The Nutritious Pond Project

*Newsletter #6, October 2017*

Highlights

The second on-farm trials were completed this summer. Results in Extensive systems shows that our system is stable and can support a longer growth period. In semi-intensive system, we notice a very high disease outbreak control, longer grow period but growth of shrimp was hindered by very low water salinity.

The project team conducted a survey about perception of risk and adoption behaviours in 250 farms in the Mekong Delta to identify underlying factors affecting adoption of technology in different type of shrimp farms

Fundamental research showed that pond ecosystem can produced significant amount of polyunsaturated fatty acids that ultimately contribute to the shrimp diet. Those results were presented at the World Aquaculture Society in *World Aquaculture Forum* in Cape Town South Africa in June 26-30th 2017.

Kabir is now investigating how does the contribution of the natural food web to fish production varies due to the changes in the benthic community in ponds. Tinh is now testing different carbohydrate, stocking densities and feed ratios in super intensive system.
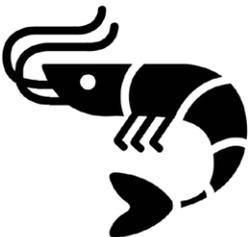
Extensive systems trials

System tested: 2 ponds, stocked with *P. vannamei* at a density of 10 PL/m^2 with the following characteristics and objectives:

- Reduction of 25% of the pelleted feed volume for the first 56 days, then a reduction of 15% only and addtion of carbohydrate.
- Natural feed contributed more than 15% to shrimp production.
- Control: ponds: Conventional extensive system without feeding but with stocking density above 10 PL/m^2

Compared to 2016, the carbohydrate (CHO) is made of cassava only Application of fertiliser and CHO before stocking to enhance natural productivity of the pond.

- Crop lenghts was increased in the two trial ponds compared to control ponds and the conventional system, leading to large size shrimp at harvest (45-35 pces/ kg).The yield achieved in the first trial pond was below expectation (>600 kg/ ha) due to low survival.

- In the tested system the FCR is lower than expected (0.37 instead of an expected FCR above 1), that might explain a slow growth at the end of the culture period. A possible explanation is that towards the end of the experiment the 85% feeding level is much less than the real 85% of the voluntary feed intake, because in the period before, the shrimp grew faster than expected. This issue will be adressed in the next trial. The second pond trial was not harvested yet in late September, after a culture period of more than 110 days, where shrimp sized reached 35 pcs /kg.

- The trials pond 1 achieved a net return above 1,000 $USD per hectare, with an investment cost of 859 $USD. Comparatively, only one of the control ponds achieved better economic results, but with higher risk of disease outbreaks with 66% percent of failure in last 3 years.

- Farmers reported that use of CHO to prepare the pond and early stage of growth has a signficant effect on shrimp production and the pond environment. Effort needs to optimise the system for the grow out period after 40 days.

	Pond 1	Pond 2	Control 1	Control 2
Crop Duration (days)	87	>110	75	33
Production (kg)	340	To Be Determined	280	-
Yield (kg/ha)	378	TBD	622	-
Size at harvest (pcs/kg)	45	35	160	-
Survival rate (%)	20	TBD	75	0
Feed Used (kg)	126	437	60	0
FCR	0.37	TBD	0.21	0
Observation	Lack of oxygen after heavy rain - change of water + partial harvest			White spot at 33 days

Semi-Intensive systems trials

System tested: 2 ponds, stocked with *P. vannamei* at a density of 30 PL/m² with the following characteristics and objectives:

- Reduction of 85% of the pelleted feed volume and addtion of carbohydrate. Natural feed contribute to more than 15% to shrimp production.
- Target yield of 3,700 kg/ha, a survival rate of 63% and a FCR of 1.3.

After for Extensive systems, the carbohydrate (CHO) is made of cassava only and fertiliser and CHO is applied before stocking to enhance natural productivity of the pond.

- Trials in rice-shrimp model in semi-intensive system were succesfull in 2017, in comparison to the control ponds and neighboring ponds in Hoa De cooperative. The tested model showed:

- Capacity to increase culture period above 70 days, without major disease outbreaks. In comaprison,, all control ponds failed due to disease outbreask after 30-50 days.

- Reduced investment cost, with less probiotics and minerals used. Water quality parameters were stables, and use of CHO + fertilizer during pond preparation was beneficial resulting in a fast growth in early stages. FCR was still below 1 and a high survival rate (>90%).

- However, low salinity in ponds (2-4 ppt) and heavy rain reduced growh rates, and shrimp sized at harvest was sub-optimal (83-150 pcs/kg), lowevering economic results.


	Trial Ponds	Control Ponds
Crop Duration (days)	70-80	31- 44
Yield (kg/ha)	1,900 -2,700	0-1,750
Size at harvest (pcs/kg)	83-150	100- 205
Survival rate (%)	74-99	0-99
FCR	0.57- 0.88	0.45-1.31
Net return $USD/ha	1,900-5,000	-4,000 to 1,000
Observation	Slow Growth >60 days	EMS

Fundamental Research

Research of Devi Hermsen on Omega-3 transfer in the pond compartment is now advancing fast.

Experimentation are finished and data are now analysed. Preliminary results showed that the ecosystem of the pond produce a type of highly unsaturated fatty acids (EPA) de novo, when all EPA are removed from the feed.
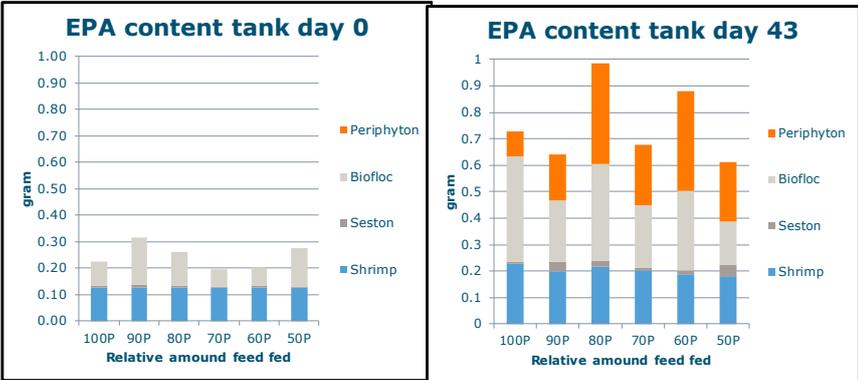
Kabir is testing the Nutritious Pond concept on tilapia culture in Bangladesh. His research aims at quantifying the contribution of pelleted feed directly eaten and the different pond compartments (water column, benthos) to fish and shrimp production. Previous experiments showed that contribution the water and benthic routes contribution declined with increase in shrimp biomass in the system.

The 2nd experiment on Tilapia follows the same experimental design in compartmentalized ponds and flow-through tanks, to answer the following research questions:

•How is the benthic community in ponds influenced by changes in the non-protein energy content of the diet?

•How does the contribution of the natural food web to fish production varies due to the changes in the benthic community developing in ponds and tanks?

Experiments are completed. Kabir is now analysing samples taken during the expriment. Beside analysis of different pond compartments, there will be microbial DNA analysis of fish guts beginning and end of the experiments.

Kabir started his 3rd experiments, with a focus on the role of addition of non-digestible carbohydrate in the feed, and its role on quantity and quality of faeces, and how does it influence the natural food-web.

While monitoring his epxeriments Kabir found time to presents his research to Bill and Melinda Gates foundation Team visiting Khulna !

Tran Huu Tinh, Vietnam

From March until the end of May 2017, Tinh experimented the effects of feed and CH addition at different culture densities and if the same principles of feed and carbohydrate addition apply to different culture densities.

The results of the 2nd experiments at low density (26 ind/m^3) earlier this year showed that increased CH addition yielded:

• Better final biomass, average final weight, daily weight gain
• Lower FCR (when CH not accounted as a food source for shrimp). Interactions between carbohydrates and feed dose was detected, which means the effects of feed load and C:N ratio level are additive

Tinh is pursuing is 3rd experiment on focusing on the effects of different feed and CH addition rates on production, water quality and microbial parameters super-intensive white leg shrimp tank culture system (300 ind/m^3).
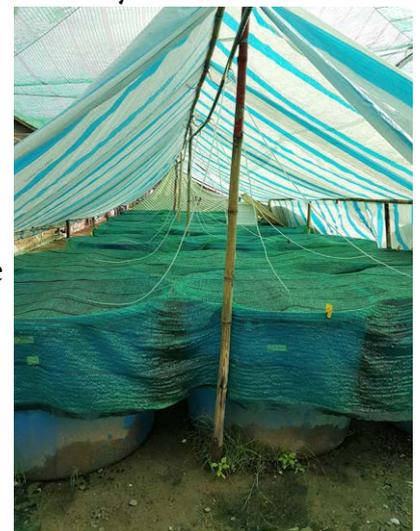
Farmer's behaviour survey

To understand role of risk perception and risk management strategies we surveyed 250 shrimp farmers in the Mekong Delta. Very little is known about farmer's decision making in the aquaculture sector beside economic modelling or correlation with farm and farmers characteristics (size, wealth status).

Previous assessment identified the importance of risk and risk management strategies to influence adoption of technology, as well as the role of network and trust of the different knowledge sources. We looked at those factors across different shrimp farm types of different farming intensities.

Preliminary results showed that confidence and relative risk attitude also determine risk management strategies, when you are confident in controlling disease and selecting inputs and a risk taker the farmer will invest technology-oriented strategies. Extensive farmers are more concerned about climate related risks, while market risk concern more intensive

farmers. Confidence in mitigating disease risk measures also varies, with higher confidence with intensification. Those differences resulting in different risk management strategies.

We identify a clear distinction between intensive and extensive farms in access to knowledge that ultimately will influence risk management strategies followed by farmers. From the survey it was clear the private sector advisors, processing companies and inputs retailers are considered as not trustworthy by farmers.

Up-coming analysis of dataset will look at building a model that can partially explain adoption of technology and choice of farmer based on those underlying factors.

Past and Up-coming events & news

Devi presented her research on Omega-3 transfer in the pond compartment at the World Aquaculture Forum in Cape Town South Africa in June 26-30th 2017, with additional support from Skretting.
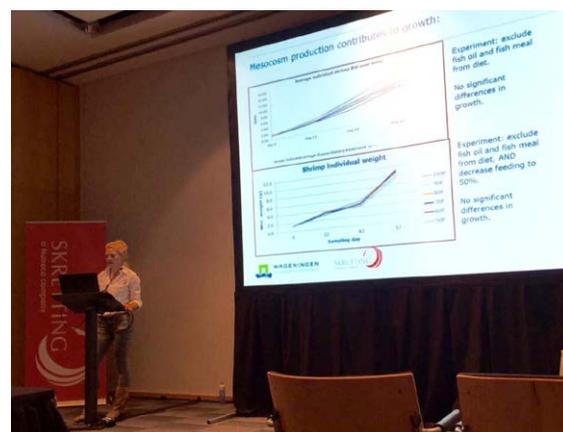
The first week of October will be the next Innovation Platform (IP) Workshop held in Can Tho University. The IP members will discuss the results of the trials and design the next trials.

We are glad to announce that Tran Nguyen Dui Khoa, our platform coordinator in Can Tho University is now registered as PhD student in Kagochima University in Japan. His research will focuss on marine aquaculture.

…and we are welcoming Dr Toi from College of Aquaculture and Fisheries of Can Tho University who will coordinate the Innovation Platform.

Next issue December 2017

- *More scientific outputs from PhD research*
- *Modelling farmers behaviours*
- *Outcome from Innovation Platform workshop*

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