

Title: Sustainable and accessible fish feeds for small scale fish farmers

Date: Thursday, 17 June 2021

Time: 15:00-16:00 (UTC+8)

Audience Questions and Answers

1. Can nutritious pond feeds for fish have an impact on the quality or nutritional value of the fish?

To date, limited evidence exists on the links between nutritious pond feeds and the nutritional value of fish to humans. However, the quality and nutritional value of farmed fish can be modified through feeds, and preliminary indications are that access to natural foods in ponds, which is optimized with nutritious pond feeds, can improve the nutritional quality of farmed fish.

2. Does the feed take care of concerns including growth rate and fat to flesh balance?

Nutritious ponds feeds are indeed formulated to meet both fish growth requirements and ponds requirements. The use of such feeds is expected to retain meat quality. Thanks for your question.

3. Is the feed truly cheaper given the labor cost involved in collection and transport of the bulk?

Feeds formulated with underutilized local ingredients are indeed less expensive, but the overall costs of the feed, including labor and transport have not yet been evaluated and are probably very context-dependant. Since local ingredients are investigated, transport costs might also be lower than for regular ingredients which are often imported, but this should be verified. Thanks for your question.

4. Is there an economic or socioeconomic analysis already carried out that shows the benefits of using local ingredients? Also, circular economy was mentioned and it is very important to come out with numbers that show this important effect.

See answer above.

5. What steps can be taken to get small/med farmers to reduce or eliminate the use of wild fish as feeds?

There are many ways to do this. We could suggest for example (i) assessment of local ingredients, (ii) identification of good local protein and carbohydrate sources, (iii) training on the formulation of "balanced" diets with local ingredients, (iv) piloting of the formulated "local diets", (v) validation of the piloted diets on farm, and (vi) scaling of the validated local diets.

6. What sort of buy-in for this programme have you had from commercial feed manufacturers? Or is it designed so farmers can formulate their own feeds?

Both commercial and smallholder feed millers can benefit from our research findings because we use rigorous scientific approaches to obtain the results that are then validated in the field.

7. What is the relative digestibility of carbohydrates in herbivorous fish (carps, tilapia) compared to monogastric livestock (pig, chicken)?

We have only tested this in tilapia so far. They can use non starch polysaccharides with an ADC between 15-40% depending on the type. The fiber that are not digested

are digested by the bacteria in the pond. I do not know how this compares with pigs and chickens.

8. Is there use of growth hormones in fish farming, if so, what are the consequences for human health?

We do not work with growth hormones.

9. Carbon is often added to ponds in soluble forms such as molasses, whereas indigestible carbohydrates from feeds are often insoluble. How do these compare in terms of efficacy for pond productivity and cost?

The carbon source can indeed be added directly in the feed or it can be external of the feed. Integrating the carbon source in the feed is probably more interesting from an economic point of view since you need less labor. It is also more likely to be distributed homogeneously over the pond. However, comparison in terms of productivity still need to be tested. Thanks for your question.

10. Protein is the most important component of fish food formulation. How can we provide sustainable feed without depleting the fish stock to support small-scale farmers?

Proteins are an important component of aquafeeds. Proteins can be derived from animal products and/or plant-based products when the fish are herbivorous. Fish meal can be partly produced from aquaculture and fisheries trimmings and other fish processing by-products. In this case, the potential impact of the feed production on fish stocks is lower, since part of the resource is not derived from dedicated capture fisheries. Other novel protein sources which do not depend on wild fish stocks are being investigated, including insect meal or yeast.

11. What is the minimum relative amount of crude protein needed in feed for herbivorous fish for sufficient growth and health?

The minimum amount of crude protein needed will vary with fish species and the life stage of the fish (fry, fingerlings, adults). Nutritional requirements for over 30 commercially important species in Asia and elsewhere can be found in a free international database (<https://www.iaffd.com/>) along their life stage. I hope you will be able to find your species requirements there.

12. What is the difference in terms of carbohydrates levels between maize bran and rice bran/wheat bran? Which one is better?

Please look at the free international feed ingredients composition database available at <https://www.iaffd.com/>. The database contains information about maize, rice and wheat bran.

13. In the experiments, did you supplement feeding with fertilizing the ponds? Or was natural food production purely dependent on the carbohydrates from the feed?

In the experiments, no extra fertilizer was used in the ponds.

14. Is there a positive climate and emissions dimension to the nutritious pond approach?

Sustainable feeds and feeding practices are expected to contribute to climate mitigation and adaptation efforts in aquaculture through increases in efficiency of feed use and reduced reliance on imported or intensively farmed feed ingredients. However, these contributions still need to be confirmed and quantified. Thank you for your question and interest.

15. How can I connect with the speaker who gave trainings on feeding and production?

Dr. Rodrigue Yossa from WorldFish can be contacted at R.Yossa@cgiar.org. Thank you for your question and interest.

16. How you will proceed to give training, especially practical training, in developing countries?

See answer above. We will continue to host trainings on nutritious pond feeds, local feed ingredients and feed formulation across Africa and Asia.

17. How can I access an application to use on my phone to formulate feed for catfish?

Findings regarding nutritious pond feeds and local feed ingredients are integrated into the FeedCalculator (<http://www.singlespark.nl/feedcalculator.html>), an open access feed formulation app.

18. Can Phosphorus sometimes be a limiting factor in natural food production and if so, should the formulation of the feed take this into account?

Inorganic phosphorous (P) is a finite resource which could become limited in the coming decades if we do not focus on P-recycling. Nutritious pond feeds can contribute to both higher N-utilisation and P-utilisation by feeding both fish and ecosystem.

19. Do you think the nutritious pond concept can also be applicable in ocean cage farming? In the ocean there is also natural food available, though it may be lower than in ponds due to currents.

The concept is not immediately applicable to large scale cage farming systems based on high flow through rates. However, when cage systems evolve to more closed systems with partial recirculation of water, feeding both the fish and eco-system (biofilter) makes sense.

20. How do you balance the amount of carbohydrates such that you do not induce growth of pathogens in the system? Is there is magic rule to follow?

Both the level of carbohydrates and type of carbohydrates will play a role. Non-starch polysaccharides (fibers) that take time to digest/ferment are more suitable than starch.

21. As noted, the content of carbohydrate (>8%) in diets for carnivorous fish may cause adverse liver condition and function. Has the use of higher carbohydrate diets for herbivorous pond raised fish included any assessment of liver condition, gut function and fish health?

Species like tilapia and carp have a high tolerance to feeds with high carbohydrate content. These species can digest and utilize the starch better than carnivorous fish and typically, their liver is not affected in a negative way.

22. When 'low cost' feed ingredients are used there may be associated mycotoxin problems due to poor storage in the tropics. Do the panellists consider this to be a problem?

Yes, that is why local feed ingredients, agricultural co-products and waste stream must be quality-assured in terms of nutritional composition, digestibility and safety from undesirable substances (e.g. mycotoxins, pesticides, heavy metals).

23. Can you comment on possibility of contamination of fish with heavy metals and other toxins when using waste to feed fish?

See answer above. Feeds have to be safe for the animal and ecosystem in order for fish to be healthy for human consumption.

- 24. Must the plant-based feeds be pesticides free as well? Assuming local partnerships were to be created between small/medium-scale fisherman and local small/medium-scale farmers, it is assumed that these farmers are still not using organic/natural farming methods.**

See answer above.

- 25. If there is a limitation on the amount of protein source from insects for fear of having fatty fish, what is the advice? Farmers are propagating black soldier fly larvae as a replacement of fish meal or soya meal.**

Black soldier fly meal can be a good source of protein for fish, but also contains high amounts of fat. Defatted black soldier fly protein meal can overcome this and be used at higher inclusion levels.