

# Adaptation of modern technologies to the local conditions for sustainable aquaculture

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**ABSTRACT:** Most of us (scientists, researchers, lecturers... and in general "white collar" people) are well aware of the meaning of sustainable and friendly aquaculture. However, the people who are really involved are those who directly produce the aqua-products: farmers, investors, capitalists. Quite naturally they all want to earn as much profit as possible and either do not understand or do not want to follow the sustainable aquaculture model, because they favour the "intensive" culture system. The government itself also wants a high export value every year.

Therefore, our most appropriate action is to find out the resolutions or technologies towards which the activities of the producers can be oriented or adapted.

What happens and is repeated every year in the shrimp industry is the higher risk of shrimp disease for the those aquaculturists who use the extensive culture system for their production. In Vietnam, it is said that the shrimps like rich people. Thus the roles of capital and proper technologies are very important in aquaculture.

There are certain topics of very great interest for all aquaculturists (rich and poor) such as: supplying disease-free broodstock and seeds, reducing transportation duration of seeds by setting up hatcheries everywhere possible (in Vietnam now there is a trend of re-distribution of shrimp hatcheries with more and more hatcheries built in the Mekong Delta), producing more efficient artificial pellets, irrigation planning for small groups of stakeholders, adaptation of modern technologies to local conditions (many examples such as: live food production of rotifers in outdoor system and intensive system; re-circulating systems and improved technologies for larviculture of multi-species using local materials as improvement for the traditional open system; rapid transfer of aquaculture technologies or culture models) to producing stakeholders or organizations, for instance, Artemia production, shrimp growout and shrimp/prawn larviculture).

## **1. BACKGROUND**

On the basis of the evaluation report of the Ministry of Fisheries of Vietnam, two years after the fulfilment of the 1999-2010 plan of Aquaculture Development, a great leap forward in both the quality and quantity of aquaculture products has been achieved. By the end of 2001, the total aquaculture area and production of Vietnam had reached 751.000 ha and 725.827 metric tons, an increase of 34% and 24,9% respectively, compared to the previous year.

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## **2. MANGROVE FORESTS**

### **2.1. Decline in mangrove forests**

In the 1940s the coastal zone of Vietnam had about 400,000 ha of mangroves. However, population growth, economic development pressure and herbicides led to extensive loss. By 1983 only 252,000 ha were still in existence. From 1983 to 1993, there was a further rapid decline caused by the conversion of mangrove forests to shrimp ponds. A determined effort by the government to restore mangroves resulted in the rehabilitation of 64,000 ha mangrove from 1993 to 2000. In 2000 about 42% of the original mangrove area remained in existence. The loss of mangrove forests has been related to various causes, but is mainly due to deforestation for shrimp culture because 80% of aquaculture area is located in coastal provinces. It is estimated that 12% of the mangrove loss in Asia is a consequence of this.

### **2.2. Legislation relating to mangrove use**

Mangrove plantation is always encouraged. A Directive on the technical procedure for the establishment and maintenance of mangrove forests was issued on 24<sup>th</sup> Oct 84. There was a Prime Minister-enacted Instruction for the establishment of forest plantations for the protection of the environment, including coastal and estuarine habitats on 24<sup>th</sup> Feb 90). There are regulations for the Full Protection Zone (FPZ) and Buffer Zone (BZ).

### **2.3. Full Protected Zone**

In the FPZ, permitted activities are listed as: reforestation, forest patrolling, forest management (thinning and pruning of rehabilitated/planted forest allowed only when necessary as a silvicultural measure to improve the coastal protection function of the plantation), eco-tourism development, scientific research, collecting of small marine organisms (snails, small crabs, mud skippers and shellfish, but no fish and shrimp/shrimp larvae), collecting dead wood, agricultural activities in areas not suitable for mangrove planting. Non-permitted activities are tree felling, collection and destruction of life vegetation, soil mining, settlements, aquaculture, commercial fishing with nets and traps, illegal hunting and trapping of wild animals and other forms of exhaustive resource uses.

### **2.4. Buffer Zone**

In the BZ, permitted activities are as follows: forest management, protection and forestation, patrolling and control of illegal fellings, silvicultural treatment, thinning and tending of forests, sustained yield management on a 20-30 year rotation (depending on species), harvesting of forest by-products and dead wood, breeding of bees and other animals, allocation of forest/land lots to households for forest-cum-shrimp production by means of standard contracts. Overall area allocated for aquaculture development is not to exceed 40%. The remainder of the land (60%) is used for mangrove forest development in support of aquaculture (or agriculture where mangrove growing is not feasible, e.g. on higher ground), recreation, scientific research, eco-tourism development, settlements in existing community centres. Non-permitted activities are: illegal fellings, forest clearing and destruction, illegal settlements and encroachment onto forest lands, illegal hunting and trapping of wild animals and other activities that affect the concept of land use.

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### 3. SUSTAINABLE USE OF RESOURCES

#### 3.1. Profitability issues

Most of us (scientists, researchers, lecturers... and in general "white collar" people) are well aware of the meaning of sustainable and friendly aquaculture. However, the people who are really involved are those who directly produce the aqua-products: farmers, investors and capitalists. Quite naturally they all want to earn as much profit as possible and either do not understand or do not follow the sustainable aquaculture model, because they favour the "intensive" culture system. The government itself also wants a high export value every year.

For these reasons, the mangrove area lost to shrimp culture is unlikely to be completely recovered. Therefore, our most appropriate action is to find out the resolutions or technologies towards which the activities of the producers can be oriented or adapted.

#### 3.2. Risk of shrimp disease in extensive culture

What happens and is repeated every year in the shrimp industry is the higher risk of shrimp disease for those who use the extensive culture system for their production. In Vietnam, it is said that that shrimps like rich people. Thus the role of capital and proper technologies are very important in aquaculture.

#### 3.3. Preventive measures

There are certain topics of very great interests for all shrimp culturists (rich and poor) such as:

- Disease-free broodstock and seeds have to be in sufficient supply. This issue is the key point because in reality, in the period of heavy epidemic (white spot disease), the intensive shrimp culture ponds are subject to a lower mortality rate than extensive ponds that stock infected shrimp post larvae. This can be done in a cheaper way by checking the broodstock with PCR facilities prior to spawning.
- Reducing transportation duration of seeds by setting up in every possible location hatcheries equipped with the recirculation system. In Vietnam now there is a trend of re-distribution of shrimp hatcheries (about 4000 backyard hatcheries in the whole country) with more and more hatcheries built in the Mekong Delta. The above-mentioned type of hatchery appears suitable because in this region the salinity decline of seawater in the rainy season does not allow normal operation for those using the open system.
- High-quality artificial pellets and medication products are increasingly supplied by many companies. Research institutions should support their extension staff in terms of scientific theory because they are mostly well selected by the companies and active in advertisement and extension.
- Irrigation planning for a small group of householders (this can take place more easily and faster than regional master planning). Farmers in the same area often chat or debate during their morning coffee about the jobs involved, for example, about their experiences in shrimp growout. The experiences of extension staff can be more convincing if he/she also joins them at this time.

## **4. POSSIBLE WAYS FORWARD**

### **4.1. New technologies**

New production models or technologies should be applied and transferred as quickly as possible to the involved majority. Many backyard hatcheries in the Mekong Delta are supplied with pure micro-algal stock that helps to improve the performance and survival rate of the shrimp PL considerably in comparison to natural-harvested or dry algae. Modern equipment can be localized and produced in series at a low cost for many local users (e.g., protein skimmers).

### **4.2. Cooperation models**

The cooperation between an institution and local individuals or organization can be much more efficient via a direct joint-venture (e.g., a shrimp hatchery). This type of cooperation could be developed to an applied research and pilot production station and could become attractive extension centres for the farmers in the region. In addition, the cooperation could also bring in extra finance for the institutions to receive more staff to continue contractual research projects.