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# Risk management in aquaculture

Aquaculture Department, Southeast Asian Fisheries Development Center

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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.

**Business Risks**

1. *Social risks* (changes in consumer tastes or social behavior). It is probable that seafood can gain substantial ground in world food markets through aquaculture. It is equally probable that it can hold that ground. To do so, however, there will have to be considerable expansion of production and an attendant increase in the area of the world's marine and freshwater resources that are taken over for aquaculture. Such an expansion in production could possibly engender social resistance to the take-over by the industry of what is seen by the public as recreational territory.

2. *Economic risks* (inflation, changes in the level of economic activity, the actions of competitors).

3. *Marketing risks* (errors in forecasting demand, loss of markets to competitors). The problem of forecasting demand is a subject for separate discussion, as is the loss of markets which may arise for a substantial number of reasons. However, the high biological risk factor in aquaculture is very relevant to this heading. It is well recognized that, to compete in the market, the fish farm product must arrive in perfect condition. Indeed the flexibility afforded by being able to harvest at the last moment, when a purchaser has been found, is one of the advantages that aquaculture enjoys over traditional fish hunting. The potential for disease to impede growth, or to cause unbalanced growth, is quite substantial. Several sectors of aquaculture have already had to grapple with the problems of unsightly lesions, misshapen product, "muddy" taste, and poor shell-to-meat ratios.

4. *Production risks* (changes in cost, problems in supply of raw materials and services, interruptions in production). Probably the major topics deserving discussion under this heading are, firstly, the supply of juveniles in a rapidly expanding industry, and secondly, the generally scarce resources of biological knowledge which are needed to ensure the success of each venture in the industry. Any business which is founded in circumstances in which the supply of juveniles is very limited, must in effect bear the burden of the risks to the hatchery that supplies it. If the hatchery goes down, and there is no other source of juveniles, then production facilities could lie idle for a long time. Production risks are also greatly increased in a situation where a high level of biological skill is needed but is not available. More often than not, success can be traced to the quality of government back-up or to the availability of a skilled technical back-up provided by universities and other centers of excellence. Much waste in an industry can be eliminated if an active, knowlegeable source of risk management is available to it. Insurance is one of the most effective tools for handling risk. However, such are the production risks of aquaculture that the insurance industry is handling them with great difficulty. Some major production risks are virtually uninsurable. It is still a possibility that the insurance industry may in the future withdraw from covering, or decline to cover, a number of other risks of production.

5. *Political risks* (nationalization, political unrest, war, trade restrictions).

6. *Financial risks* (changes in the availability or cost of credit, bad debts, etc.). The availability of credit could become a problem for the industry. The early successes of the industry have engendered a formidable desire on the part of some banks to lend money on new aquacultural ventures. In many instances, these investments have been based on unsound business plans, formulated on unsound basic assumptions. Around

the world, a number of projects have failed and lending institutions have lost substantial amount of money; more may well follow. Risk management has a great deal to offer banks and other investors. But unless they embrace the concept of risk management and apply it to their investment considerations, they will go on investing in projects which stand no chance of success.

7. *"Business" technical risks* (snags in new processes, lack of knowledge). If we know twice as much of the biology of chickens as we know of the biology of trout, it could be said the risks of growing trout are fundamentally twice as great as those of growing chickens. In fact, because of the "water" element in the trout business, the risks of growing them are even greater; supplying air to chickens is a lot easier than supplying water to trout.

New processes and technologies abound throughout aquaculture; it is impossible to overemphasize the risks associated with them. When combined with a general lack of biological knowledge, they can be debilitating to the aquacultural business venture.

**Pure Risks**

1. *Physical effects of nature* (windstorm, earthquake, drought, flood. etc.). It is an old, thoroughly proven, adage in the aquacultural insurance market that "if you want to find out about the extremes of nature in a particular place, then put a fish farm there." At every stage of the production cycle, aquaculture has to manage the risks associated with water, and with all the physical effects of nature.

2. *"Pure" technical risks* (the breakdown of plant, failure of safety devices, hazardous processes going wrong).

*Alarm systems* tend tc be seen as a panacea for all the risks associated with controlled-flow (intensive) farms. Four things have to be understood about alarm systems:

- They don't always work.
- Each one can only monitor a very limited part of a site.
- They are only as effective as the response time and knowledgeability of the staff, measured against the tolerance of the species, as related to the situation concerned.
- They can engender an unwarranted feeling of security which can directly cause losses.

There are many examples, too numerous to detail, where alarms have failed to function, or where they have functioned but there has been nobody to respond, or where they have functioned but the response has been ill-equipped to handle the situation.

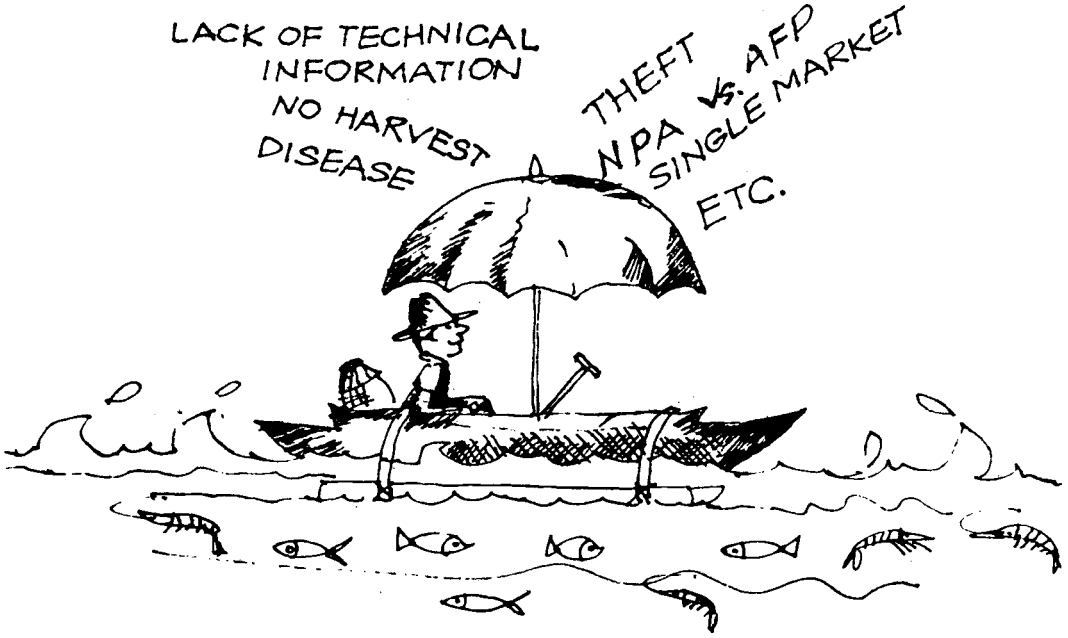
The relevance of pure, technical risks varies according to the type of growing system involved. However, there is no doubt that the breakdown of plant and the failure of safety devices afford one of the most fruitful areas for risk management investigation.

3. *Deviations from expected standards of social conduct* (theft, fraud, riot, sabotage, malicious damage, etc.)

4. *Liability* (hostile legal action from clients, employees, the public). It only needs one careless producer to sell one infected fish for the image of the industry in a whole country, or even wider afield, to be blackened. The liability exposure is one thing, but consequent effect on markets could be devastating. It has happened in the canning industry; it could happen in aquaculture.

Some areas of *liability* to be watched are:

- Liability of the vendor of fish for the transfer of diseases to the purchaser, to his site, and his other stock. (There is no such thing as "Disease Free" in aquaculture!)
- Liability for environmental damage by fish farms.
- Liability of system designers (and builders!) whose system do not come up to standards of performance promised.
- Liability of equipment manufacturers, as in the preceding.
- Liability of others for polluting fish farms.
- Liability to the general public.
- Liability to employees.




"A certain proportion of risk to the aquaculture venture is site-related and therefore a prerequisite to measuring the risks in individual operations is a large amount of information on each particular venture and on the site(s) it operates." That is a statement related to measuring risk at a very basic and isolated level. The risk exposures to individual sites can be intelligently estimated if an appropriate amount of information is available.

There is a need to coordinate all kinds of *risk-related information* of which the following are general examples:

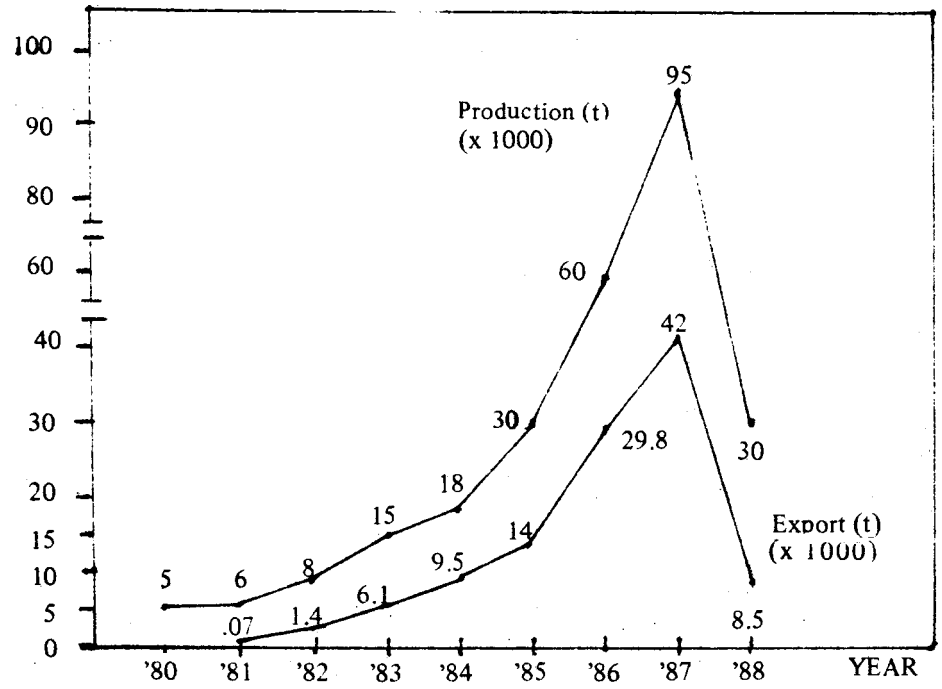
- The average and the extreme effects of various catastrophic and sub-catastrophic diseases.
- The average and extremes of various environmental factors such as droughts, hot cycles, cold cycles, floods, etc.
- The basic parameters for mooring cages and rafts in the marine environment.

- The incidence of plankton blooms, their make-up, the circumstances in which they occur, the extent of the area they cover, and the way in which they can be handled.
- Advisable stocking densities.
- Acceptable alarm systems.
- The efficacy of vaccines.
- Working conditions in aquaculture.

The list will prove to be a long one. But the compiling of risk management priorities in aquaculture urgently needs to be undertaken. Such a priority task deserves the immediate attention of the leading authorities in the industry.

Source: P.A.D. Secretan, "Risk management in Aquaculture," *Fish Farming International*, Vol. 15, No. 2, February 1988.

## ANATOMY OF THE PRAWN INDUSTRY IN CRISIS: TAIWAN EXPRIENCE




Prawn Crash of '88: Taiwan. (Data from I-C. Liao, Int. J. Aq. Fish. Technol. 1(1), 1989)

The steady, uninterrupted growth of the industry over two decades was capped by a tremendous output of 95,000 t in 1987. The sudden drop of production volume to 30,000 t in 1988 came unexpectedly, and for a while remained a puzzle to many observers in other countries who were following closely the development of Taiwan's prawn culture industry. Actually, though, as early as 1987, the local scientists were already noticing some scattered signs of an impending crisis, but by the time, there was practi-