



ROOT ZERO MANIFESTO

[ROOT ZERO.CO.UK](https://rootzero.co.uk)

CONTENTS

1	FOREWORD	31-32	CONSUMER USE & DISPOSAL EMISSIONS
2	THE WHY	33-35	CONSUMER GREENHOUSE GAS EMISSION REDUCTION PATHWAY
3	ROOT ZERO: A NEW WAY OF THINKING	36	THE ROOT ZERO CLIMATE ACTION PLAN
4	CLIMATE ACTION	37	THE ROOT TO ZERO PROJECTS
5-7	WHAT'S IN ROOT ZERO'S CARBON FOOTPRINT?	37	THE ROOT ZERO BIODIVERSITY WOODLAND – AN AMAZING CARBON CAPTURE MACHINE
7-12	CLIMATE PARTNER PROJECTS	38	SEAGRASS – THE LUNGS OF THE SEA AND A CLIMATE BOOSTING WONDERPLANT
13	SCIENCE BASED TARGETS	39	PIONEERING PACKAGING
14	OUR ROOT TO ZERO GREENHOUSE GAS EMISSION REDUCTION & REMOVAL PATHWAY	40	RESPONSIBLY GROWN
15-17	FARMING EMISSIONS FROM OUR FARMING PRACTICES	42-43	COVER CROPS
18	THE BENEFITS OF REGENERATIVE AGRICULTURE	44-45	HEDGEROWS
19-21	THE ROOT ZERO GREENHOUSE GAS EMISSION REDUCTION PATHWAY – FARMING	46	POLLINATORS
22-23	PRODUCTION AND TRANSPORT EMISSIONS	47	BRINGING BACK BARN OWLS
24-26	OUR ROOT ZERO GREENHOUSE GAS EMISSION REDUCTION PATHWAY – PRODUCTION & TRANSPORT	48	YELLOW HAMMER
27-28	RETAIL EMISSIONS	49-50	SPECTACULAR SPUDS
29-30	RETAIL GREENHOUSE GAS EMISSION REDUCTION PATHWAY	51-52	ROOT ZERO COMMUNITY
		53	ROOT ZERO PARTNERS
		54	ROOT ZERO: POTATOES WITH PURPOSE

FORE- WORD

OUR CLIMATE IS CHANGING, AND ITS EFFECTS ARE PUTTING EVERYTHING AT RISK. ON 9TH AUGUST 2021 THE UNITED NATIONS INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC) ISSUED THEIR SIXTH ASSESSMENT REPORT AND IT WAS THEIR MOST SHOCKING REPORT YET. THEIR MESSAGE IS VERY CLEAR. WE NEED TO ACT NOW TO AVOID THE CATASTROPHIC CONSEQUENCES OF A RISING GLOBAL TEMPERATURE.

We must do everything in our power to limit global warming to 1.5°C. It is now unequivocal that human-caused emissions are responsible for recent warming (IPCC Report, 2021).

The National Oceanic and Atmospheric Administration (NOAA), reported that July 2021 was Earth's hottest month in recorded history and the last decade was hotter than any other period in the last 125,000 years. Not only that, but atmospheric carbon dioxide is now at a two-million-year high.

We are pushing the world towards a dangerous climate breakdown that can only be averted by rapid cuts to greenhouse gas emissions. We need to listen to the climate science and we need to act now.

Although time is running out, the IPCC state in their report that it is not too late to avoid the worst impacts of climate breakdown. The good news is that our planet rewards good behaviour and as soon as emissions cease, heating will cease and temperatures will begin to stabilize in a couple of decades.

Climate change is no longer a future problem. it's happening right now.

CLIMATE CHANGE MUST BE THE CATALYST TO RE-THINK HOW WE DO BUSINESS. THERE CAN BE NO MORE 'BUSINESS AS USUAL' AND WE CAN NO LONGER AFFORD TO CLOSE OUR EYES.

WHY IS THIS IMPORTANT?

The IPCC Report confirmed that the global temperature rise is unequivocally linked with increases in man-made greenhouse gas (GHG) emissions.

The food system contributes up to 30% of global greenhouse gases and we must make immediate changes to become more sustainable.

The GHG making the largest contribution from human activities is carbon dioxide. This is released by burning fossil fuels such as coal and gas. Levels of carbon dioxide in the atmosphere are at the highest levels ever recorded.

Greenhouse gases cause climate change by trapping heat from the sun. The Arctic is warming twice as fast as anywhere else on the planet and there is now 40% less sea ice cover in the Arctic than in 1980.

This heat is causing glaciers and ice sheets to melt, and this causes sea levels to rise. We're experiencing more frequent and extreme weather events such as floods, wildfires and drought across the planet.

There are 5 components of our planet that regulate stability and underpin our own survival.

These are soil, water, our forests, biodiversity, and the climate.

Everything in the Earth's system is connected and when something goes wrong with one of these components there is a domino effect on the planet. As we manipulate the planet we are playing with fire in terms of unforeseen consequences.

There is an urgent climate crisis that must be addressed now.

The IPCC have agreed we have until 2030 to make changes before we hit an irreversible tipping point.

The world is on the brink of unalterable harm. If we don't make a change today, we will destroy our planet.

The immediate priority is to reduce carbon dioxide emissions to meet the goals of the Paris Agreement, and limit global warming to avoid a global temperature increase of more than 1.5°C.

ROOT ZERO A NEW WAY OF THINKING

At **ROOT ZERO** we are on a mission to have a positive impact on our planet.

That's why we have taken action to fight climate change, becoming carbon neutral and growing in a sustainable way that's kind to our planet.



**THE FOOD
SYSTEM
CONTRIBUTES
UP TO 30%
OF GLOBAL
GREENHOUSE
GASES**

**GREENHOUSE
GASES ARE
CAUSING
THE PLANET
TO HEAT UP
FASTER THAN
EVER BEFORE**

At **ROOT ZERO** we grow Planet Friendly Potatoes, to give **YOU** the power of a better choice!

We're making sure we have a planet to grow food on.

WE MUST
**ACT
NOW**

**BEFORE
IT'S TOO
LATE**

ROOT ZERO CLIMATE ACTION

AT **ROOT ZERO** WE ARE COMMITTED TO THE FUTURE
ROOT ZERO IS CARBON NEUTRAL

Carbon Neutral Definition:

Carbon neutrality means that the carbon footprint of a company, product, service or event has been calculated on the basis of internationally recognised standards and fully offset by supporting international climate action projects.

We have been a member of the Cool Farm Alliance since 2015 and have been measuring our environmental impact with the **Cool Farm Tool** on our farms. This measures our on-farm greenhouse gas emissions and soil carbon sequestration and has allowed us to make more informed decisions that will reduce our environmental impact.

We have worked with 3Keel, the UK's leading management consultants on sustainability, to calculate our carbon footprint, help select our carbon offset projects and design our carbon removal initiatives.

We believe in complete transparency and the only real way to measure our true impact when we count carbon is to count all of it. We have therefore measured every single thing that contributes to our carbon footprint – from the lights in our offices and factory, to the transport used to take **ROOT ZERO** potatoes to the supermarkets, even down to the way you cook your spuds at home.





WHAT'S IN ROOT ZERO'S CARBON FOOTPRINT – THE SCIENCE

GREENHOUSE GAS EMISSIONS ARE CATEGORISED INTO THREE GROUPS CALLED SCOPE 1, 2 AND 3. THIS IS A WAY OF CATEGORISING THE DIFFERENT KINDS OF CARBON EMISSIONS A COMPANY CREATES IN ITS OWN OPERATIONS, AND IN ITS WIDER VALUE CHAIN.

SCOPE 1 DIRECT EMISSIONS FROM OPERATIONS



SCOPE 2 INDIRECT EMISSIONS FROM PURCHASED ELECTRICITY



SCOPE 3 ALL OTHER INDIRECT EMISSIONS ASSOCIATED WITH A COMPANY'S ACTIVITIES



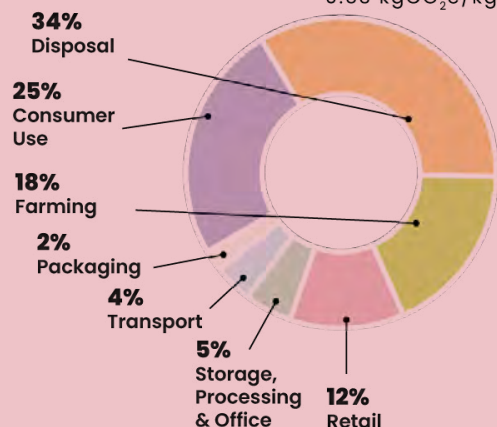
We've taken into account the energy used in Scopes 1, 2 & 3 as follows:

1. **FARMING:** Planting potato seed, manufacture of fertilisers, ongoing management of the growing process, diesel used by tractors to harvest the potatoes.

2. **STORAGE, PROCESSING & OFFICE:** Storage of potatoes in our cold storage facilities, the processing operation where our potatoes are washed, graded and packed. All office activities including company vehicle use.
3. **PACKAGING:** Sourcing the packaging, making and printing of **ROOT ZERO** bags.
4. **TRANSPORT:** Taking potatoes from fields to our factory and then taking the packed product to supermarket depots on refrigerated lorries.
5. **RETAIL:** Customer trips to the store, store lighting, retail waste, store energy use & supermarket distribution network
6. **CONSUMER USE:** Washing, cooking and storing of potatoes at home.
7. **DISPOSAL:** The number of potatoes wasted in UK households. This includes landfill, and composting.

EMISSIONS BREAKDOWN BY VALUE CHAIN STAGE:

Total Emissions
0.53 kgCO₂e/kg





The total carbon footprint of our business in 2019–2020 was **24,612 tonnes CO₂e**.

The carbon emissions from these calculations are **0.532 kgCO₂e** for every kg of potatoes sold.

We've worked out that **1.064 kg of CO₂e** are given off in the production of every 2kg bag of **ROOT ZERO** potatoes (*full cycle*).

That's the equivalent greenhouse gas emissions from driving 2.6 miles in an average passenger car for every **ROOT ZERO** bag sold.

Gaining an understanding of our carbon footprint is important because it allows us to be able to design and deliver on our journey of transformation in greenhouse gas emission reduction.

Offsetting CO₂e emissions is an important step in holistic climate action, alongside avoidance and reduction. We know where our hotspots are, and our priority is to reduce our emissions as much as possible, with a solid action plan in the effort to mitigate global climate change.

CLIMATE PARTNER – OUR INTERIM REMOVALS

Working with our trusted partner Climate Partners, we have carefully selected projects to off-set our GHG emissions. For every 1,000t of **ROOT ZERO** potatoes we sell we offset 586t of CO₂e (this is 10% more than our carbon footprint. At **ROOT ZERO** we want to do more for the planet than “just our bit”).

Climate Partner's label “carbon neutral” certifies that unavoidable greenhouse gas emissions have been offset in the production of **ROOT ZERO** potatoes.

All emissions are referred to as CO₂e emissions and measured in tonnes of CO₂e. By this, we mean CO₂ equivalents, i.e. all relevant greenhouse gases.

Our off-setting projects will support local economies and fund work that is making a real impact, helping to build a healthier, more sustainable planet.



Carbon neutral
Product

ClimatePartner.com/16893-2107-1001





WHAT IS CARBON OFFSETTING?

Carbon dioxide has the same impact on the climate no matter where it is emitted and what the source. So, if a tonne of carbon dioxide can be absorbed from the atmosphere in one part of the world it should cancel out a tonne of the gas emitted in another. Trees and soil absorb carbon dioxide from the air and store it, making forests and land two of the biggest carbon sinks.

So, in theory, countries, companies, individuals or brands can cancel out the impact of some of their emissions by investing in projects that reduce or store carbon – forest preservation and tree planting are among them, but carbon credits are also awarded for projects that reduce fossil fuels in other ways, such as windfarms, solar cookstoves, or better farming methods.

CLIMATE PARTNER PROJECT 1:

Afforestation in Nicaragua

Bamboo for deforestation-free products

Bamboo is one of the most efficient biological tools for fighting climate change. This project in eastern Nicaragua has planted more than 1 million plants of a native species of giant clumping bamboo, covering 2,361 hectares while protecting an additional 1,000 hectares of old forest as a conservation zone. It has transformed a degraded landscape into a flourishing and biodiverse ecosystem. In contrast to trees, harvesting bamboo doesn't kill the plant. Harvesting a bamboo plant means cutting mature poles, leaving enough time for other poles to regenerate.

The project saves an average of more than 37,000 tonnes of CO₂e emissions per year.

Project Standard: Verified Carbon Standard (VCS)

**AFFORESTATION IN NICARAGUA**



CLIMATE PARTNER PROJECT 2:

Clean drinking water in India

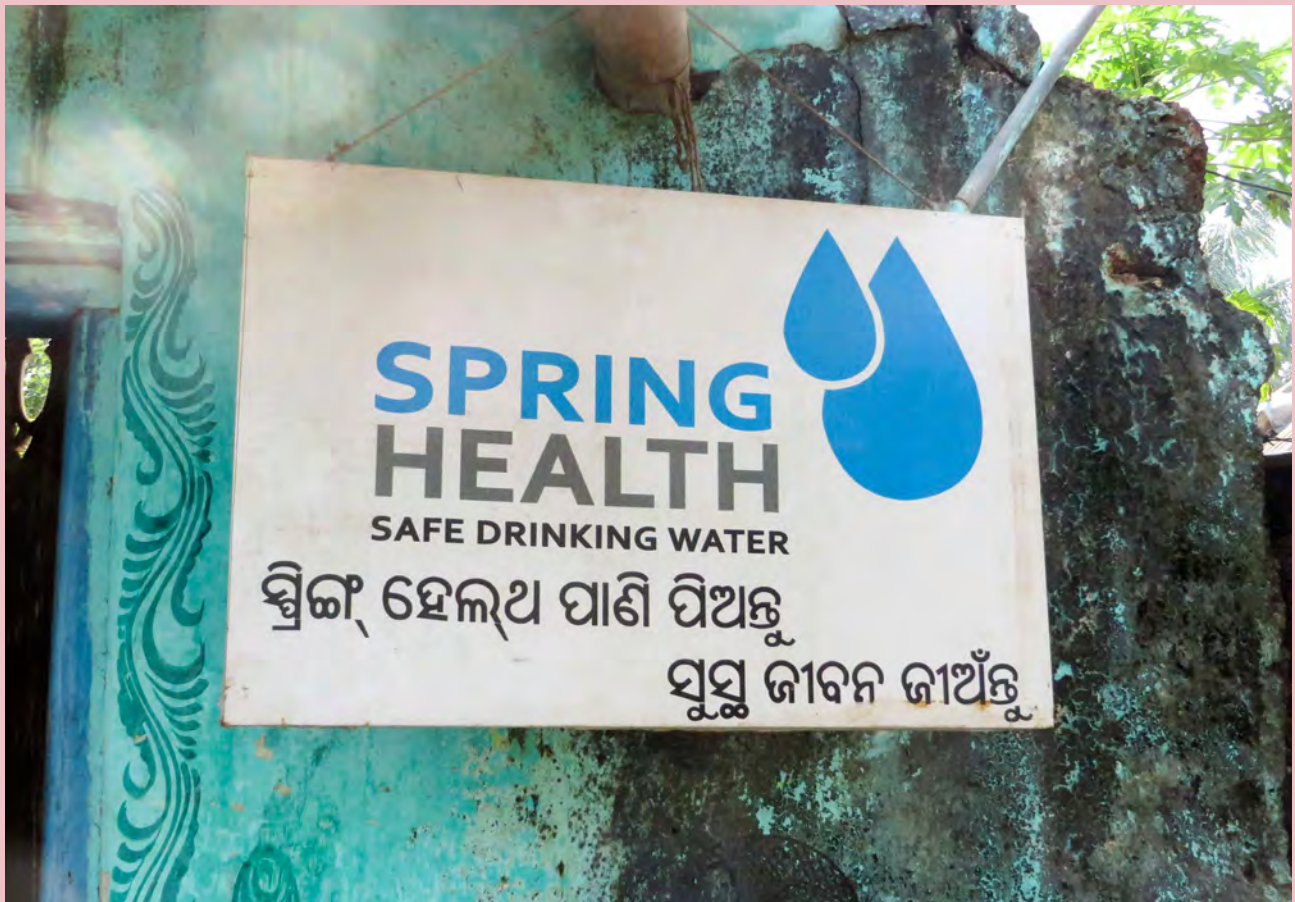
Clean drinking water, where it is not a given

In many of the world's poorer regions children die from cholera or typhoid fever each year. Such diseases are spread mainly through drinking water. But only 32% of households in India have access to treated water. Many of them have to make do with boiling their water over an open fire. Due to the high consumption of firewood, the region is increasingly being deforested. Making a safe supply of drinking water can really make a positive change, for the people and the planet.

The project avoids 30,000 tonnes of CO₂e emissions from burning firewood per year. Forests are spared and their function as a carbon sink is maintained.

Project standard: Gold Standard
VER (GS VER)





CLIMATE PARTNER PROJECT 3:

The Rwanda Improved Cookstove Project

Clean cooking stoves to prevent cooking over an open fire

In many of the world's poorer regions, families cook their meals over an open fire, often in enclosed spaces. This method of cooking is however not energy efficient, as large amounts of heat go to waste. Clean cooking stoves are often simple devices made from metal or clay that use energy more efficiently. Families can thus save fuel and cut down on carbon emissions. Sometimes the stoves are even used in small businesses.

**The project saves an average of
10,000 tonnes of CO₂e per year.**

Project Standard: Gold Standard
VER (GS VER)



**THE RWANDA IMPROVED COOKSTOVE PROJECT**

CARBON REDUCTION (SCIENCE BASED TARGETS)



SCIENCE
BASED
TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

We know carbon emissions are bad for the planet. Being Carbon Neutral is a great start. But it's only the beginning of our journey, because we do not believe simply off-setting is good enough. This means more than just measuring and offsetting our impact.

THE PARIS AGREEMENT

In December 2015 196 countries gathered in Paris at the Conference of the Parties, or COP21, and agreed to work to keep the world's average temperature well below rising to 2°C above what it had been before the industrial revolution – and preferably to keep it below 1°C. This is what is known as the Paris Agreement and represents a legally binding international treaty by which each nation sets out its own goals and plans for reduction of greenhouse gas emissions.

At **ROOT ZERO** we are 100% focussed on reducing our carbon footprint to the absolute minimum.

The IPCC have agreed we have until 2030 to make changes before we hit an irreversible tipping point and this is why we are taking action now.

NET ZERO

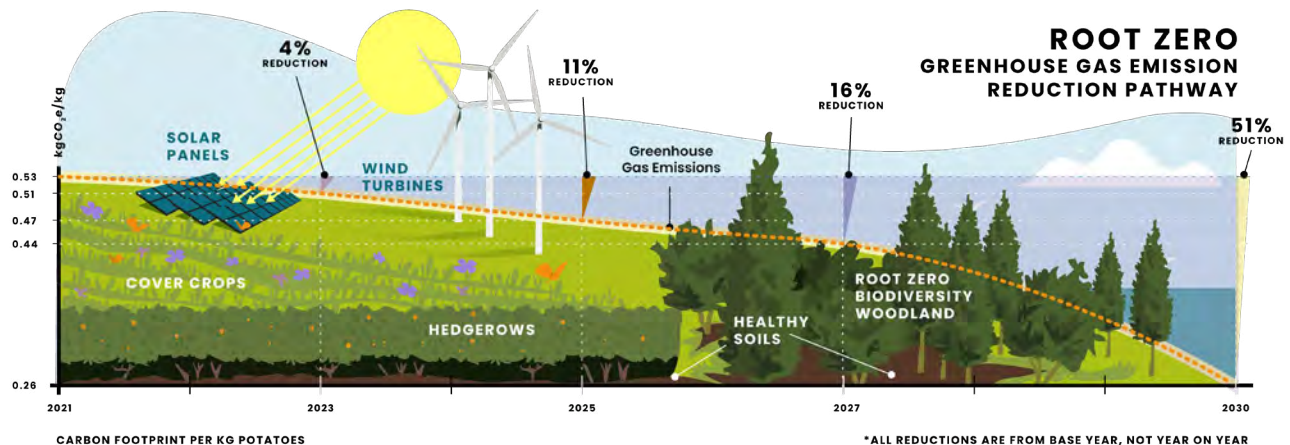
We are committed in law by the UK Government to net zero emissions by 2050, but considerable changes need to take place well before then.

To hold off some of the worst climate impacts, and avoid irreversible damage to our planet, we must hold temperature rise to 1.5°C above pre-industrial levels. This requires halving greenhouse gas emissions by 2030.

At **ROOT ZERO** we have set a target to reduce the carbon intensity of our potatoes by 51% by 2030, covering emissions from across the entire supply chain. Going further, we have committed through the Science Based Target Initiative to a company-wide 1.5°C target to reduce operational emissions by 46% by 2030.

OUR LONG-TERM GOAL IS TO ACHIEVE NET ZERO, AND FOR THIS WE ARE FOCUSED ON DECARBONISATION ACROSS THE VALUE CHAIN AS WELL AS CARBON REMOVALS IN OUR SUPPLY CHAIN.

THE ROOT TO ZERO GREENHOUSE GAS EMISSION REDUCTION & REMOVAL PATHWAY



Our pathway to achieving this will be to reduce GHG emissions in line with the Science Based Targets Initiative, whilst we work to reduce GHG emissions and balance residual emissions with verified carbon off-set projects.

Furthermore, we must also draw down the high levels of carbon dioxide that already exist in the atmosphere today. This can be achieved by enhancing our natural carbon sinks, for example, improving our soil and planting trees.

Our GHG emission reduction and removal pathway will reduce our dependency on credible carbon offsets from now until 2030 and beyond.

In order to achieve this, we have measured every contribution to our carbon footprint – from the power used on our farms to the transport

used to take ROOT ZERO potatoes to the supermarket, even down to the way customers cook their spuds at home, to see where we can improve GHG emissions in our supply chain.

STOP THE DAMAGE

WE ARE

CAUSING

TO



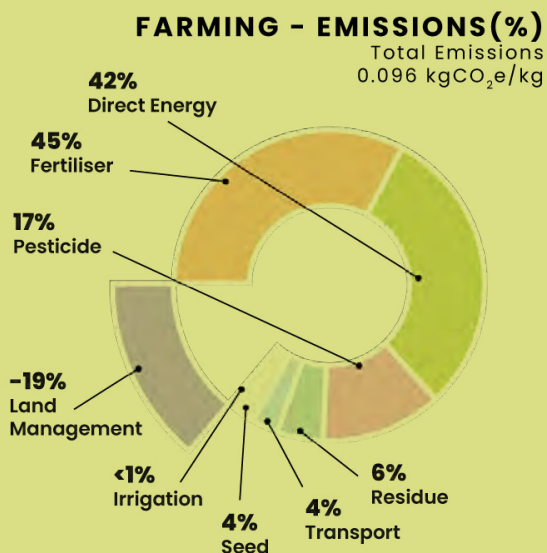
OUR

PLANET



FARMING EMISSIONS FROM OUR FARMING PRACTICES

Our FARMING practices release **4,439 tonnes CO₂e** and makes up **18%** of our total greenhouse gas emissions. Here we show the different processes that go into farming our potatoes:



- However, we are careful not to use too much so we protect our local water courses.

WHAT THE EMISSIONS COME FROM:

- The manufacturing process is energy intensive.
- Fertilisers must be applied to the fields by tractor mounted spreaders, using energy & labour.

Direct Energy (42% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- Mainly the diesel used by tractors, planting and harvesting the crop.
- Grading operations on farm.
- Crop storage refrigeration equipment.

WHY IT'S REQUIRED:

- To efficiently grow and harvest the crop in the field.
- To maintain crop quality before the crop is packed & reaches retailers.
- To minimise crop waste due to deterioration in storage.

Fertiliser (45% of total farming emissions)

WHY FERTILISER IS REQUIRED:

- To maintain the productive capacity of each crop, a higher yield from each unit of field area will lead to a lower carbon footprint for each tonne of crop grown (providing inputs are not increased at the same time).
- To maintain the quality & size of our crops, good crop nutrition will also help to reduce the susceptibility of crops to diseases & physiological disorders.



Pesticides (17% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- The manufacturing process is energy intensive.
- They need to be applied regularly on crops by tractor mounted sprayers, using energy & labour.

WHY PESTICIDES ARE REQUIRED:

- A very strict regulation process is involved to ensure they are safe and minimise environmental impacts.
- They're crucial to prevent diseases such as potato late blight which can ruin crops and cause massive amounts of waste when spuds cannot be sold for human consumption.
- We are careful how and when we use pesticides to minimise any environmental impact.

Crop Residue (6% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- Potatoes are sometimes left in the field if they are too small/large or green/cracked/rotten.

WHY DO WE HAVE CROP RESIDUE?

- The ultimate goal is to have zero waste, good farming is all about growing your crop so it is within specification without any waste.

Irrigation (<1% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- Energy required to pump water from reservoirs to fields.
- Irrigation equipment needs to be moved around regularly by tractor, using energy & labour.

WHY IRRIGATION IS REQUIRED:

- In 2019, the base year for our data collection, we had a wet summer in Wales and didn't require any irrigation, however we will have to ensure irrigation is minimised in the future.
- To maintain crop quality in terms of size & consistency.
- To maintain crop yields, a higher yield from each unit of field area will lead to a lower carbon footprint for each tonne of crop grown (providing inputs are not increased at the same time).



Transport (4% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- Movement of harvested potatoes from field to farm (often by tractor & trailer).
- Movement of potatoes from farm to store/pack house (often by lorry).

WHY TRANSPORT IS REQUIRED:

- For our local supply chain to be maintained.

Land management (-19%) this is already helping reduce our carbon footprint!

HOW DOES THE SEQUESTRATION HAPPEN?:

- In our Cool Farm Tool audits this is actually a negative measure which means we are sequestering carbon from the atmosphere!
- The main action we are concerned with here is growing cover crops.
- Also increasing soil organic matter is an important target for us to sequester more carbon.

WHY LAND MANAGEMENT IS REQUIRED:

- To reduce our carbon footprint by locking up CO₂e from the atmosphere within our crop rotations.

Seed (4% of total farming emissions)

WHAT THE EMISSIONS COME FROM:

- The production cycle of the seed potato crop, including harvest, storage & grading of these tubers.
- Transport of seed potatoes from the specialist seed producers growing our key varieties across to our **ROOT ZERO** growers.

WHY THIS SEED IS REQUIRED:

- High quality seed of the best varieties is crucial to maintain the productive capacity, quality and minimal disease loading of our **ROOT ZERO** crops.





The benefits of Regenerative Agriculture?

Our philosophy at **ROOT ZERO** is based along “regenerative agriculture” principles – these have been defined as, “the process of restoring degraded soils using practices based on ecological principles.” It requires managing farm land by considering the interactions between the soil, water, plants, animals and humans – interconnected links in one whole system. The benefits of regenerative agriculture include:

- Increased soil organic matter and biodiversity of the soil biome.
- Healthier and more productive soil that is drought and flood resilient.
- Decreased use of chemical and fertiliser inputs and lower subsequent risk of pollution.
- Cleaner air and water.
- Enhanced wildlife habitats.
- Carbon is captured in the soil & within habitats to combat the climate crisis.

With regenerative agriculture, producers are not just sustaining their current farmland base so that it can continue to be used in the future. They are actually improving what is there, leaving it in a much better state for generations to come.

Organic Farming is an approach that has been promoted since the end of World War 2, particularly by the founders of the Soil Association. It is a defined system which is governed by a strict set of standards overseen by several organic certification bodies. In order for a farmer or processor to market their products as organic they must prove to a certifier that they have followed all the organic regulations e.g. not using artificial fertilisers & pesticides or the growing of non-genetically modified seeds.

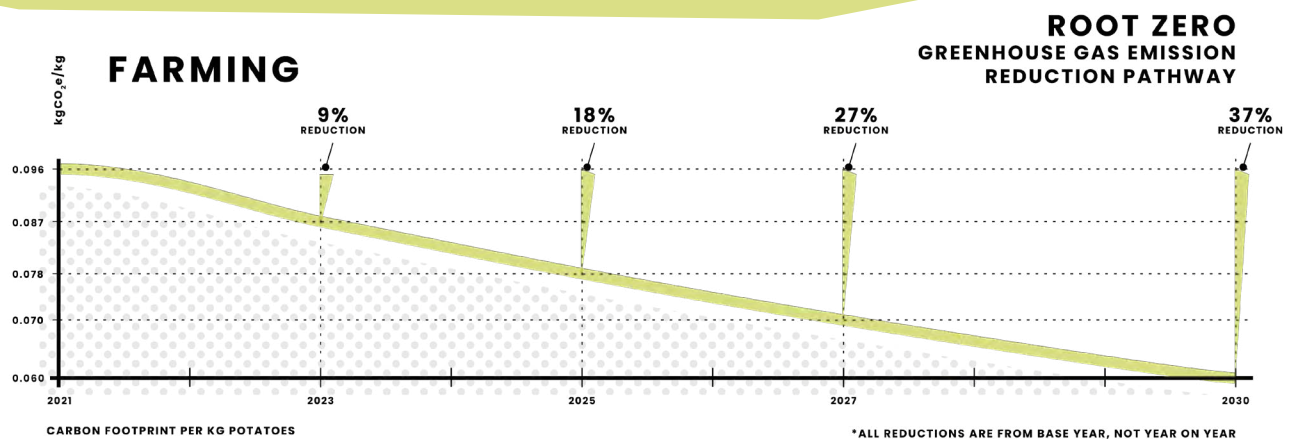
Many of the principles of Regenerative Agriculture & Organic Farming are aligned, for example in the promotion of soil health & farm biodiversity; however Regenerative Agriculture is less prescriptive – it is a philosophy that encourages each farmer to adapt their own particular systems to avoid monocultural rotations, increase soil microbes and soil organic matter which in turn beneficially locks up carbon to mitigate climate change.

At **ROOT ZERO** we are using the best aspects of both of these systems to produce potatoes with the lowest carbon footprint. Our primary objective is to decrease carbon dioxide emissions on a yearly basis.



Our Root Zero Greenhouse Gas Emission Reduction Pathway – Farming

TO REDUCE OUR GREENHOUSE GAS EMISSIONS BY 51% BY 2030, WE NEED TO REDUCE OUR FARMING EMISSIONS BY 37% OVER THE NEXT 9 YEARS.



THIS IS HOW WE WILL REDUCE CARBON EMISSIONS CREATED BY USING FERTILISERS:

- Some manufacturers (e.g., Yara) now produce abated fertilisers which reduce the nitrous oxide (a greenhouse gas) emissions to lower their overall carbon footprint. We will use these fertilisers to grow our crops.
- Focus on reducing inputs of artificial fertiliser to the minimum required for crop growth.
- Improve soil quality so plant roots are able to scavenge more nutrition from the available organic matter & natural fertility.

HOW WE WILL REDUCE EMISSIONS FROM DIRECT ENERGY:

- Use next-generation tractors that are the most fuel-efficient.
- Use precision agriculture to minimise inputs.
- Grow new varieties that do not require storage at such low temperatures.
- Better insulation on new cold stores to reduce energy requirements.
- Make use of more renewable energy (electricity) on farm, especially solar & wind.

HOW WE WILL REDUCE CARBON EMISSIONS FROM PESTICIDES:

- We'll grow newer varieties of potatoes with better disease resistance.
- We'll improve integrated crop management which will help to reduce disease pressure in the field.

HOW WE WILL REDUCE WASTE IN THE FIELD:

- Continue to focus on doing a great job on the farm; considering rotations, fertility, soil conditions, seed quality, cultivations, planting, disease control, desiccation, harvesting, grading & storage.

HOW WE WILL REDUCE EMISSIONS FROM IRRIGATION:

- At the moment the varieties we grow for **ROOT ZERO** are reasonably drought tolerant so we grow them unirrigated.
- The maritime climate in West Wales is often cool and damp which reduces the need for irrigation on many crops.

HOW WE WILL REDUCE EMISSIONS FROM TRANSPORT:

- All our **ROOT ZERO** potatoes are currently grown within a 25-mile radius of our pack house which reduces the transport requirement & their carbon footprint.
- We will use the most fuel-efficient and battery / biogas / H₂ lorries as they become available.

HOW WE WILL REDUCE EMISSIONS FROM SEED:

- When possible, we will grow the seed for our **ROOT ZERO** crops locally within Wales to reduce the distances required to deliver them to our potato growers.

HOW WE WILL INCREASE OUR CARBON SEQUESTRATION USING LAND MANAGEMENT:

- Our growers will target the production of cover crops as key features of their whole farm rotations and will implement common practice on hedgerow management.
- We already have an advantage in Wales as we have healthy mixed rotations and we must ensure this continues.

SOIL & COVER CROPS – THE UNSUNG SUPER HEROES

A cover crop is a crop of a specific plant that is grown primarily for the benefit of the soil rather than the crop yield. Cover crops are commonly used to suppress weeds, manage soil erosion, help build and improve soil fertility and quality, control diseases and pests, and promote biodiversity. At **ROOT ZERO** we plant cover crops to prepare the land prior to planting. Cover crops can help boost soil health, protect water sources, and create fields that are more resilient to climate change. A covered planet is a healthy planet, the practices that heal our soil will help heal our planet.

The soil is a marvellous phenomenon because it can hold more carbon than both the atmosphere and plants combined.

Between 2022 – 2030 and beyond, we will be planting a minimum of 445 acres of cover crops each year on our **ROOT ZERO** farms. Based on the Ruis and BlancoCanqui 2017 research paper, an acre of cover crop removes 220kg of carbon dioxide per year. Based on this, our 445 acre planting per year will sequester 97,900kg of carbon dioxide per year. At **ROOT ZERO** over the short to medium term we are confident we can sequester significantly more than this. For instance, we are measuring the soil organic matter before and after growing a cover crop, which will allow us to monitor progress more accurately. Over the coming years, we're confident we'll be able to use these results to form a more robust figure of how much carbon dioxide we are sequestering.



THE HUMBLE HEDGEROW – A HIGHWAY HAVEN FOR WILDLIFE

There are lots of promises to plant more trees, but what about hedgerows?

We have 110 miles of hedgerows on our **ROOT ZERO** farms! This is a wonderful interconnecting highway for our wildlife.

Not only do their deep roots help capture carbon, they also create vital habitats for many species of animals and provide a natural physical barrier that slows the flow of overland rainwater. They also protect the land from strong winds and rain, which can cause soil erosion.

Because of this we decided to protect our hedgerows, implementing common practice on our hedgerows across our **ROOT ZERO** Farms.

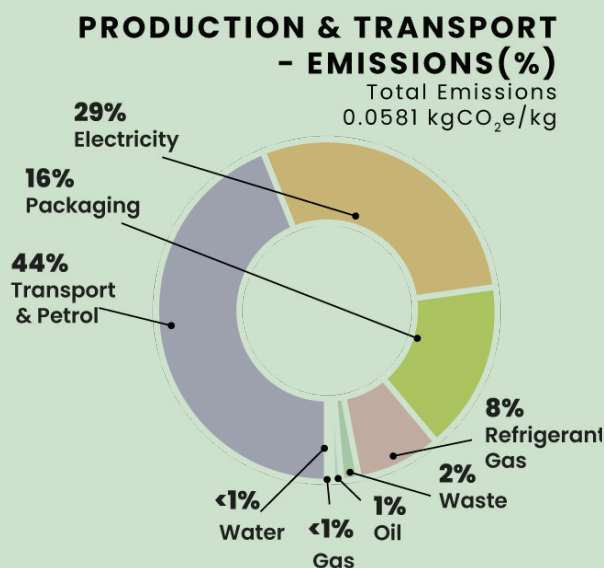
A lot of the shrubs that grow in hedgerows only produce flowers, fruit and seeds in their second year of growth which means that they can only provide food for insects and birds in the second year. Therefore, we let our hedgerows grow freely, only giving them a trim in the winter every 3 years. Some of them are restored using the skilful and traditional methods of coppicing or laying, work which ensures these age-old techniques remain part of our stewardship of our land.

These techniques are key to the survival of our hedgerows. At **ROOT ZERO** we will allow a margin around our planted areas, which will enhance the pollinating capacity of our hedgerows.

Due to the importance of our hedgerows, it's been recommended by the UK's Committee on Climate Change 2019 report that the UK's hedgerow network be extended by 40% as part of the UK's 2050 net zero target.

PRODUCTION & TRANSPORT EMISSIONS

Our PRODUCTION & TRANSPORT releases **2,688 tonnes CO₂e** and contributed **11%** towards our total greenhouse gas emissions.



Transport & Petrol (44% of Production & Transport emissions)

WHAT THE EMISSIONS COME FROM:

- Movement of potatoes from farm to store/pack house (often by lorry).
- This includes the total miles travelled by lorries delivering potatoes from farm to factory and then from the factory to supermarket depot.
- All fuel used by company owned vehicles.
- All fuel used for employee commuting.

Electricity (29% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

- The storage process requires electricity.
- The electricity usage also covers the electricity used to power the factory and offices.

WHY IT'S REQUIRED:

- Electricity runs the components in the refrigerator (the fans and compressors) that keep the potatoes cold in our stores so that we can supply potatoes all year round.
- All of the production lines in the factory are run by electricity.

Packaging (16% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

- The production of the material that makes our packaging.
- The emission calculation is based on the number of packs sold throughout the reporting year.

WHY IT'S REQUIRED:

- The packaging is required to deliver our potatoes to store and to ensure that our potatoes remain fresh post washing.
- The packaging helps protect our potatoes from travel damage and 'greening.'

Refrigerant Gas (8% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

- We use refrigerant gases to run all of our cold storage facilities.

WHY IT'S REQUIRED:

- Refrigerant gas is a chemical product used for refrigeration. These gases, which have very low evaporation points, are condensed under pressure to chill the air. We use these refrigerant gases to keep our potatoes fresh all year round.

Waste (2% of production & transport emissions)

- These emissions come from the offices and end of line productions and soil that is washed off our potatoes.

Oil (1% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

- Oil onsite is used to warm our potatoes before grading and to heat our offices and canteen facilities.

WHY IT'S REQUIRED:

- We need to warm our potatoes up to ambient temperature before packing to avoid damaging them in the factory, which would otherwise lead to food waste.

Gas (<1% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

- The main usage is from forklift trucks which manoeuvre the potatoes around our site.
- Other emissions include gas used during production, office and on-site accommodation.

Water (<1% of production & transport emissions)

WHAT THE EMISSIONS COME FROM:

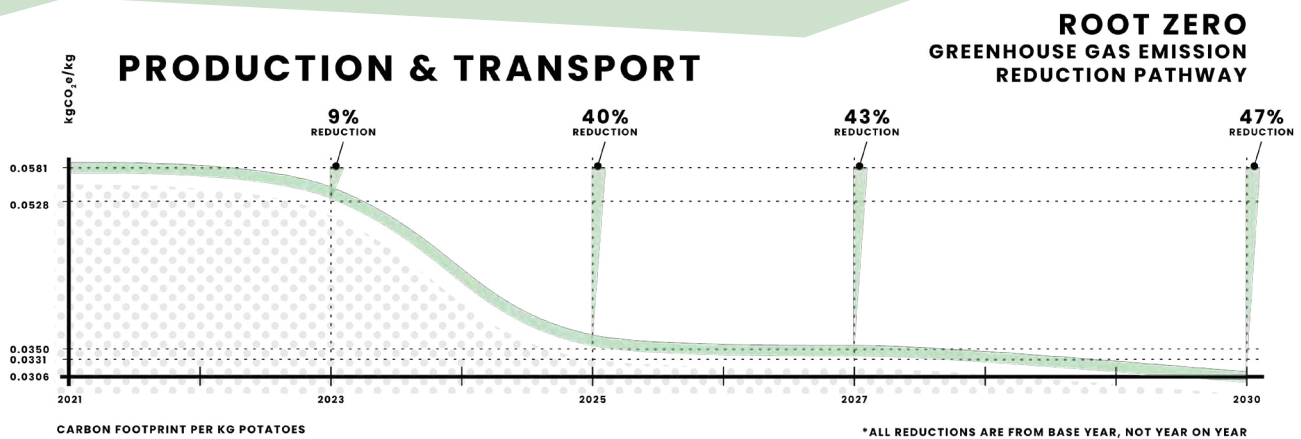
- These emissions come from treating and recycling the water onsite in our water treatment plant.

WHY IT'S REQUIRED:

- Water onsite is used to wash the harvested potatoes before packing.

Our Root Zero Greenhouse Gas Emission Reduction Pathway – Production & Transport

TO REDUCE OUR **ROOT ZERO** GREENHOUSE GAS EMISSIONS BY 51% BY 2030, WE NEED TO REDUCE EMISSIONS FROM PRODUCTION & TRANSPORT BY 47%.



GAS: We aim to reduce and where electric vehicle permits, eliminate gases used to power our forklifts.

REFRIGERATED GASES: We will actively monitor and look for developments in refrigerated gases with a lower GHG emissions factor, whilst continuing to improve what we use on site.

WASTE: Better grading and harvesting techniques to split stone and soil. The emissions are from sending stone, soil and potatoes to landfill.

PACKAGING: When technology and development allows, we will source a UK based paper supplier. In the short term and to keep plastic off our shelves, we will source using the finest paper material.

OIL: This will remain unchanged, although we will reduce our usage where appropriate.

TRANSPORT & PETROL: Transportation is a huge source of climate pollution. Not only are emissions from vehicles bad for the planet, they're also bad for our health. Electric vehicles are far better for the environment.

At **ROOT ZERO** we want to reduce and, in some cases, eliminate fossil fuels from our business, so we are working with our logistics partners on a transportation strategy that in the first instance will use biogas with the aim to move to electric when technology allows.

Biogas is a completely natural, sustainable and renewable fuel source which improves air quality and reduces carbon dioxide emissions.

To eliminate emissions, we must improve driver behaviour, route optimisation, reduce empty running and look at load fill, ensuring all lorries are at their maximum capacity.

Green – up to 90% reduction in CO₂e emissions

Clean – Better air quality

Our logistics partner has a responsibility, so do we! At **ROOT ZERO** 50% of our company car, van and pickup fleet are already using hybrid technology but over the next 10 years our aim is to increase this number to **100%**. As part of our transportation strategy, we will have a policy in place to ensure that any new vehicle purchased will be using hybrid technology at the very least.



ELECTRICITY: We have set an ambitious goal to install solar panels on our production facility in Pembrokeshire, which means that we will be using 100% renewable energy from 2023.

Working with industry leading consultant, Dulas, we have set out a strategy for using renewable energy to reduce our environmental impact. In the first phase of this strategy, we will be investing in solar photovoltaic (PV) to generate electricity. Photovoltaics is the direct conversion of light into electric power using semiconducting materials such as silicon. There is hope that one day photovoltaic systems can make us independent of fossil fuels.

Our mission over the next two years is to invest in **364 solar panels**, This is the equivalent in size to 21 city buses parked next to each other! Investing in these panels will generate 148KWp (or 148,000KWh) every year. This is enough electricity to charge a Tesla, 1,233 times (*120kwh used to charge a 100kwh Tesla battery).

148KWp will **offset 29,501 kgCO₂e**



In the second phase of our renewable energy strategy, we will invest in wind power.



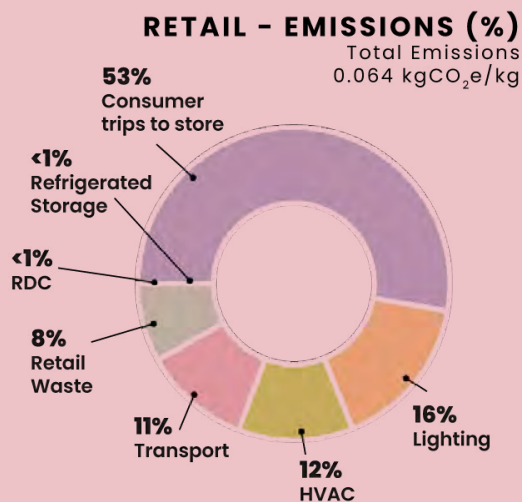
WATER: Water that is on the Earth today is the same water that was here when the Earth began – it's over 4 billion years old!! One of the key advantages of recycling water is that it reduces the need for water to be removed from natural habitats such as wetlands.

This is why we have a water treatment plant on our site to treat and recycle our manufacturing water. We have 3 different sources of water at **ROOT ZERO** and our main objective is to recycle water in as many applications as possible, only topping up with fresh water where it is absolutely necessary.



RETAIL EMISSIONS

RETAIL releases **2,963 tonnes CO₂e** and contributed **12%** towards our total greenhouse gas emissions.



Refrigerated storage (<1% of retail emissions)

The greenhouse gases emitted through refrigerant leaks and energy consumption. Emissions from refrigerant leakage when using HFC (hydrofluorocarbons such as R404A) refrigerants can be substantial and depending on the leakage rate, much higher than the emissions from the energy consumption of the refrigeration equipment.

Retail distribution centre (<1% of retail emissions)

Retail Distribution Centres play an important role in the food supply chain. They are operated continuously throughout the year and are used to balance supply of products from the manufacturer and demand from individual stores in a supermarket chain.

Retail waste (8% of retail emissions)

RETAIL WASTE (8% of retail emissions)
Food waste from retail food operations is estimated at 1.6m tonnes per annum (WRAP, 2007). The vast majority of this waste is disposed to landfill.

Surplus plastic and cardboard derived from the stores is packed and returned via the delivery vehicle. It has been common practice to reduce volume of both plastic and cardboard by compression baling at the store. Other waste includes waste water, cooking oils and ice disposal, shopping bags and other food packaging.

Transport (11% of retail emissions)

Fuel use for transporting products between the retail distribution centres and stores. The vast majority of refrigeration systems used in transport refrigeration are either driven by the main vehicle diesel engine or by an auxiliary diesel engine.

HVAC – heating, ventilation and cooling (12% of retail emissions)

The gas and electricity used for heating, ventilation and air-conditioning systems. The energy consumption of the HVAC systems (heating, ventilation and cooling) in retail food stores can be between 15% and 25% depending on the system design, geographic location and controls.

Lighting (16% of retail emissions)

Lighting plays a role in attracting customers in the food retail industry. Different types of lighting used in store / at the RDC.

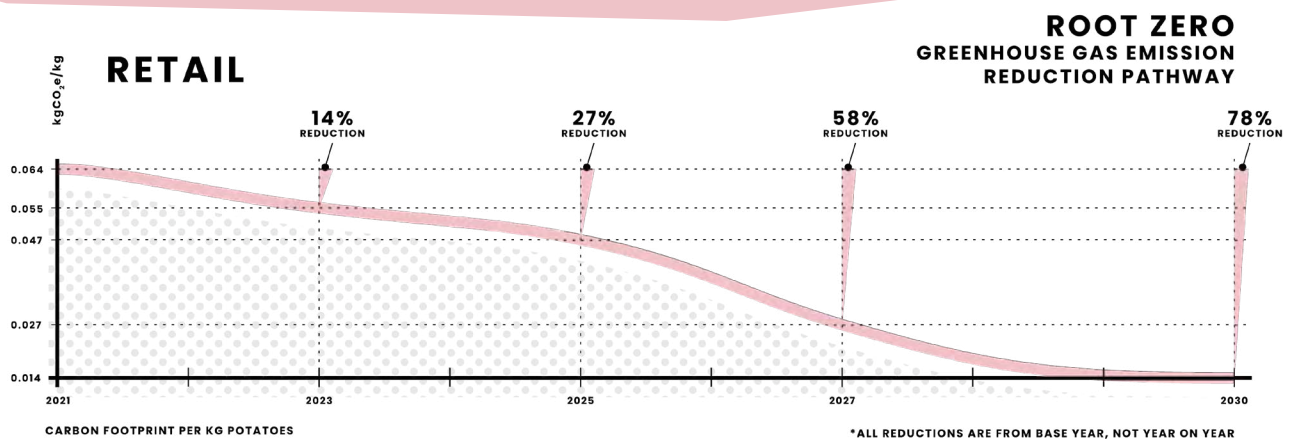
Consumer trips to store (53% of retail emissions)

The emissions emitted by customers driving to and from store.



RETAIL Greenhouse Gas Emission Reduction Pathway

TO REDUCE OUR GREENHOUSE GAS EMISSIONS BY 51% BY 2030, WE NEED RETAILERS TO REDUCE THEIR GREENHOUSE GAS EMISSIONS BY 78% OVER THE NEXT 9 YEARS.



HOW RETAILERS WILL REDUCE THEIR EMISSIONS:

The retail industry value chain emissions are approximately 215 Mt CO₂e per year (British Retail Consortium, 2020), with 62% of these emissions from the food & drink sector (DEFRA, 2021).

British retailers have come together through the British Retail Consortium to develop a decarbonisation plan called The Climate Action Roadmap, as they recognise the key role they all play in tackling climate change.

This Roadmap sets out in detail how the retail industry can decarbonise over 5 key areas:

- Putting greenhouse gas data at the core of business decision making.
- Operating efficient sites powered by renewable energy.
- Moving to low carbon logistics.
- Sourcing sustainably; and
- Helping their employees and customers to live low carbon lifestyles.

(SOURCE: BRC)

This Roadmap has been developed in partnership with twenty leading retailers, and now has over 60 retailers signed up in support.

The aim is to bring the retail industry and its supply chains to Net Zero by 2040 and to guide British retail on the way to achieving a Net Zero UK, ahead of the Government's 2050 target.

Some of the retailers that have helped steer and develop the BRC Climate Action Roadmap, will be listing **ROOT ZERO** as part of a national campaign. The retailers mentioned below are just to name a few who have helped aid the Retail reduction plan.

Waitrose have a number of sustainable food measures in place including a commitment to source only from Net Zero carbon farms in the UK from 2035 and move to extend its pledge to halve food waste by 2030 to its entire supply chain. Waitrose also aim to help halve customers' household food waste within the next decade.

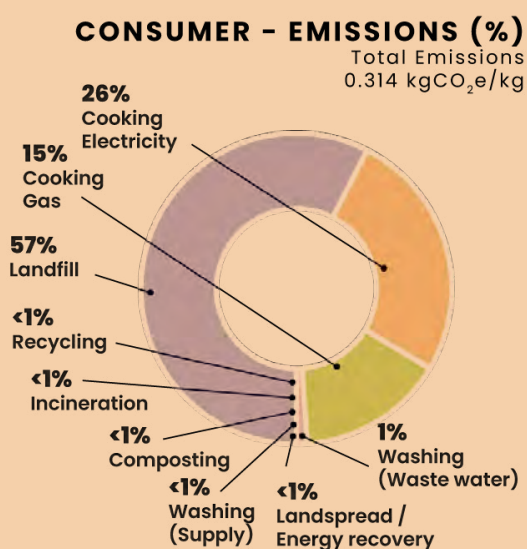
In 2009, Tesco became the first business globally to set the ambition to become zero carbon by 2050. Since then, they have set bold science-based targets aligned with the Paris Climate Agreement goals and accelerated their UK plans to achieve Net Zero by 2035.

To achieve this, they have set a target of 60% absolute carbon reduction from their operations (compared to their baseline of 2015). In 2020/21, Tesco surpassed their 2020 target, with a 54% reduction of Scope 1 and Scope 2 emissions.

As can be seen in the Coop sustainability report, the Coop have a target to reduce their direct emissions by 50% by 2025. In 2020, Coop had already achieved a reduction of 47%, therefore, in view of their 2040 Net Zero aim, it is reasonable to assume that by 2030 they will achieve a reduction of 80% across their direct emissions. In tandem with Waitrose, Coop have also outlined their commitment to reducing food waste by 50% by 2030.

CONSUMER USE & DISPOSAL EMISSIONS

Consumer use and Disposal releases **14,522 tonnes CO₂e** and contributed **59%** towards our total carbon emissions.



Cooking Electricity (26%) and Cooking Gas (15%) contribute 41% to Consumer Emissions

We burn up to a third of our total household energy in the kitchen. The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emissions.

Landfill (57% of consumer emissions)

High levels of methane gas and carbon dioxide are generated by rotting rubbish in the ground. These greenhouse gases contribute greatly to the process of global warming. Landfills trap waste underground with little oxygen, and so even waste that would usually decompose quickly, such as vegetables, will take a long time to do so in landfill.

Washing – waste water (1% of consumer emissions)

An average family of 4 in the UK uses more than 500 litres of water each day. Water can be wasted in the kitchen by leaving taps running, dripping taps (they can waste as much water in a year to fill a paddling pool every week in the summer months), filling dirty pans and dishes with water to 'soak.'

Composting (<1% of consumer emissions)

The CO₂e released during composting is considered biogenic, not anthropogenic, so is not considered in greenhouse gas calculations. Home composting therefore does not contribute to consumer emissions. Composting also reduces greenhouse gas emissions at landfills, and promotes the uptake of carbon dioxide by vegetation.

Landspread / Energy recovery (<1% of consumer emissions)

Landspreading is the disposal of waste by spreading it across the land. In this process the different constituents are made available for ecological improvements or agricultural benefits. Only the waste-water and wastes that are beneficial to crop nutrition or soil can be spread on land & there are a number of waste regulations that need to be adhered to. If these are abided by then this process will not directly or indirectly affect animals, humans or plant health. Landspreading can add organic matter and nutrients to soil and thus reduce the reliance on manufactured artificial fertiliser.

Recycling (<1% of consumer emissions)

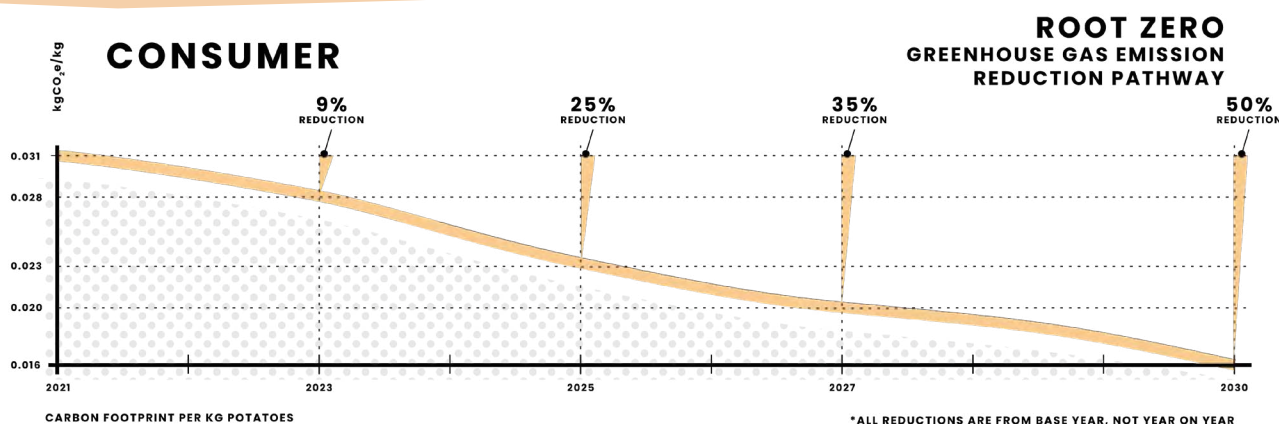
The recycling of material is the process by which waste material is turned into new material. In this instance, we will work on educating the consumer on the importance of recycling their paper packaging, which will reduce the waste into landfill. Because paper fibre contains carbon (originally absorbed by the tree), recycling keeps the carbon locked up for longer and out of the atmosphere.

Incineration (<1% of consumer emissions)

Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. This may also include energy recovery from the heat produced.

Consumer Greenhouse Gas Emission Reduction Pathway

OUR MISSION IS TO SUPPORT DEFRA AND OTHER STAKEHOLDERS TO REDUCE THE IMPACT OF THE CONSUMER ON GREENHOUSE GAS EMISSIONS BY 50%.



HOW CONSUMERS CAN REDUCE THEIR EMISSIONS FROM COOKING:

Induction hobs: Induction creates heat faster by magnetically accelerating metal molecules in steel, cast-iron and some stainless-steel pots. Once you remove the pot from the eye, the stove also cools much faster.

Waste energy: The simple act of covering a pan of water will bring it to the boil in half the time it takes uncovered, heating up faster and need less energy to hold it than uncovered.

Microwave more often: This is one of the cheapest and most energy-efficient cooking methods, using two-thirds less power than an electric oven.

Pick the correct pan: Ensure the cookware matches the size of the heating element. For example, a 6-inch pan on an 8-inch ring on a hob will waste over 40% of the element's heat.

HOW CAN WE REDUCE WASTE WATER IN THE KITCHEN?

By making small changes such as turning the tap off, consumers are not only helping to save water but energy too, as well as protecting the environment and future supplies. To avoid wasting water on dirty dishes, use a spatula to scrape out as much food as possible and then, use a small piece of paper towel to wipe out any residue. If you need to wash dishes by hand, the most water efficient way to clean them is to put a few inches of hot water in the sink, wash all the dishes at once, then repeat the process to rinse them.

HOW CAN COMPOSTING HELP TO REDUCE GREENHOUSE GAS EMISSIONS?

Composting can replenish and stabilize our soil as good composting practices balance the carbon: nitrogen ratio and provide adequate aeration and moisture in the soil. Composting promotes the uptake of carbon dioxide by vegetation which helps draw carbon dioxide out of the atmosphere, helping to tackle global warming. Composting at home also reduces greenhouse gas emissions at landfills.

HOW CAN WE REDUCE RELIANCE ON LANDFILL?

More and more consumers are starting to make a conscious effort to live more sustainable lifestyles. The more people that adopt a zero-waste lifestyle will greatly reduce the amount of food waste that is sent to landfills. High profile campaigns such as Food Waste Action Week by WRAP and Love Food Hate Waste with handy food hacks and tips to help keep food fresher for longer, will also help to prevent food from needlessly going to landfill.

FOOD WASTE – THE NUMBER ONE ENEMY

Wasting food feeds climate change! The food system contributes up to 30% of Global Greenhouse Gases. Food waste is a huge problem here in the UK. We waste 4.5 million tonnes of edible food every year according to **Love Food Hate Waste** – enough to fill 38 million wheelie bins! Using as much of the food you buy as possible is good for the planet and good for your pocket – the average family of four can save just over £60 per month by reducing their food waste.

It's a sad fact that 4million potatoes are thrown away EVERY SINGLE DAY. If everyone stopped throwing away food for just one day, it would do the same for climate change as taking 14,000 cars off the road for a whole year!

Our food is as precious as our planet and we must take action now.

At **ROOT ZERO** we have joined forces with WRAP to honour the Courtauld Commitment to reduce potato food waste and surplus by 50% by 2030. Moreover, we have made a further commitment to increase the amount of food we distribute to charity. We're working with our farmers and consumers to help tackle food waste in your homes by 2030.





POTATO

TOP TIPS

Potato skins are completely edible, full of flavour and a good source of fibre – so eating the skins is good for you and helps you avoid food waste.

Here's some of our best top potato tips to tackle that waste:

- Potatoes love it underground – so the best way to store them is in a cool, dark place. They'll last longer and keep fresher that way.
- Spotted the trend for skin-on fries? Keeping the skins on creates extra flavour and texture – try it next time you're making chips, wedges or roasties. It even makes more of your mash.
- Peeling's a pain – keep the skins on and save yourself the time and effort!
- But if you'd prefer to peel, keep the skins – bake them in a hot oven to make home-made crisps.
- Did you know you can freeze cooked potatoes? Roast frozen boiled potatoes straight from the freezer or keep leftover mash for pies, pastries or potato cakes.
- Spuds sprouting? Not a problem, just cut out any sprouting or soft bits and use the rest of the potato.

THE ROOT ZERO CLIMATE ACTION PLAN

Our Climate Action Plan details how we will reduce our GHG emissions.

We have followed the Science in our decision making, leading us on our journey from carbon neutrality to reducing our GHG emissions over the next 9 years by 51%.

The following tables show our pathway to achieving this by reducing our GHG emissions to coincide with the Science Based Targets Initiative, committed to by the wider business.

FARMING *kg of potatoes sold	YEAR 1 – 2021		YEAR 10 – 2030	
	Actual CO2e (kg) per kg	Actual CO2e (%) per kg	Reduction (%)	Expected CO2e (kg) per kg
Pesticides	0.0162	3%	5%	0.0154
Residue	0.0062	1%	15%	0.0052
Fertiliser	0.0436	8%	20%	0.0349
Direct Energy	0.0402	8%	20%	0.0322
Irrigation	0.0000	0%	0%	0.0000
Transport	0.0043	1%	50%	0.0021
Land Management	-0.0184	-3%	-80%	-0.0331
Seed	0.0040	1%	10%	0.0036
Farming total Co ₂ e kg / kg of potatoes sold	0.0960		37%	0.0603

PRODUCTION & TRANSPORT *kg of potatoes sold	YEAR 1 – 2021		YEAR 10 – 2030	
	Actual CO2e (kg) per kg	Actual CO2e (%) per kg	Reduction (%)	Expected CO2e (kg) per kg
Oil	0.0005	0%	0%	0.0005
Gas	0.0004	0%	50%	0.0002
Refrigerant Gas	0.0044	1%	50%	0.0022
Transport & Petrol	0.0253	5%	25%	0.0190
Electricity	0.0169	3%	0%	0.0000
Waste	0.0009	0%	2%	0.0009
Water	0.0004	0%	0%	0.0004
Packaging	0.0093	2%	20%	0.0074
Production & Transport total Co ₂ e kg / kg of potatoes sold	0.0581		47%	0.0306

This is based on what we know today, and we commit to reassess the progress on our journey every year.

RETAIL *kg of potatoes sold	YEAR 1 – 2021		YEAR 10 – 2030	
	Actual CO2e (kg) per kg	Actual CO2e (%) per kg	Reduction (%)	Expected CO2e (kg) per kg
Retail Distribution Centre	0.0000	0%	80%	0.0000
Transport	0.0071	1%	80%	0.0014
Refrigerated Storage	0.0000	0%	80%	0.0000
Lighting	0.0103	2%	80%	0.0021
Heating, Ventilation & Air Conditioning	0.0078	1%	80%	0.0016
Retail Waste	0.0048	1%	80%	0.0024
Customer trips to store	0.0340	6%	80%	0.0068
Retail total Co ₂ e kg / kg of potatoes sold	0.0641		78%	0.0143

CONSUMER *kg of potatoes sold	YEAR 1 – 2021		YEAR 10 – 2030	
	Actual CO2e (kg) per kg	Actual CO2e (%) per kg	Reduction (%)	Expected CO2e (kg) per kg
Landspread / Energy recovery	0.0010	0%	50%	0.0005
Landfill	0.1792	34%	50%	0.0896
Composting	0.0010	0%	50%	0.0005
Cooking (electricity)	0.0809	15%	50%	0.0405
Cooking (gas)	0.0015	0%	50%	0.0007
Washing (supply)	0.0473	9%	50%	0.0236
Washing (waste water)	0.0030	1%	50%	0.0015
Recycling	0.0003	0%	0%	0.0003
Incineration	0.0000	0%	0%	0.0000
Consumer total Co ₂ e kg / kg of potatoes sold	0.3141		50%	0.1572

TOTAL Co₂e kg / kg of potatoes sold

0.5324		51%	0.2623
--------	--	-----	--------

THE ROOT TO ZERO PROJECTS

CO₂ Removal Projects

THE ROOT ZERO BIODIVERSITY WOODLAND – AN AMAZING CARBON CAPTURE MACHINE

It's no secret that trees play an incredible and important role in combating climate change by removing carbon dioxide from the atmosphere.

But, despite their importance, it's a sad fact that less than 15% of the UK's total land area has tree cover!! At **ROOT ZERO** we want to help fix this.

The UK Government say 1.5 billion trees need to be planted to help the UK reach net zero by 2050.

NATURE STORES CARBON!!

As part of our journey towards Net Zero, we have plans to create a **ROOT ZERO BIODIVERSITY WOODLAND**, a 30+ acre-woodland, (that's the equivalent to 22 full-sized football pitches!), planted in the heart of our beloved Pembrokeshire.

By planting trees, we will also draw down the CO₂ that is already affecting our planet. This will have huge benefits for biodiversity, and the trees will also help to stabilise our climate, our fresh water and all the other services that nature provides for free.



SEAGRASS – THE LUNGS OF THE SEA AND A CLIMATE BOOSTING WONDERPLANT

Seagrass absorbs CO₂ from the atmosphere up to 35 times faster than tropical rainforests, stores 10% of the annual ocean carbon storage across the globe and locks up carbon in sediments that can stay out of harm's way for millennia.

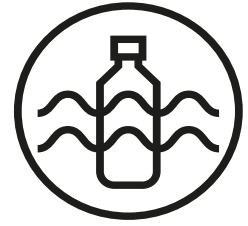
Each square metre of seagrass is capable of absorbing 83grams of carbon per year, and seagrass meadows hold around 15% of the carbon stored in the ocean, even though they make up just 0.1% of the ocean floor.

BUT SEAGRASS MEADOWS ARE UNDER THREAT

We are losing an acre of seagrass habitat every 30 seconds. 29% of seagrass meadows have disappeared over the past 100 years.

At **ROOT ZERO** we will be working on a large-scale seagrass restoration project to help capture carbon dioxide from the atmosphere.





ROOT ZERO PIONEERING PACKAGING

ROOT ZERO PACKAGING IS CERTIFIED 100% PLASTIC-FREE. THE PLASTIC FREE LOGO SHOWS OUR SUPPORT FOR A PLASTIC PLANET'S MISSION TO DRAMATICALLY REDUCE THE USE OF INDESTRUCTIBLE PLASTIC WHICH IS DESTROYING OUR OCEANS, SOILS, AIR AND HEALTH.

The paper is FSC® certified which means it is made from 100% renewable raw materials. By launching **ROOT ZERO** in paper, rather than plastic bags, we are preventing more than 5.5 tonnes of plastic hitting supermarket shelves (based on selling 2.5 million ROOT ZERO bags across the UK).



Innovations in water-based inks and a special adhesive technology makes the paper bag we use completely recyclable – it can be reprocessed back into high quality paper again and again.

And by using this special paper, the bag is not just fully recyclable, but also completely compostable. That means you have options when you've finished with the bag.

1. You can recycle – put it in your recycling along with other paper for collection.¹

2. You can compost at home – add the bag to your garden compost heap and it will harmlessly decompose in about 200–300 days.²

3. You can reuse – our bags are designed to keep vegetables fresh – they're perfect for storing your loose veg like potatoes, carrots and onions. You could even give it another life in your garden and use it for storing bulbs!³

As most councils in the UK can't process compostable packaging in kerbside food waste collections yet, recycling¹ or home composting² are the best options. If neither of those is available, and you live in an area where waste is used to fuel energy generation, the packaging has a high calorific value³ which means it can still be useful even in non-recycled waste.

ROOT ZERO RESPONSIBLY GROWN

THE IMPORTANCE OF BIODIVERSITY

BIODIVERSITY UNDERPINS OUR OWN ABILITY TO THRIVE ON EARTH. AS WELL AS PROVIDING THE FOOD WE EAT AND THE AIR WE BREATHE, WE DEPEND ON IT FOR PROTECTION FROM OTHER THREATS, LIKE POLLUTION, FLOODING AND CLIMATE BREAKDOWN. NATURE IS IN DECLINE AND THE LOSS OF SPECIES AND HABITATS POSES AS MUCH A DANGER TO LIFE ON EARTH AS CLIMATE CHANGE DOES.

There is also a connection between the soil, the climate and the planet.

The soil has the unique ability to sequester (or store) carbon dioxide out of the atmosphere.

Due to its vast scale and its ability to store immense quantities of greenhouse gases, the soil could be the one thing that can balance our climate, replenish fresh water supplies and feed the world.

But when we damage soils, carbon goes back into the atmosphere, and water evaporates. This increases humidity and there is more rainfall as a result. The end result is a changed micro-climate.

If we are doing this over and over across the globe, we eventually also change the macro-climate.

When our soil is healthy, our plants are healthy, our food is healthy, our people are healthy and so is our planet.

At **ROOT ZERO** we are passionate about protecting our precious soil, and by working with Mother Nature's low-tech but genius approach – Photosynthesis – we can begin to put the carbon back into the ground where it belongs.





COVER CROPS

Soil contains over three times the quantity of organic carbon found in vegetation and double that of the atmosphere (IPCC, 2000).

The soil in Pembrokeshire is packed full of nutrients and perfect for growing potatoes.

At **ROOT ZERO** we do everything we can to look after it and keep it healthy.

We plant cover crops to:

- Build up carbon and feed the soil with nutrients. We grow cover crops to enhance the life and function of the soil.
- Sequester carbon – studies estimate that the rate at which cover crops can sequester carbon in agricultural soils is 0.22 tons/acre/year (Ruis and Blanco-Canqui, 2017).
- Provide food and habitat for wildlife and beneficial insects and attract essential pollinators.
- Protect the soil and the precious carbon-rich topsoil during winter months, to prevent soil erosion and water pollution. Cover crops keep the soil temperature cool and provide food for worms and other creatures that aerate and enrich the soil and make it more absorbent.

NURTURING NATURE

— WE NEED —

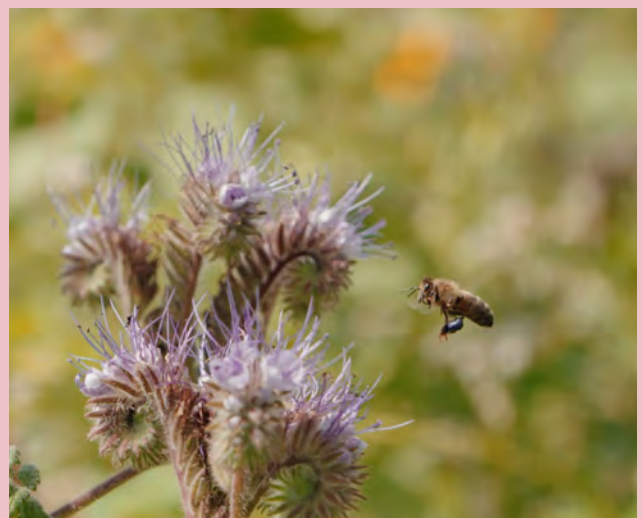
NATURE

AND IT NEEDS US

In 2021 we have planted 150 acres of cover crops – or a whopping 369 football pitches worth of cover crops!! Based on the Ruis and BlancoCanqui 2017 research paper, this represents 33,000kg of carbon dioxide removed from the atmosphere.

We plant several varieties of cover crops to feed the army of micro-organisms underground.

We plant species such as sunflowers, common vetch, linseed, buckwheat, phacelia and berseem clover for the Shril Carder Bee. Phacelia produces an abundance of nectar and pollen which attracts Honeybees and short-tongued Bumblebees such as White Tailed Bumblebees, Buff Tailed Bumblebees along with the Shril Carder Bee.

**COVER CROPS**

HEDGEROWS

Hedgerows come in many shapes and sizes and are one of the special features of our wonderful landscape, especially in Pembrokeshire.

The best hedgerows are thick and broad, with a range of woody species such as hawthorn, blackthorn, small trees, bushes, and honeysuckle. They look like 'mini' woodlands,' and provide natural wildlife corridors, interconnecting thousands of different species for miles and miles. They provide excellent habitats for wildlife while the abundance of berries, nuts and nectar provides nutritious food for our insects, mammals, and birds.

A SINGLE HEDGEROW CAN SUPPORT A HUGE AMOUNT OF LIFE!

Why are hedgerows important?

Our fields are surrounded by wonderful hedgerows. Initially they were created to mark boundaries between neighbours, then to divide land into manageable areas – fields. Our Pembrokeshire hedges are usually an earth bank covered in shrubs, flowers, grasses and trees. That's a whole variety of habitats for so many species. We are now understanding the importance our hedges have in nurturing our crops and animals, wildlife, soil and air.

Hedges aren't new though; they have been a feature of our farmed landscape for hundreds and hundreds of years.

If we look at a hedgerow, and count the number of woody species in a 30-yard stretch, each species will indicate very approximately 100 years in the life of a hedge. So, a hedge surveyed with 7 species in 30 yards will be around 700 years old. Some of our hedges are ancient! Typically, the hedges we see around our crops contain a mix of elder, hazel, ash, ivy, honeysuckle, blackthorn, hawthorn, oak, willow, holly, bramble and dog rose. Occasionally we see crab apple and elm.

If cared for correctly, they can be transformed into a long network of corridors, perfect for wildlife to become better connected. They are vital in providing food, shelter and places to breed for pollinators, birds, reptiles, mammals and much of our favourite farmland wildlife.

Our hedges are useful for insects too – insects that play an essential role in our ecosystems as pollinators, nutrient recyclers and food for other animals. These insects are essential for the future of our planet. They do not need us but we need them.

"If they were to disappear, the world's ecosystems would collapse."

Sir David Attenborough

A planet without insects is not a functioning planet. We really care about them and do lots of things to help them!



HEDGEROWS

POLLINATORS

Many species of bee, moth, butterfly, hoverfly, fly and beetle provide an essential service in the UK for free, pollinating £690 million worth of crops annually.

We have pollinators to thank for every third mouthful we eat; 70% of the world's crops rely on pollination and 85–95% of the UK's insect-pollinated crops rely on wild pollinators.

They're also vital for the survival of other wild plants that support so much of our wildlife too.

There are over 270 species of bees in the UK. There is only 1 species of honey bee, around 250 species of solitary bee, and 24 species of bumblebee.

A **ROOT ZERO** we do lots of things to help them:

- We provide bits of wood and drill holes for them to live, breed and sleep.
- We dig holes and excavate bare earth, exposing south facing hedge banks which mining bees and mason bees can use as a place to nest and live.



SHRILL CARDER BEE

This is a South UK species and one of the smallest species of bumblebee. Sadly, there are just a few clusters of them left in England and Wales. They currently only exist in five isolated areas, with a small cluster in South Pembrokeshire.

They are very particular about what they can eat, and cover crops are hugely important for bumblebees. This is why our Growers are making sure Red Clover is in their mix of cover crops, as this is one of their preferred plants to visit.

We are supporting the Bumblebee Conservation Trust with their critical work for the Shrill Carder Bee, a priority species significant to sustain biodiversity under Section 7 (Environment [Wales] Act 2016). We will help to raise awareness and increase population numbers on our **ROOT ZERO** farms in Pembrokeshire through initiatives such as habitat creation to both increase populations and improve genetic resilience.



BRINGING BACK BARN OWLS

All species need three things in order to survive: somewhere to live, somewhere to feed and somewhere to breed. If one of these key things is taken away then species will decline. Barn Owls have declined by at least 70% in the UK and all of the causes of this decline are man-made.

A survey completed in 2007 found that there were just 66 breeding pairs in Pembrokeshire. At ROOT ZERO we aim to support the population we now have county wide..

They have been struggling for places to breed and feed due to a decrease in derelict barns to breed for nesting, as well as a loss of open grassland for hunting due to changing land use.



WHY DO WE CARE?

A decrease in their numbers is a warning sign that all is not well with the wider environment. It is a warning sign that other wildlife, which depends on these habitats – such as bats, butterflies, insects, and other wildlife – may be under threat too.

Barn Owls are iconic! They're one of Britain's favourite birds and we must do everything we can to encourage them to thrive.

WHAT ARE WE DOING ABOUT IT?

We've recently begun a programme of work, carefully placing 30 Barn Owl boxes across our **ROOT ZERO** farms in Pembrokeshire. For each **ROOT ZERO** farm there will at least be 2 boxes – a place for them to breed and a second home to roost. We hope to place hundreds of boxes in the coming years.

By planting mixed cover crops and managing grass margins we are also providing a great place for them to hunt and feed.

SURVEY

We'll be monitoring the up-take of the Barn Owl boxes and will be collecting information about distribution, numbers and breeding status.

We'll report back on our findings later in the year!

YELLOW HAMMER

The yellow hammer is a farmland bird with the most adorable song, the 'Little-bit-of-bread-and-no-cheese.' They love nothing more than to sit on a hedgerow and chirp away to their hearts content.

They love to eat seeds such as wheat and barley and thrived in the age of the horse, but sadly today there are only remnant populations in Pembrokeshire, and we must put measures in place to protect them.

WHAT ARE WE DOING TO HELP?

We plant an arable crop ('bird seed mix') and leave it to grow over the winter. This creates a habitat and also provides natural food for these birds.

Furthermore, we are placing large feeding stations around our farms, to provide vital winter and spring food. The months of January through to April can often become 'hungry gaps' in the life of a yellow hammer.

The autumn bounty of seeds and fruit are often depleted in late winter. Providing supplementary food for them can not only help them survive the coldest times, but also help them get in great condition as they get ready to nest and breed in April and May.

They will also love our bigger, stronger hedges which are full of song posts and places to hide from predators.

We will count the numbers we have now (along with other farmland bird species), and monitor any changes. This work will further shape the help and management we want to provide.

Our biodiversity work will move with the seasons, after all, the species we are looking to support are all in their own cycle of life.

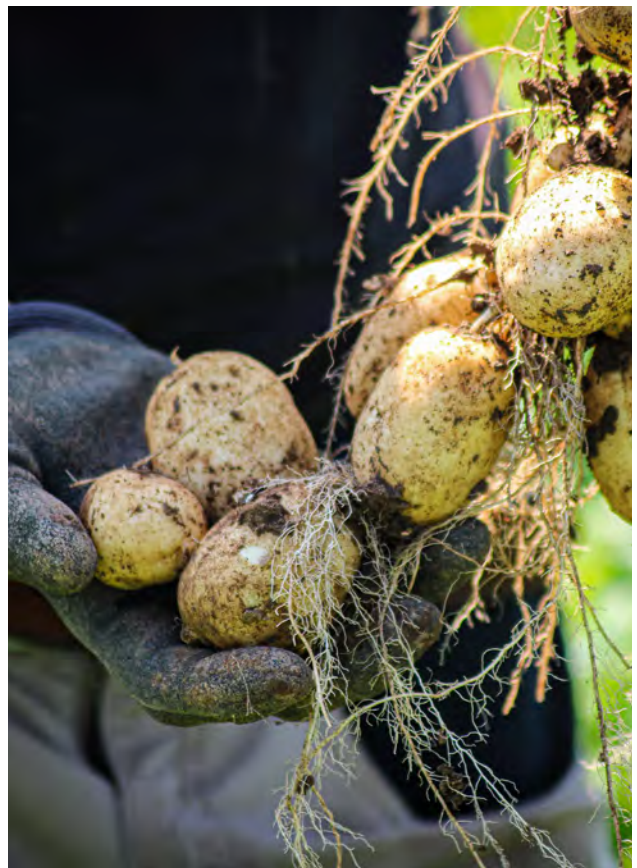




ROOT ZERO SPECTACULAR SPUDS

NOT ONLY DO THEY TASTE DELICIOUS, THEY'RE ALSO
SPECTACULAR IN SO MANY DIFFERENT WAYS!

1. **THEY'VE GOT HISTORY!** 7,000 years' worth to be exact. The humble potato has contributed to the human diet for thousands of years, first in the Andes of South America and are now grown across 80% of the world!
2. **SUPERIOR SPUDS** They contribute key nutrients to your diet including vitamin C, potassium, and dietary fibre and contain a variety of phytonutrients including carotenoids, polyphenols, anthocyanins, and phenolic acids.
3. **SOOO SATISFYING!** They make you fuller much faster than other carbs like rice or pasta because they have a low Glycaemic Index, compared to the equal number of calories from rice or pasta.
4. **SUSTAINABLE SPUDS** can be grown almost anywhere, need less water to grow and use less land per kg of production compared to most other foods. One tonne of potatoes requires only 0.06 ha of land, while rice and wheat require 0.24 and 0.35 ha of land. In other words, potatoes have a much lower carbon footprint and are one of the world's most sustainable foods!
5. **POTATO POWER!!** Originally, the Incas had many other uses for the potato besides consumption. Raw slices were placed on broken bones to promote healing. Potatoes were carried around to prevent rheumatism and also eaten with other foods to prevent other diseases. Other folk remedies consisted of washing the face with cool potato juice to treat facial frostbites. Sunburns were treated by applying raw grated potato or potato juice on the skin. Carrying a potato in the pocket helped toothaches. Sore throats were treated by putting a slice of baked potato in a stocking and tying another around the throat!!
6. Potatoes can grow from sea level up to 4,700 meters above sea level, from southern Chile all the way up to Greenland!
7. **RANDOM POTATO FACT** – potatoes have been grown in space!!



SPECTACULAR SPUDS

ROOT ZERO COMMUNITY

THE FUTURE OF FOOD IS IN OUR HANDS

No-one is too young to make a difference.

We need a wake-up call about the importance of teaching our children about sustainability.

We must educate our children to prepare them to be able to live more sustainable lives.

Our farmers have set aside parcels of land that can be used as an outdoor learning resource for our local schools.

We want to create strong links with our local communities and environment

The **ROOT ZERO COMMUNITY** is creating a generation that genuinely cares about our environment and understands how to grow planet friendly potatoes.

EDUCATION FOCUS

JOHNSTON PRIMARY SCHOOL, HAVERFORDWEST, PEMBROKESHIRE



ROOT ZERO farmer Morgan Scale and **ROOT ZERO** agronomy assistant Jack Davies delivering cover crops and barn owl boxes to Year 4 children at Johnston Primary School.

Some of the projects that we will be helping with in the future:

- Soil testing.
- Farmer visiting/talks.
- Helping to develop their field - planting wildflowers.
- Developing pupils understanding of local businesses.
- Barn Owl boxes.
- **ROOT ZERO** veg patch.
- Solitary bee "houses".
- Hedgerow planting.
- Log piles for insects.
- Hedgehog houses.

**ST MARK'S VA SCHOOL
COMMUNITY GARDEN,
HAVERFORDWEST, PEMBROKESHIRE**

We've supported St. Mark's school by providing a Polytunnel for growing seasonal vegetables, in their Community Garden. The schools' aim is to get all children to learn the skills for planting, growing, harvesting and sustaining these skills for life. Our support and advice will help St. Mark's achieve their goals of enabling the pupils to become cultivators and responsible citizens as they grow up.

We look forward to reporting on their **ROOT ZERO** growing journey!

There's lots more to come here...
watch this space.

**INTRODUCING SOME OF OUR
SPLENDID ROOT ZERO SPUD
GROWERS AND ADVISORS**

Walter Simon
ROOT ZERO FARMER

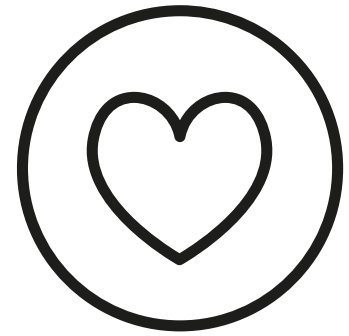


Morgan Scale
ROOT ZERO FARMER



Roger Mathias
**ROOT ZERO ENVIRONMENT AND
BIODIVERSITY ADVISOR**

OUR ROOT ZERO PARTNERS



3KEEL The UK's leading sustainability consultancy committed to making food systems, supply-chains and landscapes fit for the future.



CLIMATE PARTNERS: from carbon footprints and climate action strategies all the way to climate neutral products with the support of international carbon offset projects. Their climate neutral label guarantees transparency and traceability in climate action.



ClimatePartner

A PLASTIC PLANET A Plastic Planet was founded to ignite and inspire the world to turn off the plastic tap. They want to dramatically REDUCE the use of indestructible plastic that is destroying our oceans, our soils, our air and the health of future generations.



BUMBLEBEE CONSERVATION TRUST

Bumblebee Conservation Trust is a registered charity in both England and Wales (No.1115634) and Scotland (Scottish Charity No.SC042830) and a company limited by guarantee in England and Wales (No. 05618710). The Bumblebee Conservation Trust was established because of serious concerns about the 'plight of the bumblebee' Their mission is to increase the number and distribution of bumblebees. A growing number of committed supporters are helping their team of staff make a big difference.

Proudly supporting



LOVE FOOD HATE WASTE: Love Food Hate Waste aims to raise awareness of the need to reduce food waste and help us take action. It shows that by doing some easy practical everyday things in the home we can all waste less food, which will ultimately benefit our purses and the environment too. Love Food Hate Waste is brought to you by WRAP.



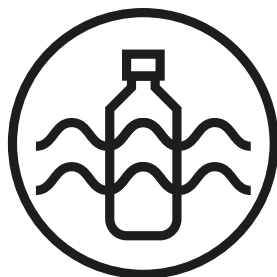
ROOT ZERO

POTATOES WITH PURPOSE

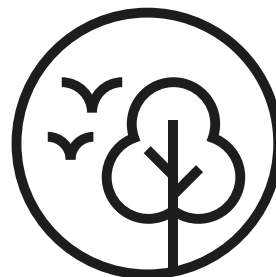
WE ARE THE UK'S FIRST CARBON NEUTRAL FRESH PRODUCE POTATO BRAND. EVERYTHING WE DO IS FOCUSSED ON FIVE KEY PILLARS



**CLIMATE
ACTION**



**PIONEERING
PACKAGING**



**RESPONSIBLY
GROWN**



**SPECTACULAR
SPUDS**



**ROOT ZERO
COMMUNITY**

**"SO WE DON'T HAVE TO MOVE TO MARS"
THANKS FRANNY, AGE 10**

**#PLANETFRIENDLYPOTATOES
ROOT ZERO.CO.UK**



ROOT ZERO.CO.UK