

Additional Questions from the F3 Webinar:  
Emerging Trends in Alternative Feeds for Shrimp

**All Panelists**

1. How can your showcases/innovation/models be applied by small farmers? Any challenges and conditions for them to adopt in the view from the private sector?
  - Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Capital becomes the constraint if small also implies small capital. Then create a RAS type recycle with total waste capture and recycle is additional costs to what is commonly practiced today. That said, the Vietnamese tank farm model has been adopted by small farmers building tanks (not expensive) in the bottom of existing ponds. Such farms however do not recycle; but do use smaller amounts of processed water.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: These have to be worked out together among stakeholders with a win-win-win scheme solution. In fact, we have successfully introduced a low fishmeal diet for the shrimp market in Indonesia and have been leading our sales volume for the last 4 years.
2. The biggest problem now feels like it's still the perception and acceptance of farmers, and feeds with less fishmeal are considered low grade. So many companies are currently staying in the R&D stage and dare not easily carry out mass production. For this problem, what advice do the experts have?
  - Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Yes this is very correct; technology is not the biggest hurdle; it is educating farmers that the feeds are equivalent in production and in cost as to current feeds. And smell/taste plays a large role in this perception. It is hard to understand (or maybe not) that a farmer thinks a shrimp perceives flavors the same way the farmer does—but there is a strong feeling out in the farms as to this being true. You can only overcome this with aggressive marketing (education, discounting etc.) - and being aided by the market which starts to demand such feeds be used. A carrot and stick approach.
  - Ewen McLean, Aqua Cognoscenti Answer: Alternative commodity proteins, such as soybean meal, concentrates and fermented products, canola meal, etc. are much cheaper than FM and using them to replace FM should result in cheaper diets. The feed industry might increase the interest of farmers in F3 diets by suggesting (and incentivizing) use of alternate protein-based feeds during mid-production periods followed by traditional feeds to demonstrate the realities with respect to growth rates, FCRs, health, etc.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: Obviously in my view, zero/low fishmeal is possible depending on species-specific, trophic level and life stages of the animal. When you are talking about tilapia, milkfish, and common carp I believe less amount of fishmeal being incorporated in the diet. However, for carnivorous fish fishmeal replacement is definitely challenging and I would say that fishmeal and/or fish oil need to be optimized to improve fish performance, sensory properties of the final product (LC PUFA, vitamins, minerals and so on) as well as cost effective formulation.

- Alexandre Veille, Gold Coin Group Answer: Farmer perception is an issue, but further to it is the cost, producing a fishmeal-free diet is actually more expensive than with fishmeal. Additionally, consumers are not ready to pay more for vegetarian fed shrimp.
3. Have algae that are rich in protein, such as spirulina, been tried to supplement the diet? What about the digestibility and the toxicity of them?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Spirulina has been used in larval diets for a long time and has occasionally been used in grow out feeds, not for the protein; but for the carotenoid pigments that make the shrimp more beautiful to the consumer. The issue with spirulina as a protein is it is an expensive protein and fails to deliver the much sought after and valuable omega 3 fatty acids of other marine microalgae.
  - Ewen McLean, Aqua Cognoscenti Answer: Krill and other marine meals (squid, scallop, clam) are excellent palatants but are marine resources – a non-marine palatant that has been suggested is BSF larvae but I do not have personal experience with this. Some algal meals have been used successfully as has galangal root. We found that taurine enhanced feed intake with alternate protein-based feeds with fish and similar studies with shrimp report like effects.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: No. We normally use spirulina for enhancing body coloration in ornamental fish.
  - Alexandre Veille, Gold Coin Group Answer: Microalgae don't have problems with toxins, this is of concern for macroalgae. Hence analysis has to be performed prior to use, similar to ANF in soybean.
4. What palatants do you find most promising, especially to use in fish-free or low-fishmeal diets?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Honestly, I am not sure palatants are needed. I know we think you need that flavor (again assuming shrimp perceive as we perceive.) But in Belize I fed a pellet of only soybean, corn and wheat—and the shrimp would aggressively feed on this pellet. From that time on, I really questioned the need for palatants (for vannamei shrimp). Monodon is a different story.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: Ingredients that are rich in low molecular weight amino acids, such as fisheries/aquaculture by products.
  - Alexandre Veille, Gold Coin Group Answer: Seaweeds are cost effective.
5. How do you value animal-based novel proteins (insect meal for example) compared to plant-based novel proteins? Are they complementary or is a 100% plant based diet possible for shrimp without adverse effects?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: I am not an expert; but digestibility of animal is generally better because vegetables have all the protective anti-nutritional chemicals—That said if you use higher protein plants, they are generally more digestible than low protein plants materials. And the reason for doing selective genetics is to select genotypes that will digest plant material more efficiently.

- Ewen McLean, Aqua Cognoscenti Answer: Insect-based proteins generally are currently too expensive to consider. Until prices/t can become competitive with commodities such as soybean meals etc. then they will remain impractical other than for their immunostimulant properties, maybe. Plant and SCP-based feeds have already been demonstrated as feasible alternatives for FM-based diets. However, it is more likely that some animal proteins (terrestrial) will be required to balance the nutrient requirements of shrimp.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: The evaluation should be done through the combination of factors between nutrient x price. For instance, US soybean meal 46% protein has 3% lys content (as is), while the black soldier fly 57% has 3.5% lys content (as is). Then after all, you need to consider other significant nutrients that might affect the shrimp performance, for instance anti-nutritional factors observed in plant ingredients. Finally, the justification comes to the cost benefit.
  - Alexandre Veille, Gold Coin Group Answer: They are most of the time cost burden vs. fishmeal. And until now it's very difficult to use in volume.
6. Do you use probiotics or other additives to improve the performance of FM-free or to boost immunity? What is your selection criteria to adopt additives?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Not a big fan of "probiotics" So many of these are just extra expenses.
  - Ewen McLean, Aqua Cognoscenti Answer: Yes to both. Effectiveness and cost!
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: Yes we do. You need to calculate the performance and/or disease resistance measured by survival rate as compared to the price offered. At the end, the additive you use has to give a significant cost and performance/survival benefit to your farmed animals.
  - Alexandre Veille, Gold Coin Group Answer: Immunity enhancement in shrimp is very tricky. As a nutritionist the best way is to work on nutritional benefits. Health benefits through immune stimulants are hard to prove efficient on the field.
7. We are trying to replace some of the fishmeal in the shrimp feed with soy protein concentrate. Do you have any suggestions for this?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Should work well; as it is high protein with little antinutritional chemicals. Only need to balance out the methionine.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: Possibly. Remember that you are not only replacing protein sources, but also you are going to replace essential nutrients in fishmeal such as EFAs (LC-PUFA), sterols (cholesterol), phosphorus, vitamins as well as trace minerals.
  - Alexandre Veille, Gold Coin Group Answer: SPC have significantly reduced feed intake
8. Sometimes bile acids are included in the diet for shrimp. What are your opinions on this?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Bile acids are expensive for an emulsifier. I would generally use a lecithin or some surfactant which is less expensive but effective at emulsification of fats.

- Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: I don't think it is necessary to include bile acids in shrimp diets because shrimp can produce bile acids de novo. It is important to identify whether the cholesterol source (in-bound to ingredient or supplemented one) in the diet already fulfills the requirement of the shrimp to maximize growth.
  - Alexandre Veille, Gold Coin Group Answer: Why do you want to reduce gut pH in an animal that has developed a special range of enzymes to work under basic pH conditions?
9. How can we reduce feed waste caused by feed crumbling down?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Advanced pellet processing—but most important providing smaller pellets. The shrimp needs to be able to place the entire pellet into the gastric mill and not chew off the pellet. Most times pellets are too large.
  - Ewen McLean, Aqua Cognoscenti Answer: Repelletize the fines and crumbles
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: Crumble feed is normally intended for the early phase of grow-out culture. The usage amount of crumble is negligible. As soon as the shrimp reach a certain body weight (size), it is recommended to shift the crumble to pellets starting with diameter 1.0 mm fed with an automatic feeder. By feeding the shrimp with an automatic feeder, it can feed the shrimp 24 hours in sufficient amount of feed so that water quality will be stable throughout the culture. Another alternative to reduce feed waste is extruded shrimp feed for the whole grow out cycle.
  - Alexandre Veille, Gold Coin Group Answer: Use of a natural binder, formulate on a digestible basis and on an energy requirement basis.
10. Do you have experience using fermented plant protein in nursery stage shrimp feeds?
- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: I am sure this is ok; but I do not use it.
  - Erwin Suwendi, Ardi Budiono, JAPFA Group Answer: No
  - Alexandre Veille, Gold Coin Group Answer: Yes and quite efficient.

### **Jennifer Kuo**

1. How do diets for Monodon compare with those for Vannamei?
- Jennifer Kuo, Grobest Answer: In terms of vannamei versus monodon, perhaps we should note that vannamei is totally omnivorous and adapts to lower protein feed or even fish free feed. Monodon is a lot more carnivorous and requires higher protein feed. In short, they are
    1. Different requirement of protein and limiting amino acid.
    2. Different feeding habits in different culturing stage.
    3. Different utilization in different protein source.

### **Robins McIntosh**

1. Is there any taste difference between the whole vegetable-fed shrimp and normal fed shrimp?

- Robins McIntosh, Charoen Pokphand Foods Public Company Answer: No, protein and oil profiles are similar if the diet has been balanced. Taste is more from salinity levels in the pond than from feed ingredients. Unless you have off flavor microbes in the pond or tank.
- 2. Is the shrimp feed used in Florida supplied by CP Thailand? Was the algae oil added before feed pelleting or after (spray coating)?
  - Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Yes it will be supplied and we normally will spray coat.
- 3. Regarding CP USA, is production 180 mt/year? 2000 tons volume with 5 Kg/m<sup>3</sup> and 4 cycles, so 40 mT/year? Please clarify.
  - Robins McIntosh, Charoen Pokphand Foods Public Company Answer: Tanks are 100 M<sup>3</sup> x 5 kgs x 4cycles x 100 tanks (20 tanks/unit and 5 units). Actually a bit over the 180 but then we dial it back a bit for errors.

#### **Ewen McLean**

1. In those successful fishmeal replacement trials, was the fishmeal replaced on a digestible nutrient basis or just at a gross nutrient level?
  - Ewen McLean, Aqua Cognoscenti Answer: FM was replaced on a unit protein basis
2. Did you adjust your mineral premix for formulating the F3 diet by including organic minerals?
  - Ewen McLean, Aqua Cognoscenti Answer: Yes

#### **Loc Tran**

1. Do you have more detail on Muscle Necrosis? The syndrome that it sounds like IMNV, I wonder if it is a variant of it. Any more insights on this disease?
  - Loc Tran, Minh Phu AquaMekong Answer: It is a bacterial infection disease, not IMNV which is a viral disease. This bacterium is *Vibrio harveyi*, very common in brackish/seawater. The disease usually happens when a shrimp's immune system is suppressed, probably due to nitrite toxicity.
2. Could you please introduce the situation of shrimp farming in Vietnam from last year to this year and the disease situation?
  - Loc Tran, Minh Phu AquaMekong Answer: WSSV, EHP, EMS/AHPND, White feces disease, Muscle necrosis are the five most common diseases. Even though those are devastating, now we understand the causes and have proactive prevention methods.
3. When vibrio count is low, can the shrimp be infected by *vibrio harveyi* and cause muscle necrosis when nitrite is high?
  - Loc Tran, Minh Phu AquaMekong Answer: The answer is yes.