Aquamimicry

The New Shrimp Aquaculture Paradigm Shift in Thailand.

With the global population projected to reach 9 billion by 2050, the call for a global food production increase is inevitable. Fish production holds an important role in addressing the food security issue because it substitutes about 17 percent of the global animal-based protein supply and is expected to become a larger part of human diet in the future. Fish, including finfishes and shellfishes, is also the fastest growing food production sector based on FAO data. Nevertheless, the production from capture fisheries has been stagnant since about 1990, leaving aquaculture or farmed seafood as the only sector that can keep up with the demand for aquatic food. Currently, South East Asia countries, such as Thailand, Indonesia, and Vietnam, make up the major region for aquaculture production in the world. The governments of these countries are actively promoting aquaculture development through incentives and policies. However, unlike Vietnam and Indonesia, whose main priority in aquaculture development effort is still targeted towards expansion and national economic growth, Thailand has shifted its priority to sustainability.

Aquaculture in Thailand is facing two main problems; namely, negative environment impacts and disease outbreaks. According to Thailand's Department of Marine and Coastal Resources, seafood farms, shrimp in particular, have damaged about 70,000 ha of mangrove forests or about 19% of the total mangrove forest area in Thailand. Moreover, shrimp production in Thailand has collapsed many times due to disease outbreaks. Shrimp farmers in Thailand are still struggling to recover from the recent EMS problem. Farmers are not only suffering from losses due to the outbreaks, but also from the increased cost of production due to sticker biosecurity protocols. One of the viable solutions to solve these sustainability issues is through Aquamimicry.

Current Biofloc Technology

The principle of conventional biofloc technology is to promote the growth of heterotrophic bacteria by adding an external carbon source to the system such as molasses or sugar. With adequate carbon sources, heterotrophic bacteria will convert ammonium and other organic nitrogenous waste into biomass, which in turn will serve as an in situ feed for higher organisms in the system. By utilizing natural ways to treat the water and provide supplementary feed, biofloc technology shows potential to alleviate the sustainability issue in aquaculture. However,

due to the complexity of the system, the mode of actions of biofloc organisms in the system remains unknown. Research suggests that performance of biofloc varies depend on the selection of the carbon source and preferably smaller systems. Nonetheless, experts agree that a good candidate for carbon source should come from low-cost non-conventional agro-industrial residues. To answer this challenge, the **Thai Organic Shrimp Group** is advocating the use of fermented rice bran (FRB) as the carbon source and provides large surface area for probiotics to colonize and keep them suspension in their culture system. They have coined the term “Aquamimicry” to introduce their innovation in producing disease-free shrimp with minimum impact toward the environment. The key concept of Aquamimicry is rehabilitation and the usage of FRB as a natural food source with high surface area material for bacterial colonization (biofixation) to further encourage the growth of synbiotics and copepods development in the system prior to stocking new post larvae.

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Aquamimicry technology in shrimp farming is best installed in a relatively small pond, about 0.3 – 0.6 ha. The pond should have a central drainage and be aerated intensively with paddlewheel aerators. Sludge management is a major element of the operation. It is suggested to pump out the sludge for 5 to 15 minutes, 2 hours after each feeding. Prior to stocking, it takes about 7 to 12 days for biocolloids and copepods to develop as natural feed for post larvae. The Aquamimicry system requires a low biocolloids concentration of only 0.25 – 1.0 mL/L as settleable solids after 30 minutes settling time (SV30). Unlike current biofloc technology practices, C:N ratio is not monitored in this system. The management of Aquamimicry is done by adding 1-5 ppm of fermented rice bran everyday in order to maintain the biocolloids (turbidity) of water at 20-30 cm throughout the operation. Using this technology, fluctuation of pH and dissolved oxygen in the system is minimized; pH ranges from 7.7 to 7.9 and dissolved oxygen is stable at above 4.5 ppm (most preferably 5-8 ppm throughout the day and night).

Field trials of Aquamimicry (Table 1.) show promising results. Farmers were able to achieve a production rate of 16 tons to 23 tons per hectare in about 70 days with the total production cost per kg of shrimp (80 counts) being less than $2.50. Following the success of the trials, there are already some early adopters of this technology from various countries such as: Vietnam, China, India, Malaysia, Philippines, Indonesia, Korea, Ecuador, and many more. Universities in Thailand, including AIT and Kasetsart University, are conducting scientific research regarding Aquamimicry to study the mechanisms of the system and collect supportive scientific data.

Government's Support toward Aquamimicry in Thailand

Innovation in Aquamimicry is impossible without governmental support, whether through regulations or research. Fortunately, the government of Thailand has taken a proactive role in supporting the development of Aquamimicy technology. Recognizing the importance of bio-based technology in aquaculture, especially marine shrimp farming, the National Bureau of Agricultural Commodity and Food Standards of Thailand issued a standard on Good Aquaculture Practices for Marine Bio-Shrimp Farms in 2012. The issuance of this certificate is intended to encourage Thai farmers to produce higher-quality and safer products so that they could compete in global markets.

Furthermore, the transfer of knowledge in Aquamimicry between research institution or private sector and farmers has been made possible through the enactment of Thai National Farmers Council in 2010. Recently, the Thai National Farmers Council endorsed Aquamimicry technology to be adopted by Thai shrimp farmers, and as the result an Aquamimicry demo farm was established in Pranburi Province.

Lastly, Thailand has just approved an ambitious proposal from the Ministry of Science and Technology to make Thailand a global food innovation hub earlier this year. The newly launched project, called Food Innopolis, will serve as a platform to support food industry advancement at all levels. With production of premium seafood and aquaculture being one of the project's core focuses, it is anticipated that more research and development in Aquamimicry and natural aquaculture will be underway in the near future.

Trial	#1	#2
Pond Size (ha)	0.64	0.40
DOC (day)	71	67
Stocking (pcs)	900,000	900,000
Density (pcs/ sqm)	140	225
FCR	1.04	1.17
ABW (g)	13.15	12.19
ADG (g/day)	0.19	0.18
Survival Rate (%)	0.87	0.84
Production (g/ sqm/ crop)	1,609	2,315
Production cost (USD/ kg)	2.40	2.44

Table 1. Aquamimicry field trial results from the Thai National Farmer Council Demo Shrimp Farm in Sam Roi Yod, Pranburi Province, Thailand.

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Credit : Mr. Buncha Bunluedej farm owner and President of Sam Roi Yod "Co Op".
Mr. Veerasun Prayotamornkul, Founder of Thai Organic Shrimp Group and Aquamimicry.
Aquamimicry is the terminology developed by Aquaculture Aquaculture Alliance (AAA).