Importance of Sustainable Aquaculture in Rural Development

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Abstract: Aquaculture is one of the fastest growing segments of the Turkey agriculture. Its popularity and success as an investment opportunity and a means of diversifying farming operations have resulted in a growing interest among traditional agriculture producers and others. As Turkish people have become more health conscious, the demand for fisheries production has increased. Per capita consumption of seafood has grown from about 1kg in mid 1980's to around 7 kg in 2008. To be successful, producers must have the ability to make a reasonable assessment of sustainable aquaculture enterprise opportunities and limitations including current breeding, feeding, water quality, production technologies and management practices. Therefore, in the present paper some aspects of sustainable aquaculture on the rural development will be discussed.

Key words: sustainable, aquaculture, rural development

Sustainable Development

The Brundtland Commission (WCED, 1987) defined sustainable development as:'...the ability to meet the needs of the present without compromising the ability of the future generations to meet their own needs'. The Principle of Sustainable Development as it was endorsed in the Rio-Declaration of 1992, interpreted as comprising the inter-relation of natural and technological aspects on the one hand, with socio-economic and value-based considerations on the other. Folke and Kautsky (1992) reported that a successful aquaculture system should not have wastes, only by-products, to be used as positive contributions to the surrounding ecosystems and the economy. The Food and Agriculture Organization of the United Nations (FAO,1995) define sustainable development in their Code of Conduct for Responsible Fisheries, as:. . . the management and conservation of the natural resource base and theorientation of technological and institutional change in such a manner as toensure the attainment and continued satisfaction of human needs for presentand future generations. Such sustainable development (in the agriculture,forestry, and fisheries sectors) conserves land, water, plant, and animal resources,is environmentally non-degrading, technically appropriate, economically viable,and socially acceptable. Sustainability can be defined simply as the maintenance of capital (Goodland and Daly, 1996). According to Edwards and Demaine (1997) a new revolution or philosophy is required to promote sustainable development that will more equitably allocate resources among the world population. The Western philosophy in which humanity is considered as above and not part of nature, with a mandate to exploit it, should be replaced by the Oriental philosophy of man being a part of nature.

Most of the countries in the world, the poor people live in rural areas. The most reported problems of rural areas are: poverty, unemployement, lack of land etc.. (Yanik, 2009a, Yanik 2010a). Various types of aquaculture form an important component within agricultural and farming systems development. These can contribute to the alleviation of food insecurity, malnutrition and poverty through the provision of food of high nutritional value, income and employment generation, decreased risk of monoculture production failure, improved access to water,enhanced aquatic resource management and increased farm sustainability (FAO 2000, Prein and Ahmed 2000). In order to solve these problems global aquaculture is now the fastest growing food production sub-sector in many countries. For example, FAO supports this process by promoting sustainable aquaculture development in its member countries and aims to assist them in achieving an increased contribution of this sector to rural development. As a developing country Turkey shows many similarities with the other countries with respect to reduce poverty and hunger and to ensure food security. Rural development has various dimensions such as the process of sustained growth of the rural economy and improvement of well-being of rural men, women and children (Yanik 2009b) .

Fisheries being one of the four sub-sectors (plant production, animal husbandry and forestry) of the agricultural sector of Turkey. Although it has very large potential for aquaculture with its marine and fresh waters, it is not easy to say that the fisheries sector, with a share of 0.3% in GNP (Gross National Product) and 2.7% in the agricultural sector, has played its expected role in agriculture and national economy. However, it is estimated that more than 5 000 employees work in the sector and related activities (Okumus, 2003); the secondary support services, namely feed, equipment and consultancy are also developing rapidly and provide job opportunities. Aquaculture is one of the fastest growing segments of the Turkey agriculture (Yanik 2005). Its popularity and success as an investment opportunity and a means of diversifying farming operations have resulted in a growing interest among traditional agriculture producers and others. As Turkish people have become more health conscious, the demand for fisheries production has increased. Per capita consumption of seafood has grown from about 1kg in mid 1980's to around 7 kg in 2008 (Yanik, 2009b) . The aquaculture share of total fishery production (140.000 metric tonnes in 2007) is around 10–14 percent by volume and around 25 percent by value. The majority of production (about 98 percent) comes from intensive farming systems; rainbow trout is mainly consumed locally, while around 75 percent of seabass and the seabream are exported to EU countries. Almost all the aquaculture products are marketed as whole fresh fish. Aquaculture sector is developing in Turkey (Yanik 2009a and Yanik 2010ab). Major strengths of the sector are public support, fish demand and relatively cheap labour, and the limiting factors of it are poor species and product diversity, resource use conflicts, water availability and increasing environmental and animal welfare issues.

To be successful, producers must have the ability to make a reasonable assessment of sustainable aquaculture enterprise opportunities and limitations including current breeding, feeding, water quality, production technologies and management practices. Some problems have been faced in the rural regions for sustainable aquaculture production:
-Feed staffs and proving feeds for the farmers,
-business viability and competitiveness,
-marketing and processing problems
-water sources should be cleaned by filtering or transferring sewages with a pipe and collecting in a septic tank. -
-Then this could be used as manure for agricultural purposes.
-Soil erosion to the riverine systems
-Adaptations to mitigate climate change. Due to climate changes some of the species may not give best performance, so studies should be conducted considering this matter (Yanik, 2009).

Sustainable System

According to FAO, (1995) the sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry, fisheries sectors) conserves land, water, plant, and animal resources, is environmentally non-degrading, technically appropriate, economically viable, and socially acceptable.
It is believed that the rapid development of aquaculture and its social-economic environment necessitates a periodical re-assessment of the guidelines as well as their implementation. The sustainable development of aquaculture requires adequate consideration of interactions among environmental, social, and economic factors that accompany any development (Chua 1992; WB 1998; NACA/FAO 2000). In assessing the sustainability of any enterprise or technology, consideration should be given to at least the following (Frankic and Hershner, 2003):

. the sustainability (or continuity) of supply, and quality of inputs;
. the social, environmental and economic costs of providing the inputs (e.g., depletion of resources elsewhere);
. the long-term continuity (or sustainability) of production;
. financial viability;
. social impact and equity;
. environmental impact; and
. efficiency of conversion of resources into useful product.

Full development of aquaculture has been constrained by a variety of technical, institutional, and financial problems. More specifically, aquaculture is faced with the following key constraints: (i) limited access of fish farmers to high-yielding environment-friendly aquaculture technologies; (ii) inadequate research and protocol development for breeding high value species; (iii) inadequate processing facilities for producing value-added

products for the export market; (iv) lack of private sector participation in various stages of aquaculture production, trade, and marketing; (v) inadequate regulatory framework including land and water use; (vi) slow market development including infrastructure and market information support, trade and commercialization; and (vii) non-implementation of international accreditation systems (e.g., European Union and Hazard Analysis Critical Control Point). (Anonymous, 2005). Ommani and Chizari (2010) showed the interactions between social, ecological and economical factors in sustainable system (Fig 1).

According to Greenpeace (2010), in order to be regarded as sustainable, an aquaculture system should have following properties that must be fully realised to achieve the sustainability.
-using of plant-based feeds originating from sustainable agriculture
-not using fishmeal or fish-oil-based feeds from unsustainable fisheries
-using cultured juveniles instead of wild-caught ones.
-cultivating non native species in land-based tanks
-not releasing discharges and effluents to the surrounding environment
-not disturbing the ecological balance by representing a risk to local wild plant and animal populations
-not using genetically modified fish or feed
-using suitable stock size to prevent the risk of disease outbreaks and transmission
-not depleting local resources, i.e, drinking water supplies
-not creating risks for the health of inhabitants
-giving support to the long-term economic and social well-being of local communities (Greenpeace, 2010).

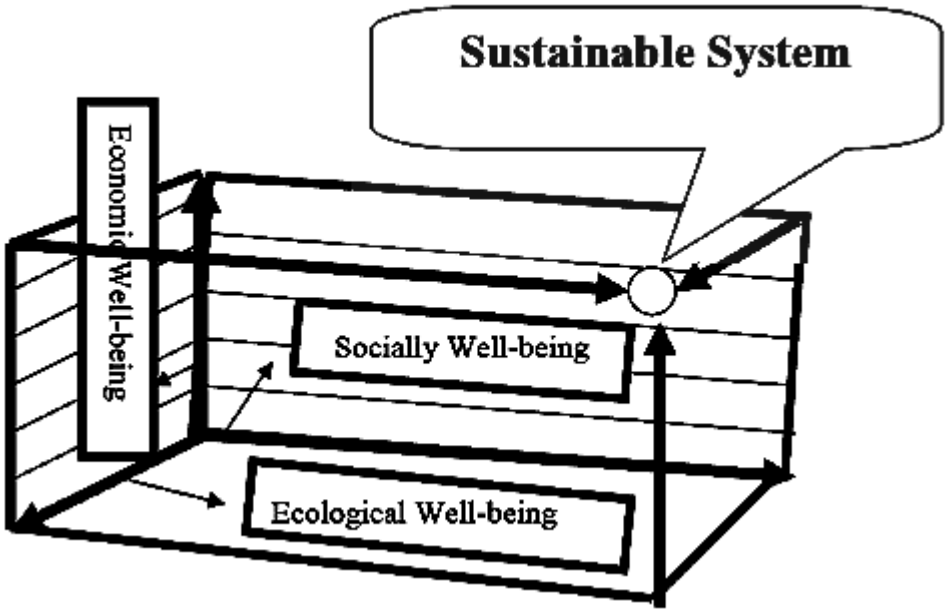

Fig. 1. Indicators of ecological, economic and social aspects of sustainability of the fishery system (Ommani and Chizari 2010).

Regarding sustainable development many efforts has been given to increase aquaculture in rural areas (Caffey et al. 1998;Yanık, 2005) For this purpose many guideleness have been published and symposiums were held in many countries. For example The First International Symposium on Sustainable Fish Farming in Oslo in 1994 and the Second International Symposium on Sustainable Aquaculture in Oslo in 1997. It was the time the Holmenkollen Guidelines for Sustainable Industrial Fish Farming were declared. According to Holmenkollen guidelines for sustainable aquaculture (Anonymous 1998.)

Each State should:
-establish an aquaculture development plan based upon the need for food security, rural development, disease control, biodiversity and sustainable use of resources. The context of integrated use of water resources and of potential production areas should be applied
-establish and implement a national strategic development plan, which identifies and designates areas and resources important for future aquaculture or other food productions, and protects them from being irreversibly allocated to other purposes.

-ensure co-ordination between relevant governmental departments, and implementation of participatory planning processes involving local communities and all stakeholders, in the development of aquaculture.
-establish, implement and enforce appropriate laws and regulations to ensure responsible aquaculture, including food safety, environmental safety and ethical criteria and the protection of the rights of indigenous people and local communities.
-establish and implement a licensing or regulatory system governing the use of exotic species, including genetically modified organisms and organisms from breeding programs, with due considerations to human health and to impacts of escapees.
-be appreciative of the difficulty that allowing aquaculture to develop
in response to market demand can generate problems of equity, for example if aquatic resources currently consumed by the poorer section of the community are to be used as feed for aquaculture.

Producers and industry should:
-take full advantage of new technologies and management procedures that can improve quality and quantity of aquaculture products and reduce risk of adverse effects on the environment and on the livelihood of other people including future generations.
-strictly abide by the internationally agreed food safety, environmental safety and ethical criteria if genetically modified organisms, chemo-therapeutants or hormones are utilized in the production.
-develop standards and practices, which embody ethical principles for ensuring health and welfare of fish and shellfish and for slaughter practices.
-become increasingly customer oriented in defining quality attributes and strengthen dialogue with the consumer. In particular the industry has an independent responsibility to provide adequate product and production information on all issues recognized to be of consumer concern.

The scientific and technological community should:
-give a priority to domestication of relevant aquaculture species, involving control of the whole life cycle and thus allowing genetic improvement. As the economic costs of domestication efforts are high, concentration will be on few species. However, this should not preclude the evaluation of alternative species.
-give a priority to the development of integrated, polyculture-based fish farming for omnivorous or herbivorous species, specially those useful in utilizing organic wastes.
-give a priority to the development of sources for animal feed other than fish protein and fish lipid.
-recognize the responsibility to develop and make available the best technology, in particular for the efficient use of the resources and for avoiding harm to the environment.

Intergovernmental organizations and development agencies should:
-recognize the potential of aquaculture to contribute significantly to the world´s aquatic food supply and support its realization.
-require, as a precondition for involvement in aquaculture development projects, that all parties abide by these guidelines.
-give a priority to transfer, adaptation and implementation of technological innovations, capacity building, training and education in order to harvest the full potential of aquaculture in developing countries.

Conclusions

Farmers should be able to;
-Explain the primary water chemistry parameters and water quality management strategies required to maintain health.
-Recognize how to select an aquaculture site and explain the differences in construction techniques, and yields from levee ponds, cages, raceways, and recirculating aquaculture systems.
-Describe the life histories (reproductive, nutritional and temperature) and production strategies for 20 species of food, bait, sport, and ornamental species with highest aquaculture potential.
-Describe the processing and marketing strategies with special emphasis on niche marketing.
-Select a species, production system, and market and write an aquaculture business plan (Yanik 2009b).

Recommendations

The Technical Assistance

The Technical assistance should be given freely and help to construct fish farms at different capacities as long-term aquaculture subsector strategy that will reduce poverty and enhance the sustainability of the subsector. It will cover teaching govermental laws and policies about rural areas, projecting fish farms to be submitted Ministry of Agriculture and Rural Affairs (MARA), aquaculture support infrastructure facilities and services, including research, training and extension, credit, trade and marketing as well as fish health management. The outcomes will include rationalization of subsector policies, institutional arrangements, and planned interventions expansion of aquaculture production and productivity that will particularly benefit the poor and prevent the migration from villages to city centers or even big cities.

Methodology and Key Activities

In long term, area specific strategies and interventions based on an in-depth study and evaluation of present conditions and projected changes in the regional, national, and international settings should be created to overcome the constraints of the areas. In order to solve the problems, the technical assistance will be included surveys to gather pertinent information in support of strategy formulation, and workshops for consultation with stakeholders.
In short term, considering the aquacultural potential of the areas, the technical assistance will cover the analyzing existing policies and institutional arrangements and identify required changes for subsector development; reviewing technical issues relevant to aquaculture development and management, and formulating a strategy and innovative measures to effectively address the issues i.e finding suitable places for aquaculture and solutions for the water pollution. As an example Aras et al. 2002 reported that the nort eastern anatolia has 30000 metric tonnes per year aquacultural potential, although there has been only about 1000 metric tonnes of annual production.

Implementation Arrangements

There should be a reponsible govermental organization such as Managery of Agriculture in city centers for administration, implementation and designing strategies for sustainable aquaculture. It will implement the technological assistance through its Fisheries division.

References

Anonymous 1998. Sustainable Aquaculture. *Proceedings of the Second International Symposium on Sustainable Aquaculture, Oslo, Norway 2.-5. November1998;* A.A.Balkema: Rotterdam/Brookfield

Anonymous, 2005. *Technical Assistance Republic of the Philippines:* Strategy for Sustainable Aquaculture Development for Poverty Reduction Project. Project Number: 39031

Aras NM, Yanık T, Kocaman EM, Haliloğlu HI., 2002. Kuzey Doğu Anadolu Bölgesi kapsamında su ürünleri sektörünün ulaşabileceği potansiyel büyüklüğünün mali projeksiyonu. *Atatürk Üniv. Ziraat Fak. Derg*. 33:447-449

Caffey, R.H., R.F., Kazmierczak, R.P. Romaire, and J.W. Avault. (1998). Indicators of aquaculture sustainability: a Delphi survey. *Presented at World Aquaculture '98; Las Vegas, NV*. The international triennial conference and exposition of the World Aquaculture Society, the National Shellfisheries Association and the Fish Culture Section of the American Fisheries Society. Book of Abstracts, p. 91.

Chua T.E. 1992. Coastal aquaculture development and the environment: the role of coastal area management. *Marine Pollut. Bull*. 25(1–4): 98–103.

Edwards, P. and Demaine, H. (1997) Rural Aquaculture: *Overview and Framework for Country Reviews. Regional Office for Asia and the Pacific (RAP),* Food and Agriculture Organization of the United Nations (FAO), Bangkok, Thailand. RAP Publication 1997/36.

FAO (1995) Code of Conduct for Responsible Fisheries. *Food and Agriculture Organization of the United Nations*, Rome, 41pp.

FAO. 2000. Small ponds make a big difference. Integrating fish with crop and livestock farming. *Food and Agriculture Organization of the United Nations*, Rome, Italy, 30 pp

Folke, C. and Kautsky, N. (1992) Aquaculture with its environment: prospects for sustainability. *Ocean and Coastal Management* 17, 5–24.

Frankic, A. and Hershner, C., 2003. Sustainable aquaculture: developing the promise of aquaculture. *Aquaculture International* 11: 517–530.

Goodland, R. and Daly, H. (1996) Environmental sustainability: universal and non-negotiable. *Ecological Applications* 6, 1002–1017.

Greenpeace, 2010. Sustainable Aquaculture. At: *http://www.greenpeace.org/international/campaigns/oceans/sustainable-aquaculture/*

NACA/FAO 2000. Aquaculture development beyond 2000: the Bangkok Declaration and Strategy. *Conference on Aquaculture in the Third Millennium*, 20–25 February, Bangkok, Thailand, 27 p.

Ommani A.R. and Chizari, M., 2010. Strategies for Sustainable Aquaculture: Designing for the future. *Retrieved 10 April, 2010 from http://ommani.webs.com/a35.pdf*

Prein, M. & Ahmed, M. 2000. Integration of aquaculture into smallholder farming systems for improved food security and household nutrition. *Food and Nutrition Bulletin*, 21, 466-471

WB (World Bank) 1998. Sustainable aquaculture. Rural Development Department. No. 22.

WCED (1987) *Our Common Future*. World Commission on Environment and Development. Oxford University Press, Oxford, UK.

Yanik, 2005. Some General Aspects in Fish Farming, American Fisheries Society Student Sub-unit at SUNY Cobleskill, NY. Sep 12.

Yanık T., 2009a. Aquaculture in Turkey. *FAO/NACEE Conference on Aquaculture in the Caucasus Region, International Conference on Aquaculture* 21-22 April 2009, Armenia

Yanik, 2009b. Main Concerns to Increase Potential Aquaculture in Ispir Region of Erzurum. *Rural Development Challenges in the EU and Turkey, Workshop of Defining of Alternative Products İspir-Erzurum Turkey*, 3-4 April 2009

Yanık T., 2010a. Status and Poteinal of Aquaculture in Turkey. *Seminar of Erasmus exchange staff at Firenze University*, Feb 4.

Yanık T., 2010b. Some Sample Boreal Water sources of Anatolia For Fish Culture in Erzurum, *Visitor staff at Erasmus Program (European Region Action Scheme for the Mobility of University Staff/students) Firenze University Italy*, Feb 4.