norilia

Sustainability Focus Report 2023

Pure
nature
refined

Table of contents

Introduction by our CEO

As Norilia's CEO, I'm excited to share our sustainability report. This year, we're enhancing our focus on elevating the value of our products and broadening their market reach, driven by our core values of responsible production and dedication to the welfare of people and animals.

Sustainability is at the heart of everything we do. Our report amplifies our commitment to leveraging every resource for high-quality, in-demand products. We maintain strict safety and quality controls across our value chain and prioritize ethical practices in all our operations.

We embrace innovation through collaboration, actively seeking partnerships that advance our sustainability goals. Our efforts, like our collaboration with the biotech company Bioco, demonstrate our commitment to transforming by-products into valuable resources., demonstrate our commitment to transforming by-products into valuable resources.

Thank you for supporting our journey toward a sustainable and innovative future.

Morten Sollerud, CEO of Norilia

About This Report

Sustainability is important to Norilia and is a part of our DNA. Our business is based on raw materials from the Norwegian meat industry and our goal is: “To utilize and exploit plus-products from the meat and egg industries in order to contribute to profitable and sustainable agriculture.”

Norilia is a wholly-owned subsidiary of Nortura, one of Norway's largest food producers.
Nortura is the farmers' own company and a cooperative owned by approximately 16,000 Norwegian farmers.

Responsible value creation
Nortura strives towards sustainable and responsible production. To achieve this, it is vital to ensure that all resources are utilized in the best possible way. Therefore, every part of the animal is used, and nothing is wasted.

At the same time, additional value is created, adding a plus to the cooperative owners and to society. These plus-products are handled by Nortura’s subsidiaries, Norilia being the most important one, controlling how plus products are utilized.

Sustainability reporting
This report contains relevant excerpts from Nortura's Sustainability Report 2023, translated into English.

In addition, relevant information regarding Norilia’s business is included where relevant.

The results reported are from the fiscal year January 1 to December 31, 2023,
related to the goals in Nortura’s sustainability strategy. The selection of significant
aspects is based on our stakeholder and materiality analysis from 2021.

Used standards
The report is prepared based on the Global Reporting Initiative (GRI) standard ("with reference") and forms the basis for Nortura's annual Communication on Progress to the
UN Global Compact.

For reporting greenhouse gas emissions, we follow the GHG Protocol. In some areas, GRI does not cover all aspects; therefore, we use the Sustainability Accounting Standards Board (SASB) for reporting on food safety and the
Business Benchmark on Farm Animal Welfare (BBFAW) for reporting on animal welfare.

Regarding reporting on public health and nutrition, there is currently no standard. Therefore, Nortura has developed its own result indicators

Scope and Delimitation

The 2023 report covers Nortura SA as the parent company and not the entire group. Nortura has considered their entire value chain and reports on the impact from farm to fork.

In 2024, Nortura will start an extensive process to report in accordance with the new EU directive on sustainability reporting (CSRD). This means that the report for 2024 will be in compliance with the new European Sustainability Reporting Standards (ESRS) and will include the entire group: Nortura SA and subsidiaries.

Error Reporting

Inconsistent reporting of data discovered in previous years' reports was corrected and clearly marked in this year's report.

Verification

The Nortura sustainability report for 2023 is not externally verified. The report for 2024 will be prepared in accordance with the new European standards (ESRS), and the report for 2025 will be externally verified in compliance with the requirements of the new European directive on sustainability reporting (CSRD).

About Norilia

Norilia is a part of the Nortura ecosystem and was spun out as a separate company in 2000. We have full responsibility for sales and value creation for plus-products from all of Nortura's livestock species. This gives us a unique position, enabling us to create high-value and high-quality products.

Our business is based on raw materials from the Norwegian meat and egg industry. We take care of and utilize co-streams, or plus-products as we call them, to contribute to a profitable and sustainable agriculture. Our work is based on more than 60 years of experience, and today we export worldwide.

Our mission is to ensure that the whole animal – all available resources is used for products the world can benefit from and enjoy. For example, dietary supplements, food, animal feed, or materials. Research, innovation, and collaboration are core elements of our work.

Circularity in practice
Norilia utilizes raw materials from from Nortura and independent abattoirs in Norway, Denmark, and Sweden. Co- streams, or plus-products, make up around 35% of all biomass received by the meat industry from animals and eggs.

We emphasize ensuring good quality and efficient product flows with the least possible environmental footprint throughout the value chain, from the origin of raw materials to the market.

Some of the plus products undergo bioprocessing to become new ingredients, while others are sorted to achieve the highest possible value.

Plus-products are therefore very important resources for value creation, and creating value from these products is exactly what Norilia does. We sell 150,000-160,000 tons of plus-products per year and create added value through our competence, collaboration, and innovation.

Green and sustainable solutions
Our focus is international, with products in nutrition and ingredients, pet food, natural casings, offal, bone and meat products, hides and skins, and wool. Today, we have nearly 50 employees and a turnover of around 500 million Norwegian kroner, with 65 % from exports.

The world demands greener and more sustainable solutions. We aim to contribute to solving some important societal challenges, and focus on solutions for better health, more sustainable food production, and sustainable materials.

Bioco

Bioco is a joint venture between Norilia and Felleskjøpet Agri. It is a biotechnology and biorefinery company located in Hærland, Norway.

The company is the result of considerable investments in the development of a more sustainable agriculture. Bioco has implemented continuous enzymatic hydrolysis for poultry in their biorefinery plant.

Bioco increases value creation and resource utilization for chicken and turkey raw materials.

Norilia Nordic

Norilia Nordic was established in the spring 2020 by Norilia and the Danish company Himmerlandskød A/S. Norilia Nordic markets and sells all Nordic hides and skins from the businesses of Norilia and Himmerlandskød.

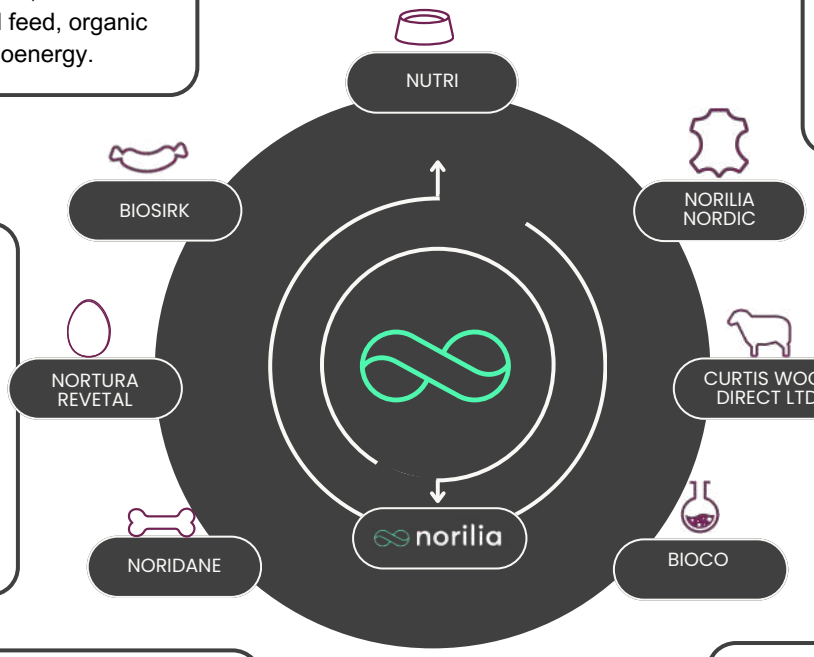
The company buys services from Norilia and Himmerlandskød's processing facilities. This collaboration enables us to offer a significant volume of top-quality hides and skins.

Norilia controls how plus products are utilized. They are either sent for further processing at other subsidiaries within the Nortura ecosystem or to external customers. Norilia ensures optimal resource utilization and value creation from plus-products in the Nordic meat and egg industry. Norilia finds markets for all plus-products and explores new ways to process and use raw materials.

Nutri
Uses offal to produce high-quality pet food both in Norway and for export. The products are sold in Norway under the brand PROVIT.

Biosirk
Further processes by-products that are not in demand as raw materials for food or pet food. Biosirk produces meat and bone meal and fat, which are used for animal feed, organic fertilizer, and bioenergy.

Norilia Nordic
Markets and sells hides and skins from the Nordics to the luxury industry worldwide.



Nortura Revetal
Processes 800 tons of eggshells and produces ingredients such as eggshell membrane and calcium, which are used for wound healing, dietary supplements, animal feed, and fertilizer

Curtis Wool Direct Ltd
Their main business is in general wool trading and processing

NoriDane
Is our export channel for bone and plus-products and imports meat to Norway when there is a market shortage.

Bioco
Processes bone raw materials from chicken and turkey into nutritious proteins and oils used in food and dietary supplements for both humans and animals.

Hides and Skins

Hides from Norwegian cattle and skins from sheep are sold to tanneries worldwide. Norwegian hides and skins are known for their high quality due to good animal care and excellent animal health. They are used for luxury bags, car seats, belts, shoes, and furniture.

Poultry and Eggs

By-products from chicken and turkey are processed at our biorefinery, Bioco, and turned into ingredients used in food and dietary supplements for both humans and animals. At Notura's egg-cracking facility in Revetal, the membrane is separated from the eggshell. The membrane is used in dietary supplements and wound healing products, while calcium from the eggshells is used for everything from fertilizer and animal feed to dietary supplements.

How the Plus Products Are Utilized

Offal and Bones

We preserve offal and bones from all our livestock. Some products made from these are exported to food markets in countries with different food cultures than Norway. Some offal is even considered delicacies. Much of the offal and bones not used for human food is sold as pet food. Offal is a sought-after raw material with high nutritional value.

Wool

Norwegian wool is especially known for its good resilience, fine luster, high durability, and longevity. Wool from Norilia has also received the Swan label. The wool is used for knitting yarn, ready-made knitwear, shoes, coats and outerwear, blankets and pillows, as well as furniture and traditional Norwegian costumes (bunad fabric).

Natural Casings

Casings from sheep, pigs, and cattle are imported for sausage production. At the facility in Tønsberg, equipment for cleaning pig casings has been installed. During the process, mucosa is extracted from the pig casings. From the mucosa, raw heparin is derived, which is used to produce blood-thinning medication. At the facility in Forus, equipment for cleaning sheep casings has also been installed.

Norilia is circularity in practice

Why it is Important

Nortura receives livestock from all over Norway for our production. Two-thirds of the animal is meat delivered for consumption in the Norwegian market. The rest consists of hides, skins, wool, plus-products, casings, blood, and bones, which go into other cycles and value chains. Utilizing the entire animal is a sustainable practice that shows respect for both the animals and the environment.

Full utilization of all raw materials is crucial for good sustainability. All parts of the animal are used to create products that are useful and enjoyable worldwide. By converting by-products into high-quality products, we reduce the climate footprint of food production while increasing profitability for the farmer. We call our by-products "plus-products" - these are raw materials that come in addition to meat and, when handled correctly, contribute to increased value.

How we work

We and Norilia are responsible for optimizing the management of our plus-products. With over 60 years of experience and high competence in value creation from by-products, we in Norilia ensures that all parts of the animal are used for, for example, dietary supplements, food, animal feed, or materials. Research, innovation, and collaboration are core elements of our work.

We and Nortura emphasize ensuring good quality and efficient product flows with the least possible environmental footprint throughout the value chain, from the origin of raw materials to the market. Some of the plus-products undergo bioprocessing to become new ingredients, while others are sorted to achieve the highest possible value. We operate in a global market, and currently, around 65% of our plus products are exported.

100%

of the raw materials that come into our production will be utilized, with a focus on increasing the proportion used for human food.

Environmental measures 2023

→ At Hærland, most of the by-products from chicken and turkey were previously sold for fur animal feed. In 2022, new equipment was invested in to harvest hearts, livers, and gizzards, now resulting in an annual delivery of 1,500 tons of these products for pet food production at a higher price.

→ Our products help several of our customers reduce the climate footprint of their end products. For example, two of our customers have chosen to replace limestone flour with protein meal and calcium from eggshells. This is because the production of limestone flour and phosphate results in higher CO2 emissions. Using our circular products gives them a lower environmental footprint.

→ At the hide facility in Skjeberg, there has been active work to reduce energy consumption. This has resulted in a 23 percent decrease since 2021. Measures include the introduction of active management of dehumidifiers and cooling systems. At the casing facility in Fredrikstad, new CO2 cooling has been installed, and old water heaters and ovens have been replaced. The new CO2 system is 30 percent more energy-efficient and automatically adjusts the cooling according to activity and need.

155.000
tons of plus products are managed by Norilia

65%
of Norilia's revenue comes from exports to the world.

20.000
tons of pet food are produced each year from plus products.

→ In 2023, a collaboration was initiated with Salsus for a joint investment in bone-breaking equipment at Rudshøgda, enabling the delivery of 30 tons of cattle bones per week for stock production at Salsus. Previously, these raw materials were used for animal feed.

→ The wool, which is suitable for knitting yarn, becomes durable quality products and was again approved for certification with the Swan label for the period 2024-2026 in 2023.

→ Several projects are ongoing where we work on new ways to use by-products. One example is the collaboration with Woolero, a Norwegian start-up that uses low-value wool, which is not suitable for knitting yarn, to produce wool pellets and wool flower pots. Woolero received approval for the use of wool pellets as fertilizer from the Norwegian Food Safety Authority in 2023, and their products are now available on the market.

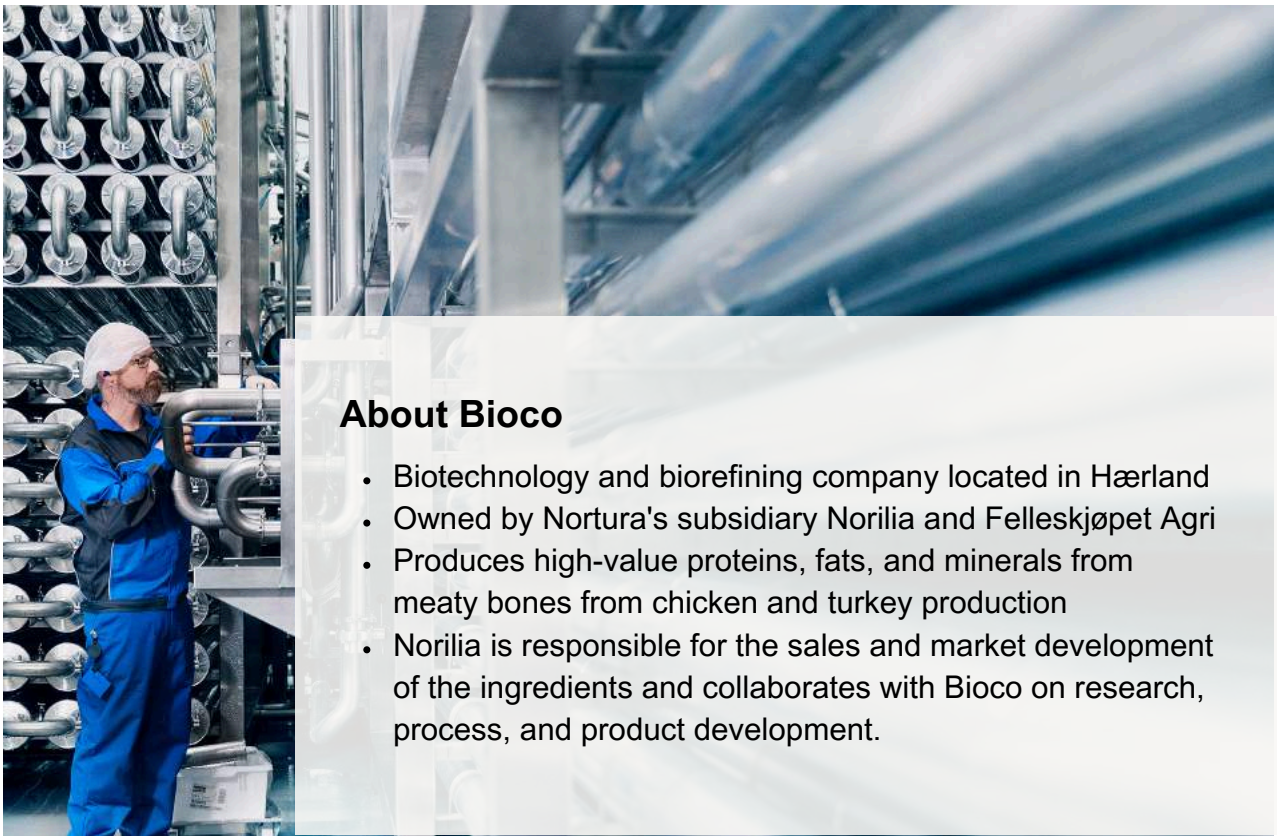
→ By avoiding freezing, energy consumption and emissions from additional transport to cold storage are reduced. In recent years, there has been a successful reduction of 90 percent in the freezing of raw materials for pet food production. At the same time, the sale of fresh hides from Sweden has increased from 2 percent to 50 percent.

Meaty bones from chicken and turkey are a significant source of protein

The future of sustainable agriculture is about utilizing and increasing the value of all parts of slaughtered animals, with the goal of using as much as possible for human food. Bioco, a biotechnology company based in Østfold and officially opened in 2021, processes by-products from Norwegian chicken and turkey into new ingredients with high nutritional value. Previously, this raw material was sold as feed for fur animals.

By processing the raw material, the ingredients can now be used in new markets with higher value. The process involves enzymatic hydrolysis, where enzymes in a bioreactor break down the protein structure to separate proteins, fats, and minerals. These enzymes are natural proteins from nature's own toolbox.

Bioco is the first facility in the meat industry to use tubular hydrolysis, a new and innovative technology. Bioco is a joint venture between Norilia and Felleskjøpet Agri. We aim to invest in sustainable agriculture, where all raw materials are utilized in the best possible way. The products from Bioco also provide access to Norwegian-produced high-quality ingredients for Felleskjøpet's production of pet food.



About Bioco

- Biotechnology and biorefining company located in Hærland
- Owned by Nortura's subsidiary Norilia and Felleskjøpet Agri
- Produces high-value proteins, fats, and minerals from meaty bones from chicken and turkey production
- Norilia is responsible for the sales and market development of the ingredients and collaborates with Bioco on research, process, and product development.

Norwegian agriculture and sustainability

Animals in Norway are among the healthiest in the world. Norway's antibiotic use is the lowest in Europe and one of the lowest in the world. Norway’s livestock industry, together with veterinarians and farmers, has been working systematically to reduce the use of antibiotics in food-producing animals, both through preventive health work, breeding, and responsible use of antibiotics.

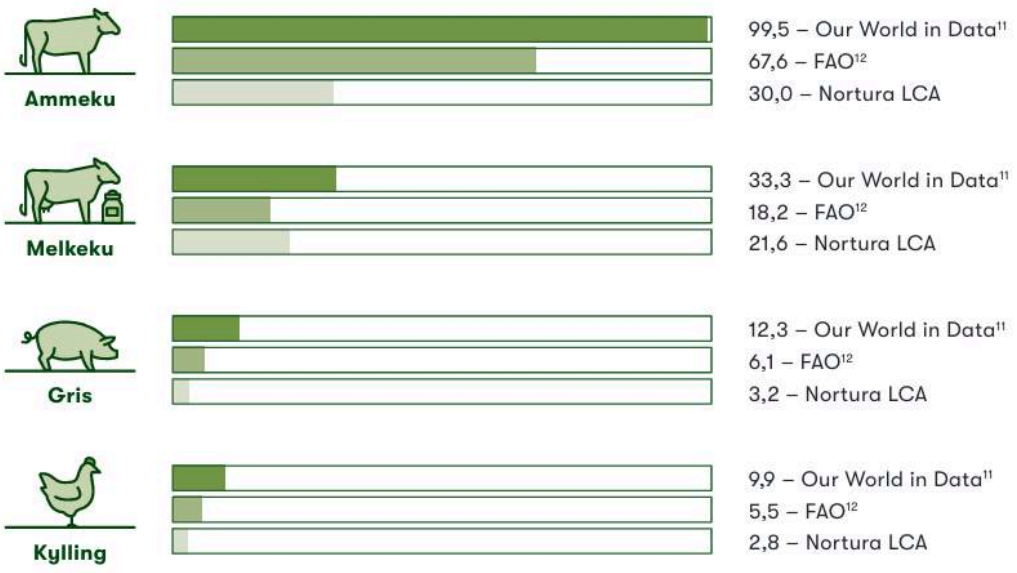
Food production accounts for a significant portion of the world's climate emissions. In Norway, 9.4 percent of the country's greenhouse gas emissions come from agriculture, mainly methane and nitrous oxide from livestock and manure. Norwegian livestock production is world-leading in climate impact due to healthy animals, dual-purpose cows, grass-fed and grazing beef cattle and small ruminants, and feed-efficient pigs and poultry. A key factor is the unique Norwegian dual-purpose cow, which produces both milk and meat, contributing to high resource utilization and a low climate footprint.

Lower emissions from Norwegian livestock

Good Animal Health and Low Mortality: Norwegian livestock has fewer cases of serious diseases, leading to significantly lower climate emissions per unit produced. Healthy animals require less feed, grow better, produce more milk, have better fertility, and have lower mortality rates. In contrast, regions with high animal mortality, like Sub-Saharan Africa, see higher climate impacts due to extreme conditions.

Climate-Friendly Breeding: Geno has developed the Norwegian Red (NRF) cow, which is efficient in both milk and meat production. This breed excels in performance, growth, fertility, and health, which are crucial for reducing the climate impact of production. On average, NRF cows produce 420g of methane per day, helping to minimize feed consumption, waste, and water usage.

Feed Efficiency: Norwegian pigs and poultry are bred to be highly feed-efficient, consuming by-products from the food industry, which reduces waste and lowers the climate footprint. This practice frees up 130,000 decares of Norwegian grain land. For ruminants, improvements in roughage quality have led to better feed efficiency, resulting in more resource-efficient production and lower greenhouse gas emissions.



Note: Our World in Data is used as a source in the report from the Nordic Council of Ministers 2023, "Nordic Nutrition Recommendations 2023".

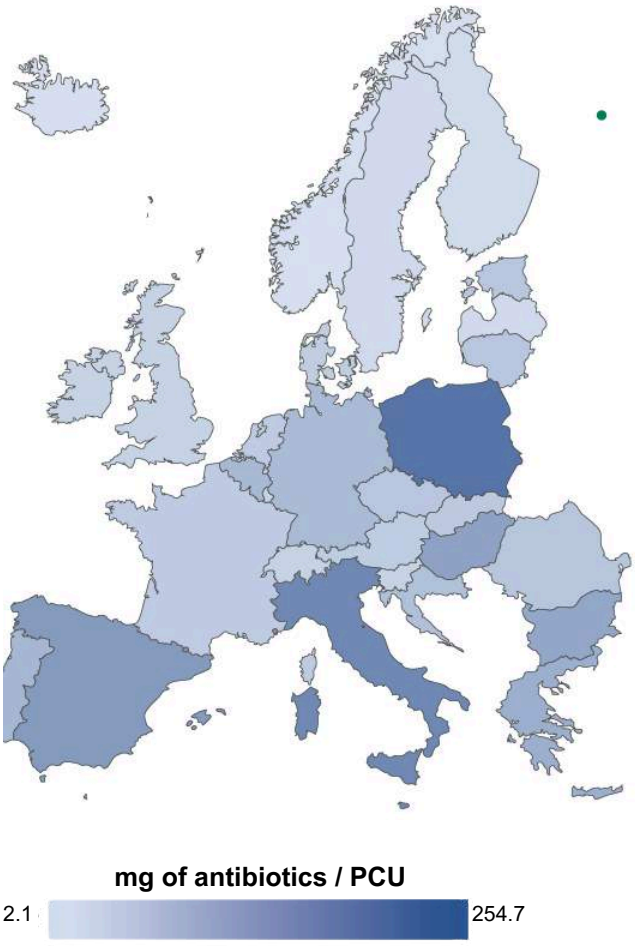
Norway has the world's lowest use of antibiotics

Skilled farmers, strict regulations, and continuous efforts in prevention, monitoring, and control of infectious animal diseases contribute to our animals being among the healthiest in the world. We only use antibiotics when necessary and only if the animal needs it due to illness.

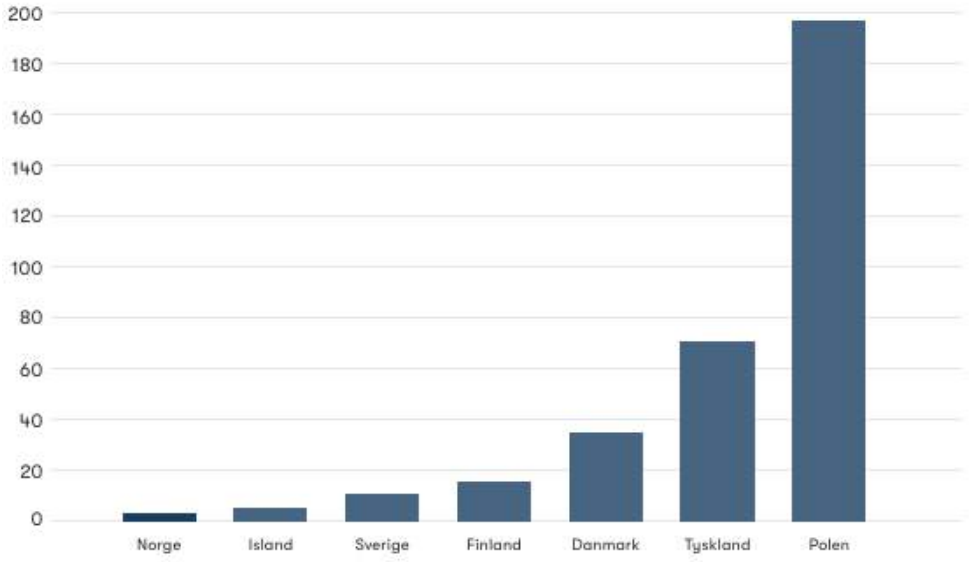
In Norwegian food production, antibiotics are never used preventively, which unfortunately is the case in many other countries. In fact, only about 10 percent of all antibiotics in Norway are used for livestock, while the rest are used for humans. In the rest of the world, the situation is almost the opposite.

Figures from the latest report by the European Medicines Agency show that Norway, along with Iceland, has the lowest use of antibiotics in Europe. In most European countries, there is a positive trend with a decrease in antibiotic use. Between 2011 and 2020, the sales volume of antimicrobial agents for food-producing animals in Europe fell by 43%.

Strict rules for the use of antibiotics are important to avoid the development of resistant and multi-resistant bacteria. Such bacteria can have serious consequences for public and animal health, as diseases become difficult to treat.



Use of Antibiotics for Food-Producing Animals per kg Biomass (mg/PCU)



Traceability and Transparency

Why it is important

Many consumers want to know more about where their food comes from and under what conditions our food products are produced. To strengthen trust in our products, we must be transparent throughout the value chain from farm to fork. Traceability can also be used throughout the value chain to improve slaughter forecasts, increase productivity, improve the economy, and reduce greenhouse gas emissions.

Many also want to make more sustainable choices when it comes to food and drink but find it difficult to know what is most sustainable. This is the biggest barrier to making sustainable choices and comes before price.

Today, several actors use pure climate labeling on their products, but this focuses only on one of many sustainability dimensions, and such labels do not provide a comprehensive answer to how sustainable the product is. A more holistic sustainability declaration or labeling system would make it easier for consumers to make more conscious and sustainable choices.

How we work

Work is being done on traceability, transparency, and product labeling towards consumers and customers across all Nortura brands.

We continuously work to map out what and how we can provide more relevant information about our products from farm to fork and make this information easily accessible to consumers.

Some of Nortura's brands and products already have traceability technology that allows consumers to trace back to the farmer.

Nortura are also working to increase their openness and build knowledge about various productions of Norwegian livestock among consumers and customers.

For Norlia, increased tracability and transparency is important for many of our product catagories.

For example, Norilia actively works with improving traceability of cattle hides and has tested methods for providing full traceability of hides throughout the value chain, all the way to the end-user, in the finished "iProcess" research project.

Animal Welfare

Why it is Important

When we humans take responsibility for animals, it is also our responsibility to ensure their well-being. Keeping animals for food production involves placing certain limitations on the animals' ability to live a natural life. Additionally, transport and slaughter are situations that can be stressful for the animals.

Following up on animal welfare is one of Nortura's most important tasks. The foundation of our parent company operations is the keeping of livestock for food production. Ensuring, developing, and improving the welfare of the animals is a prerequisite for Nortura to succeed in supplying consumers with high-quality meat and eggs.

Protecting animals from negative factors – such as disease, injuries, and pain – is an obvious and important part of the work on animal welfare. Additionally, Nortura increasingly emphasize creating positive experiences for production animals. Providing poultry with more environmental variation so they can express their natural behaviors is an example of this.

As Norway's largest meat and egg producer, Nortura have many routines throughout the value chain to ensure good animal husbandry. They also have a zero-vision for poor animal welfare and have worked purposefully in recent years to establish a solid system to detect conditions in the value chain that may indicate that animal welfare is not being maintained.

Pigs

Most Norwegian pigs live indoors all their lives. One reason is that they depend on a good and stable climate, which also gives the farmer good control over feeding and potential infection and disease. It is possible to keep pigs outdoors in Norway, but a pig kept in outdoor enclosures can be more vulnerable to disease and cold and is just as dependent on the farmer as a pig kept indoors.

Pigs are exploratory animals and have a need to dig and forage. When pigs are kept indoors, these opportunities are limited, and it is important to compensate by providing rooting materials. The farmer is therefore required to offer pigs activity and rooting materials so they can express their behavioral needs.

In 2023, the Norwegian Food Safety Authority presented the results of an inspection campaign on pig welfare. The campaign revealed non-compliance in just over half of the inspected herds. One in three did not meet the requirements for rooting materials, and one in four did not meet the requirements for bedding. Violations in the treatment of sick and injured animals were found in one in four.

The results are disappointing. Bedding, rooting materials, and the treatment of sick and injured animals are important aspects of the animal welfare program for pigs. Together with the rest of the industry, Nortura is taking measures to ensure the program is followed. For example, consistent understanding and implementation of the regulations among the veterinarians in the animal welfare program, KSL auditors, and the Norwegian Food Safety Authority will be important so that non-compliance with requirements is quickly addressed.

Cattle

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For Norilia, increased traceability and transparency are important for many of our product categories.

For example, Norilia actively works on improving traceability of cattle hides and has tested methods for providing full traceability of hides throughout the value chain, all the way to the end-user, in the finished "iProcess" research project.

Small ruminants

About 9,000 of Nortura's suppliers engage in small ruminant production, primarily sheep and a few goats. Through the use of grazing during the summer months, small ruminants have great freedom of movement and good opportunities for natural behavior. These are important prerequisites for good welfare in small ruminants.

The animal welfare program for sheep was launched in the fall of 2023. The program applies to all with more than 30 winter-fed sheep, which constitute 93% of all sheep. Since sheep are the species with the most herds, follow-up is particularly resource-intensive.

The animal welfare program requires mandatory veterinary reviews. Nortura hopes that this will contribute to closer follow-up of herds that need to improve animal welfare.

Chicken and turkey

Chicken and turkey live indoors in heated and insulated houses. They move freely on litter and have access to food and water. The lighting is adjusted to the animals' needs, so they get sufficient amounts of light and dark. For several years, Nortura has required that chickens and turkeys have access to environmental enrichment measures to provide the animals with more variety and increased well-being. Research shows that this is positive for animal welfare.

The number of animals per square meter also affects the animals' ability to practice natural behavior at the end of their life. The maximum density for Norwegian broilers is 36 kg/m². The limit in most other EU countries is 39 kg/m² or 42 kg/m². For broilers, Nortura offers special productions kept at a lower density than the maximum allowed density in the regulations.

Nortura currently has two types of chickens. The difference between these is that the slower-growing type, which lives a few days longer, may have a slightly lower risk of certain health problems. However, good competence and close follow-up from the farmer help to reduce this risk in the fast-growing breed. In the fall of 2023, Nortura decided to phase out fast-growing chickens. Over the next few years, all chickens from Nortura will be slow-growing chickens.

Laying hens

Approximately 98% of the laying hens in Nortura's value chain are kept in free-range systems, while 2% are in enriched cages (meaning they move around in furnished cages in groups of 7 to 42 hens). All eggs that go to the PRIOR brand come from free-range or organic hens that have access to environmental enrichment measures.

Free-range hens move freely in the henhouse and have access to perches, nesting boxes, and the opportunity for dust bathing.

Hens in organic farming have a bit more space, the opportunity to go outside, and eat organic feed. Hens in enriched cages have access to perches, nesting boxes, and dust baths. Mortality in free-range systems and organic systems is higher than in enriched cages. For this reason, this is an area that Nortura focuses on greatly in its animal welfare work.

Result reporting

Animal welfare is important to us and Nortura. In Nortura’s sustainability report for 2023, the results for Nortura's slaughter lines were included. We have included a short summary of Nortura’s results for their slaughter lines. For more detailed information, please contact us.

Results: In 2023, 64 percent of Nortura's slaughter lines for four-legged livestock received an A rating, 32 percent a B, 0 percent a C, and 4 percent a D in the Ethical Accounts. The slaughter line with a D rating received this grade due to a "knock-out" point issue, after findings of inadequate deviation handling.

For Nortura's wholly owned poultry slaughterhouses, a total rating is given for both catching, transport, and slaughter. Both of Nortura's wholly owned chicken slaughterhouses received a B rating. For the transport and slaughter of turkeys, an A rating was achieved.

Measures 2023

In addition to complying with regulatory requirements, it is important for our parent company, Nortura, to develop animal welfare initiatives independently. They therefore have ongoing research or development projects related to topics that affect animal welfare. Examples of such projects are:

Griseløftet: A research project aimed at gaining knowledge and developing tools that promote the welfare of slaughter pigs. Funded by the Research Funds for Agriculture and the Food Industry.

Boars4all: The goal of the project is to find solutions that make boar production possible without the challenges of boar taint. If successful, castration of boars could be eliminated. Funded by the Research Funds for Agriculture and the Food Industry. Read more about Boars4all here.

Pigs with More Light, Air, and Space: A research project aimed at gaining knowledge about how the welfare and behavior of pigs change when they are given more light, air, and space, and how this works in practice for the farmer. Funded by NorgesGruppen's Sustainability Fund.

Velferdshøna: A research project to investigate the health and welfare of laying hens. Animalia is the project leader, and Nortura is a contributor to the project. Funded by the Research Funds for Agriculture and the Food Industry.

Parent Welfare: four-year project focusing on the welfare of breeding animals in broiler production. Animalia leads the project, and Nortura participates. Funded by the Research Funds for Agriculture and the Food Industry.

How we work

Our parent company, Nortura, will promote good animal welfare through quality assurance and follow-up of the value chain, continuous improvement work, advisory services, and knowledge development. We are an active advocate and initiator at the industry level to develop knowledge about animal welfare and participate in several research or development projects aimed at improving and developing animal welfare for all our productions.

Animal welfare on the farm

The farmer is responsible for ensuring that the regulatory requirements for animal welfare are followed on the farm. Through animal welfare programs and the Quality System in Agriculture (KSL), our parent company, Nortura, sets requirements for the farmer, and we have advisors and veterinarians who offer guidance on how the farmer can develop and improve operations and animal welfare.

Joint animal welfare programs

Norwegian animal welfare regulations, managed by the Norwegian Food Safety Authority, set requirements for how animals in Norway should be treated. Although public regulations form the basis, Nortura is an active advocate for developing industry-based animal welfare programs for all our animal species. The animal welfare programs document animal welfare, implement welfare measures beyond the regulations, and maintain and improve animal welfare in Norwegian herds. The programs require annual veterinary visits and, for some programs, external audits.

Today, there are animal welfare programs for pigs, cattle, and poultry, and the program for small ruminants started in the fall of 2023, with phased enrollment over two years.

How Nortura follows up on deviations

Nortura has also established its own routines to detect herds at risk of poor animal welfare, including through observations when animals are delivered for slaughter. If deviations are detected, they are followed up. Our work aims to identify animal welfare issues before they develop. The routines are primarily aimed at helping the farmer prevent animal welfare challenges and correct deficiencies. If measures are not followed up, Nortura can implement actions such as financial sanctions, exclusion from supply chains like Nyt Norge, Gilde, and PRIOR, and notification to the Norwegian Food Safety Authority.

Animal welfare during transport

Only animals that are fit for transport can be transported. For animals with health deviations and special needs during transport, accommodations are made. The Norwegian Food Safety Authority has developed a guide to help assess transport fitness. Because it is important for Nortura that the farmer has good knowledge of what is required to ensure animal welfare during transport, Animalia, at Nortura's initiative, has created a digital course for farmers on the requirements for transport fitness and ensuring animal welfare during loading/unloading and transport.

All animal transport drivers must have a competency certificate. This means they must have undergone specialized training in how to care for animals and animal welfare during transport. At Nortura's request, a joint industry scheme for mandatory continuing education for animal transport drivers has also been established.

The regulations set clear requirements for maximum transport time, and Nortura records the travel time for all animal transports to the slaughterhouse. They also register transport mortality and transport injuries for all animals.

Animal welfare at the plant

All of Nortura’s slaughterhouses have their own animal welfare officers, and everyone handling live animals must complete mandatory training programs and have a competence certificate from the Norwegian Food Safety Authority.

The slaughterhouses have standardized animal welfare routines for the reception, handling, housing, stunning, and slaughtering of animals, for each animal species. All animals are stunned before slaughter, and we have control routines to ensure this is done.

During halal slaughter, the slaughterhouse follows the same animal welfare, stunning, and slaughtering requirements as other types of slaughter. Violations of regulatory requirements or Nortura's own requirements are followed up with deviation handling and measures to prevent recurrence.

Reviewed through "ethical accounts"

Nortura actively works to identify areas for improvement, systematics, and measures that enhance animal welfare and uses third-party audits in the improvement work.

For over 20 years, we have conducted Ethical Accounts for animal welfare at our slaughterhouses – longer than anyone else. Ethical Accounts are unannounced audits conducted annually and provide a comprehensive mapping of factors that can affect animal welfare.

The industry organization Animalia conducts the audits on our behalf, and since 2021, the audits have been unannounced.

Ethical Accounts are based on the following principles:

- The animals' basic physical needs must be met (dry lying area, clean drinking water, and acceptable ventilation/temperature).
- Animals that can harm each other must be kept separate.
- The facilities must be designed so that no animals can be injured.
- Driving lanes must be designed so that most animals move without coercion (proper lighting, clear lanes, correct width, non-slip floors, solid walls, and low noise).
- Sick or injured animals must be euthanized as quickly and humanely as possible.
- It should appear that the animals are well.

Nortura has a central system for reporting and anonymous reporting of animal welfare issues. All Nortura employees are required to follow the Animal Welfare Act's requirements for reporting.

Slow-growing chicken

Our parent company, Nortura, has been producing and selling slow-growing chicken for over 15 years, mainly in the professional market. In 2021, They announced a collaboration to introduce slow-growing chicken into larger parts of the retail market. In November 2023, it was decided that Nortura would make a complete transition to slow-growing chicken.

Nortura aims to contribute to sustainable and good chicken production and has a proud history of working on improvements in Norwegian chicken houses for many decades through animal welfare programs and industry initiatives. They have been a pioneer in ensuring that animals have feed without narasin, environmental enrichment, and good health. A sustainable and successful transition to slow-growing chicken is a natural part of this work.

Veterinary communities, the Norwegian Food Safety Authority, and society around us increasingly expect the industry to switch to slower-growing chickens. Nortura also sees that more and more customers signal that they want a change. We will facilitate this, but it must happen at a pace that ensures a safe implementation for farmers, animals, and Norwegian consumers. The transition requires changes at all levels of the value chain, which will affect the time until a full transition.

Gender sorting of hatching eggs

In September 2023, Nortura's partially-owned hatchery, Steinsland & Co in Bryne, installed Norway's first machine for gender sorting in eggs. The machine can identify the sex of the chickens nine days into the incubation process instead of after hatching, which is the common practice in Norway and the rest of the world today. The first eggs laid by hens from the new production method will be available in stores in the summer of 2024, with the goal that this will apply to all eggs from PRIOR by 2025.

Gender sorting is performed using a hormone analysis of the fluid from the egg, which determines the sex of the embryo. This makes it possible to sort out male chick eggs and represents a more ethical production of eggs, as it avoids having to euthanize newly hatched male chicks. Male chicks cannot naturally lay eggs, and they are of a breed that does not grow enough meat to be used for regular meat production.

Nortura wants to share its experiences and knowledge with the rest of the industry so that this quickly becomes the only standard for egg production, both in Norway and Europe. Nortura is among the first in the world to implement gender sorting in eggs.

Pigs with more light, air, and space

Nortura has conducted a collaborative project with Norwegian University of Life Sciences, Fjøssystemer, and NorgesGruppen's Sustainability Fund HANDLE to investigate whether barn renovations can improve the welfare of pigs by giving them more light, air, and space.

The project is based on existing farm buildings and areas and aims to provide knowledge about practical feasibility and economic sustainability for farmers. The goal is to develop solutions that can be easily implemented by more farmers.

The project started in the summer of 2023 at Kirkevold Farm in Vestfold, with approximately 250 slaughter pigs in the barn. The pigs stay in a building with several larger pens and gates that can be fully opened. Indoors, they can rest on straw, and outdoors, they have access to concrete platforms. After the barn renovation, the pigs have had the opportunity to move freely both indoors and outdoors. The project also includes data collection from two other farms.

To assess the pigs' welfare, researchers use a protocol and video recordings to document behavior, environmental conditions, and injuries. To analyze how the solutions affect practical operations and the farmer's economy, several parameters must be assessed and compared before and after the renovation.
The results are expected to be ready by March 2024.

New Parliamentary Report on Animal Welfare

It has been over 20 years since the Norwegian Parliament set overarching goals for the welfare of Norwegian livestock. In 2024, a new parliamentary report on animal welfare is expected. The report is important because it sets the direction for how the welfare of meat- and egg-producing animals should be developed going forward. Nortura is Norway's largest player in meat and eggs, and there is a wide range in how the farmers who supply Nortura operate, from specialized productions to small niche businesses. The frameworks set by public regulations are therefore important to raise and develop the welfare level for as many animals as possible. In 2023, Nortura, together with the rest of the meat and egg industry, submitted specific measures to the animal welfare report. For Nortura, it is important that the new parliamentary report continues to ensure that good animal welfare is an advantage and a strength for Norwegian livestock production.

Biodiversity and Ecosystems

Why it is important

Access to clean air, clean water, and nutrient-rich soil depends on a rich diversity of plants and animals, and well-functioning ecosystems both on land and in water. In recent decades, changes in land use, climate change, pollution, over-exploitation of natural resources, and soil degradation have had a severe negative impact on the diversity of plants and animals, as well as ecosystems, worldwide.

Although Norway is among the countries with the most intact nature, and only three percent of our land area is cultivated, Norway's Nature Index shows that the condition of Norwegian ecosystems is significantly weakened due to human activity, with great variation from region to region. In many regions, the main challenge is related to the cessation of traditional management and large-scale farm closures, leading to the overgrowth of cultural landscapes. This poses a threat, among other things, to pollinating insects that are critical for food production. In other parts of the country, the challenge is the intensification of agricultural methods, runoff from livestock manure, and the use of pesticides and fertilizers.

Grazing

About 45 percent of Norway's land area is suitable for grazing, and agriculture has, over thousands of years, created habitats for a variety of plant and animal species. Today, the cessation of traditional extensive farming, such as summer farming, grazing, and mowing, is the main threat to these habitats.

The culturally dependent habitats in open lowlands (below the tree line) and mountain areas are most vulnerable to abandonment and the cessation of extensive agricultural management, leading to the overgrowth of cultural landscapes. These are habitats that are important for a range of species, and extensive management is essential to maintain the biodiversity and ecological functions that characterize these areas. The Red List, which is an overview of threatened nature, shows that 24 percent of the red-listed plant and animal species depend on grazing animals. Grazing resources in these areas also represent important soil resources that can easily contribute to future food production.

Did you know that..
In Norway today, we have 4,957 red-listed species, and 29% of these depend on grazing animals for survival.

Soil health

Of Norway's total land area, only about three percent consists of arable land. It is therefore very important that the cultivated soil functions optimally. Good soil health is not only the foundation for good yields; functioning soil also provides important ecosystem services such as water purification and carbon storage, and makes agriculture more resilient to extreme weather events like drought and flooding. Soil health is thus a prerequisite for sustainable agriculture.

Any form of soil cultivation carries the risk of carbon loss to the air and nutrient loss to the water. Soil degradation and loss pose a significant societal risk. According to NIBIO, soil degradation is a significant problem in Norwegian agriculture, especially due to erosion and the breakdown of soil structure. This can lead to loss of productivity and an increased need for fertilizers and other resources.
Increasing carbon sequestration in the soil provides many benefits, such as making the soil more porous and more resistant to damage from both water and drought.

Runoff and eutrophication

Over-fertilization in agriculture and runoff of nutrients such as nitrogen and phosphorus from soil contribute to algal blooms in freshwater (eutrophication). This leads to a reduction in oxygen levels in the water, which has significant negative consequences for plant and animal life in rivers and lakes. Over-fertilization and nutrient pollution are therefore considered one of the most serious forms of pollution from agriculture.

Overall, over-fertilization significantly affects 15 percent of river water bodies and seven percent of lakes, but there are large regional differences. The challenges are greatest, particularly in lowland areas with intensive agriculture in central parts of Eastern Norway, Jæren, and Trøndelag.

Pesticides

Pesticides are used in agriculture to protect plants from fungi, bacteria, and viruses, as well as to keep pests and weeds at bay. At the same time, pesticides can lead to the spread of toxic chemicals in soil, water, and air, negatively affecting animal and plant life in the area. Although we generally have good plant health in Norway, reducing chemical pesticides is important for both the farmer's health and economy, as well as for the environment and public health (through residues in food).

In Norway, the use of pesticides is more extensive in the cultivation of fruit, berries, and vegetables than in livestock production. Nevertheless, Nortura aims to reduce the use of chemicals in our value chain and will work to map the use of chemical pesticides and promote the transition to mechanical and biological alternatives in the coming years.

Did you know that...

The largest share of nitrous oxide emissions comes from the application of fertilizers associated with synthetic fertilizers and livestock. Other sources of nitrous oxide emissions from agriculture include cultivated peatlands, manure storage, and the breakdown of crop residues such as straw in the soil.

Livestock manure and synthetic fertilizers account for emissions of 1.1 million tons of CO2-equivalents.

How we work

As one of the country's largest agricultural cooperatives, Nortura has a significant impact on nature. The impact is greatest throughout our value chain and primarily on the farms.

They are in the early stages when it comes to working with biodiversity and ecosystems. At the same time, many of our owners and the agricultural sector, in general, have long been concerned about this. Taking care of nature in a way that allows the farm to be passed on slightly better from generation to generation is in the DNA of the Norwegian farmer.

In the coming years, we and Nortura will work systematically to ensure that we achieve our ambition of being nature-positive throughout our value chain. Nortura will preserve and improve soil quality in agriculture, reduce the use of pesticides and chemicals, and prevent pollution of nature. They will also promote species diversity and protect and rehabilitate land and water-based ecosystems throughout our value chain. This is important to ensure long-term productivity and sustainable food production.

Measures 2023

→ Through the life cycle analyses we have commissioned from NORSUS, Nortura has obtained results on how livestock production affects biodiversity, eutrophication, land use, acidification, and water consumption.

→ They have collaborated with TINE, Felleskjøpet, and the Norwegian Farmers' Union to understand what information and data need to be collected from farmers to report on their impact on biodiversity and ecosystems. This work will continue in 2024 and will involve several stakeholders, such as the Quality System in Agriculture (KSL) and Climate Smart Agriculture.

Life cycle assesments (LCA)

What is included?

Understanding how the production of our parent company, Nortura, impacts the outside world is essential for their strategy for sustainable food production in the future. Therefore, in 2023, they engaged the independent research institute NORSUS – Norwegian Institute for Sustainability Research - to conduct life cycle assessments (LCA) of the environmental impact from the different species included in Nortura's production. These analyses were completed in October 2023.

The life cycle assessments map and evaluate the total footprint of a product, addressing environmental and resource impacts such as energy and water consumption, emissions, acidification, soil quality, land use, and biodiversity. The analyses cover emissions from farm to factory door. The results from Nortura's life cycle analyses can be seen on pages 50 and 54. On our website, you can read more about the life cycle analyses and download the report from Norsus.

What is not included?

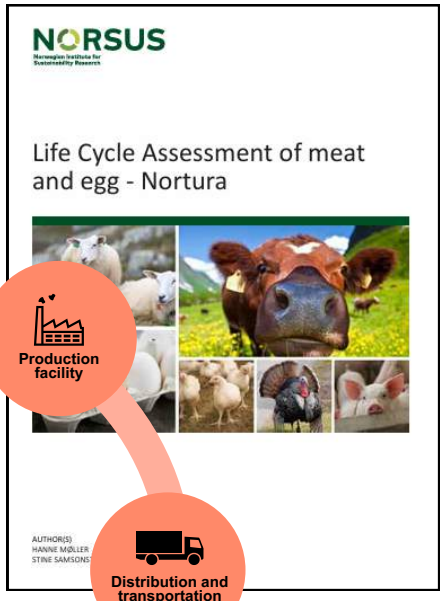
Carbon storage in soil and forests According to the IPCC, afforestation, improved forest management, and carbon storage in soil are currently the only significant methods for carbon capture and storage, and proper land use is key to achieving global climate goals. Forests bind the most carbon, and research shows that about half of Norway's total emissions are "captured" by forests.

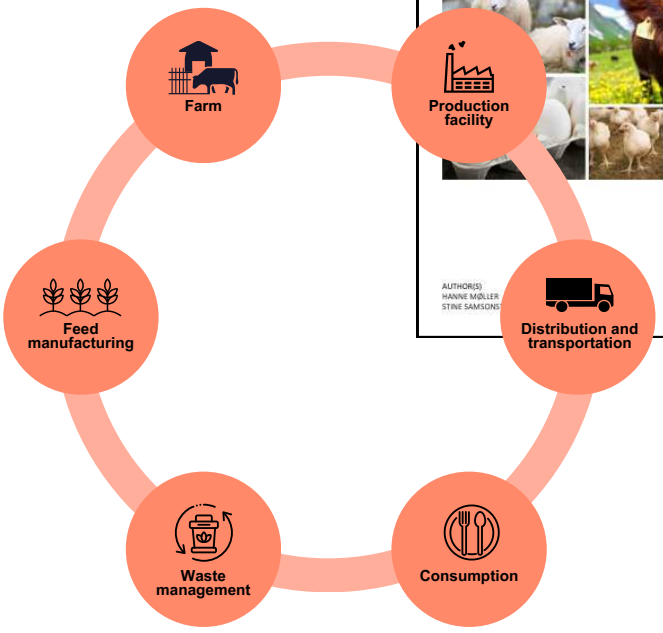
Grazing livestock contribute organic material, in the form of manure, and increase the activity of mycorrhizal fungi and bacteria that stimulate carbon binding in the soil. Grazing also enhances the transport of carbon from plant roots to the soil. Annual carbon binding through photosynthesis is estimated at 2.8 million tons of carbon in agricultural land in Norway. In Norway, there is already a high content of carbon in the soil, which means there is less potential for further binding. Ruminants, with good grazing practices, can ensure that the carbon in the soil stays there.

Albedo effect: cooling solar reflection

Solar reflection from open areas such as pastureland is also not included in climate calculations. When the sun shines on the ground, especially open, snow-covered areas, some of this will be reflected back into the atmosphere - up to 60-90 percent - and contribute to cooling the planet.

If an area is overgrown with shrubs and forests, less light is reflected (coniferous forests only reflect 5-15 percent), and the ground gets warmer. Grazing animals such as sheep, goats, and cattle are effective measures to prevent such areas from overgrowing.





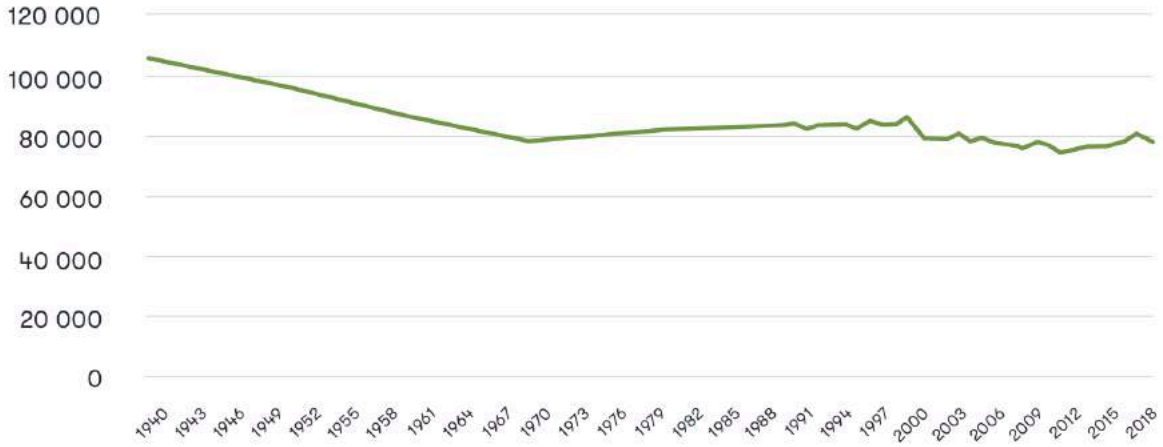
Emissions from Norwegian agriculture decrease while fossil emissions increase

Although food production has increased over the last fifty years, greenhouse gas emissions from Norwegian agriculture have decreased. In short, more food is being produced today with fewer animals. Since 1940, the number of cattle has almost halved, from 1.5 million to just over 800,000 today.

In this period (until 2018), methane emissions from cattle production have dropped from nearly 109,000 tons of methane per year to 79,000 tons per year in 2018 (the reason the decrease is not greater is due to the increased size of the animals). Since 1990, as the figure below shows, methane emissions from Norwegian agriculture have decreased by an average of -0.1% per year.

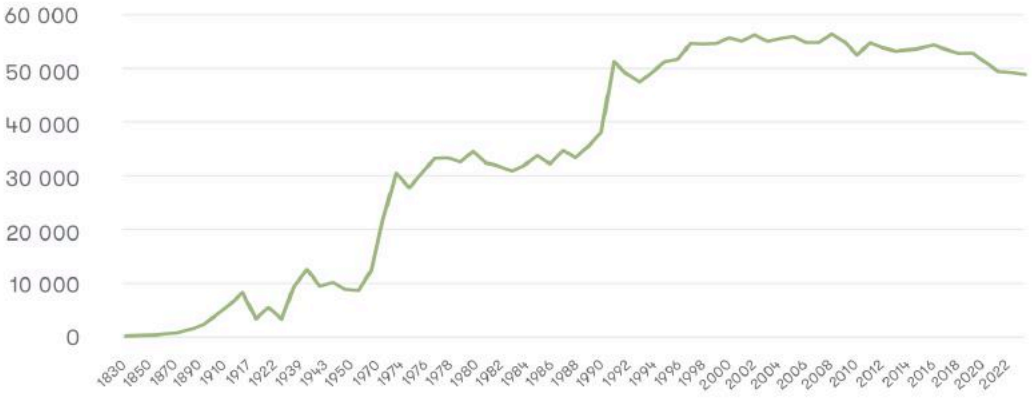
Meanwhile, since the 1960s, Norwegian emissions of greenhouse gases have increased significantly. According to Statistics Norway, the largest sources of this are oil and gas extraction, industry and mining, and road traffic, aviation, and maritime transport. See the bottom figure.

Methane Emissions from Cattle Production in the Period 1940-2018



Source: Report 13-2019 - Methane - new methodology for a short-lived greenhouse gas | AGRI Analyse

Norway's Territorial Greenhouse Gas Emissions in the Period 1830-2022 (in 1000 tons)



Sources: Emissions within Norway's geographical boundaries. Aftenposten, CDIAC (1829-1973) and SSB (1973-2022)

The performance of our livestock has significantly increased over the last 60 years, partly due to major advancements in breeding and the development of technology that provides better feed.

	1959	2023
Number of liters per dairy cow per year:	2564	7273
Number of kg of beef and veal per cow** per year:	82	285
Number of kg of sheep/lamb meat per winter-fed sheep per year:	17.3	25.5
Number of kg of pork per breeding sow per year:	746	1845
Number of kg of eggs per hen per year (1969):	8.8*	18

**Milk and beef cows

Are Norwegians eating more meat than ever? And how does this affect the climate?

In public debate, it is often claimed that Norwegians are eating more meat than ever, and that this trend must be reversed to reduce agriculture's impact on climate change. Looking at the actual development, it is true that overall meat consumption has increased in the last 20 years.

The increase is due to a significant rise in demand for poultry and pork, while consumption of beef and small ruminants has remained more or less stable. Pork and poultry have lower emissions than both salmon and some plant-based alternatives, which calls into question the claim that increased meat consumption is detrimental to climate change.

Estimated Actual Consumption of Meat and Wholesale Consumption of Eggs in kg per Inhabitant

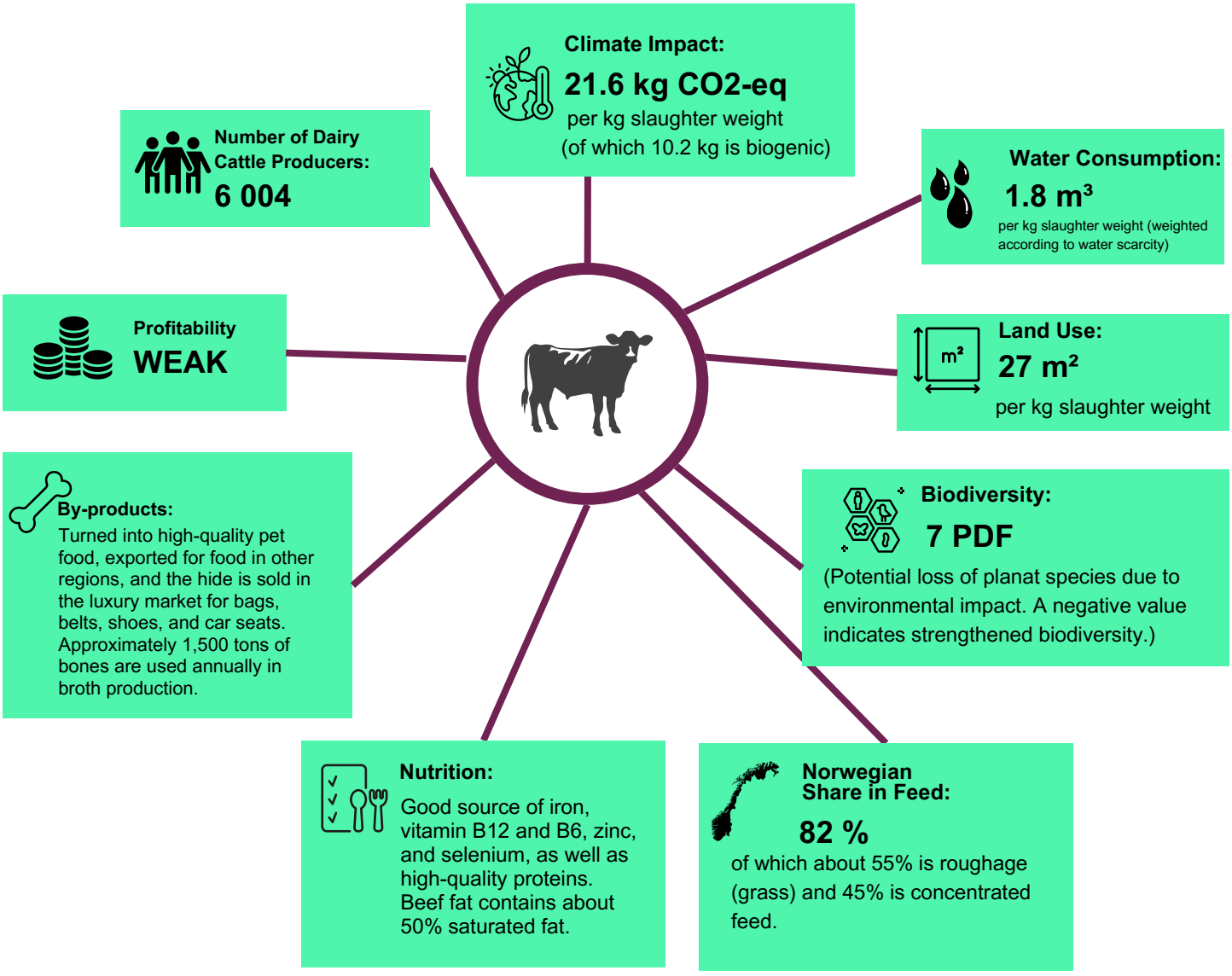
	1990	2022
Beef	13.0	13.9
Small ruminants	4.0	3.2
Port	16.1	20.2
Poultry	3.4	15.7
Total meat consumption (incl. game and others)	41.7	58.0
Egg*	11.0	13.3

Source: Animalia kjottets-tilstand-2023.pdf (animalia.no) (p. 119).
*Wholesale consumption of eggs in kg per inhabitant.

Key Figures from LCA: Dairy Cattle

70% of the beef from our parent company, Nortura, comes from combination cows that produce both milk and meat. This results in lower emissions per unit of production.

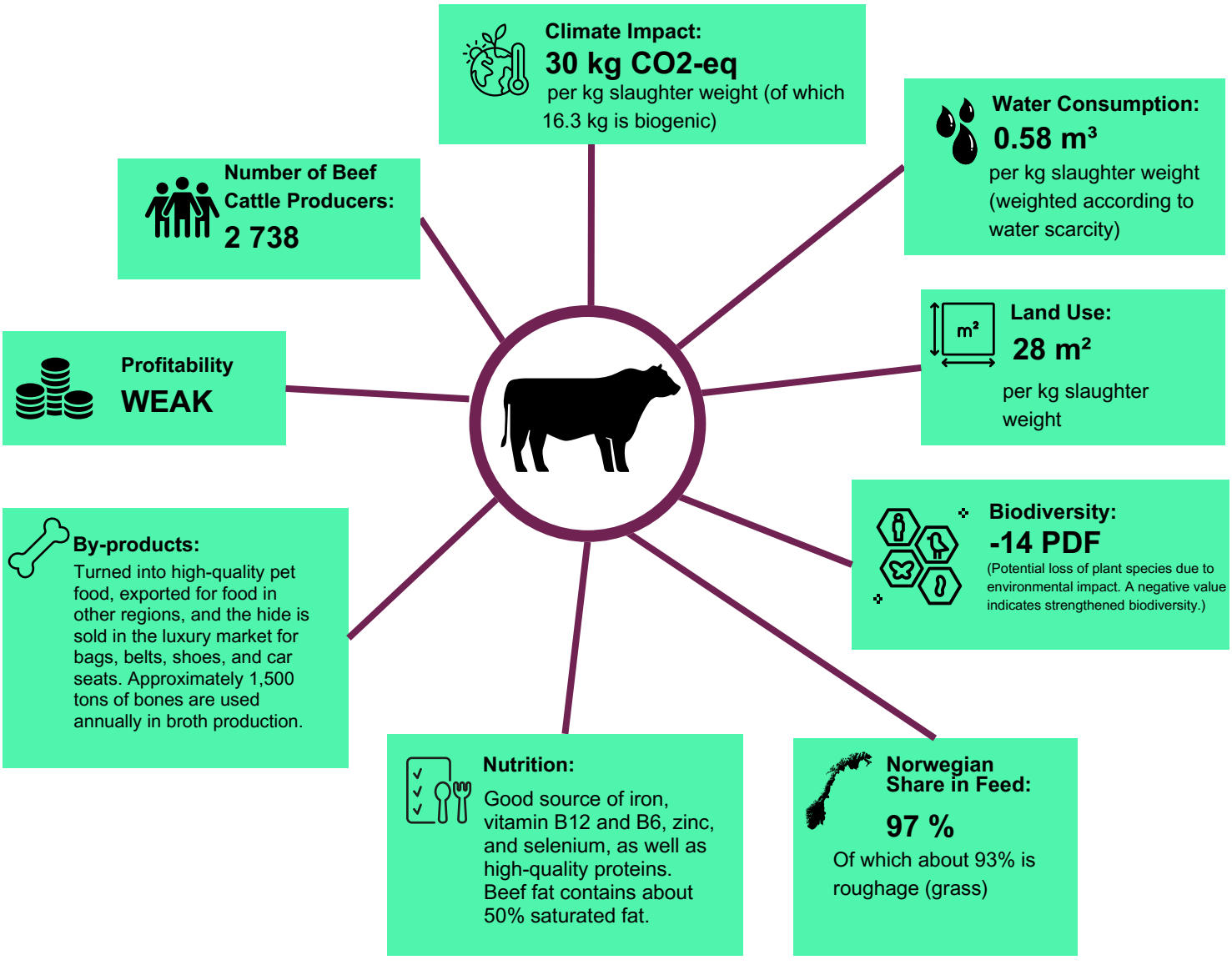
Dairy cows have a high proportion of Norwegian ingredients in their feed but consume more concentrated feed than pure beef cattle. Therefore, they do not have the positive impact on biodiversity that other ruminants have. Water usage is significantly lower than the global average. Dairy cow production is found throughout the country and is a vital pillar of Norwegian agriculture.



Key Figures from LCA: Beef Cattle

Beef cows are pure meat cattle and eat almost exclusively Norwegian grass. They often graze outdoors for longer periods, including in outlying pastures.

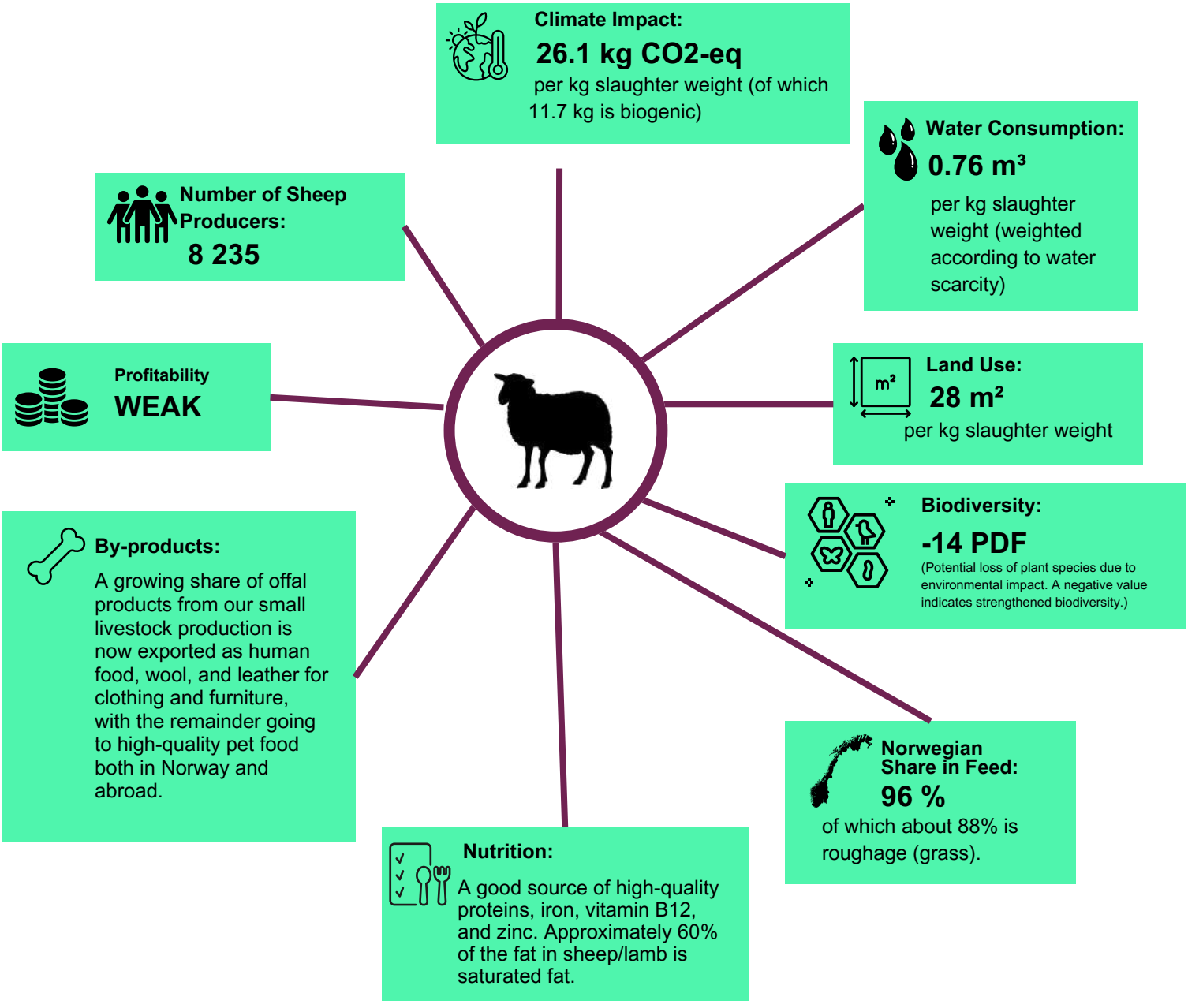
They have slightly higher climate emissions than their dairy cow colleagues, but in return, they have a positive impact on biodiversity and are important for preserving the rich species diversity we have in this country. Their water consumption is significantly lower than the global average.



Key Figures from LCA: Sheep

The sheep is the earliest domestic animal to arrive in Norway, about 5,000-6,000 years ago. Since then, it has transformed Norwegian nature into nutritious food and warm wool for humans.

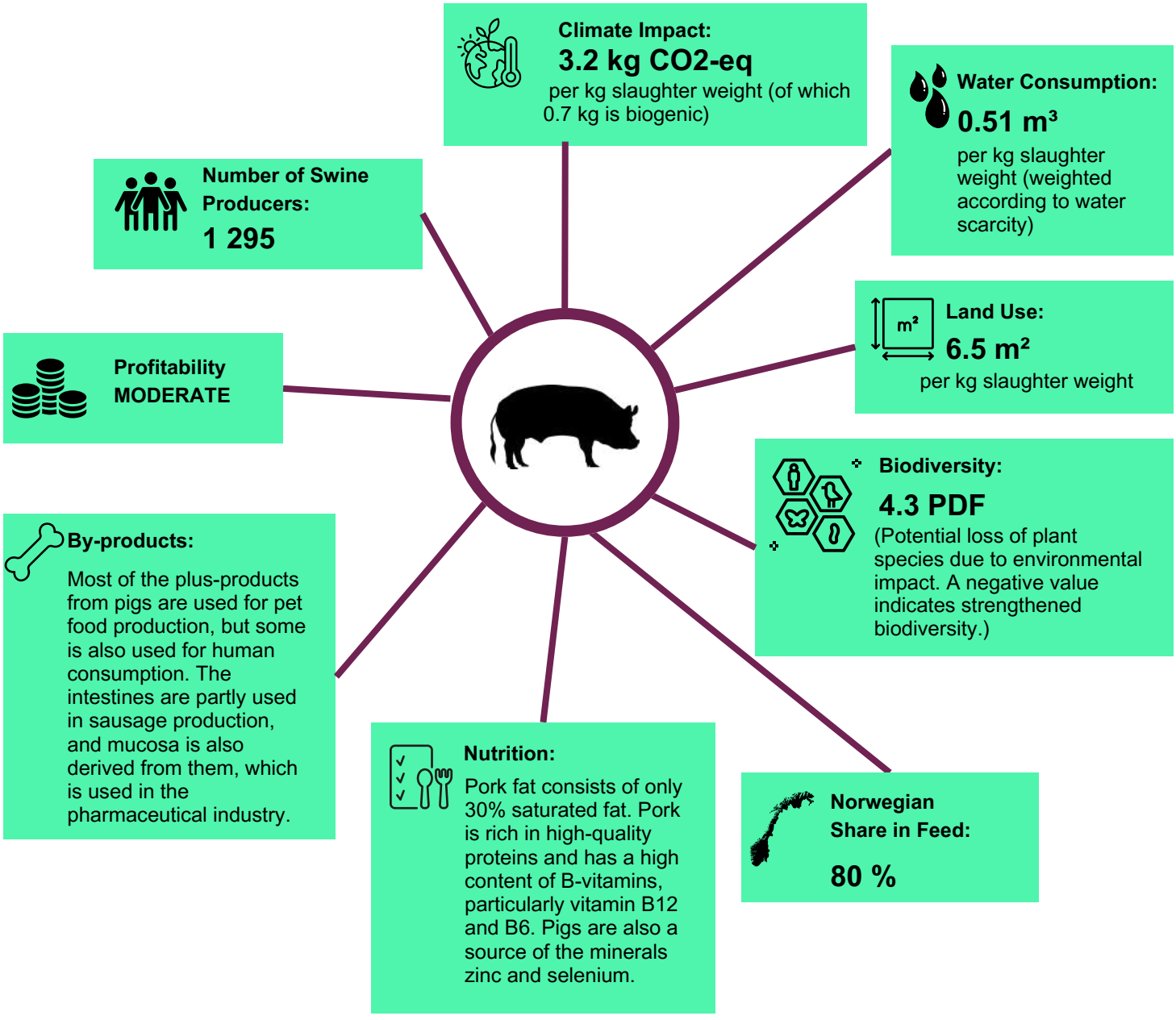
A high degree of grazing in outlying areas means that sheep play the most important role in strengthening Norwegian biodiversity, and they have a high proportion of Norwegian raw materials in their feed. As a ruminant, they have somewhat higher greenhouse gas emissions. Profitability is weak, and few sheep farmers live solely off sheep.



Key Figures from LCA: Pig

Norwegian pigs have good health, low mortality, and half the climate emissions of international pig production. Very few protein-rich foods have lower emissions than pigs, and they actually have lower emissions than both salmon and some plant-based alternatives.

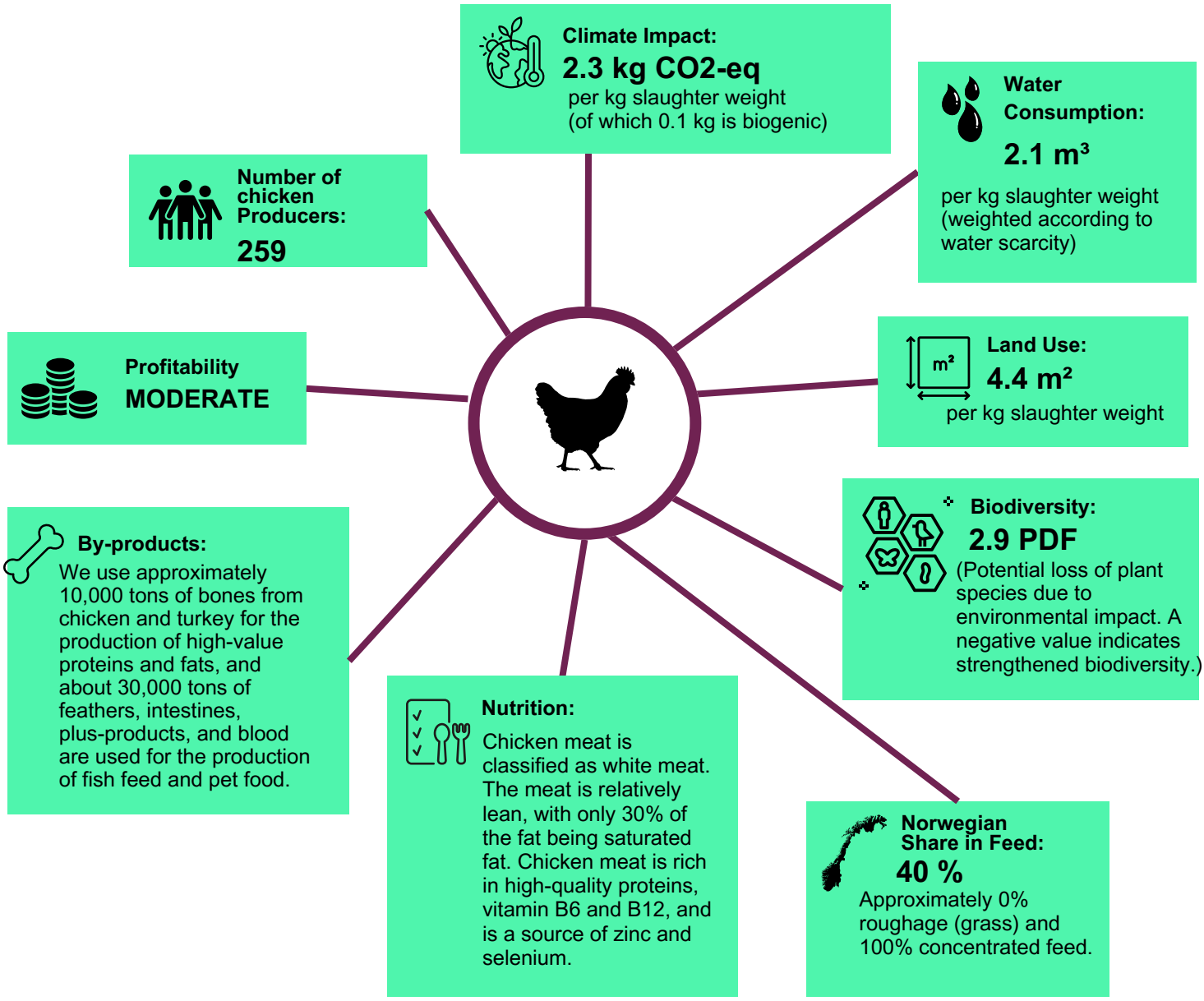
They are the world's most feed-efficient, utilizing local raw materials like barley-suitable for cultivation in our cold climate but not consumed enough by humans. We consume 87% of the slaughter weight, more than any other livestock.



Key Figures from LCA: Chicken

Chicken is one of the most climate-friendly protein sources we have in this country, and production requires little land per kg of meat. One of the world's strictest animal welfare regulations ensures that Norwegian chickens have more space, better health, and a richer environment compared to chickens in other countries.

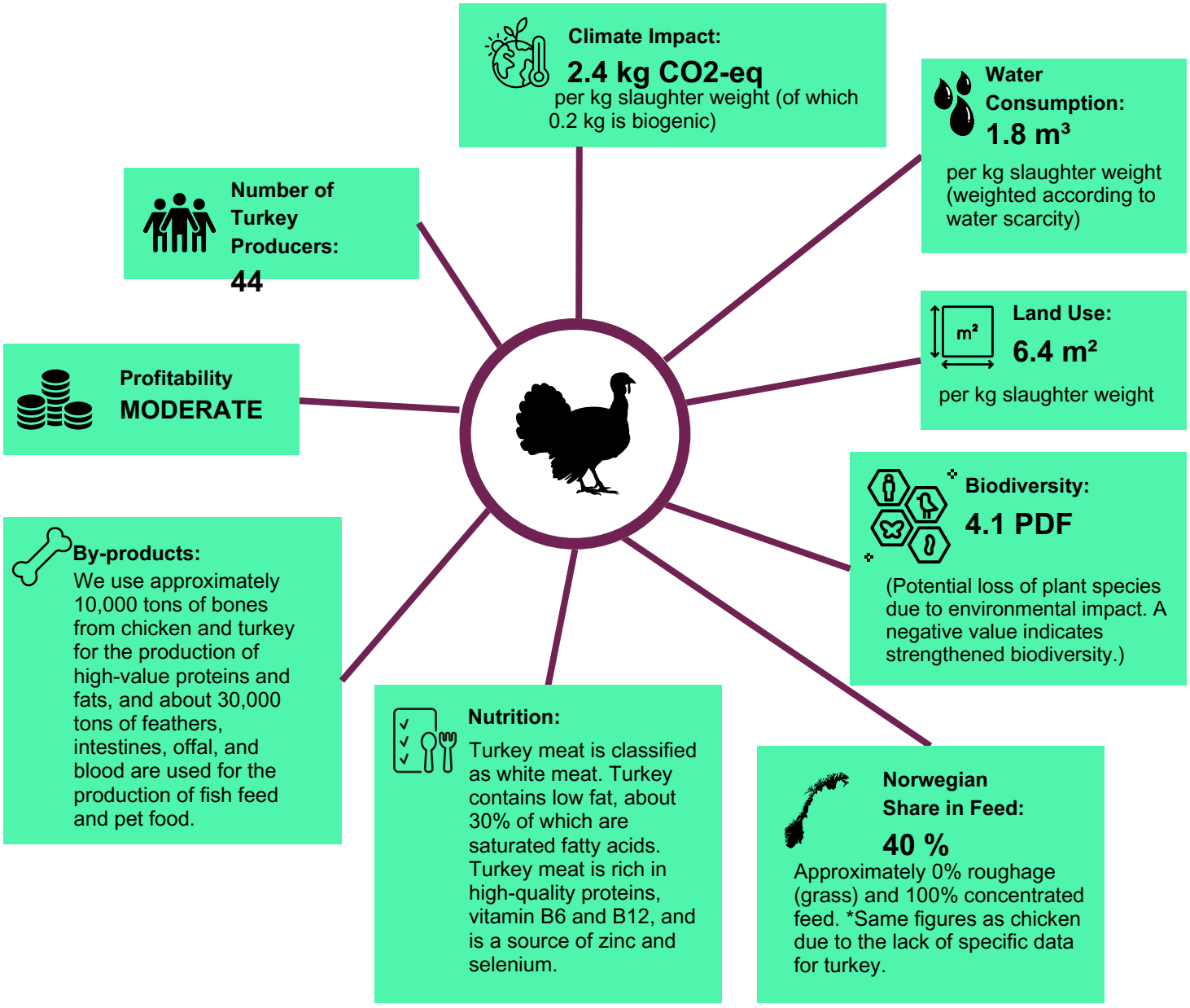
A significant portion of the feed for the chickens is imported soy, but 100% is certified sustainable and deforestation-free. We are working towards Norwegian feed in the future and have tested a new feed on 4.7 million PRIOR chickens, consisting of 90% Norwegian feed.



Key Figures from LCA: Turkey

Turkey is among the most climate-friendly protein sources we have in this country, and production requires little land per kg of meat. One of the world's strictest animal welfare regulations ensures that Norwegian turkeys have more space, better health, and a richer environment than turkeys in other countries.

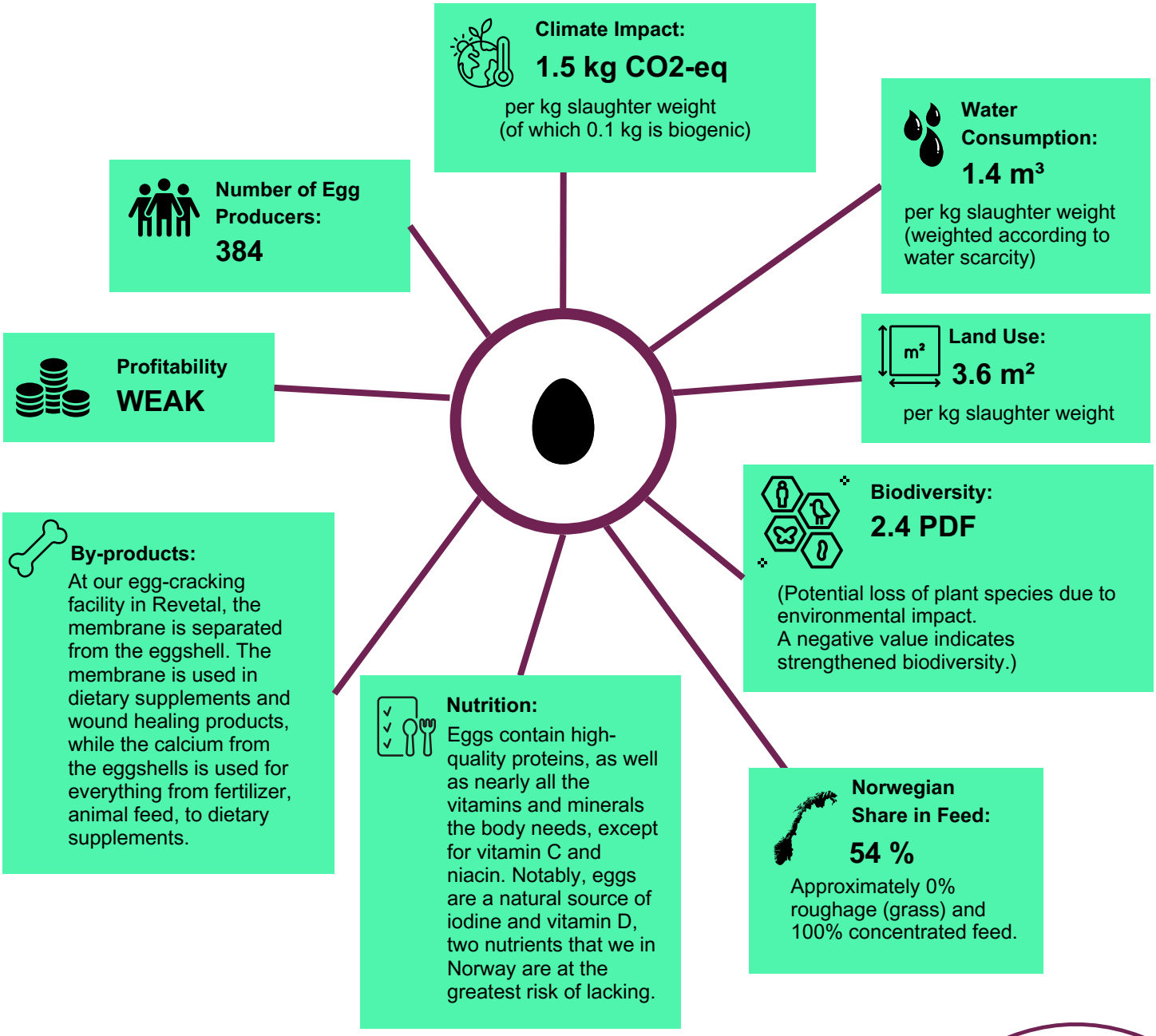
Since turkey has a low degree of Norwegian feed raw materials, this is a focus area for our production. All imported soy used in the feed for our turkeys is certified sustainable and deforestation-free.



Key Figures from LCA: Eggs

Eggs are a nutritional powerhouse containing almost all the vitamins and minerals the body needs except for vitamin C. Egg production is an important part of the agricultural industry, and Nortura produces around 750 million eggs annually.

Norwegian eggs are the safest in the world, can be eaten raw, and are the most climate-friendly protein source we have. Additionally, all off Nortura's PRIOR eggs can be traced by consumers back to the farm they were produced on. A significant portion of the feed for laying hens is imported soy, but 100% is certified sustainable and deforestation-free. Nevertheless, Nortura is working towards Norwegian feed in the future.



Responsible supplier management

Why it is important

As a significant purchaser of goods and services, Nortura has a unique opportunity to monitor, work with, and influence ethics and sustainability in the supply chain. Our and their production depends on ingredients, packaging, transport, machinery, IT systems, and other services to produce finished goods. Nortura has just under 500 corporate agreements. Just under 90 percent of these are with Norwegian suppliers, who in turn purchase from subcontractors in various parts of the world. This means that we have a direct and indirect impact on social, environmental, and economic conditions in a large value chain.

Suppliers play an important role in sustainability for the products and services we and Nortura purchase. We therefore work with them to ensure that both of our overarching sustainability goals are broken down into actions. Both parties actively work on these actions to ensure that the goals are met. Focus areas include packaging and transport.

All suppliers wishing to supply goods and services to Nortura must sign ethical guidelines for suppliers. This clarifies the expectations and requirements they have for the supply chain before entering into an agreement. Just as Nortura conduct their business in accordance with ethical guidelines, we and Nortura expect and require our suppliers to do the same. Suppliers must communicate and follow up on the ethical guidelines with their subcontractors. Upon our request, suppliers must document compliance with the guidelines.

How we work

Corporate procurement is responsible for selecting, entering into agreements with, and following up on external corporate agreement suppliers of products and services. Purchases of meat raw materials and eggs from owners, other slaughterhouses, and farmers are handled by others.

We are BRC-certified, which is an international standard for food safety. The standard imposes extensive requirements for supplier follow-up, which we comply with, are audited on, and approved by an external auditor annually.

Supplier approval:

All suppliers must go through a prequalification process before they can supply goods and services to us. Depending on what they deliver, suppliers can be approved by being BRC- or GFSI-certified, being audited by an auditor according to defined criteria, satisfactorily responding to the self-evaluation, or through approved product testing, in addition to signing a written agreement including ethical guidelines for suppliers. This will assist us in ensuring that we collaborate with reputable suppliers who take responsibility for food safety, share our ethical values with a focus on human rights and decent working conditions, and work on sustainable solutions.

Follow-up process:

Follow-up of Nortura's corporate agreement suppliers is done annually or in the event of significant changes. This includes risk analysis, vulnerability assessment, supplier evaluation, supplier audit, and due diligence assessments of all corporate agreement suppliers. Departments such as quality, PU, and transport work together with corporate procurement to ensure that corporate agreement suppliers meet all our requirements. If supplier deviations are identified in the process, these must be rectified by the supplier. High-risk suppliers must annually confirm compliance with the principles in our ethical guidelines.

Research projects

We in Norilia and our parent company Nortura have a high focus on research and innovation. Because we get our raw material from Nortura, it is important to show Nortura's journey towards becoming a more sustainable company. Their path is interlocked with ours.

In the coming years, Nortura will build a modern, efficient, and smart industry, and adopt new technology throughout the value chain. The aim is to streamline production based on renewable energy sources.

We and Nortura will contribute to research and knowledge development, ensuring that the course we set together is sound. And we will enhance our focus on innovation and product development to ensure that we develop new products and product flows that will uphold health and sustainability, and appeal to future consumers.

Sustainable development
The research projects we present here are excerpts from the Nortura report. To us, research is key to becoming more sustainable and developing new ways to harness the potential of our raw materials and ingredients. We do this in collaboration with research partners and industry partners.

The included research projects are also part of our and Nortura's measures to innovate and work in a more sustainable way. In this chapter, we have also included some of Nortura's ongoing research and development projects related to topics that affect animal welfare.

Foods of Norway – revolutionary research on new Norwegian feed: Since 2014, the research project Foods of Norway has been working to develop sustainable Norwegian feed ingredients from natural bio-resources that we do not use for other food.

The results show that it is fully possible to enrich protein with energy from, among other things, Norwegian forests and seaweed. The feed is locally sourced, better for animal health, provides better animal welfare, and has a lower climate footprint.

Nortura sits on the board of Foods of Norway and participates in several projects to test new ingredients. Participation in Foods of Norway is an important part of our strategy to strengthen Norway's self-sufficiency.

Seaweed from the Norwegian coast for cattle: With the world's second-longest coastline, seaweed can play an important role in the future of Norwegian self-sufficiency.

Nortura is participating in a groundbreaking research project with NMBU where cattle are fed seaweed. Not only do the results show significant environmental benefits, but the meat also becomes more tender and gains better flavor.

Additionally, the content of iodine and selenium, substances that consumers need more of, increases.

Climate Smart Sheep: Norway has large outlying resources (140,000 km²), and approximately half of these are currently unused.

The political goal of increasing food production based on national resources in line with population growth depends on utilizing these resources, which involves the use of ruminants. At the same time, agriculture has committed to reducing its greenhouse gas emissions. The challenge is therefore to combine increased ruminant production based on outlying grazing with the goal of reducing greenhouse gases from livestock production.

The purpose of the project is to contribute to sustainable, climate-smart sheep production based on the use of national feed resources, including outlying grazing, combined with the lowest possible climate footprint. The project will contribute to the development of a farm model to calculate greenhouse gas emissions from Norwegian farms with sheep.

The project is carried out by the Norwegian University of Life Sciences.

BlueMusselFeed: In December 2022, the research project BlueMusselFeed was awarded nearly 12 million kroner in support from the Research Council of Norway.

The project aims to produce chicken meat from blue mussels. The Norwegian marine and agricultural industries are collaborating to establish an entirely new protein source based on Norwegian blue mussels to replace imported protein in chicken feed.

Large-scale cultivation of blue mussels in Norwegian waters will reduce both eutrophication and ocean acidification, while also increasing sustainability and self-sufficiency in our food production, both on land and at sea. PRIOR chickens will be the first to taste the new, all-Norwegian feed.

→ **Project "Increased Norwegian Content in Feed up to 100%":** In 2022, Nortura's executive management established an interdisciplinary project tasked with developing solutions to achieve Nortura's goal of "up to 100% Norwegian feed" by 2030.

In December 2023, the project's knowledge base was completed, and potential ingredients such as insects, meat and bone meal, marine proteins and residual materials, alkaline feed, and microalgae were identified as possible raw materials. The project concluded that the barriers related to scaling up and commercializing production are significant, and Nortura is now leading an industry collaboration with an expected launch in 2024.

MethaneHUB: Testing Methane Inhibitors in Ruminant Feed

In 2023, the MethaneHUB project received funding through the agricultural agreement. Over the next four years, the agricultural industry, with TINE as the project leader, will use 40 million kroner to reduce methane emissions from Norwegian milk and meat production. The MethaneHUB project will be a cornerstone in addressing agriculture's biggest climate challenge towards 2030 while strengthening Norwegian milk and meat production.

The MethaneHUB project will support Norwegian livestock farming and the use of roughage and grazing. The climate footprint of Norwegian ruminants is among the lowest in the world. A further reduction in methane emissions will make the climate footprint per kg of milk or meat from Norwegian ruminants even more competitive in terms of climate and sustainability. The goal is to achieve greenhouse gas reductions without compromising food safety, raw material quality, animal health, animal welfare, or farmers' production economy.

Goals: According to Agriculture's revised climate plan 2021-2030, methane inhibitors and roughage quality should reduce CO2-equivalent emissions by 815,000 tons by 2030. Once the knowledge base is in place, the goal is to use methane inhibitors as a permanent climate measure for ruminants. The aim is for all Norwegian ruminants to be allocated methane inhibitors from 2027.
The project will run from 2024-2027, with TINE as the project owner and Geno, Tyr, Norwegian Sheep and Goat Association, and Nortura as project partners.

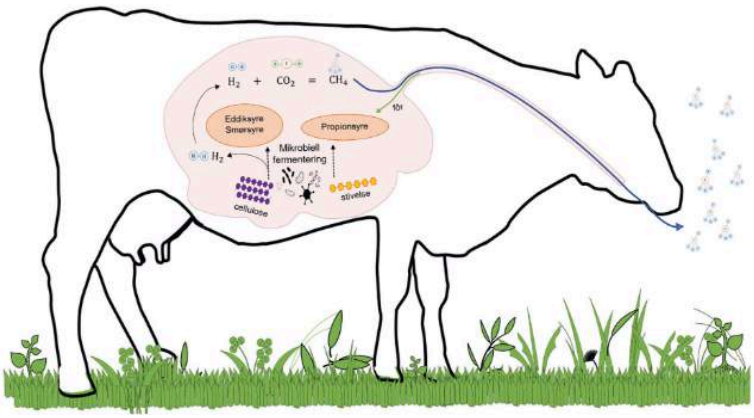
Norway's First Feeding Trial with Methane Inhibitors in Meat-Producing Animals

From May to September 2023, Nortura, Mære Agricultural School, and NMBU conducted a test of the methane-inhibiting additive Bovaer (active ingredient 3-Nitrooxypropanol (3-NOP)) in the feed ration of 34 Norwegian Red bulls. The aim was to see if 3-NOP results in reduced methane production per kg of meat under Norwegian conditions, thereby contributing to Nortura's goal of reducing methane emissions from ruminants by 30% by 2030.

After an acclimatization period, the 34 bulls were divided into two groups: one group of 17 animals was given feed with 3-NOP, and the other control group was given feed without 3-NOP. Methane emissions from the animals were measured using a Greenfeeder system, which is a concentrate feeder that measures methane in each bull's exhaled air multiple times a day. In addition to methane measurements, several other measurements and recordings related to the animals' growth and health, as well as the effect of 3-NOP, were made. After the trial ended, various meat quality analyses were conducted.

The results showed that methane emissions from the bulls were reduced by 13.2% when 75% of the recommended dose of Bovaer was added to the feed.

The project is funded by NorgesGruppen's sustainability fund HANDLE, and Sparebank 1 SMN, Nortura, and Mære Agricultural School. Other partners include TINE, GENO, Norwegian University of Life Sciences (NMBU), G.O Johnsen, Vilomix, and Teagasc Research Centre (Ireland).



Are methane inhibitors dangerous?

Enteric methane is a byproduct of the rumen fermentation of fibrous feed/organic matter in the feed. Fermentation produces carbon dioxide (CO_2) and hydrogen (H_2), which the animal expels by emitting methane (CH_4). Methane emission represents an energy loss (2-12%) for the animal, which in turn reduces the animal's feed efficiency. Methane inhibitors are a collective term for components in the feed that reduce the production of methane during the digestion process in ruminants. This is a natural process that is not harmful to the animal.

The additives that have been tested in Norway are Bovaer, which contains the active ingredient 3-Nitrooxypropanol (3-NOP), and red algae (Asparagopsis armata). Both types of methane inhibitors block the production of methane in the rumen and are well-documented as feed ingredients. 3-NOP is approved by the European Food Safety Authority (EFSA) and the Norwegian Food Safety Authority. None of the more than 60 scientific studies that underpin the approval have shown negative effects on animal health and welfare, and no residues in milk and meat.

Climate related research projects

Nortura is a partner in several research projects related to climate and sits on the steering committees for the SUSCOW and Climate Smart Sheep projects.

SUSCOW - The Impact of Animal Health and Carbon Sequestration in Pastures for Sustainability in Norwegian Ruminant Productions

The climate and topography mean that about 2/3 of Norwegian agricultural land is only suitable for grass production. In addition, we have large areas of outlying land, which have traditionally been used by grazing animals. Ruminants are still of significant importance for food security in Norway. Agriculture has entered into a climate agreement with the government to reduce emissions by 2030 and has a climate plan with concrete measures.

SUSCOW consists of two main parts:

1. How variable animal health affects the environment.
2. Ecosystem carbon storage in permanent pastures and outlying pastures in different climatic regions in Norway.

The results from SUSCOW will contribute to the further development of the Holos models, which form the basis for the calculations in Agriculture's Climate Calculator.

SUSCOW is a collaboration between NMBU and other research environments as well as industry partners in the agricultural sector.

Sources

Content in this report is a translation of selected sections of Nortura's Sustainability Report 2023 (Norturas bærekraftsrapport 2023 Husdyrenes rolle i en fremtid med klimaendringer).

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