



— *Sustainable* —
DEVELOPMENT REPORT 2017



Heart disease, Type 2 Diabetes
and obesity globally endemic



Quorn Mince 90% less saturated fat
than a meat spaghetti bolognese

Global demand for meat
unsustainable and rising



Quorn more sustainable
than meat

Livestock 14% of
global GHG emissions



Quorn Mince over 90% lower
GHG emissions than beef

Serving sustainability worldwide

In October 2015, Monde Nissin purchased the Quorn Foods business. I am incredibly proud of this. The vision of Monde Nissin is to build a business respectful of our planet as well as contributing to improved public health and food security. Quorn will play a big part in this journey. We want to increase availability of Quorn products around the world, investing in further improving their outstanding sustainable qualities.

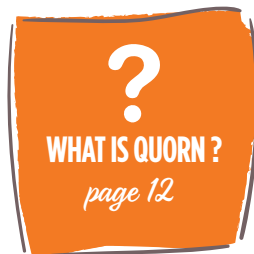
We are confident that by making meat reduction easier for consumers, there will be a continual shift toward healthier options especially in countries where consumption levels are unsustainable. In essence, we're passionate about bringing leadership and commitment to the sustainable food community.

Henry Soesanto, CEO Monde Nissin Corporation



A Vision for Sustainable Nutrition

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FOREWORD



Kevin Brennan, Chief Executive

BUILDING A SUSTAINABLE FOOD FUTURE

It is possible that 2016 will be remembered as the year that the world woke up to the sustainability issues of current meat production and future meat demand.

Governments are starting to act: Both China and the Netherlands have issued policies seeking a dramatic reduction in meat consumption by their populations. Companies are being challenged to respond by investor groups such as the Farm Animal Investment Risk & Return Initiative (FAIRR) and some like Tyson Foods, the largest beef producer in the US, have already acted.

Every week, celebrities endorse the vital need to consider what we eat in the context of combating climate change - from Arnold Schwarzenegger going vegan to Leonardo Di Caprio's thought-provoking 'Before the Flood' documentary film. None other than former US President Barack Obama is raising awareness of the links between diet and climate change and the need to cut back on meat eating.

I suspect 2017/2018 will see this trend continue and consumer behaviour change.

“The world's over reliance on factory-farmed livestock to feed the growing global demand for protein is a recipe for a financial, social and environmental crisis.”

Jeremy Coller

Founder - FAIRR initiative
Chief investment officer - private equity company,
Coller Capital.

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Our consumer research shows that up to 40% of meat eaters are looking to reduce their meat consumption. Increasingly we hear consumers referencing sustainability as a driver of this. Companies, schools and restaurants are continually asking us for help in replacing meat on their menus.

It makes us incredibly proud at Quorn to play a part in addressing this growing concern. Consumers eating Quorn instead of meat will be healthier and have made a very positive move for the planet – something which is very empowering in a world of increasing uncertainty.



Quorn Foods is the first global meat-alternative brand to achieve third-party certification of its carbon footprint figures.

In 'The Future of Food' review (pages 6-11) we highlight three global issues:

1. An unsustainable increase in demand for meat as populations grow in number and wealth.
2. Significant environmental impacts from the production of meat – at least 14% of Greenhouse Gas (GHG) emissions coming from livestock¹
3. Major health issues associated with over consumption of meat – heart disease, Type 2 Diabetes and obesity are now of serious concern in most developed economies.

This report provides a reminder of these issues and how Quorn can play a part in resolving the problems. In addition to the clear environmental benefits compared with animal-based protein, we also continue to seek to improve the sustainability of what we do. 2016 saw us invest in many initiatives which are highlighted in the report and we are continuing to do so in 2017.

I hope you share our concern for these issues and can see the role Quorn is playing in resolving them.

Kevin Brennan, Chief Executive

Quorn Foods Ltd. June 2017



THE FUTURE
OF FOOD

SHIFTING THE BALANCE AWAY FROM MEAT

The way we currently eat is unsustainable². We face significant challenges because of this – not least obesity, lifestyle-related ill health, rising food prices, climate change, waste and damaged or destroyed ecosystems.

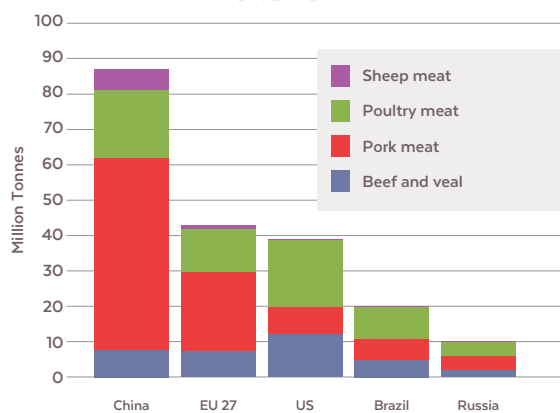
Many organisations have made good progress in addressing the question of what does a more sustainable diet look like? (Eating Better Alliance 2017, United Nations FAO 2010, World Wildlife Fund 2017) Consumption-side changes are vital for a fairer, more secure and less damaging food system. One of the widely agreed principles is a reduction in the amount of red, white and processed meats we are eating. A ‘less but better’ approach to meat eating³.

1. Unsustainable demand

By 2050 world population is set to increase from the current 7.3 billion to over 9 billion⁴. Nearly all of this growth will occur in developing countries. Combining these predictions with rapid urbanisation and rising affluence will mean that food production will need to rise by an estimated 70% from 2006, with production in developing countries needing to almost double⁵.

Figure 1

The largest meat consumers, 2016

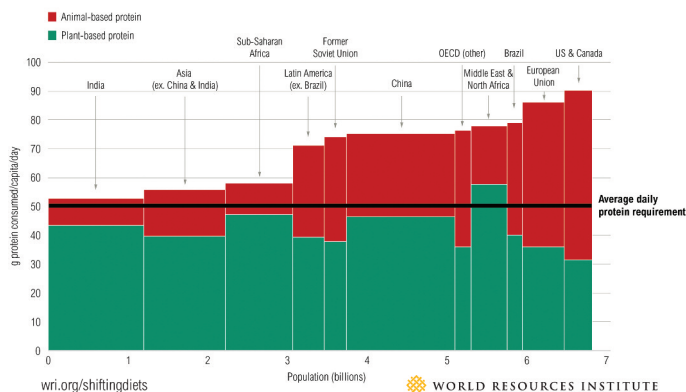


Source: OECD/FAO (2016), OECD-FAO Agricultural Outlook 2016–2025, OECD Publishing, Paris.

Demand for animal protein is growing. Global consumption of meat is forecast to increase 76% on recent levels by mid-century⁶. In the developing world a ‘protein transition’ is occurring, whereby as incomes rise, consumption of meat is increasing, whilst in the developed world per capita demand for meat is thought to have reached a plateau – but at excessive levels⁶. The Royal Institute of International Affairs (2015) states that among industrialised countries, the average person consumes around twice as much as experts deem healthy and in the United States, the multiple is nearly three times.

Figure 2

Protein overconsumption and animal vs plant-based protein imbalance



wri.org/shiftingdiets

WORLD RESOURCES INSTITUTE

Figure 3

Animal-based foods are more resource-intensive than plant-based foods

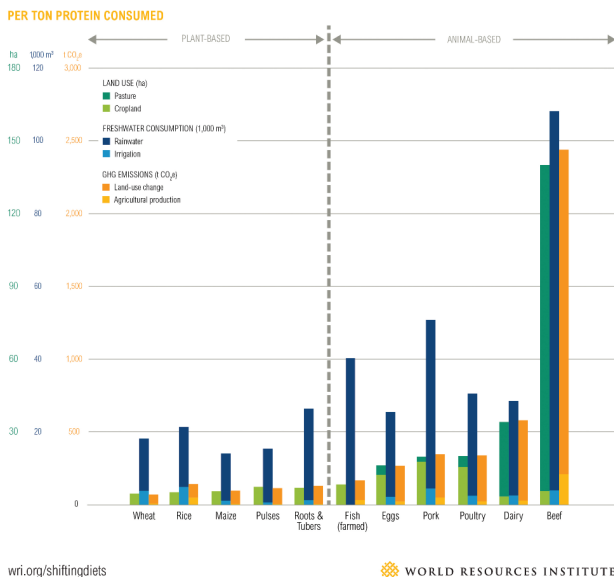


Figure 2 shows that the share of animal-based protein is growing in people's diets relative to that of plant-based foods. The World Resources Institute (WRI) advocate for a reduction in overconsumption of protein, particularly in wealthy regions, by reducing animal-based foods as a proportion of the diet⁷.

2. The environmental impact of meat

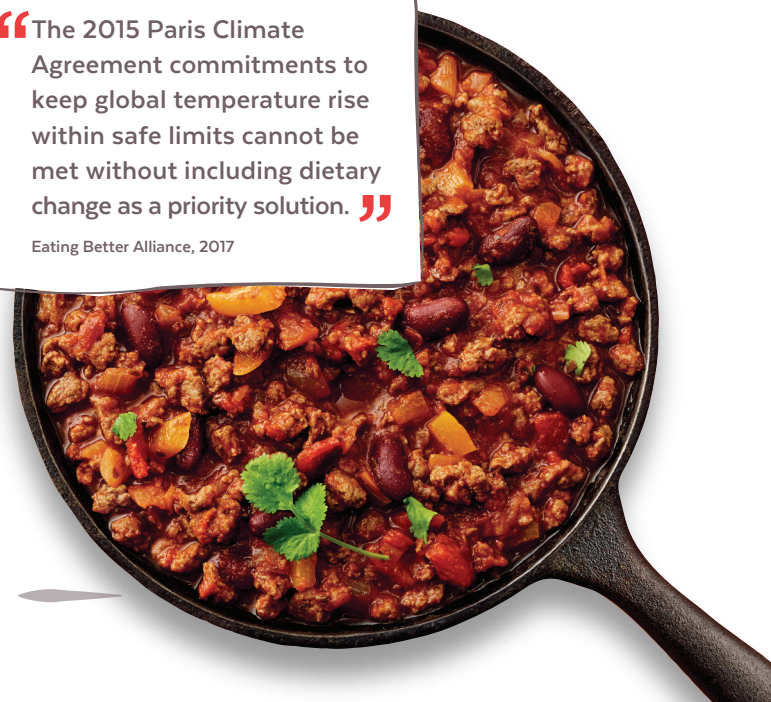
Animal-based foods are typically more resource-intensive and environmentally impactful to produce than plant-based foods (see Figure 3). The current scale of livestock production represents an inefficient use of scarce land and water and is a principal driver of deforestation, habitat destruction and species loss⁶. Therefore the trends in meat consumption mentioned previously are even more of a concern.

Of all environmental issues, climate change is undoubtedly the biggest threat facing our global population. Numerous reports have detailed the significant contribution of meat and dairy to global Greenhouse Gas (GHG) emissions. The livestock sector is responsible for 7.1 GtCO₂e a year of GHG emissions – just under 15 per cent of the global total and more than direct emissions from the transport sector⁸. Unsustainable demand for meat and dairy is 'incompatible with the objective of avoiding dangerous climate change'⁶.

Shifting global demand for meat and dairy produce should surely be central to achieving climate goals, however the role of food and diets is rarely discussed or addressed. Potential climate change mitigation efforts would need to include both production- and consumption-based solutions. Moderating meat and dairy intake is key for a more sustainable diet and has the potential to ensure a fair and secure livelihood for farmers and producers, more ethical and humane farming methods and better health outcomes.

“The 2015 Paris Climate Agreement commitments to keep global temperature rise within safe limits cannot be met without including dietary change as a priority solution.”

Eating Better Alliance, 2017





THE FUTURE OF FOOD

“Food is both behind many environmental and social problems and a key part of the solutions. The current food system is the primary cause of biodiversity loss, water use and a significant driver of climate change. The system has resulted in unhealthy diets, obesity, over consumption of meat, especially chicken, all from a shrinking gene pool. A shift to a sustainable diet will not only help our health and preserve diversity, it is also tasty, varied, affordable and a traditional way of eating. The future of food needs to be grounded in a sustainable diet which leads to a sustainable food system.”

Duncan Williamson

Food Policy Manager – World Wildlife Fund

Our appetite for more and cheaper meat is driving a whole industry of chemicals used extensively as fertilisers and pesticides, with concerns that this is altering much of the balance of nature and biodiversity⁹. In addition, whilst some nations are working to restrict and control the use of antibiotics as growth promoters in the production of meat, their widespread use has caused many now to talk of a new era of antibiotic resistant bacteria and the return of pandemic disease in humans.

We will also need to fix problems in our global supply chains relating to food waste. The UK and USA between them waste over 55 million tonnes of food every year at a cost of over \$200m. Ironically, 10% of the greenhouse gases emitted by developed economies come from food that was never even eaten and required irrigation and processing water theoretically sufficient for the domestic use of every person on the planet¹⁰.

With intensive livestock production and extreme pressure on supply chain costs comes growing concerns over animal welfare powerfully described by Compassion In World Farming in their investigations into the true costs of cheap meat.⁹ Research in 2014 into the motivations that are shifting the dietary behaviour and meat consumption of UK consumers showed concerns over animal welfare as the number one reason for considering change¹¹.



Intensive livestock production and supply chain pressures are adding to animal welfare concerns

“Reducing meat consumption, especially from industrial farming, is one of the biggest things we can do to help tackle climate change and ensure a more efficient and sustainable food system.”

Philip Lymbery

Chief Executive of Compassion in World Farming and author of 'Farmageddon: The true cost of cheap meat'.

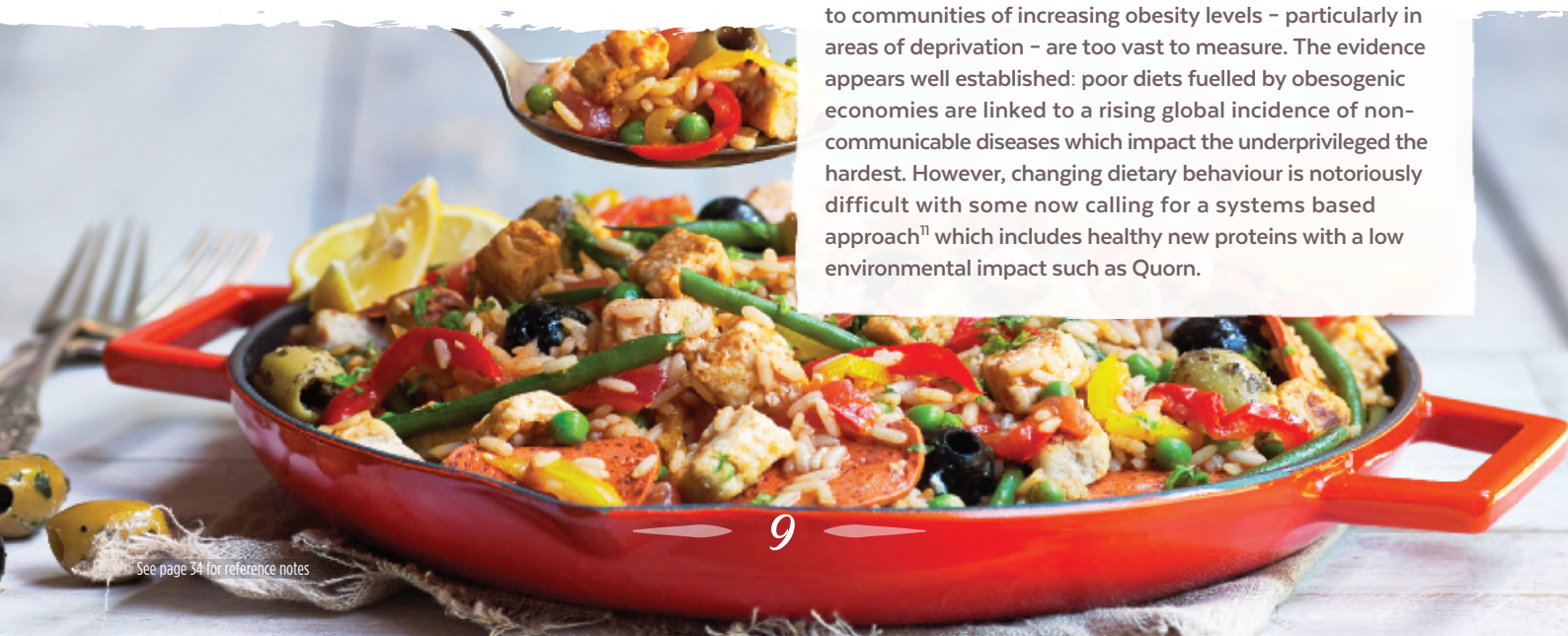
“ While meat represents an important source of high quality protein and a range of micronutrients, energy-dense diets containing excessive amounts of red, and particularly processed meat have been associated with an increased risk of a range of chronic diseases including cardiovascular disease, Type 2 Diabetes and colorectal cancer. While such concerns were largely restricted to Western industrialised countries, the rapid increase in meat consumption associated with many emerging economies is of concern. Quorn represents a low fat, high protein alternative which can substitute for such products and potentially reduce these risks. In addition, unique properties of the fibre and/or protein associated with Quorn may have specific benefits in themselves. ”

Andrew Salter BSc, PhD, RNutr
Professor of Nutritional Biochemistry,
University of Nottingham

3. Health impacts of meat consumption

Meat can play a vital role in a balanced diet. However, research is also showing clearly that excessive consumption of red and processed meat at the expense of fresh fruit, vegetables and whole grains may contribute to chronic health conditions including obesity and its associated complications of heart disease, Type 2 Diabetes, and some cancers. The global obesity epidemic in developed economies shows no signs of abating, and a recent report from the Overseas Development Institute (ODI)¹² has pointed to an alarming increase in levels of obesity in developing economies as well. Whilst in total one third of all adults are now thought to be obese or overweight¹², this number rises sharply to over half of all adults living in more developed economies. Families in these countries have greater access to surplus energy from animal products, and recent research suggests that meat availability in particular may be correlated to obesity figures globally to the same extent as sugar¹³.

The cost of this to public health is a major concern for governments worldwide. A report from McKinsey¹⁴ placed the economic costs of global obesity at over \$2trillion, surpassed only by smoking and armed conflict. Furthermore, the psychological costs to the individual and the social costs to communities of increasing obesity levels – particularly in areas of deprivation – are too vast to measure. The evidence appears well established: poor diets fuelled by obesogenic economies are linked to a rising global incidence of non-communicable diseases which impact the underprivileged the hardest. However, changing dietary behaviour is notoriously difficult with some now calling for a systems based approach¹¹ which includes healthy new proteins with a low environmental impact such as Quorn.





THE FUTURE OF FOOD

In the UK per capita, we consume around 500 meals containing meat every year¹⁵. This is at an unprecedented level and is unlikely to support a healthy diet. In fact, research at the University of Southern California¹⁶ has shown high levels of consumption of animal protein to be associated with a fourfold increase in the risk of cancer. In the UK the NHS now recommends a reduction in the consumption of red meat from 90g to a maximum of 70g per day in order to reduce the risk of bowel cancer¹⁷. Modelling by researchers at Oxford University has shown that eating meat no more than three times a week and replacing with plant based foods would prevent 45,000 early deaths a year and save the NHS £1.2bn¹¹.

We believe that for each of the 3 issues highlighted we can play a significant part in the solution.



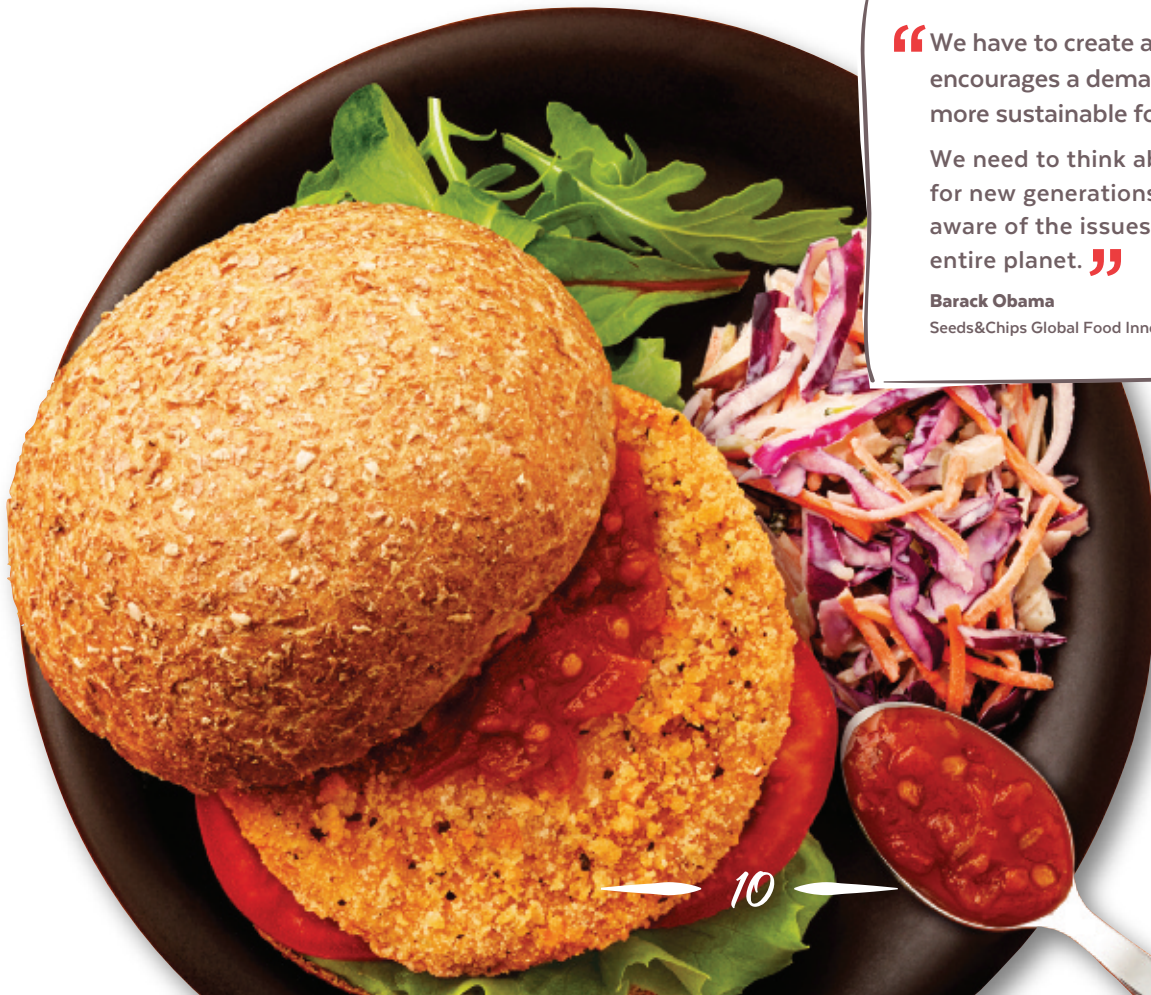
**UK estimate: 500 meals
a year each are eaten
containing meat**

“ We have to create a food culture that encourages a demand for healthier, more sustainable food.

We need to think about the future for new generations and make them aware of the issues that concern the entire planet. **”**

Barack Obama

Seeds&Chips Global Food Innovation Summit, May 2017





“Strong evidence now exists of the need to shift diets towards reduced levels of meat-eating among high consuming countries like the UK to help prevent dangerous climate change, improve health and help feed the world more fairly and humanely. The challenge now is to create the cultural and system changes that will make it easy for people to eat healthily and sustainably. Quorn is part of the solution.”

Sue Dibb

Coordinator - Eating Better: for a fair green healthy future



WHAT IS QUORN?



J. Arthur Rank image by Walter Sanders/The LIFE Picture Collection/Getty Images

IT STARTED WITH AN IDEA

Our origins go back to the 1960s, a period when there were genuine concerns about our ability to feed the world. As a response to this, our founder, Lord Rank set up a project to find a new source of protein. This was deemed by many to be the search for the first new food since the potato.

The aim was to find a micro-organism that could easily convert plentiful carbohydrates into scarcer and more nutritionally valuable proteins but without the use of animals as the method of conversion. Many years of R&D and over £100m investment identified a tiny member of the fungi family that could be converted into a protein. This led to the production of Mycoprotein™, (Greek for Fungus protein) - the unique ingredient that makes Quorn products so special.

We start with a natural nutritious fungus that grows in the soil. We then use fermentation - a technique very similar to the way beer or yoghurt are produced - which creates the perfect conditions to convert carbohydrate into protein. The result is Mycoprotein. What is amazing about this protein is its ability to replicate the taste and textural experience of eating meat. It easily takes on flavour and its lack of aftertaste means it can deliver the taste of meat and meat dishes brilliantly. Plus the health credentials of Mycoprotein are impressive - it is high in protein, high in fibre, low in saturated fat, and contains no cholesterol.

“Quorn is almost unique as a foodstuff. It is probably the only successful example of a technological exploitation of a naturally occurring new protein source in order to create a new food and the future will need more of this ingenuity to meet the challenges of food security.”

Dr Phil Cox

Head of Bio-Food Engineering Group,
University of Birmingham

The result is a £250m global brand of great tasting foods, Quorn™, which gives you the freedom to enjoy loads of delicious meals that are good for you, your family, and the planet.

Quorn has a vision to make the world's diets healthier and more sustainable by helping you create great tasting meals. We're able to do this because we take an innovative approach to producing protein.



Mycoprotein is a tiny member of the fungi family and is at the heart of all Quorn foods. Uniquely it replicates the textural as well as flavour experience of eating meat.

Sustainable Nutrition

2017 sees the biggest relaunch of the Quorn brand seen for many years. You will see new packaging, TV adverts, websites and a fresh approach to New Product Development (NPD).

We want to inspire people with delicious and irresistible recipes, packed full of flavour and bursting with new taste experiences from around the world. We will be showcasing the versatility of meals that can be created with our huge range of Quorn products. We also want to do this by producing food that's better for you and better for the planet.

“As consumers we are paying increasing attention to the types of food we buy and consume. Dietary advice, global warming and potential future global food shortages are influencing the choices we make. Our research at Newcastle Business School is showing that a low fat content and a low carbon footprint are important food attributes that consumers value and highlights how Quorn can play an important role as consumers change their behaviour and eat healthier, more sustainable and environmentally friendly food.”

Prof. Fraser McLeay

Professor of Strategic Marketing Management
Newcastle Business School



Quorn is in the Top 10 biggest UK Frozen and Online brands – bigger than Ben & Jerry's, Goodfellas & Häagen-Dazs

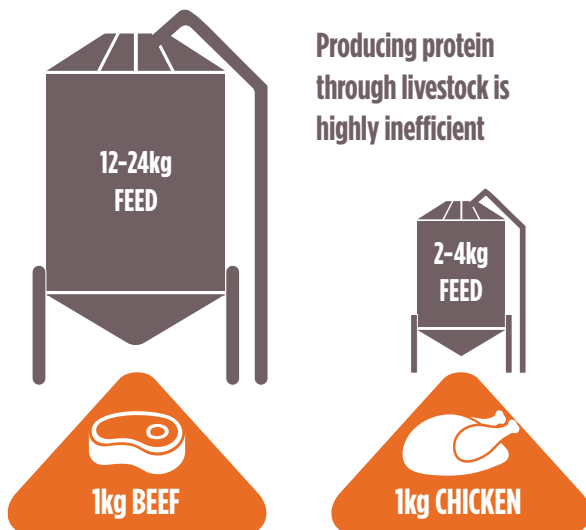


THE BENEFITS OF QUORN

LAND AND FOOD SECURITY

Quorn Foods provide an efficient and sustainable way of producing a healthier protein with a lower environmental impact.

The production of meat is inherently inefficient – with huge amounts of grain and crops being used to feed livestock when they could be fed directly to humans. 90% of all soybean meal is used in animal feed with analysts estimating that over 40% of global crops are used in this way, representing a highly inefficient use of this food and the land required to grow it.^{5,18}



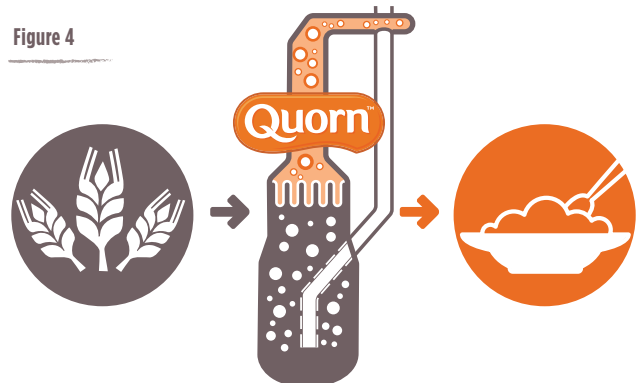
A number of studies have shown that between 12-24kg of feed are required to produce 1kg of edible beef¹⁹. Poultry has a higher conversion efficiency but typically requires 2 to 4kg²⁰ and in both cases more protein is fed to the animal than is actually produced.

FACT: To make 1kg of Quorn requires less than 2kg of wheat



With Mycoprotein we simply take the carbohydrate from the grain and convert it to protein – without the need for animals (Figure 4). In fact, because the original grain protein remains available, our method actually increases the overall protein balance (Figure 5).

Figure 4



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Livestock is the world's largest user of land resources - with grazing land and cropland dedicated to the production of feed representing almost 80% of all agricultural land²¹. The growing demand for meat means that more efficient solutions are needed as land becomes scarcer²². The simple elegance of Quorn Foods' production lies not only in its ability to create protein really efficiently but also in its ability to deliver a taste and texture that people enjoy, making it easier to moderate and reduce meat consumption.

Quorn mince uses less than 1/8th of the amount of land needed for beef mince



Quorn



x 20,000

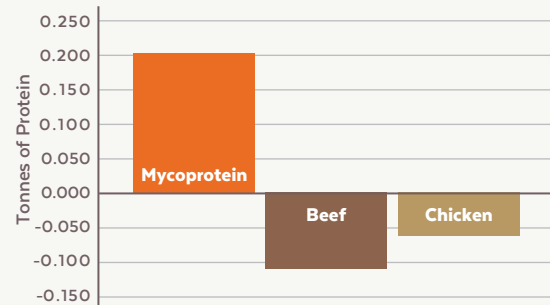


x 1,800

If you cooked with Quorn mince instead of beef mince once a week for a year you'd save enough energy to boil approx. 20,000 kettles... the equivalent to around 1,800 cups of tea EACH WEEK!

Figure 5

Protein Yield per tonne of wheat



“We need different ways of producing food to meet the demands of a world population predicted to rise to over 9 billion by 2050. Protein from fungi, such as Mycoprotein, is a major step in the right direction.”

Prof. Lynne Boddy
Cardiff School of Biosciences,
Cardiff University



THE BENEFITS OF QUORN



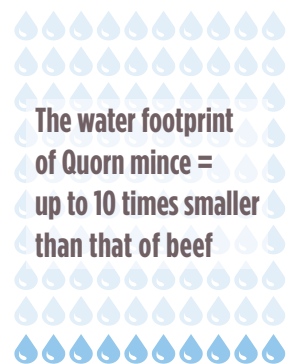
“A global reduction in meat consumption could bring a quarter of the emissions reductions needed to meet the two-degree target at which dangerous climate change can be avoided.”

Wellesley, 2015

Water Footprint

Water is a scarce resource that will come under increasing pressure as the impacts of climate change continue to be realised. 30% of the water footprint of humanity is related to the production of animal products²³. The water demand of the livestock supply chain reveals that it is the feed requirements of the animal that contributes the greatest demand for water. This brings added significance to the importance of the conversion of crops to edible protein (see page 14). As both populations and demand for meat grows, then pressure on water resources will inevitably increase.

Quorn has the potential to play an important role by providing protein that is more efficient in its use of limited water resources. Available data reveals that one kilogram of beef requires between 15,000 – 20,000 litres of water to produce²⁴, whilst the equivalent figure for Quorn Mince, for example, would be a fraction of that – at just under 2,000 litres per kilogram²⁵.



The water footprint
of Quorn mince =
up to 10 times smaller
than that of beef



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Greenhouse Gas emissions

Food production is a major contributor to GHG emissions and thus climate change. Livestock specifically is estimated to contribute over 14% of emissions¹ - a greater share than global transport. Over the last six years we have worked to understand the GHG impacts of Mycoprotein, Quorn products and the main animal-based comparators, to provide context. There is extensive data around animal-based proteins, especially red meat, yet inevitably data will vary depending on assumptions. We have worked for many years now with the Carbon Trust to reach a balanced view of extensive peer review publications, NGOs and food manufacturer reports.

Comparative carbon emissions*

*Comparison figures based on edible meat.
Ref: Carbon Trust, 2014



The results are remarkable. They show that Quorn products can have a carbon footprint up to thirteen times lower than beef, and up to 4 times lower than chicken²⁵.



By converting dishes from meat to Quorn ingredients such as Mince and Pieces, consumers can significantly reduce their carbon emissions.

At Quorn Foods, we believe that only multiple solutions and radical thinking will help us address these substantial challenges. The evidence suggests that we cannot rely solely on the intensification of existing agriculture and food production to provide solutions to the challenge. We believe that Quorn foods can deliver an important new dietary tool that will help to address our future needs for a tasty, healthier protein source with a lower environmental impact.

Only multiple solutions and radical thinking will help us address the 9 billion challenge





HEALTHY, DELICIOUS & SUSTAINABLE MENUS

The eating out of home market is estimated to be worth £47.6bn annually²⁶ and 28p in every food pound is spent on food out of home²⁷.

Foodservice provides the perfect platform for Quorn to engage with consumers everywhere and every day; in schools, restaurants, hospitals, the workplace and at sport and leisure facilities.

And, with more than 70% of adults wanting to eat more healthily out of home²⁸ and a third of UK consumers claiming to be reducing their meat consumption – there has never been a greater opportunity for the brand in Foodservice.

We work closely with our customers to give consumers tasty meat free meals that are better for them and the planet and we're passionate about educating and engaging with the next generation to build Quorn customers of the future.



Sampling healthy Quorn dishes during
NHS Sustainability Day, 2016



Education

Did you know that nearly 1 in 4 children across England, Wales and Scotland start primary school either obese or overweight?²⁹

We take our responsibility in education really seriously because we have the power to make a real difference and set a positive trend for years to come.

From local authority and academy-status primary and secondary schools to independent schools, colleges and universities – we work with cooks and caterers right through to nutritionists to help provide nutritious, tasty and creative dishes to children and young adults. We do this through our direct relationships and our school meals recipe books that are distributed to inspire menu planning for seasonal menus.

We have even worked with students at Weston-super-Mare college on competitions to create Quorn dishes as part of their Level 3 & 4 NVQ and this year we will launch a study app for Technical Colleges highlighting protein diversity and explaining the role of plant proteins.

“Our team of home economists deliver demonstrations and workshops with children as young as four, right through to those studying food and hospitality at colleges or university. There’s an incredible enthusiasm and hunger from pupils, students and those responsible for feeding them and the engagement levels around healthy eating makes it so rewarding.”

Kate Snow, Quorn Home Economist

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Healthcare

Replacing meat four times a week would prevent 45,000 early deaths a year in the UK and save the NHS nearly £1.2bn a year³⁰.

Working alongside NHS Trusts and supporting industry-wide campaigns, we have started to make a difference.

In only two hours across the NHS hospitals that supported the 2016 Quorn 'Sausage Swap' and 'Sustainable Dish of the Day' (where pork sausages or beef mince dishes were replaced with Quorn) we are estimated to have saved approximately



348,000 calories



14kg of saturated fat



35,000 baths of water



4,000kg of GHG emissions



as well as providing an additional 9kg of dietary fibre!

Given these impressive benefits, the majority of staff and visitors we speak to understand why the NHS should make changes for this to become a permanent swap on their menus.

And, in a 2016 month-long Swap Challenge with Broomfield Hospital (where they swapped beef mince for Quorn mince on their staff/visitor restaurant menus) – 83% of respondents said they would make the change permanent³¹.

“Driving a cultural change of menu choice in healthcare catering is vital if we are to raise initiatives around sustainability. Quorn has worked tirelessly with hospital caterers to help provide food options that promote staff and visitor wellbeing as well as balanced preferences for our daily patient menu.”

Philip Shelley, Chair of the Hospital Caterer's Association (HCA).



THE CHANGING FACE OF FOODSERVICE

Workplace

On a daily basis, our Foodservice partners have the responsibility for feeding both the millions of consumers that are wanting to eat more healthily and the growing number of 'flexitarians'.

Working closely with them directly we build relationships with the chefs, food development, nutritionist and marketing teams to build on-trend, relevant menu solutions for every eating occasion that are typically lower in fat and salt and have fewer calories, yet remain big on taste.

We drive and support national campaigns such as World Meat Free Day and National Vegetarian Week as well as customer-specific campaigns around health, wellbeing and sustainability. We provide resources, deliver cookery demonstrations and offer ongoing chef support, to help educate their consumers and internal teams on the benefits to them personally and the planet of adopting a healthier diet and lifestyle – it really is as simple as that.

“At Bidfood, it is our job to react to the demographical changes in ethical and sustainable ways. Human beings are living longer than ever before and the world population is increasing rapidly, which is becoming an ever increasing and important challenge within the resources of our world. Quorn provides us with a long term solution for healthy and sustainable food and has demonstrated significant environmental savings across the Bidfood supply chain.”

Gokan Ozkan

Bidfood Category manager – Meal Occasions
<http://www.plate2planet.co.uk/>



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Beyond the Plate

Our work as a Foodservice team goes much further beyond the deliciously tasty, nutritious meals that we help our customers to create as part of their menus.

We are proud to:

- Have a voice on the Fit and Healthy Childhood All Party Parliamentary Group (APPG)
- Be members of the All Party Parliamentary Food & Health Forum
- Be a Meals & More partner, supporting more than 65 child holiday hunger projects across the country
- Headline sponsor Compass Group UK & Ireland's 'Women in Food' ambassador programme
- Support The Creative Kitchen in Dorset – an educational community kitchen facility for children
- Be instrumental in the development of the award-winning menu at Forest Green Rovers and Ecotricity Schools Outreach, which achieved Vegan Society status in 2017, the first in the world.

All of which helps to position us in the Foodservice industry as a thought leader and a long term, sustainable supplier partner – helping to educate the next generation of Quorn consumer and their families whilst supporting a more sustainable planet.



Women in Food (WIF), a Compass initiative to attract more females into Catering, visited Westminster Kingsway College this spring, hosting a lunchtime sampling of delicious Quorn recipes and delivering a student lecture.





RESEARCH AND DEVELOPMENT

A LONG-TERM VIEW

At Quorn we have exciting Research and Development (R&D) programmes spanning areas to help improve knowledge and advance our understanding about how we can help shift the balance away from meat in favour of plant based foods.

Our R&D is focused across three main areas:

- a. Health and Wellbeing
- b. Sustainable Manufacturing
- c. Behaviour Change

Health and Wellbeing

An excellent and high quality protein: The benefits of diets rich in Mycoprotein have been published over many years³². Today, we are building on this body of knowledge and have a number of exciting collaborations with leading academics and universities focusing on both our protein and our dietary fibre. This is because many plant proteins, when viewed in isolation, can be deficient in some essential amino acids, so we wanted to find out more about Mycoprotein. We now know it contains all the essential amino acids³³ and measures of protein quality based on this place it higher than some animal proteins. More importantly, early results from current clinical studies show that Mycoprotein delivers good availability of these amino acids to the body with an important anabolic response (muscle building) that appears similar to milk protein. More research is now underway to build on these initial observations. We feel that protein quality, and not just quantity, will become increasingly important and that's why we need to understand how our bodies digest and assimilate the proteins in Mycoprotein. This is because good quality proteins have important future roles within healthy ageing (sarcopenia) as well as providing new products for healthy lifestyles and sports nutrition. We cannot simply continue to rely on animal proteins to deliver these.



“Our research at Imperial has shown interesting beneficial effects of Mycoprotein on satiety, glycaemia and insulinaemia. Whilst there is more to do to understand these effects, these results build on previously published research and position Quorn foods as an important choice in helping to address modern day diet and health related issues.”

Prof. Gary Frost

Chair in Nutrition and Dietetics,
Imperial College London

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A good source of dietary fibre: The exciting thing about Mycoprotein is that it is a source of not only protein, but fibre too. Dieticians recommend we increase the amount of fibre consumed in our diets, however existing recommended levels are already difficult to achieve³⁴. New fibre-rich foods may therefore be important in helping achieve this goal. Recent research has shown the dietary fibre in Mycoprotein is digested in the gut to produce short chain fatty acids (SCFAs) which are known to have several beneficial effects³⁵. We are busy with additional research in this area to understand the significance of SCFA production as it may explain recently published observations³⁶ where diets rich in Mycoprotein were shown to help modulate the appetite and insulin response.

Biology is life: We have exciting research programmes to understand how we can improve the way we grow Mycoprotein, from reducing our own environmental impact to improving the quality of the meat-like texture that Quorn foods are so famous for. Working with some of the leading universities and research organisations such as National Institute of Agricultural Botany (NIAB), we are committed to applying the skills they have developed with new bioscience and plant breeding within our own biology research



programmes. So far the work is providing important insights that will offer new approaches to placing healthy protein from fungi at the heart of our sustainable food future. We are especially interested in whether we can combine the skills of others in creating fermentable carbohydrate from waste crops (so-called second generation biofuel technology) with our know-how and so convert waste carbohydrate into protein.





Sustainable Manufacturing

Engineering focus: Our engineering teams continually strive to improve the efficiency of our manufacturing process. Success in this area also reduces our environmental impact, important in the ongoing carbon certification from the Carbon Trust. Within R&D we have a particular interest in the composition and use of our fermenter waste streams because we believe we can recover important components which can be used as food. For example, if we dry the waste stream we know we can create a new savoury ingredient, a bit like a yeast extract, that could have a role in the savoury-flavours market as a sustainable new way to create flavour³⁷. There is much more to do here, but by way of comparison it is interesting to note that in days gone by, whey from cheese factories was sprayed onto the land and was viewed as a waste stream. Food technology now allows important components such as protein and lactose to be extracted for further use, providing new revenue streams whilst improving efficiency and reducing waste³⁸. This is the sort of outcome we hope our research will uncover for our fermentation process, and with it show new ways to improve how we grow and harvest Mycoprotein.

Shelf Life and Food Waste: In the western world we waste approximately 30% of our food³⁹. Given the significant contribution that food and agriculture makes to global greenhouse gas emissions⁴⁰ this means that in a developed economy around 10% of its greenhouse gases come from food that was never even eaten⁴¹. It's why we have research programmes seeking to understand how we can extend the shelf life of our food both in the freezer and in the chiller cabinet or household refrigerator. This research focuses on two key considerations: Firstly to assure microbiological safety at all times especially within extended chilled shelf life, and secondly to develop technologies that maintain the quality and enjoyment of our products. Disregarding either of these means food will still be wasted and the purpose of the research defeated.



New Uses: Mycoprotein is a very versatile ingredient which not only allows us to create authentic meat-like textures, but with the addition of simple technology such as homogenisation commonly used in dairy processing, we can prepare it for use in ice cream or desserts by creating really creamy textures without the need for extra fats⁴². Our research is currently exploring the versatility of Mycoprotein in the creation of new innovations within dairy-free and vegan drinks and snacks – new and creative ways to enjoy the protein and fibre contained within this sustainable ingredient.



Sustainable Development Report 2017

Behaviour Change

Understanding food psychology: Our relationship with food is complex, and for many the consumption of meat is deeply engrained, culturally, socially and economically⁴³. We are working with leading researchers in this area to understand more about this relationship and how we might change it, shifting the balance in favour of plant based foods. This approach acknowledges that for many it is more realistic to promote a 'flexitarian' approach to change, where meat-free meals are introduced once or twice a week. To contribute to

this, we have recently supported research into a systematic review of the health and wellbeing of a flexitarian diet. This research has shown important benefits and offers an evidence base for this behaviour change⁴⁴.

Our R&D Collaborations: Delivering effective R&D for sustainable growth is only possible through close collaboration and the support of various network partners including leading UK and mainland Europe universities, industry experts, research establishments, grant funding bodies, retailers and NGOs.

We work in close collaboration with various network partners to deliver effective R&D for sustainable growth.



“Addressing many of the issues we have highlighted relies on understanding the drivers of behavioural change, particularly for groups of people who could benefit most from swapping excess red and processed meat for healthier alternatives. To begin to explore and address these drivers, Quorn have partnered with psychologists at Leeds Beckett University and health promotion programme MoreLife in an Innovate UK Knowledge Transfer Partnership project. The aims are to research and develop strategies to diversify protein source intake in families affected by overweight and obesity. We are excited that the partnership will deliver critical new insights for communicating the benefits of sustainable, healthier protein sources for individuals attempting to manage their weight and improve their wellbeing.”

Isabelle Teresa Kelly

(Nutritional Behaviour Change PhD student & Project Lead)





A NEW STRATEGY - 'LIVE SUSTAINABILITY'

At Quorn Foods, we believe we have a role to play as part of the future food challenge. The environmental benefits of our products are impressive. We take seriously our responsibility to ensure we are managing our own impacts on the environment.

Our new Supply Chain Sustainability Strategy (our Quorn 'Strategy House') has three main aims:

1. Support the business vision – Quorn will be experts in delicious, healthier and sustainable alternatives to meat
2. Manage and reduce the environmental impacts of our products and operations
3. Truly 'live sustainability' at Quorn by embedding sustainable values throughout the organisation

At home with sustainability, our 'Strategy House' is built with four key pillars.



The four pillars highlight our focus and commitment to saving carbon, energy, water, natural resources and ensuring an ethical supply chain. The sun represents the United Nations Sustainable Development Goals, a source of energy and a guiding light for our ambitious sustainability journey.

We take a science-led approach to our environmental research and analyses of the entire supply chain, from 'farm to fork', in order to understand our own impacts and the challenges ahead. Our commitment is backed by our new owners, Monde Nissin who are providing vital support and direction.

Quorn Foods was the first global meat-alternative business to achieve third-party certification of its carbon footprint figures and we encourage other food brands to join us in exploring how we can all contribute to more sustainable diets for our consumers.

In 2017 we certified a reduction of more than 15% for the carbon footprint of our chilled Quorn Pieces and Mince

GREENHOUSE GASES

6.1 Product Carbon Footprinting

(Scope 1, 2 and 3)

We began to model the carbon footprints of our best-selling products and certify them independently with the Carbon Trust back in 2012. This achievement of third party verification to global standards was just the start of work to calculate our greenhouse gas emissions. We remain committed to monitoring and measuring the carbon emissions of our products, to gain insight into their sustainability attributes.

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We're proud to reveal we successfully achieved recertification of our product carbon footprints with the Carbon Trust in June 2017. We achieved an impressive reduction of over 15% for the carbon footprint of our chilled Quorn Pieces and Mince and a further 5% reduction for Mycoprotein.

You can read more about our carbon footprint facts and figures on the Sustainability section of our website. www.quorn.co.uk



Quorn Foods achieved reductions in the product carbon footprints of all certified products – with up to 15% footprint reductions!

This research remains vital in allowing us to release information about the impacts of our products and target our carbon reduction projects in the areas of highest impact throughout our supply chain. The reductions achieved were chiefly a result of the hard work and dedication of our operations teams – improving the energy and materials efficiency at our manufacturing sites.

The product carbon footprint methodology allows for careful monitoring of emissions 'hotspots' along the entire supply chain. As such, our own product carbon footprint reductions are also a result of a number of efficiencies and emissions reductions realised by our suppliers. So it is absolutely vital that we continue to engage and work in collaboration with our key suppliers and customers, as well as communicating our findings to the consumer.

Working with the Carbon Trust allows us to proudly display the Carbon Reduction Label on-pack – emphasising our third party certification achievement and exemplifying to our consumers a commitment to further carbon reductions.

“We continue to be impressed with Quorn’s ongoing commitment to sustainability, which has yet again resulted in the company delivering significant reductions in the carbon footprint of its products.

As a company makes improvements year after year it can become increasingly challenging to find new ways to keep achieving sizeable reductions, so Quorn’s team deserves to be congratulated for their dedication and for the results they have achieved.”

Hugh Jones

Managing Director, Carbon Trust Advisory Services



Raw
material

Product
manufacturing

Distribution
& retail

Consumer
use

Disposal &
recycling

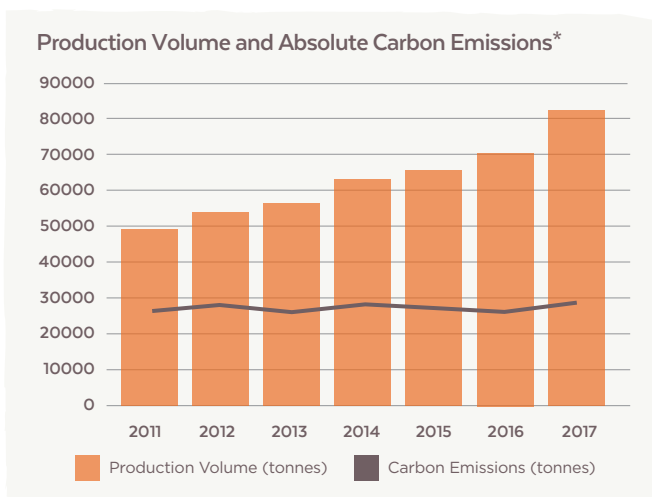
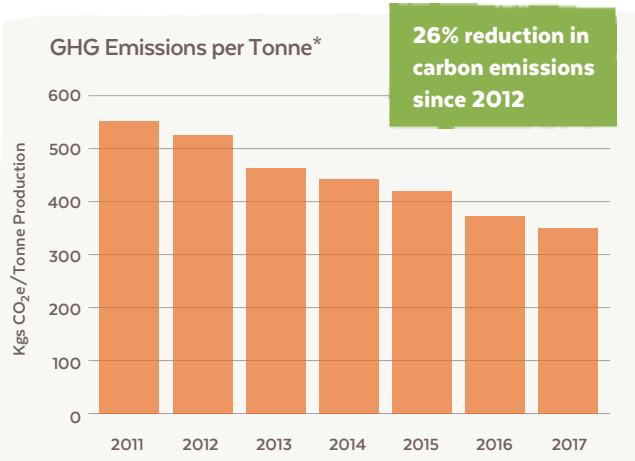


MANAGING OUR ENVIRONMENTAL PERFORMANCE

6.2 Operational Emissions

(Scope 1 and 2)

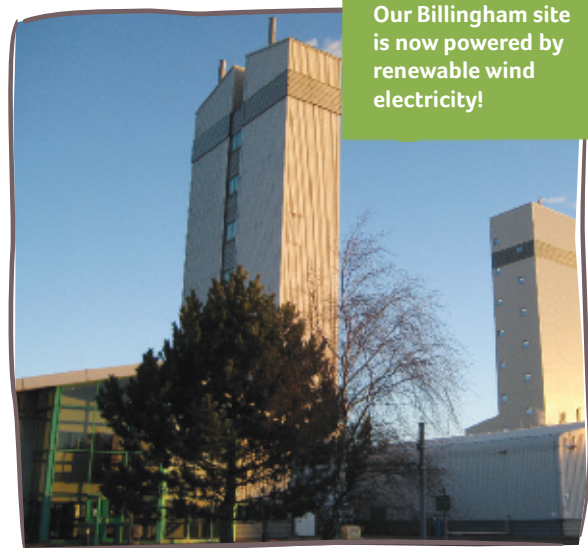
Improving our understanding of the environmental impact of our business is key to further driving down our direct GHG emissions. In 2016, we improved the carbon efficiency of our production (tonnes GHGs released per tonne of production) by 26% from a 2012 baseline. This achievement is very encouraging progress yet our business will work even harder to find energy and resource efficiency opportunities and projects.



CASE STUDY

Our Belasis site at Billingham is the only production site in the world that produces our unique ingredient, Mycoprotein.

The site commissioned a third fermenter in 2015 which adds capacity to the existing two fermenters. The new fermenter is 10% larger in volume and operates with yield and utility efficiency gains of around 5%. The demand for Mycoprotein is continuing to increase rapidly during 2017.



Our Billingham site is now powered by renewable wind electricity!

The site has started construction of its first continuous harvesting and forming production line this year. This plant is designed to produce finished Quorn products in line with increasing sales demand and is scheduled to be producing by July 2018. The plant will incorporate the latest high speed, high efficiency forming and packing equipment.

This capacity expansion also demands additional effluent treatment capacity which is being constructed in parallel.

Plans are also being developed for a further two fermenters on the site, along with another harvesting and forming line.

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Total investment on the site, over the next 7 years, is forecast to be £143m.

As a growing business, it is more important than ever for us to track our emissions performance and seek continual improvement. In line with launching our first ever strategy for supply chain sustainability across our business in 2017, we will be establishing science-based targets for our future emissions performance – enabling a longer term view of our contribution to decoupling business growth and climate change impact.



By making one simple change and choosing Quorn, you can reduce the carbon footprint of your favourite Spaghetti Bolognese or chilli dish by over 90%.

Less miles, less emissions

Our Methwold site has been working hard to maximise vehicle utilisation, avoid empty trucks and evaluate existing logistics routes to understand where efficiencies can be made.



‘Project WIP’ (Work In Progress) aimed to ensure that ‘WIP’ products – e.g. Quorn Escalope and Southern-style burgers (specifically, products that go through multiple stages of manufacture before being packaged in a carton) would no longer be moved to and from off-site storage but would instead remain on-site until finished. This avoids unnecessary road movements – estimated to achieve a saving of nearly 5 trucks per week, avoiding 48,500 road miles in a year – the equivalent of driving twice round the world!

Our Belasis site was the first in our business to achieve certification of their Environmental Management System to the ISO 14001 international standard in April 2016. We are working to extend this to group-level and our other manufacturing sites will achieve certification in 2017.

ISO 14001 helps organisations to reduce their environmental impact while growing their business – something that will be key as our sites continue to grow and expand.





MANAGING OUR ENVIRONMENTAL PERFORMANCE

6.3 Water

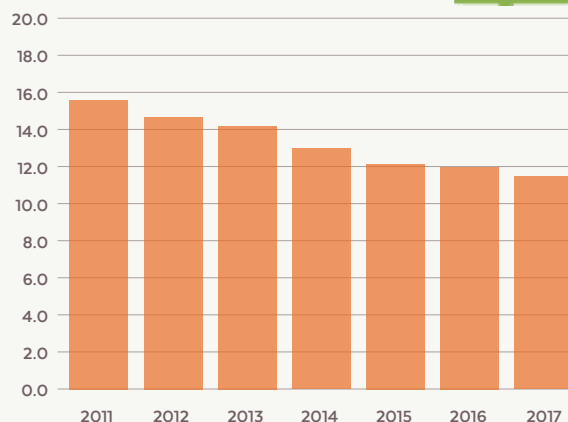
We continue to drive down our water usage across the business. We have reduced our relative water usage (m^3 water used per tonne of product) across our 3 main manufacturing sites by 17% at the end of 2016 against a 2012 baseline. The vital issue of water stewardship, with particular attention given to our Methwold site in East Anglia, where water scarcity is a very real threat, and also across our supply chain requires active and ongoing collaboration. We will be working with WRAP and WWF in 2017 on water risk mapping and 'hot spot' identification.

Water use and effluent management are key challenges, particularly for the fermentation technology used at our Billingham site. Our current method of liquid waste treatment is energy intensive, but we are actively researching alternative treatment and technical solutions to this situation. In addition, research collaborations with UK universities have identified a number of exciting molecules within the waste stream with important commercial applications and value. Our R&D agenda is focused on understanding more about this future potential (see page 24).



**12% reduction
in water use
since 2012**

Water Usage - m^3 per tonne of production*



* 2017 figures show actual data to end of April with forecasted figures to year end.

“We fully endorse Quorn’s drive toward sustainability and sustainable food production. Our research at the Green Chemistry Centre of Excellence and the Biorenewables Development Centre is showing the fermenter waste stream to be a rich and exciting source of natural components with significant commercial potential in both food and non food applications.”

Prof. James H Clark
Director, Green Chemistry
Centre of Excellence

Dr Avtar S Matharu
Deputy Director, Green Chemistry
Centre of Excellence

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6.4 Packaging & Waste

Reducing food waste

One third of the food we produce today is wasted⁴⁵. This is an appalling reality. As a global food manufacturer we have a part to play in ensuring we cut down waste in our factories and across our supply chain; particularly where there is food that should never even become 'waste' in the first place.

Quorn teams up with FareShare

We are very proud to announce a new partnership with UK food redistribution charity FareShare, beginning in May 2017.



FareShare works to tackle hunger and food waste by redistributing good food that would otherwise go to waste to frontline charities and community groups supporting vulnerable people. Homeless shelters, older people's lunch clubs and domestic violence refuges all benefit from the scheme which is championed by our Methwold site in Norfolk and supported by Fowler Welch, our distribution partner based in Lincolnshire. The food is in date and safe to eat, but has become surplus for simple reasons such as over-production, labelling errors or short shelf-life.

In the first delivery alone, 158 packs of Quorn and Cauldron tofu products arrived with FareShare who redistributed them to charities. These organisations transform the food into nutritious meals, which they provide alongside life-changing support.

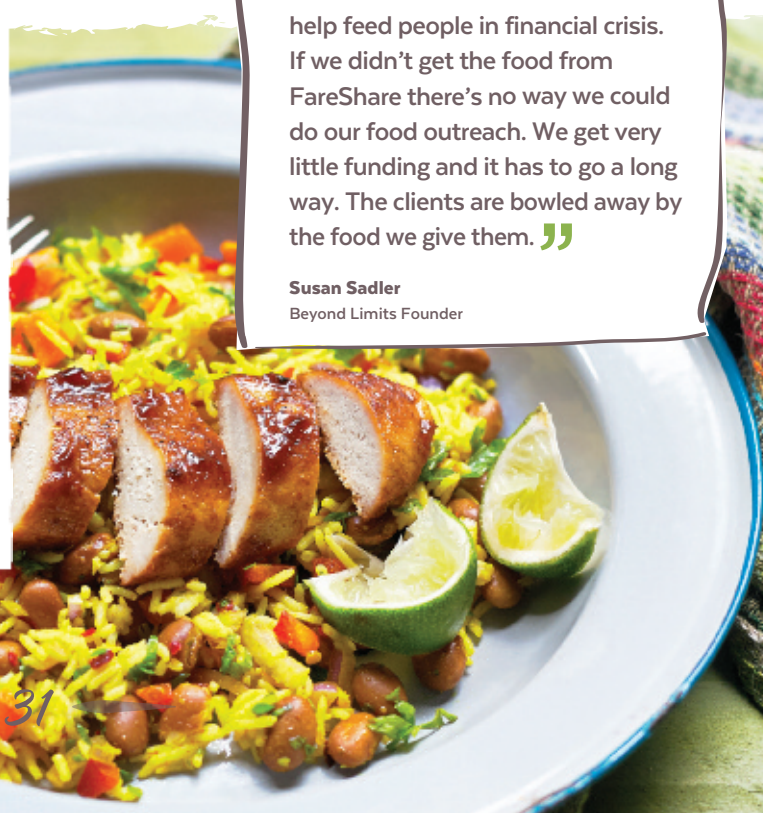
Our first two deliveries to FareShare North East have benefited 17 charities from community cafés for low income families, to homeless hostels and addiction recovery centres. These 17 charities support over 1,000 people in the North East area.



Beyond Limits volunteers with Quorn Peppered Steaks

“Thank you for supporting Beyond Limits with our bonanza dinner to help feed people in financial crisis. If we didn't get the food from FareShare there's no way we could do our food outreach. We get very little funding and it has to go a long way. The clients are bowled away by the food we give them.”

Susan Sadler
Beyond Limits Founder





MANAGING OUR ENVIRONMENTAL PERFORMANCE



Courtauld Commitment 2025 - Cutting the cost of food and drink

We continue to work closely with WRAP (Waste Resources Action Programme) – a not for profit organisation who work with

governments, businesses and communities to deliver practical solutions to improve resource efficiency.

In 2016 Quorn Foods became a signatory to Courtauld 2025 – an ambitious voluntary agreement that brings together a broad range of organisations involved in the food system to make food and drink production and consumption more sustainable. Our collective ambition is to cut the amount of resource needed to provide food and drink by one fifth over ten years.

“The Courtauld Commitment 2025 is our most ambitious agreement yet and we are delighted that Quorn has pledged their support as a signatory.

We are faced with some big challenges ahead with rising populations, climate change and dwindling resources. But tackling food waste offers a practical option to address these challenges and in doing so, will create new opportunities.

Only by working together can we hope to realise the big changes that are essential to ensuring a more prosperous future for individuals, businesses and the planet.”

Steve Creed

Director of Business Programmes – WRAP
www.wrap.org.uk/courtauld2025

For every 2 tonnes of food we eat, another tonne is wasted (WRAP, 2016)



Packaging

We continue in our commitment to optimise all of our packaging – avoiding over-packaging, reducing the gauge of our material used but still ensuring that product safety and quality remains paramount.



‘Light weighting’ of packaging is a standard requirement at product design stage. We work closely with our suppliers to establish the minimal materials possible to create a functioning pack – resulting in less material, energy use, logistics and waste throughout the supply chain.

In 2016 we also began a programme of projects to ensure that we do everything we can to make recycling our packaging easier for the end consumer.

In 2016 we:

- ✓ achieved a PP (Polypropylene) plastics reduction that resulted in over 30 tonnes of polymer being avoided
- ✓ continued to make good progress in transferring our polymer use from PP to APET plastic (APET is more easily recyclable)
- ✓ began to evaluate our use of black plastic packaging (e.g. for our chilled ingredients and sausage packaging, ready meals) further to the recent WRAP conclusion that deemed black plastic as not currently recyclable by the waste industry.

Sustainable Development Report 2017

We use 100% CSPO (certified sustainable palm oil).

We are members and active supporters of the Roundtable on Sustainable Palm Oil (RSPO), which has developed a globally recognised standard and certification scheme for sustainably produced palm oil.

6.5 Responsible Sourcing

With the launch of our new Supply Chain Sustainability Strategy, we also begin to incorporate progress being made across our supply chain in terms of responsible sourcing. There is of course much complexity to this but we recognise this is vitally important in contributing to a fairer, sustainable and more ethical future. Our consumers and customers expect us to be leading the way in areas such as animal welfare, transparency and traceability, ethical sourcing, human rights and labour standards.



We are proud to announce that Quorn and Cauldron Foods have been awarded the Good Egg Award by Compassion in World Farming. This award recognises our dedication to responsible sourcing of high welfare free range eggs.

Sustainable Palm Oil

We are a low user of palm oil – however in products where it is necessary for its unique properties, we use only certified sustainable palm oil (CSPO).

Palm oil is a hugely important commodity but can also be the source of significant environmental and social concerns regarding its production. It is now the most widely used vegetable oil on Earth⁴⁶ and as demand continues to expand the industry has a responsibility to stop illegal and irresponsible practices and ensure palm oil is produced sustainably.

In the 2016 World Wildlife Fund (WWF) Palm Oil Buyers Scorecard, only three companies out of 137 global retailers, manufacturers and foodservice companies used 100% CSPO in 2015. Our business had achieved this in 2014, so we consider ourselves to be leading the way in this incredibly important area.

The next step is to continue this progress by shifting our use of CSPO toward a fully segregated supply chain – where CSPO is kept separate from uncertified palm oil all the way from the mill where it is first pressed to the end user. In 2016 we made commendable progress by working with our suppliers to achieve an impressive result such that 97.5% of our palm oil usage was from fully segregated sources.

Availability of certified segregated palm products can be limited but as it increases, we aim to convert all usage to the segregated scheme.

SEDEX

In 2016 Quorn Foods became a member of the world's largest collaborative platform for sharing responsible sourcing data on supply chains. Sedex is a global not-for-profit membership organisation. Membership will help our business to manage both our own and our supply chain's performance around labour rights, health & safety, the environment and business ethics.

'Palm oil doesn't have to be destructive, and in fact has the potential to be a major force for sustainable development' – World Wildlife Fund, 2016





Our People

We employ almost 700 employees and have 4 sites across the UK – Belasis (Teesside); Stokesley Head Office (North Yorkshire); Methwold (Norfolk) & Manchester. Additionally we have commercial operations across 4 international locations: Chicago (US), Frankfurt (Germany), Milan (Italy) and Amsterdam (Netherlands).

We are an equal opportunity employer and are committed to working within the spirit and letter of UK employment law.

65% of our UK employees live within a twenty mile radius of our sites, injecting economic activity into the communities where we operate. We encourage community giving and raise funds for a number of charities through charity fundraisers and payroll 'give as you earn' schemes.

The Fast Moving Consumer Goods (FMCG) industry employs 1 in 7 people in the UK and to help build a workforce for the

future, we work in partnership with the IDG and Business in the Community programmes aimed at inspiring school children about the career opportunities in the FMCG industry. We employ between 9 and 12 apprentices at any one time, and offer short term work experience and around 10 longer term work placements per year to provide opportunities for school and graduate students to develop work based skills and to be potential future employees of our business. Our people have access to wellbeing training, occupational health, a cycle to work scheme and an employee assistance service

Quorn products have been assessed and approved for sale by all markets we have approached for launch including UK FSA, US FDA, Australia FSANZ, EU EFSA and Health Canada.

For further details please visit our the Sustainability section of our website. Recipes for all meal shots shown in this report can also be found at www.quorn.co.uk.

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“The food we eat and enjoy has one of the biggest roles to play towards a more healthy and sustainable future for ourselves and our families. We all need to recognise this and be empowered by it.

Our business continues to ensure that we are researching, learning, adapting and trying to do the right thing – for people, for our environment and for all of our futures. ”

Louise Needham

Environment & Sustainability Manager
Quorn Foods





Join the debate

We believe Quorn makes a positive contribution to making diets more sustainable. Our aim is to keep the conversation going and create debate. We welcome your help and ideas to make this happen.

Please email:

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