

Improved Water Cycle Systems for Sustainable Fisheries Production in Aquaculture

Implemented by the *Fund for the Promotion of Innovation in Agriculture (i4Ag)*
As part of the special initiative *Transformation of Agricultural and Food Systems*

The Challenge

Meeting global demand for fishery products without harming local water resources

Shrimp production has gained in economic importance tremendously across Southeast Asia and holds great potential. It has become a branch of the agricultural economy, generating jobs, income, food security and foreign exchange as an export product. Indonesia and Vietnam together account for nearly a quarter of global shrimp aquaculture production.

Shrimp has become one of the most commonly consumed seafoods in recent years, as it is low in calories but rich in nutrients. Increasing demand for fish and aquatic products is putting pressure on natural resources and is putting the sustainability of marine and inland fisheries and aquaculture development into question. High market demand has contributed to a dramatic increase in land use for intensive and extensive shrimp production. The rapid expansion of aquaculture has made the sustainable use of natural resources (water and land) a problem and has contributed to the decline of mangrove forests. In addition, issues of environmental pollution, food safety and sustainability in the shrimp industry are receiving increasing attention at the political and operational levels.

At the same time, the driving innovations and technologies for shrimp production have not yet caught up and have been unable to resolve issues brought on by unsustainable practices and water resource use. Therefore, the adoption of innovative technologies for farming systems is the key driver of change towards the sustainable development of shrimp sector.

Name of the Project	Improved water cycle systems for sustainable fisheries production in aquaculture
Name of the Global Fund	Fund for the Promotion of Innovation in Agriculture (i4Ag)
Commissioned by	Federal Ministry for Economic Cooperation and Development (BMZ)
Project Region	Viet Nam, Soc Trang and Ca Mau province Indonesia, Nord-Kalimantan
Implementing Partners	Ministry of Agriculture and Rural Development (MARD), Vietnam Ministry of Environment and Forestry (MOEF), Republic of Indonesia
Duration	07/2021 - 12/2024

The Innovation

Development of cost-efficient alternatives for established technologies and sustainable shrimp production

The project promotes four innovations in different states of evolution:

Further development of improved water circulation systems
RAS (Recirculating Aquaculture System) is applied to recirculate farming water; this helps to minimise water usage and disease transmission, and reduce negative environmental impacts. This innovative technology has been used mainly by large-scale enterprises as it requires significant initial investment, understanding and experience with the technology. As part of this measure, the usability of RAS will be tested on small- to medium-sized farms.

Application of a mangrove shrimp production system
Innovations in water quality improvement for mangrove shrimp production, which help to reduce diseases and improve shrimp growth, will be promoted to enhance economic development and sustainable mangrove ecosystems.

Testing of shrimp larval production
Technologies to improve water quality in shrimp hatcheries will be tested to increase the survival rate of the post-larvae.

Redesigning extensive shrimp pond areas
Development of an innovative aquaculture system with traditional shrimp ponds and hatcheries for mangrove crabs. The aim is the sustainable use of mangrove forests and water resources, achieved through the promotion of intercropping, thereby reducing the water surface of the ponds and increasing the area of mangrove forest. 🌿

The Main Objective

More efficient and sustainable local value chains in order to safeguard jobs and improve environmental sustainability

Methodological Approach and Innovation Partnership

The project strongly promotes innovations and technologies for sustainable farming systems, ranging from intensive conventional farming to extensive farming. The success of the innovations depends, however, on how farmers adopt the appropriate technologies and management practices in the specific farming systems and environment. Hence, the approach of the project is to test innovative farming systems to prove that most sustainable systems work successfully, even extensive or intensive farming systems that require a high level of operational and management skills on the part of the farmer.

There is no unique system that can be identified as sustainable, and no single path to sustainability. The project establishes a strong partnership between different actors in the shrimp value chain to achieve mutual economic and environmental benefits while meeting global food demands. The knowledge and expertise from academia and institutions are utilised for innovations testing, via farmer education and training, advisory and information sharing. Gender-sensitive business models are initiated and implemented to secure farmers' incomes and promote gender equality. All project activities are designed to support the shift towards balancing economic efficiency with environmental and social sustainability.

Important Activities

- Develop and implement RAS (Recirculatory Aquaculture System) in the medium-sized shrimp farms and hatcheries
- Monitor environmental indicators through Information and Communication Technology (ICT) solutions
- Test innovations on water quality improvement for extensive sustainable mangroves shrimp production
- Organize workshops, forums and training courses on the technology's application for farmers and stakeholders and disseminate experiences
- Develop and implement an accompanying gender strategy to promote gender-sensitive business models for higher income opportunities for women

The objectives in figures

90 tons of shrimp/ha/year (3 cycles of 30 tons/ha) are harvested

90% of the wastewater is circulated

90% of the resulting sludge is collected and used

The project contributes to the achievement of these Sustainable Development Goals (SDGs):



Sustainability and Scaling Strategy

Shrimp farming communities are concentrated in the coastal and river delta areas of Vietnam and Indonesia, a sensitive region vulnerable to the impacts of natural conditions and climate change. In addition, the rapid expansion of aquaculture has contributed to the decline of mangrove forests and non-sustainable use of water resources. All these negative impacts make it difficult for shrimp farming households, headed by both men and women, to secure their livelihoods. As a result, labourers tend to quit production, change jobs or even move to other areas to live, leading to a population imbalance as well as to a lack of qualified human resources. Therefore, the successful testing of shrimp farming renovations, business models and improving environmental quality supports social security and the stabilisation of living conditions for residents of the coastal communities.

By documenting the lessons learnt, farmers and their families are able to build long-term capacities and pass on the agricultural innovations and disseminate them in the Asian region. The focus is not only on technical issues but also on socio-economic problems and the sustainable use of natural resources.

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