

Special Feature

Contributing to Solve Issues in the Domestic Livestock Industry for Sustainable Food Supply for the Next Generation

The stable production of safe and reliable fresh meats has become a major concern for sustainable food supply for the next generation, as the risk of stable food supply increases due to epidemics and climate change. The NH Foods Group is covering all aspects of meat production from upstream to downstream, that is, from stockbreeding to food processing, as well as distribution and sales. Thus, we decided to contribute to revitalizing the livestock industry and to provide a stable supply of fresh meats through the Smart Pig Farming Project and the development of a detection test kit for the foot-and-mouth disease (FMD) virus.



Case 7

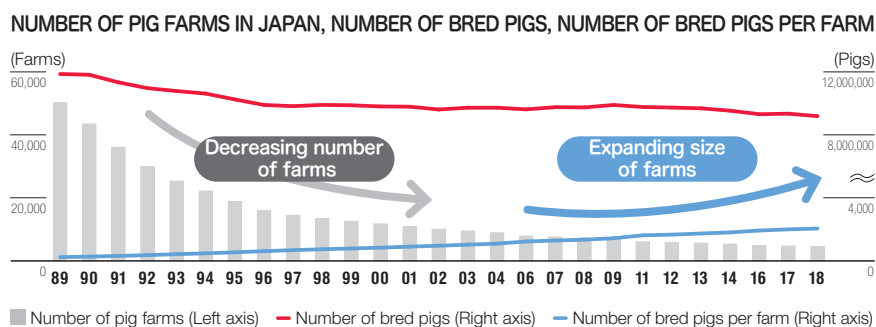
Contributing
to workstyle reform
and improved
productivity
at farms

Smart Pig Farming Project

Improving labor productivity at farms has become a big issue. In December 2018, the NH Foods Group companies and NTT DATA Group companies teamed up and launched a project—Smart Pig Farming Project—utilizing AI and IoT technologies for pig farming business. Verification tests are being conducted at farms of the NH Foods Group, to achieve highly productive farm operations. The goal is to put the smart pig farming system into operation within the NH Foods Group by 2022, and to provide farms outside the Group with the system by 2024.

Improving Labor Productivity Is an Issue for the Livestock Industry

In Japan, the number of pig farmers is decreasing, and the number of pigs per farm is increasing these days. To rear healthy pigs, a comfortable environment is essential; however, it has



Source: Livestock statistics survey, Ministry of Agriculture, Forestry and Fisheries

become difficult to secure enough time for it with a current limited workforce. In addition, expert workers are exiting the industry due to their advanced age, and concern for the shortage of workers in the future is growing.

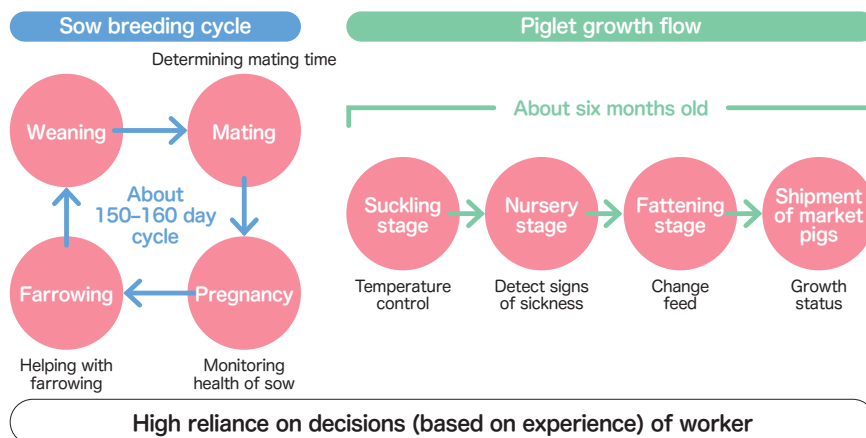
Pig Farming Heavily Reliant on Experienced Workers

In pig farming, it is necessary to manage sow breeding cycles and piglet growth flow in parallel, which requires highly experienced workers.

The sow breeding cycle—mating, pregnancy, farrowing, and weaning—is repeated every 150–160 days. It is difficult to determine the mating time, since it requires very careful observation to recognize signs of a sow in estrus, such as a change in appetite, reaction to a boar coming in contact, or a different behavior when touched by a worker. As missing such clues can lead to the loss of opportunities for piglet production, a keen ability to catch the signs is indispensable. Health care of a pregnant sow and assisting the birth of piglets also require a lot of experience.

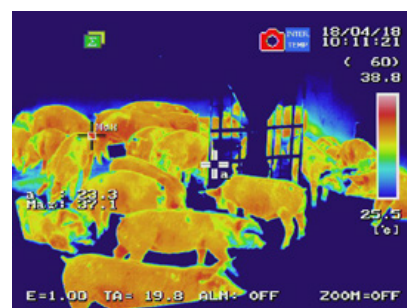
The piglets go through three stages in six months, the suckling stage, nursery stage, and fattening stage, and then are shipped. There are hundreds or thousands of piglets on a farm. As farm workers are limited in number, they are only able to go through the farm to visually check the piglets' health, growth status, and the environmental conditions two or three times a day. Missing such signs and delay in suitable treatment would lead to diminished growth or spread of diseases, thus leading to an increase in production costs.

PRODUCTION STAGES AND CHARACTERISTICS OF PIG FARMING



Start of Smart Pig Farming Project to Solve Problems in Pig Farming

Our project, Smart Pig Farming Project, is aimed at developing a farm management system which contributes to achieving the high productivity of pig farming using AI and IoT technologies. AI will “learn” the knowledge of expert workers, and help to pass it to the future. Implementation of the system will also lead to workstyle reforms, such as reducing working hours on farms.

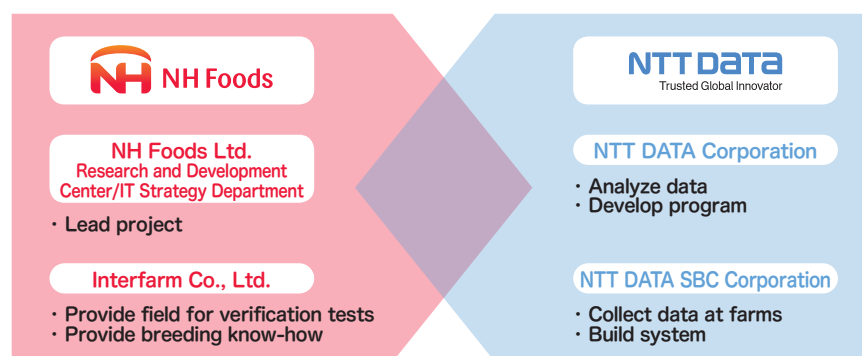


Ltd. lead the project while Interfarm Co., Ltd. provides breeding know-how and the field for verification tests. NTT DATA SBC Corporation installs cameras and sensors in the piggeries and builds the system for collecting data. NTT DATA Corporation analyzes big data obtained from the system and develops an AI-powered diagnostic program.

Four Companies Engage in Open Innovation

The Research and Development Center and IT Strategy Department of NH Foods

PROJECT STRUCTURE



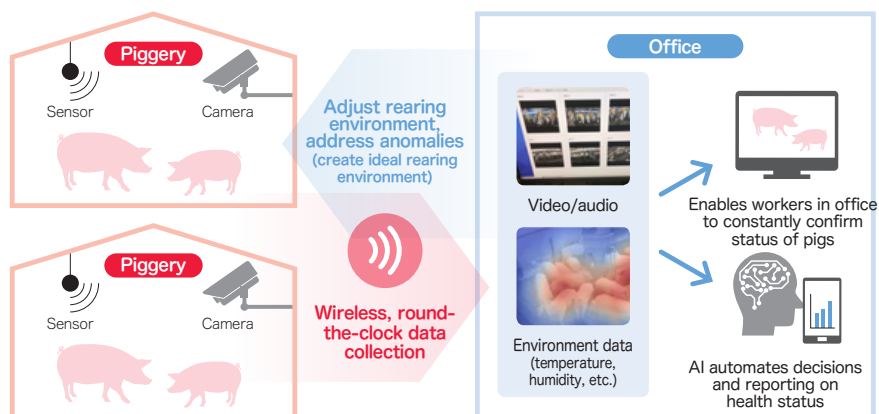
Change in Attitude toward Management with Installation of IoT Technology

Many farms are located in rural areas, and each piggery is placed distant from one another even on the same farm. With this project, we built network systems to “watch” multiple piggeries simultaneously by infrared cameras, environmental (ambient temperature and humidity) sensors, and wireless networks. The infrared cameras made it possible to see pig activity at night, offering a new perspective on pig management. Also, the system enabled farm workers to check piglets’ growth status and health as well as temperature and humidity in piggeries simultaneously. It helped workers to raise awareness on the current status of piglets.

Future with AI

In this project, we are now developing an AI-powered diagnostic system based on big data collected from IoT technology installed farms. This is the first trial to apply

IMAGE OF PIG FARMING MANAGEMENT SUPPORT SYSTEM OPERATION



AI in the pig farming industry. The AI will identify each piglet and analyze their behavior, which will allow us to determine the status of the farm based on data rather than relying on workers’ experience. For example, the analysis of the piglets’ squeals, grunts, or quantity of movement will help to make an environment comfortable for pigs. Detection of signs of diseases will help to respond quickly with the necessary

treatment. AI will also be used to pinpoint the estrus status of a sow, which will make the decision on artificial insemination more accurate, and this should promote stable breeding cycles and higher piglet production.

The AI-powered diagnostic system will be cloud-based, which boasts the advantage of averting the risk of data loss due to natural disasters or problems caused by power outages.

The NH Foods Group Contributes to Revitalize the Domestic Livestock Industry through Promoting Smart Pig Farming inside and outside the Group.



Shin Sukegawa

Researcher
The Research and Development Center
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The advance of AI and IoT extends the scope of possibilities for addressing such emerging issues as the shortage of labor power in the livestock industry and the need for higher productivity in farm operation systems. We have been working with Interfarm as a test field, and subsequently came up with this project. My role in this project is to intermediate the farm site and the engineers to build an IoT system using AI. Our goal is to contribute to improved performance at farms by the installation of AI. Though AI cannot replace all the work done by humans, we have learned that AI can “learn” expert workers’ knowledge or experience in this project. We have also realized that AI could improve farm productivity by utilizing big data accumulated on farms or data captured by IoT cameras and sensors. Many aspects, cameras, sensors, or IT platforms are needed to promote this project. However, there are few designed for the pig farming industry. We have to start from early stage development in some aspects. Going forward, we will remain tenaciously engaged in project activities. For now, smart pig farming has only been introduced into some of the operations at Interfarm. With further progress, especially on the development of devices, smart pig farming will be more applicable to various regions and environmental conditions or various structures of piggeries. In addition, since the Group runs farms that raise cattle and chickens as well, the technology we have acquired through this project could be applied throughout the Group. As the use of the system will prevent disease and reduce costs and also improve animal welfare and enhance productivity, we will be helping to revitalize the domestic livestock industry by extending application outside the Group.

Case 2

To prevent foot-and-mouth disease, which threatens stable supply of fresh meat, from spreading

Development of Antigen Detection Kit for Foot-and-Mouth Disease

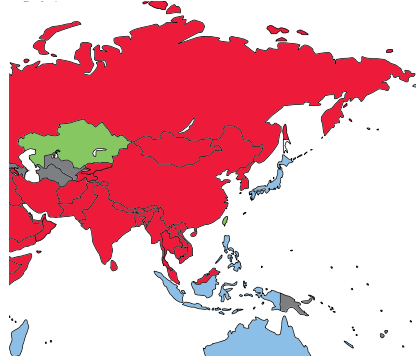
One of the factors that threatens the stable supply of fresh meats is livestock disease. Of such diseases, foot-and-mouth disease (FMD) is an extremely serious disease with huge economic impacts. In December 2018, the NH Foods Group launched an antigen detection kit for FMD ("NH Immuno Stick for Foot-and-Mouth Disease"). The test kit is the first and the only FMD antigen test kit to be approved as an in-vitro diagnostic medical device (IVD) in Japan. Widespread use of this kit in Japan, of course, and overseas as well should contribute to the development of the global livestock industry.

Preventing FMD, a Disease with Major Economic Impacts

FMD spreads through the infection of viruses to livestock, including cattle, pigs, and sheep. Japan experienced a pandemic in Miyazaki Prefecture in 2010, and about 300,000 livestock had to be destroyed. Damage to the industry in Miyazaki Prefecture is estimated to have reached ¥235 billion by 2014. Farmers forced to kill their valuable livestock were also hurt emotionally.

OIE (the World Organisation for Animal Health) recognized Japan as an FMD-free country in 2011, but the threat of the disease reentering Japan from neighboring countries is still continuing. The Japanese government describes their basic policy as having a tougher quarantine system at ports and airports, early diagnostics and reporting, and immediate and accurate initial responses. Early detection is the key to preventing the spread of the disease, and quick diagnosis is essential in that regard.

OUTBREAKS OF FOOT-AND-MOUTH DISEASE (FMD) WORLDWIDE (As of April 2, 2018)



■ Countries where vaccination is not practiced, and confirmed FMD outbreak since 2008

Source: Ministry of Agriculture, Forestry and Fisheries



Antigen detection kit for FMD "NH Immuno Stick for Foot-and-Mouth Disease"

Simple Test to Detect FMD On-site

The antigen detection kit for FMD "NH Immuno Stick for Foot-and-Mouth Disease" is a simplified kit for quickly performing tests on-site, such as at a farm, in the case of finding livestock suspected of FMD. The test kit uses immunochromatography* as a detection method, and no special analytical instrument is required. The results are to be ready in about 20 minutes visually. Use of this kit to test for FMD prior to the government's final diagnostics will help permit quick and accurate initial responses to prevent the spread of FMD. Our test kit showed good results in validation tests using clinical samples from Japan and overseas, and thus, the usefulness of the kit was confirmed. The Japanese government approved our test kit as a veterinary-use in-vitro diagnostic test kit.

* A measuring method using antigen-antibody reactions. The formation of an immune complex combining antigens of the test sample and antibodies of the reagent increases visibility and appears at a predetermined place as a visible line.

Contributing to Stable Supply of Fresh Meats with Pharmaceutical Products beyond FMD

Our FMD antigen detection kit is the first pharmaceutical product from the NH Foods Group. By developing the test kit, we accumulated technical knowledge needed for veterinary-use pharmaceutical products. We are willing to apply the knowledge for the development of new technologies which will contribute to prevent the outbreak and spread of serious livestock diseases, not just FMD, and thus contribute to the stable supply of fresh meats.

