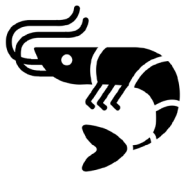


The Nutritious Pond Project

Newsletter #8, July 2018

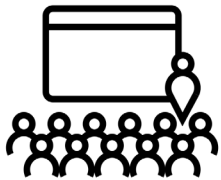
Highlights - In this issue



2018 On farm trials: Preliminary results of 2018 trials

Cluster or not cluster: effect of farmer clusters on technology adoption

Lab. research: Progress in data analysis about organic matter production in different compartments of the pond, effect of protein :energy ratio of feed on fish growth and the effect of carbohydrate source on shrimp growth



New publications and The Nutritious Pond Project at World Aquaculture Montpellier

Update about the farm trials



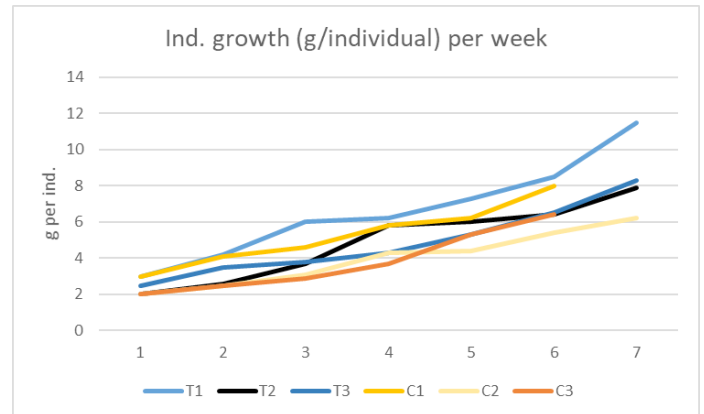
Field trails were conducted in 3 trials and 3 control ponds from April 10th mid and end of June in Hoa De Cooperative, Soc Trang Province Vietnam. For this trial we tested a new combination of feed and carbohydrate, with the following characteristics:

- Molasses as carbohydrate – added daily to the pond at the same frequency as feed;
- Progressive feed load, with a reduction of the recommended feed load of 25% (from day 1 to day 25), then 15% reduction until day 45, followed by a reduction of 5% until day 60 and 10% reduction until harvest.
- Farmers could adjust feed load based on feeding tray monitoring (daily adjustment) and growth rate (weekly adjustment).

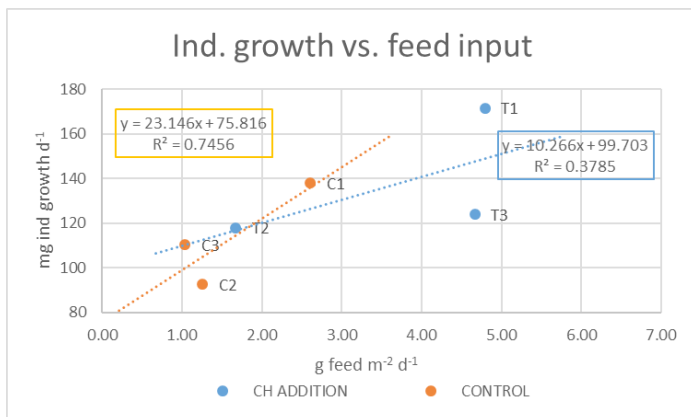


Both trials and control ponds faced slow growth and symptoms of Yellow Head diseases appeared after 29 and 50 days of culture in control and trial ponds. The culture period was shortened, with 66 days of culture in *Control ponds (C)* and 72 days of culture in *Treatment ponds (T)* with carbohydrate addition (see figures below). Slow growth was observed in *Control ponds*, more than *Treatment ponds*, inciting farmers to reduce the feed load during the crop.

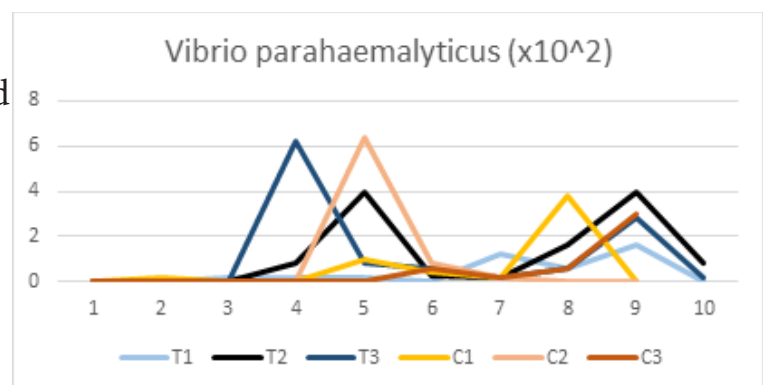
The amount of feed per square meter was variable in both control (0.06 to 0.15 kg/m²) and trial ponds (0.11 to 0.31 kg/m²), resulting in different size at harvest: 6.2 to 6.4 g/individual in control ponds and 7.9 to 11.5 g/individual per trial ponds.



With increased feed input, the final weight at harvest is higher. The average individual growth per day was higher in trial (138 mg/day) than control ponds (114 mg/day) but with higher feed load, as farmers in control ponds reduce feeding rate due to slow growth and early symptoms of diseases.



In all ponds water quality was good, with limited NO₂. However, shrimp culture suffered from early rain, a possible trigger of disease outbreak. The monitoring of algae and bacterial community shows large variations across time and no difference can be seen between control (C) and trial ponds (T).



Additional analysis are required to learn from this trails and understand the potential of using molasses as source of carbon in semi-intensive shrimp ponds.

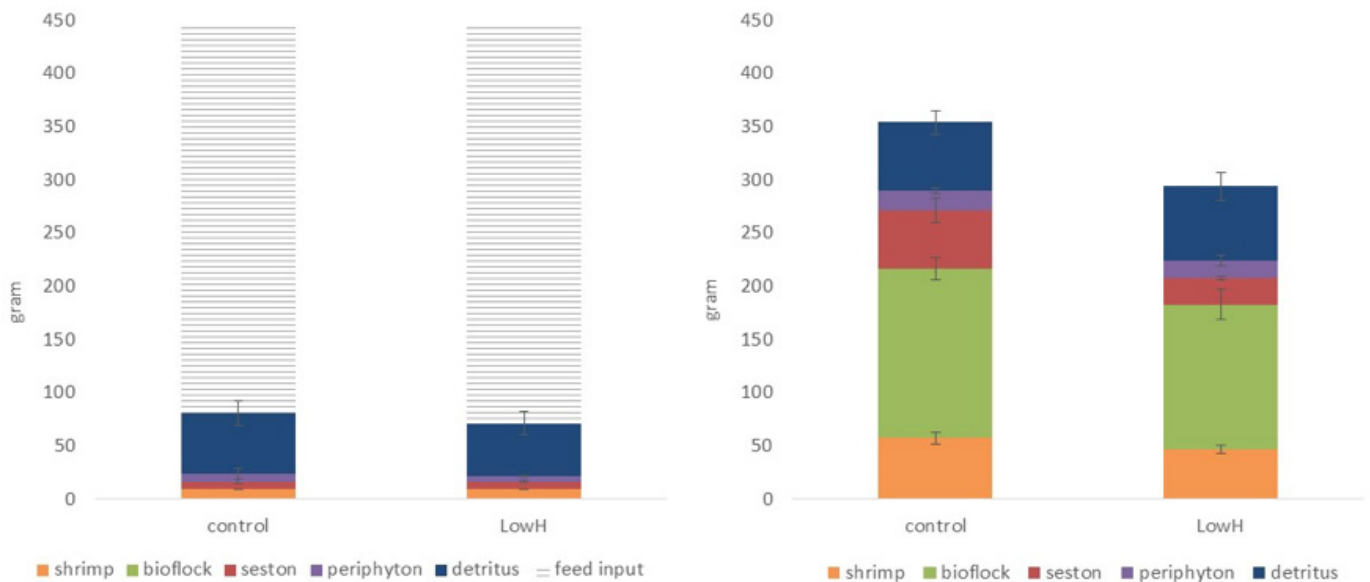


Fundamental Research



Devi experiment are now finished. After submitting her first re- search paper, Devi continue her endeavor by finalizing her second paper on the effect of feed quality on productivity of different com- partment of the pond.

The experiment tested 2 type of feed: one conventional shrimp diet and a diet without any fish oil or fish meal (LowH). Analyzing weight of organic matter (grams) at the start and end of the experiment in the different compartment of the pond food web in- dicates that the pond is not efficient. The experiment shows that only a small 18% ends up as shrimp organic matter, and the rest ends up in the food web. Some parts of that food web are available to shrimp (like biofloc), but not all parts, due to foraging behavior or particle size.



The results also shows that the pond produces more organic matter when fish oil and fish meal are added to the diet. Additional analysis is conducted to explain those results and identify key knowledge gaps.



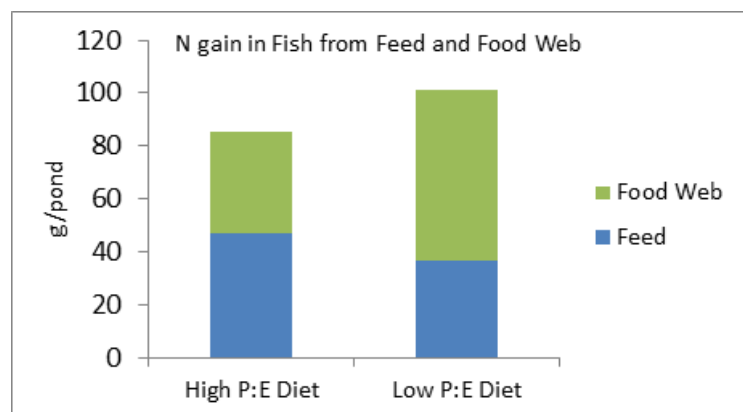
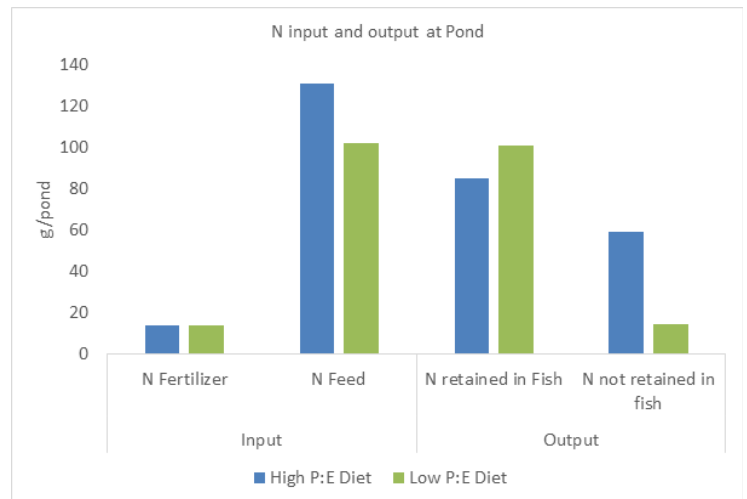


After several experiments, **Kabir** started the analysis and writing phase of his PhD. His research aims at quantifying the contribution of pelleted feed directly eaten and the different pond compartments (water column, benthos) to fish production. He uses tilapia culture systems in Bangladesh as a model.

Kabir submitted an article titled : “*Effect of Dietary Protein to Energy Ratio on Performance of Nile Tilapia and Food Web Enhancement in Semi-Intensive Pond Aquaculture*” to Aquaculture journal.

In a nutshell , his results of the 1st experiment reveal that managing Protein: Energy ratio of the diet stimulated the contribution of natural food to fish production, reaching 60%, in the low P:E ratio ponds.

Kabir conclude that it is possible to manage more than 85% of N retention in a pond by optimizing Protein: Energy ratio of the ponds and diet.



He will present his results and conclusion to the World Aquaculture Conference in Montpellier in August 2018. In addition to his research Kabir supervised 4 Bangladeshi and 1 Dutch Master students who completed their thesis on pond ecology and food web transfer in the pond.

- *Feeding the pond: Measuring stable isotope concentrations ($\delta^{13}C$ and $\delta^{15}N$) to gain insight in direct and indirect feeding on the growth of pond cultured tilapia (*Oreochromis niloticus*) – AFI, WUR*
- *Effect of changing dietary carbohydrate composition (Starch vs NSPs) in Tilapia feeds on the species diversity and richness of benthos community* (Fisheries and Marine Resources Technology Discipline, Khulna University)
- *Effect of changing feeding levels on the abundance of benthic food web in Tilapia aquaculture ponds* (Fisheries and Marine Resources Technology Discipline, Khulna University)
- *Effect of changing dietary fat content and carbohydrate type on the stomach content of Nile Tilapia in pond aquaculture* (Fisheries and Marine Resources Technology Discipline, Khulna University)
- *Impact on nutrient loads in pond water and soil due to application of different level of dietary C & N in Tilapia Aquaculture Pond* (Soil, water and Environmental Science Discipline, Khulna University)

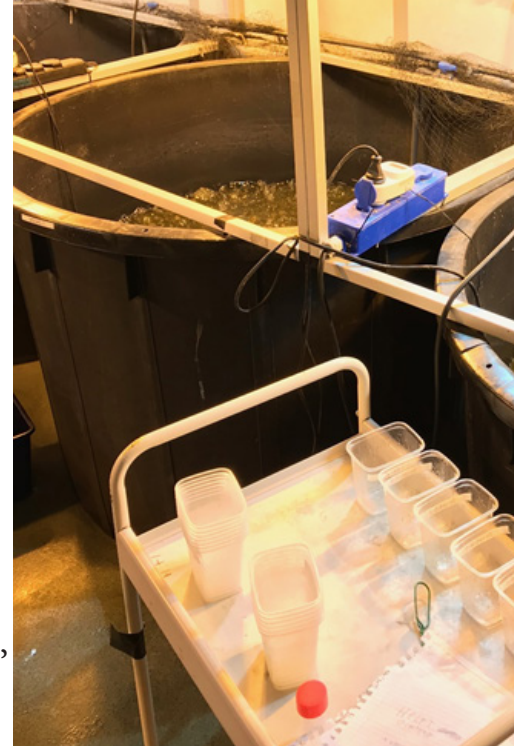


Tran Huu Tinh, Vietnam

Tinh's 2nd experiment in the Netherlands was recently finished. The experiment tested the effects of molasses and corn starch addition in shrimp culture. Preliminary results showed that NH_4 concentration remains low ($< 0.1 \text{ mg/l}$) throughout the culture period. Corn starch treatment yielded significantly higher shrimp production, survival rate, growth rate, and better FCR. Results of this experiment will be used for the design of next pond trials in 2019 and perhaps corn starch will be used instead of molasses.

Tinh's 3rd experiment is being prepared for its initiation in the middle of July 2018 in Can Tho University. In this experiment, the frequency of carbohydrate addition will be tested. It is expected that, when considering the same total amount of carbohydrate, more frequent carbohydrate addition will result more stable water quality in the culture system. The outcome of this experiment will help improve the efficiency of biofloc technology and address questions raised during the pond trials.

In November 2018, results from Tinh's research on the effects of carbohydrate addition across culture densities, and of different carbohydrate sources will be presented in International Fisheries and Symposium in Thailand.



Cluster or not cluster?

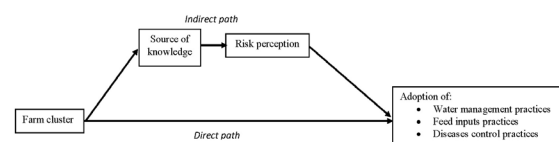
Based on 2017 survey of farmer risk perception and adoption of aquaculture practices, we analysed the role of farmer cluster in the Mekong Delta on adoption of aquaculture practices. Our model explore the role of clusters on interactions of farmers with different actors of the value chain and the influence it has on risk perception and ultimately adoption of practices.

Our analysis done jointly with Strategic Communication group of Wageningen University shows:

- farm clustering has a positive relationship with the adoption of water quality management, feed inputs, and disease control practices.

- increasing interaction frequency with public sector and private sector actors, and also the perceived degree of market risk positively influence the adoption of the three pond management practices under study.

We conclude that clusters – by fostering linkages and facilitating interaction between different knowledge sources – can promote adoption of practices towards sustainable intensification.



Publications & up-coming events

Two recent publication from our research in the Mekong Delta, Vietnam. One providing the first innovation system analysis of the shrimp aquaculture, and a second one exploring the risk perception and its influence on adoption of risk management practices.

Joffre, O.M. & Klerkx, L., 2018. *Aquaculture innovation system analysis of transition to sustainable intensification in shrimp farming*. *Agronomy for Sustainable Development*. 38:34
<https://doi.org/10.1007/s13593-018-0511-9>

Joffre, O.M., Poortvliet, P.M. & Klerkx, L., 2018. *Are shrimp farmers actual gamblers? An analysis of risk perception and risk management behaviors among shrimp farmers in the Mekong Delta*. *Aquaculture* 495(April), 528–537.

<https://doi.org/10.1016/j.aquaculture.2018.06.012>

Up-coming events

The Nutritious Pond project will be present at World Aquaculture in Montpellier from August 26th to 29th

We will present in different session and covers different topics related to our project:

- *Aquaculture Value Chain Innovation*. Special Session Monday 27th in the afternoon
- *Nutritious pond concept and its potential for sustainable intensification of aquaculture* Tuesday 28th in the afternoon – Special session on “Expanding aquaculture within the planetary boundaries”
- *Effect of dietary protein to energy ratio on performance of Nile Tilapia and food web enhancement in semi-intensive pond aquaculture* – Sunday 26th – Tilapia Session
- *Microorganisms in bioflocs make unavailable phosphate, fixed in dietary phytate available for Nile Tilapia*, Biofloc Session, Monday 27th August

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