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## **PROSPECTS OF SEAFARMING THROUGH THE FISHERIES SECTOR PROGRAM (PHILIPPINES)**

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### **ABSTRACT**

The status and problems confronting the fisheries sector are discussed. An exploratory discussion of the five-year Fisheries Sector Program addressed on aquatic resources regeneration, conservation, and sustained management of coastal fisheries, production intensification in aquaculture within limits of ecological balance, and commercial fishing away from over-fished areas into the deeper water is made. Seafarming as one of the alternative livelihood for a large number of coastal subsistence fishermen is emphasized particularly in the 12 priority bays under the program to uplift their economic condition. Rapid resources assessment in the 3 priority bays during the first year of the program implementation pinpointed existing aquaculture practices, potential sites for Seafarming and recommended species for culture. The credit, extension services, and training components of the program are envisioned to enhance Seafarming development in the country.

### **INTRODUCTION**

Fisheries as an economic sector accounted for 3.8% of the Gross National Product in 1990 (BFAR 1990). It made a significant contribution to the national economy in terms of income, employment, and export earnings. Fish production during the year was about 2.5 million tons, of which 73% came from capture

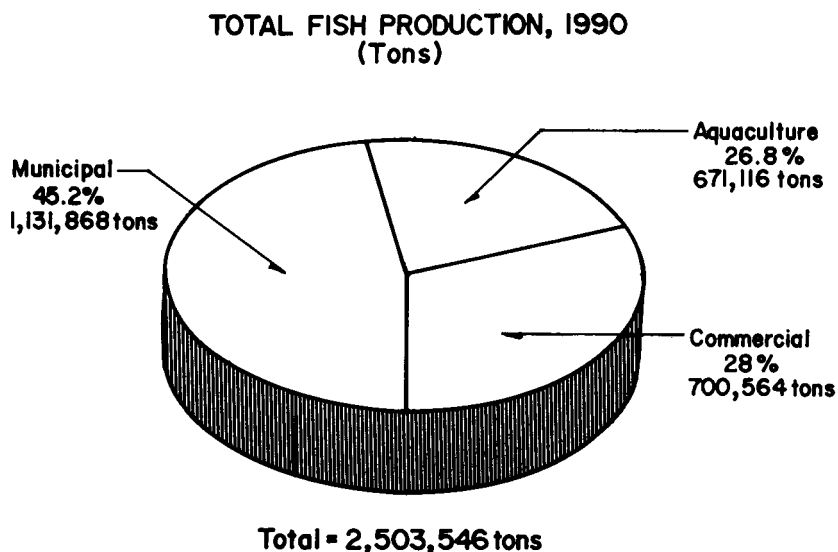


Fig. 1. Total fish production by sector, 1990

fisheries and 27% from aquaculture (Fig. 1). The fisheries industries also gave employment to about one million fisherfolks, 750,000 were fishermen and 250,000 were in aquaculture operations. Total export earnings in 1990 was US\$474 million.

Over the years, the sea has provided its natural bounty to many fishermen and their families making the Philippines the 11th largest fish producer in the world (FAO 1988). Aquatic resources were gathered indiscriminately in large quantities annually. Continuous fishing took place without consideration to conservation, regeneration, management, and limitation of the fishery resources, until it was realized that the coastal waters which used to be the most biologically productive area of the sea is over-exploited. The coastal waters is now beset with the problems of over-exploitation caused by illegal fishing, habitat destruction, intense competition between fishing groups, and other pressures. Fish production records from traditional fishing areas by the Bureau of Fisheries and Aquatic Resources (BFAR) showed a down trend since 1975 (BFAR 1987), affecting the socioeconomic conditions of sustenance fishermen.

With the deteriorating state of capture fisheries, focus was directed to aquaculture. It is recognized that this area is the most stable and profitable in terms of production, efficient use of resources, and employment (Bardach et al. 1972).

Aquaculture in the Philippines is practiced in three types of environment: freshwater (fishponds, fish pens, and cages in lakes and reservoirs), brackish water (milkfish and shrimp ponds), and marine (Seafarming or mariculture). The latter which is the managed cultivation of fishery resources from the shoreline to the sublittoral zone of marine waters (Hansen et al. 1981, Palma et al. 1989),

is the least practiced in the country, although it has the most potential. The archipelagic nature of the Philippines, consisting of about 7,100 islands, offers a vast coastal area where mariculture activities can well be undertaken. These are the coves, bays, inlets, estuaries, reef flats, and lagoons. Seafarming offers an alternative livelihood to sustenance fishermen while waiting for the fishery resources to regenerate.

## STATUS OF SEAFARMING IN THE PHILIPPINES

Seafarming or mariculture in the country involves three major commodities: seaweeds, shellfishes, and fishes. Each commodity contributes a significant percentage in the overall production in aquaculture during the past four years (Table 1). The status of the Seafarming industry as of December 1990 is discussed below:

### Seaweeds Culture

Seaweeds are the most important product of Seafarming in terms of export. Since 1985, it has ranked third among the fishery export of the country (BFAR 1988,1990). Records of BFAR showed that from a production of 85,824 tons in 1978, it rose to 291,176 tons in 1990 (BFAR 1990). This consisted mainly of *Eucheuma* spp. cultured in an estimated area of 5,700 hectares in western Mindanao and central Visayas, with a small percentage gathered from the wild. Other species cultured in ponds, to a limited extent, are *Gracilaria* and *Caulerpa*. Another seaweed of commercial value that is gathered from the wild is the *Sargassum*.

The culture of seaweeds in the country was enhanced by the private sector because of its commercial value. In foreign markets, the Philippines has established its identity as the fourth among the world producers of seaweeds

Table 1. Comparative production in different sectors of aquaculture from 1987 - 1990

Sector	Production (tons)			
	1987	1988	1989	1990
1. Brackishwater fishpond	267,814	240,206	253,580	265,814
2. Freshwater fishpond	30,105	32,922	34,238	35,816
Fish pens	35,588	23,814	24,102	24,379
Fish cages	17,789	18,263	19,502	20,931
3. Seafarming				
Oyster	10,361	12,445	12,819	13,485
Mussel	11,644	15,502	16,403	17,515
Seaweeds	220,839	256,405	268,701	291,176
Total	594,140	599,557	629,345	671,116

supplying 70% of the demand for carageenan (Rabanal 1986). Exported carageenan is usually in semi-refined or refined form as there are now existing processing plants in the country.

The local seaweed industry is beset with problems that hinder its expansion (Rabanal 1986). Among these are: inferior quality products caused by poor postharvest handling, weak marketing system causing unstable price of the product which discourages farmers to produce more, disease called "ice-ice", lack of quality seedlings which are resistant to diseases, and natural calamities. Few studies have been conducted to solve the problems.

## Shellfish Culture

The coastal waters abound with marine shellfish but only oyster (*Crassostrea* sp.) and green mussel (*Perna viridis*) have been farmed since the 1940s. Farming sites are in open waters, limited to areas with natural spatfalls. Although transplantation to other areas has been successful (Aypa 1979), the process has not been widely adopted.

Culture methods used are still traditional with minor innovations. The hanging method using rafts for suspension and the longlines for mussel culture in deeper waters were successfully tried but not adopted (Rabanal 1985). The rope webb proved to be effective in producing mussels in commercial scale but is capital intensive and causes siltation when installed in shallow waters.

Although the shallow water culture is being practiced, production of shellfish can be comparable to that of other countries in terms of quantity. Delmendo (1989) reported that the Philippines ranked 8th among the oyster and mussel producing countries in the world.

The potential for expansion of the industry is great (Glude et al. 1982), particularly with over 10,000 hectares identified as suitable area for shellfish farming (Figs. 2-3) (Rabanal 1982, Delmendo 1989).

Other shellfish with culture potentials and awaiting development are abalone (*Haliotis* sp.), cockle (*Anadara*), scallop (*Amusium* sp.), windowpane oyster (*Placuna placenta*), and angel wing shell (*Pholas orientalis*).

## Fish Culture

Seafarming of fish is still young in the country. It was started on a limited scale about three years ago. The commercial demand for grouper, sea bass, siganid, and snapper stirred the interest of some fish growers. To date, fish cage projects in central Luzon, western Mindanao, and other regions have been reported (Basa 1988). The greatest bottleneck of the industry, however, is the insufficient supply of fingerlings. Except for sea bass, which can be successfully produced in the hatchery, grouper fingerlings come from the wild which is seasonal and uncertain. The smuggling of grouper fingerlings to other Asian countries aggravates the problem. Foreign buyers offer higher prices for fingerlings resulting in the prohibitive cost locally which is disadvantageous to local fish culturists.

1. Buguey, Cagayan (NG, FA)
2. Ilocos Norte (NG, FA)
3. Ilocos Sur (NG, FA)
4. Aringay and Sto. Tomas, La Union (NG, FA)
5. Lingayen Gulf and Tambac Bay, Pangasinan (NG, FA)
6. Agno River, Manat, Binmaley, Pangasinan and Davel, Dagupan City (NG, FA)
7. Binuangan and Malolos, Bulacan (NG, FA)
8. Abucay and Mariveles, Bataan (FA, NG, PS)
9. Bacoor and Ternate Bays, Cavite (NG, FA)
10. Balayan Bay, Batangas (NG, FA)
11. Batangas Bay (NG, FA)
12. Tayabas Bay (PS)
13. Makato, Aklan (PS)
14. Sapi-an Bay, Capiz (NG, FA)
15. Banate Bay, Iloilo (NG, FA)
16. Bacolod (Port of Banago) (NG, FA)
17. Binalbagan and Hinigaran, Negros Occidental (NG, FA)
18. Himamaylan, Negros Occidental (PS)
19. Panguil Bay, Misamis Occidental
20. Luuk, Bongao Cave, Saool Island, Zamboanga del Sur (PS)
21. Atoll Lagoon, Sta. Cruz Zamboanga del Norte (PS)
22. Malalag Bay, Davao City (NG, FA)
23. Del Carmen Dapa, Surigao del Norte (PS)
24. Calape, Bohol (NG, FA)
25. Cebu (NG, FA, PS)
26. Leyte (PS)
27. Maqueda Bay and Jlabong Samar (PS, NG)
28. Catbalogan, Samar (PS)
29. Sorsogon (NG, FA)
30. Calauag Bay, Quezon (PS)
31. Alabat Island, Quezon (PS)
32. Polillo Island, Quezon (PS)

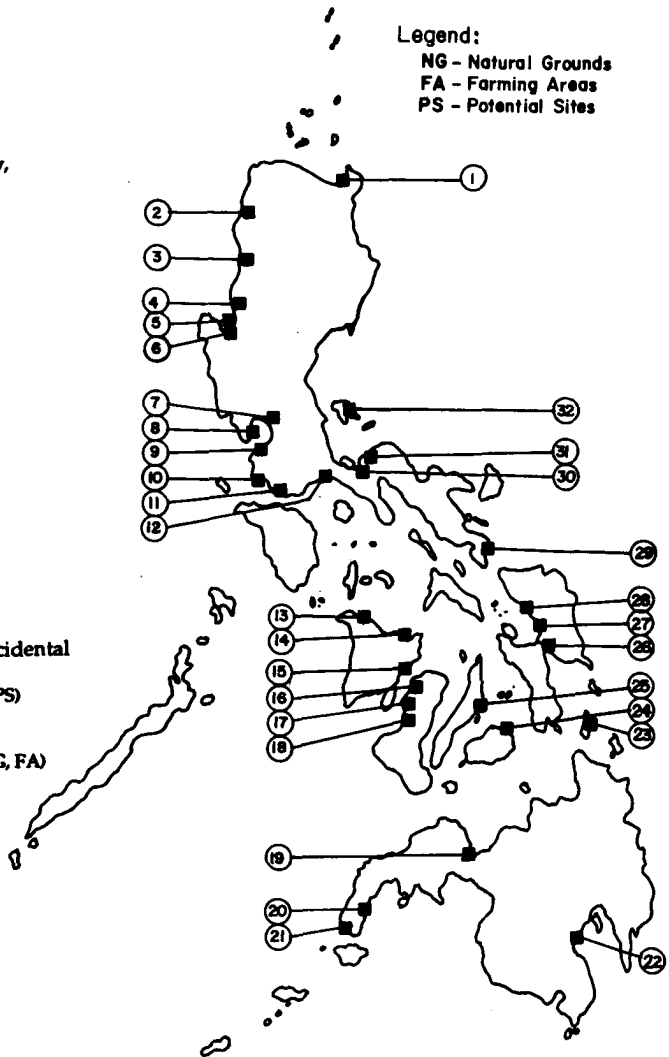


Fig. 2. National oyster grounds, forming areas, and potential farming sites in the Philippines. (Source: SCS/82/WP/103.)

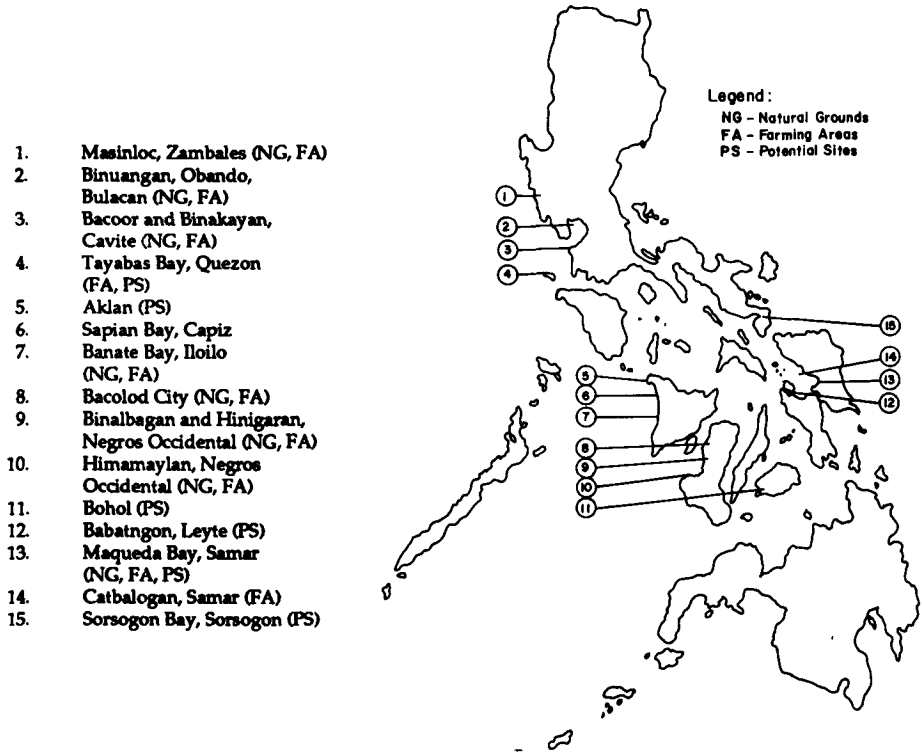


Fig. 3. National green mussel grounds, farming areas, and potential farming sites in the Philippines (Source: SCS/82/WP103)

Another problem affecting the industry is the lack of trash fish to feed carnivorous species. Unless formulated feeds for these species are made available using local and inexpensive ingredients the development of the industry will be slow. Other species which feed at a lower trophic level should be tried.

Financing is another constraint to the industry. Fish cage culture is capital intensive and sustenance fishermen are not able to engage in it unless a low-interest financing scheme is made available to them.

## THE FISHERIES SECTOR PROGRAM

The Fisheries Sector Program (FSP) is the first coordinated effort between the Philippine Government, the non-government organization (NGOs), and the fishing communities to rehabilitate the degraded coastal waters and enhance productivity and alleviate the extensive poverty of the sector. It is a five-year program that recognized that fisheries management and regeneration could be effected through concerted action of the government and the fisherfolks to sustain future economic growth (FSP 1990). This is being implemented by the Department of Agriculture through the Bureau of Fisheries and Aquatic Resources (BFAR)

The primary objectives of the Program are:

1. Regeneration and conservation of aquatic resources with emphasis on balancing fishing effort to maximum sustainable yield;
2. Rehabilitation and protection of the coastal zone environment;
3. Alleviation of poverty among municipal fishermen particularly through diversification of their sources of livelihood;
4. Improvement of aquaculture production but within limits to maintain ecological balance; and
5. Inducement of commercial fishing away from overfished nearshore waters and into the 200-mile exclusive economic zone.

The program has six components, namely: fishery resources and ecological assessments, coastal zone management, research and extension, law enforcement, credit, and infrastructure.

For the coastal zone management component, the coverage would be the 12 priority bays (Fig. 4) which are traditional fishing grounds selected according to the immediate needs of resource regeneration, environmental degradation, poverty level of fisherfolks, and initiative in self-regulation. These bays are:

- |                   |  |
|-------------------|--|
| 1. Manila Bay     | Metro Manila, Cavite, Pampanga,<br>Bulacan, and Bataan |
| 2. Calauag Bay    | Quezon   |
| 3. San Miguel Bay | Camarines Sur and Camarines Norte                      |
| 4. Tayabas Bay    | Quezon Province  |
| 5. Ragay Gulf     | Quezon Province and Camarines Sur                      |

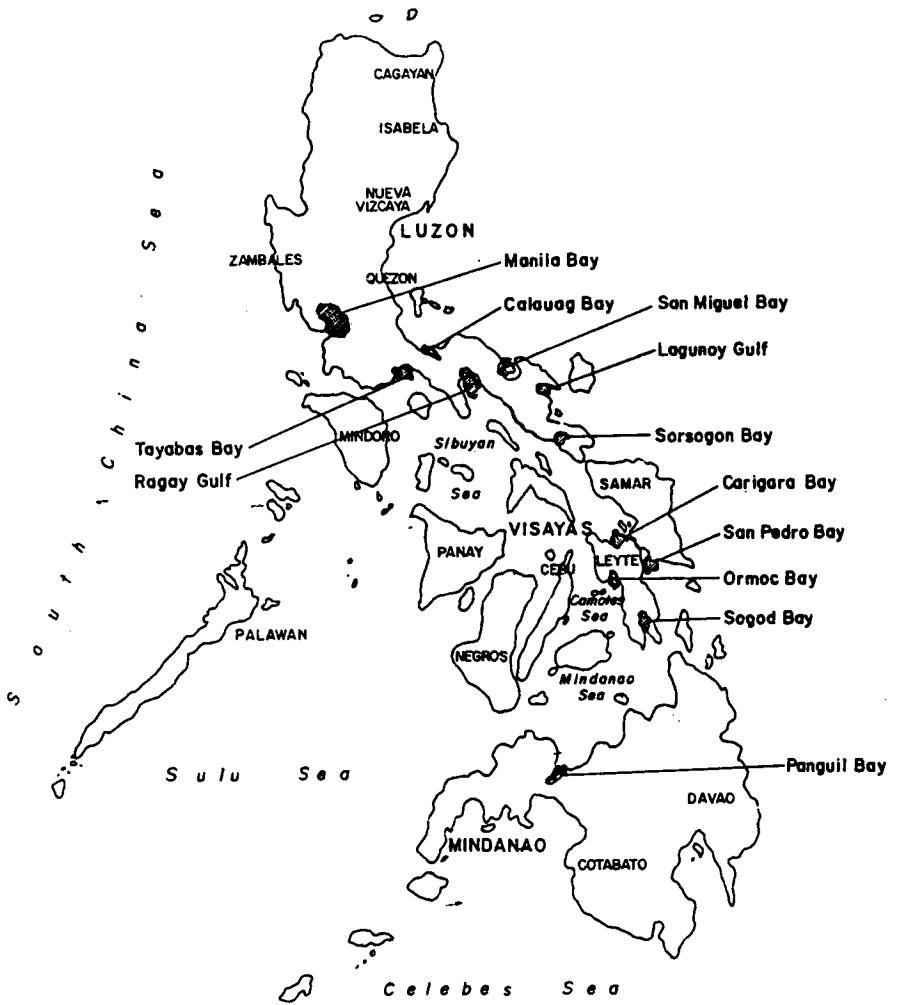


Fig. 4. The twelve priority bays under the Fisheries Sector Program



6.	Lagonoy Gulf	Camarines Sur, Albay, and Catanduanes
7.	Sorsogon Bay	Sorsogon
8.	Carigara Bay	Leyte
9.	San Pedro Bay	Western Samar, Leyte
10.	Ormoc Bay	Leyte
11.	Sogod Bay	Southern Leyte
12.	Panguil Bay	Misamis Occidental, Lanao del Norte, and Zamboanga del Sur

Initially, only three bays are covered during the first year (1990) of the Program implementation namely: Calauag, Carigara, and Panguil Bays. But within five years, all the bays would have been assessed of its resources, and rehabilitation and management measures instituted.

For aquaculture, assessment of fishponds particularly those under the Fishpond Lease Agreement would be done in the following Regions:

1.	Region I	Ilocos
2.	Region III	Central Luzon
3.	Region IV	Southern Tagalog
4.	Region V	Bicol
5.	Region VI	Western Visayas
6.	Region IX	Western Mindanao

Criteria for selecting the above regions was the extensive acreage of existing fishponds.

### **Potential of Seafarming under the Program**

Under the different components of the program, Seafarming would be directly or indirectly benefited. The following discussion relates each component to Seafarming.

### **Fishery Resource and Ecological Assessment**

To provide a scientific foundation for rational management, studies and monitoring of the fishery resources, habitats, ecological parameters, and socio-economic indicators will be undertaken in the offshore, nearshore, and inland areas of the bays. Data collected would be analyzed and stored in a National Fishery Information System Office, to be established within the Department of Agriculture.

With data available on the fishery resources and environmental conditions existing in each, seafarmers or sustenance fishermen would be guided in selecting the most appropriate aquaculture activities to engage in as well as the commodity to be cultured and placement of the project. Information on suitable sites for mariculture would also be made available (FSP 1991). An example is in Calauag Bay, Quezon. Before the rapid resource assessment study, little was

known about its resource and the nature of the habitat. After the survey, it was found that potential areas for mariculture existed. These are the sites along Apud Bay and Lopez Bay, within the vicinity of Niogan Island (Fig. 5). Extensive growth of seagrasses in the locality enhance the abundance of fry/fingerlings of siganids and groupers collected in February to April thus revealing a new fry ground for these commercially important fishes. Giant clams (*Tridacna* sp.) were also found thriving in the reef portions of the bay.

Rapid Resource Assessment study conducted in Panguil Bay showed that an extensive mariculture industry like seaweed culture, crab fattening, cage culture of grouper, milkfish, and squid are now existing in the bay which have never been reported. More areas for development of mariculture industry were also identified.

### **Coastal Resource Management**

This component is the core of the resource and environmental rehabilitation thrust of FSP. The significant decline in the fishery harvest from the once rich coastal resources of the country reflects a lack of effective resource management brought about by overcrowding, overfishing, illegal fishing, habitat degradation, and competition among user groups of the resources.

As a basic strategy, community based initiatives in resource management will be encouraged. The government, in cooperation with NGOs will organize and train fishermen to undertake resource enhancement measures like establishment of fish sanctuaries and marine reserves, construction of artificial reefs, transplantation of corals, and reforestation of mangrove areas. Viable alternative projects will be developed and piloted to draw the attention of fishermen into other economic activities to relieve pressure on already overfished coastal waters. Seafarming would be the appropriate alternative livelihood for these fishermen.

### **Research and Extension**

The component thrust of the program is the preparation of a Comprehensive National Fisheries Research Program, networking and upgrading of existing research facilities, manpower development through provision of scholarships and trainings, expansion of extension services, conduct of priority studies on searanching and fish farming, impact evaluation of artificial reefs, and red tide monitoring.

Seafarming, which is faced with many problems, would greatly benefit from this program. Some of these problems are highly technical in nature, requiring research and development which entails high cost, that only the government and research institutions can support. Among the research areas are: refinement of existing technologies, verification of existing technologies not adopted but with prospects of adoption to increase production, and technol-

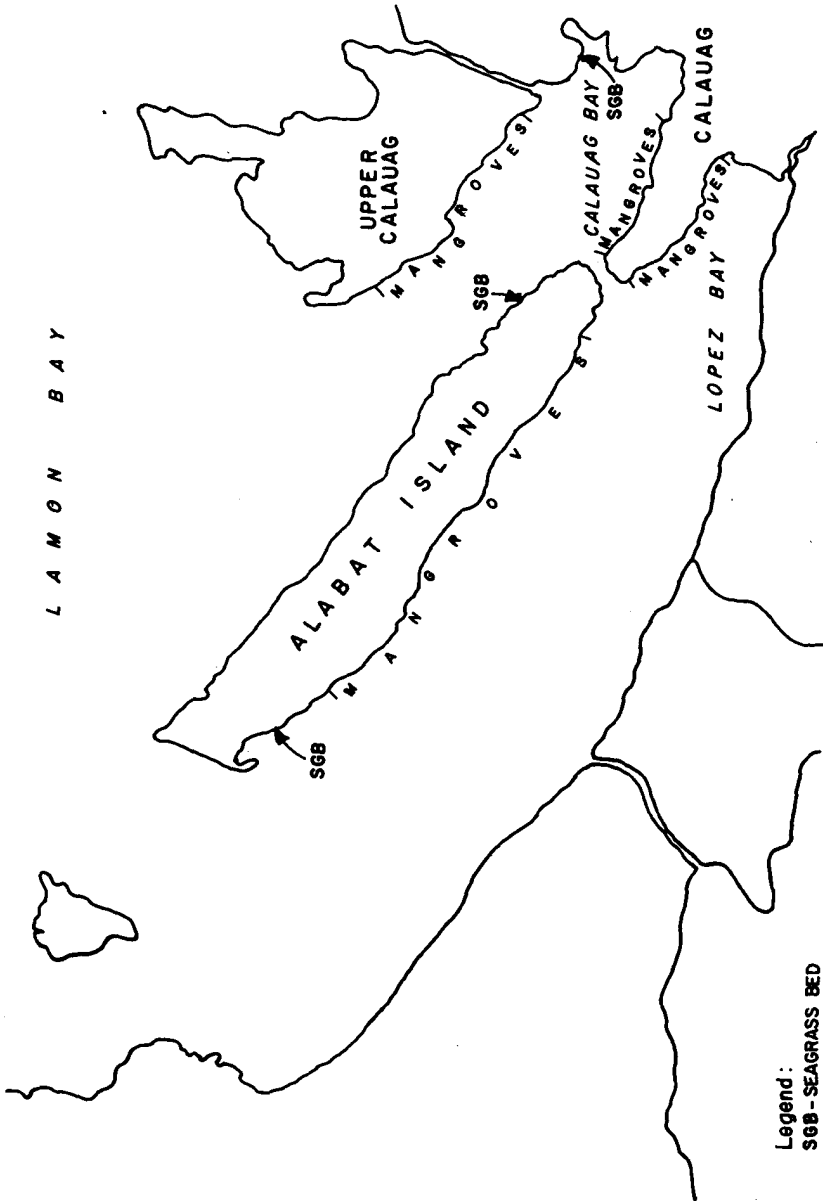


Fig. 5. Mangroves and seagrass beds of Calauag Bay

ogy generation on the culture of some fishery resources with aquaculture potential, especially for species which are already over-exploited (Rabanal 1985, 1986).

An example is the present interest on grouper culture. The source of seedlings for groupers, sea bass, siganid, and snapper is the wild. The seasonal abundance and occurrence in different parts of the country of these highly economical and important species should be studied to support the growing industry, while the hatchery techniques for the mass production of seedlings is still being refined. While the attention of the fishermen is being directed to seafarming activities, training on related projects will be undertaken. Furthermore, during project implementation, fishery technicians and extension workers will regularly visit the sites to ensure the success of the projects and make the fishermen feel that they are partners to progress.

### **Law Enforcement**

Successful enforcement and effective protection of the marine resources will require a decentralized and organized effort based in the fishing community. Community-based task forces composed of local police, government personnel, and fishermen will be given training to implement the laws in their respective areas, hence areas designated for a particular use would be zonified. Aquaculture projects, therefore, would not be disturbed by other fishing activities.

### **Credit**

This is the most important part of FSP that would greatly enhance seafarming development. Support for small scale fishermen to engage in diversified projects including seafarming is provided. A seed fund to supplement the government Integrated Rural Financing Program will be set up.

To date, the Agricultural Credit and Policy Council was designated as manager of the credit seed fund on 15 May 1990. The Land Bank of the Philippines was designated as the conduit bank for alternative livelihood projects for fishermen on 24 November 1990 (FSP 1991). The Philippine Crop Insurance Corporation and the Guarantee Fund for Small and Medium Enterprises were tapped to provide the guarantee mechanisms for loans given by rural financing institutions and commercial banks, respectively. Negotiation with the Development Bank of the Philippines as conduit bank for aquaculture project is underway. The amount of P100 million credit seed fund has been allocated and released.

### **Infrastructure**

Through this component, postharvest facilities such as fish landings, cold storage, and processing centers will be made available for the sector. Researches to develop and promote technology to reduce spoilage and upgrade the quality of fishery products will be undertaken.

As an offshoot, the shellfish industry will be highly benefited through the construction of depuration facilities to produce high quality product. The restriction of foreign markets to buy our shellfish due to the presence of some harmful bacteria which poses danger to human health would be reversed making shellfish as another export commodity.

## CONCLUSION

Seafarming in the Philippines as an alternative livelihood for sustenance fishermen can fully substitute for fishing from the coastal waters. The development of the industry can be enhanced with the assistance of the Fisheries Sector Program. With all the components of the program supportive to mariculture, it is expected that in the near future this area would be the major contributor to fisheries production in the country.

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