

Feed for Farm-Raised Fish from Methane

by Hiroko Nishimura

US Calysta is turning greenhouse gas into a food resource

NEW YORK — US venture company Calysta has developed a technique for mass-producing feed for salmon and other farm-raised fish from methane gas. It has acquired a sales licence for Europe and is aiming for commercial production by 2018. The small fish used to feed farm-raised fish are a natural resource. Since the catch is limited, the market potential for a substitute is high. It is gaining attention as an initiative to use methane, a greenhouse gas, as a food resource.

Mass-Production Using Bacteria

“Protein is being created in here as we speak”, says Josh Silverman, founder and CTO of Calysta—a research institute on the outskirts of Silicon Valley—as he inclines a glass bottle with a few centimetres of liquid at the bottom.

The sealed bottle contains not air, but methane gas. Living in the liquid at the bottom are bacteria that live on gas. These bacteria eat the gas, and protein derived from amino acids created as a by-product becomes the fish feed raw material that the company is aiming to commercialize.

Silverman, an expert in biochemistry, began to focus on methane approximately five years ago. While furthering his research on alternative fuels, he had doubts about the sustainability of substituting sugarcane and corn, which are in high demand as food items, for fossil energy. “Can we not create a substitute from the most inexpensive carbon source?” So saying, he zeroed in on methane gas, a type of hydrocarbon.

Methane is the main component of natural gas. It is also produced in the decomposition of animal faeces and plants. It is considered to have 25 times the greenhouse effect of carbon dioxide, and its negative effects on the environment are a cause for concern. However, since its molecules are stable, it is difficult to process and “its use is mainly limited to fuel” (Silverman).

Bacteria that live on methane live in surface soil. Their role in breaking down methane gas in the ground was known, but there was no technology for effectively breaking down large quantities of methane. Calysta developed a technique for making methane easily soluble in water, which it is not normally. By populating water with a high concentration of the bacteria and pumping

in oxygen and methane gas, the company has paved the way for the mass production of protein.

When Silverman first established Calysta, he mainly expected to market amino acids made by genetic manipulation of these bacteria as a raw material for substitute plastic. Because price competitiveness has fallen with worsening market conditions, he is set to establish the marketing of methane-derived amino acids for fish feed as the company's main business. Last year, Calysta acquired Norwegian company BioProtein, which has a track record of commercialization in this field. It has set up a Nutrition branch as a new undertaking.

BioProtein acquired a licence to market its products in Europe in the 1990s, but it halted production in 2005 due to profit deterioration. By using BioProtein's mass production techniques and inexpensive natural gas produced in the US, Calysta is sure that it "can create a cheaper, high quality product" (Silverman).

Tackling a \$50 Billion Market

Feed for farming of marine produce is said to have a market scale of \$50 billion (approx. ¥6.15 trillion), and \$5 billion for salmon alone. Calysta says that the products it aims to market are suited to the digestion of salmon and other fish and that they have a good nutritional balance, including fat and dietary fibre. The product is in a dried granular form, and is easy to ship and store. They also say that "there is high interest from the fish-farming industry in places such as Europe and Asia" (Calysta).

A problem standing in the way of growth is the establishment of a mass production system. Alan Shaw, CEO of Calysta, says, "There's no point if we cannot mass produce". They will start work on a prototype factory in Europe in 2016. The company also aims to build a mass-production factory with an annual 80,000 tonne production capacity in the US and have it in operation by 2018.

The company expects to build the US factory with investment from other companies as well. "We have had proposals from multiple companies including chemical majors and major food companies and are currently selecting business partners" (Shaw). Japanese companies are also making investment offers. In the longer term, following Europe the company plans to extend sales to countries and regions in Asia, where the fish-farming industry is booming. Shaw says he wants "to look into licensed production in places such as Asia" with a view towards early mass production.



FeedKind Aqua fish feed comes in dry pellet form and is easy to ship and store (top photo). The glass bottle contains bacteria and methane gas (bottom photo, Calysta CTO Silverman).

«Company Profile»

▼ Company Name	Calysta
▼ Headquarters	Menlo Park, California
▼ Established	2011
▼ Sales	Undisclosed
▼ Employees	Approx. 30
▼ Representative	Alan Shaw President & CEO

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Publication Date 2 December 2015 Nikkei Sangyo Shimbun Page 005

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