



Aquaculture for increased fish production in East Africa[★]

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Abstract

Fish is produced for human consumption and other purposes through capture fisheries and aquaculture. Fish production from natural stocks has already reached its limits and is declining while aquaculture production is increasing. Aquaculture is making a significant contribution to fish production in several countries thus proving to be a potential alternative to supplement the declining capture fisheries. In East Africa the contribution of aquaculture to the total fish production is still insignificant although it has been practised in the region since the 1900s. The predominant aquaculture production system in East Africa at present is small scale earthen ponds characterised by low inputs and low yields. Important ingredients for the emergence of a commercial aquaculture industry are highlighted with emphasis on the need for a conducive and harmonised policy framework across the region. This paper advocates a focused plan of action for aquaculture development in the region and makes succinct recommendations for fast transformation of the industry.

Key words: Aquaculture, East Africa, Lake Victoria basin, production, marketing, regulation, new technologies.

Introduction

Fish are produced for human consumption and other purposes through capture fisheries and aquaculture, both of which can make substantial contributions to economic growth and food supply. Capture fisheries harvest resources in both marine and freshwater environments and are equivalent to hunting while aquaculture is the farming of aquatic organisms such as fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production and these include regular stocking, feeding, and protection from predators, amongst other things, as well as the manipulation of the environment, the formulation of feed, genetic improvements, and marketing in a manner that maximises profitability.

Although aquaculture has some similarities with capture fisheries, the core issues are different. These include differences in the socio-economic and bio-physical environments, tools and operational practices, and the psychology of investment and management. Consequently, the priorities for capture fisheries and aquaculture will differ significantly. It is now recognised that production from capture fisheries cannot be increased much above its current level and the supply of fish from

capture fisheries is dwindling on a per capita basis at a time when demand is increasing. It is estimated that in order to maintain the current level of per capita consumption, global aquaculture production will need to reach 80 million tonnes by 2050 (FAO, 2006). The decline is most pronounced in sub-Saharan Africa which is the only region in the world where fish consumption is falling. In East Africa, the gap between supply and demand is widening to such an extent that even the axial skeletons of fish (*mgongo wazi*), eaten by local people, are becoming scarce.

Several countries have now focussed their attention on the development of aquaculture with Egypt being the leading example in Africa. In that country the government proposed an aquaculture development plan in the late 1970s to boost the development of the sector and by the mid-1980s, the annual production from aquaculture had increased dramatically from a mere 17,000 tonnes to 45,000 tonnes. The target is to produce 1.7 million tonnes of fish by 2017 with 1.0 million tonnes coming from aquaculture (FAO-NASO, 2009). Aquaculture production alone in Egypt exceeds the total national fish production (captures fisheries and aquaculture combined) of any of the East African countries (FAO, 2009) in spite of plentiful water resources in the region.

There are several other countries that have considerably increased aquaculture productivity, which suggests that it can mitigate the predicted global shortfall in fish production. In China, for instance, the

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landlocked province of Sichuan alone produced more than one million tons of fish from aquaculture in 2006. This is in stark contrast with total fish production in Kenya (159,000 t), Uganda (399,000 tonnes), Rwanda (9,000 t), Tanzania 359,000 and Burundi (14,000 t) (FAO, 2009).

Why then the dismal performance in East Africa?

East Africa has so far relied heavily on capture fisheries with a tendency to marginalise aquaculture as far as resource allocation and manpower development is concerned. The countries in the region are not exceptions to the global trend of declining stocks of wild fish and capture fisheries alone can no longer meet demand for fish, both for local consumption and export. Fish processing plants around Lake Victoria, for example, are operating at less than 50% capacity while some have closed down. Therefore, the need for aquaculture to supplement capture fisheries cannot be overstated.

Aquaculture potential in the region

Aquaculture can generate a wide range of benefits including employment, food and income but governments must develop mechanisms for sustainable aquaculture on a large scale. East African aquaculture not only has significant strengths and opportunities, such as good sites for aquaculture development with adequate water resources, processing capacity, and expanding markets for fish, but it also faces some challenges and threats. These include the lack of an enabling regulatory environment, limited access to appropriate technologies, credit and markets, trade barriers that restrict the trade of farmed fish, and the rising costs of imports and production inputs. The crucial areas where action is needed include suitable production systems, the availability of affordable feeds, quality seed, equipment, capital, outreach, research, education and training, marketing, producer organizations, regulation, control, monitoring and evaluation.

While addressing these issues it should be emphasised that aquaculture is a business, and should provide attractive investment opportunities. The lack of a commercial or business approach to aquaculture production is one of the principal obstacles confronting the expansion of the industry. Early assumptions about the availability of inputs such as land, labour and capital did not realistically consider the economic and financial costs of fish farming and profitable yields were difficult to obtain. Much of this early effort attempted to integrate subsistence crop farming with fish farming by establishing farm ponds and while this may have contributed to household incomes it had little impact on national fisheries production. These low-input family systems are still practiced by rural people in East Africa but new aquaculture paradigms now focus on the development of commercially viable aquaculture enterprises.

Aquaculture operates as a business, no matter how small the enterprise, which is market- and profit-orientated, which will have to attract private sector investment (NEPAD, 2005). The development of aquaculture requires investments in a number of areas such as assessing supply and demand, developing trade policies, improving markets, and building capacity for continued technical innovation, market exploration and

self-regulation. New aquaculture technology requires investment in research and development before it can be adapted to local conditions and markets and it is unrealistic to expect pioneer entrepreneurs to shoulder the full burden of these activities. The risk involved in establishing a new technology without state assistance is simply too great for most entrepreneurs and this calls for public-private partnerships. The most successful aquaculture industries have emerged where the state in partnership with the private sector has shared the initial risks, especially in relation to the development of new technologies.

This paper identifies constraints and suggests ameliorative measures that constitute key elements of a private/ public partnership required to develop commercial aquaculture in the region. These can be incorporated into a regional strategy and made operational by a regional aquaculture sector plan that is structured and realistic.

Suitable production systems

Appropriate production systems are essential for successful aquaculture and there are a number of options available to the fish farmer. These have various advantages and disadvantages and there is a need to prioritise the development of systems that will significantly increase productivity. Efforts should be concentrated on those systems that can maximise returns on investment (whether public or private). It is obviously not possible to suddenly discourage small-scale fish farmers using farm ponds but well-defined support for commercialising other systems such as tanks and cages will be needed since ponds are generally less efficient (Table 1).

Table 1. A comparison of the potential fish yield from different cultures systems (derived from unpublished data, Aquaculture Research Centre, Kajjansi, Uganda).

Production system	Yield (kg m ⁻³)
Ponds	0.2
Tanks	100
Cages	150
Raceways	200

Ponds

Ponds are still widely used in many parts of the world and well constructed and managed ponds can be productive. In East Africa, however, ponds tend to be scattered and far from each other making it difficult to disseminate new knowledge, or to coordinate production and marketing. Aquaculture parks are a possible model for improving this situation and they could be employed to achieve a critical level of production that can meet market demands. Under this approach farmers would be encouraged to own fish farms individually but at one locality to ensure economies of scale and to synchronise programmes leading to well planned and predictable production.

Cages

Cage culture has a great development potential and is currently one of the fastest growing segments of global aquaculture production and plays a significant role in most leading aquaculture producers with a reported production of about 3,500,000 tonnes from 62 countries (Tacon and Halwart, 2007). It is now widely perceived that cage culture has the potential to increase fish production on the scale that will be needed to meet Africa's fish deficit.

Tanks

Highly productive systems have been developed in tanks and raceways with Nigeria leading the development of these production systems in Africa. Stocking are reported to be as high as 300 fish m⁻² with an average harvest weight of 1.5kg achieved in 5-6 months (Rutaisire personal observation, Kaduna, Nigeria). This has been made possible by the availability of high quality feeds and this is an aspect that will need improvement in East Africa.

Availability and access to inputs

The availability of inputs, especially feeds, is a major bottleneck for aquaculture development in East Africa. Unlike the traditional farming systems that have established supply networks, aquaculture inputs are difficult to obtain in local markets because the industry is young and the demand small. It is difficult for farmers to obtain equipment like aerators, fish graders, water quality test kits, chest waders, fish medications, and so on. These all have to be imported, which is a difficult process for ordinary fish farmers while commercial firms are reluctant to import them because of the limited customer base. Suitable feed is of critical importance as commercial fish farming is impossible without high-quality feed, including specialised types such as the floating pellets used in cage culture. Local feed manufacturers may have the capacity to provide such feed but will not import the necessary equipment until an assured market exists.

Outreach, education and training

Modern aquaculture is a high-technology activity and investors must get the right advice before starting fish farming. In the past some farmers have fallen into the hands of self-declared consultants with no experience in fish farming, resulting in financial losses, abandonment of fish farms and a general reluctance to invest in aquaculture. Much needs to be done to ensure that an extension service system with well-qualified advisors is available in the region to advise potential investors.

Marketing and producer organisations

Farmed fish should be marketed as a different commodity from fish caught from the wild because age and size are not a legal consideration in aquaculture as long as the market accepts the product. A system should be put in place so that farmed fish can be distinguished from wild fish so as to prevent the capture of immature fish. In many countries farmed fish are sold live, thus the purchaser can be certain that it is fresh. Effective organisations that are able to link producers with markets will be needed if aquaculture is to grow and produce

enough farmed fish to meet the current and future demand for fish. Such producer organisations can develop systems for transportation to markets, the sale of produce from the farms, information gathering and sharing among members

Profitability

Successful aquaculture is usually preceded by successful fishing industries that establishes a demand for fishery products, and develops markets and infrastructure for processing and distribution. The opportunities for the growth of aquaculture arise when fishery production begins to decline and the price of fish products increases. The decreasing supply of fish from Lake Victoria creates just such an opportunity for aquaculture development in the region. Farm gate prices are rising to the extent that it may be more profitable to supply fish in regional markets rather than export it to Europe. However cost-benefit ratios will depend on the species being cultured, the availability of quality feeds, and other input costs and it is not possible to predict probable profit margins for all production systems. This is one of the areas where research should help to provide indicative figures to meet the need for bench marks to guide potential investors.

Regulation, control, monitoring and policy implications

Each East African country currently has its own regulations for fish farming. In Uganda, for instance, it is regulated under the Aquaculture Rules 2003, which describe the various requirements, permits and fees set out by the Department of Fisheries Resources. From a farmers' perspective the rules seem to have been developed ahead of the industry they are supposed to regulate. They need further revision to produce a regulatory framework commensurate with the growth of the industry. A National Aquaculture Development Strategy for Uganda has been developed with support from FAO and is about to be adopted by the government.

In Kenya, a new fisheries policy seeking to regulate aquaculture practices, amongst other things, has been launched. Subsequently, the Fisheries Act Cap 378 (1989) is being reviewed. The government in its effort to promote fisheries and aquaculture created a fully fledged Ministry of Fisheries Development. Like in Uganda, Kenya with the aid of FAO is finalising its National Aquaculture Development Strategy, which is in line with its National Fisheries Policy. The Ministry of Fisheries Development has established a Directorate of Aquaculture Development and a National Aquaculture Development Working Group to spearhead the development of the aquaculture sector. As more emphasis is put on aquaculture there will be need to ensure that the regulations developed are conducive for the growth of the industry and not a hindrance. The National Environment Management Authority (NEMA) of Kenya is mandated to exercise general supervision and co-ordination over all matters relating the environment. One of the environmental aspects of aquaculture that is regulated by NEMA is the introduction of any animal or plant (or any part of plant specimen) whether alien or indigenous in a lake, river or wetland. This regulation is found in the

Environmental Management and Coordination Act (EMCA, 1999).

In Tanzania the government has established a Directorate of Aquaculture Development (DAD) responsible specifically on issues pertaining to aquaculture development. Tanzania also has been formulating a National Aquaculture Development Strategy (NADS) which is in final stages of endorsement.

Conclusions

Capture fisheries can no longer meet East Africa's fish needs, whether for local consumption or export. The broad strategic approach is to safeguard the capture fisheries whilst promoting regional aquaculture programmes that can make significant contributions to the supply of fish. The gap between the supply and demand of fish is likely to widen if aquaculture programmes do not move from policy pronouncements to a practical transformation of the industry.

East Africa has adequate resources to produce fish from aquaculture but this potential can only be realised if the sector is reorganised and production targets set. Reorganisation should be extensive and take into consideration production systems, infrastructure development, linkages between production and markets, and the harmonisation of development strategies and plans across the region. The linkages between public institutions such as regulating agencies, research institutions, and finance houses with the private sector are particularly important and will need to be given special attention.

In view of the urgent need to increase aquaculture production to a much greater level than at present, the following recommendations have been made:

1. Clear and harmonised policies and legislation for aquaculture development in the region must be developed.
2. The formation of producer organisations should be promoted, and supported until they become self-sufficient.
3. A system for the collection and publication of reliable and up-to-date aquaculture statistics should be developed.
4. Training institutions, such as universities or agricultural colleges, should be assisted to develop

aquaculture curricula with an emphasis on practical training.

5. Governments should consider strategic interventions to support the private sector in aquaculture.
6. The efficiency of earthen ponds should be improved through the promotion of aquaculture parks or clusters. At the same time, aquaculture systems should be diversified from earthen ponds to tanks, raceways and cages.
7. Scientists and managers in the region should be encouraged to produce well packaged information for various users.
8. Service providers such as well as consultants and other experts, should be certified to safeguard investors from wrong advice.
9. Researchers, managers and the private sector should collaborate to provide bench marks to guide potential investors in aquaculture.

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