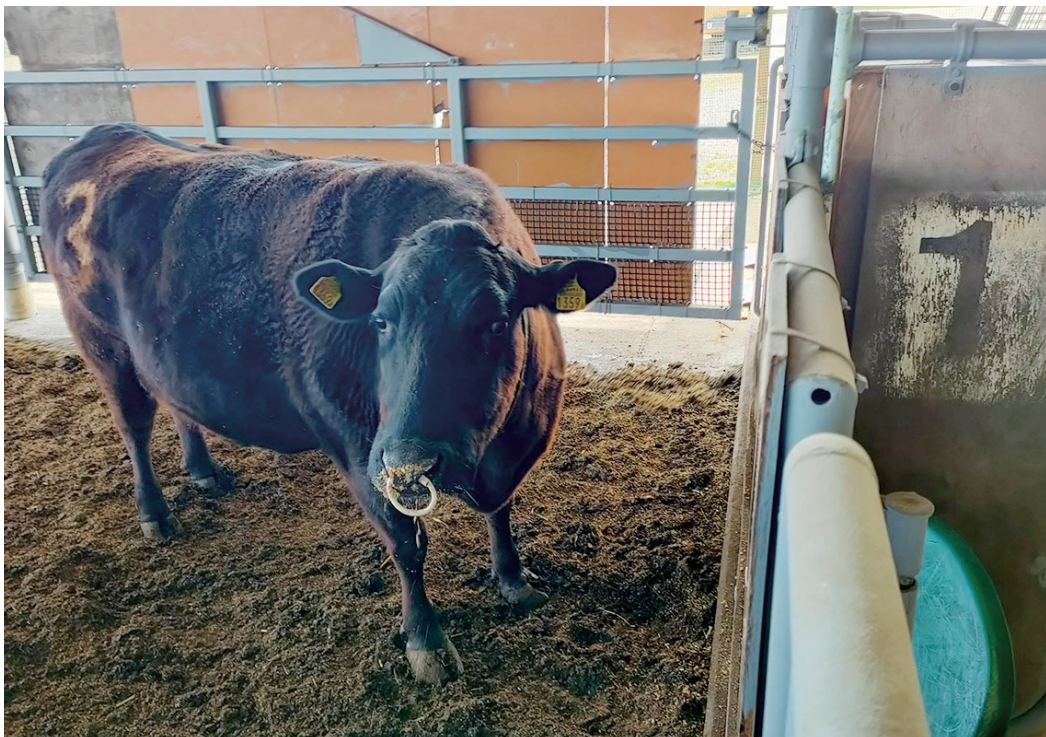


Cutting Methane in Cow Burps: Cashews Offer an Innovative Solution

Mika Sugiura, Chief-in-Editor, JAPAN 2 Earth

Japan's beef industry has launched pioneering research aimed at reducing methane emissions from cow burps by investigating innovative feed solutions.



Cattle at the National Livestock Breeding Center (NLBC) in Fukushima Prefecture participate in a methane-reduction experiment. (Photo: Mika Sugiura)

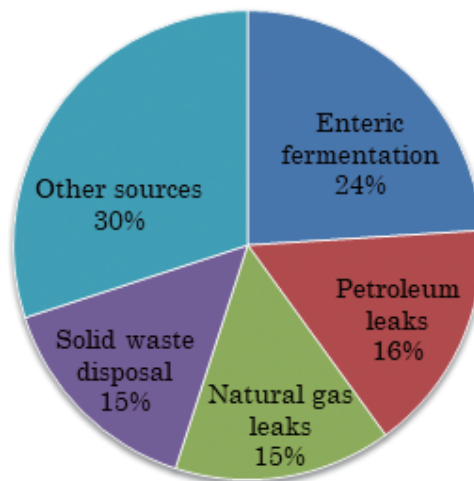
Cow burps are often cited as a significant contributor to global warming. As the environmental impact of cattle farming receives increased scrutiny, the Japan Cattle Industry Cooperative (JCIC) has taken proactive steps to address this concern.

The organization has launched a project focused on reducing greenhouse gas emissions in beef production. To accomplish this, they are developing new feeding strategies aimed at curbing methane emissions, based on scientific research.

1 Are Cows an Environmental Burden?

Unlike humans, it's not always obvious when a cow is burping. Cows digest the cellulose from the grains in their diet with the help of microorganisms in their first stomach, one of four. This digestive process produces methane, which is continuously released through their mouths.

Global Methane Emissions (2015) 2.4 billion tons (CO₂ equivalent)



Global Methane Emission Sources (Based on UNFCCC 2015 Data)

Methane is 25 times more potent than carbon dioxide as a greenhouse gas. Of the 2.4 billion tons of methane emitted globally each year, around 31% comes from agriculture. In this sector, digestion-related emissions account for roughly 80% (UNFCCC, 2015).

With approximately 1.5 billion cows worldwide, methane emissions from their burps contribute to about 4% of total greenhouse gases (in CO₂ equivalent). This highlights the significant environmental impact of cow burps.

In response, the European Union and the United States launched the Global Methane Pledge in 2021, aiming to reduce methane emissions by 30% from 2020 levels by 2030. Over 100 countries, including Japan, have pledged their commitment to this goal.

2 New Research on Cashew Nut Shell Liquid

Cashew nut shell liquid (CNSL) has emerged as a promising solution to the problem of methane emissions from cow burps. CNSL is obtained by grinding and pressing the shells of cashew nuts, which come from an evergreen tree (*Anacardium occidentale* L) in the sumac family.

Known for its antibacterial properties, CNSL has traditionally been used as a coating material. It has also been imported to Japan as a substitute for traditional lacquer.

Crucially, CNSL contains alkylphenols, with anacardic acid as its primary component — an exceptionally rare compound in nature.

The idea of using CNSL as a feed additive originated when a member of the agro-bio division of the Japanese petroleum company Idemitsu Kosan (which became its subsidiary, SDS Biotech KK, in July 2022) came across a 1971 study by a Belgian scientist. The study found that combining anacardic acid with cow (*Bos taurus*) stomach fluid significantly increased propionic acid levels.

Based on this discovery, Idemitsu Kosan sought technical consultation with Professor Yasuo Kobayashi of Hokkaido University, paving the way for further research.



Feed containing CNSL (top center), along with cashews and Wagyu beef. (Courtesy of JCIC)

3 Methane Reduction Potential of CNSL

Kobayashi conducted his experiment at the Livestock Metabolism Research Facility of the National Agriculture and Food Research Organization (NARO).

The study used a large chamber known as a respiratory trial device, designed to measure total gas emissions. Each cow was placed individually into the sealed chamber and fed a diet mixed with cashew nut shell liquid (CNSL). This allowed researchers to observe the impact of CNSL on respiratory methane emissions.

Although the actual gas measurements were taken over just two days, the experiment itself lasted two months. To establish a baseline, the cows were first fed regular feed without CNSL for three weeks before the first measurement. For the second round of measurements, the cows were fed CNSL-mixed feed for three weeks before emissions were recorded.

The results were striking. Cows fed CNSL emitted 20–40% less methane, with an average reduction of about 30% compared to those on a regular diet. These findings were published in 2012 in the *Journal of Dairy Science*, a leading American scientific journal.



Methane emissions are measured using a respiratory trial device, which holds a cow inside. Only four such devices exist in Japan, all located at NARO. (Source: NARO website)

4 Experiments by Japan Cattle Industry Cooperative

The environmental impact of cattle farming began to gain attention in Japan around 2020. At the same time, interest in food tech innovations, such as alternative meats and edible insects, also grew.

Campaigns against cattle farming, along with statements from some politicians advocating for alternative proteins in school lunches, have further fueled the debate.

The Japan Cattle Industry Cooperative (JCIC), which represents about 1,000 Wagyu production businesses and supporting members, has responded by researching methods to reduce methane emissions.

Since Professor Kobayashi's research was conducted using dairy cows, JCIC sought to assess the potential for methane reduction in beef cattle with the cooperation of its association members.

Full-scale gas measurements in large chambers are costly and labor-intensive in nature. Therefore, the organization adopted a more efficient "sniffer" method in collaboration with the Tokyo University of Agriculture.

This approach allows for multiple daily gas measurements and uses methane data from dairy cattle as a reference for calculations.

The project received guidance from the National Agriculture and Food Research Organization (NARO). It also involved partnerships with SDS Biotech KK, Itoham Yonekyu Holdings, and other organizations.

5 Sniffer Experiment with Wagyu Cattle

The experiment focused on feedlot Japanese Black cattle, with CNSL provided through Ruminup P, a pellet-type feed mixed with cashew nut shell liquid.

A total of about 90 Japanese Black cows, each around 11 months old and castrated, were divided into three groups. Each group received Ruminup P for 17–20 months at different daily doses: 0g (control group), 100g, and 200g per cow. The methane emission reduction rates per 1 kg of body weight from each group were then compared.

Cattle fed 100g of Ruminup P daily showed a maximum reduction of 15.3% compared to the control group. In addition, those fed 200g daily achieved a maximum reduction of 31.4%.

The experiment confirmed that feeding cattle CNSL is an effective method for reducing methane emissions.



A researcher inspects feed prepared for the experiment at the Livestock Improvement Center. (Photo; Mika Sugiura)



Measuring exhaled breath data from cattle. (Photo; Mika Sugiura)

6 Seaweed and Persimmons

Other feed sources, aside from cashew nuts, have also been studied for their potential to reduce methane emissions. In Australia and the US, research has shown that feeding cows powdered *Asparagopsis* seaweed can reduce methane emissions in their breath.

This red seaweed is also found in Japanese coastal waters, where institutions such as Kochi University and the major construction firm Kajima Corporation are exploring its potential.

In Nagano Prefecture, Japan Agricultural Cooperatives (JA) are investigating the use of Ichida persimmon peels — known for their popularity as dried fruit — as a feed additive to reduce methane emissions.

All livestock feed must comply with the Feed Safety Act to ensure quality and safety. In September 2022, Japan's Ministry of Agriculture, Forestry and Fisheries (MAFF) introduced evaluation standards for feeds claiming to reduce methane emissions.

Currently, CNSL is undergoing the approval process to be officially designated as a feed additive for this purpose. In addition to reducing methane emissions, CNSL has also been shown to enhance livestock productivity.

7 Visualizing Greenhouse Gas Reduction

Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF) developed the MIDORI Strategy for Sustainable Food Systems to achieve carbon neutrality by 2050. This initiative aims to accurately assess the producers' environmental efforts and provide consumers with clear information to help them make environmentally conscious choices.

In March 2024, MAFF introduced the Visualization and Labeling Guidelines for Environmental Impact Reduction in Agricultural Products. These guidelines, which cover 23 items including rice and vegetables, are designed to help visualize the environmental friendliness of purchased items.

These efforts also extend to livestock products, such as beef and milk, with calculations and verifications currently underway.

The Japan Cattle Industry Cooperative (JCIC) has fully supported this initiative by conducting methane reduction research and contributing to the development of the visualization framework.



Labels marked "greenhouse gas reductions" (blue) and "biodiversity conservation" (green). The trademarks are pending registration. (From the MAFF website)

8 Bringing Eco-Friendly Wagyu to the Global Stage

JCIC Chairman Nobuhiro Sasaki emphasized the dedication of Japanese beef producers, stating, "We take pride in raising cattle in accordance with Japan's three livestock environment laws, which regulate manure management and feed safety."

He continued, "As Japanese Wagyu enters an increasingly competitive global market, it is crucial to proactively highlight our methane reduction efforts through scientific data and communicate this advantage internationally."



A team of researchers measuring methane emissions in cow burps. (Photo; Mika Sugiura)