A SUSTAINABLE FUTURE FOR BRITISH DAIRY

CONTENTS

FOREWORD FROM ALICE SWIFT, DIRECTOR OF AGRICULTURE, ARLA FOODS UK

When coronavirus shook us all into a reality check on our health, the importance of good, natural, nutritious food was evident by the shopping habits of the nation. And it was eye opening as the realities were pushed front and centre; that our diets are monopolised by too much ultra-processed food, our younger generations are coping with some of the highest levels of both obesity and eating disorders and far too many in society can't afford the nutrition they need.

Our farmers felt the pressure of filling the empty supermarket fridges, but at the same time, some of our farmer owners approached me with a glint of hope asking, *"has the nation had a reawakening to the importance of real food?"*

Of almost equal importance as the concern for our health, is our concern for the planet, where there is much to be done. While it's well-known not all calories are equal in terms of the nutrition they provide, not all greenhouse gas emissions are either. We mustn't disconnect the carbon footprint of a food from the nutritional benefits it brings. It is essential that we don't divide nature and food production to create a healthier planet at the expense of a healthier society.

At Arla, we believe that a healthy planet and healthy people can go hand in hand and, as this report shows, just as our farmers stepped up to feed the nation after world war two, they are already stepping up to help the planet through this climate crisis.

The solutions to do this must be multifaceted. It includes more plant-based food into our diets, and it also includes dairy, which continues to be recommended on a daily basis by FAO (Food and Agriculture Organization of the United Nations) and by dietary guidelines across the world. It's a view shared by many farmers, whether arable or livestock farmers. They would tell you it has to be both as the two systems work hand in hand to create the best balance for the environment overall.

But dairy production in Britain is different from many other parts of the world, partly because we have the perfect climate, and partly because of the high standards in British farming. Should we be doing more than simply following international guidance?

Is it too simple to think that if we just focused on making the most naturally nutritious foods in the most sustainable, affordable and environmentally friendly way then we would help the planet and the health of our nation?

To me that seems logical, but we need more research into farming, we need more knowledge, more input and more finance to enable farmers to go even further, and faster. This report shares openly where Arla farmers are on this journey. It maps the current carbon footprint of our raw milk, the source of the emissions on farm and the emerging thinking, technologies and practices that give us the confidence that Arla's dairy production will continue to evolve so our farmers retain their title as some of the most carbon efficient farmers in the world.

The next decade will be a defining one, in the availability and affordability of natural nutrition for the generations to come, and in the health of our planet. It's time to think big but be driven by both environmental and nutritional science. It's time to be bold but not jump the gun, but most of all, it's time to support those really taking action, and use politics and profit to help put people and planet first.

CHAPTER ONE: COWS, CLIMATE AND CO-OPERATION

Welcome to Arla

Arla is a co-operative owned by dairy farmers. The farmers that own Arla are based across Northern Europe – there's 2,241 farmers in the UK, 2,357 in Denmark, 2,374 in Sweden, 1,576 in Germany and the remaining 858 are situated across the Netherlands, Belgium and Luxembourg.

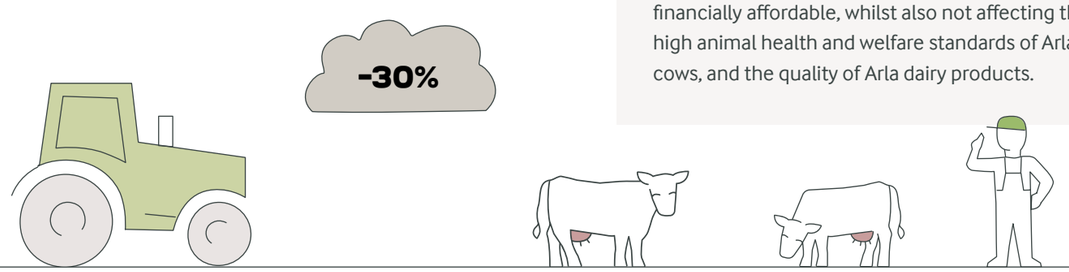
We're proud to be owned by the farmers - and proud of their approach to dairy farming. Through the cooperative democracy, our farmers' hands-on knowledge shapes Arla's thinking and actions, with elected farmers' representatives visible across every part of our company.

We're especially proud of the passion and responsibility they bring to producing the milk for some of Britain's best loved dairy brands, including Lurpak®, Anchor®, Arla Cravendale®, Arla Skyr®, Arla B.O.B®, Arla Big Milk® and Castello®.

Many of Arla's 2,241 UK dairy farmers run family farms, handed down through generations. **Arla farms on average have 206 cows each**, and collectively, make up 28%[1] of the UK's dairy farms.

Our farmers believe you can't manage what you can't measure. To fast-track our co-operative's sustainability ambitions on farms, and set out a path to becoming carbon net zero by 2050, we introduced climate checks.
This means offering every farmer the chance to know the carbon footprint of their farm operations and helping them to find opportunities to reduce emissions further.

The depth and detail of Arla's climate checks provides Arla farmers with the knowledge and insight to fast-track the sustainable journey they have been on for many years.
With a 30% reduction needed in farm emissions by 2030 to remain in line with the Paris agreement, a 3% year-on-year reduction is required. This will not be simple, but Arla farmers are committed and with carbon footprint scores for each farm they now have the tools to identify individual areas for improvement.



About the report

This report covers the aggregated data from 1,964 of our UK farmers. It's an important set of results, with the data increasingly supporting the decisions farmers are making in the running and management of their farm. It will also be critical in helping farmers share best practice and measuring our progress as we move to being carbon net zero across our entire supply chain by 2050.

In total, 90 per cent (1,991) of Arla UK dairy farmers submitted data across 203 metrics to identify the carbon footprint of milk production on their farms.

The data used in this report includes that of 1,964 farmers whose data sets have been validated by external consultants. Our climate check process covers all inputs to farming that currently have science-approved measuring processes and the carbon dioxide equivalent (CO_2e), including the impact of other greenhouse gases (methane and nitrous oxide) produced in farming. While it's not yet possible scientifically to account for all of the positive contributions farmers make to natural emission removal processes, e.g carbon sequestration, we intend that over time, these too will be included within this data set.

Our first phase in this journey is achieving our 2030 targets for a 30% reduction in emissions across our business and a 30% reduction per kg of milk at a farm level.

These are science-based targets which have been approved to align with the Paris Agreement (the globally agreed process to reduce global warming). While we know that farm emissions account for approximately 86% of Arla's overall footprint, we also know that reducing these has to be done in close collaboration with our farmer-owners. Farmers need support to ensure that reducing emissions is financially affordable, whilst also not affecting the high animal health and welfare standards of Arla cows, and the quality of Arla dairy products.

Arla farmers are among the most climate–efficient dairy farmers in the world

The data tells us that across Arla's European business, raw milk is produced with emissions of 1.15 CO_2e per kg of Milk[2].

Within Arla UK, raw milk is produced with 1.13 kg CO_2e. While not all methodologies are the same[3], looking at the closest comparisons, this equates to around half the average emissions of milk production globally (2.5 kg CO_2e per kg, FAO[4]) and less than the UK average of 1.25kg CO_2e (NFU[5])

This is the result of years of hard work and expertise from Arla farmers to manage their soil, crops, animals and businesses to produce dairy in the most efficient and sustainable way.

Different challenges

Unfortunately, there is no simple set of criteria for what makes a sustainable dairy farm.

Challenges and opportunities vary for each farmer, depending on their unique context. While the data shows there are common themes in the emissions across all farms, every farmer has to account differently for a range of factors, largely determined by UK location.

Geography has significant impacts on climate and soil type which, in turn, impact the type of feed and farming systems they are able to implement.

But whatever the circumstances the data shows there is no one way to farm sustainably. It's the farmers who balance their resources successfully whose farms create the lowest amount of greenhouse gas emissions.

Steps to reducing carbon footprint

Because there are many ways to farm sustainably, every farmer will now use their own data to take informed and pro-active steps to manage and reduce their footprint in a way that is most appropriate for their farm. With 1,964 farmers using bespoke data in the UK and a further 6,026 Arla farmers across Europe, the collective gains can lead to significant reductions in the carbon footprint of Arla's milk.

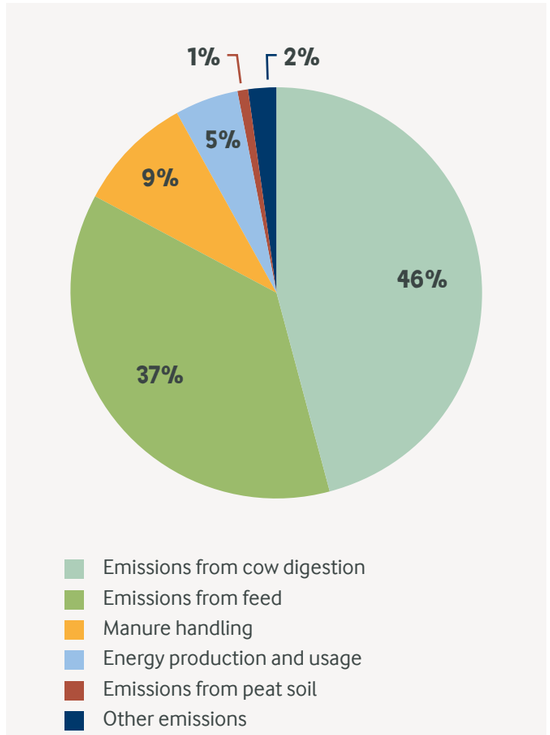
This report aims to provide an overview of the many different approaches and balances taking place on Arla farms, and illustrate some of the innovative technology and scientific research that could lead to game-changing reductions in the future.

What causes Arla's on–farm emissions?

Six key categories make up Arla's emissions:

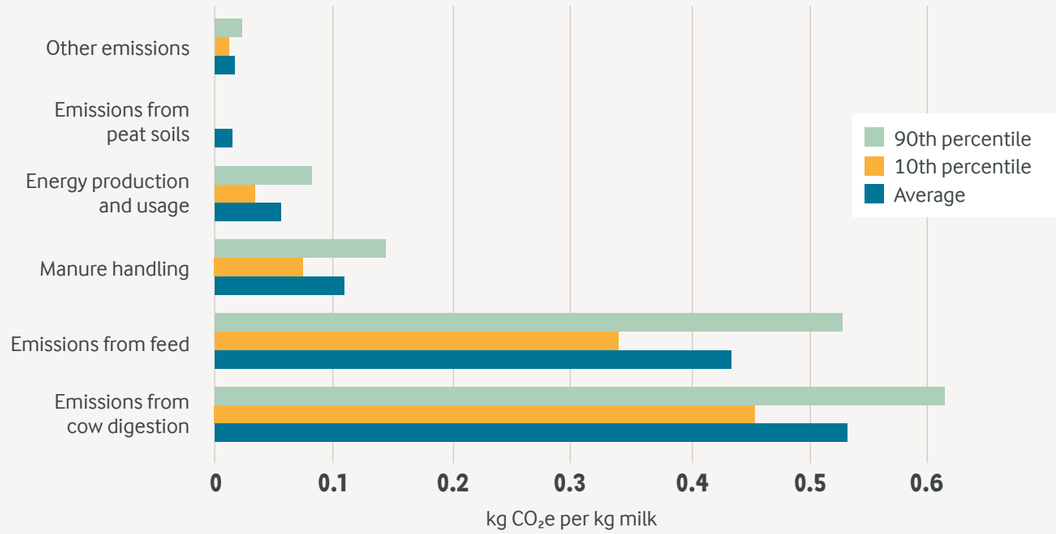
- The cow's digestion
- The cow's feed
- The storing and handling of manure (cow poo)
- The energy used on the farm
- The emissions from peat soils (where relevant)
- The other emissions are grouped together due to their lower contributions.

Data shows that methane emissions from the cow and feed production offer the highest opportunity for reductions in overall emissions short-term, while all the different categories are needed to support Arla's ambition to be carbon net zero by 2050.



Looking at the highest and lowest 10% of farmers in each of these key areas also shows the significant difference between farmers in managing their farm emissions. Greenhouse gas emissions are, however, closely interlinked. The most efficient farm when it comes to feed digestion may not have the lowest emissions from feed production. So when pin-pointing what's achievable, it's important to study **the farms with the lowest total carbon footprint.**

Average, top and bottom 10% on emissions source based on kg CO_2e per kg of milk



The farms with the lowest total carbon footprint (< 1.01 kg CO_2e per kg of milk) produce milk with on average 16% lower emissions per kilo of milk compared to average farms. This suggests that if all farms could be helped to reduce their emissions to the scores of the lowest 10%, Arla would reduce the current carbon footprint of its UK milk production to around 0.95 CO_2e per kg of milk – a significant drop.

Alongside further on-farm efforts, additional reduction in dairy emissions will come from the evolution of new technologies already being tested on farms. With the right funding and provision for farmers, the newer technologies will likely prove game-changing.

The wider impact

Dairy farming is intertwined with nature and animal health, so the process for farmers is not as simple as just reducing emissions in each of the six areas. **Every decision taken at farm level is likely to impact emissions from other areas.**

For example, if a farmer changes the type of feed they grow, this could have unintended consequences as to the quality and emission-inducing capacity of the diet fed to the cows. Every day, Arla farmers manage their businesses as an entire system of soil, crops, animals and other input resources. It's this balancing process across every vital decision that makes the challenge so complex for farmers, and the data so difficult to analyse.

CHAPTER TWO: WHAT COWS EAT, WHERE IT COMES FROM AND THE IMPACT ON FARM EMISSIONS

What a cow eats has always been an incredibly important topic for Arla farmers. Ensuring the cows are fed in a way that maintains health, supports fertility and provides the right energy levels is a key part of running a successful farm business.

But it's only been in the last decade or so, as science around animal diets linked to the climate has advanced, that Arla farmers have started to consider how to feed their cows as sustainably as possible.

A cow's feed not only impacts the methane emissions from digestion, but producing its feed also accounts for well over a third (around 37%) of Arla's total farm emissions.

Feed emission calculations include the production of all feed used on a farm whether it is made on site or imported from other farms.

Increasingly, the science indicates that to be climate-friendly, a cow has to eat the right amount of nutritious food, grown or sourced in the most climate-friendly way and mixed for optimum health and milk production.

But if only it were as simple as an agricultural Deliver-moo.

Farmers have a great deal more to do than simply ordering the right feed. They must decide how much of the feed they can or should grow on their farm, the types of protein and energy sources they want to provide their cows and how to adapt the cow feed depending on the animals' age and factors such as whether it is milking or not at any given time.

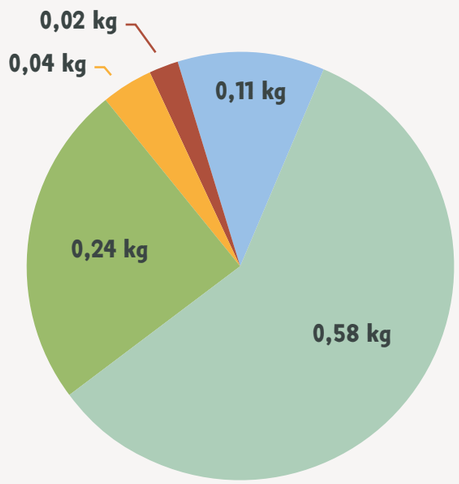
The good news for farmers is that **Britain's climate is perfectly suited for** growing the grass needed to feed cows in the most sustainable way possible.

Of the 330,751 hectares of land on Arla UK farms, a huge 79% is used for **growing grass, which provides 58% of cows' feed on Arla UK farms**. They can eat it as it grows on the fields, or as cut grass in the cow sheds.

But while it can be a great source of protein, the quality can be greatly impacted by weather and season. There is a risk that the nutritional content of the cows' diet could vary too greatly for consistency in both health and milk production. That's why Arla's UK farmers supplement with other feed sources to provide this consistency.

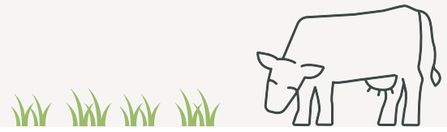
The Arla cow's diet

Feed (kg dry matter) used to produce 1 kg of fat and protein corrected milk



- Grass based
- Concentrates and minerals
- Grains and roots
- By products
- Other forages

Around 2% of the feed given to Arla UK cows comes from by-products. This is the waste from other areas of food production - primarily flour, sugar, alcoholic spirits and beer. For this set of data it included beet pulp, molasses, malt culms, brewers' grains, potato pulp and palm kernel meal. However, the concentrate mixes fed to cows often also contain by-products from food production. This highlights the role animals can play in moving towards circular economies, creating value from what could otherwise be seen as waste products.



Managing protein levels

The feed farmers give to their cows must be rich in protein to ensure they have the right nutrition to grow and produce milk, but as with humans, there is a limit to the amount of protein a cow can absorb. Any excess passes through and is excreted.

Overfeeding of protein leads to unnecessary greenhouse gas emissions of methane and nitrous oxide being released.

Carefully measuring feed with the right protein levels means lower nitrogen levels in the slurry, which leads to less nitrous oxide.

Even emissions from feed production may decrease with more focus on protein level in the feed ration.

The maximum protein a cow should consume is around 16% of the total feed. Any farmer feeding their cows too much protein can make significant reductions in the carbon footprint of milk by re-addressing this balance.

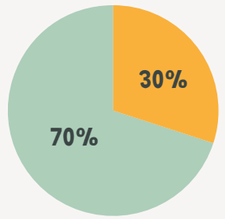
Preliminary results suggest that approximately half of the farms in the survey could benefit from optimising the feed ration for a more efficient use of protein.

Where the feed comes from

A consistent and quality source of feed must be available, as too many dietary changes can have a negative effect on the micro-organisms in the cow's stomach.

The origin of additional feed sources needs to be balanced with its supply reliability for the cow's welfare and feed sustainability.

Feed grown on and off Arla farms



- Total land (metres squared per kg milk used to grow feed **on** farm)
- Total land (metres squared per kg milk used to grow feed **off** farm)

To measure the true sustainability of the cows' diet, it's essential to consider not just what a cow eats, but the **amount of land used to grow feed** and where it's located.

To do this, Arla's Climate Check measures land use in metres squared per kg of milk produced and whether it lies on or off Arla farmland. This data shows that of all the land used to grow feed for Arla animals, 70% is on Arla farms with the remaining 30% on UK or foreign land not owned or managed by the dairy farmer.

So any feed brought onto an Arla farm comes with a carbon footprint from growing, processing and transporting the feed.

Soy — hero or villain?

A concern for many people is the suggestion that deforestation is due to land being cleared for farming and growing feed for animals – particularly soy.

In the UK, Arla's milk is made with approximately 2% of the soy imported to the UK. The climate check data estimates a total annual use of 57,000 tonnes of soy bean meal or -cake used or around 2% of the total feed given to cows on Arla UK farms.

Milk can be produced without soy. In this set of data, 372 Arla farms were producing milk using no soy product at all. However, because soy is such a **highly nutritious form of feed and good for cows' digestive systems,** despite its carbon footprint per kg of feed being higher than alternative proteins such as rapeseed, it does not necessarily follow that zero soy is better for the cow and/or the environment.

What is important is where that soy comes from. Although Arla farms use a tiny proportion of Britain's imported soy products,we still believe that further work is needed to identify its source.

Arla has been monitoring use of soy across Arla Foods since 2010, when the organisation became a member of the Round Table of Responsible Soy (RTRS). Since 2014, Arla has supported the use of responsibly produced soy by covering the full volume of soy used on Arla Farms that's not already certified, by purchasing RTRS certificates. Since 2019, all RTRS credits have been purchased from one region where farmers comply with the RTRS standard. This is an important approach in aiding the development of a segregated supply of certified soy over time.

However, it is currently impossible to be 100% sure that no soy used on Arla farms has contributed to deforestation. This is particularly difficult to check in agriculture where often, soy is one ingredient of many in a concentrate feed given to animals to provide additional amino acids and balanced nutrients.

Identifying the source of soy in some animal feed is an area where greater transparency and traceability is needed. Arla is encouraged by the collaborative work already taking place across the value chain to help improve the sustainability profile of soy and continues to support this.

The palm oil dilemma

Palm oil makes up less than one percent of the total feed combinations on Arla farms. Small amounts are used in cow feed because of the vital role it plays in helping the balance of energy and protein in a cow's diet, which has a positive impact on the production of high quality milk.

Any additional palm oil used in the production of Arla products is responsibly sourced and certified according to the standard of Round Table of Sustainable Palm Oil (RSPO).

How the feed is grown

It's not just the feed that is important - it's how the feed is grown, and a significant proportion of the associated emissions involve the application of animal and artificial fertilisers to the field.

Manure, in the form of slurry, is the perfect example of why the food sustainability debate can be so confusing. A by-product of dairy farming is slurry, or cows' waste, a vital product in feeding and nourishing UK soils. Healthy soil is an essential part of both arable and animal farming. It's needed to produce food for humans, and it's vital for plants to grow and produce oxygen.

Dairy cows produce around 70 kg of slurry a day, each. This is collected and stored while the manure starts to break down, releasing the nutrients into forms that can be used by the soil and plants. This process also starts releasing ammonia emissions.

The most important nutrient in this process is nitrogen, needed for grass or crops to grow and it must be replaced frequently in the soil for this process to continue. When spreading slurry onto their fields, **farmers have to ensure that unnecessary emissions aren't released into the atmosphere,** and that they are giving the soil the right amount of nutrients.

Spreading slurry the right way

Precision slurry applications are becoming increasingly common with Arla Farmers and include techniques such as dribble bars, or injecting the slurry directly into the ground with specialist equipment. When used instead of spraying, these techniques stop nitrous oxide from leaking into the atmosphere, and allow more nitrogen to be made available to the soil, increasing the benefits.

Around 53% of Arla's UK farms currently spread slurry using precision techniques which can reduce air-born emissions of ammonia by between 30 and 90 per cent[6]. And as a bonus for those living near a farm, fewer emissions also make a noticeable difference to the smell of the air when slurry is being spread!

Precision spreading equipment generally costs between £15,000 and £40,000, a significant investment for farmers and one that requires long-term financial planning. Using farm manure to fertilise the soil adds organic matter which is important for a healthy soil. Precision techniques mean farmers use slurry more effectively, and reduce the amount of artificial fertilisers needed.

Some Arla farmers also measure the quality of their slurry before spreading it on their fields. Research has shown that the nutrient content in a slurry tank can vary by up to 25%, so by analysing the slurry first the farmer can calculate the exact amount of slurry to spread to ensure the right amount of nitrogen ends up in the soil.

To find out more visit our **'Forward thinking Dairy'** web page with Ben Fogle and Arla Farmer, Jason Bayley.

Balancing the books

Many Arla farmers work with cow nutritionists to help get the balance of their feed right, but with variables such as the weather, legislation, the age of a cow, the availability of by-products for feed and the variable costs of feed, balancing these factors is a complex business.

Significant reductions are possible through precision farming methods and new technologies. However, while Arla farmers are looking at these measures, the biggest barrier to implementation is cost. Farmers have to balance investment with the welfare needs of their animals and the financial needs of farm businesses.

There are many variables that can affect the emissions related to the food cows eat, where it's come from and how it's grown. They are an indicator as to why the way a farmer manages his land is the most vital factor in producing the best quality milk in the most sustainable way.

Arla's Climate Check data shows just how important the right balance in these decisions is, with a difference of 35% in the average feed emissions between the 10% of Arla UK farmers with the lowest carbon farm footprint in this area and the 10% of UK farmers with the highest farm footprint related to feed emissions.

CHAPTER THREE: HELPING THE COWS REDUCE EMISSIONS

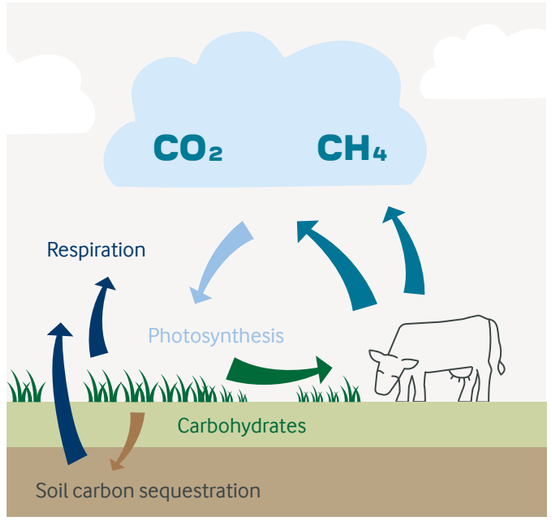
How methane differs compared to other greenhouse gases

While some methane emissions on Arla farms come from the management and handling of slurry and manures, most come from the cows themselves, mainly from a stomach process known as enteric fermentation. Digesting feed creates methane released by burping and a smaller proportion (around 5%) from flatulence.

Methane emissions from cows occur because their stomach has four sections – it's why they can eat food inedible to humans and turn it into milk. The first part of their stomach, the rumen, is where grass and other plant materials are broken down by microbes, turning the fibrous parts of the plants into nutrients the cow can absorb and use for milk production. This process also produces the methane.

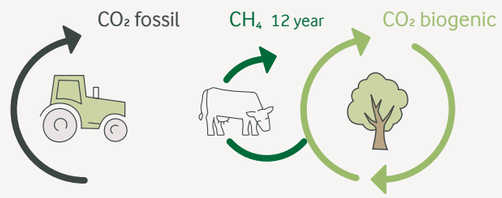
Different types of methane

Methane from dairy (i.e. from enteric fermentation and manure) is termed a biogenic source because of the natural processes dairy is part of. After around 12 years, methane turns into CO2 a greenhouse gas that dairy farming helps take out of the atmosphere through the process of growing grass and crops as feed for the cows. The grass/feed that the cow eats has removed, or sequestered CO2 from the atmosphere when it grows. This is then released back to the atmosphere again as CO2 (respiration from the cow) and methane (enteric fermentation from digesting the feed). This biogenic cycle is illustrated below.



In comparison, CO_2 from fossil sources is not part of a similar cycle. Therefore when CO_2 from fossil sources is released into the atmosphere it is creating a new carbon atom that potentially increases global emissions.

The 'long' (fossil) and 'short' (biogenic) carbon cycle.



Why is the impact of methane debated?

When calculating the carbon footprint of a product all emissions are converted into CO_2e (carbon dioxide equivalents) by multiplying each gas with its specific global warming potential (GWP) factor for a 100 year perspective. It is important for Arla to follow the international standards and guidelines that exist within its climate check model and therefore we use GWP100y when calculating the carbon footprint of products, as explicitly proposed by existing standards and guidelines (e.g. ISO 14067, IDF 2015, PEF 2018).

However, there is a lot more scientific research needed into methane given that it behaves differently in the atmosphere than CO_2. While methane is a more potent ('stronger') greenhouse gas compared to CO_2 as reflected in current carbon calculations, the methods do not account for the fact that methane has a shorter lifespan in the atmosphere (about twelve years compared to 300-1000 years for CO_2) and therefore responds differently to a change in emission rate. It is argued by some that rather than multiplying methane with a GWP for a 100 year perspective, a different methodology may be more accurate for methane.

Arla is always in favour of new research to more accurately reflect the actual climate impact. We support current research efforts across the scientific community to provide greater clarity around the difference in impact of methane vs CO_2 due to their lifespans, and the further consideration that needs to be given to the cycles of biogenic methane and how these are accounted for. To support research, Arla is participating in the FAO LEAP Technical Advisory Group

on methane, where international experts will look at how to improve the guidelines on GHG emissions assessment. This new research may change the methodology in years to come, but Arla will only incorporate any changes if new calculations are recommended by international standards and guidelines.

Can dairy reduce emissions to help the transition to falling emissions?

We believe that every emission source matters, if we are to collectively reduce the impact of humans on the planet and so methane reduction remains a focus at Arla. Even if future methodologies reduce the emissions value in this area, it doesn't negate the fact we think we can go even further in helping the cows reduce their emissions. We are working with scientists and researchers to find ways to reduce the emissions created in the rumen, without changing the flavour, quality or volume of milk from our farms or having a negative effect on the health of the cows.

Fibre and protein are two key areas where management of feed can significantly impact emissions:

- **Excess protein increases emissions**
  Excess protein (above 16% of total feed) creates excess emissions and therefore something which farmers need to measure carefully. Using a good quality protein is also important to help the cows digestion and therefore minimise emissions.

- **Fibre is important**
  It protects the health of the cow's stomach, however, products from fibre digestion contribute to more methane production than e.g. starch digestion. Furthermore, fibres are of different quality. Coarse fibre is hard to digest, which reduces the energy a cow can obtain from the feed and also increases methane emissions created in the digestive process. Harvesting good quality grass and fibre and balancing the fibre to protect the cows stomach without causing it damage or difficulty is key to managing emissions.

Our climate check data shows small changes in farm practice can be beneficial here. For example, farmers cut grass approximately three times a year to dry and keep for feed in the winter months. By initiating the first cut of grass one week earlier than normal, and by maintaining the same number of weeks between cuts, the fibre content in grass reduces by between two and four per cent. This reduction in fibre makes it easier for the cows to digest and therefore reduces methane emissions.

The challenge here for farmers is the consistency of quality in the feed grown due to the unpredictability of UK weather.

Other ways to reduce methane

More significant reductions in methane are likely to come from new research in feed types as noted in the previous chapter and from possible additives that can be added to the cows diets.

Arla is encouraged by initial findings in potential additives, however, before they can be more commonly used by farmers, further steps in the research journey are needed to understand whether they impact the health of the cow or the milk production (specifically whether they change the taste, volume or quality of the milk).

To drive this research from the lab to farm, Arla is sponsoring further academic work in this area in partnership with Aarhus University in Denmark. This involves an extensive range of feed additives with a potential methane reducing effect undergoing serious testing regimes. Many of those being tested are currently showing potential as a possible solution for the future.

However, it is important to note that widespread use of any additives is still a number of years from becoming mainstream on farm. Arla will undertake the extensive research in this area to ensure that any additive with a negative effect to the cows is weaned out prior to advising use of these by its farmer owners.

CHAPTER FOUR: MANAGING MANURE

Before manure can be spread on fields - only done in the growing season to avoid it running off the soil and into waterways – it's stored in a slurry tank. Here, the manure begins to break down, releasing the nutrients into forms that can be used by the soil and plants. This process also releases GHG emissions and accounts for around 11% of Arla's farm emissions in UK.

Some of these also come from the way slurry is managed in the sheds. Fast removal of cow waste is vital and automatic robots which clear the slurry quickly out of the way for the cows are now used on some Arla farms.

But high-tech aside, the simplest way of reducing emissions from storage is to cover the slurry tank. A cover also increases the nitrogen content of the slurry, meaning farmers can spread less on their land without compromising nitrogen content for the soil. But slurry covers are expensive, and in many cases would require farmers to install a brand new tank.

Around 15% of Arla UK milk is from farms which currently use slurry covers, but with costs ranging from £25 - £35 per m^2 per slurry tank, it's hoped that the Government will seriously consider this as an opportunity to provide financial support or long-term loans to farmers.

Harnessing poo power

Slurry is needed to fertilise soils – so finding an effective way to reduce these emissions is key.

Anaerobic digestion could play a part in this, though the use of anaerobic digestion in the UK is still very limited and currently used by just 19 Arla farms.

The process uses bacteria to break down slurry, producing a digestate and bio-gas. Digestate is the slurry that comes out of the Anaerobic digester. It is still spread on the fields, but it retains more nutrients for the soil and it's estimated to release **up to 7% fewer emissions** compared to slurry that has not been bio-gas fermented. The Bio-gas can be used as a source of energy for electricity, heating or transport The slurry Anaerobic digestion can also work with waste water bio-solids and food waste and is a great example of how we can recycle and reuse materials once considered waste products.
Arla has looked at the potential uses of the bio gas, or 'poo power'.

In 2020, Arla UK trialled the use of the biogas from the anaerobic process as a fuel for its tankers.
This trial showed that poo power could be a credible alternative to diesel if the infrastructure in the UK could be developed. Arla continues to evolve this concept and **hopes to bring more poo- powered trucks to the road in 2022.**

The evolution of poo power as an industry in its own right is exciting - not just as a potential revenue source for farmers, but also for the by-product.

WWW.

Find out more about our Poo Power trial here and discover how natural waste can be converted into biofuel

CHAPTER FIVE: CONTENTED COWS

The single most essential factor on any Arla farm is the welfare of their cows.

Overall, there is a direct correlation between the farms with the healthiest cows and those with a lower carbon footprint per kg of milk. Putting animal welfare front and centre of dairy farming is good for the cow and good for the environment. It's also good for the economics of farming.

Growth hormones are illegal for use on dairy farms in the UK and across Europe. Arla's farmers also only use antibiotics when absolutely necessary. So the health of a cow is directly determined by the food it eats and the care it gets from the farmer.

There are two key reasons that healthy and contented cows are so important to Arla's sustainability footprint. The first is the stress reactors in cows. When a cow is stressed its body reacts, making milk production less efficient. This has clear implications for the cow and the farmer. Secondly, the carbon footprint of milk is increased, as the cow's feed and care is still calculated even if she is no longer producing high quality milk. For Arla farmers, the priority is to manage healthy, contented cows producing the highest-quality milk in the most resource efficient, and therefore most sustainable, way.

Farmers already manage the welfare of their cows by closely measuring a number of indicators that can show if their health is changing. On an increasing number of Arla UK farms, cows will wear Fitbit-like collars or ankle bracelets, providing their farmers with access to multiple data sets to measure and monitor a wide range of health indicators such as how much a cow is eating, moving or lying down. Ongoing (rather than just emergency), veterinary support is also a key part of managing the cow's health.

Every Arla UK cow has its own personal health record.

High tech trials for happy cows

Leading UK retailers Morrisons and Aldi support Arla UK's leading farm standards programme, Arla UK 360. This support means that Arla farmers can trial new technologies, working with ground-breaking science and technology innovation partners.

Two key Arla UK 360 trials currently underway include the use of on-farm scanning technology and the development of a Happy Cow scale, to determine whether a cow's contentment and wellbeing can actually be measured.

The Happy Cow measure

While lots of data exists on animal health, there is currently little evaluation of animals' experiences and happiness. Just what constitutes a happy cow has never really been defined - something Arla is actively exploring with help from project partners FAI Farms and Nedap.

The Happy Cow project is being spearheaded at the Arla UK 360 Innovation Farm, where the herd are using Nedap sensor technology capable of tracking activity, behaviour and location. Sustainability experts at FAI Farms are analysing the data to identify key behavioural traits that signal changes in positive welfare.

Ultimately, the study will allow Arla to map and measure positive behaviour among the cows, and promote better welfare as the results are shared with the wider Arla farmer network.

While most farmers instinctively know if their cows aren't content, the Happy Cow measure could save significant amounts of time for the farmer. They can access real-time data when in the shed, to assess each cow's wellbeing based on key behavioural traits such as how much time the cow spends in the herd group or alone or how much time it spends lying down.

Moo–vement scanners

Sometimes it can be difficult for farmers to know when a cow is experiencing health issues, before it presents visibly. By monitoring small changes in a cow's movements and body condition, the Cow Scanner project uses 3D imagery systems Herdvision (developed by Kingshay working in partnership with the Centre for Machine Vision in the Bristol Robotics Lab at the University of the West of England and AgsenZe). **The imaging systems help Arla UK 360 farmers identify changes in each cow's physical wellbeing, mobility and weight, before they are visible to the human eye.**

The scanners work from a fixed position, recording movement data on each cow, every day. They are also hidden – which is key to the accuracy of the data. Just as humans react differently if we know there is a camera filming us, cows do the same.

Studies show that cows behave differently if they think they are being watched, affecting the way they walk or move. It's ingrained primitive behaviour not to show weakness - and even though cows have been domesticated for thousands of years, the mindset of 'best foot forward' still seems prevalent in today's animals.

Overcoming that issue, and with artificial intelligence built in, it is hoped **this system will help measure and identify changes to cow health based on each individual's own health record.**

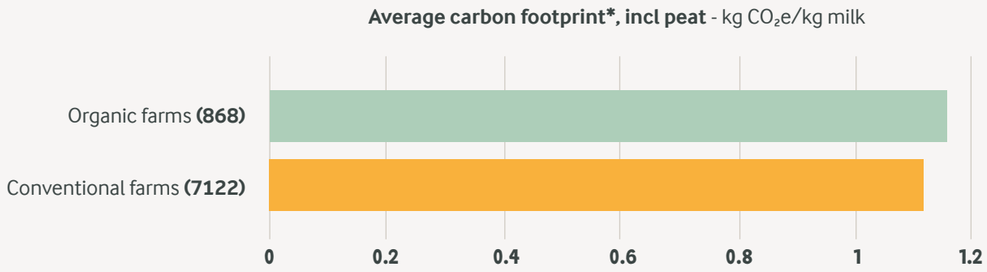
But while technology helps, the most important factor in keeping cows healthy and content is, and always will be, the care and attention given to them by the farmer and all those working on the farm.

CHAPTER SIX: THE MOST CLIMATE EFFICIENT FARMING METHODS

Arla believes it's not the farm's system, size or location that determines how low its carbon footprint is – but how the farmer manages the use of resources in all the farm's processes.

Conventional vs organic

One of the most widely-discussed areas is whether conventional or organic farming is more sustainable. Because the number of organic farms within the UK data pool is significantly smaller (84) than the number conventional farms (1,880), it is more relevant to look at the wider pool of climate check data from Arla's total global farmer base across countries.



* Milk volume, weighted averages

While the average emissions are slightly lower overall on Arla's conventional farms than organic ones when looking across all countries, the data reveals enough variation from country to country and indeed from farm to farm within the same country to require more detailed analyses before conclusions can be made on differences between production systems. For example, there are only two organic farms among the ten Arla farms in the UK with lowest carbon footprint.

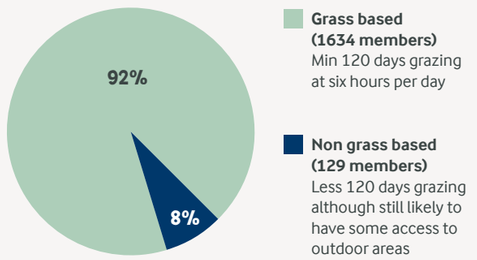
While there are some key advantages within organic farming principles and practices which certainly support lower carbon farming, such as avoidance of artificial fertilisers, the lower-input systems of organic farming also mean lower output and therefore higher land use.

Finding the sweet spot is key. Arla believes that it's a balance of inputs rather than farming system that is the determining factor. Further analysis is needed into sustainability of the two farming systems to understand all influential factors better.

To graze or not to graze?

It's sometimes suggested that systems only with housed cows are likely to generate the least emissions due to the efficiencies of the systems. However, the data shows a minimal difference between grazed vs non grazed cows, which is unlikely to be significant. Non-grazing systems having an average of just 2.2% fewer emissions.
It's important to note here that non-grass based systems can still include cows with access to grass, but not enough to categorise as grass based farming (a minimum of 120 days grazing, at least six hours per day).

Grass–based farming at Arla UK



Balance is best

It's not the system, but the way the farm is managed that determines how sustainable a farm really is – and that's good news.

As a society, we demand many different things from our farmers. We want milk to be harmless to the planet, as cheap as possible, and to come from the healthiest cows, living their best lives. **Having different systems that meet the different needs of the planet and our lifestyles creates a holistic system that works for all.**

Every system has pros and cons, but all have a cost to the farmer, some of whom would argue that they're continually being asked to do more, for less.

Arla believes that action not arguments is what matters, not just from farmers, but every part of society. For farmers, that means striving for the right balance of inputs and outputs to make their farms as sustainable as possible, **whilst never compromising on animal welfare.**

For Government, retailers and foodservice companies, it needs to be about appreciating and supporting farmers at every opportunity, making it easier and more affordable for them to make the decisions that really matter on their farms. And for the public, it's about helping farmers do more by buying the best you can afford, either directly from a farmer, or from a farmer-owned cooperative like Arla Foods wherever possible.

Change can only happen if we support those who are prepared to take the action needed.

Green power

A growing number of Arla farmers are also using renewable energy in their efforts to reduce farming emissions. Over a quarter (27%) of Arla's UK farmers are producing green energy from wind or solar - 533 farms in total. Some electricity is used to power the farm operations, **but some farmers are also feeding back their renewable energy into the grid for others to use**, adding further benefits to society.

To support our farmer owners further with investing in renewable energy, Arla has taken a more circular approach to energy sourcing, setting up the process for the co-operative to buy Renewable Energy Guarantees of Origin from our farmer owners.

These energy guarantees will help reduce emissions from energy usage throughout the Arla supply chain, as we move towards our goal of carbon net zero by 2050.

CHAPTER SEVEN:
WHAT STILL NEEDS WORK

While the current arguments for and against the sustainability of farming are often over-simplified, the industry is still some way off from having the full picture. There is much more scientific understanding and measurement needed, of farming, of nature and of how these systems work together.

Carbon sequestration

Grass is an extremely important part of British dairy farming. Not only is it a key part of the diet for British cows, the process of growing and grazing grass helps sequester carbon (the process of taking carbon out of the atmosphere) and keeps it locked in our soils as the ground is not being tilled or ploughed.

In fact, farming and forestry are the only two industries which have natural carbon removing benefits as part of their processes. While this is not yet measured nor included in our data, some academics believe that **finding ways to support, increase and speed up these natural processes could make farming a signifcant part of the solution** to our climate challenges.

Arla is proud to be part of the international project C-Sequ alongside other food companies, working to develop an internationally recognised and globally adopted carbon sequestration calculation method to be used in Carbon Footprint assessments at farm level. **While current estimates suggest carbon sequestration could offset agriculture emissions by as much as 10%,** Arla will not incorporate estimates on this into carbon data until a science based and ratified model exists, that has been trialled and tested by farmers and approved by the International Dairy Federation.

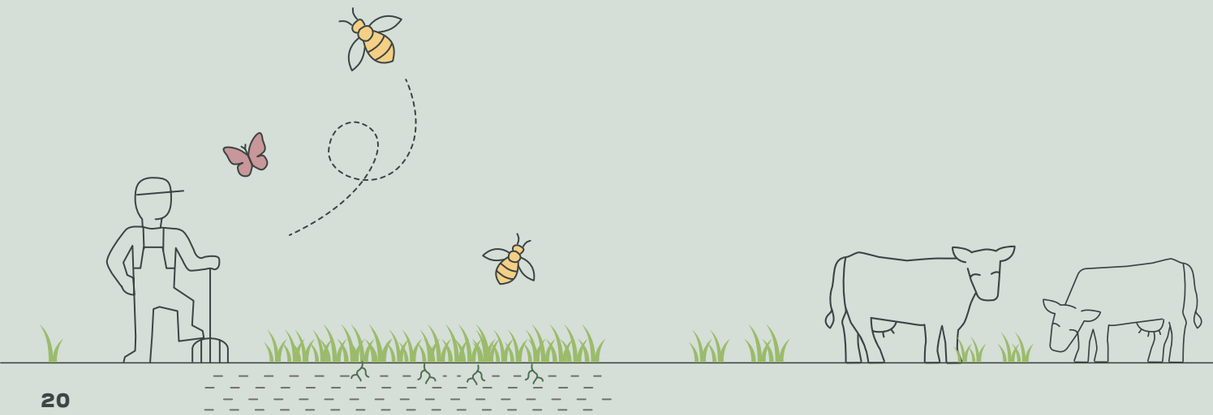
In addition to creating a science-approved measurement, Arla is also trialling methods to increase the carbon captured in our soils. One such trial, taking place through the Arla UK 360 programme, is seeking to determine how much carbon can be sequestered through different leys, or plants being mixed within the grass seeds. By testing soil and vegetation samples on farm, we hope to identify practices which further increase the amount of carbon our farms take out of the atmosphere and store in their soils.

Biodiversity: Bringing wildlife back

Every Arla farm takes action to support biodiversity. It's so important to Arla famers, they've made it part of Arlagarden, Arla's farming standards programme that every Arla farmer has to comply with to be part of the cooperative. But with 'biodiversity' a small term for a broad range of actions, it's hard to quantify the positive impact farmers' efforts have in this area.

Historically, biodiversity has lost out when it comes to food production. After World War Two, the UK relied on farmers to produce as much food as possible, in the most efficient way and at the cheapest price possible. That meant farmers used every scrap of land they could to produce food for the country.

But over the past decade or so, that has been changing on Arla farms. Farmers have started regenerating wildlife habitats, from wildflower plots for pollinators to hedgerow homes for reptiles, nesting boxes for owls and new ponds for frogs, toads and newts. But this is a huge learning curve for farmers and collaboration with scientists, environmentalists and experts is key to optimising their land and farming practices in a way that benefits the soil, the wildlife and the farm.



To help, UK farmers have access to an e-planner tool created by the Centre for Ecology and Hydrology. The tool is able to analyse satellite imagery and environmental data-sets, assessing the suitability of unproductive or hard-to-farm areas of land and suggesting one of four environmental options for the area: Planting flower-rich pollinator habitats; creating woodland; protecting water resources from pollution; and sowing winter bird food.

Arla is delighted that biodiversity is starting to get the attention it needs and that a growing number of experts in this area are increasingly working with farmers to help improve their knowledge. Through the project pollinator trial as part of the Arla UK 360 programme, **farmers saw a notable difference in bees, birds, insects and wildlife on farms,** and are now on a mission to spread this further through Arla's Bee Road campaign, to get pollinator bees the help they deserve.

You can **find out more here** and join our farmers in creating the Bee Road .

Our global responsibility

The true importance of sustainable foods is highlighted by the challenges of the developing world.
The need for food with high nutritious values which best sustain human life is evident, and it's important to recognise that with developing countries emitting a significant 63% of current carbon emissions[7], we must also play a part in supporting these countries.

What else is Arla doing?

As a global co-operative with over 9,000 farmer owners, **Arla is actively sharing the learnings of its European farmers with farmers in developing countries** which tend to have far greater emissions per kg milk from the production of dairy.

Most importantly, we are sharing the knowledge to produce dairy in the most efficient, balanced and sustainable way possible. Examples of this include Arla's support for the DK Chinese Technology centre where we share knowledge from our farmer owners on sustainable dairy farming practice and in Indonesia where we are participating in a project to help develop organic dairy farming practices.

Most recently, Arla has announced plans to build a dairy farm in Nigeria to support local production through hands on training as to what efficient dairy farming looks like. This is the latest step in our investment in Nigeria where we have already partnered with the Kaduna State government to offer up to 1,000 nomadic farmers permanent farmlands and the facilities to collect and process milk for the local market.

Find out more about our **Milky Way Project** here

A SCIENCE BASED APPROACH

Arla's Climate Check tool is based on ISO (14044) standards for life cycle assessment and follows the International Dairy Federation (IDF) guidelines on Carbon Footprint methodology, while emissions from animals, manure and soils are based on IPCC (Intergovernmental Panel on Climate Change).

It is developed in collaboration with 2.0-LCA consultants and thoroughly documented at www.lca-net.com. The tool will continuously be aligned with new developments in climate science as well as new developments in farming practices.

More information can be found at: https://www.arla.com/sustainability/sustainable-dairy-farming/how-we-measure-dairy-farmings-carbon-footprint#what-methodology-has-arla-used-to-develop-its-climate-check-tool

SOURCES AND REFERENCES

1 According to AHDB's recent milk purchaser survey the number of UK milk producers at the start of April had fallen to an estimated 8040 meaning Arla farmers now account for 28% of UK dairy farmers

2 For more information on our Global data visit: www.arla.com/sustainability/sustainable-dairy-farming/how-arla-farmers-reduce-dairys-carbon-footprint/

3 Our main objective for our Climate Checks is not to compare or compete on CO_2e levels against other dairy companies or farms outside Arla. Our objective has been to create the best tool to support our farmer owners in reducing their emissions further in the most effective way. This is why we have gone quite far in designing a tool that ensures accurate calculations for our specific regional parameters. However, that also means that the exact results from Arla's Climate Checks are not suitable for one to one comparisons with results generated by other calculation models.

4 FAO: http://www.fao.org/3/ca3165en/CA3165EN.pdf

5 https://www.nfuonline.com/nfu-online/sectors/dairy/mythbuster-final/

6 Bittman, S., Dedina, M., Howard C.M., Oenema, O., Sutton, M.A., (eds), 2014, Options for Ammonia Mitigation: Guidance from the UNECE Task Force on Reactive Nitrogen, Centre for Ecology and Hydrology, Edinburgh, UK

7 https://www.cgdev.org/media/developing-countries-are-responsible-63-percent-current-carbon-emissions

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