-term, and preliminary results for ecological characteristics and socio-economic conditions in Travinh and Camau provinces allow an in-depth analysis of the possibility of shrimp farming development.

Seeing the rapid development of shrimp farming areas and environmental alteration, the Gambas project requires a systematic and strategic approach.

Its research must be closely related to the urgent and practical demands of the country's economy.

The field trips

Two field trips have been conducted so far in the Mekong delta. They made it possible to :

- select the stations with the required characteristics for various topics (marine ecology, terrestrial ecology, zootechnics, socio-economics) and test the practical organization, - enable the different teams (Vietnamese and French) to work together,
- collect data, compare and standardize sampling methods.



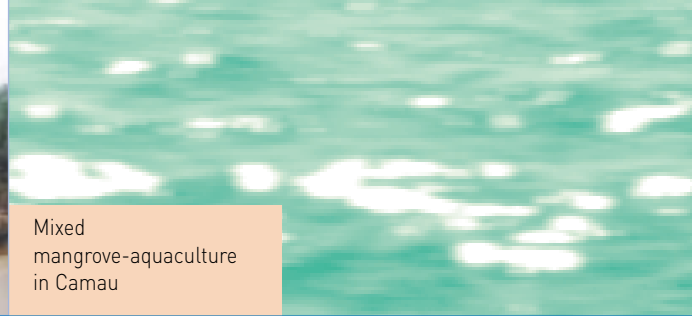
The Fisheries authorities boat used in Tra Vinh site



Natural mangrove in Tra vinh



Mixed mangrove-aquaculture in Camau



Preliminary results

Hydrobiology

The first investigations show huge differences in the hydrobiological and ecological characteristics of Camau and Travin. In January 2001, the salinity measured at high tide for surface water (i.e., the water entering the pond during water renewal operations) was always higher than 15 ‰ and for most stations close to 25 ‰ in Camau, while in Travin the salinity was always lower than 12 ‰. Likewise, the total suspended matter (TSM) concentrations in Travin remained lower than 200 mg.l⁻¹, while in Camau, most stations showed values higher than 200 mg.l⁻¹, up to 800 mg.l⁻¹. For heterotrophic bacteria (living off the organic matter present in the water), values in Travin can reach up to 2 10⁸ cells.ml⁻¹ water, while they are always lower than 10⁷ cells. ml⁻¹ in Camau stations.



Bank erosion in Camau channels



ION scientist at AIT Bangkok with other Msc students

The differences observed between the two sites lead to differences in their respective capacity to support aquaculture activities. In particular, these system may not be able to cope with inputs of organic matter (feed pellets) which characterize intensified aquaculture. This addition of organic matter would increase the concentration of bacteria and lead to a higher dystrophic state of the water.

Terrestrial ecology

The striking facts that appeared after the two field trips are the different land patterns in Tra Vinh and Ca Mau. They certainly result from the geomorphology and the water regime. In Tra Vinh, the aquacultural perimeter is limited in size, with a sharp limit between brackish and freshwater zones. Clearly the high freshwater inputs maintain shrimp aquaculture mainly close to the sea. Patches of primary mangrove are still present, but are tending to disappear under the pressure of aquaculture projects. The outer tip of the peninsula is covered by

primary mangrove. Water circulation in the channel network (driven by both the tide and the Mekong's water pressure) is very active, as testified by strong currents and generally deep channel cross-sections.

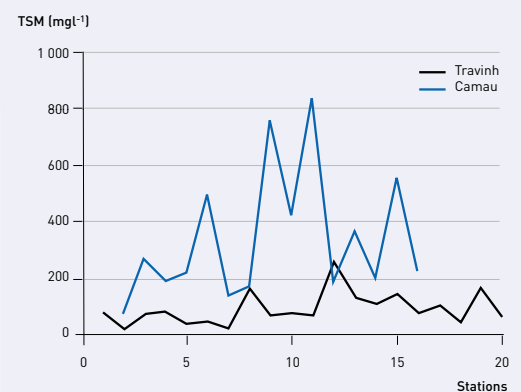
In Ca Mau, probably due to a more tidal regime, shrimp aquaculture is possible over a huge surface area, even far upstream from the seashore. The strong concern about mangroves has led to an extensive replanting policy, which has modeled the landscape in an odd, patchy pattern, quite easily identifiable on the Spot image acquired for the project on April 10, 2001.

The strong tendency toward bank destruction in Ca Mau channels leads to subsequent strong sedimentation, reduced channel depth and water circulation, and hence hazards to aquaculture.

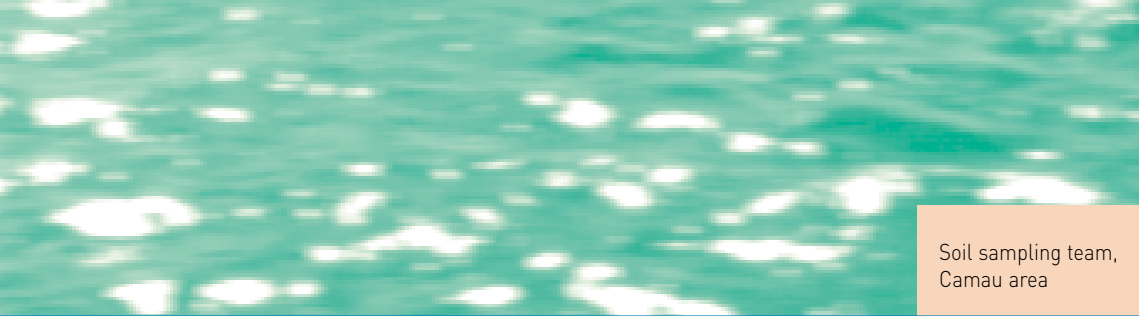
Some soil parameters are thought to be indicators of the sites' environmental conditions. Therefore, soil samples were collected on the 2nd field trip, and will be analyzed in the lab.

Socio-economics and zotechnics

Farm survey and qualitative information was collected. 129 farms were sampled: 69 in Tra Vinh province and 60 in Ca Mau. Hatcheries and nurseries were also studied. Both cost-effectiveness and zotechnical expertise are being analyzed. Data are still



Total suspended matter in mg.l⁻¹



Soil sampling team, Camau area



being processed, but high variability and uncertainty characterize the techniques and production. Differences in yields, both intra and inter-province, also highlight this variability (almost 400 kg/ha/year for Tra Vinh and less than 200 kg/ha/year in Ca Mau). This can be expressed in terms of lack of knowledge and capital, environmental degradation and site selection, competition for space, externalities, etc. Moreover, the high development dynamics brought on by the high profitability enjoyed by the pioneers, has led to an unsustainable context where there is a tendency towards intensification without suitable infrastructures and knowledge.

Such problems need to be addressed at a higher level than that of the farm, seeing the difficulties in planning and monitoring shrimp development.

That is why, beyond the usual ecological impact and cost-effectiveness analysis, this socio-economic study will focus on a comprehensive description of the institutional organization of shrimp farming activities and the nature of the socio-economic transformation brought on by shrimp aquaculture.

The training program

Training is an essential aspect of Gambas. Not only does it concern fellow researchers at the IO Nha Trang but also local officers and even some farmers themselves.

Training of researchers has already involved 4 people, one Master's degree at AIT Bangkok in integrated coastal zone management (ICZM), one 3 month training period in remote sensing and geographic information systems (GIS) and two short training periods in mangroves and soils in Toulouse, France. An equal amount of training remains to be achieved.

For example, the three month training period on remote sensing and GIS led to the production of land use maps for the Gambas investigation sites.

Local training will focus on a workshop to be held in Nha Trang in March 2002, involving 24 staff from the provinces and possibly a workshop in the Mekong delta later. They will aim at transferring results and technical skills for monitoring of environmental indicators linked to shrimp aquaculture.

Workshops

The First Gambas workshop was organized at IO Nha Trang on 20-21 September 2000, with the presence of Mr. Xavier Nuttin from the EC Delegation in Hanoi.

September 2000 workshop at IO Nha trang



The participants were the heads and experts of the provincial services in the Mekong delta and in coastal provinces of Central Vietnam (about 30 people were invited), plus all the project participants.

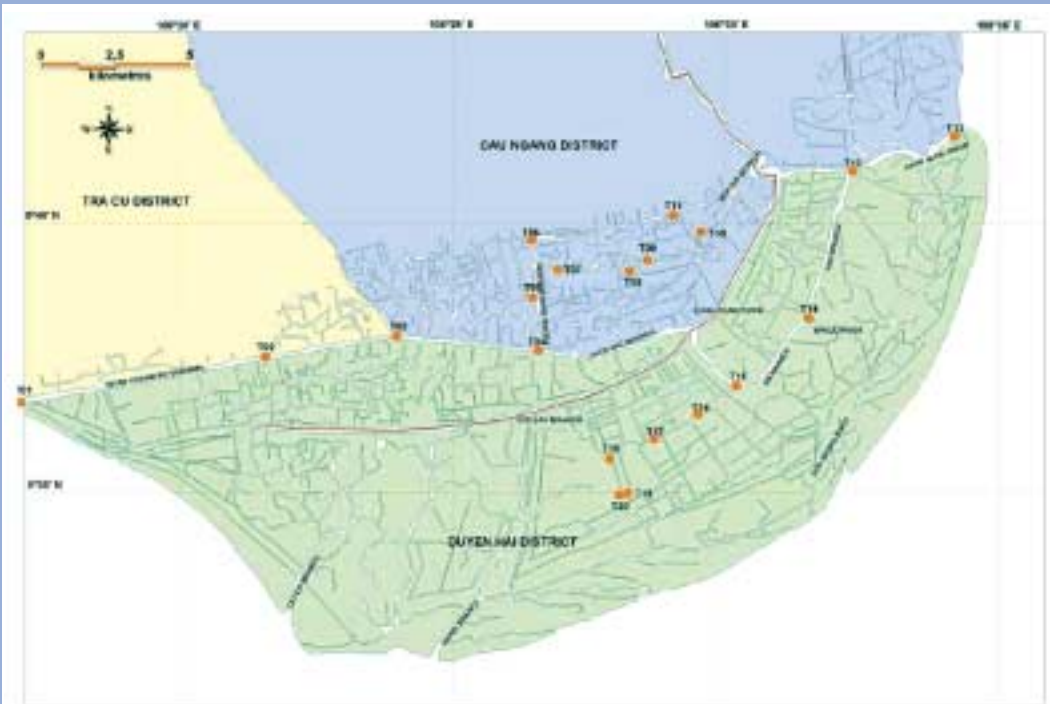
There were 10 lectures in three sessions. The last session allowed discussions between all project's participants on the following points: field trip debriefing, relevance of some parameters concerning the farms and their environment, data base construction, web site design, training, management, etc...



ION scientists during training in GIS, mangrove and soils in Toulouse, France.



Land use map of the Travinh site obtained by classification of the satellite SPOT image dated Jan. 22, 2001.



Map of Tra Vinh produced from ancillary maps showing the sampling stations as red spots.

GAMBAS Partnership

Ifremer

Institut Français de Recherche pour l'Exploitation de la Mer



Institute of Oceanography of Nha Trang, Vietnam



Institut de Recherche pour le Développement



Université de Bretagne Occidentale, CEDEM (Centre de Droit et d'Economie de la Mer)



Université Paul Sabatier, LET (Laboratoire d'Ecologie Terrestre)

Contacts : IFREMER

Jacques Populus at:
jpopulus@ifremer.fr

ION

bibion@dng.vnn.vn