



2020

# Sustainable dairy in Europe

Safeguarding our resources

Denmark, The Netherlands, United Kingdom (Northern Ireland), France, Belgium, Ireland

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Foreword:

# The European dairy sector acts to mitigate climate change and **feed the world in a sustainable manner**

The average temperature of our globe is on the rise. We are experiencing increasingly extreme weather conditions. The food sector is facing major challenges as the global sector accounts for 24 percent of world's greenhouse gas emissions, according to the United Nation's (UN) body for assessing the science related to climate change; The Intergovernmental Panel on Climate Change (IPCC).

As our climate is changing, the population of the world is growing. The UN estimates that we should expect

to reach a population of 10 billion people in the year 2050. Climate changes and sustainability has become an urgent challenge that needs immediate global action.

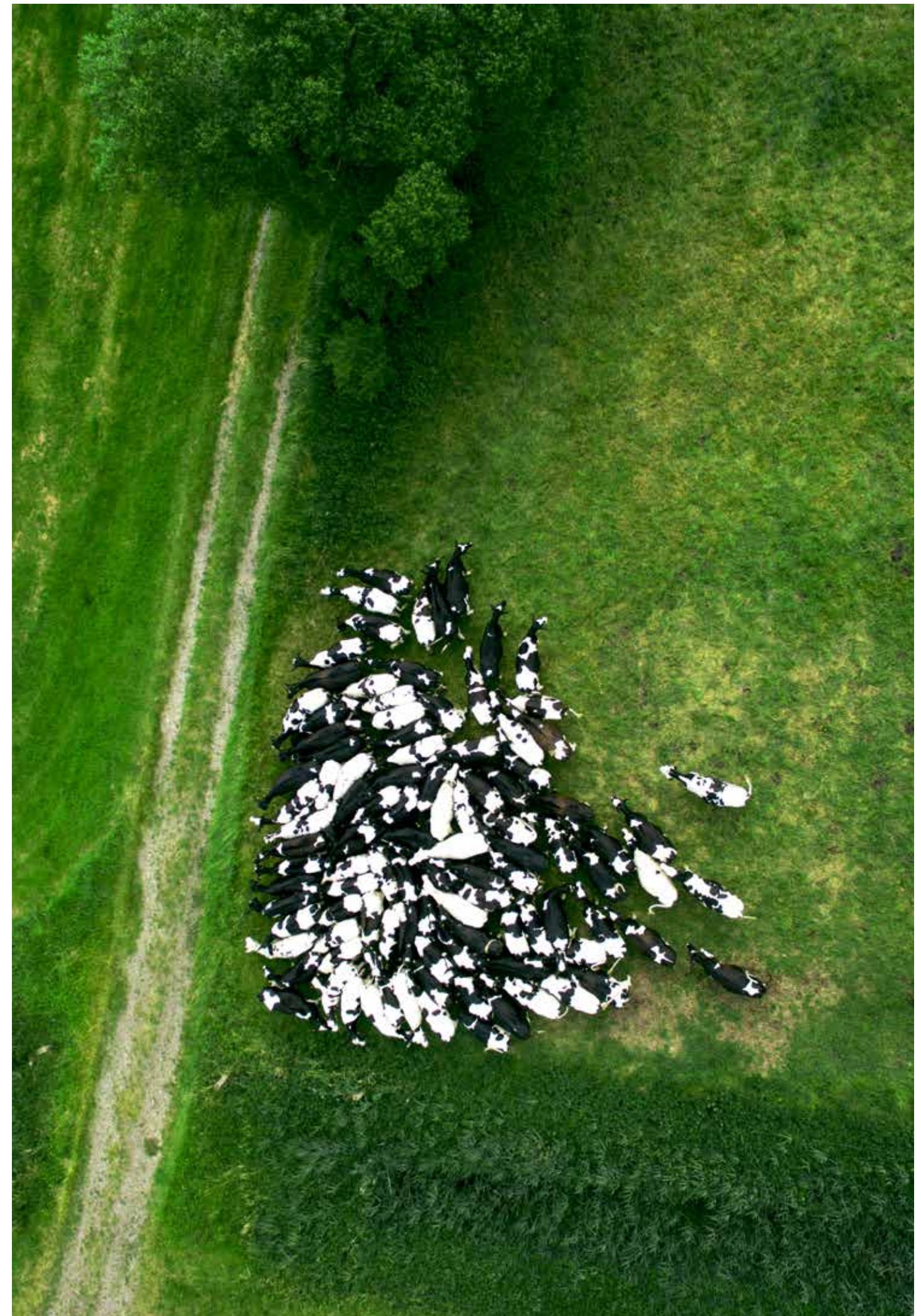
## **European commitment to the UN Sustainable Development Goals**

Taking actions to address this challenge is one of the EU's top priorities. And the targets for the actions are ambitious. By 2030 the EU wants to reduce at least 40 percent of the emission of greenhouse gases from 1990 levels, be at least 27 percent

more energy efficient, and at least 27 percent of the energy consumption should be renewable energy. With these targets the EU has also chosen to play a significant role in the achievements of the UN Sustainable Development Goals (SDGs).

The European dairy sector wants to contribute to this strong European commitment. In our sector, we have committed to reducing our emissions by signing the Dairy Declaration in 2016<sup>1</sup> and align with the SDGs. We have already worked on this agenda

1) The Dairy Declaration from Rotterdam: The dairy community accepts sustainability challenge, October 19th 2016.





for the last decade, and this has resulted in a 11 percent decrease in the sectors global emissions. Our efforts will continue and intensify during the next decade.

#### **Sustainable dairy action across six European markets**

Within this programme launched by the European Milk Forum and funded by the EU we share facts, knowledge and experiences across six European markets – Ireland, Northern Ireland, Denmark, France, Belgium and The Netherlands – engaging our stakeholders in dialogue on the dairy’s role in a sustainable future.

As part of our initiative we conducted a multi country survey each year, exploring the perception of the climate issue and the dairy sector amongst the populations in our six countries. The survey confirms that the majority is concerned about climate change, but still optimistic about the possibility of mitigating the consequences of climate change. About three out of four agree that we need to change our patterns of consumption and production of food. The most popular climate actions among consumers are recycling and reducing

food waste. Price, taste and health are the most important factors when buying food, and only few consider carbon food print. Also, the surveys tell us that the dairy sector is perceived as as economically important to society and to some extent sustainable – and only to a smaller degree as polluting

This publication shows examples of initiatives across the markets towards a sustainable future, addressing the European dairy sector’s challenges and possibilities. The first chapter exemplifies measures already taken in the dairy sector to establish a sustainable food production – from pilot projects, to national programmes and applied research.

Following, in chapter two we present interviews with some of the leading experts within our field. Building our efforts on acknowledged facts and research we prioritize sharing the scientific perspectives on challenges and solutions in a sustainable transformation.

With this publication we wish to share our insights and inspire others to partake in our journey towards securing sustainable, healthy and nutritious food for generations to come.



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## Chapter 1

# Tackling climate change across Europe

*In this chapter we highlight some of the different sustainability initiatives activated in European markets. The purpose is to exemplify the many possibilities that lie in the European dairy sector as well as some of the challenges the sector is facing now and in the future.*



# The dairy sector's initiatives in the fight against global warming

The French milk industry's commitment to sustainable development and to the environment is long-standing. For thirty years, it has involved all the players in the chain: Initially with farmers and farmers, afterwards with cooperative and private processors, and alongside with them, technical institutes. All acting on their own with one objective: to reduce the environmental footprint in an effective and a sustainable way.

According to a survey conducted in March 2019 by both the European Milk Forum and the Cniel as part of the multi-country 'Milk & Climate' campaign. 50 percent of the respondents believe that the food industry can act effectively against climate change. A statement that confirms that the efforts of the dairy industry are noticeable and above all, can have a vital impact.

In 2018, as part of the multi-country 'Milk & Climate' campaign, Cniel highlighted the

commitment of the dairy sector in the fight against global warming, in particular through the 'France, a milk's land' strategy, of which the ambition is notably to reduce the sector's carbon footprint by 20 percent per liter of milk by 2025.

In practice, the dairy sector has implemented initiatives to reduce its carbon footprint at farm level and act to preserve the environment and resources. First in 2013 with the LIFE Carbon Dairy experimental approach. This aimed to reduce GHG emissions, thanks to a calculation, simulation and consultancy tool intended to identify areas for improvement during operations. Then came the 'Low Carbon Dairy Farm' initiative, implemented as of 2015, which allows farmers to identify the levers for reducing the carbon footprint suited to each farm based on an environmental diagnosis. There are many levers available: increasing protein autonomy, making better use of meadows or else planting hedges.

**90%**  
of produced milk in France  
comes from farmers who  
have joined the Charter for  
Good Breeding Practices



## **A Charter for Good Breeding Practices has been signed by farmers**

Today, 92 percent of the milk produced in France comes from farmers who adhere to this charter. Farmers are specifically committed to adopt these practices intended to save energy and water, as well as to manage waste efficiently. In order to improve the quality of water, dairy farms have participated, like the whole agricultural sector, in the implementation of the Agricultural Pollution Control Program (PMPOA). This national program is a result of the application of the European directive known as "Nitrates" aiming to protect waters against nitrates pollution of agricultural origin. This encouraged dairy farms to make a substantial contribution to reducing the nitrate content from water.

At a later stage, processors also adopt good environmental practices. They reduced carbon dioxide emissions (CO<sub>2</sub>) by minimizing the

frequency of the milk collection routes. In 2012, 30 million kilometres have therefore been avoided in France. They are also working on better energy management, limiting energy consumption by using low consumption machines and sometimes producing their own renewable energy. Finally, the management of water resources is now the subject of particular attention.

## **The Low Carbon Dairy Farm initiative to reduce the carbon footprint**

The will of the dairy industry is to make France a sustainable and competitive breeding land, with a goal to reduce the carbon footprint by 20 percent per liter of milk produced by 2025. In order to do so, a major tool is the Low Carbon Dairy Farm.

The Low Carbon Dairy Farm approach initially involves carrying out an environmental diagnosis on dairy farms. This allows estimating





GHG emissions from livestock, energy consumption, positive contribution to biodiversity, feed capacity (number of people fed by livestock) as well as carbon storage. It is followed by the implementation of an individual action plan to improve the farm's carbon footprint and its technical and economic performance.

The Low Carbon Dairy Farm is a guarantee of sustainability. In fact, environmental performance and technical and economic

performance are closely correlated. The farms with the lowest GHG emissions present a raise of an average gross margin of 10 € per 1 000 liters of milk produced.

To date, more than 9 300 farmers have committed to the Low Carbon Dairy Farm approach. The goal is that 1 out of two farmers be involved within five years and 100 percent within ten years.





# The dairy sector is fully committed to a sustainable future

## The Belgian dairy industry today



**The sustainability monitor**  
Aiming to map the sustainability efforts of the dairy sector and to raise awareness among dairy farmers about the issue, agricultural organizations have been consulting with the dairy industry since 2012. This resulted in a

sector-wide sustainability program, that was rolled out in 2014 throughout the entire dairy chain in Belgium. Besides monitoring the efforts, all parties involved are provided with a benchmark, encouraging them to perform even better.



**In the entire dairy chain**  
By implementing a sector-wide sustainability program across the entire dairy chain, the monitor is more effective in making the whole dairy sector more sustainable. This is because

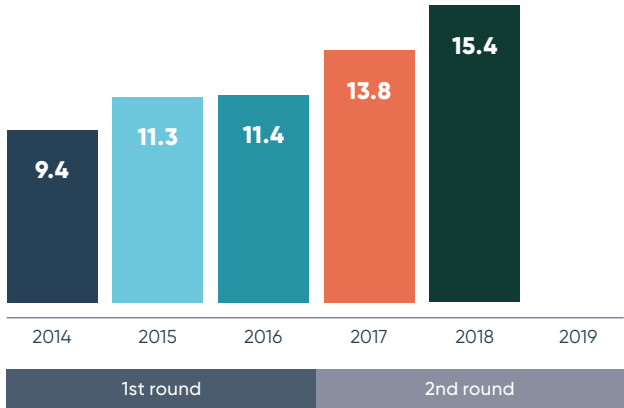
the various sustainability initiatives and their progress are mapped at the level of dairy farming, transport and the dairy processing business. In this way, every link in the chain contributes to more sustainable dairy.

## 1. At the dairy farm

35 sustainability initiatives are being monitored on the farm. It is up to the dairy farmer to set his own priorities, to identify the measures that are best suited for his farm and to decide which ones he wants to apply. This joint approach recognizes the individuality of each company. The first round (or baseline measurement) ran from 2014 to 2016. During this period, all dairy farmers were visited, and all initiatives were charted.

The second round shows the progress after 3 years. Once every 3 years, the dairy farm is inspected by independent auditors to check whether it meets the requirements of the IKM specifications (Integrated Milk Quality Assurance) with regard to quality assurance and production method. From 2014 onwards, these inspection visits were expanded with the sustainability monitor.

**Average number of sustainability initiatives taken by the dairy farmer baseline measurement – 1st round / 2nd round**



Source: Belgian national dairy program (2019)\* BCZ-CBL annual report (2019) based on FOD Economie/Statbel, MCC-Vlaanderen & Comité du lait, Eurostat and NIS.



**26% decrease in the carbon footprint of 1 liter of raw milk**  
(2015 compared to 2000)



**30% of dairy farms produce own renewable energy**  
(2018)



**14% decrease in fuel consumption**  
(compared to 2008)





**86%**  
of dairy farmers  
work with a permanent  
veterinarian



**69%**  
of milk trucks meet  
the highest emission  
standard  
(Euro standard 6)



**66%**  
provide fur care



**56%**  
feed by-products from  
the food industry



**13%**  
offer secondary  
activities in a  
social context  
(care farm or open  
farm, tourist activities  
or farm shop)



**41%**  
make use of  
alternative water  
sources  
(rain or surface water)



**57%**  
are committed to a  
well-maintained business  
environment and more  
ecological waste disposal

(Source: Duurzaamheidsmonitor MilkBE, 2018)



## 2. During the milk transport

Since 2006, data have been provided annually by 8 dairy companies, representing approximately 82 percent of the national milk supply. These figures show the evolution of the transport sector in terms of mileage, total fuel consumption, environmental performance of the milk trucks (RMOs – Mobile Milk Receiving), and the efficiency per milk truck (RMO).

### Figures compared to 2008 (evolution 10 years):

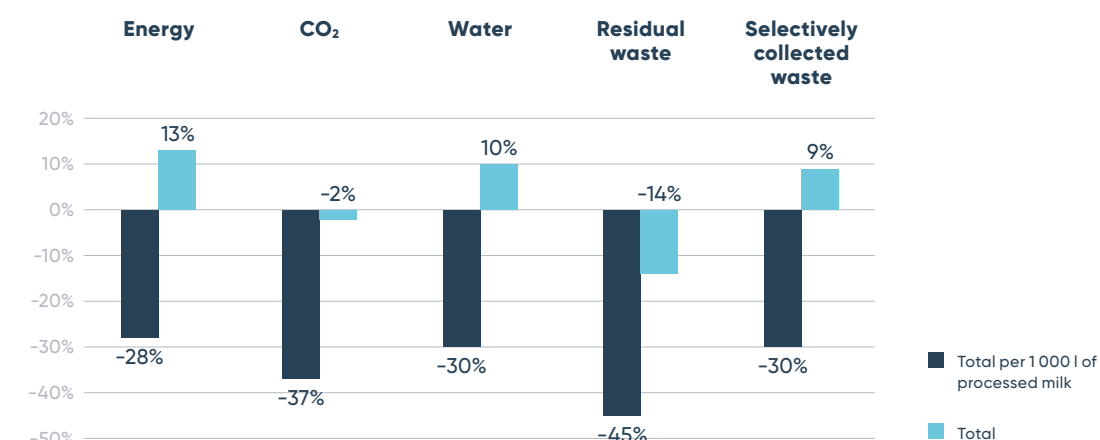
- 6% decrease in mileage per 1 000 liters of milk transported;
- 14% decrease in fuel consumption per 1,000 l of milk collected;
- 69% of the RMOs meet the highest emission standard (Euro standard 6);
- 35% milk volume increase per RMO;
- 8% decrease in number of RMOs.

## 3. In dairy processing

The level of sustainability of dairy processing companies has been researched every year since 2005. In 2018, 12 site locations took part, representing more than 90 percent of the nationwide processed milk. They provide figures on annually produced and processed milk, energy and water consumption, water recycling, waste water, CO<sub>2</sub> emissions, waste processing and the production of green electricity.

### Figures compared to 2008 (evolution 10 years):

- 28% decrease in energy consumption per 1 000 l processed milk;
- 37% decrease in CO<sub>2</sub> emissions;
- 30% decrease in water consumption;
- 45% decrease in residual waste



Source: Belgian National Dairy program (2019).

## Sustainability monitor update

The dairy sector commits itself to the climate effort. As part of the solution, farmers and dairy processors are willing to further reduce their climate impact. That is why the sustainability program, which has been in place since 2014, will be given a thorough update. New initiatives

and existing initiatives are being followed up or adjusted, in order to even better meet the ever-changing demands of society. The dairy sector chooses to proactively take part in the climate debate and acknowledges its role within a sustainable food system.



# Dairy farm provides excess heat to local homes

**The small town of Rødkærsbro in Denmark, is close to being self-sufficient with energy, ensuring heat to local industry and private homes. Partly because of Arla Foods's local dairy plant providing excess heat from the cheese production to the local heating plant. The energy used for heating the town is now 90 percent fossil free. And Arla Foods expect, that this project has the potential to spread across Europe and globally.**

Arla Foods's dairy plant in Rødkærsbro produces cheese of raw milk received mostly from the local farm, Kuhr Hedegaard. The same farm supplies biogas from their very own biogas plant. Kuhr Hedegaard utilizes the manure from the cattle and extract gas from this unused biomaterial. Through a pipeline, the gasline is directed to Arla Foods's dairy plant, where the biogas is converted to energy.

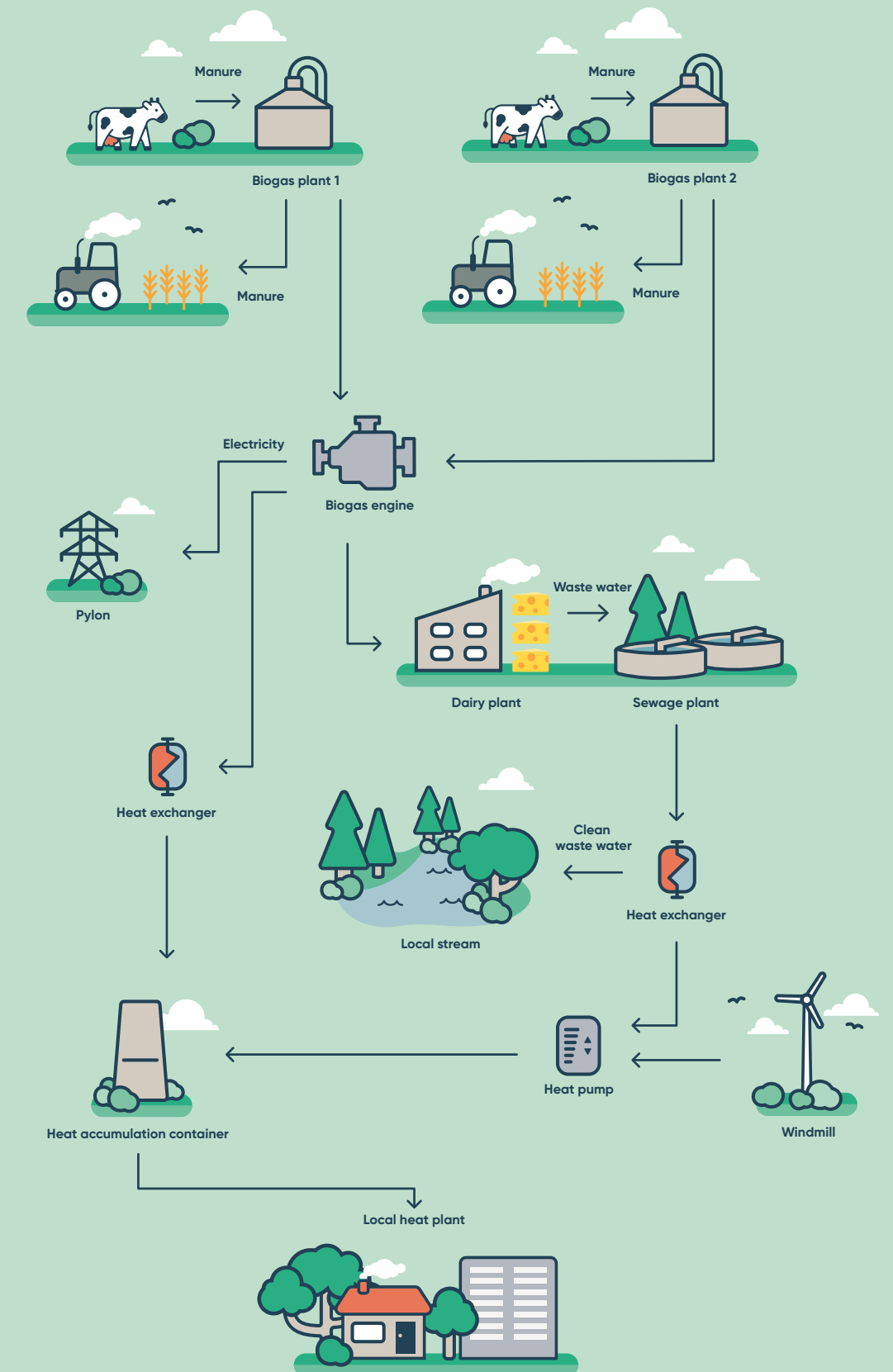
The conversion of biomaterial and the processing of raw milk generated more heat than the dairy plant could

use on its own. This inspired Arla Foods to initiate a collaboration with the local heating plant in Rødkærsbro, which was able to utilize the excess heat to heat houses and industries in town. The cooperation has been crucial to heating in Rødkærsbro now being based on recycled and fossil free energy.

The collaboration between Arla Foods and Rødkærsbro heating plant was established in 2016, when Arla Foods's dairy plant was left with more heat, than they could use in the production – the reasons

among others being the energy provided from Kuhr Hedegaard and newly installed heating pumps: "And we didn't want the heat to just vanish into thin air," Jonna Mortensen, former director of Arla Foods's dairy plant in Rødkærsbro explains.

Frede Hansen, the chairman of the local heating plant agreed, and they launched the pilot project. And according to the chairman the results speak for themselves.





# 90% fossil free heat in Rødskærsbro

*"The result of the project is, that approximately 90 percent of the heat consumption in Rødskærsbro being fossil free and only 10 percent is based on natural gas during peak periods. We are very happy with the results and consider it a contribution to the Danish government's ambition to reduce emissions with 70 percent by 2030."*

Frede Hansen

## The project can be copied in other small towns and has potential for export

Frede Hansen explains, that other towns have been inspired by the project. In the town of Padborg in the southern region of Denmark, a local dairy plant and the heating plant are now working together with the utilization of the wastewater from the dairy plant.

"It's amazing what you can do, when you set your mind to it. In the beginning, we saw it as a kind of pilot project, but the results have been much better than expected. And we believe, that we will be able to inspire others," Jonna Mortensen elaborates.

The project in Rødskærsbro is a key example of Arla Foods's ambitions to mitigate the climate changes. Arla Foods finds solutions like this one crucial to delivering climate neutral dairy products by 2050. Puk Lykke-Møller is Environmental Systems Manager at Arla Foods and she points out that in the case of Rødskærsbro is all about utilizing existing resources as much as possible.

"In a sustainable transformation, it is fundamental that we utilize residuals and reduce loss of resources. Cases like these are a win for both climate and the local environment. And this might be the primary thing learned; A lot is possible, if we explore the local conditions and potentials," Puk Lykke-Møller concludes.



Arla Foods's local dairy in Rødskærsbro.

The dairy plant of Rødskærsbro produces approximately 80 000 ton of mozzarella every year with the cost of energy. With the installation of heating pumps and biogas, the dairy plant has been able to reduce the CO<sub>2</sub> emissions with 14 350 ton on a yearly base.



Kuhr Hedegård's biogas plant.



# The Carbery Greener Dairy Farms Project

This project is a joint initiative between Carbery and Teagasc – the semi-state authority in Ireland responsible for research and development, training and advisory services to the agri-food sector.

The purpose of the project was to benchmark and analyse twelve farms in terms of quantifiable key areas of sustainability – nutrient use, economics, energy consumption, water use and carbon foot printing – and to assess what areas of sustainability required improving. It brought together farmers and agricultural researchers to review what strategic practices were in place to improve areas such as soil fertility and to set up strategies for improvement that can be implemented in the wider Carbery area. The sustainable image of pasture-based milk production on Carbery dairy farms is a unique selling proposition for their products.

Three of the farms were from each of the Co-ops that supply Carbery, namely Barryroe, Lisavaird, Drinagh and Bandon. Data analysis carried out over three years covered the areas of carbon footprint, nutrients, economics, water footprint, biodiversity (analysed once); and energy consumption.

Over the course of the project, the area of soil fertility was highlighted as an area that required the most improvement. Information regarding how to improve soil quality on the farm was disseminated to farmers through workshops and farm walks with farmers fully engaging with the advice given.

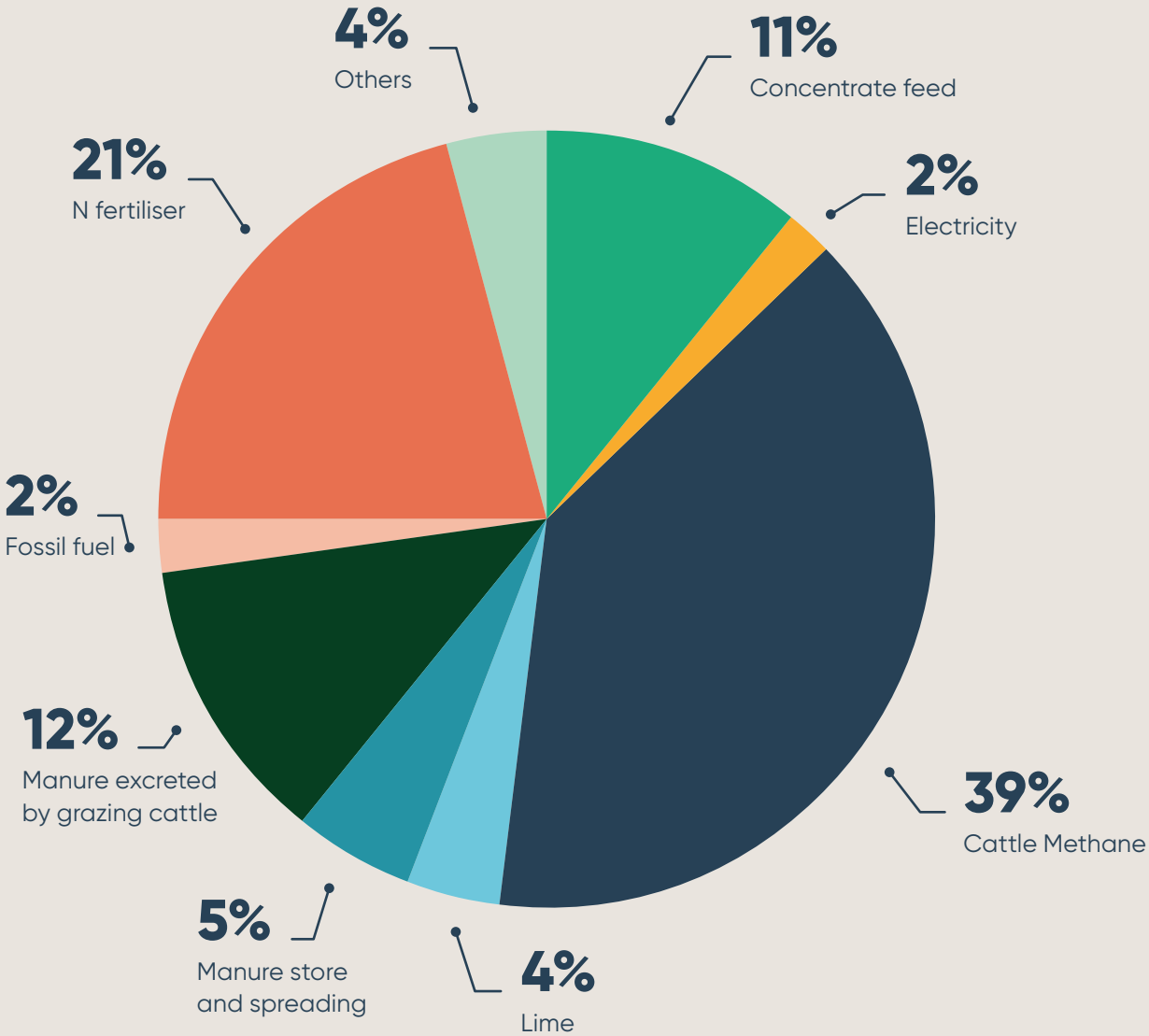
**Soil Fertility**  
Each farmer sampled their farm at least once throughout the duration of the project. A set of soil samples was only considered for inclusion in

the project if it was deemed to be representative of the farm, i.e. there was one soil sample for every 5 ha on the farm.

The pH levels across all the farms were below the optimum agronomic level recommended for grass production (6–6.5). The release of nutrients from the soil and the response to applied fertilizers will be reduced where the soil pH is low. Therefore, in the first meeting with the farmers they were advised to increase the use of lime on farms.

The first year of the project, on average the amount of lime purchased per farm was 8 tonnes. This figure increased to an average of 111 tonnes per farm one year later and to 57 tonnes of lime purchased per farm by year three. Analysis of the soil test results on the two farms that sampled in year one and then year

The percentage contribution of on and off-farm greenhouse gas sources to the Carbery Greener farms average carbon footprint of milk





## Ireland

Innovative pilot project

three show the average pH level increased from 5.85 to 6.16.

### Soil Fertility Index

As part of the project a Soil Fertility Index was developed to identify soil samples that achieved the right balance in terms of P, K and lime. The grass growth potential of a field is determined by limiting nutrient, for example, if a field had adequate levels of P and K but is deficient in lime, then it is the deficiency in lime that determines the productivity of the field. This index looks at the balance of P, K and pH in each soil sample taken. If the soil sample has a pH of between 6 and 6.5, and if the P and K were in either Index 3 or 4 then the soil represented by the sample was considered to be at the optimum agronomic level for grass production.

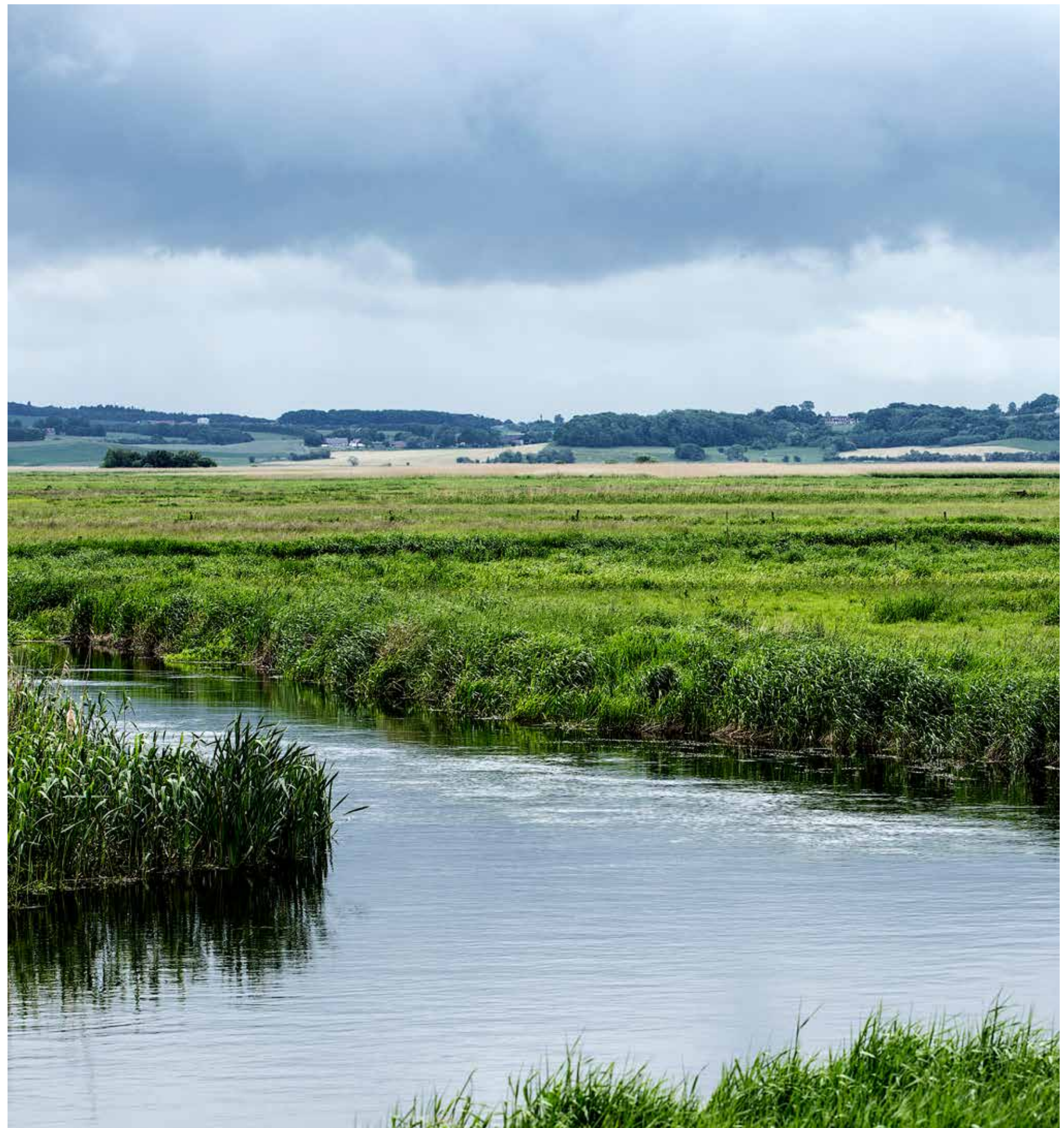
A total of 168 individual soil test results were analysed from each of the farmers. Of these soil samples, 15% were adequate for pH, P and K. Of the samples analysed at the beginning of the project only 27% of samples had a pH between 6 and 6.5 and 64% of samples had a pH of less than 6.

Unlike most important sources of carbon footprint, there was a very wide range across farms in GHG

emissions associated with lime and concentrate. The emissions associated with lime were determined by the quantity used, which was largely influenced by soil pH or fertility.

Generally, the pH of soil on farms was identified during the project to be sub-optimal (<6.0). Therefore, to improve performance, several farms applied more lime. However, to correct pH levels to an appropriate range (6.5), farms applied different levels of lime, which resulted in large differences in emissions from lime between farms.

Carbery's farm milk carbon footprint is amongst the lowest in the world. Improvements in farm efficiency have reduced Carbery's average milk carbon footprint by more than 15% since 2013. The Group's carbon footprint could be further improved post-quota by continuing to increase farm efficiency, but it is unlikely this strategy alone will be sufficient to meet current and future national GHG targets. The Group therefore could examine other strategies to directly reduce their GHG emissions (e.g. methane inhibitors etc.) and assess the potential to reduce GHG emissions indirectly by planting hedgerows or forestry.





# Grass Milk: A way of adapting to climate adaption

**There are sustainable rewards in fields of grass. Therefore, the farm, Hvanstrup, in the town of Farsø in Denmark has shifted into producing a new type of milk, 'Grass Milk.' Produced from cows that only feed on grass.**

"To mitigate the climate changes, we must adapt our food consumption to less meat and more greens. This means we have to find solutions in the methods of our food production," Poul J. Pedersen, CEO of Thise Dairy, explains.

So Thise Dairy developed 'Grass Milk' in 2017 in collaboration with dairy farmer at Hvanstrup, Torsten Wethe. Today, the cows living at Hvanstrup only feed on grass, grass plants, and herbs from the field.



Torsten Wethe,  
dairy farmer at Hvanstrup.



"Grass Milk is based on the 'Feed no Food' concept which means that what people can eat, should not be used as feed for cows. Thus, we only feed the cows with feed that cows are able to digest, and we don't feed them anything which could be used as food for humans," Poul J. Pedersen explains.

As part of the transition, Torsten Wethe planted grass on 40 percent of his fields, while organic vegetables are grown on the remaining 60 percent. With this mix, the grass and manure from the cows provide the foundation for the production of both vegetables and Grass Milk.

## **Grassland has multiple advantages to environment and climate**

Grass has the advantageous feature of binding carbon to the soil and preventing it from entering the atmosphere. If grasslands are permanent, the green imprint increases as the erosion of the soil decreases and biodiversity is strengthened. At the same time, the grasslands lower the leaching of nitrate, which ensures a better water environment in the surrounding streams, fjords, and the groundwater.

*"Grass Milk is based on the 'Feed No Food' concept,"*

Poul J. Pedersen

Feeding with grass can also mean a decrease in the import of soya, which is often produced under poor conditions resulting in deforestation – and having a long transport before it reaches European farms.

"Grass Milk is a new type of milk that shows how our production can adapt to climate changes. We consider it a proposal for the direction of tomorrow's food production," Poul J. Pedersen concludes.

## **About Thise dairy**

Thise is an ecological dairy founded in 1988. Today, it's owned by 70 shareholders.



# "Sometimes you only have to look to the past for sustainable business operations"

*"For me, a sustainable future means that I am a farmer who is respected and appreciated by society."*

Toon Hulshof

Toon Hulshof (40) is the fourth generation of a dairy farmer's family and he sincerely hopes that one of his three young children will later taste get a taste of it.

His majestic farmhouse from 1875 is located in Lievelede, a village in the Achterhoek with an ancient agricultural tradition. Because the region attracts many tourists, many dairy farmers try to get a piece of it with, for example, camping spots on the farm or a playground. "My neighbor has developed the concept of 'farmer's golf,'" says Toon cheerfully.

"You will have to learn from each other by doing it," is his motto. He is therefore one of the initiators of the Vruchtbare Kringloop Achterhoek (VKA), a network of farmers who are committed to more sustainable business operations. The project originated from public-private partnerships between, among others, the province of Overijssel, water boards, Vitens and Friesland Campina. This year the VKA has continued as an independent association, with one third of all dairy farmers in the Achterhoek now associated.

## Experiment

In study groups, VKA members compare environmental performance and, where necessary, bring in specialized knowledge. There will always come a time when someone has to take a risk, for example by experimenting with a certain crop. Toon likes to step forward. That sometimes results in some compassionate



Toon Hulshof, farmer





feedback from other farmers in his area, who prefer to first see how things are going, such as when he started with red clover, as food and to store nitrogen. "But when they see the results, they will think twice," says Toon Hulshof.

#### **Salad buffet**

He has a 4-hectare herb-rich 'salad buffet' and has sown part of his land as a botanical field. By using red clover, which stores nitrogen, nitrogen from fertilizer is no longer needed. Toon has also stopped pitting grass, so there is less loss of sugar and protein. The ultimate goal

is to no longer buy soy through a self-sufficient food supply. This provides money and sustainability benefits.

*"Sometimes you don't have to reinvent the wheel at all, and you just have to see how farmers used to do it, especially when there was no fertilizer yet"*

*Toon Hulshof*

#### **Water quality**

"A more conscious use of manure and crops leads to better ground

and groundwater quality. I have done research myself at Wageningen University into the effect of manure policy on water quality since 2005. That is considerably been improved through various measures. A lot is really changing. I am convinced that the new working method that we, as VKA farmers, are trying and implementing if successful will become the new standard. But you cannot control everything yourself. In this region, for example, we have suffered a lot from drought in recent years. Then you can get less of your own food from the country and you are still forced to buy soy. It is

themselves can also produce less food for their cows.

With a loss of biodiversity, the dairy farmer shoots himself in the foot. He knows better than anyone that the agricultural sector is not a factory, where you can control the process at set times. He must live in harmony with nature. An incentive is to ensure that dairy farmers who work on increasing biodiversity, for example by reducing more herb-rich grassland or reducing the negative impact of nitrate and ammonia emissions, receive an appropriate reward for this. In 2017, a prototype for a biodiversity monitor was developed from DZK. This is currently being further specified.

In particular, we look at what objectives are possible, so that measurable results also become visible. It is already visible that more and more dairy farmers have taken on or will receive tasks in the field of nature management and are being paid for this. Better cooperation between farmers, landscape managers and nature organizations are a broadly endorsed interest.

#### **Land and nature management**

Dairy farmers are the most important managers of the green landscape. This direct and visible relationship between the farm and the connected grasslands is stressed in the context

of land-relatedness. A dairy farm includes more than just grasslands. Often there are also natural elements such as forests and ditches, birds and other animals find a place there as well as everything that lives and grows underground. It has been agreed within DZK that the biodiversity of dairy farming will improve.

Biodiversity is perhaps the most uncontrollable of all the themes on the sustainability agenda of the dairy sector. How do you define that? What do you include and what not? And how can you measure biodiversity? Promoting biodiversity also raises economic issues. Dutch dairy farmers work with relatively expensive land that must be cultivated as efficiently as possible. With the replacement of grazing land by, for example, a strip of plants and flowers, the earning capacity is reduced. That can even clash with other objectives. For example, we want dairy farmers to buy as little animal food as possible. Then she or he often needs every piece of land to be able to grow enough food.

The Sustainable Dairy Chain focuses on a broad definition of biodiversity. You cannot simply determine that by counting the number of plant species and animals in a given area.



# "People need to know that milk comes from a cow and not from a package"

That is why Auke van der Wal (28) is happy to open the doors of his farm to show people what they are doing and how they are working on, for example, sustainability. Schools are already among the regular visitors, but anyone is very welcome.

Dairy farmers need to come forward more to tell their story, says Auke. He is the fourth generation Van der Wal who is a farmer at this place. He runs a dairy farm together with his parents, with approximately 200 dairy cows and 100 young cows in Kootsterstille, a village in the northeast of Friesland. It is a region where traditionally many dairy farmers live, also because the ground is not suitable for crops other than grass. The criticism about the 'landscape pain' due to one-sided and intensive cultivation is not present here, also because there is much room for biodiversity. For example, the garden plots of the company of Auke van der Wal count twenty kilometers of hedgerows, which they maintain themselves, and other natural components.

## Energy bill

In recent years, he has done a lot of work to reduce the energy bill and thereby make the business operations more sustainable.

*"We have solar panels and inverters on the vacuum pumps. We also try to be economical with diesel, by using lighter machines and not always driving too fast on the tractor. Those investments pay off because our gas and electricity bill are at least half the bill of before."*

Auke van der Wal

The last item on the wish list is a small windmill. They are already fully visible in the province of Groningen and the new provincial government of Friesland has decided that there will also be room for such windmills in this province. "Then we come full circle and we can get rid of the gas," says Auke.

"Themes such as animal welfare and biodiversity have been on the agenda since the 1980s," says Auke's father. "We are now working on it much more intensively." Sometimes they reach their limits.

"A solar park was built nearby. As a result, there is not enough capacity to process all the solar energy that we could generate. There are no more solar panels allowed."

He would also like to produce more protein-rich animal food himself, but he does not have enough land. That is why Auke is now looking for innovative solutions, such as the production of algae or duckweed.



Auke van der Wal

## Dialogue

Sometimes objectives in the field of sustainability are even contradictory.

"As a sector, we have significantly reduced the use of antibiotics. At the same time, we have the ambition to extend the lifespan of our cows. That is a difficult combination. Antibiotics were used more easily in the past. I would also like to use more manure on my own land and that of the neighbors. However, I have reached the cap. As a result, you have the strange situation that I have to get rid of my own animal manure and at the same time have to purchase much less sustainable manure."

The social dialogue between farmers and citizens is of great importance to clarify such dilemmas.

*"I have full confidence in a good future. Also, by continuing to work on sustainability. That requires a long breath; puzzling, trying and finding new ways. We have to keep telling that story."*

Auke van der Wal

## Food and manure

With energy-saving and stimulating measures, the dairy sector contributes to the reduction of CO<sub>2</sub>

emissions. The sector also has a share in the emission of other greenhouse gases, in particular nitrous oxide and methane. In addition, dairy farmers have to deal with the emission of ammonia and phosphate. These are related to the natural processes that are inherent in dairy farming, in other words 'peeing, pooping and farting.'

The dairy sector has made progress in reducing greenhouse gas emissions. The target of achieving a 20 percent reduction compared to 1990 has not yet been achieved. The phosphate reduction plan has been implemented to tackle the sudden increase in phosphate emissions from 2015 - as a result of the abandonment of milk quotas. This makes the phosphate utilization better than a year earlier. The emission of ammonia, on the other hand, increased.

A cow's food in the Netherlands consists of 90 percent grass and corn, also known as roughage. In addition, cows get concentrated food, including corn products, wheat and other residues from the food industry.

Soy is part of the concentrated food, and 1.25 percent of a cow's portion consists of soy products. The cultivation of soy is sometimes accompanied by deforestation, damage to other nature and careless use of pesticides. Moreover, soy must be transported to the Netherlands. Dutch dairy farmers have been opting for 'responsible soy' since 2015. The next step is to import less soy, because the daily portion of concentrated food is produced by the farmer himself or in the near area.

With land-based business operations, it is possible to become increasingly self-sufficient or even completely self-sufficient.



# Ongoing work at the Agri-Food & Biosciences Institute

## AFBI Precision Grassland Platform

The AFBI Precision Grassland Platform aims to use new technologies to better understand and manage dairy cows in a grazing environment. The platform integrates soil, plant, animal and climate data to improve understanding and management of grasslands, which will in turn influence the environmental footprint of the grazing system. The platform infrastructure covers dairy and beef systems (78 ha), and looks at soil using technologies such as Normalised Difference Vegetation Index (NDVI), Satellite, Lidar, animal based data feeds, and using GPS to analyse soil, fertiliser and slurry application.

The platform also encompasses in-field animal monitoring such as rumination, activity, concentrate feed stations and live streams of data to an online platform for rapid decision making for grassland management.

Other research on carbon efficiency that AFBI are undertaking includes looking at dietary additives such as 'biological additives' like probiotics, and 'novel plants' for example essential oils and seaweeds. AFBI are also looking at the impact of improved diet quality on carbon efficiency, and genetic selection, in terms of higher performing animals

(lower production per unit product), more efficient animals (high 'residual feed intakes'), and genetically low CH<sub>4</sub> emitters.

Considerable improvements have been made in carbon efficiency in NI farms in the last few decades. Northern Ireland grasslands have a key role to play in sequestering carbon and good grassland management practices such as liming, reseedling, targeted nutrient use will help achieve this, and improving technical efficiency on farm remains a key driver of carbon efficiency – targeting production and functional traits are essential.

## Soil carbon sequestration – Dr Dario Fornara AFBI

Agricultural grasslands account for over 90% of the area farmed in Northern Ireland and thus represent a very important land use type, which is crucial for sustaining the beef and dairy cattle sectors. Agriculture, however, is responsible for 27% of total Greenhouse Gas (GHG) emissions in Northern Ireland and there is an increasingly urgent need to reduce the carbon (C) footprint of these livestock-based production systems. Grasslands can significantly sequester carbon in their soils thus contributing to offset GHG emissions and improve both environmental and economic sustainability of the agri-food sector.

Over the last five years AFBI's research has been particularly focussing on three key areas, which include:

- Quantification of soil carbon sequestration potential of agricultural grasslands under common management practices;
- Understanding of what biogeochemical mechanisms might influence soil carbon gains and losses in managed grasslands and thus soil carbon stock changes across years;
- Quantification of the economic value of enhanced soil carbon stocks for livestock farming systems across Northern Ireland.



**Agriculture is responsible for 27% of Northern Ireland's total GHG emissions (mostly as CH<sub>4</sub> and N<sub>2</sub>O; = ~ 5.4t CO<sub>2</sub>-e)**



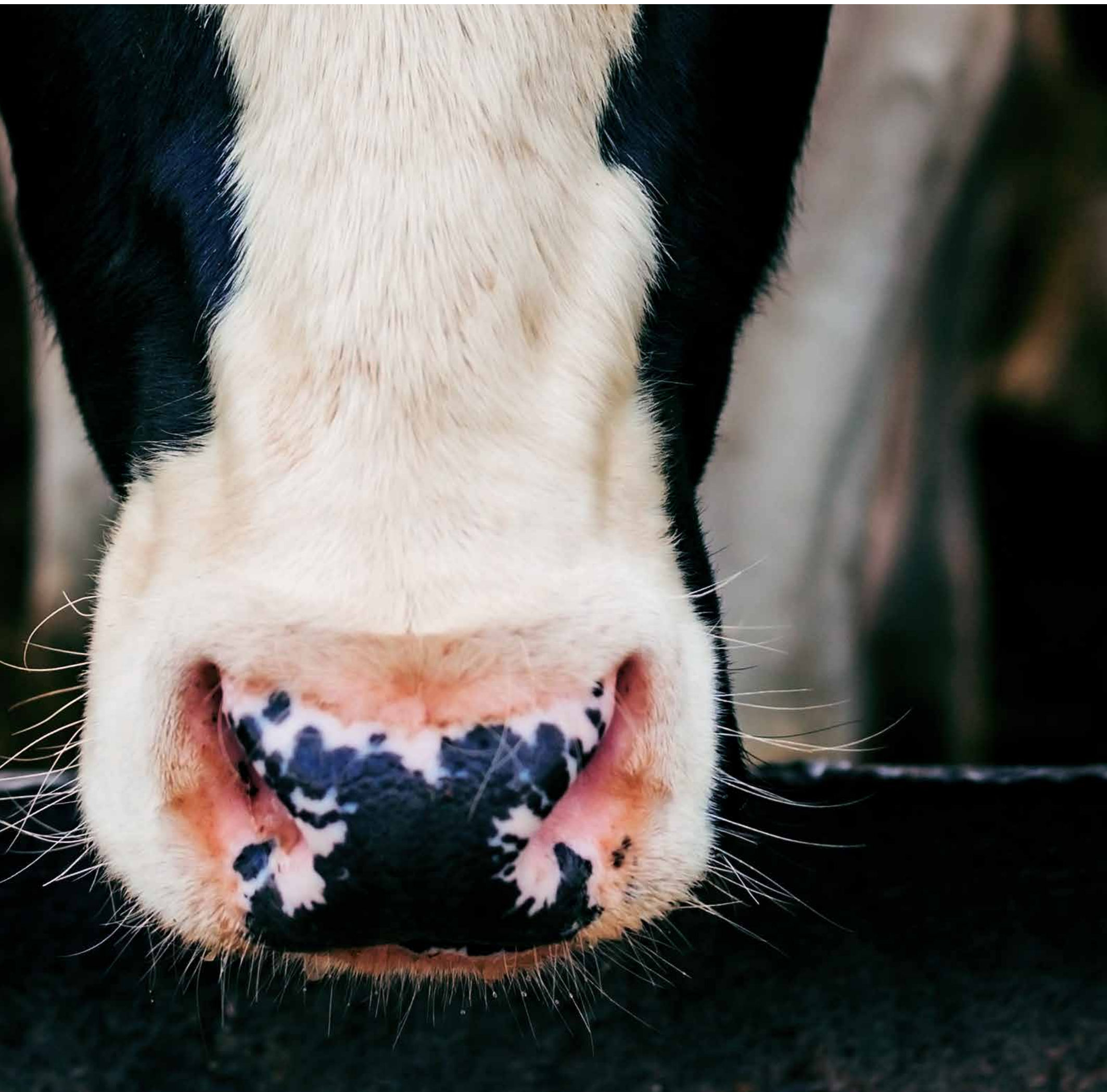
**Agriculture is responsible for 91% of Northern Ireland's NH<sub>3</sub> emissions; with the cattle sector making up 71% of emissions**



**In Northern Ireland, there is currently 112 000 ha forest and approximately 60 000 ha of hedgerows<sup>2</sup>**

2) Benefits of trees and hedgerows on carbon emissions from dairy farms' (2019) Olave, Carolan – Dairy4Future Workshop.





## Chapter 2

# Expert interviews

*In the European dairy sector we build our initiatives, programmes and overall efforts on acknowledged facts and scientific research. And this, we want to share. In this chapter, we introduce some of the leading experts within the field of agriculture and nutrition*



# "A simplified debate on sustainable diet can **harm people living in poverty**"

**The UN estimates that we will be approximately 10 billion people on the planet in 2050. This poses a number of challenges; especially with feeding the growing number of people while also reducing our impact on the planet. UN expert states that the sustainable food system of tomorrow needs a holistic and global approach. Otherwise we risk harming food-insecure people.**

Designing the future sustainable food system is a great challenge with an inherent paradox: We are looking at feeding more people than ever before, and we must reduce our impact on the planet.

## Smarter production and distribution are key

Anne Mottet, who is Livestock Development Officer at FAO, UN's Food and Agriculture Organization, is working with this challenge and stresses that we must produce the sufficient amounts of foods within our planetary boundaries.

*"If everybody was consuming the way we do in the West, some say we would need 3-4 planets. So, we need to distribute better, we need to produce more and better. Efficiency of production is key. That's what the question is about."*

## Holistic and global approach

When asked about the solutions, Mottet puts great emphasis on a holistic thinking. She points to the UN Sustainable Development Goal-framework (the SDGs) as the right framework that enables this holistic approach to a sustainable transformation of our food system:

"Sustainability is also about social and economic sustainability. Livestock is of great economical importance to a lot of people in developing countries. And sustainability is also about the cultural importance of foods. The UN SDGs are not only about GHG-emissions – we must consider the whole range of dimensions," she says.

Moreover Mottet stresses that diversity of diets is a key prerequisite, when thinking about food globally. She argues, that "there is not a single diet that feeds all." People

have very different living conditions and options and thus we cannot define one diet for all.

## Consumer concerns versus food security

This need for diversity is one of the reasons that Anne Mottet is very attentive to the simplified debate on sustainable diet that is going on in Western media today. The debate often revolves around the dichotomy of animal foods vs. plant-based foods.

But this distinction is way too simple, Mottet elaborates. And misinformation harms the food-insecure people in developing countries.

"Wealthy consumers have options and alternatives. But the 800 million people living in extreme poverty depend on livestock and don't have the same options. The information from Western media can feed a negative crisis on livestock which will have a huge influence on food-insecure people whose lives depend on livestock," Mottet continues.

She underlines that livestock often is the only source for nutritious foods in deprived, rural areas – and that livestock turns inedible crops into foods. Moreover livestock is the key to rural vitality and resilience in many developing countries and it can thus have huge consequences if livestock is cut out of future diets.

*"In Botswana the debate on animal vs. plant-based foods doesn't make sense. In Kyrgyzstan they are not aware that it could be bad for the environment to eat animal products."*



*But in Europe we assume that we need to reduce animal foods."*

Thus, the drivers for change is very different in developing and developed countries. Consumer concerns is a key driver in the West, but food security is the number one driver in developing countries.

## We must engage together

How then, do we tackle these challenges? According to Mottet inter-governmental organizations and national governments are crucial.

*"Governments play a vital role in educating consumers in production and consumption, and they should invest in the necessary research and infra-structure to move products around"*

But private actors too can partake in the needed transformation.

"We already see global food companies who are implementing strategies to reduce climate change

and reduce environmental impact. But it cannot be done unilaterally, they need to engage with governments, research, civil society, because it's a multi-dimension problem. We have to engage together."

## About

Anne Mottet has a background with a Ph.d. in Agronomy and Animal science. Currently she is working as a Livestock Development Officer at FAO (UN's Food- and Agriculture Organization), where she is engaged in supporting livestock sector analysis and policy making.

The FAO works with developing agriculture and food systems in developing countries, with a focus on counselling, transferring knowledge and gathering data and knowledge on key agriculture and food issues. Moreover, FAO has a unique role in implementing and evaluating international policies and strategies within agriculture and foods.



This article is based on key messages  
from Adam Drewnowski at the symposium  
in Northern Ireland

# Healthy diets from sustainable food systems

In 2010, the United Nations Food and Agriculture Organization (FAO) defined the four pillars of a sustainable diet as: Health, Economics, Society, and the Environment

Each pillar plays an equally important role in ensuring that the diet in question provides the appropriate level of nutrition, in an affordable, accessible way, with minimal negative impact on the environment.

Professor Adam Drewnowski, Director of the Centre of Public Health Nutrition at the University of Washington has observed that many approaches to sustainable diet modelling often overlook the nutritional dimension, instead focussing on the environmental credentials with little or no regard for nutrition. For example, calculating the carbon footprint of our diet per kg of food weight rather than in relation to the nutrients a food provides.

*"...In other words, a diet cannot be considered a sustainable diet, if it doesn't meet the nutritional need of the community it is designed to serve..."*

Where models do give due attention to health and nutrition, it is often the case that they measure the nutritional value of the diet based on energy (calorie) density rather than ensuring that the food systems are rich in nutrients.

A better way of profiling a 'sustainable diet' would be to move away from energy density modelling and refer to the nutrient content of the



Health



Economics



Society



Environment





foods. Properly addressing the nutritional need will allow the discussion to move from simply sustainable diets to 'healthy diets with low impact on the environment'.

Similarly, measures of the affordability of a diet frequently look at calorie density (kcal per £) but Professor Drewnowski maintains that a more accurate picture can be gained by building an overall nutrient profile.

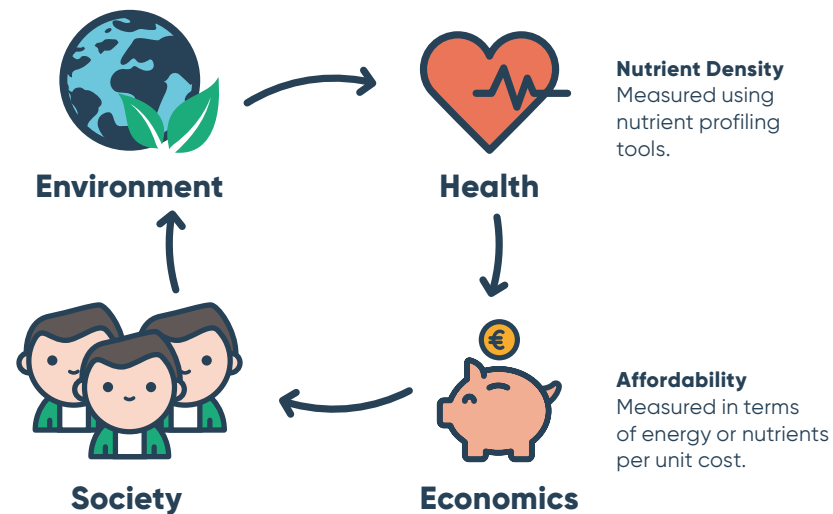
This process can involve dividing nutrients into two categories, those we want to encourage (for example; calcium, fibre, magnesium, vitamins A, C, E, K and D), and those we may want to discourage (saturated fat, added sugars and sodium).

Newly developed methods also now focus on protein quality, separating animal and plant proteins, distinguishing the usually higher quality animal proteins such as milk.

Once this information on nutrient density or other measures of diet quality is available, the data can then be used for a wide range of purposes including innovation, product development, and reformation or for comparing against other food models. It may be in the future that ways can also be found to take into account the health effects of a food, which may go beyond the nutrients it contains.

**Environmental impact**  
Measured in terms of land, water and energy use associated with food production, distribution and retail.

**Social Values of Foods**  
Measures can include attitudes and beliefs, perceived pleasure and social context of eating.



© Adam Drewnowski – Suitable diets symposium – Nutrition 2019.

## Important contribution of dairy foods to the European and Northern Ireland diet

Milk and dairy foods make an important contribution to the nutritional quality of the European diet. In many countries, including Northern Ireland, they are the main providers of calcium. Dairy also makes significant contributions to the intake of many other nutrients including highquality protein, riboflavin, vitamin B12, phosphorus, vitamin A, iodine, zinc and potassium.

In Northern Ireland, the dairy food group is the largest contributor to intakes of calcium, iodine, vitamin B2 and vitamin B12, supplying around a third of adults' intakes and even more in children and teenagers.

Nutrients	4-10 years	11-18 years	19-64 years
Protein	21	15	13
Calcium	45	37	37
Potassium	22	15	12
Iodine	55	44	35
Zinc	23	16	15
Vitamin A	24	18	17
Vitamin B2	43	32	29
Vitamin B12	54	40	35

Contribution (%) of dairy foods to nutrient intakes in Northern Ireland.<sup>3</sup>

<sup>3</sup>) National Diet and Nutrition Survey. Results from Years 5-9 (combined) of the Rolling Programme (2012/13-2016/17): Northern Ireland. [www.food.gov.uk/sites/default/files/media/document/national-diet-and-nutrition-survey-northern-ireland-y5-9-full-report\\_1.pdf](http://www.food.gov.uk/sites/default/files/media/document/national-diet-and-nutrition-survey-northern-ireland-y5-9-full-report_1.pdf)



# "Preservation of soil is a prerequisite for all food production – but is neglected in public debate"

**The public debate on sustainable foods is way too simple, says Swedish researcher in agriculture and animal science Anders Herlin. He argues that we need a holistic view on food systems in order to ensure a sustainable food production. In particular, he points to the role of livestock in safeguarding biodiversity and preservation of soil – a prerequisite for all food production.**

Over the past 40 years, approximately 33 percent of the world's adequate or high-quality food-producing land has been lost.<sup>4</sup> This loss of soil has occurred mainly due to excessive crop planting and harvesting. If soil is repeatedly turned over, it fails to bind carbon and oxygen effectively which in turn decreases the soil's ability to store water and provide a fruitful base for plants.

"It is crucial to slow this development down," says Swedish researcher Anders Herlin from the Swedish Agricultural University, SLU.

*"We must stop soil erosion in order to feed the world. It is even more important in developing countries where the soil is in danger in certain areas. But if livestock is included in the agricultural system it will enrich the soil with manure and by grazing – increasing the biodiversity and enhancing food security"*

Thus, livestock cannot be discarded from food systems as they help slow down erosion and keep up the fertility of soil, Herlin points out. And fertile soil is a prerequisite for all

food production, plant-based as well as animal-based.

## Higher food security with livestock

Moreover, Anders Herlin emphasizes that livestock is crucial in terms of food security. Plants are more vulnerable to natural disasters like drought or flood than livestock and yields from plants quickly decrease when natural disasters occur. Livestock, on the other hand, is much less vulnerable and can contribute to food production under tougher conditions. This is especially important in developing countries in rural areas where the livelihood of families depend on their own food production.

Furthermore, it's essential that especially ruminants convert plant proteins that are not edible for humans into human edible proteins.

## We need a holistic approach to evaluate the food system sustainability

In the light of this holistic view on the food system Anders Herlin calls for a more bio-circular approach to assessing the environmental impact of food.

Today, the main theoretical model used to evaluate environmental impact of food is the life cycle analysis (LCA). Anders Herlin explains:

*"LCA is widely used for assessing the environmental impact of human activities. But when using it as a single trait – such as climate impact – of complex and multifunctional food systems it will not indicate the total the sustainability"*

Comparing impact of food based solely on its mass is not adequate because this method does not take into account the nutritional value of the product and therefore comparisons will be flawed.

"Agricultural food systems are complex and multifunctional. And a bio-circular approach is more appropriate using systemic modeling which includes the effects over time," Anders Herlin says.

Especially when it comes to livestock it is important with a holistic approach to the food system capturing the benefits on soil fertility and biodiversity maintenance.

"Everything is important in some way, and farmers and researchers have to work together and focus

on the common goal. Qualifying our policy and decision making we need the right parameters and a reliable theoretical model that monitors and predicts outcomes," Anders Herlin reasons.

According to Herlin it is evident that we cannot diminish the role of livestock in our food systems, both in terms of food security and preservation of soils.

## About

Anders Herlin AgrD/Associate Professor, PhD Agric, Senior Research Lecturer – Extension Specialist /Swedish University of Agricultural Sciences.



4) FAO 2015: [www.fao.org/news/story/en/item/357059/icode/](http://www.fao.org/news/story/en/item/357059/icode/)



# "A healthier diet is also **more sustainable**"

Irish nutritionist Ian Givens believe that we should focus on improving public health in Western populations, as this will also have sustainability benefits. Moreover, he stresses that the current public debate on foods is way too simple, as the dichotomy between animal and plant-based foods doesn't take the nutritional aspect into account.

## High-dairy diets are healthier than low-dairy diets

The current debate on a sustainable and healthy diet is too simple, Ian Givens states. The debate is focused on the dichotomy between animal and plant-based foods. But "foods are not just foods," he argues.

Even animal foods cannot be categorized like that: "It is not correct to talk about animal-based foods like that, every food is different." He stresses that there are vast

differences between dairy products and red, processed meat for example. And that the current rush to replace animal proteins with plant proteins can result in nutrition deficiencies: "Some foods, like dairy, provide high quality protein and are nutrient dense. That is unique compared to plant products." Because 'proteins aren't just proteins', they are made up of different kinds of amino acids, and the amino acids that dairy products provide is uniquely well fitted to human needs.



Moreover, he also stresses that a recent study in the UK, shows that diets with a high intake of dairy products often are healthier than low dairy-diets:

*"Low dairy-diets are correlated with a higher intake of soda, sugar and a lower intake of greens and vegetables than dairy-rich diets,"*

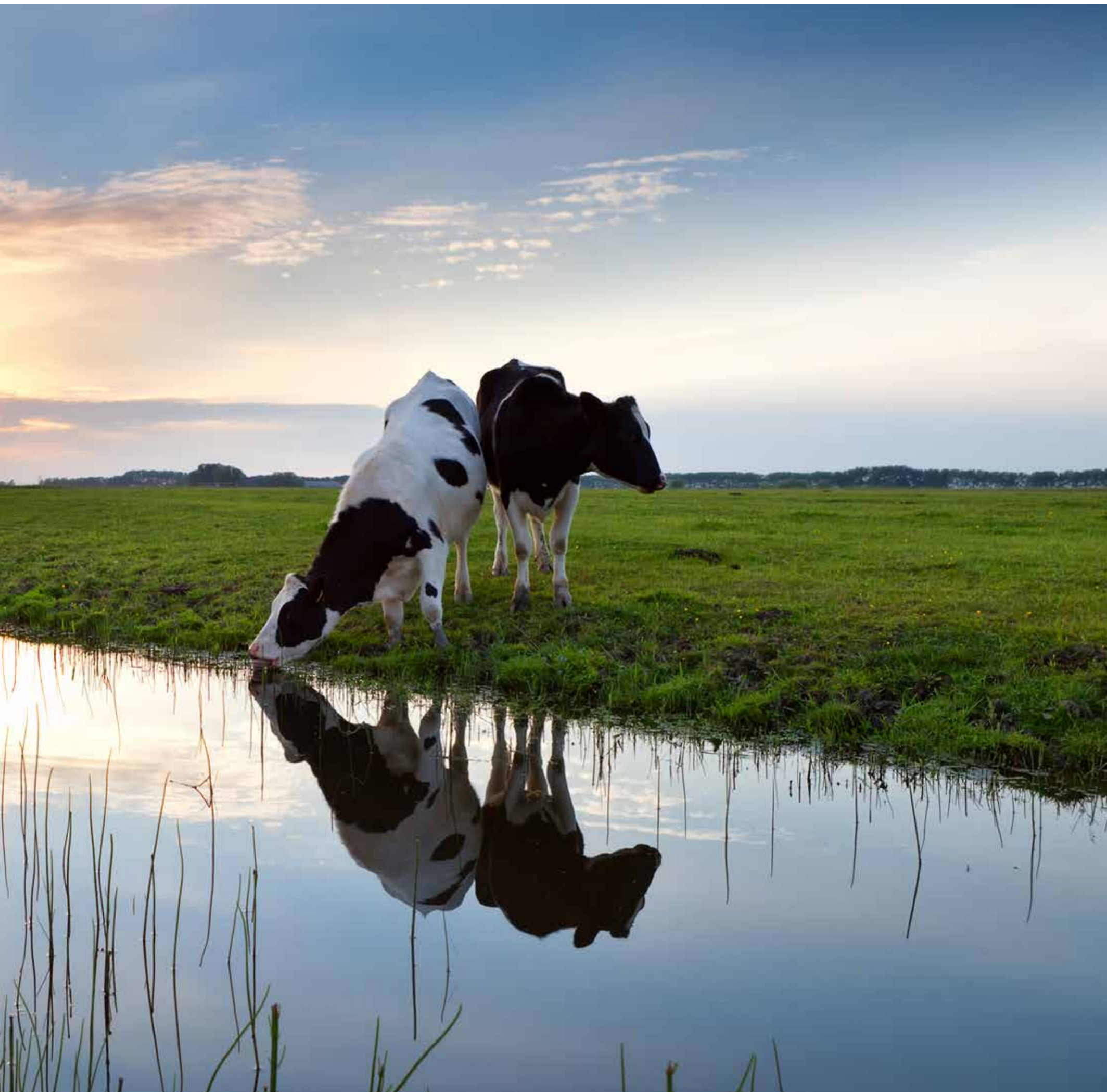
## Improving public health is sustainable

When talking about sustainability, Ian Givens believes that it would be beneficial to invest in improving public health, as this would result in more sustainable diets as well. Diets like the New Nordic Diet, which contains a low intake of meat, are both healthier and more sustainable than the way we eat currently in many Western countries. But he also acknowledges that improving public health is extremely difficult.

## About

Ian Givens is a professor in food chain nutrition at University of Reading. His areas of expertise is nutrition from animal-derived foods and human health. This involves pre-consumption factors, which affect food composition and functionality and its effects on human health. Currently he is researching nutrition and health effects of dairy in the UK.





## Chapter 3

# **Facts and figures about the European dairy sector**



The European dairy sector

# Facts

France

**54 000** dairy farms

**762** processing sites

**63** dairy cows/farm on average

**24.6** billion liters

Ireland

**18 000** dairy farms

**30** processing sites

**76** dairy cows/farm on average

**7.5** billion liters



## Denmark

**4 100** dairy farms

**61** processing sites

**127** dairy cows/farm on average

**4.7** billion liters

## Northern Ireland

**3 428** dairy farms

**12** processing sites

**92** dairy cows/herd

**2.2** billion liters

## Belgium

**6 995** dairy farms

**45** processing sites

**76** dairy cows/farm on average

**4.9** billion liters

## Netherlands

**16 500** dairy farms

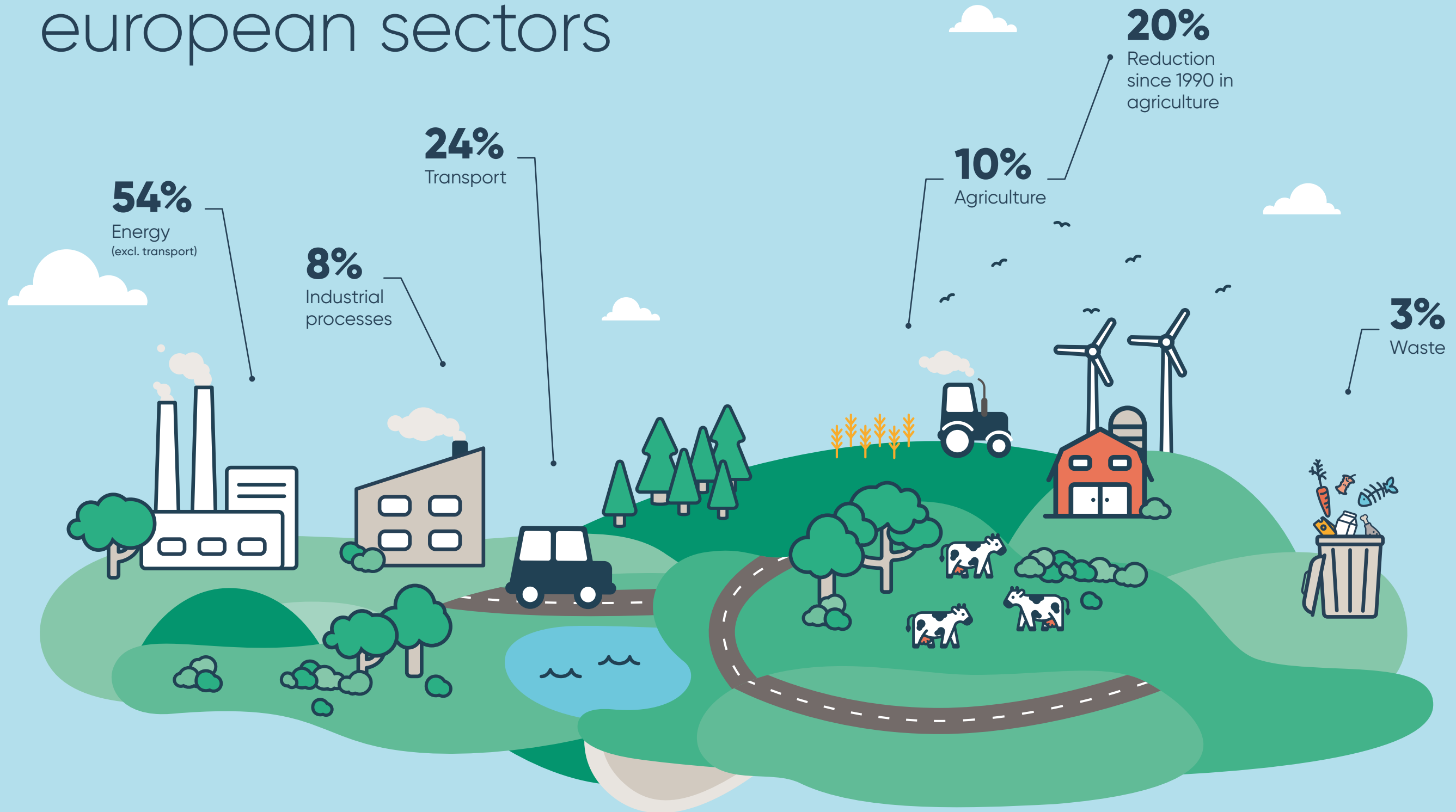
**53** processing sites

**97** dairy cows/farm on average

**13.9** billion liters

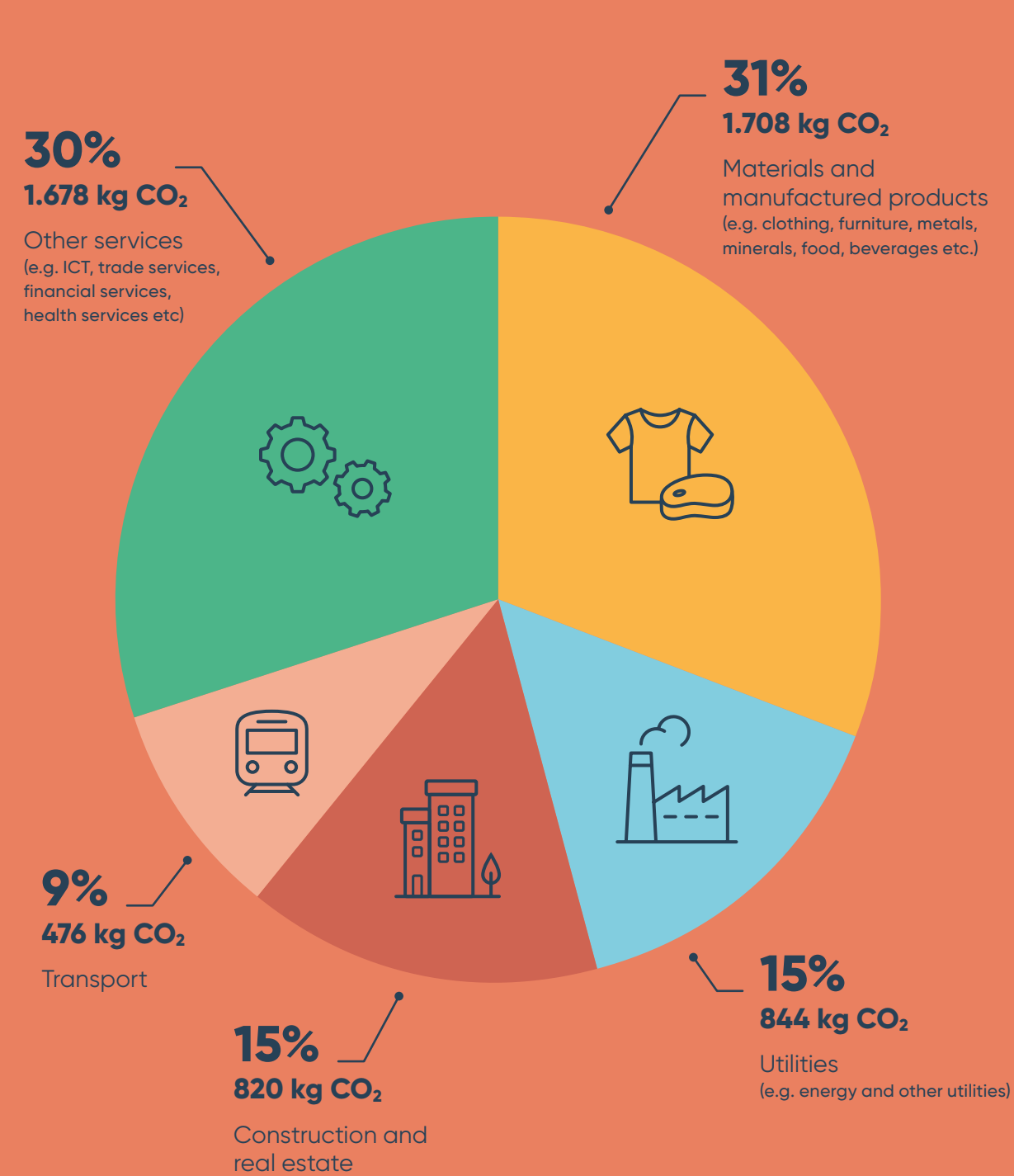


# Emissions from european sectors





## The carbon footprint of the average European citizen



## Materials and manufactured products

