SUSTAINABLE AQUACULTURE DEVELOPMENT IN DEVELOPED ECONOMIES

Rae Weston [1] & Sciona Browne [2]

[1] Professor of Management at Macquarie Graduate School of Management, N.S.W. Australia e-mail (rweston@laurel.ocs.mq.edu.au)
[2] Executive Director of Aquaculture Investments International, Floreat, Western Australia e-mail (browne@aquacultureinvestments.com)

Abstract

While over 75% of human fish consumption comes from the taking of wild species in natural environments, aquaculture has been the fastest growing part of the world fish supply for the past decade. Developing economies to date are introducing and expanding their aquaculture production at a faster pace than more developed economies. China accounts for two thirds of world output.

This paper analyses some recent developments in the aquaculture in Australia in the context of sustainable economic development. The quest for sustainable development requires not just the preservation of the environment but the simultaneous satisfaction of the objectives of environment protection, economic efficiency and social equity (Briassoulis (1999). (Atkinson et al (1997), (Commission of the European Communities (1997)).

Common problems raised about aquiculture include the amount and expense of fishmeal used to produce fish in aquaculture, the waste problem and the availability of a quality water supply.

The Australian developments discussed in the paper suggest that a realistic approach is being taken to sustainable aquaculture development.

I

While over 75% of world fish consumption comes from the taking of wild species in natural environments, aquaculture has been the fastest growing part of the world fish supply for the past decade. To date developing economies are introducing and expanding their aquaculture production at a faster pace than more developed economies.

This paper analyses some recent developments in the aquaculture industry in Australia in the context of sustainable economic development. In the next section, the various prisms through which sustainable development are seen are discussed as these will be later considered with respect to aquaculture development.

The following section examines the threats to sustainable aquaculture development that have been identified in the several FAO Fisheries Department Reviews of the past decade. The fourth section examines the potential of the combination of two recent developments in the Australian industry in the context of sustainable aquaculture development. In the final section implications of this development in the context of the increasing government intervention in the industry internationally are discussed and suggestions for a positive approach are made.

II

Chaharbaghi and Willis (1999 at p 48) reflect that the "precise meaning and significance of sustainable development varies according to the prism through which it is viewed".

The prisms they identify are those of economists, environmentalists, politicians, media, technologists and industrialists. There is a substantial and growing literature on sustainable development, which was defined in 1987 in the Brundtland Report as, "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Hecht (1999, p 111) argues that there are three factors which, when acting in harmony, form a triad for sustainable development in developing countries. These factors are: first, supportive domestic policy actions in the form of the creation of open and free market economies, sound, enforceable environmental policies and public participation in decision making; second, financing policies of bilateral and multilateral lending agencies; and third, private sector investment and clean technology development.

Superimposed on this triad, however, are the conflicting views of the 5 interest groups noted by Chaharbaghi and Willis (1999). They summarise these conflicting views in terms of images of sustainable development. For the environmentalist this means avoiding a catastrophe, and while their case is at best "shrouded in scientific uncertainty"(Charharbaghi and Willis at p 43) they have succeeded in ensuring that the process of economic growth is inhibited by the green agenda.

For the economist sustainable development is seen just as Hecht does, as achievable by freeing markets and pursuing clean technology development. The latter may involve limiting consumption, as would be required by the adoption of the mandatory emission goals supported by the Kyoto Climate Accord, which would have a very depressing effect on economic development.

The view of the technologist is well encapsulated by Sousane (1996) who claims that environmental technologies are the path through which sustainable development can be achieved. The caveat to this approach is that technology solves specific problems but is unable to predict the long-term implications of its solutions, which may engender further environmental problems.

Politicians, in the interests of re-election will " rhetorically at least, take on board many of the concerns raised by environmentalists " (Chaharbaghi and Willis, p 45), but are in fact caught by the conflict between the environmentalists and the level of economic growth that is necessary to keep governments in power.

The media exploit the concerns of environmentalists as a commercial opportunity to capitalise on growing awareness of environmental issues.

The view of industrialists is to ensure a commercial advantage from incorporating the environment into their decision-making process, especially to the extent that environmental regulations might lead to innovations that may lower the cost of production or improve their value. They are aware of the potential that some environmental legislation may have on their businesses.

Nowhere here is there a "management" group whose task is to resolve the conflicts inherent in the variety of views just summarised. Perhaps the resolution may occur by a re-evaluation of the approach to incorporate one further prism, that of nature, where the waste of one organism becomes the resource of other organisms.

III

The FAO reports on the state of world fisheries and aquaculture (1996, 1998 and 1999) focus much attention on the creation of an enabling environment for sustainable aquaculture and concede that it is a complex task to clarify how sustainability choices could work in practice. The same debates outlined in the previous section are also relevant here. The technologists have led development, and politicians have viewed aquaculture in isolation from other sectors. Also, regrettably there has been a tendency for the philosophy applied by some governments to fisheries policies-control and regulate-to be applied to aquaculture which is at the stage where its development should be fostered. The environmental and economic challenges of creating new forms of integrated aquaculture-agriculture systems (aquaponics) are still only slowly being considered and there is continued controversy over the use of coastal land for aquaculture. Industrial aquaculture is emerging but is in danger of being frustrated in some locations by inappropriate regulations. An essential prerequisite for the creation of an enabling and eventually sustainable environment is the existence of "functioning channels of communication with institutions and representatives of other competing sectors of the economy." (FAO, 1999, p 3).There is no established network yet to accomplish this end.

Tacon (1996 p 1) in the FAO Report (1996)discusses aquafeeds and feeding strategies, and identifies two global challenges to aquafeed development: first, the need for aquaculture to be seen as a net contributor to total world fisheries landings and global food supply rather than a net consumer of potential food-grade fishery resources; and second, the need for finfish and crustacean farming systems to develop feeding strategies based wherever possible upon the use of non-food grade locally available feed resources.

In the case of non-fresh-water production systems for finfish or crustaceans they are almost entirely dependent on the use of whole or processed fishery products as feed inputs, so that they reduce net fishery resources rather than increase them. According to Tacon (loc sit) the quantity of dietary fishery resources exceeds outputs in terms of farmed fishery products by a factor of 2 to 3. Further, the conversion of pelagic biomass to fishmeal then used for aquafeeds counts the fish production twice, once as capture fish landings and second as aquaculture production.

Of the locally available non-food grade feed resources, terrestrial animal by-product meals, plant oilseed and grain legume meals, cereal by-product meals and other miscellaneous protein sources are favoured, but as Riaz (1997) and Watanabe and Kiron (1997) have noted, the eventual success of these as fishmeal replacements will depend on improved techniques in feed processing and manufacture as well as in formulation.

IV

The focus of this section of the paper is to discuss a combination of resources used in the inland production of marine fish in Australia, which gives the promise of sustainable aquaculture development. In the view of the authors this combination of resources represents the type of initiative which, if positively supported by governments, could materially alleviate the concerns expressed by Tacon.

In the semi-arid agricultural regions of Australia salinity from rivers and in rising ground water tables are major problems. Saline ground-water is pumped into purpose-built on-farm evaporation ponds so as to retain arable land in New South Wales, Victoria, South Australia and Western Australia.

Fielder and Allan (1997) suggest that marine fish could be grown-out directly in these evaporation basins or grown in floating cages situated in the evaporation basins or the saline ground water could be used for intensive indoor systems. Barramundi and bream have already been successfully farmed in this environment. Fielder and Allan suggest that mulloway and snapper are suitable for the first two types of farming in the southern inland areas of Australia, but elsewhere extremes of temperature would require the third method to be used. Growing from fingerling size and starting in the early spring should provide a time to market of 12 to 18 months.

Coincident with the work of Fielder and Allan has been a growing number of research studies examining fishmeal replacement in aquaculture feeds. Australia is poor in its supplies of fish and other aquatic meals but, by comparison, is abundant in the availability of terrestrial animal and vegetable protein feeds. The amino acid composition of the protein in these latter sources is very low compared to that of fishmeal, and this poses a problem . Nevertheless, research results (Williams 1995) suggest that substitution of fishmeal by terrestrial protein feeds and the consequent deterioration in the

essential amino acid profile of the dietary protein can be kept from influencing fish productivity provided the fish are fed liberally and the protein content of the diet remains above 50%.

The potential of high-ash meat-meal and legumes has already been established for barramundi and silver perch.

The recently released "R&D Plan for Integrated Agri-Aquaculture Systems 1999-2004" in Gooley (2000) suggests that the Rural Industries Research and Development Corporation is moving down this path. Their proposal is to facilitate the establishment of an Australian Integrated Agri-Aquaculture Systems (IAAS) primary industry sector at a national level. Included within this scheme is the integration of aquaculture with terrestrial farming systems to achieve sustainable management and utilisation of natural and "waste" resources.. The report notes the use of inland saline waters for culturing fin fish among those "undertaken on an opportunistic, somewhat ad hoc basis to date"(Gooley ,2000,at p 6) and proposes the development of a comprehensive ,well-coordinated plan to enable investors to proceed with confidence.

The proposed coordination in the R&D Plan of the resource inventory and information, the marketing, economics, quality assurance and business development aspects, followed by policy and planning, biology, husbandry and technology and system design and finally education, training and extension offers the strong likelihood that the prospects of sustainable aquacultural development will come to fruition in Australia.

V

Sustainable aquaculture development in inland Australia appears a certain consequence from the combination of the waste saline water already available in evaporation ponds and waste meat and vegetable meal products, with barramundi and bream , and it seems that this success may be extended to other species of fish. This satisfies the second of the global challenges suggested by Tacon (1996) - the need for finfish farming systems to develop feeding strategies based wherever possible upon the use of non-food grade locally available feed resources - and starts on the path towards the first, that is, making aquaculture a net contributor to total world fisheries landings and global food supply.

If we return to the prisms described by Chaharbaghi and Willis(1999),it is possible to visualise how the various interested parties could coordinate to support this and similar developments, in the pursuit of sustainable aquaculture development. Environmentalists would recognise the significant contribution to the environment of this solution and promote it to others. Economists would recognise the development as a cost-effective solution to a long-standing problem ,while industrialists will interpret it correctly as an opportunity for further investment in the industry. Technologists will continue to assist in refining the solution , for example ,with the amino acid deficiency issue.

Perhaps the two most important parties here are the media and the politicians. It is crucial that the "good news" of these events be disseminated as widely as possible and the role of the media is to ensure that this occurs. Equally importantly the "control and regulate" stance which many countries have transferred from the fishing industry directly to aquaculture must be changed to a role of support and sustain if these endeavours are not to be strangled at birth. It is time for a positive approach to improving the viability of aquaculture to improve the fish supply capabilities of the world.

A focus by governments on the support of schemes of this type would seem able to make a speedy contribution to the development of sustainable aquaculture development, and to ensure that it is supported by all the other interested groups.

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