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IN THIS ISSUE:

SEAFDEC "Better life through aquaculture"

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KALEIDOSCOPE OF THE PRAWN INDUSTRY

Item One: View of Cause-oriented Group

A study conducted by the Negros Council for Peace and Development (NCPD), a non-government organization, showed that prawn (*Penaeus monodon*) farms in Negros, Central Visayas, have disastrous effects on the economy and the environment. Prawn producers, a minority, rather than hundreds of small-time Filipino businessmen, would soon have the monopoly of credit offered by financial institutions. This is so because the IMF-World Bank and affiliates prefer prawn projects which allow the government and the private sector to pay back the country's billions of dollars of foreign debt. With this financing, the industry further paves the way for foreign control of the country's economy.

Foreign groups cashing in on the prawn boom are the Japanese and the Taiwanese businessmen, with the Japanese controlling processing and export, and the Taiwanese, formula feeds and pond equipment. They have poured P11 billion in investments since last year, and the Taiwanese have even branched out into the poultry industry.

Although Negros prawn growers claim that they will be able to employ 20,000 people by 1990, only 7% of the investment in the industry goes to the workers. While seven to eight workers could be employed in a hectare of sugarcane field, only three are needed in a prawn farm.

The livelihood of thousands of people also has been adversely affected by prawn farms, the NCPD said. Ricefields were destroyed during flash floods and typhoons in the Valladolid and Binalbagan towns after prawn growers constructed dikes and dams to divert freshwater into their farms. People in Magalona and Victorias towns further complained that poison, especially teaseed cake, destroys breeding grounds of fish when flushed out of the ponds. Weavers of nipa shingles also reported losing their only job when swamps where nipa grows were converted into prawn farms. As a result, the price of nipa shingles sky-rocketed.

The effects of the prawn industry on the ecology are also disastrous. Among the irreversible consequences are denudation of 75% of mangrove swamps, draining of underground freshwater table, and subsequent seepage of seawater into springs and deep wells, and sinking of land surfaces. The study also rang alarm bells on lands converted into prawn farms as these become infertile or unproductive for later use with land crops.

Antonio Claparols, President of the Ecological Society of the Philippines, in opposing the construction of these ponds, said that the prawn industry has a productive life cycle of only 10-20 years as determined by economic forces. Meanwhile, the ponds will yield lower productivity and poor-quality prawns due to diseases. "Today, the landscape of Negros alone has been geographically altered by aquaculture development. The coastal area is there but is reduced yearly at an alarming rate. At times, I fear we may see our beloved Island of Negros turn into a desert atoll surrounded by water, with its rich soil, our natural and agricultural bounty, lost forever," Claparols said.

Source: **News Express**, February 8-14, 1989.

Item Two: A Personal Touch

From Bacolod City came a very sad letter. It complained about the assault on the ecology by the booming prawn industry in Negros Occidental. The letter said that this early, the prawn industry has brought irreparable damage to the environment. Prime lands are being converted into ponds; trees and houses are being uprooted; man-made floods are becoming more frequent; freshwater supply is endangered. Those with more money rush headlong into prawn-raising without thinking of its dire impact on the ecology.

Anguish and resignation were etched all over the letter: "I would know very well because my family happens to be victims. We live near the river (salty, because it is near the sea). We have a small orchard which has been giving us considerable income. Because of the prawn rush, the land adjacent to ours was bought and converted into a prawn farm. A few months after production started, the leaves of our jackfruits began to fall. The trees then died. Our mango trees did not die yet but they stopped bearing fruits. Our guavas tasted differently. The coconuts became smaller. And our deep well which services the neighborhood, has become polluted. Now we have to get our drinking water from a relative who is 400 meters away. My family's problem is the problem of many more families in the entire province. What price for progress. While a few moneyed ones are raking in the millions, a big majority suffers."

Source: Art A. Borjal, "Jaywalker," **The Philippine Star**, January 14, 1989.

Item Three: Lesson from Taiwan

The culture system used for *P. monodon*, the species with which Taiwan has staked its claim to aquaculture history, has caused a serious problem with the water table, resulting in a partial settling of land in the vicinity of the aquaculture areas. This arises from the uncontrolled use of freshwater drawn indiscriminately from the underground water table. The use of underground freshwater is the result of the current practices of the prawn farmers in Taiwan who dilute seawater with freshwater to obtain brackish-water. As the success of the culture of *P. monodon* increased, so did the use of freshwater. By depleting the natural freshwater table, land depression results. In some areas, land had settled so much that an originally two-storey house became a single storey. Too much dependence on underground water has resulted in a much lower water table which, in turn, led to a serious competition for the use of freshwater between agriculture and households.

Certain warnings must be considered with the onset of more intensive aquaculture such as the impact on the environment and possible subsequent impact on the industry. Land depression and diseases are manifestations of this impact. Often, the various farmers were so impressed by the success of their neighbors that they embarked on an aquaculture enterprise without adequate or basic knowledge of the possible adverse consequences. While this results in a rapid increase in production, what is actually occurring is a skipping over of crucial steps in the rational expansion of aquaculture.

In the light of the foregoing problems, Taiwan is making advances in other areas of aquaculture. Like Japan, Taiwan is exploring the possibility of initiating stock enhancement programs. Such a study has already been carried out and has resulted in a 15% recovery rate of tagged *P. monodon* which were released into the sea at an average body weight of 50 g, and when recaptured showed an average growth rate of 30 g/month. The limited natural resources of Taiwan do not interfere with this method, which, perhaps, will prove to be the future direction for aquaculture. However, this new technology is being adopted slowly and only through a series of exhaustive tests to determine and prevent the possibility of any adverse impact on the environment of Taiwan.

Source: I-Chiu Liao, 1988. Status and prospects for aquaculture in Asia. In: *Aquaculture International Congress and Exposition Proceedings:* Vancouver, British Columbia, Canada: 6-9 September 1988.

Item Four: Sea Monsters on the Loose in America

This giant tiger shrimp is one of many that fishing crews have caught on the east coast of the US since some have escaped from a research laboratory in South Carolina. Scientists and shrimpers alike are wondering how the shrimp (*Penaeus monodon*) will affect native species of the crustaceans. The shrimps weigh up to 110 grams.

Source: **New Scientist** , October 29, 1988.

Item Five: Message to Growers and Financiers

Our agricultural resources are threatened by poor stewardship. Take the denudation of the mangrove forests, for example. In 1968, the country had 448,310 hectares of untouched mangrove forests. At present, only 110,000 hectares remain. One major cause of this denudation is their conversion into fishponds, and, lately, prawn ponds.

The continuing attrition of our mangrove forests has led to the destruction of breeding and nursery grounds of many marine fishes, the erosion of shorelines, and the displacement of subsistence fishermen who depend on these swamps for a living.

Another example: With the proliferation of grow-out farms, particularly those of the intensive type, excessive pumping of freshwater from the underground has lowered the water table, sank land surfaces, and caused the seepage of seawater into springs and deep wells. Furthermore, flushing brackishwaters from prawn ponds has led to salinization and microbial infestation of neighboring agricultural farms and irrigation systems.

Meanwhile, the outbreak of diseases in hatcheries and grow-out ponds has encouraged the indiscriminate use of antibiotics, many of which we also use for treating human diseases. This practice raises the risk of developing not only immuned prawn pathogens, but also drug-resistant human pathogens.

These are but a few samples of how we mismanage our finite resources. The situation puts us in a dilemna. On one hand, we need to maintain and even expand prawn culture. On the other hand, the ecological problems that our present methods of production entail are so great, no amount, not even billions of exports earnings, can compensate for the loss.

But we can grab the dilemna by the horns, so to speak, by exploring the following options:

One, we can all agree on ecologically based limits to freshwater wells of prawn farms through a licensing system.

Two, we can gradually shift from highly intensive to semi-intensive and extensive prawn farming systems. This could greatly reduce freshwater pumping, and lessen the prawn diseases and use of antibiotics.

Three, we can raise prawn species that thrive on purely marine water, instead of those that survive only in brackishwater. Along this line, SEAFDEC is conducting experiments on *Penaeus indicus* and *P. merguiensis*.

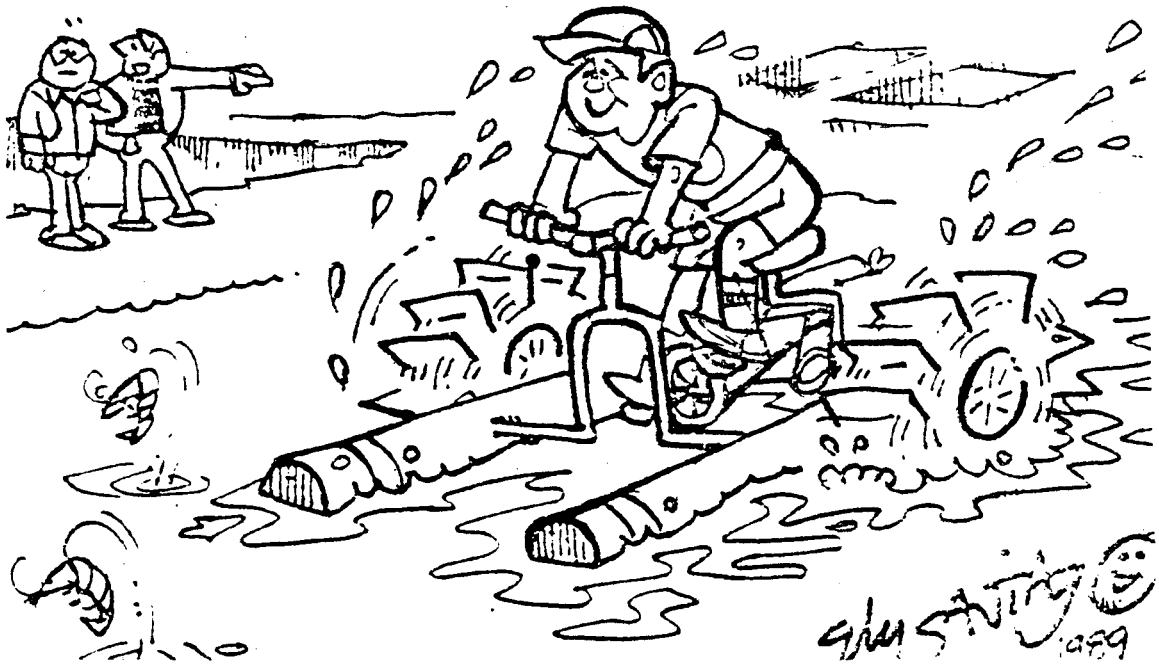
A lot of research, verification, and dissemination have to be done first, of course. But the point is: there are alternatives.

One last point. Government's efforts in increasing the productivity and profitability of agricultural industries, including prawn, focus on the participation and welfare of our small farmers. Our priority concern is to alleviate poverty among agricultural workers. While we therefore work to achieve production goals, we also seek to achieve social justice and equity for the least advantaged in the countryside.

The real challenge for us, then, is how we, the prawn farmers and the government, can enhance the productivity and profitability of the prawn industry and at the same time achieve equity and sustainability in agriculture.

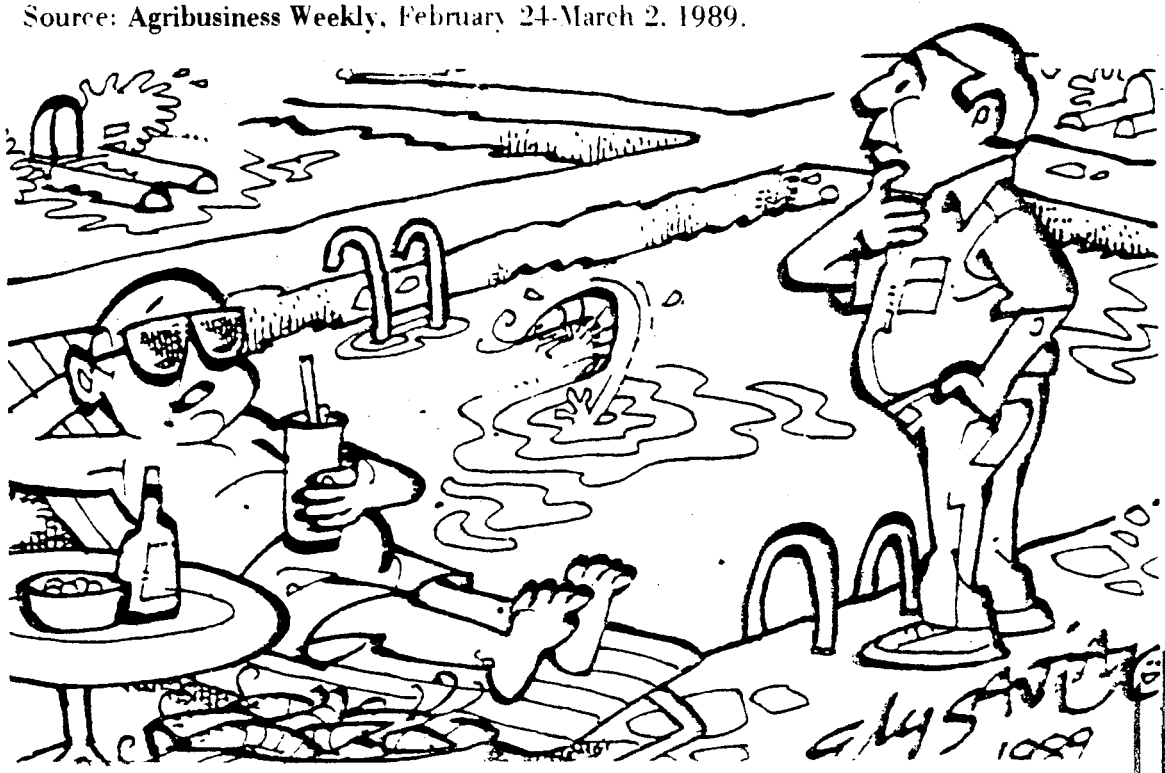
Source: Department of Agriculture Secretary Carlos G. Dominguez, "The Prawn Industry: Meeting Today's Challenges," speech delivered at the First Congress of the Philippine Prawn Industry, Bacolod City, November 25, 1988.

Item Six: Dose of Humor



"That's our 'Aerator-Cycle' Model. It saves you energy costs and it's good for your health!"

Source: Agribusiness Weekly, February 24-March 2, 1989.



"I believe in mixing business with pleasure!"

Source: Agribusiness Weekly, January 6-12, 1989.

Item Seven: Media Blitz — a Battle of Ads

Magazines and dailies proliferate with advertisements of prawn feeds, farm equipment and chemicals being used, showing the magnitude of the industry. How long will the boom last?

Compiled by Publications Staff, SEAFDEC.

SPAWNING AND REMATURATION OF TIGER PRAWN

Spawning of "sugpo" or the tiger prawn (*Penaeus monodon*) generally takes place between 8:00 p.m. and 6:00 a.m. although most females spawn between 10:00 p.m. and 2:00 a.m. Normally at rest or slow-moving at the bottom, a female about to spawn becomes restless and starts swimming upwards in circles. The eggs (and sperm) are released, often forcefully, as she swims and may continue even as she returns to the bottom. Active movements of the swimming legs or pleopods disperse the eggs and the nonmotile sperm. Spawning lasts from 2 to 7 minutes.

Ovarian discharges released into the water together with the eggs form bubbles completely covering the water surface as an effect of aeration. After a few minutes, the bubbles break up and disappear within half an hour after spawning. The discharges turn into pink to orange scum forming along the sides of the spawning tank a thin to very thick ring which hatchery technicians often take as a sign of spawning. In the absence of aeration, no scum is formed.

Of a given batch of ripe (Stage III and IV) (*See* AFN VI(4) 1988 for stages in maturation of ovary) females, some will spawn completely, others partially, while the rest may not spawn at all. Partial or non-spawning is associated with stress due to transport, handling, crowding, etc. Both unspawned or partial spawners will either spawn or continue spawning in the next 2-3 days or absorb their ovaries. Partial or complete spawning can be determined by holding the female against a bright light - some of the anterior or posterior portions of the ovaries remain in partial spawners while complete spawners have no traces of the ovaries.

A gravid female that does not spawn for the 2-3 successive nights but remains in Stage III or IV without regressing may have the "white ovary" or "milky ovary" disease. Infection by a protozoan (microsporidian) parasite causes the ovaries to become whitish or milky and yet retain the diamond or butterfly outline visible externally.

In nature, *P. monodon* females probably have multiple spawnings in a year. Penaeid or marine prawns have a short life of 1-2 years, as documented for *P. merguiensis* and *P. semisulcatus*. Data for broodstock of other species that have matured without ablation show that on the average, *P. merguiensis* females spawn once every 2.6 months, and *P. japonicus*, once every 2.8 months.

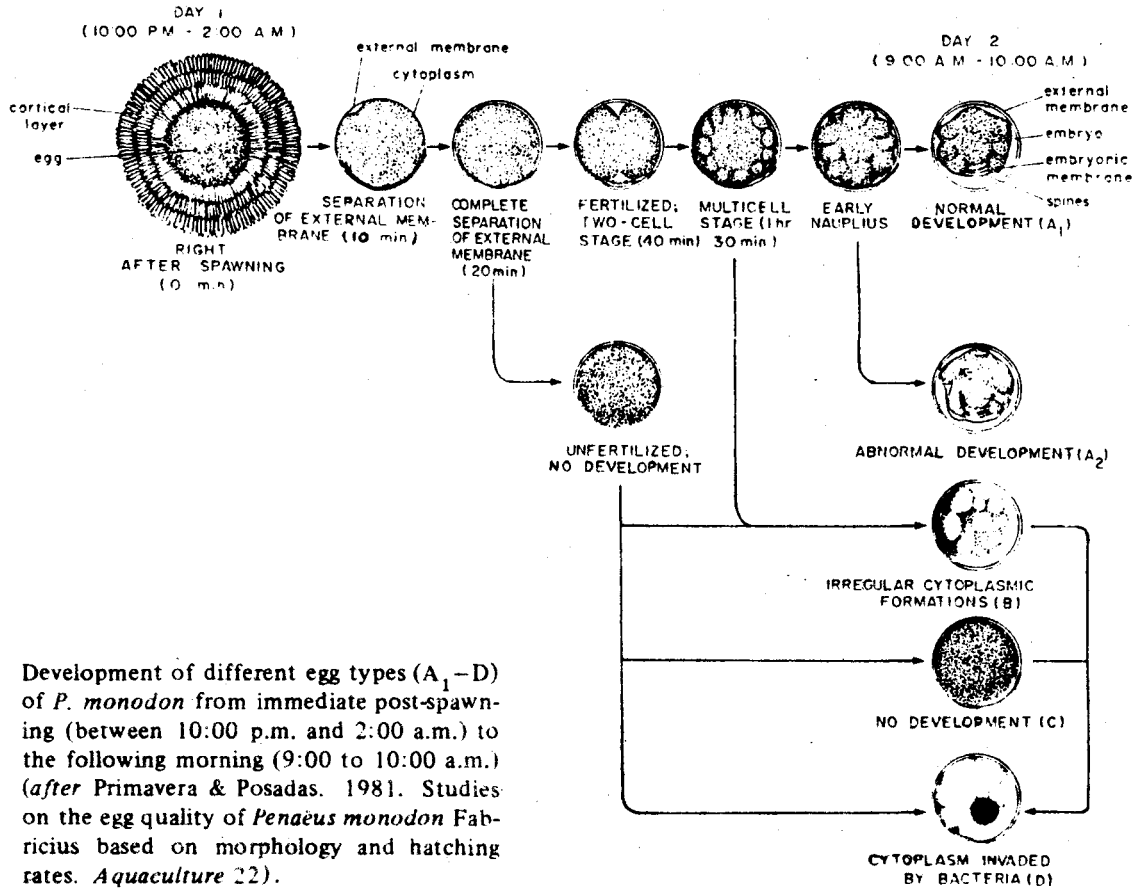
Of a given number of ablated *P. monodon* females that have spawned once, at least 50% will spawn a second time and 15% a third time. Subsequent spawnings may take place as quickly as 3-5 days after the preceding one. Rematuration rates can be increased by reducing factors that cause post-spawning mortality among spent females, thereby increasing their chances to remature and spawn again. Nevertheless, both maturation and hatch rates progressively deteriorate 6-8 weeks and 10-12 weeks after initial ablation of wild and pond stock, respectively.

Source: Lecture Notes of J. Honculada-Primavera, Scientist, SEAFDEC Aquaculture Department, Tigbauan, Iloilo, Philippines. 1988.

FECUNDITY AND EGG QUALITY OF TIGER PRAWN

In the tiger prawn (*Penaeus monodon*), fecundity or number of eggs in a complete spawning averages 300,000 (range: 100,000–800,000) for ablated females, and 500,000 (range: 200,000–1 million) for wild spawners.

Both wild and ablated spawners may produce good or bad eggs. To avoid wasting time and effort in rearing inherently weak larvae, the quality of eggs from a given spawning should be determined as early as possible. Toward this end, a system of classification of *P. monodon* eggs into five different types based on appearance (figure below) has been established. Because technicians normally report to the hatchery at 8:00 a.m., the various egg types are described below according to their appearance in the morning (8:00–10:00 a.m.) after a spawning, rather than at any other time.



Development of different egg types (A_1–D) of *P. monodon* from immediate post-spawning (between 10:00 p.m. and 2:00 a.m.) to the following morning (9:00 to 10:00 a.m.) (*after* Primavera & Posadas. 1981. Studies on the egg quality of *Penaëus monodon* Fabricius based on morphology and hatching rates. *Aquaculture* 22).

Type A_1 or good eggs – nauplius undergoing normal development with distinct setae or bristles (only the multicell stage may be visible if the female spawned late, e.g., 5:00 a.m.): mean hatch rate (HR) 58%; larvae strongly phototactic, i.e., swim actively toward a source of light.

Type A_2 or not-so-good eggs – development of embryo either delayed or abnormal in comparison to A_1 eggs of the same batch; mean HR, 32%; newly hatched nauplii may be weak.

Type B – bad eggs showing irregular cytoplasmic formations; 0% HR.

Type C – bad eggs with cytoplasm remaining a single undifferentiated mass; 0% HR.

Type D – bad eggs with very little remaining cytoplasm because of bacterial invasion; 0% HR.

There is a highly significant linear relationship between the proportion of A_1 eggs and hatch rates of ablated pond and wild stock.

Source: Lecture Notes of J. Honculada-Primavera, Scientist, SEAFDEC Aquaculture Department, Tigbauan, Iloilo, Philippines. 1988.

FEED HANDLING IN AQUACULTURE

Feed Storage

The quality of feedstuffs during storage will deteriorate with time. Many problems can occur during storage and some adverse effects are inevitable. To ensure that the fish and shrimp which depend on aquaculture feeds receive the best nutrients available, ingredients should be stored for as short a period as possible and compounded feeds used quickly, especially in tropical conditions.

Environmental factors such as moisture, temperature, light, chemical changes, and oxygen influence deteriorative changes and weight losses in feed ingredients and prepared feeds either directly by chemical reactions or indirectly through proliferation of insects, fungi, bacteria, and other pests.

The major factors that cause losses in quality and weight of feedstuffs during storage are rain, condensation and high temperatures, theft, fire, scavenging animals such as rats and birds, presence and breeding of insects, growth of fungi, enzymatic actions, and the development of oxidative rancidity. Larger fish farms often have a central or primary feed store with individual secondary stores and often, silos at the pond sites.

Storage Principles

In order to ensure maximum benefit from feeds, several points are worth noting and implementing wherever possible:

– Provide a proper, well-insulated and -secured building for storage. Ensure that the roof will protect the feed from rain and that surface water cannot enter the store. Provide it with ventilation entry points (windows are not necessary nor recommended). The ventilation points should be low on the side facing the prevailing winds and high on the opposite side. Orient the buildings so that one of the long sides faces the prevailing winds. Ensure that all entry points are meshed to prevent entry of birds, rats, etc. The drier and cooler the store, the better the feed quality will be.

– Plan ingredient purchases carefully and do not accept deliveries which are obviously infested with insects or are visibly damp. Do not keep large quantities – one should not be tempted to buy a year's supply of seasonally cheap or scarce materials. It may prove very expensive indeed if half of them have to be thrown away. The recommended maximum storage periods for several feedstuffs are outlined below:

Storage guidelines for feed materials

	Condition	
	Tropical	Temperate
Ground ingredients	1–2 months	3 months
Whole grains and oil cakes	3–4 "	5–6 "
Compounded dry feeds	1–2 "	3–4 "
Vitamin mixes (kept dry and cool)	6 "	6 "
Wet ingredients	2–3 hours	2–3 hours
Frozen materials	2–3 months	2–3 months

– Always keep the store clean. Floors and walks should be regularly swept. Spilled materials must be removed and contents of broken bags or containers have to be used first. Cleared areas of the store must always be cleaned before new materials are placed there.

– The "first in, first out" principle must be applied – that is, the oldest stocks should be used first.

– Make high stacks. High stacks of sacks lessen chances of insect damage which occurs mainly at the surface. Stacking sacks on wooden pallets and leaving spaces between them and the walls of the store enhance circulation of air.

– Do not allow personnel to sleep, eat, or smoke in the store, and apply strict stock control system.

Source: Gerald Roessink. **Infofish International**, January-February 1989.

SEAWEED FARMING – PHILIPPINES' NEW SUNRISE INDUSTRY

The Philippines is now Asia's largest exporter of dried seaweeds and their natural extracts, carrageenins, which are used as thickening and gelling agents in many modern products.

About 4,000 hectares of coral fields in central and southern Philippines have been planted with *Eucheuma* and other red algae. Farming and production are covered by hundreds of contract-farming agreements.

The Department of Agriculture, under its Livelihood Enhancement for Agriculture Development Program (LEAD), is going to invest more than US$15,000 on a 20-hectare farm owned by 20 members of the Seaweed Plants Association in Guisok, Tabu-Manuk, Panamao, Sulu.

Processing of domestic seaweed production into quality carrageenins is done at Shemberg Marketing Corporation's plant at Pakna-an, Mandaue City, Central Philippines, employing nearly 300 workers. Shemberg has planned to double its seaweed farm production to supply world requirements for carrageenins.

Around 200.000 Filipinos work in the seaweed farming industry.

Source: **Fish Farming International**, Vol. 15. No. 11, November 1988.

PLANNING YOUR FISH FARM

An integrated, systematic approach to the planning and design of aquaculture facilities is described in a new guideline document published under FAO's Aquaculture Development and Coordination Programme.

Planning an Aquaculture Facility was prepared by consultants Carol M. Brown and Colin E. Nash. It includes among others: fish and shellfish hatcheries, land-based farms, offshore farms and cage complexes, research laboratories, and training centers. Public aquaria, which are often associated with aquaculture facilities, are also included.

The authors point out that modern aquaculture is an emerging technology, and each year scientists make technical advances in their disciplines which push husbandry and management of aquatic animals to new limits.

The 42-page document is directed at upper-level and mid-level management, specifically investors and managers of both public and private funds who often have little or no knowledge about aquaculture and the mechanics of designing and operating the special facilities which the aquaculture sector requires.

The contents of the new guidelines document are concerned particularly with the role of engineering and engineering services in the design and development process, as this role is not well understood by non-professionals. The document is also sufficiently detailed to be useful to aquaculture biologists and technicians who often try to fulfill this role themselves. It also contains criteria about all aspects of the proposed facility and some typical terms of reference for the engineer, architect, biologist, and economist who may be employed in the planning and design of aquaculture facilities.

Planning an Aquaculture Facility – Guidelines for Bioprogramming and Design, ADCP/REP/87/24, is available from the Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

Source: **Fish Farming International**, Vol. XV, No. 8, August 1988.

FAO AWARDS FILIPINO FISH FARMER

A Filipino aquaculturist, along with eleven other farmers from various Asian and Pacific countries, recently received an award from the Food and Agriculture Organization (FAO).

He is Job Bisuna from Bato, Camarines Sur who operates three hatcheries and 250 fish cages in different lakes in the Bicol region, including 100 fish cages in Lake Bato. He is currently executive vice-president of the Federation of National and International Outstanding Fish Farmers of the Philippines.

The FAO citation noted that Bisuna has been "highly innovative in using modular system in cage operations which gives three croppings a year, against hardly two croppings otherwise." From each cage of 5 m x 10 m, Jobsky, as he is called, harvests about 400 kilos of tilapia per year. His average income from the 100 cages is about P600,000 per year. The FAO also noted that Bisuna has been "generously sharing" his expertise and fingerlings with other farmers.

The awards were given by FAO during the World Food Day celebration in Bangkok, Thailand last October 16, 1988. The celebration was marked to focus international attention on the problems of hunger and to marshall cooperative action to curb malnutrition.

Source: **Manila Bulletin,** November 15, 1988.

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