



*The following draft will be updated periodically. Last update: 03-24-2021*

When an ingredient is novel, a nutritionist will need to experiment with how the ingredient may be optimally included to improve its level of performance in an aquafeed. A feed nutritionist may need to conduct a series of experiments, and constantly refine inclusion levels in order to compete in the aquaculture feed market. Companies entering this field should be prepared to conduct multiple rounds of testing and modifications to optimize inclusion levels of their products. Following standardized evaluation protocols after modifications are made is key to validating product performance results for feed company customers. This document relays a few pointers to enhance ingredient performance.

## **Methods to Improve Ingredient Performance**

Ingredient companies may choose to modify their ingredient or the experimental feed during the Ingredient Evaluation process. There are many reasons for making modifications, including the need to know if there are limits to inclusion levels of an ingredient due to:

- Poor performance in one or more steps in Ingredient Evaluation, eg poor palatability or undesirable waste outcomes
- Cost optimization: *The ingredient may be expensive, but can be mixed with other ingredients for cost optimization*
- Enhancing ingredient performance in feed manufacturing: *From a nutrition perspective, the ingredient may be desirable, but it may have a physical property that limits inclusion levels, because it may prevent feed machinery from functioning, ie cause machinery to muck up*
- Raw material availability: *The feed ingredient may rely on another input whose availability may vary.*
- Changes in nutritional profile of an ingredient

Below is a list of common modifications to the design of feeds to enhance ingredient performance within them:

- Conduct an experiment with varying levels of the test ingredient in experimental feed in order to pass Palatability Testing or Solid Waste Management (Repeat step).
  - Increase inclusion of test ingredient to determine maximum inclusion rate during Ingredient Functionality testing (Repeat step)
  - Decrease inclusion of the test ingredient until the inclusion level is optimized according to cost or nutrition criteria
- If there is poor animal growth performance or histology results, the feed nutritionist may want to add other ingredients to complement the novel ingredient

to keep the nutritional profile of the entire feed constant (Start at Nutritional Composition of Feed step)

- Alteration of nutritional profile of test ingredient due to new raw material used in manufacture (Start at Nutritional Composition of Ingredient step)

When you have decided how to improve ingredient performance you will need to manufacture experimental batches of feed and run your experiment again.