

## MARICULTURE ENGINEERING (SEA FARMING SYSTEMS)

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### Summary

Multidisciplinary efforts of fish farmers, feed factories, vaccine producers and equipment manufacturers have shown notable results, which the mariculture industry has benefited from. Sustainable researches have been carried out. Biological researches enable us to understand and control the growth of fish species. Technological innovation gives the fish species the best growing conditions at the lowest costs. Knowledge of nutrition improves the feeding strategies for fish species. Efficient vaccines also provide mariculture creation the enhanced resistance to diseases.

### 1. Introduction

Today the sea farming systems are based upon more or less two types: the artificial reefs and the cage nets. For example, in Taiwan the artificial reefs are established by office to cultivate and grow the resources of fisheries. The cage nets belong to the private enterprise but are now opening to private investment. Heavy research efforts to develop some fish species have given significant results when it comes to volumes, especially, species like the *Rachycentron canadum* (cobia) seems to have a bright future, this year about 2000 tons.

Conditions for the success of the sea farming industry are the well-suited coastline for growing of general water-fish species and the well-developed coastal infrastructure. If aquaculture is a fairly major area for the authorities, research and development have

been pushed to help the industry. In addition to the general research on biological matters, the research has resulted in large steps forward when it comes to vaccine development, feed development as well as development in farm technology and farming strategies.

The technological development towards a sustainable industry has mainly been focused on two areas: artificial reef and cage technology, as well as feeding technology.

To be able to expand the industry, it was necessary to develop a new cage technology, which should allow for more flexible location of the farms. The farms should be located where the conditions for fish farming are best, not where it is convenient for the fish farmers to have them. The farms moved to more exposed sites, and this trend did certainly demand new cages. However, even more effort was allocated to develop farming systems with appropriate strategies to make it possible to grow fish at remote sites without increasing the production costs. The overall trend has also been shown to be correct from an environmental point of view.

## **2. Sea Farming Technology Research and Development**

Global sea farming productivity has shown impressive growth over the last years due to professional technology and management of each individual farm as well as the industry as such. New knowledge also provides vital input into decision regarding optimal sites for sea farming from both environmental and production points of view. Research has established a technological basis for the production of equipment for the aquaculture industry, which has led to the development of more reliable artificial reefs and cage nets that can be used under much rougher conditions than earlier.

Most of the research has been directed towards the highly value-added fish production. For instance, how can this fish be produced at a competitive price without risking too much and with an acceptable quality? One of the largest challenges here is to make cages for fish farming for another type.

Aquaculture is young industry and is developing extremely fast. It is important to take advantage of the momentum without losing ground. There will also be a constant need for development of new cage systems to give the fish-farmer an opportunity to be competitive on the fish markets.

## **3. Choosing a Location Requires Experience and Technological Knowledge**

The location of floating sea farming is a strategic choice which involves the evaluation of several parameters including safety, profitability and governmental regulations. In the end it often has to be a compromise between several objectives.

Before deciding on a fish-farming site, the answer to these four questions must be positive:

1. Are the fishes' requirements satisfied?
2. Are the authorities' requirements satisfied?
3. Is the required technology available?
4. Are the economic prospects satisfactory?

### 3.1. The Fishes' Requirements

The fishes' requirements are very specific and may vary with the species. However, sufficiently good water quality will always be one major requirement. The water's temperature, salinity and oxygen content are parameters that must be kept within certain limits to ensure satisfactory growth of the fish. It is important to avoid problems caused by nearby pollution sources and ensure sufficient water exchange for the planned biomass in order to avoid self-pollution.

Some of the above requirements may have to be monitored for a prolonged period to ensure their quality over time. Laboratory analyses may have to be made. New technology including mathematical modeling can be used to simulate water flow in fjord and open sea systems, through the fish farms and within the net enclosure.

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#### Biographical Sketch

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