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Peter Edwards writes on

Rural Aquaculture

Aquaculture for Poverty Alleviation and Food Security

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There was a lively and stimulating session on "Aquaculture for Poverty Alleviation and Food Security" at World Aquaculture 2002, the recent annual meetings of the World Aquaculture Society and The China Society of Fisheries, held in April in Beijing. This issue's column, based on five presentations of speakers kindly sent to me on request for this purpose as chair of the session with Professor Li Sifa, will enable persons unable to attend the meeting to benefit from the collective experience and wisdom of the speakers. My column in the next issue will outline another six presentations from the session.

Simon Funge-Smith from FAO's Regional Office for Asia and the Pacific led off with background to one of the main themes of the session with a presentation entitled, "Focusing Aquaculture on Poverty Alleviation". Simon's presentation was based on a recent FAO/NACA Expert Consultation of field-level professionals in Asia who shared experiences and prepared a platform for future networking. Living aquatic resources play a fundamental role in sustaining the livelihoods of many of the rural poor in Asia with poorer people often the most dependent on aquatic resources, particularly low-value fish and other living aquatic organisms. Such resources provide opportunities for diverse and flexible forms of income generation and contribute towards food security. Aquaculture may offer significant advantages over other activities such as cash crops and livestock and may be easily integrated into other farm and livelihood activities. Low-cost aquaculture technologies using available on-farm inputs exist, providing limited need for investment, low levels of risk and low labor requirements that "fit" with household divisions of labor. Low levels of production may still provide an important source of household nutrition, and buffers against shocks. Women often benefit from aquatic resource use and management in production, processing or trading the extent to which aquaculture can improve the position of poor women will also be taken up with Cecile Brugere's presentation in the next issue.

To realize the potential for small-scale aquaculture and aquatic resource management to alleviate poverty, it is recommended that poverty alleviation be taken as the strategic starting point for aquaculture interventions. This has significant implications for how interventions are conceptualized, planned and executed as well as the institutional arrangements and partnerships. Distinctions between "farmed" and "wild" living aquatic resources are often artificial and thus mask flexible and often complex relationships between the two in the livelihoods of the rural poor. As with any production–based intervention, poor people face significant constraints to entry into aquaculture. Those currently involved in aquaculture may not be the very poorest since aquaculture requires resources such as land, ponds, water, credit and other inputs. Furthermore, many aquaculture interventions have not always directly addressed the needs of the poorest people. However, as Simon pointed out, experience from the consultation clearly demonstrates that there are considerable opportunities for poor people's entry into aquaculture, if appropriately planned. Previous thinking was in terms of aquaculture development. Now the emphasis now is on aquaculture *for* development.

Small-scale integrated aquaculture with pigs (above), chickens or vegetables usually has too low a production to provide a significant income. Photo courtesy Thomas Hecht.

As aquaculture technologies for poor people are largely in place, greater emphasis should now be given to more effective extension of low-cost technologies and appropriate management practices for poor people, and securing their right of access to and control of resources, rather than technical research. Targeting the poor to understand their needs and to identify opportunities for them to benefit from aquaculture and aquatic resources management is essential. Targeting should be based on a range of criteria

and participatory methods. Local people's views of categories of the poor and poor people, including those of women, should be taking into consideration in defining objectives, strategies and indicators of "success". Opportunities for the entry of the poor and / or landless can be created by breaking up the aquaculture production cycle, facilitating access to fingerlings by decentralizing seed production, supporting seed traders and seed distribution networks, facilitating pond lease or purchase, and by providing inputs. Collective action of poor people should be supported through securing access to or leasing common water bodies, enhancement of communal water bodies including the establishment of locally devised pro-poor rules and regulations, introduction of small cages into water bodies, dry season refuge management, establishing farmer groups and supporting credit and savings groups.

The enabling institutional environment for the poor to benefit significantly more from living aquatic resources management than at present is wanting as fisheries institutions are traditionally oriented to technical issues, often have limited experience in training and extension methods appropriate for the poor, and usually face serious budget and personnel constraints. New learning opportunities are required for these institutions, including increased interaction with other agencies as "aquaculture for development" should not be the sole responsibility of fisheries institutions. This will require innovative institutional arrangements and partnerships between governments, NGOs, civil society groups, donors and poor people.

Considerable donor funds were spent on construction of fish stations in Africa...

The next two presentations, by John Moehl, FAO Regional Aquaculture Officer for Africa, and Thomas Hecht of Rhodes University, South Africa, outlined the current low level of aquaculture in Africa and possible reasons for limited adoption by farmers, in spite of significant investment, and offered views on strategies to promote aquaculture for development.

...and on supporting field extension workers. Photos courtesy John Moehl.

John, in his presentation entitled, "Aquaculture Development as a National Strategy for Poverty Alleviation and Improved Food Security in Africa", explained that to understand the potential for aquaculture development in Africa, there is a need to appreciate the past as remnants of early efforts still very much affect present processes aimed at increasing the impact of aquaculture. The donor community spent millions of dollars in the 1970s and 1980s on aquaculture development across Africa to introduce technology and reinforce government programmes. Significant funding was spent on creating infrastructure, particularly fish stations / hatcheries and supporting aquaculture extension services which were frequently linked to the new government fish stations through subsidized transport for extension staff.

The technology extended by many of these externally-funded operations was based on maximizing outputs often presented as a "cook book" methodology as it was assumed development was resource-limited and an injection of funds and technology would translate into increased fish yields. Indeed, most countries demonstrated a dramatic increase in the number of fish farmers as revitalized extension services stimulated interest in aquaculture but adoption was at times marginal and at best has had a minor impact on food security and poverty. Yields did not progressively increase as foreseen but often declined, as did the number of active fish farmers, especially when donor funds dwindled.

Although aquaculture failed to fulfill expectations, Africa now has a core of practicing fish farmers producing low yields with little government support i.e. aquaculture has evolved from an introduction into an enterprise with which a few farmers are familiar. These are the persistent and resistant individuals who form the foundation for future development and expansion of aquaculture in Africa. While there are a limited number of medium- and large-scale aquaculture enterprises that supply fish to urban centers and also employ poor people, it is estimated that 95% of African aquaculture production comes from small-scale rural farms. Most household aquaculture is of tilapias and/or catfish, integrated within a traditional farming system, producing an average of 0.5-1 tonnes/ha in one or more 100-500 m^2 ponds, and providing fish for the home and market.

Present day development of aquaculture in Africa is constrained by both political- economic and technical issues. Aquaculture has acquired a high degree of donor dependence but external funds have become extremely scarce. Macro-economic difficulties have precipitated adoption of national structural adjustment programmes, accompanied by decentralization and down-sizing of government agencies. The situation has been exacerbated by geo-political turbulence, economic recession, natural calamities, and significant and often negative changes in demographics. In aggregate, these have led to weakened public sector institutions, reduced extension / outreach, declining infrastructure, and chronic shortages of human and financial resources. Aquaculture development has also been affected by persistent input supply problems: unreliable supplies of good quality seed; difficulties in obtaining adequate quantities of cost-effective feeds; and no ready access to capital. At the same time, a combination of swelling populations and declining natural resources puts increasing pressure on aquaculture to fill the growing fish supply: demand gap. The capacity to fill this gap appears to exist as there is un- or under-utilized land and water resources, available labor and suitable climate. These attributes can justify development of small-scale integrated aquaculture and large-scale intensive fish farms, as well as raising crustaceans and molluscs.

Relatively high value grass carp is cultured on grass grown on pond dikes, supplemented with pelleted feed. Souchow, China.

According to John, a holistic view is required for growth and increased impact of aquaculture in Africa that examines aquaculture in a matrix of variables, addressing size / scale, intensity and ownership i.e. there is need for proper technical and socio-economic fit for aquaculture in each location. Each production system should have a target group, utilizing a specific set of inputs and producing a product aimed at a defined market. This requires increased understanding of the socio-economics of target groups, participation and sharing of responsibility with stakeholders, increased private sector involvement, divestment by government, and enhanced information exchange / flow. The effort to generate information and match systems and producers will require considerable up-front expenditure but will reduce long-term maintenance costs and promote sustainable aquaculture.

Thomas Hecht in his presentation, "Strategies and Measures for Sustainable Aquaculture in Sub-Saharan Africa", explained that sustainable aquaculture has a dual meaning: first and foremost it refers to placing aquaculture on a sustained growth trajectory in terms of production, job creation, poverty eradication and enhanced trade; but also that it is dependent on aquatic ecosystems and the maintenance of the integrity of the environment will ultimately determine the sustainability of the sector as a whole. Aquaculture in Africa will only reach a sustainable threshold once it enters a steady growth phase, is less dependent on foreign donor aid, and is practiced in an environmentally sustainable manner.

Africa contributes < 0.5% to global aquaculture production. Three Mediterranean countries produce almost 60% of the African total and 6 sub-Saharan countries produce 93% of the remaining 40%. But the 27 countries that produce 7% (2,400 tonnes) of the sub-Saharan total receive the bulk of donor support. Although sub-Saharan aquaculture is generally practiced within environmentally sustainable boundaries, aquaculture makes little if any contribution to sustainable livelihoods, as also pointed out by John Moehl, except in certain countries and circumstances.

According to Thomas, there is the need for a paradigm shift in philosophy away from focusing on food for the poor, which addresses symptoms of poverty not causes, to creation of wealth (financial, knowledge, health etc.). He believes that capture fisheries have a greater role to play in providing food for the poor than aquaculture. The sustainable aquaculture threshold will only be attained when production changes from low-yielding small-scale ponds to larger-scale and higher-yielding fish ponds.

Ferrocement boat used to harvest aquatic weeds from canals and lakes to feed grass carp. Souchow, China.

Thomas also presented a plan for promoting aquaculture development in sub-Saharan Africa, including the recognition of both the down-side and the up-side of past mistakes. The over-arching mistake was allowing economic reality to be overshadowed by philanthropy and political expediency. Specific mistakes included a flawed developmental philosophy, inadequate planning, transfer of inappropriate technologies, inappropriate channeling of donor funds, neglect of the private sector and the consequences, and a focus on hatcheries and the poorest of the poor. On the up-side, a fundamental knowledge base has been established e.g. ponds, species and integration; it is now recognized that profit motivates activity; and it is also recognized that there are resource limitations for which appropriate plans need to be made to overcome them. To establish a self-sustaining sector requires a change in philosophy, appropriate strategies, careful participatory planning, goal oriented donor participation, private sector investment, capacity building and appropriate technology.

With respect to appropriate technology, Thomas highlighted poor nutrition for the fish, which translates into poor production efficiency. The previous focus has been on organic fertilizers that are available in limited amounts, and maize bran. Use of maize bran is logical as it is widely available but it is a waste of money with a FCR of 25:1. Previous research on alternative feeds has been unfocused and should be redirected to legumes as soybean with a FCR of 5:1 has led to considerably increased extrapolated fish yields of 5 tonnes/ha/year.

It is ironic that there was no Chinese presentation on the role of aquaculture in food security and poverty alleviation as China dominates global aquaculture production, has had the fastest growth rate in total production over the past few decades and the meeting was held in Beijing. Fortunately, Miao Weimin sent me a copy of his paper presented in another session, "Economic Profile of Aquaculture Practices in China: Implication for Sustainable Aquaculture Development" which is of relevance. The rapid development of aquaculture over the past two decades has significantly increased the availability of aquatic produce from less than 10 kg to over 30 kg/caput, making an important contribution to national food security. There has been tremendous diversification of species and culture systems in China but traditional pond fish culture still dominates aquaculture production.

Recent experience with intensification of pond culture in China has involved increased use of commercial formulated feed, reduced integration and a change from polyculture to monoculture of high value species. A degraded culture environment has led to increased frequency of disease requiring extensive use of various medicines and chemicals. A further adverse environmental impact

Small grass carp fed with duckweed cultured between fish ponds. Souchow, China.

is the current practice of discharging effluents from pond culture to natural water bodies without any treatment. This has led to the conclusion that traditional pond fish culture with moderate intensity and integration with other agricultural activities is a sustainable aquaculture system. Clearly, more widespread application of the principles of Chinese aquaculture practice elsewhere in the world would help aquaculture to fulfill its potential contribution to food security and poverty alleviation.

There were two presentations on India, the second largest aquaculture production in the world : "Role of Fish Consumption in the Food Security of India" by Ramachandra Bhatta, M.M. Dey and F. Parguas; and "Contribution of Aquaculture to Poverty Alleviation and Food Security in India" by M.C. Nandeesha. According to Ramachandra, the growth rate of fish production in India is second only to eggs and is considered to be one of the most promising sectors to achieve food security. Their presentation was based on a comprehensive survey of food consumption of rural and urban fish consumers in five Indian states known to be prominent in inland fisheries (Haryana, Karnataka, Orissa, Uttar Pradesh and West Bengal).

Fish contributed more to the welfare of poor than better-off consumers. The percentage of expenditure on fish relative to total expenditure decreased with an increase in income; furthermore, the percentage contribution of fish protein to total animal protein was relatively higher among poorer than medium and rich income classes. This indicates that higher fish production would benefit the poor more than the better off. Rural consumers who mainly represented producer–consumers had an annual fish consumption twice that of their urban counterparts. Rohu was consumed the most by all income classes in all states, followed by catla, mrigal and marine fish. The average annual consumption of fish was about 15 kg / caput, two to three times higher than previous estimates but ranged from 5 for urban Karnataka to 30 kg/caput for rural Haryana, the latter indicating the impact of increased production and accessibility of fish on consumption, and greatly underdeveloped potential for aquaculture in India.

Nandeesha pointed out that more than half of the more than 1 billion people in India are non-vegetarians. Although most fish consumers live in the eastern part of the country, demand for fish is increasing throughout most of the country. However, overall growth of aquaculture has been slow compared to several other countries, calling for a vigorous campaign if aquaculture is to fulfill its potential.

In several parts of India, family fish ponds are common with the majority of farmers being poor and raising carps for both household consumption and sale. Although the national average for inland fish production is only 2 tonnes/ha/year, farmers have demonstrated the commercial viability of carp farming with yields of more than 15 tonnes / ha / year in several areas where aquaculture has been introduced. Nandeesha described the development in Andhra Pradesh of a system based largely on rohu, which has the highest market demand in a previous issue (Volume 6, No. 4, pp. 29-32, 2001).

Anabas, Channa, Clarias and Heteropnustes are important cultured fish in some areas. Tilapias are also widely cultured and are increasing in popularity. In Kolkata (Calcutta) tilapia is the most sought after fish by both poor and rich people. Culture of prawn, *Macrobrachium rosenbergii*, has increased dramatically in several states with small-scale and poor farmers also involved. Contrary to the perception that penaeid shrimp farming is carried out largely by big business, more than 90% of the area is farmed by small farmers who mostly hold < 2 ha. Low salinity and freshwater shrimp culture are also widely practiced.

According to Nandeesha, there is a need to employ a farming systems approach to increase aquaculture production with a change in extension strategies to focus more on people than on technologies. There is also a need to evolve more farmer friendly technologies that minimize risk to reap the full benefits from aquaculture.