

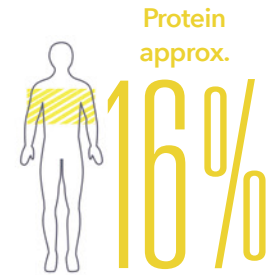
DELIVERING STABLE SUPPLIES OF PROTEIN INTO THE FUTURE

In recent years, factors such as global population growth have led to predictions of protein supply shortages in the future. Within this environment, the NH Foods Group has been working to realize sustainable livestock rearing and to develop alternative proteins so that it can continue to provide stable supplies of protein in the long term.



Protein is an essential nutrient that makes up around 16% of the human body

Protein is one of the three major nutrients together with carbohydrate and fat, and in addition to building body parts including muscle, internal organs, skin, and hair, it is also a source of energy. Approximately 16% of the human body is made of protein, and the recommended daily protein intake for adults aged 18 or older is thought to be 65 grams for men and 50 grams for women*1. A shortage of protein would lead to a decline in the functioning of the entire body.



*1. Source: Dietary Reference Intakes for Japanese (2020) by the Ministry of Health, Labour and Welfare

Protein supplies need to be doubled by 2050!

Recently, the prediction that protein supplies will become insufficient by 2050*2 has been gaining attention. Factors such as global population growth mean that the volumes of meat and fish consumption per person continue to grow, and as livestock farming and aquaculture require grains and fish meal, there will be a global shortage of protein, and supplies equivalent to twice the amount produced today will be needed.

*2. Source: World Agriculture Towards 2030/2050: The 2012 Revision by the Food and Agriculture Organization of the United Nations



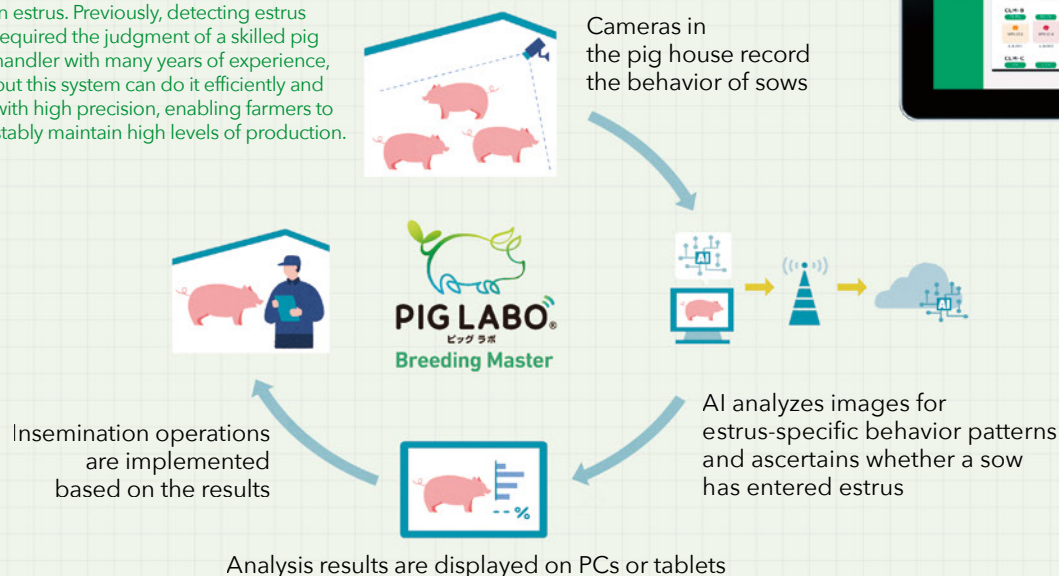
REALIZING SUSTAINABLE LIVESTOCK REARING

In order to provide stable supplies of pork, we are taking on the challenges of reducing rearing workloads and realizing more efficient production.

Energizing pig rearing in Japan through the country's first AI-based estrus detection service

The number of pig farms in Japan has been declining since 1980 and the aging of skilled, experienced pig handlers and a lack of people to inherit their skills have become issues. In light of this situation, NH Foods Ltd. is developing PIG LABO®, a support system that utilizes digital technology to aid in every aspect of pig rearing operations. The first service to be released through this initiative is PIG LABO® Breeding Master, which is currently being test-marketed. Through this initiative, we are aiming to energize the pig rearing and production industry and to solve social issues by realizing stable, productive operations and better working environments at pig rearing facilities.

Pig behavior captured using image data from cameras installed in pig houses is analyzed using AI to detect when a sow is in estrus. Previously, detecting estrus required the judgment of a skilled pig handler with many years of experience, but this system can do it efficiently and with high precision, enabling farmers to stably maintain high levels of production.



Interview with an employee

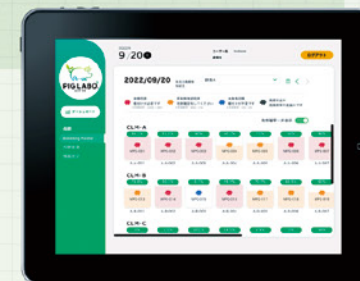
We will develop new functions for realizing sustainable pig rearing.

Under our slogan of “giving shape to a new style of rearing that is considerate of pigs, people, and the planet,” we are aiming to not only improve worker productivity, but also to realize pig rearing that is beneficial to the pigs and the global environment as well. In order to realize this sustainable pig rearing, we need to develop technologies that support every aspect of pig rearing and production operations, and we have only just begun. Going forward, we will work on developing new functions to follow the estrus detection service.



Masaki Okuda

R&D Center
NH Foods Ltd.



CREATING NEW PROTEINS



The NH Foods Group is advancing research and development into what is expected to become the next generation of protein. This includes cell-based foods (cultivated meat) that use ingredients derived from animal cells, and soy meat made from plant-based ingredients such as beans.

02-1

Tackling the challenge of realizing cell-based foods (cultivated meat)

Cell-based foods, which are created by culturing animal cells, are expected to become a means of supplying animal protein that exerts a lower environmental burden than that of livestock rearing. The NH Foods Ltd. Research and Development Center has been advancing research and development in this area since 2019. In 2022, it successfully replaced the animal blood component (serum) required in culture media with components derived from commonly distributed foodstuffs. We have taken a step forward toward the realization of cell-based foods by discovering a stable way to procure an important material used in their production at low cost.

Technical hurdles cleared



Proliferation in a culture medium
made of food-grade ingredients



Formation → Food



Test cell-based meat product (chicken) made using culture media with components derived from foodstuffs instead of blood component
35mm length x 25mm width x 5mm thickness

Merits Cost reduction and high volume procurement

- Animal blood component (serum) is difficult to procure due to its high cost
- Using an alternative derived from foodstuffs enables high volume procurement (stable supply) at a lower cost

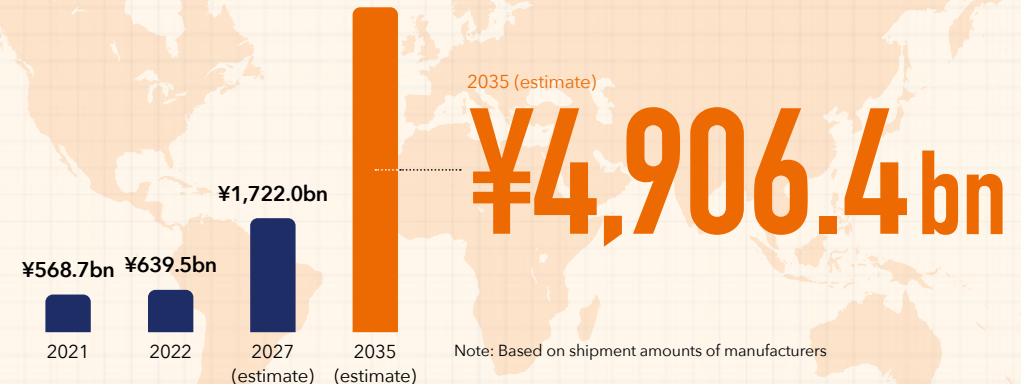
Future challenges

- Making culture media from edible components
- Increasing the volume of cell harvests
- Scaling up culturing

Global Alternative Protein Market Size Forecast

(plant-based meat, plant-based seafood, cultured meat, cultured seafood, insect protein)

Survey by Yano Research Institute



Interview with an employee

Advancing research into new options for protein supplies

We think that creating protein sources by culturing animal cells can help us secure stable supplies of environmentally friendly food staples into the future. Cell-based foods are one possible way of achieving this, but delivering them to people's tables will require more technological development. We will continue to advance research and development aimed at realizing cell-based foods so that they can become a new option for protein supplies in the future.

Food Research Team

R&D Center
NH Foods Ltd.



02-2

Developing plant-based fried fish fillets as a seafood alternative made using soy meat development technology

We are developing the *NatuMeat* series as protein products made using plentiful soybeans. By finding ways to reproduce the same tastes and textures as animal meat, we are providing products that are being chosen by a growing number of consumers. In March 2023, we launched *NatuMeat Fishless Fried Fish Fillets (Plant-based)*, the newest product in the series which provides the same taste and flakey texture as fish without actually containing any. Going forward, we will work to enhance our lineup of products that not only contribute to stable protein procurement and supply, but also help conserve fish stocks.



Interview with an employee

We are working to achieve both the texture and nutritional functions of white fish.

The market for soy meat has grown on a global scale due to factors such as animal welfare and its environmental impact, but the global consumption of seafood has also grown approximately five times its former size over the last 50 years, so there is demand for the development of seafood alternatives. We have developed plant-based fried fish fillets, which not only recreates the texture of white fish, but also performs the same nutritional functions. Through products like this, we will further expand the possibilities of protein.

Mutsumi Komazaki

Deli Foods Section, R&D Office
Product Management Division
Processed Foods Business Division
NH Foods Ltd.

**NatuMeat
Fishless Fried
Fish Fillets
(Plant-based)**

Reproduces the fluffy,
soft texture of
white fish
Protein per pack
(104g): 4.6g

