Health Management for Sustainable Aquaculture

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Abstract

Aquaculture is a dynamic activity. To be successful and sustainable in this business, new techniques have to be continually developed, and adopted by farmers. Over the last decade, "sustainability" has become a key word for many different activities, including aquaculture. Many factors are involved in aquaculture sustainability, and health management has an important role among these. In order for aquatic animal health management at the farm level to aid the achievement of optimum yields, the following issues should be considered: suitable site selection, quality of broodstock and seed, reasonable stocking density, feed and feeding programme, water management, prophylactic and therapeutic treatment, and information dissemination. The sustainability of aquaculture at the national and regional levels requires different considerations among which are national policy, assistance priorities for farmers, legislation needs, technology development, and information needs.

Introduction

Since 1950, global aquaculture production has increased rapidly as a result of the successful development of many new technologies in a variety of fields. Spawning and breeding techniques have enabled the mass production of seeds, and production and survival levels have increased due to improved feed quality and new methods for disease prevention and control. As a result, global aquaculture production has increased at an average of 10% per year. Aquaculture systems have changed from extensive to semi-intensive, intensive and super intensive because most farmers want to achieve the highest yield from each cycle. Along with this rapid development and the over-utilization of natural resources, there have been various damaging effects on the environment, resulting sometimes in dramatic declines in aquaculture production. Therefore, the concept of sustainable aquaculture was conceived and has been implemented over the past 10 years. Now, most farmers realize that if they want to maintain their business they have to develop aquaculture in a way that causes minimal environmental impacts.

Sustainable Aquaculture

The word "sustainability" became popular in aquaculture development plans and project documents after it was accepted that the potential for aquaculture development was threatened by increasing environmental problems, including serious disease outbreaks, which have exacted heavy economic losses in various aquaculture systems. Sustainable aquaculture was defined as "the wise and productive methods of culturing aquatic animals and plants, using natural resources in a manner that is environmentally non-degrading, technically appropriate, economically viable and socially

acceptable; ensuring the attainment and continued satisfaction of critical human needs for the present and future generations" (ADB/NACA, 1998).

How can health management support sustainable aquaculture? It is important to understand the relationship between disease control and health management. Diseases in aquaculture often depend on the quality of the environment of the ponds. Therefore, maintaining optimal environmental conditions and providing good health management in the culture unit is important to reduce losses and sustain production levels. To achieve good health management at the farm level and maintain optimum yields, the following issues should be considered:

Suitable site selection

The site used for aquaculture is important in terms of initial start-up and the eventual success of the venture. The criteria for site selection should include: assessment of soil quality, water quality and quantity, land use, infrastructure and economic viability. Guidelines for site selection for different types of aquaculture are available in many countries. Such information should be modified and made suitable for local conditions.

Quality of broodstock and seed

Stocking with natural or wild seed is a health risk factor in the farm. Development of domesticated brood stocks will ensure the regular supply of certified seed. Use of specific disease resistant seed is another option for farmers to avoid production loss due to a particular disease. Therefore, sustainable aquaculture requires a supply of seed of sufficient quality and quantity.

Reasonable stocking density

It is very difficult to change the common practice of farmers to over-stock ponds. Information about pond capacity should be strongly promoted to educate farmers that over-stocking does not mean that the pond is being optimally utilized. During the early stages of culture, the animal may be able to grow and survive but later on, problems of competition for space and feed may cause slow growth or death of the animals. Therefore, the use of optimum or reasonable stocking rates should be practiced for successful aquaculture. A suitable stocking density for specific pond depends on many factors such as water quality and quantity, number of farms in the area, available equipment, quality of seed, seasonal variation, and experience of the farmer.

Feeds and feeding programme

Proper selection and preparation of feed need to be considered before stocking to ensure that there is appropriate food available to the animal. Feed quality and quantity need to be considered. Starvation, malnutrition or nutritional deficiency can easily cause slow growth, increased susceptibility to diseases, and death in aquatic animals. However, over-feeding can increase production costs and also pollute the pond water, thereby predisposing the animals to disease or poor health. Therefore, an appropriate feeding programme is required for each species cultured.

The use of animal manure for inducing plankton blooms may introduce eggs of digenean parasites to the pond, which can cause metacercarian disease in fish. Using moldy feed that contain aflatoxins can cause liver disease in fish.

Water management

It is very difficult to set up the standard programme of water management for aquaculture as a whole. Optimal water quality parameters vary for each species of aquatic animal cultured. Management should ensure water quality is maintained at a level suitable for optimum growth. Cleaning incoming water and use of flow-through water is usually the ideal option for aquaculture, which is applicable for some species of high market value like trout, salmon or some ornamental fish. However, changing water can sometimes introduce disease to the pond.

Prophylactic and therapeutic treatment

Health problems and disease outbreaks are recognized as significant constraints to aquaculture production. Diseases in aquatic animals always involve an environmental component. Some infectious diseases can be prevented by pond management such as increasing water flow, reducing the stocking biomass of fish, eliminating sources of skin or gill irritants, and filtration of the inlet water to reduce the number of incoming pathogens. Maintaining good water quality, improving the environment, and good management practices are of great value for the success of aquaculture.

There are however a number of virulent pathogens, which are capable of causing high mortality, even under excellent culture conditions. Prevention measures are the most effective way to control these virulent diseases. Rapid detection of the disease at the very early stages helps the prevention process. Rapid diagnostic procedure for serious diseases of fishes of high economic value should be further developed and made more widely available. Reliable and rapid diagnosis helps in the screening of diseases and can prevent the introduction of important diseases of aquatic animals to new areas.

Chemotherapy is effective in hatcheries and ornamental fish farms, but in grow-out ponds chemical treatment is normally difficult and uneconomical to undertake. Antibiotics are widely used in aquaculture and residues can be detected in the animals. The improper use of antibiotics can result in the development of resistant strains of bacteria.

Diseases of cultured aquatic animals can be reduced by maintaining a healthy environment or through proper management practices.

Information dissemination

Information dissemination systems should be developed to ensure that farmers have access to research information. The sharing and exchange of information between and among fanners, and from researchers to extension officers and farmers, is of particular importance. Government should disseminate information on health management to farmers. Promoting contacts between research institutions, extension officers and farmer groups can enhance the dissemination of research finding to farmers. Small group seminars or workshops organized by farmer associations, feed companies or government are other effective means of dissemination.

National or regional Policy

Clear policies on the direction of aquaculture development for each country or region should be formulated and implemented. The rapid expansion of aquaculture and the transport of aquatic animals between countries are recognized as potential risks to aquaculture sustainability. Therefore, appropriate regional guidelines on aquatic animal health and quarantine should be formulated, and used for the development of national legislation.

Legislation

The rapid expansion of aquaculture emphasizes the need for a legal foundation for the industry in many Asian countries. Governments of each country should review existing legislations affecting aquaculture and define which activities are to be covered by legislation. The enforcement capacity and capability should be considered to ensure compliance with existing legislation.

Development of aquaculture zones may promote sustainable aquaculture. Codes of practice should be established as interim measures before new legislations are issued. Governments should undertake regular monitoring and evaluation of aquaculture activities and implementation of any necessary corrective measure.

Research

Research is essential to identify and assist the removal of constraints to health management in aquaculture. Therefore, donor agencies should support more research projects that focus on farm management and sustainability. As the aquatic animal health constraints in many countries are similar, collaborative research should also be focused at problems of socioeconomic significance to each country.

Research institutions should be strengthened in aquatic disease diagnosis and prevention. Research on economical and practical ways of maintaining water quality and managing farm effluents using recycling systems should be considered. Applied and adaptive research at the farm level should be more focused. Appropriate biotechnology research related to health management for aquaculture sustainability should be enhanced.

Governments should attempt to provide necessary incentives in order to maintain sufficient number of trained personnel in research institutes. National lead centers in aquatic animal health should be strengthened.

Regional information

Knowledge about health management among the countries in the region is variable such that some countries have more knowledge and capability than other countries. Therefore, networks or linkages for the sharing of aquatic animal health information in the region should be stimulated to function actively. Information on sustainable aquaculture technology should be further promoted and shared among countries.

Governments and the private sector should consider the establishment of a central facility with a database of information on aquatic animal health management to provide the necessary information to end-user farmers. Research information should flow to the farmers through government extension officers or NGO workers.

Conclusion

Aquaculture is a very dynamic activity, and management techniques are continually being modified as exemplified by shrimp culture in Thailand. As in other shrimp culturing countries, shrimp farming systems in Thailand have developed over the last 10 years from extensive systems spread along coastal areas to semi-intensive, intensive and super intensive units. Farmers have over-utilized natural resources, causing severe damage to the environment. Infectious diseases involving parasites, bacteria and viruses have caused severe losses to the shrimp industry. Farmers and researchers need to work

together to find solutions to the problems. Culture systems have been greatly modified. For example, open systems, which require massive exchange of water, have resulted in good production at the early stages of shrimp farming development in Thailand, but later on, when viral diseases became a major problem, semi-closed and closed systems were adopted, and high-cost chemicals were used in the farms. Still, diseases spread and caused losses to the industry. From that point, low salinity systems became more popular and farms have expanded into rice-production areas. This movement, and the resulting environmental impacts, caused great conflicts between rice farmers and shrimp farmers. Following this, integrated closed systems of low salinity shrimp culture were developed and practiced, requiring farmers to move back to less intensive systems to sustain the operation of shrimp farms. Farmers have utilized ponds at optimum stocking levels to avoid risk of diseases. Shrimp farming is a rapidly changing industry and techniques are continually being developed and modified.

Reference

ADB/NACA. 1998. Aquaculture sustainability and the environment. Report on a Regional Study and Workshop on Aquaculture Sustainability and the Environment. Bangkok, Thailand: Asian Development Bank and Network of Aquaculture Centres in Asian-Pacific.