

Evaluation of the Contribution of Fisheries and Aquaculture to Food Security in Developing Countries.

R. C. Akpaniteaku, M. Weimin and Y. Xinhua

Abstract

Fish contain important nutrients such as essential fatty acids, iron, zinc, calcium, vitamin A and vitamin C. Production of freshwater fish depends on the strategic application of various management techniques. The demand for fish products has increased beyond the natural supply, resulting in a high pressure on fisheries. Development of aquaculture is necessary for a rapid growth in fish production. A number of constraints hamper the development of aquaculture. Introduction of polyculture technologies in some countries is a way of maximizing production from different levels of the food chain. The roles of women in making fish products available to consumers is frequently over-looked by policy makers. Gender equity in policy-making and management of fisheries and in capacity building is an important issue. Fish production from inland waters and coastal areas can be increased by adopting cage and pen culture systems. Input subsidies and loans to resource poor farmers can boost fish production.

Introduction

The impact of increasing production and the changing structure of supply of aquatic products in developing countries are not yet fully understood. This is particularly important for the poorest segment of the population, which traditionally derives a substantial amount of food security through participation in small-scale production, consumption and sale of aquatic products (Williams 1996). Each year, there are an additional 80 to 90 million people to feed, most of them in developing countries. The most reliable source of protein for many of them is fish. Yet millions of people who depend on fish to live are constantly faced by fear of food shortages. In the developing countries, the people in the fishing sectors are some of the poorest and most neglected (WorldFish Center, undated).

In low income countries staples such as rice, wheat, maize and cassava make up the bulk of the food consumed and supply the major part of energy and nutrients.

According to WHO (1992), there are some essential nutrients that are not found in these staples or found only in small quantities, for example, essential fatty acids, iron, zinc, calcium, vitamin A and vitamin C. These nutrients are supplied by food that is consumed with the staples such as vegetable and fish. Big and small fish contain a relatively high amount of minerals. The contribution of small fish to food and nutrition security is especially important as they are consumed whole, including bones. Some small fish species also contain large amount of vitamin A. Vegetables contain vitamin A as B-carotene, which is not readily absorbed and is destroyed to some extent by cooking. In small fish, vitamin A is present as retinol and anhydroretinol, which are readily absorbed and utilized in humans (WHO 1992).

Fisheries, including aquaculture, provide a vital source of food and economic well-being for people throughout the world. Therefore, they should be managed in a responsible manner.

Fish Production

Large-scale abstraction for water, alteration of the water environment and riverine hydrology, and the destruction of fish habitats as a result of land-based activities have caused many fisheries resources to degenerate and lose their economic and food potentials (Ahmed 1999). De Silva (pers. comm.) estimated world fish consumption to be an average of 15.8 kg/caput. The consumption patterns in developing countries differ from country to country (Table 1). The consumption pattern does not depend on the availability of fisheries resources within the country but on nutrition habits of the people, fish imports price and supply of alternative sources of animal protein, especially poultry.

Freshwater fish represents an essential often irreplaceable source of high quality, cheap animal protein crucial to balanced diets in marginally food secure communities.

Table 1. Fisheries resources and estimated per capita fish consumption for some developing countries.

Country	Fisheries resources	Per caput consumption (kg)
Cambodia	Freshwater, marine	30.0
Chile	Freshwater, marine	8.0
Cuba	Freshwater	8.0
Ghana	Freshwater, marine	25.0
Hungary	Freshwater	5.0
Indonesia	Freshwater, marine	25.0
Kenya	Freshwater, marine	3.0
Mexico	Freshwater, marine	-
Namibia	Freshwater, marine	-
Nepal	Freshwater	1.5
Nigeria	Freshwater, marine	19.0
Pakistan	Freshwater, marine	-
Philippines	Freshwater, marine	-
Romania	Freshwater, marine	-
Sudan	Freshwater	-
Uganda	Freshwater	13.0
Vietnam	Freshwater, marine	-

Source: 2003 TCDC International Training Course, Integrated Fish Farming Center (IFCC) Wuxi, China.

Table 2. Number of cultured fish species used for seed multiplication in some developing countries.

Country	No. of species used in aquaculture	No. of species reproduced in hatchery	Percentage of species reproduced in hatchery
Cambodia	7	3	42.9
Chile	3	1	33.3
China	8	5	62.5
Cuba	4	3	75.0
Ghana	7	1	14.3
Hungary	5	1	20.0
Indonesia	7	2	28.6
Kenya	3	1	33.3
Mexico	5	1	20.0
Namibia	3	-	-
Nepal	7	3	42.9
Nigeria	8	3	37.5
Pakistan	5	3	60.0
Philippines	6	3	50.0
Romania	5	2	40.0
Sudan	4	-	-
Uganda	3	1	33.3
Vietnam	6	3	50.0

Source: 2003 TCDC International Training Course, IFCC, Wuxi, China.

Capture fisheries

World production of fish, crustaceans and mollusks was 129.3 million tonnes in 2000. More than 75% of this was used for direct human consumption. Demand for fish continues to exceed supply resulting in overfishing of natural fish stocks. In the future, many of these over exploited stocks will not sustain their current catch let alone cater to the expected increase in demand. World population is expected to increase from 6 to 8.5 billion in the next 25 years. Fish production must double in the next 25 years to meet projected demand. One solution is to increase productivity (WorldFish Center, undated). According to Sverdrup-Jensen (1999), inland fisheries have not been given the priority they deserve in the competition for the rights to use inland water resources. The recognition of the importance of the sector together with integrated planning and management of river basins, lakes and other inland waterbodies will contribute substantially to long-term fish production. Welcomme and Bartley (1998) observed that the poor management of fisheries has resulted in the natural reproduction of many fish species not being able to compensate for excessive or inappropriate fishing pressure. As a result, the catch from inland water fisheries based on naturally reproducing fish populations is declining worldwide. Many of the coastal marine resources are similarly threatened. The response to this crisis in management has been to increase the level of human intervention through stocking of target species and habitat maintenance (Welcomme and Bartley 1998).

Aquaculture

Reduction in the level of fishing in capture fisheries conflicts with the requirement of a greater supply of food fish for the poor. The problem of overfishing and the increasing demand for fish need to be addressed simultaneously. Traditional measures for the management of capture fisheries did not consider demand as an important factor. Many people regard

increased aquaculture production as an important option for dealing with the conflicting problems of overfishing and increasing demand for fish. An increase in the supply of aquaculture products will reduce both the demand for and price of products of capture fisheries. This could in turn reduce the investment and fishing effort in capture fisheries (Worral 1995; Ye and Beddington 1996).

In developing countries, aquaculture development has become a necessity because of rapid growth of populations and deterioration of natural fisheries. The development of aquaculture has been hampered by a number of constraints. The principal one is the shortage of quality fish seed, due to a shortage of operating hatcheries. As a result, most farmers do not have enough seed to sustain their operations, and many have had to abandoned aquaculture altogether (Charo and Oirere 2000).

In Africa, aquaculture is generally practiced on a small-scale, usually as simple, low-input, freshwater pond culture. Given its size and demand for fish products, the continent produces very little, only about 0.5% of world aquaculture output. About 80% of this quantity is produced by just two countries, Egypt (tilapia, carp, mullet) and Nigeria (tilapia, catfish, carp) (Sverdrup-Jensen 1999). In Asia, China has evolved a technology for fish polyculture using four types of carp that feed at different levels of the food chain. According to Kangmin (unpublished), tilapia was introduced to China from Africa more than two decades ago, but has not caused any harm to native species in inland water bodies. However, introduction of new species to Africa, especially those species that are already used in polyculture systems, is opposed for biodiversity reasons. Akpaniteaku (unpublished) observed that there is no fear of destruction of diversity of local species by introduced species through interspecific breeding. In Nigeria, the common carp has been reared in ponds for more than two decades without any adverse effect in the wild. Studies should be carried out on

local species with high nutritional values that have the potential for polyculture.

Role of Women

Increased access to productive resources is a more reliable guarantee of food security than increases in purchasing power for the rural poor. Resource management and production improvements in capture fisheries and aquaculture should focus on the rural poor as the primary beneficiaries (Pomeroy 1995). According to WorldFish Center (undated), employment in capture fisheries and aquaculture in 1998 was estimated at about 30 million people, while the number of people dependent on fisheries for their livelihoods has been estimated at 200 million worldwide. Fish is the most important commodity handled by women. In rural communities surrounded by water, women are predominantly engaged

in fish handling, processing and marketing. Families depend mainly on free fish supplied by the women of the household, who are engaged in fish marketing (Adeyemo 1983).

Policy makers overlook the significant role women play in fisheries. The vital role played by women particularly in the post harvest processing and marketing of fish, is not recognized. They frequently provide a major part of the labor in fish processing and marketing, working under conditions of great inequality and receiving little direct remuneration for their work (WorldFish Center, undated). In spite of their contribution, they play a minor role in strategic developmental planning. Table 3 shows that the number of women per group during capacity building programs rarely matches the significance of their role in the fisheries sector.

Table 3. Gender representation at the 2003 TCDC International Training Course on Integrated Fish Farming.

Country	No. of participants		
	Men	Women	Total
Cambodia	2	–	2
Chile	2	1	3
Cuba	1	1	2
Ghana	3	1	4
Hungary	2	–	2
Indonesia	2	–	2
Kenya	1	–	1
Mexico	1	–	1
Namibia	1	–	1
Nepal	2	–	2
Nigeria	4	1	5
Pakistan	1	1	2
Philippines	1	–	1
Romania	1	–	1
Sri Lanka	1	–	1
Sudan	1	1	2
Uganda	1	–	1
Vietnam	1	–	1
Total	27	6	33
Percent of total	82	18	100

Source: Akpaniteaku (unpublished).

Development consideration

Fish serve as a primary food source as well as a source of economic security. The problem of declining fish stocks is often compounded for families whose income and food requirements are based on fish. A lower catch means less to process and market, so there is nothing left over for the family to eat. Fisheries development must be promoted to the level of a key policy issue to be addressed by the international community. In addition to overfishing and destructive fishing, many of the factors that impact the sustainability of coastal and inland aquatic resources are driven by actions outside the fisheries and aquaculture sector (WorldFish Center, undated). In the short term, intensifying the existing aquaculture production technology and optimal utilization of local feed and input ingredients are ways of improving fish supply for the rural poor (Abdullah 1999). In the long term fisheries development and food security can be achieved through the following actions (Thilsted and Roos 1999).

- Collecting and making use of reliable data on fish consumption patterns.
- Developing production systems that make use of local fish species, including small fish species.
- Increasing accessibility of poor households to different species for culture.
- Protecting women in fisheries; sharing training information on fisheries among men and women.
- Developing more low-cost technologies for fish processing

Welcomme and Bartley (1998) noted that in many cases, yields have been increased through stock enhancement. Semi-intensive polyculture practiced in land-based systems is the main source of supply of low priced food fish for household consumption. From the point of view of environmental and ecological sustainability, this system has proved to be more promising and, in many ways, mimics natural ecosystem functions. Policies are needed to promote such systems to

provide enhanced food security (Folke and Kautsky 1992).

Conclusion

Fisheries and aquaculture have an important role to play in food security programs in developing countries. The importance of data collection and analysis of fish production, consumption and efforts to increase yields through aquaculture, cannot be overemphasized. Success in the execution of fisheries or aquaculture projects depends on a proper analysis of accurate data. People involved in data collection should have a sound technical background, because good information is essential for planning fisheries development in developing countries.

Financial assistance should be given priority in aquaculture development planning, in order to encourage resource poor farmers, especially women, to produce more fish. Women who are engaged in processing and distribution of fisheries products, can also be encouraged to invest in small-scale aquaculture where possible. Skilled and semi-skilled women should be given soft loans to enable them to establish homestead fish farming. Subsistence rearing of fish should be made mandatory for people living around good sources of water supply.

Loans and subsidies are signs of genuine effort by governments to boost fish production. Managers of the grants should ensure that "political fish farmers" are denied access to the loan facilities.

References

- Abdullah, N. 1999. Comments, p. 60. *In* M. Ahmed, C. Delgado, S. Sverdrup-Jensen and R.A.V. Santos (eds.) Fisheries policy research in developing countries: issues priorities and needs. ICLARM Conf. Proc. 60.
- Adeyemo, R. 1983. The power of fish trader associations in marketing of fish in Lagos State, Nigeria, p. 141-147. *In* Proceedings of the 3rd Annual Conference of the Fisheries Society of Nigeria (FISON), Maiduguri, 22-25 February 1983.
- Ahmed, M. 1999. Policy issues deriving from the scope, determinants of growth and changing structure of supply of fish and fishery products in developing countries, p. 37-57. *In* M. Ahmed, C. Delgado, S. Sverdrup-Jensen and R.A.V. Santos (eds.) Fisheries policy research in developing countries: priorities and needs. ICLARM Conf. Proc. 60.
- Akpaniteaku, R.C. (unpublished). 2003. TCDC International Course on Integrated Fish Farming, Asian-Pacific Regional Research and Training Center for Integrated Fish Farming, Wuxi, China: A training course report.
- Charo, H. and W. Oirere. 2000. River-based artificial propagation of the African catfish *Clarias gariepinus*: an option for the small fish farmer. *Naga – The ICLARM Q.* January-March 2000, 23 (1):14-16.
- Folke, C. and N. Kautsky. 1992. Aquaculture with its environments: prospects for sustainability. *Ocean Coast Management* 17:5-24.
- Kangmin, L. (unpublished.) Fighting water hyacinth by surface aquaponics in unison with aquaculture in tropical Africa. Equator initiative: the innovative partnership awards for sustainable development in tropical ecosystems.
- Pomeroy, R.S. 1995. Community-based and co-management institution for sustainable coastal fisheries management in South-east Asia. *Ocean Coast Manage.* 27 (3):143-162.
- Sverdrup-Jensen, S. 1999. Policy issues deriving from impact of fisheries on food security and the environment in developing countries, p. 73-91. *In* M. Ahmed, C. Delgado, S. Sverdrup-Jensen and R.A.V. Santos (eds.) Fisheries policy research in developing countries: issues, priorities and needs. ICLARM Conf. Proc. 60.
- Thilsted, S.H. and N. Roos. 1999. Policy issues on fisheries in relation to food and nutrition on security, p. 61-69. *In* M. Ahmed, C. Delgado, S. Sverdrup-

Jensen and R.A.V.Santos (eds.)
Fisheries policy research in developing
countries: issue priorities and needs.
ICLARM Conf. Proc. 60.

Welcomme, R.L. 1992. A history of
international introduction of inland
aquatic species FAO Fisheries Tech.
Paper 294.

WHO. 1992. National strategies for over-
coming micronutrient malnutrition.
Draft resolution proposed by
Rapporteurs of the Board Executive
89th Session, WHO, Geneva.

Williams, M.J. 1996. The transition in
the contribution of living aquatic
resources to food security. FAO.
Discuss. Pap. 13.

WorldFish Center. (Undated). Fish: an
issue for everyone. A concept paper
for *Fish for All*.

Worral, S.J. 1995. Aquaculture and ocean
fishery regulation. Sem. Pap. Center
for International Economic Studies,
University of Adelaide, Australia.

Ye, Y. and Beddington. 1996. Bioeconomic
interactions between the capture

fisheries and aquaculture. *Mar. Res.
Econ.* 11:105-123.

R.C. Akpaniteaku is from Anambra
State Agricultural Development programme,
P.M.B. 5051, Awka, Anambra State, Nigeria.

Miao Weimin and Yuan Xinhua are
from the Asian-Pacific Regional Research
and Training Center for Integrated Fish
Farming Wuxi, China.
Email: rupertca2004@yahoo.com