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AQUACULTURE – FOR GENUINE DEVELOPMENT?

Item One: Aquaculture Development and the International Division of Labor

The framework of development of aquaculture ("the blue revolution") in the Philippines falls squarely within the scheme of the international division of labor. In the scheme of international trade, aquaculture farms produce the primary products needed by developed consumer markets. Development of sectors other than the primary industry is neglected, since the economy devotes its resources to the production of such primary products. Thus, the development of aquaculture in the Philippines is an important element of the export-oriented growth strategy which purports to exploit the comparative advantage of the Philippines in primary products.

As a neocolony, the Philippines was assigned the role of producing primary agricultural products such as sugar, logs and timber, pineapple, ores, and the like for use and processing in foreign industrial markets. Such traditional role persists in the development of the aquaculture industry. The Philippines, along with other countries like Indonesia and Taiwan, was assigned the role of producing prawns, shrimps, and other primary marine exports. The allocation of local productive resources (cheap labor, land, capital) emphasizes the continuation of such traditional role. It is in this context that aquaculture farms are mainly located in Third World countries. The economy allocates resources toward the production of agro– and aqua–based commodities needed by the foreign markets. The needs of the domestic markets are not emphasized.

There are extensive forward and backward linkages in the aquaculture industry. Most capital inputs are still imported – pumps, aerators, and raw materials for feeds (fish meal, shrimp meal, soybean meal). The requirements for trading services are also extensive – transport, storage, financial intermediation (credit), and the like. These linkages require foreign capital infusion. This is where the unfavorable terms of trade associated with the insertion of foreign intermediation services are high, while prawn and shrimp prices in the export markets are relatively cheap. Under this arrangement, the Philippines is further integrated into the losing end of the global supermarket.

There is no doubt that the development of aquaculture brings in tangible benefits as a whole. However, certain negative aspects are associated with its growth. Such drawbacks indicate that the current thrusts of aquaculture development do not systematically take into account the criteria for social development. Such criteria may include, but is not limited to, the following: that aquaculture contributes to the alleviation of poverty, generation of employment opportunities, and in general, the improvement in the standards of living in the communities where the aquaculture farms are located.

So far, the most pronounced reported drawback associated with the establishment of aquaculture farms involves the displacement and further marginalization of small-scale peasants and fishermen in the communities where these farms are established. There are other social costs: disturbance of the ecological equilibrium with negative effects upon the environment, and the export reorientation of the domestic market previously self-sustaining in terms of marine-based food products. The latter is manifested in the conversion of milkfish and tilapia ponds into prawn farms. Milkfish and tilapia are aquaculture products which previously catered exclusively to the domestic market. Such

pond conversions resulted in a smaller supply of milkfish and tilapia. Thus the price of milkfish and tilapia increased significantly in the domestic markets. The export reorientation of aquaculture development therefore meant more prawns for the U.S. and Japanese market, but less food for the Philippine consumers.

Item Two: Panay Island – An Aquaculture Laboratory

The hospitable topography and rich aquatic resources of Panay Island qualify the area for exploitation of its aquatic potential. The Visayas Sea in Northeast Panay is one of the richest fishing grounds in the country. The island's coastline is also a rich breeding ground for milkfish, shrimps, and prawns.

Currently, national and international capitalist investors, reinforced by financing institutions such as the Asian Development Bank are mobilizing more of their resources to take advantage and extract surplus from Panay aquaculture. These efforts resulted in the close integration of the prawn industry in Panay with international business. Integration, however, meant a strong dependency relationship of local prawn production with market demand from the developed countries. Semi-feudal relations of production in Panay enable the aquaculture industry in the area to be inserted into the sphere of dependency relations with the developed industrial consumer market.

Big business interests, both local and foreign, race among themselves to fully exploit Panay's aquaculture resources. These companies including national food conglomerates link themselves with local prawn farm owners through various subcontracting and domestic trading arrangements. In turn, these companies are linked with international investors through financing and trading arrangements.

Panay's rich natural resources is the magnet which attracts foreign business. In their entry, big business interests create dependency relations wherein the foreign capitalist is assured of a positive surplus in the exploitation of the island's resources.

Item Three: Benefits of Aquaculture do not Trickle down into the Grassroots

Funded by the World Council of Churches, the Panay Self-Reliance Institute (PANSRI), a non-profit, non-stock service organization, undertook an analysis of the development of the aquaculture industry in Panay. The study focused on aquaculture's impact upon the life of the people in the communities where the prawn farms are loca-

ted: Bgy. Lubok in the municipality of Lapuz in Iloilo and Bgy. Maninang in the municipality of Sapian in Capiz. The objective is to provide a basis for genuine, people-oriented development program for aquaculture in the area.

The case study documents the major finding that the benefits of aquaculture in Panay do not trickle down into the living standards of the grassroots. There are even negative effects on employment, wages and incomes of the workers in the farms and on the domestic market as well. There are social costs being borne by the community in terms of displacement and further marginalization of small-scale fishermen. Most urgent among the drawbacks is the disturbance of the ecological equilibrium: changing salinity of the arable area, lowering of water levels, and other environmental costs - pollution of the estuarine and mangrove areas by organic chemicals used in prawn farms.

The following statements are a synthesis of the comments made by workers and community residents in response to the question: "Who benefits from the aquaculture industry?"

"Traders who export prawns greatly benefit from the industry, as well as their foreign partners. Foreign consumers benefit from the cheap prawns being sold to them."

"Corporations and their owners benefit - such as Shoemart, Purefoods, and San Miguel Corporation. (The latter two are the biggest food conglomerates . . . engaged in production and trading in prawns for export to Japan and other countries.)"

"The economy benefits as a whole, since foreign exchange earnings are generated from the prawn exports."

"The local government gets revenues from prawn farms who pay business taxes. The national government derives tax revenues from prawn exports."

"Merchants/traders of prawn farm inputs also benefit." (In the area. Chinese businessmen have control over the trading and marketing of raw materials used in prawn production.)

In their statements, the respondents (total = 106) were consistent in their perception that it is largely the prawn farm owners and the traders who mostly benefit from the aquaculture industry. Only a minority of respondents included workers employed in the farms in their list of who benefits from the industry. The pattern of responses indicates that workers and community residents derive few benefits, if none altogether, from the industry. The respondents pointed out that it is the prawn farm. or company (not they as workers) who benefit.

Perceptions of respondents on the effect of aquaculture upon village life

	Positive Effect	*Negative Effect*	*No Effect*
Employment	17%	30%	53%
Income	20	31	49
Standard of living	9	51	40
Health	10	58	32

Distribution of respondents by province and by perception of the effect of the prawn farms on their living standards

	Iloilo Village	*Capiz Village*
No Effect	43	9
Positive Effect	2	19
Negative Effect	5	28
	50	56

Chi-Square: 51.85 (Highly significant)

Distribution of respondents by income level and perception on the effect of the prawn farms upon their living standards

Income Level (monthly)	*No Effect*	*Positive*	*Negative*
Less than P500	4	0	1
P 500–P 999	9	0	16
P1,000–P1,999	17	3	28
P2,000–P2,999	7	1	4
P3,000 and above	6	3	4
	43	7	53

Chi-Square: 14.449 (Highly significant)
Probability: 0.0708

Item Four: PANSRI Recommendations

Short of a genuine structural transformation in the political economy of the Panay Island (and the Philippines), the Panay Self-Reliance Institute put forward these recommendations consolidated from the views of the respondents, community organizers, and committed development workers in the aquaculture areas in Panay:

1. Prawn farm workers need to be organized, for them to be able to bargain better for additional wages and benefits. Government must monitor compliance with wage and other labor standards in this sector.

2. Health and safety standards, especially in terms of sanitation, must be given attention. Even a water supply system for the use of workers in the prawn farms does not exist.

3. Prawn workers need alternative forms of employment. Provision must be made for a system of advanced skills training and accreditation of on-the-job experience. Migration of non-local workers has given rise to social tensions, and residents feel that local workers must be given priority in employment or placement especially for low-skilled jobs.

4. Cooperatives must be encouraged, which could be sources of credit in order for

small fishermen to acquire means of production (i.e., own small fishing boats). Soft loans are needed from the rural banking sector, and government policy must encourage and even guarantee such soft loans. This would require government subsidy as well as other infrastructure support for marketing, storage and processing facilities. Marketing cooperatives for small-scale traders serving the domestic market must be supported by such schemes as a consignment arrangement.

5. Small fishermen need assistance to enable them to form cooperatives as prawn producers. Access to credit such as soft loans with a minimum of collateral is a priority for them. Agrarian reform must be implemented in big-sized prawn farms. There is, however, great resistance among the big landowners of Panay to the idea of extending land reform even among prawn farms. In fact, there is a well-organized landowners' group in Panay Island which aims to block agrarian reform in the area. To prevent social unrest especially among the peasants and the small fishermen, they have supported the militarization of various areas of the island.

6. Grassroot organizations of marginal fish producers need to be strengthened. The various organizations of small fishermen must get together to influence local government officials to provide support services. One urgent area of democratization of resources is to grant priority to small fishermen's cooperatives in terms of access to concessions. Government policy on aquatic resources, such as grant of concessions, must prioritize and favor the small-scale producers.

7. The entry of new technology in prawn production may, at the same time, encourage dependent linkages on the foreign sources of such technology. There must be a policy to nationalize the technology being used in prawn farm production. Import-dependent linkages must be minimized. For instance, farm owners still procure imported equipment and machines when these could be assembled or even manufactured locally.

8. Prices of prawn are vulnerable to low fluctuations during peak harvest seasons. Some form of a commodity futures market must be examined for applicability in the area, to facilitate trading and to force the prawn farm owners to improve their production planning.

9. It is urgent that the national agency concerned with pollution control formulate regulations with respect to the use of aquaculture chemicals in relation to environmental protection. Local governments must be informed of the relationship between aquaculture chemicals and environmental pollution, and local officials must formulate ordinances in this respect. In particular, construction of additional fishponds along mangrove areas must be stopped. These areas must be protected, to perserve the estuarine ecological system in the same manner that Palawan province has been declared to be a mangrove and coral reef reserve area.

10. The fisheries and aquaculture industry must be protected to prevent massive depletion of the natural resources of the country and to protect Filipino small fishermen from undue competition. Legislation in this regard must be enacted.

Source of Items One, Two, Three & Four: *Political Economy of Aquaculture in Panay (Philippines)* by the Panay Self-Reliance Institute (PANSRI) (Research Team: Maragtas S.V. Amante, Fatima V. Castillo, Lorna Z. Segovia), March 1989.

Item Five: Criteria for Funding Aquaculture Development Projects

Aquaculture has become very popular among developing nations as a solution to problems of low income, inadequate hard currency to pay international bank debts, insufficient food and malnutrition. Hundreds of millions of dollars are being invested in aid, tied and untied, for aquaculture. The shrimp culture industry already has grown into a multi-billion dollar giant. Numerous conferences on aquaculture are held every year and large numbers of books and manuals are being published. Considerable expertise and funds are being devoted to aquaculture research.

But does aquaculture always supply the appropriate solution to poverty and malnutrition?

Does it tend to increase the income of the middle and upper classes, instead of the poor?

Does it improve nutrition over wild-caught and gleaned marine resources?

Is the cost of cultured fish too high for the poor?

How much of the harvest is exported to well-to-do countries?

How much naturally productive environment is displaced by aquaculture?

Would the funding be better spent on restoring the natural environment?

How much of the benefits flow to the food and aquaculture industries of developed countries?

Have independent environmental assessments of the impact of the aquaculture project been made?

Automatic approval and promotion of aquaculture for developing countries are thus questioned. At times aquaculture may be appropriate, may be inappropriate, or, may be of uncertain benefit to developing countries.

To evaluate whether a given aquaculture project is appropriate, the criteria listed below are based on the assumption that the development project aid is aimed primarily at providing long-term benefits for the poor– income, quality of life, good health, etc. – and that appropriate aid should little disturb the diversity, productivity and beauty of the natural environment. It is the overall quality of life, not just dollars, health, etc. that is in question.

CRITERIA	**YES** *(Favorable Project)*	**NO** *(Less favorable or unfavorable project)*
SOCIAL		
Whose income does it benefit?	Poor	Middle class, rich
Capital needed	Low capital	Capital intensive
Return to worker/family	Self-employment	Low wages
Operated by	Individual, family co-op or community	Company
Gender	Benefits men, women & children	Exploits/neglects women & children
Disturbance to culture, customs	None	Some, much

Working conditions – – capture fishery or gleaning	High quality	Low quality
Nutritional quality – natural food	Equal to or greater than	Lower than
Food for	Poor	Wealthy
Effect on public health (drinking water, mosquitoes, parasites, etc.)	Low	High
Who made the decision?	Local community after mature debate & discussion	NGO, Washington, London, Ottawa, consulting company
ENVIRONMENT		
Culture method	Polyculture	Monoculture
Relation to natural environment	Displaces none or little	Replaces one with another
Used as an excuse not to restore natural environment or uses restoration funding	Not so	Is used
Uses few artificial genetic strains	Not so	Is used
Risks escape of selected strains into nature	No	Yes
Cultured stock	Native	Exotic
Risks to native species - disease, hybridization, extinctions, etc.	None	Some, much
Disease, predators, competitors controlled by	Biological means	Chemical means or by drugs
Fertilizers	Organic	Chemical
Output into natural environment – chemical, organic & physical	Low	High
Culture subjectivity to disease/ stress	Low	High
Facility design effect on wildlife predators	Naturally excludes birds & mammals	Fish-eating ducks, herons, cormorants otters, seals, etc. controlled by gun
AESTHETICS		
Culture area	Beautiful	Ugly
WORLD ORDER		
Produces food for	Third World	Developed countries
Profit flow ratio	High for Third World	High for developed countries
Needed supplies & most goods from	Third World	Developed countries
Import of foreign technology	None	Some, much
Needed 'seed' stock from	Third World	Developed countries

The above table can be used to analyze projects proposed for funding, compare projects, select projects, or enhance project design. A few criteria are discussed below as the intent of most is obvious.

Polyculture may offer more ecological and economic stability than monoculture. Culturing two species of fishes plus shrimp in an existing rice paddy means no additional land is impacted, diversity and production is enhanced, and the animals fertilize the rice.

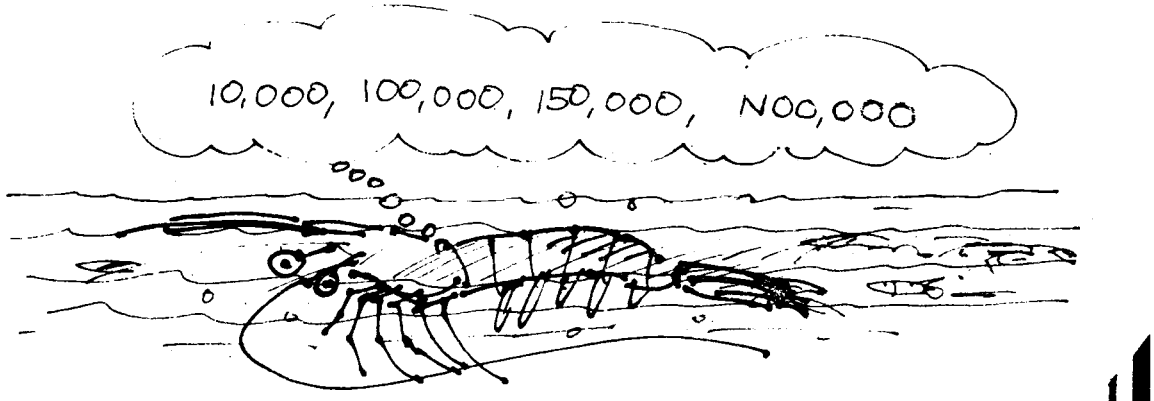
Productive coral reefs, mangroves or estuaries should not be displaced by aquaculture ponds and traditional small-scale fisheries and gleaning should not be displaced by entrepreneurs. Even if productivity of these environments has deteriorated, consideration should be given to the possibility of restoration or reforestation before aquaculture ventures are instituted. Even if funding has been decided for an aquaculture project, funds should be added to, not diverted from, environmental restoration.

The introduction of exotic species for aquaculture carries complex long-term risks and should not be done without funding in-depth impact studies. Predicting the complex effects of such releases is at the limits of today's biological knowledge. It should be assumed that exotic species will escape into the wild. Will this cause local species extinctions? Will burgeoning escapee populations modify the environment? What are the economic and social consequences? Nile perch and new fishing gear are implicated in the loss of populations of African cichlids in Great Rift lakes. Mosquitofish introductions have driven native species to extinction. The escape of an exotic shrimp in Kunming, China has endangered an endemic species. Consider cultivating native species instead. South America has for example many native cichlids and there is no need to introduce African species. Plans to introduce planktivorous clupeoids into African lakes lacking them are risky. There are already cichlids which consume plankton in these lakes and most larval cichlids consume plankton.

Aquaculture offers many benefits to Third World countries. But the overall effects on society and environment should be weighed before individual projects are supported.

Source: Don E. McAllister, "Aquaculture, Yes, No, Maybe?," **Sea Wind**, Vol. 3, No. 1, January-March 1989.

Item Six: How Far Can Intensification Go?



As the Taiwanese developed "better and more sophisticated" technology, their production grew so rapidly it was projected that from some 10,000 hectares of farms production would reach 100,000 metric tons by 1988. This would have put them at par

with China where an estimated 100,000 hectares of prawn farms were in production. But the anticipated record production *failed* to materialize. Taiwan's production for 1988 was estimated to have "at best" reached only 50,000 mt, half of the projected output. Taiwanese farmers, who normally incur higher production costs than their Asian counterparts, were beset with mortality problems and suffered heavy losses. Thus, in what has been described as "the worst year for Taiwanese (prawn) farms," prawn farmers everywhere took a long, hard second look at the once seemingly endless promise of the Taiwanese high-density method – what went wrong?

During their best years, Taiwanese farms, using an average stocking density of 340,000 per hectare were producing 11,000 kg per hectare per year on the average. The high densities employed meant that farms were energy-intensive, needing artificial aeration, and water exchange. At the stocking rates used, it was also surmised that the risk of disease was correspondingly high. The application of supplemental feeds, chemicals and antibiotics, as well as "good management practices" such as adequate pond preparation, good water management, and close monitoring throughout the various grow-out stages, might have initially checked the incidence of disease. Increased production costs resulting from the need to control diseases were offset in part by high demand and good prices for prawn abroad.

Eventually, however, these measures might not have been enough. In 1987, scientists at SEAFDEC AQD warned of the "consequences of Taiwan's high-density prawn farming." In a memo for SEAFDEC AQD Chief Flor Lacanilao, which was later passed on to Agriculture Secretary Carlos G. Dominguez, SEAFDEC scientist Jurgenne H. Primavera noted that the "occurrence of disease (rot disease, blue prawn, tail rot, etc.) and unmitigated use of chemicals and antibiotics (in Taiwan) have led to resistance of disease-causing organisms and could cause a slump in Taiwan's prawn production in the next two to three years." By October 1988, Taiwan's prawn production was reported to have gone down "dramatically" due to "a variety of climatological and technical reasons," a succinct but incomplete explanation.

Intensification advocates were disappointed, but Taiwan's crop failure last year was nonetheless expected. For years, aquaculture experts knew of the costs and attendant risks of high intensification. Not a few cautioned against it – overcrowding, they said, result in "environmental stress" which in turn weakens the prawn, making them more susceptible to diseases.

Explained D.F. Fegan of Tri-Jade Aquaculture Corporation (*Aquaculture Watch,* March 1988):

"Disease occurs because the prawn are already stressed by other factors, thus reducing their resistance. To give an analogy, up to 60 percent of humans carry the *Herpes* virus which causes cold sores around the mouth. This does not mean that 60 percent of the population have cold sores. The virus usually lies dormant, kept in check by the body. At times of emotional or physical stress, however, the virus becomes virulent and causes a sore to develop.

"So it is with many prawn diseases. Most of the common disease-causing organisms are normal constituents of the body flora or environment of the prawn. When the prawn is stressed, these organisms may grow unchecked and result in disease.

"Little is known about specific diseases. What is certain is that disease occurrence becomes more widespread as stocking rates and levels of intensification increase."

Experienced prawn growers have long been cognizant of the risks experts speak of – they have seen intensive operations fail only too often. But, until 1988, a great number of them had always had something to blame for the crop failures – poor water management, inadequate pond preparation, low-quality feeds, weak fry, etc. For as long as the Taiwanese were harvesting good crops, the method "worked." If a farmer failed, everything but the stocking density is blamed.

Year '88 gave prawn growers reason to take a kinder view on their past failures with intensification. Taiwan's experience last year showed the limits of the high-density method. As yet, there is no affordable technology available that can effectively manage all the problems associated with very high stocking densities. Chemicals and antibiotics – today's answers to prawn disease – can solve the problem only up to a certain point; they do not remove the underlying cause of disease which is the environmental stress brought by intensification itself.

In Sri Lanka, a mortality problem hit the shrimp farming industry last year, reported *Trans Asia News Service* (*Aquaculture Digest*, January 1989). The report said many farms were affected but the company Lever Brothers was "hit hard" because it operates "the most *intensive* farm in Sri Lanka. Marine Culture Enterprises, "the *most intensive* (prawn) farm in the world" into which some $10 million in investment was poured, was also hit by a virus and had to close down last year, only two years after it started full-scale operations. (The company has since been sold to Norwegian interests that are preparing to raise tilapia and *Penaeus vannamei* under the name Pacific Sea Farms.) And, in the Philippines, some growers who ventured into intensive operations now speak of having been "burnt," a "painful" learning experience that they say others need not have to go through. Because of the huge capital requirements of intensive operations, they explain, a single crop failure can be devastating.

So what should be the limits of intensification, given the technologies now available?

"SEAFDEC AQD has always recommended semi-intensive – 50,000 per hectare, tidal water only supplemented by pumping with no deep wells – and extensive farming," said Primavera.

While SEAFDEC is primarily concerned with the well-documented ecological and sociological costs of intensive farming, there are also economic considerations behind the promotion of the less intensive shrimp farming methods. Primavera maintained that, contrary to common perception, intensive stocking rates of 200,000-500,000 per hectare are in fact among the least cost-effective levels of intensification now in use. Intensive farms are not only the most capital-intensive and disease-prone, she said, but studies made by SEAFDEC, the University of the Philippines in the Visayas, and the United Nations' Food and Agriculture Organization also show that they do not fare well when export market prices fluctuate. "This is because (intensive farms) operate with a narrow profit margin per volume although they have a high profit margin per area," she explained.

Why then push for 200,000 to 500,000 per hectare with all the costs and problems these stocking rates entail?, Primavera argued. Compared to the higher densities, she

pointed out, stocking rates of 50,000 to 100,000 per hectare are not only "profitable" but also entail "a minimum of disease and quality problems."

Said Fegan: "In the final analysis, with prawns as with humans, prevention is better than cure. Rather than the pursuit of higher stocking levels, higher and more elaborate technology and higher risks, isn't it preferable to accept lower production levels with lower production costs and higher quality of product?"

Source: **Aquaculture Watch** , Vol. 3, No. 1, January 1989.

Item Seven: Social Costs of Intensive Prawn Farming

The social implications of intensive prawn farming include the reduction of domestic and agricultural water supplies, decline in quantity of food fish, marginalization of coastal fishermen, displacement of labor, and credit monopoly by big businessmen.

From Negros Occidental where intensive farms proliferate come reports of drying up of shallow wells and browning of previously green orchards. Such reports have led the columnist of a daily bulletin to predict that pretty soon, the prawns will have all the freshwater and people will be forced to drink seawater. So funny, were it not so sad.

Rice and other agricultural crops are also adversely affected by the drying up of groundwater and saltwater intrusion in coastal areas. The Deputy Director General of the Department of Forestry of Thailand has asked: ". . . how much land has to be spoiled by (prawn) farming and how much rice output has to be reduced?"

Rice, the Filipino and Asian staple, is not the only food commodity affected. Fisheries statistics show that production of the popular milkfish which hit a peak of 252 000 mt in 1982 has progressively declined to only 164 000 mt in 1986. For the most part, the decrease is associated with a decline in Laguna Lake pen culture of milkfish. However, it may also be traced to a shift in pond hectarage from the domestically consumed milkfish to the more lucrative prawn crop. Are we then sacrificing food sufficiency for export dollars?

The depletion of coastal fisheries due to mangrove conversion into ponds and the discharge of prawn culture by-products into adjacent waters further marginalized sustenance fishermen dependent on mangrove areas. The conflict stems from the nature of fishing which is rooted in the communal use of a resource, e.g., mangroves, in contrast with culture which presupposes control over an area through private ownership or lease. The wide array of economic goods and services including materials for fuel, construction, and fishing; food; and shoreline erosion control is no longer available to coastal communities with the decline of mangroves.

Farm workers, too, are displaced. Figures from the National Federation of Sugar Workers show that seven to eight laborers are needed to maintain 5 ha of sugarland in contrast to only three for an intensive prawn culture farm of equal size. Intensive aquaculture with its high capital cost has a poor employment-to-investment ratio. Extensive farms utilizing wild prawn fry benefit numerous fry collectors whereas intensive ponds are dependent on hatchery fry reared in the millions by only a few technicians.

It is unfortunate that the livelihood of our society's small fry – the subsistence fisherfolk and agricultural workers – is endangered rather than enhanced by intensive prawn farming.

The SEAFDEC Aquaculture Department, since the start of its prawn research in 1974 and its training and information dissemination program in 1977, has focused on semi-intensive prawn farming because of the social, ecological and economic trade-offs. Moreover, as an attached agency of the Department of Agriculture, it has to follow the national mandates of social equity and environmental conservation.

Source: J. Honculada-Primavera, "Social, Ecological and Economic Implications of Intensive Prawn Farming," SEAFDEC Asian Aquaculture, Vol. 11, No. 1, March 1989.

Item Eight: Needed – Redirection of Government Fisheries Policies

Some of our development approaches to fish production have caused more harm than good. Only the rich have gained from these ventures. The economic benefits have hardly trickled to improve the living condition of the poor. Moreover, such "development" has degraded the environment. The following examples can be cited:

1. *Development of mangrove swamps into aquaculture sites.* Mangroves provide nutrients and breeding places for many marine fishes and invertebrates. Numerous scientific studies confirm this fact. For instance, studies have shown that for every hectare of mangrove swamps converted to other uses, harvests of fishes and shrimps from coastal waters are reduced by 0.8 to 1.4 tons annually. Land reclamation and fishpond development, however, continue to reduce our mangrove areas. Thus, increasing aquaculture in brackishwater areas in effect lowers the catch of small-scale fishermen.

2. *Intensification of fishpond culture, especially in prawn farming.* This production approach is negated by the occurrence of fish diseases and unwanted environmental impact. To control fish diseases, prawn raisers use antibiotics and other drugs. These chemicals eventually pollute coastal waters and harm marine organisms. A more serious consequence is the development of drug-resistant human pathogens.

3. *Increasing use of agricultural land for prawn farming.* One example of the adverse effect of inland aquaculture is the reported intrusion of saltwater into the underground water supply in Negros Occidental. This results from the overpumping of well water used to dilute seawater to attain required salinity in prawn ponds. Another example is land depression or subsidence in Taiwan where two-storey houses have sunk to become one-storey bungalows due to the same overdrawing of underground water in some areas.

4. *Introduction of pen and cage culture in lakes.* In the early 1960s when there were yet no fishpens in Laguna Lake, annual fish catch was about 80,000 tons. With the introduction of fishpen culture, which occupied one-third of the lake by the early 1980s, open-water fishing yielded only 19,000 tons yearly. Fishpen culture, on the other hand, reaped an annual harvest of 62,000 tons. Combining the two production figures

adds up to 81,000 tons, similar to the 1960s harvest. However, the distribution of benefits favored the big fishpen operators numbering only a few hundreds, in contrast to the more than 10,000 small fishermen dependent on the lake. Note also that cultured fish (without supplemental feeding) and wild stock compete for the same natural food in the lake so that reduction of the fishermen's catch was to be expected.

5. *The use of some commercial fishing gears such as the destructive trawl and muro-ami.* A case study in San Miguel Bay in Bicol showed that 77% of the total profit from the bay fishery went to trawlers owned by only 35 families. Share of the 5100 small-scale fishermen who used traditional fishing gears was less than 15%. Without the trawlers the fish catch of small fishermen would be more and fish habitats would not be destroyed. Such habitats include coral reefs which in excellent condition produce a fish yield of 300 kg/ha/yr.

The above are only some of the "developments" in local fisheries that have succeeded in creating environmental problems and in worsening the plight of the small fishermen. It is therefore not surprising that fish production in the last five years (1983-87) improved by only 30,000 tons or an annual rate of increase of a measly 0.3%, while our population grew at 2.5% each year.

A redirection of development policies toward greater environmental consideration and broader levels of beneficiaries is therefore necessary. This calls for greater emphasis on coastal development, as the government now pursues, involving small-scale fishermen.

Source: "Countryside Development Through Small-Scale Fisheries," paper presented by Dr. F.J. Lacanilao, SEAFDEC AQD Chief, at the Regional Symposium on Coastal Fisheries Conservation and Development, Iloilo City, March 9, 1989.

Item Nine: Looking Beyond Profit

Prawn farms, orchards, and other capital-intensive agribusiness projects generate very little employment. Thus, in the spirit of solidarity and recognizing the harsh fact that the Government is not ready to help millions of small farmers to be more productive, those who earn profits in these ventures exempted from the law's retention limits, must be active in projects that can help the poor farmers around them. For example, individual entrepreneurs or corporations engaged in the various phases of the prawn industry can put up private volunteer organizations (PVOs) that can deliver support services to small farmers.

These PVOs can replicate in their respective regions some of the successful programs of the Philippine Business for Social Progress, Pilipinas Shell Foundation, and the Mother Rose Foundation to help poor farmers. For example, a group of agribusiness entrepreneurs will establish the first Family Farm School in the country. Family farm schools have been successful in France and Spain in training the children of small holders in modern farm practices. Spain and Italy have farmers' cooperatives that can be models for organizing Filipino farmers.

Agribusiness investors who will benefit from a more realistic Comprehensive Agrarian Reform Program (CARP) should heed the exhortation of Pope John Paul II in

his recent social encyclical *Sollicitudo Reis Socialis* (Social Concern) that "A greater responsibility rests on those who have more and can do more." Those who have more than enough to provide for themselves and their families a decent and comfortable life cannot be deaf to the Pope's call: "I wish to ask them to be convinced of the seriousness of the present moment and of each one's individual responsibility, and to implement – by the way they live as individuals and as families, by the use of their resources, by their civic activity, by contributing to economic and political decisions and by personal commitment to national and international undertakings – the *measures* inspired by solidarity and love of preference for the poor."

Source: "Perspectives," **The Manila Chronicle**, April 28, 1988.

RISK MANAGEMENT IN AQUACULTURE

Risk management is defined as "the identification, measurement and economic control of risks that threaten the assets and income of a venture."

Husbandry of the stock must remain the focal point of interest throughout. However, any comprehensive study must examine management of the risks during harvesting, processing, packaging, shipping and marketing of stock.

Knowledge of the comparative level of risk inherent in the business is also useful. On a scale of one to a hundred, it might be said that we know 75% of the biology of human beings, and perhaps we know 50 to 60% of the biology of chickens, cows, pigs and other farm animals. But our knowledge of the aquatic creatures we farm ranges from a minimum of 20% down to 5%. We thus have a good indication of one of the industry's prime risks – the biological one.

Any attempt at uniform identification of risks across the industry encounters the problem of its enormous diversity, e.g., the hazards to trout in Denmark are substantially different from those in Italy. To further complicate the problem, there are differences in risk within the cycle of each species. Thus the hatchery-to-smolt stage of the salmon involves a vastly different set of risks from those of the cage-rearing stage.

But there are also similarities, with a surprising number of aspects of each type of rearing system common from one system to another. Moving water in a controlled way is very common in many systems; so, too, is heating, filtering and sterilizing it. Although aquatic plants and creatures have widely different biological demands, they can still share common needs such as treatment of parasites, treatment with antibiotics, and common water temperatures.

Equally common to all aquacultural operations, regardless of species and their requirements, or even the systems involved, are the perils of the elements – of wind, wave, flood, drought, freezing, and so on.

It is clear that, despite the diversity of the industry, techniques developed for the management of any risk, while they may be related to a particular species or system, may be directly transferable to another species or system. But the risks need to be identified.

For convenience, the various types of risk can be grouped within two main categories – Business Risk and Pure Risk.