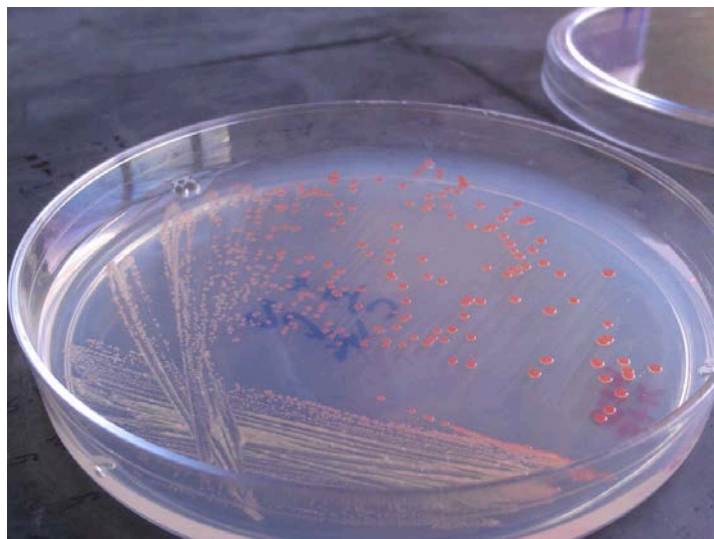


# INNOVATIONS IN SUSTAINABLE AQUA FEED

Fish need a carefully formulated diet to maintain health and promote growth that includes protein, fats, and immune boosting nutrients. In the past, wild fish made up the bulk of the protein source in the feeds for some species. The development of alternative feed ingredients, mostly proteins and fat sources, have greatly improved the sustainability of aquaculture feeds.

Feed typically accounts for more than half of the operating costs of an aquaculture farm and the ingredients are 70 percent of the cost of making feed. The cost of fish meal and fish oil increased dramatically in the last decade, spurring development of replacement ingredients. Today, plant-based ingredients, like soy, wheat, and corn, used in feed, as well as insects, are reducing the amount of fish oil and fish meal in fish diets.



## CUTTING EDGE TECHNOLOGY

Now, with new technology, single cell ingredients such as algae, fungi, bacteria, and yeast are being substituted for fishmeal or plant-based ingredients as a protein source in aqua feed. In a process similar to beer brewing, single cell ingredients are produced by aerobic fermentation, pasteurized, dried, and then added to the other dry ingredients during feed manufacturing. These products provide nutrients that replace less-sustainable ingredients. Their high protein content and essential amino acids make them ideal for fish for growth and development. This cutting-edge feed technology improves fish health, reduces environmental impact, and improves the farmer's bottom line.



Fish farmers will continue to need better solutions for feed ingredients that are scalable, affordable, and sustainable. Single cell protein technology meets this challenge. Raw materials are affordable and abundant in nature and the microbes grow quickly. Gases such as methane and carbon dioxide, or liquids like agricultural wastes or methanol can be used as feedstock in the fermentation process. Land conversion rates are minimal and the product can be produced continuously throughout the year.

**It is estimated that the amount of fishmeal in salmon diets has dropped from being 70 percent of the diet in the 1980, to about 25 percent in 2017.**

## CLIMATE CHANGE: A REAL AND GROWING THREAT

Research into feed is vitally important for sustainability, particularly in light of climate change. In the 2012 El Niño year, the Peruvian anchovy fishery collapsed, leading to shortages in fishmeal. Entrepreneurs from all walks of life—with interests in bacteria, yeast, fungi, and insects—stepped up, offered solutions, and solved the technical challenge of using these novel ingredients in fish feed. As more severe weather events and warming waters impact traditional feed ingredients, it is critical to build resilience in the supply chain for our feed ingredients, just as we must do in our seafood supply chain.



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