



SARNISSA AQUACULTURE POLICY BRIEF #2



Key policy messages

- Small-scale aquaculture linked to agriculture and/or livestock systems can enhance the diversity, resilience and output of the total farm system and improve household food security and nutrition, but requires intermittent technical assistance to fish producers to best combine fish farming with other production activities and to develop locally appropriate technologies. Farmers must also have access to good quality fingerlings.
- Small- and medium-scale, (semi-) intensive aquaculture production systems (SME's) can enhance local economic development and urban food supply and nutrition, but need appropriate support in business management and marketing, better access to finance, and to reasonably priced quality inputs, especially quality fingerlings and commercial feeds.
- Large-scale, industrial aquaculture can help to generate foreign exchange and employment and may increase supply of fresh fish and other aquatic products, but requires private sector investment, minimization of environmental impacts, a stable political and economic climate within the country and strong international partnerships.

BUILDING BLOCKS

Specific development perspectives and support needs of three main aquaculture production systems

Three main aquaculture systems can be distinguished in sub-Saharan Africa, differing significantly in their management logic as well as their resource use:

- Small-scale aquaculture as a component of rural farm systems:** the fish cultivation is linked to agriculture/livestock; mainly on-farm resources (animal wastes, agricultural by-products, family labour) are used; only supplementary use of artificial feed; mainly extensive and some semi-intensive fish production for self-consumption and, occasionally, local markets.
- Small- and medium-scale, (semi-)intensive aquaculture (SME's):** more specialized aquaculture enterprises; use of artificial feed; mainly semi-intensive/small-scale and some intensive/medium-scale fish production for local and urban markets; apply mainly family labour; at medium scale also hired labour.
- Large-scale, industrial aquaculture:** industrial fish production; often vertical integration of fingerling and fish feed production, ongrowing, processing and marketing; hired technical management and labour; mainly foreign capital; producing for export and, increasingly, for regional and national markets.

When defining aquaculture policies and strategies it is crucial to recognize that the three aquaculture systems have their own merits and limitations and contribute differently to achieve various policy objectives. They differ also in their support needs and each aquaculture system requires a specific set of interventions, resources and budget to help solve its specific constraints and to allow its development to full potential.



Government fisheries research and demonstration farm, Niger

Small-scale aquaculture as a component of rural farm systems

The development of aquaculture in sub-Saharan Africa has for many years mainly been placed in the context of poverty alleviation and enhancing food security in rural areas by its complementary introduction to existing crop and livestock farming systems, mostly comprising of small fish ponds (between 100 and 200 m²).

Mainly family labour and on-farm resources are used, such as farm by-products and animal wastes. Nile tilapia and African catfish are the most widely farmed species. Yields vary widely but are commonly found to be in the range of 0.1-2.0 tonnes per ha per year.

Main benefits

- Enhanced diversity, efficiency and total output of farm systems (by on-farm use of crop by-products and animal wastes and by making use of land that is less suitable for crop and livestock production).
- Raised income for rural smallholders (due to the higher efficiency and total output of the integrated farm system).
- Enhanced resilience as fish ponds make water available for irrigation during dry periods, reducing the risk of crop failure.
- Enhanced food security and improved nutrition (animal protein, vegetables) at household and (to some extent) local level.

Main constraints

- Many programmes promoting fish ponds in rural areas show a lack of understanding of the local socioeconomic context and the resource limitations of the smallholder farmers (for example, labour limitations, competition for farm-based inputs with the other components of the farm system).
- Promoted aquaculture technologies are often inappropriate for the local conditions due to a lack of understanding of the local farming systems and low level of farmer participation in the selection and local testing/adaptation of the technologies.
- While the integrated model assumes optimum use of locally available resources, often subsidized inputs are provided during the introduction period through externally funded donor projects or government extension. This (in combination with poor selection of beneficiaries) has important consequences:
 - a. Many beneficiaries may just participate to get access to scarce and subsidized inputs (which they then often use in farming operations other than aquaculture).
 - b. The distribution of highly subsidized inputs creates a culture of dependency rather than a spirit of commitment, auto-development and entrepreneurship.In this context, a relatively high percentage of these rural fish ponds are abandoned as soon as the external support ceases.
- The technical knowledge/skills of the fish farmers remain insufficient due to the short period of (often project-based) technical assistance, lack of real exchange between technicians and producers and little practical, hands-on training, often resulting in poor water management, feeding and breeding practices and only partial integration of aquaculture in total farm management.



Poultry-fish integration, Salama farm, Uganda

Small-scale aquaculture as a component of farm systems, Cameroun



Policy recommendations

Support for the development of aquaculture as a component of farm systems is especially meaningful in the context of policies and strategies that aim to enhance the diversity and resilience of existing smallholder production systems, enhancing income for rural smallholders (resulting from increased total farm output) and improving food security and nutrition in rural areas.

Recommended “building blocks” for effective policies and strategies to support the development of this production system:

- Focus research and extension support on areas with high potential for integrated fish-crop and/or fish-livestock systems and on the most promising clusters of fish-producing smallholders with a strong commitment and sufficient capacities to further develop their integrated fish/farming system.
- Stimulate the private sector to set up hatcheries in order to ensure supply of quality fingerlings to clusters of fish producers
- Aquaculture researchers to develop practical and financially viable models (extensive and semi-intensive) and technology packages that are well adapted to the local conditions (available land, labour, financial means, by-products and animal wastes) through participatory, on-farm trials and research, taking into account the opportunity costs of aquaculture in comparison to other farm sub-systems.
- Ensure intermittent training and technical assistance to clusters of fish-producing smallholders, focussing such assistance on better integration of fish farming with other production activities and improving the technical and business management of the integrated system.

Strong involvement of the beneficiaries in the decision-making on training and extension activities is needed.

- Local educational centres, small-scale businesses, NGOs and producer organizations should play an important role in implementing training and extension activities. A good example of this is the Nana Siaw commercial Clarias hatchery farm in Ghana, which runs hatchery training courses for other farmers in the region.
- More support is needed for strengthening the organization of and cooperation among small-scale fish producers (good examples include the Aquaculture Association of Southern Africa, and the Walimi Fish Farmers’ Co-operative in Uganda). Stronger involvement of the producers’ organizations in marketing and project design and implementation. Encourage annual national fish farmers conferences, such as those in Uganda and Ghana, to share information and develop contact networks.
- Improve availability, quality and cost of feed ingredients for farm-made feeds and access to information on adequate fish feed formulas that can be produced on-farm.
- Monitoring of this type of aquaculture should focus on the productivity and efficiency of the whole farm and not just of the fish farming in isolation.



Semi-intensive production, Nyaguta, Kenya

Small- and medium-scale, (semi-) intensive aquaculture (SME's)

This production system includes the small- and medium-scale entrepreneurs that are specializing in producing fish and other aquatic products for local and urban markets. They invest their own, and loaned resources, apply family labour and sometimes outside labour and make use of purchased inputs. These systems can achieve production levels of around 2.5-6 tonnes per ha per year, and in areas with good market access, profits can be significant. Newer developments involve the use of more advanced technologies, such as the use of cages, tanks and recirculation systems.

Main benefits

- Local economic development; development of SME's by local entrepreneurs (in fish production as well as in supply of required inputs and equipment, transport, marketing).
- Higher volumes of fish marketed with positive effects on local and urban food security and nutrition.
- Generation of income and (mainly self-) employment.
- Relatively low levels of investment needed.

Main constraints

- Quality fingerlings and fish feeds are often irregular in supply, of low quality, or prohibitively expensive (for example, when feed is imported). Government-operated nurseries, hatcheries and feed mills often do not function well, while there is a lack of privately owned and operated input suppliers.

- Lack of financial resources to buy the required quality inputs due to insufficient access to credit.
- Poor links with markets; locations far from urban markets, bad roads and lack of preservation and storage facilities; poorly developed value chains; limited access to up-to-date information about legislation and market opportunities.
- Insufficient knowledge and skills to allow successful commercial operation due to limited access to extension support which is often of low quality: not practical, with insufficient attention to business/marketing.
- Low level of development of producer organizations, which hinders access to sources of information, joint purchase of inputs and marketing, and farmer participation in policy and project design.
- Technologies and species are often not well adapted to local conditions due to a lack of applied on-farm research and low level of farmer participation.

Policy recommendations

Support for the development of small- and medium-scale, (semi-) intensive aquaculture is most meaningful in the context of policies that seek to enhance local economic growth, develop local enterprises, as well as to promote income generation and increased supply of fish/protein to local and urban populations.

The following measures have been identified as important “building blocks” for effective policies and strategies to support the development of small- and medium-scale, (semi-) intensive aquaculture:

- Focus support on farms located in peri-urban areas in order to reduce logistical problems and lower the costs of input supply and marketing.



Entrepreneurial *Clarias* production, Lagos, Nigeria

Pumping equipment for (semi) intensive farming



Research and extension support is also easier/cheaper to organize in these areas, there are better opportunities for multi-actor value chain development and there is less need for cold storage infrastructure.

- Give special attention to enhancing the profitability of small- and medium-scale aquaculture farms; Stimulate producers' skills in market analysis and business planning; Better selection of technologies and cultured species ("hardy" with efficient feed conversion).
- Promote effective record keeping of the fish farms' technical and economic performance by the producers with the help of tools that are adapted to their abilities.
- Promote separate establishment of local hatcheries and feed producing units by private actors that supply good quality fingerlings and fish feed (plus advice) to clusters of fish farmers at affordable prices. This may require public-private partnerships and government co-investment in infrastructure and/or equipment. Also, easy-to-follow manuals for design and management of various types of installations need to be provided. In Uganda and Kenya, the establishment of commercial private sector feed mills producing floating pellets has greatly benefitted the development of aquaculture.
- Provide high quality training and intermittent technical assistance to improve technical management (especially broodstock management, hatchery and fingerling production skills, optimum stocking practices), business management and marketing skills of the small-scale fish producers. To that effect, producer associations, NGOs and local universities need to be strongly involved as providers of training and extension services.

Also, online information centres and other modern media should be applied to improve the access of the fish producers to technical and market information.

- Develop financing mechanisms that enhance access of small- and medium-scale commercial fish farmers to start-up and working capital (for example, support the establishment of savings and rotating credit schemes by farmer associations and provide guarantees to credit institutions enabling them to provide credit to small-scale producers on acceptable terms).
- Support product branding/promotion and market diversification; support infrastructure development (for example, for fish preservation, as in Nigeria, where a fish smoking sub-sector was set up, allowing the fish marketing chain to develop without dependence on cold storage facilities); establish quality standards; support diversification into niche products such as ornamental fish, organically certified aquaculture, seaweed and other aquatic plants, amongst others, by providing information on successful experiences such as the market-oriented production of spirulina by groups of women along Lake Chad.
- Enhance the capacities of the associations of small- and medium-scale fish producers so that these can play a stronger role in information collection and sharing, purchase of inputs and marketing. Also, group/cluster certification of fish products could be encouraged (see for example, guidelines developed in India by the Network of Aquaculture Centres in Asia-Pacific: <http://www.enaca.org>).



Supply of quality fingerlings crucial to aquaculture, SON farm, Uganda



Large-scale industrial aquaculture

During the past few years, governments have also supported the development of larger-scale fish producing enterprises, mainly by making investments more attractive to foreign organizations. These enterprises are generally located around larger cities and close to export hubs since they often produce for regional and international markets. They use high levels of high quality inputs, which are mainly imported or produced by the same enterprise (through vertical integration of a hatchery, nursery and feed mill). Production systems are advanced and include large-scale tilapia production in lake-based cages (Ghana and Zimbabwe), production of shrimps (Madagascar), of abalone, mussels and oysters in the marine environment (South Africa) and niche products such as trout (Kenya, South Africa), crocodiles (Kenya) and ornamental fish (such as koi carp in South Africa). Production levels are high (10-200 tonnes per ha).

The ownership and investors are often separated from the technical management of the fish farms, which, in these enterprises, is performed by contracted specialists.

Main benefits

- Earning of foreign revenues.
- Direct and indirect employment creation; some employers are also offering employee health care and local community support.
- Next to export, fish (e.g. tilapia and Clarias) and fish by-products are increasingly made available in the in-country markets.

- Potentially also: positive effects on the local economy (if resource materials and equipment are bought locally and/or the enterprises take on a role as suppliers of quality fish seed and feed to local small-scale producers or share the results of their own research).

Main constraints

- Political and economic instability (partly due to bad governance) and tax regimes that scare off foreign investors.
- Complex import regulations and corruption that hinders the import of essential equipment and quality inputs.
- Complex or missing legal frameworks; lengthy and costly legal procedures (for example, for environmental impact assessments).
- Lack of good infrastructure (such as well-serviced land at low cost close to export hubs).
- Smaller (especially local) investors often have trouble finding sufficient capital (for infrastructure, equipment and inputs) and qualified technical assistance.
- Foreign exchange earnings from large-scale, commercial fish farming are often misused and poorly (re)allocated, reducing the net benefits of this system for the country.

Policy recommendations

Government support to the development of large-scale industrial aquaculture enterprises is most meaningful in the context of policies and strategies that focus on industrial development and enhanced export revenue earnings with potential for significant direct and indirect employment generation.



Commercial abalone culture, South Africa



Industrial aquaculture, MALDECO, Malawi



Key “building blocks” for the support and regulation of the development of large-scale aquaculture enterprises are:

- Stimulation of investment by the private sector in medium- and large-scale aquaculture production, as well as high-production fish hatcheries and quality feed mills, for example, by reducing taxes on the import of essential inputs and ensuring their rapid flow through customs (which can have important impacts on the industry’s costs structure and, hence, competitiveness), preferential foreign exchange rates, simplification of certain regulations and processes (for example, obtaining licenses, simplification of environmental impact assessment procedures and requirements).
- Enhancement of the benefits provided by large-scale enterprises to the small-scale aquaculture sector (supply of quality seed and feed to small-scale producers, sharing technological advances, etc.), the local economy (use of locally sourced materials and machinery, employment of local workers) and to society at large (government to apply effective income redistribution schemes for foreign cash earnings generated by the aquaculture industry); Promising examples are Lake Harvest, Zimbabwe, which puts by-produce on the local market, and Tropo Farms, Ghana, which makes wide-ranging use of local suppliers.
- Prevention/minimization of negative environmental impacts (threats to biodiversity, conversion of mangrove systems and sea grass beds, negative effects of intensive feed use) using environmental impact assessments;

Having well defined and transparent legal processes for new entrants to the aquaculture sector, for example, clear guidelines on Environmental Impact Assessments, Employment legislation and Post Harvest Food Safety.

Government staff should have the necessary expertise, qualifications and experience to implement these regulations.

- Promotion of the development of specialist, high-performing non-fish meal feed sources, funded largely by the private sector.
- Promotion of stronger partnerships, cooperation and communication between actors in exporting and importing countries across regional and international markets and value chains for aquaculture products.



Commercial cage culture, Uganda

SARNISSA-Sustainable Aquaculture Research Networks In sub-Saharan Africa

Aquaculture (the farming of aquatic organisms, including fish, molluscs, aquatic plants and other aquatic products) in sub-Saharan Africa has good potential due to increasing demand for fish and other aquatic products, the decline in marine and freshwater fisheries, favourable natural conditions for fish farming and the availability of relatively low-priced land and labour. The development of aquaculture in sub-Saharan Africa has received much policy and donor attention over the past 30 years, but generally the results have been disappointing.

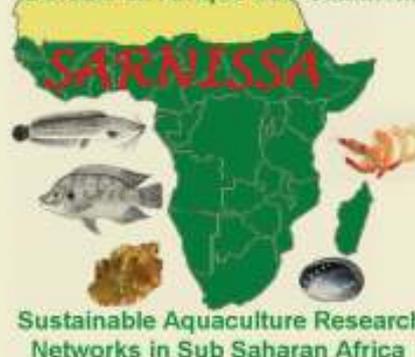
*SARNISSA, an EC funded collaborative research project of European organizations and partners in sub-Saharan Africa, implemented **analytical reviews of national aquaculture policies and development programmes of ten countries in sub-Saharan Africa (Malawi, South Africa, Zambia, Madagascar, Uganda, Kenya, Cameroon, DR Congo, Ghana and Ivory Coast)** in order to understand why the development of aquaculture remained below expectations and to identify opportunities for improvement (reports available at: www.sarnissa.org).*

The results of the SARNISSA studies are summarized in two Policy Briefs that provide evidence-based recommendations for governments and other stakeholders to ensure aquaculture fully fulfils its potential in SSA.



On farm handling and sorting fish for the market, Egypt

Reseaux de Recherche sur L'Aquaculture
Durable en Afrique Sub-Saharienne



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