

# TopDutch Innovation Challenge: **The case of Kikkoman**



**Kikkoman was founded in Japan and has had a facility in Hoogezand-Sappemeer for more than 25 years. Kikkoman is known for its soy and teriyaki sauces and is committed to sustainability and circularity. The TopDutch Innovation Challenge is therefore perfectly to their taste!**

**At Kikkoman, soy sauce is made from the 4 natural ingredients of soybeans, wheat, salt and water. Proteins from soy beans provide the unique umami flavor of Kikkoman Soy Sauce. Its pleasant aroma and sweet taste are largely due to starch in wheat.**

## **Production Process:**

Soybeans are soaked in water and then steamed at high temperatures. Wheat is roasted and crushed to facilitate fermentation. For this purpose, 'Kikkoman Aspergillus', a kind of koji mold, is mixed into the steamed soybeans and roasted crushed wheat. After a three-day process, the basis for soy sauce production - soy sauce koji - is made.

Next, salt and water are mixed into the soy sauce koji to create a mixture called 'moromi'. The moromi is transferred to a tank for fermentation and aging. This process takes several months. Once complete, the soy sauce is pressed from the aged moromi by pouring it into three-fold cloths that are folded back into multiple layers. Under the force of gravity, the soy sauce flows out from the moromi.

After this, the moromi is slowly and steadily mechanically pressed for about ten more hours to obtain a beautifully clear soy sauce. The soy sauce pressed from moromi is called "raw soy sauce", and this is left in a clarifier for about three days to separate into its various components. Oil floats to the surface and sediment settles on the bottom.

Only the clarified portion in the middle is extracted. The clarified raw soy sauce is then passed through a heating device, halting all enzymatic activity, stabilizing its quality, adjusting its color and aroma, and readying it for its final quality-control check and bottling.

Several waste streams are created during the production process: soy cake (sediments), soy oil and wastewater.

## **Challenge:**

Kikkoman hopes to find a sustainable and innovative application for the soy cake. Can we make a high-quality product from this waste stream?

Currently, soy cake is sold as animal feed. But Kikkoman would like to value it higher, and use it as a raw material for a new product. The ideal solution according to Kikkoman? Use it to create their own packaging material.

Currently, bottles for soy sauce are purchased at a high cost. How great would be to make a circular version of these bottles from their own waste streams! So, is it possible to make bio-plastics from soy cake to produce Kikkoman's soy sauce bottles?

Kikkoman is looking for a production partnership. As solution provider, you will start a partnership with Kikkoman in which you develop a process to handle the soy cake, in order to produce packaging exclusively for Kikkoman at your own company.

## **Soy Cake:**

Soy cake at the end of the process consists of the following components: (continues on following page)

<b>Factor</b>	<b>%</b>
% Moisture	31.3
% Crude protein	19.2
% Starch	4.9
% Crude Fat	11.2
% Ash	7.69
% Calcium	0.31
% Phosphorus	0.11
% Magnesium	0.04
% Potassium	0.28
% Sodium	2.506
PPM Iron	57
PPM Zinc	38
PPM Copper	38
PPM Manganese	10
% Sulphur	0.21
% Chloride Ion	3.67

Per year, Kikkoman keeps about 5,000 to 6,000 tons of soy cake after the production process. This generates between €600,000 and €800,000 through sales to farmers. A nice new circular application should be economically beneficial for the business in the long-term, but is not necessary in the short-term.

**Call for solutions:**

As you read this challenge, are you thinking, "I have the solution!" and want to explore with Kikkoman which circular application could be found for soy cake? Are you able to provide technology, knowledge or expertise that would help them do this?

Then apply no later than September 15, 2024 by filling out [the online form](#). If you have further questions, feel free to reach out to Fleur Mulder (NOM) by sending an email to [mulder@nom.nl](mailto:mulder@nom.nl).

After an initial selection by Kikkoman and NOM, we will invite a number of applicants to visit Kikkoman. During that visit we can go deeper into the technical specifications and examine the soy cake. With the party offering the best solution for Kikkoman, the chemical and financial feasibility of the new application will be investigated further. Of course, during and after this visit, there will be plenty of time to ask questions and refine the solution.

The final selection of the winner will take place in early October. The applicant offering the best solution for Kikkoman will win the tender to develop the new soy cake application. In addition, the winner will go together with Kikkoman and the NOM to the World Expo in Osaka, Japan in September 2025. There, they will present the innovation together.

**In short, seize this opportunity to find a new customer in Kikkoman and show your innovative strength on the world stage!**