



AgriFoSe2030

Agriculture for Food Security 2030
- Translating science into policy and practice



Knowledge exchange to promote sustainable development of small-scale aquaculture

Aquaculture plays an important role in meeting the global goal of ending hunger, achieve food security and improve nutrition (Sustainable Development Goal 2). A workshop in An Giang, Vietnam in 2017, gathered aquaculture researchers and stakeholders from Vietnam, Cambodia, Tanzania and Sweden. The aim was to initiate north-south-south collaboration and identify forms of knowledge exchange between researchers in the different regions as well as between researchers and farmers in each region to promote sustainable small-scale aquaculture production. In this brief, the authors summarize the main findings from the workshop and follow-up held at the Agri4D conference, September 2017, Uppsala, Sweden.

Fish from small-scale aquaculture matter for food security, nutrition and livelihoods

The Food and Agriculture Organisation (FAO) underline the great importance of small-scale aquaculture for nutritional and food security in resource-poor tropical regions. For many, fish is the main or only source of animal protein, and fish products contribute with essential fatty acids and micronutrients. Since the 1980s, the main growth in fish supply for human consumption has been from aquaculture; inland pond aquaculture is the fastest growing food production form globally, given volumes.

Key findings

1. Small-scale aquaculture is important for low- and high-income countries, however, to reach food and nutrition security, improve livelihoods and understand which fish are assessed as high-value niche products depend on the context.
2. Large size aquaculture farms are cost-effective, so to obtain the regional and local socio-economic benefits of small-scale aquaculture, the public sector must find ways to create financial incentives to overcome the size effect.
3. All regions can gain much by learning from Vietnam's parallel development of small- and large-scale aquaculture and initiatives on climate change adaptation.
4. Aquaculture leads the way in the ongoing paradigm shift from knowledge transfer to knowledge exchange between high- and low-income regions.
5. By including a partner acting as an interface, high-income regions can improve their production methods. They could increase their efficiency in terms of technology, animal health and environmental measures.
6. The gap between applied research and daily routines at the farm must be bridged by developing dialogue mechanisms, e.g. via intermediators with one foot in each world, and via experimental farms.



Fish plays an important role in fighting hunger, malnutrition as well as in providing livelihoods and income to vulnerable populations. To the left local labour feeding fish in a typical small-scale fish pond farming system in the Mekong Delta. To the right fish caught as bycatches in the local rice fields.

Aquaculture in Southeast Asia

In Southeast Asia, there is a long tradition of aquaculture dominated by small-scale pond farming of e.g. carp, catfish, shrimps and lately also tilapia, often farmer-owned and managed. In Vietnam, small-scale aquaculture is crucial for food security, human health and livelihoods of resource-weak groups, while, in parallel, the developed intensive large-scale production of *Pangasius* catfish and shrimp provide revenues by exporting to resource-strong markets. In 2014, Vietnam was the third largest exporter of fish products globally. At present the fisheries and aquaculture sector are under pressure from population growth, climate change, environmental degradation and upstream river basin development activities such as dam constructions. This has forced the region, with Vietnam at the forefront, to develop aquaculture techniques and practises to adapt to these changes.

Aquaculture in sub-Saharan Africa

In many sub-Saharan countries, pond farming of fish has existed for many decades, but productivity is low. In Tanzania, the main farmed species are Tilapia and African catfish. Faced with stagnating wild catches and a decreasing species diversity, the African Union has prioritized aquaculture to reduce pressure on wild resources and promote social and economic development. However, poor quality of seeds, feed and preventive health methods as well as a poor knowledge base in general are main obstacles to increased aquaculture production in Tanzania.

Aquaculture in the Baltic sea

In the Baltic region, including Sweden, aquaculture was originally initiated by low-intensive pond culture using carp fishes, but has since then transformed into intensive open cage farming of cold-water salmonid species. More recent there is a growing interest in closed land-based systems using a combination of high tech and traditional IAA (Integrated Aqua- and Agriculture) solutions, farming tropical species, e.g. tilapia, shrimp and catfish. Total production is rather low and growth of the open farming production is stifled by environmental requirements aimed at limiting eutrophication and transmission of alien genes and diseases to the wild ecosystem. Even though technical skills and resources are good, Sweden lack the tradition and knowledge in farming tropical species.

North-south-south knowledge exchange

Vietnam has through the years built practical expertise in farming techniques and practices of both small and large-scale farming, and is presently looking for collaboration around sustainable and cost-effective measures for small-scale farming. Since increased aquaculture production is prioritized in most African national development plans, researchers at the workshops concluded that the sub-Saharan aquaculture industry could benefit and make fast progress from cooperation and learning from aquaculture success stories in other countries, such as Vietnam. Sub-Saharan Africa and Southeast Asia are two regions that share the



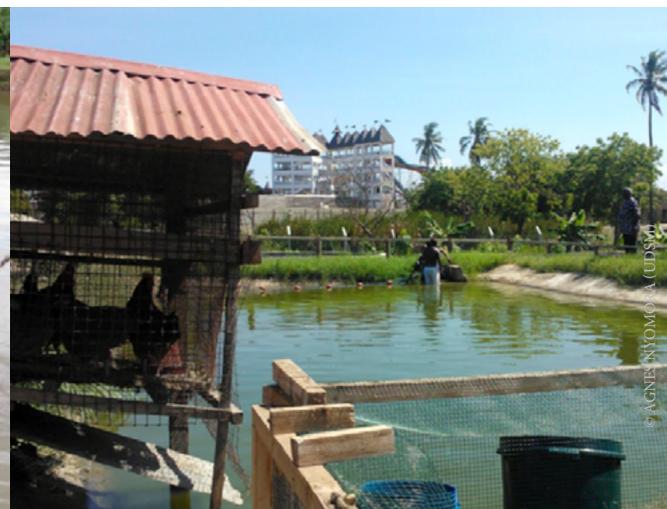
Small- and large-scale aquaculture provide work opportunities for women and thereby an income for families, where women often work on smaller farms and in fish processing in large-scale production industries.

same type of aquaculture species and systems, and challenges linked to climate change. Furthermore, it was concluded that such south-south collaboration could be significantly enhanced by including Swedish know-how of technical, veterinarian medicine and biological components of intensification, and where a partner such as Vietnam may function as an interface. Based on the discussions during the two workshops we concluded that there are some universal and common steps to develop both small- and large-scale businesses, giving nutrition security at local level, and an industry able to yield export incomes at national level. Such development requires the combination of both advanced technology and system knowledge, and a partner able to transform that into a low-tech environment. It was also recognized that a high-tech country as

Sweden, with a growing interest for IAA systems would benefit from extended knowledge exchange with countries experienced in tropical aquaculture. The workshop participants concluded that the flow of knowledge was not from one end to the other but rather consisted of a triangle or circle, which should be the future avenue for global aquaculture collaboration.

Knowledge exchange between aquaculture researchers and farmers

To develop aquaculture techniques and practises sustainably and efficiently, whether in Tanzania, Vietnam or Sweden, close dialogue between the research community, the government and the farmers is needed. But instead, there is often a gap



Typical low intensive small-scale pond aquaculture in Tanzania based on Southeast Asian traditions; Integrated Aqua- and Agriculture (IAA).



Two examples of IAA in Sweden. To the left African catfish in an indoor recirculation tropical farm rebuilt from a former dairy farm and to the right an indoor intensive tropical bioflock pilot farm for shrimp and tilapia rebuilt from a former industry facility.

between these three groups. Different models for how to bridge the gap between researchers and farmers were exchanged and discussed during the workshops. Farmer field schools (FAO <http://www.fao.org/farmer-field-schools/en/>), where farmers or local trainees attend an applied course at a national/regional education centre/farm connected to research institutions, was one example discussed and evaluated. An important conclusion was also that researchers should interact with those who train the farmers, i.e. the “master trainers” in a typical Farmer Field School setting. This middleman/intermediator could help bridge the gap between researchers and farmers by being the “translator” of both new research findings, and problems the farmers face. Further, the importance of building upon already existing advisory organisations and networks, e.g. women groups, were stressed. The workshop concluded that this is where academia can play an important role; in training the trainers. More traditionally, the academic researcher is interacting directly with the farmers. However, most participants indicated that researchers usually obtained only a more general understanding as their realities were too far apart. A middleman structure is therefore necessary to translate research findings into daily practices and vice versa; daily problems into relevant research questions. Also, based on interviews with farmers during the workshop, it was concluded that an experimental farm, where results from research could be transformed into daily routines and farm practices could be taught and implemented, would help integration of research findings. It would also increase researchers’ understanding of their relevance and identify knowledge gaps.

Recommendations and way forward

- Use intermediators to bridge gaps both at country and at research-farm level.
- Experimental farms are vital in the dialogue between researchers and farmers.
- Any business model for small-scale farming must include economic compensation for “soft” values, for example local food/nutrition security and livelihoods, including gender perspectives.
- Use aquaculture as a pilot to develop north-south-south exchange in food production.

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