

Factsheet midterm findings Global Challenges Programme Call 1



Nutritious-System Pond Farming in Vietnam

Summary

Aquaculture is the farming of fish and shellfish production in freshwater, marine and coastal environment. These production systems play a central role in global nutrition security and contribute to livelihoods of millions of people around the globe. With wild fish stock declining and aquaculture production increasing at almost 8% per annum in the last decades, aquaculture has become more important than fishery as food provision. This growth is enabled by an expansion of fish and shellfish farming areas and an intensification of the production systems that provide currently roughly half of the fish and shellfish consumed worldwide. An essential component for this intensification of aquaculture is feed, which uses significant quantities of aquatic (e.g. fish meal) and terrestrial (e.g. cereals and pulses) resources. At present, the aquaculture feeding systems target the animal (e.g. fish or shellfish), of which the requirements in terms of nutrients and energy have been studied, but without considering the possible contribution of the pond ecosystem and its food web to the animal's diet. The food web (e.g. the food chain within the pond from phytoplankton, microbes, and other organisms until the fish or shrimp in the pond) is stimulated by non-eaten and non-digested feed, which acts as a fertilizer to the pond.

The objective of this GCP-project is to design a "nutritious system" pond concept that exploits the potential of the pond ecosystem to mineralize wastes and produce natural foods. The project aims to increase the contribution of natural food produced in ponds to total pond production, and to make aquaculture less reliant on fish-oil and fishmeal. The "nutritious-system" concept aims to stimulate the microbes activity that mineralizes (or "processes") wastes in the pond and the production of high quality natural foods. Actually, *Nutritious-Ponds* search to optimize mineralization and nutrient fluxes through the food web. As such, the aim is to make pond farming more sustainable and predictable to farmers. This five-year project integrates three components: firstly, fundamental research; secondly, applied research with on-farm trials; and lastly, interactive design platforms to adapt the new feed system to the local technological, social and institutional context.

The *Nutritious-Ponds* project develops this concept using shrimp aquaculture in Vietnam as a model, and an innovation platform to design the technology in order to enable its uptake by the sector. This innovative feed-the-system concept will be developed in cooperation between industry (Nutreco - the Netherlands, Skretting- Vietnam, and Vemedim Animal Health - Vietnam), universities and research organizations (Wageningen University - the Netherlands, Can Tho University - Vietnam, and WorldFish) and Vietnamese farmers. The platform fosters the dialogue between stakeholders in the sector, shares results from fundamental research and on-farm trials, and supports the inclusion of different farm types in the innovation process.

Interim Research Findings

- Removing fishmeal and oil from shrimp feed did not reduce shrimp growth significantly, and replacing expensive organic nitrogen and carbon inputs by cheap inorganic forms did not affect shrimp growth..
- In a controlled environment, reducing the feed load of 40% while doubling the Carbon/Nitrogen ratio (up to 16; decreasing the amount of protein while increasing the amount of inexpensive carbohydrate) did not significantly reduce the total produced shrimp weight.
- Participatory analysis of the shrimp system showed that the uptake of the technology will be easier if the nutritious system ponds becomes more robust, such as: less sensitive to climate change and disease agents than the existing systems; counteracts inefficiencies in input quality of the feed; and disease management at the landscape level.
- An innovation platform composed of farmers, extension services, the private sector, researchers and NGOs defined experimental trials and their monitoring. The preliminary results showed that in semi-intensive and improved extensive systems, replacing about 25% of high priced ingredients

with less expensive carbohydrate sources can reduce the cost of production up to 10% while reaching similar productivity than in a conventional system.

Messages to

A) Actors from private sector:

- Co-design a new feed system with farmers, extension services, local authorities and other stakeholders. This will help to better fit the new feed system to the context and might facilitate its future uptake by different types of farmers.

B) Civil society and practitioners organizations:

- Sustainability and yield of extensive aquaculture systems, often applied by smallholders, can be improved by using the pond as a component of the feeding system.

C) Policy makers:

- To be sustainable, intensification of aquaculture production for smallholders should be based on ecological processes to reduce cost and environmental impact.
- Smallholders with limited investment capacity can also participate in an innovation process.

Knowledge products

- Two posters presented at the International Fisheries Symposium, held in Phu Quoc, Vietnam (October 31 - November 2, 2016):
 - Innovation Platform In Aquaculture, The Case Of The Nutritious Pond System Project
 - In situ production of omega-3 polyunsaturated fatty acids (PUFA) in shrimp ponds.
- One abstract presented by the PhD Devi Hermsen at World Aquaculture 2017 held in Cape Town, South Africa from 27 to 29 June 2017:
 - Nutritious Pond Project: New Steps in Developing a Sustainable Aquaculture Production System Through Diet Formulation.
- One paper published:
 - How is innovation in aquaculture conceptualized and managed ? A systematic literature review and reflection framework to inform analysis and action. *Aquaculture*, 470, pp.129–148 (December 20, 2016);
- A quarterly project newsletter is available on [Research Gate](#) and the [F&BKP website](#).

Knowledge networks

- The project initiated the Nutritious Pond Innovation Platform that includes farmers (extensive and intensive), private companies, feed producers, aquaculture certification bodies, research institutes, universities, and extension services.
- The Nutritious Pond Platform will soon be linked with a national aquaculture platform in Vietnam and other Asian countries as supported by the EC (EURASTIP platform) in 2017.

Co-creation

The Innovation Platform contributed to the design and the organization of the experimental trials. This multi-stakeholder approach helped to share results and ideas and discuss the implementation and responsibilities of each stakeholder's groups for the trials. It also created linkages and dialogue between stakeholder groups in Vietnam that usually do not meet such as small scale farmers and companies. The platform was also used to support the Rapid Appraisal of Aquaculture Systems where different stakeholders groups have identified constraints and opportunities for sustainable intensification of the shrimp aquaculture sector. It has supported lively debates between different stakeholder groups to identify future solutions for shrimp aquaculture development.

Future research and activities

The knowledge generated by experiments in a controlled environment will be published in peer review articles and integrated into the design of the new feed system by using the Innovation Platform as a tool to foster knowledge sharing. Research findings will also be presented in conferences to reach the scientific community. In the first months of 2017, new on-farm trials will be designed and deployed with the consortium of partners to test and fine-tune the new feed system and adapt it to local needs and environments. The project will facilitate uptake of the new technology by providing training seminars to extension services and private sector advisors by using the existing network of project partners that has been further developed and maintained from the beginning of the project. In addition, a communication plan will be developed to target different types of farmers (from low input extensive to high input intensive farmers) but also practitioners in for example international NGOs and development agencies supporting sustainable coastal aquaculture development, including the launch of the technology in local media in Vietnam.

Consortium Partners

- Can Tho University
- My Thanh shrimp association
- Hoa De farmer group
- [Wageningen University](#)
- [WorldFish](#)
- [Skretting Vietnam](#)
- [Nutreco](#)
- [Vemedim Animal Health](#)

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Project website

[F&BKP Research Project page](#)