ROYAL AGRICULTURAL SOCIETY of ENGLAND

DECARBONISING UK HORTICULTURAL PRODUCTION

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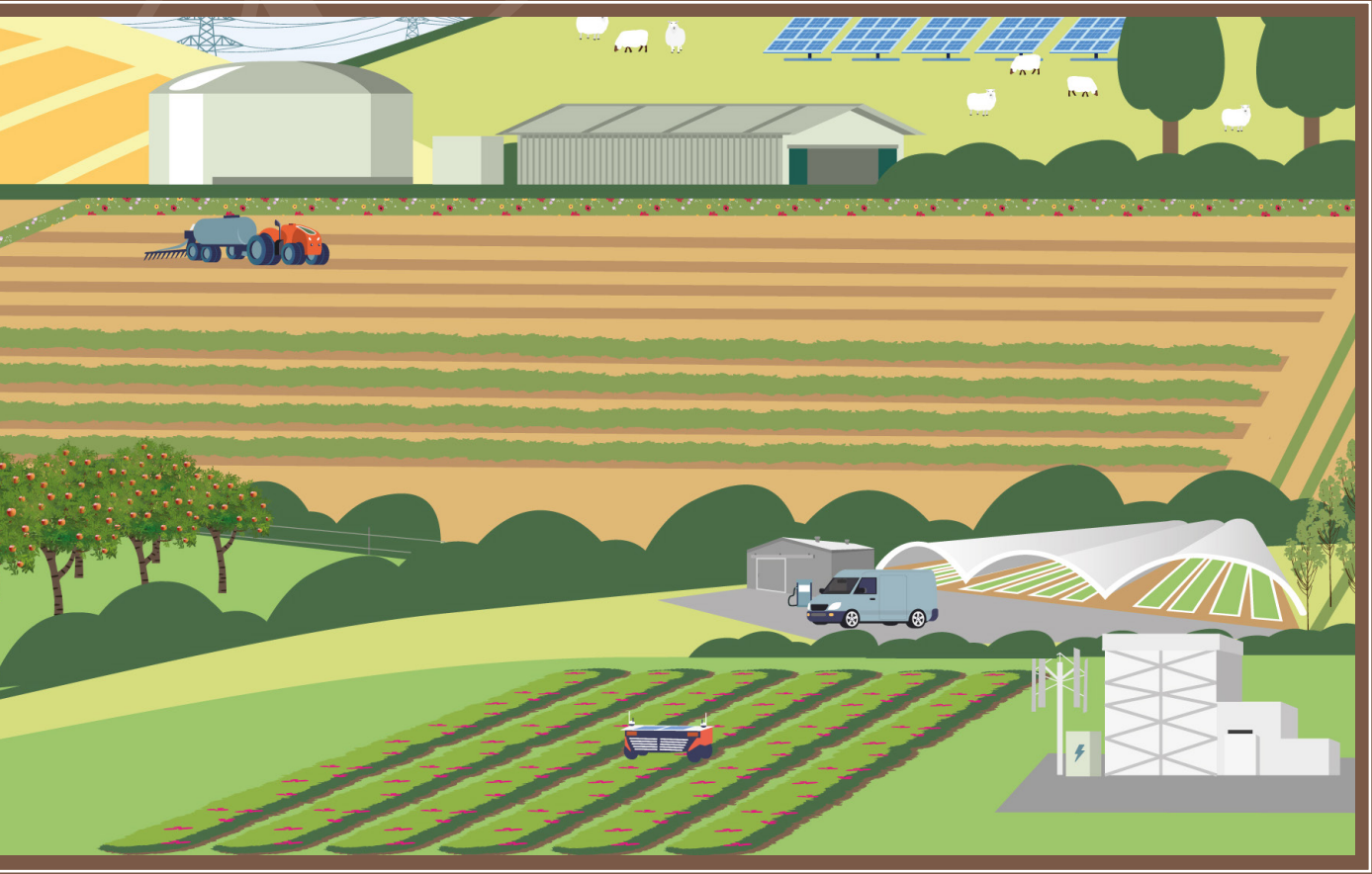

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SUMMARY OF KEY POINTS

1. Farmers and growers are facing increasing pressure from consumers, regulators and retailers to meet sustainability targets. At the same time they will also have to respond to decarbonisation demands from the investors in the businesses that process and manufacture their products.

2. There needs to be increased focus within the horticulture sector both on delivering produce that meets diet changes of consumers and on cutting carbon emissions, with systems being deployed to avoid product waste, reduce use of unnecessary plastics and boost production efficiency. This should encompass sustainability targets to be included in favourable loan syndication agreements.

3. The most greenhouse gas (GHG) intensive elements of the UK fruit and vegetable supply chain are glasshouse heating, transport and refrigeration. Hence, food that is produced, but not consumed, represents unwanted production, processing and distribution emissions.

4. The field and protected horticulture sectors encompass a diverse range of systems, products and processing operations from field horticulture, through to intensive production under glass and innovative systems such as 'vertical' or indoor farming operations. Increasing local production of higher value produce has to be a priority with the transition to a more plant-based diet.

5. Transition leaders in the sector will tend to be the leading commercial farmers (mainly those in the top 25% of UK growers that produce 75% of the output) but efforts to increase local production should be focused on horticultural crops and products that deliver the most environmental gain.

6. Growers across the horticultural sector need confidence in systems used to measure emissions and secure value from in-soil carbon capture. Greater assurance can be provided by more transparent, standardised systems, with commercial incentives to curb emissions and benchmark performance.

7. Support for emissions reduction by growers ought to be combined with better engagement from regulators and planners, to avoid thwarting efforts to decarbonise existing production systems.

8. For smaller farm and horticultural businesses, the scope for R&D investment is limited and it would help them to have access to an industry body able to fund research, plus delivery of best practice and innovative solutions, given that the AHDB will no longer perform this role after 2022.

1. INTRODUCTION

Farmers and growers have a major role in the UK's move to Net Zero. While agriculture contributes 10% of the UK's greenhouse gas (GHG) emissions, the sector also offers significant potential for offsetting emissions through carbon capture, while turning CO_2 into food, fibre and fuel.

According to the UN's Intergovernmental Panel on Climate Change 2021 report[1], food supplies will suffer as global warming reaches the 1.5°C threshold. Hence, food producers have a vested interest in halting climate change and this needs to be reflected in the policy framework post Brexit.

Speaking at the 2021 Festival of Fresh, Defra minister Victoria Prentis said that it is "exciting times for agriculture in this country as we leave CAP after 40 years of receiving money for owning land. We're moving quite quickly...into a system where we provide 'Public Money for Public Goods' ... at the same time, we need to do all we can to produce more food, and those two are not contradictory".

Defra is also looking to increase biodiversity and capture carbon in the soil, but Mrs Prentis accepted that some fruit and vegetable producers are going to be heavily intensive. Increasing the market share of homegrown produce is a focus, based on local and sustainable supply chains.

Horticulture must be fully part of delivering the UK's pledge of reaching zero emissions by 2050 (2045 in Scotland) and the related pre 2030 commitments, including methane reduction. The UK has also committed to reducing carbon emissions by 78% by 2035 and to introduce legally binding targets to restore biodiversity, alongside radical reforms to agricultural subsidies.

Across the horticulture sector, production efficiency and waste avoidance are key to cutting emissions from farms. The sector encompasses a wide range of products and vegetable and fruit productions systems from field horticulture, through to intensive or protected[2] production under plastic and glass and in future more innovative, local systems such as vertical farming.

[1] See Sixth Assessment Report — IPCC\

[2] Protected' horticulture includes a range edible crops such as tomatoes, cucumbers, peppers and baby leaf vegetables, plus soft fruit that is are grown under cover (either in permanent glasshouses or temporary systems like polytunnels.

At COP26, some food was supplied from the Intelligent Growth Solutions (IGS) demonstration vertical farm facility at the James Hutton Institute plant science research centre near Dundee. This is part of plans to position Scotland as an innovative agri-tech leader in developing 'soil-free' farming, where key environmental factors can be fully controlled to optimise plant growth. A number of these innovative production systems are being developed to supply premium crops in Scotland.

Figure 1: Vertical farm

Vertical farming[3] offers reductions in food miles and water wastage, as well as the elimination of the need for pesticides. It also allows produce to be grown locally and on demand, which according to the James Hutton Institute, could reduce fresh food waste by up to 90 per cent.

There is an increased focus on the impact of diet and food choices on public health which should improve opportunities for the sector to meet increasing (health-related) demand for such foods, e.g. grains and 'pulses' (legumes harvested for dried seeds). There will be continued and growing interest in crops like chickpeas, lentils, and dried peas and beans, produced in the UK by companies such as Hodmedods.

The National Farmers Union (NFU) has set the goal of reaching zero greenhouse gas (GHG) emissions across agriculture in England and Wales by 2040, including the horticulture sector - in contribution to the UK's ambition of reaching net zero by 2050.

[3] In vertical farming systems, such as IGS, plants are grown indoors typically using some form of stacked system in a controlled environment (light, temperature, humidity, air). Plants may receive nutrition hydroponically (i.e. grown in water) or water and nutrients can be delivered aeroponically via misting.

2. CUTTING HORTICULTURE'S EMISSIONS

Improved productive efficiency is needed to reduce UK greenhouse gas emissions, enabling farms to produce more or the same quantity of food with fewer inputs, in smarter ways. While farming contributes 10% of the UK's emissions, fruit and vegetable production accounts for circa 2.5% of this and the industry needs to contribute to emissions reduction.

This can include farmland carbon storage, improving land management and changing land use to capture more carbon, plus more hedgerows and woodland and carbon enrichment of soils. Adoption of 'minimum tillage' systems is increasing, although this method is unsuited to field crops like carrots or onions that require alternative crop husbandry techniques - such as using gantry systems.

Other GHG reduction options include boosting renewable energy use and developing the bioeconomy to replace fossil fuels and enhance GHG removal through photosynthesis and carbon capture. NFU evidence[4] suggests that in two decades, efforts under these three 'pillars' could reduce, offset or counterbalance current agricultural emissions of 45.6 Mt CO_{2e}/year.

The NFU surveyed its members in 2020 and found that many have plans to invest in energy efficiency and their Deputy President Stuart Roberts commented, "This potential will never be maximised if a lack of confidence, certainty and opportunity holds British farming back. The industry is facing serious changes and farmers need to know that the government is not only supporting them but investing in levelling up urban and rural areas to provide the same opportunities for rural businesses as those in towns and cities enjoy. Confidence can be boosted by something as simple as ensuring farm businesses have access to efficient broadband which is so crucial for running a modern-day business.

Figure 2: Agroforestry using apple trees

[4] Achieving Net Zero: Farming's 2040 goal, NFU, September 2019

"If more than half of farmers are already preparing to invest in planting trees and improving soil health, just think how much we could achieve if farmers are given confidence ... to invest in their enterprises."

2.1. The horticulture supply chain

The most greenhouse gas intensive elements of the UK fruit and vegetable production and supply chain are the glasshouse and protected crop sectors. However, product processing, transport and refrigeration are also key contributors that need urgent attention.

Waste is also a significant issue - food produced but not consumed represents energy wasted and unnecessary emissions from production, processing and distribution. WRAP (Waste & Resources Action Programme) reported that positive food management behaviours adopted during the Covid lockdown led to a 43% decline in food waste, but as the UK has reopened household food waste is rising again. Waste in the production chain is being reduced but more effort is required.

GHG-intensive fruits and vegetables include air-freighted produce, such as US berries and cherries, African green beans and peas, and pre-prepared salads produced outside Europe plus unseasonal Mediterranean-style produce grown either in heated greenhouses in the UK or under protection (sometimes heated) overseas[5]. Examples of UK grown high emission protected crops include tomatoes, courgettes, aubergines, peppers and salads.

Figure 3: Strawberry robot

The least GHG intensive fruit and vegetables are seasonal field-grown UK produce cultivated without external heating or protection, which are not fragile or easily spoiled. Overseas grown produce that is reasonably robust, cultivated without heating or protection and then transported by sea or short distances by road have a fairly low greenhouse gas intensity.

[5] Fruit and Vegetables & UK Greenhouse Gas Emissions: Exploring the Relationship, Tara Garnett, Centre for Environmental Strategy, University of Surrey, 2008.

While the Covid-19 lockdown generally increased demand for fresh produce, sourcing more UK supplies should be a priority. This required an effective GHG reduction strategy for the supply of fruit and vegetables alongside promotion of the transition to more plant-based diets.

For individual businesses, assessing new markets alongside potential carbon reduction opportunities is essential. Growers also need to avoid actions that undermine productivity, or even lead to more imports. And this will also require change at a retail level and perhaps revisions to their category manager system which ensures year-round supply of produce.

2.2. Production and sector data

Transition in the horticulture sector will be mainly led by the larger commercial growers, primarily the ones that populate the upper quartile (the 25% of UK farms that produce 75% of the output).

The increasing size of the horticulture sector is shown by area under cropping in the UK, as reported annually by Defra[6]. Vegetables and salad, which make up the majority (71%) of the land used for fruit and vegetable production, increased by 3.2% to 118,000 hectares (ha) in 2020.

UK fruit and vegetable output in 2020 required 152,000 ha. Vegetables and salads took 118,000 ha (inc. 40,000 ha of peas and beans), plus orchards 23,000 ha and small fruit (e.g. strawberries) 10,500 ha. Total glasshouse area in 2020 was 2,911 ha, up 3% on 2019.

The value of home-produced vegetables (field and protected vegetables) increased by 10% to £1.7 billion in 2020 (Figure 4). The volume of home production increased by 3% to 2.6 million tonnes (see Figure 4). There was an increase in the value of field vegetables, which rose by 12% to £1.3 billion (£140 million increase) while the value of protected vegetables increased by 4.1% to £350 million (£14 million increase)[7].

[6] Farming Statistics – final crop areas, yields, livestock populations and agricultural workforce at 1 June 2020 United Kingdom, DEFRA, 22 December 2020

[7] Horticulture Statistics 2020, Defra, 20 July 2021.

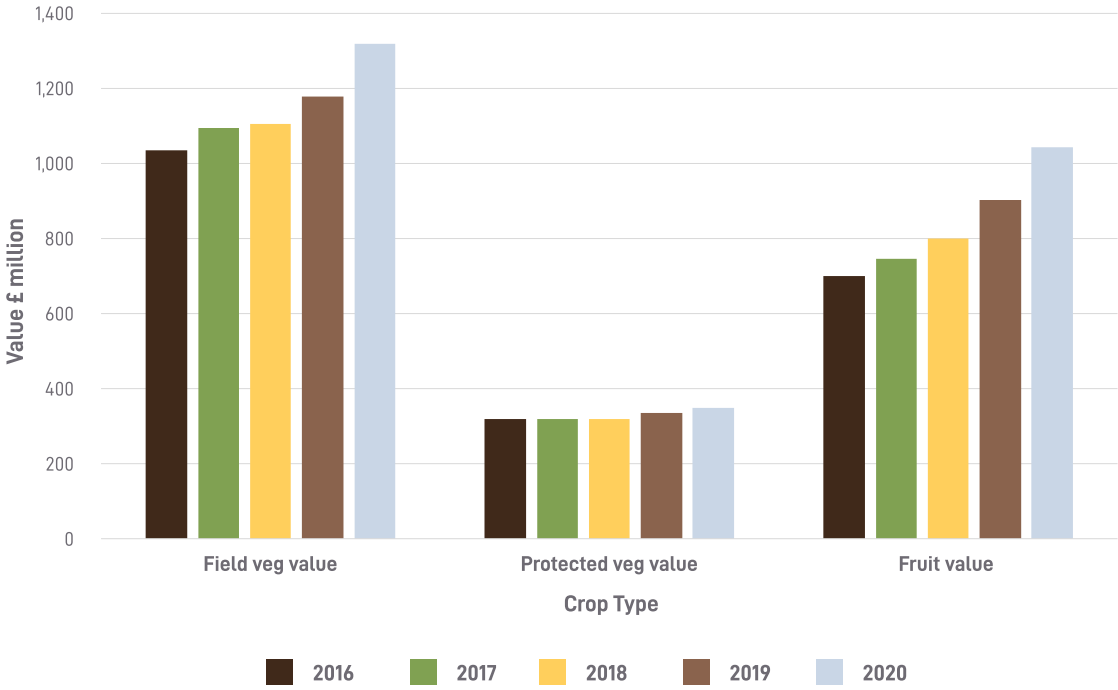

Figure 4: Value of UK fruit and vegetables (£ million). Source: Defra Horticulture Statistics 2020 (provisional 2020 figures)

The value of fruit in 2020 was just over £1 billion for the first time, up 16% (Figure 4), with production volumes falling 4.5% to 657,000 tonnes. The value of fruit grown in the open accounted for the bulk of this at £993 million, a 17% increase, whereas glasshouse fruit decreased by 3.8% to £51 million. Fruit imports cost £3.9 billion in 2020, a 0.9% increase on 2019 with volumes decreasing by 3% at 3.5 million tonnes.

Apple and pear production was worth £231.6 million at the farm-gate in 2019. This represents nearly 84% of the £276 million value of orchard production, which includes plums and cherries, for the same year.

Home vegetable production (field and protected vegetables) increased by 3% to 2.6 million tonnes (Figure 5). Overall supply decreased by 1.4% to 4.7 million tonnes. Imports of vegetables decreased by 7.5% to 2.2 million tonnes and exports also showed a decrease of 25% to 107,000 tonnes. UK production of vegetables contributed to around 56% of the total UK supply in 2020, compared to 53% in 2019.

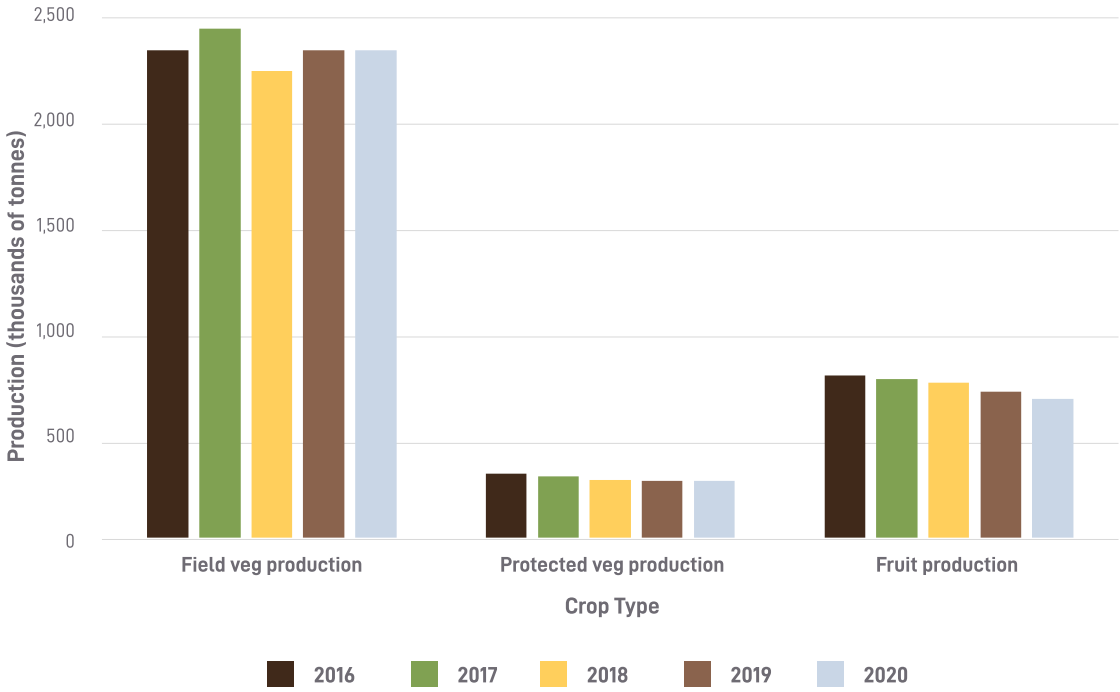

Figure 5: Production of UK fruit and vegetables (000's tonnes). Source: Defra Horticulture Statistics 2020 (provisional 2020 figures)

Home production contributed 16% of the total UK supply of fruit in 2020, remaining similar to 2019. Fruit production fell by 4.5% to 657,000 tonnes (Figure 5). The area total for fresh fruit supply in 2020 fell by 2.8% to 34,000 hectares when compared to 2019.

Vegetable imports include tomatoes, onions and lettuce. Most onion, tomatoes and sweet pepper imports are from Spain, Holland and the Irish Republic. Imported fruit includes bananas (Colombia and Costa Rica), grapes (South Africa and Spain) plus other soft fruit. Efforts to increase local production of imported products should be focused on the crops and products that can deliver the most environmental gain.

Changes in diet and food choices, based on new eating trends and public health concerns, also brings new opportunities for the production of crops like chickpeas or lentils, alongside efforts to exploit new demand for home grown produce and reduce seasonality impacts. Better resource use in a more circular economy can only help avoid product wastage and reduce the usage of single-use plastics.

2.3. Changing market trends

Pressure for dietary change is increasing and this includes the change to vegetable-based diets and reduced meat consumption. Caroline Drummond of LEAF has observed that 66% of the UK population can be categorised as obese or overweight, costing the NHS an estimated £18 bn a year.

She states: "Health experts recommend that fruits and vegetables should make up 50% of our daily food intake, yet they account for just 17% of global agricultural output. This fundamental mismatch between what is being grown and what people should be eating presents a huge opportunity. [People] … want to look good, improve health and have a genuine commitment to the environment. We need to be working with, and inspiring, young people."

Other factors that have affected UK demand for home grown produce by consumers and retailers include issues like 'food miles' and reducing seasonality impacts (also reducing air freight), plus sales campaigns, like the NFU's Back British Farming and Red Tractor schemes. However, a key issue for many growers is access to the seasonal labour they need post Brexit and Covid.

In 2019, the percentage of unemployed, economically active people aged 16 and over was 4.2% in urban settlements and 2.6% in rural areas[8]. Ending the Seasonal Agricultural Workers Scheme (SAWS) in 2013 curtailed the number of EU workers and Brexit in 2020 cut labour supply further[9]. Efforts to recruit British pickers (e.g. Pick for Britain) were largely unsuccessful.

Ending the EU's Common Agricultural Policy (CAP) subsidies is changing mindsets. The Environmental Land Management (ELM) scheme in England (to be fully rolled out by late 2024 - the devolved administrations have their own schemes) replaces the mechanisms previously available under the CAP.

Under the ELM transition, Tier One payments will encourage English farmers to adopt more sustainable farming and forestry practices, while farmers, foresters and land managers in Tier Two focus on delivering locally targeted environmental outcomes. The third tier should pay for larger-scale, transformational projects – such as restoring peatland[10].

[8] Economic Activity: Statistical Digester of Rural England, DEFRA, updated 25th November 20201.
[9] Seasonal Workers Pilot request for information, DEFRA/Home Office, Updated 7 October 2021 update, available at
[10] New details of the flagship Environmental Land Management scheme unveiled by Environment Secretary, Defra Press Office, 25 February 2020, blog.

During the Covid crisis, food security and healthy eating became bigger issues, as cited by reports from the Food Foundation[11] and the National Food Strategy[12] but the industry needs better access to seasonal labour, and this must be addressed by DEFRA.

Post Brexit, with labour issues and increased demand for healthy UK produce, consumer pressure, automation and robotics are often cited as ways to avoid price inflation, increase productivity and combat labour supply shortages. Agritech reports that in Holland 11% of growers are using robots[13].

Improved access to funding is required for investment in cutting emissions. There is concern that loss of the Agriculture and Horticulture Development Board (AHDB) after its levy payers voted for its cessation in February 2021 will impact on research and development. The new funding routes including Industrial Strategy are less focused on the horticulture sector.

Figure 6: Lincoln University robot in strwberry polytunnel

[11] A Crisis Within a Crisis: The Impact of Covid-19 on Household Food Security, The Food Foundation, 01 March 2021.
[12] National Food Strategy Independent Review. The Plan, July 2021.
[13] Use of robots in greenhouse horticulture increasing, Future Farming, 05 December 2019

3. CUTTING HORTICULTURE EMISSIONS WHILE BOOSTING OUTPUT /CUTTING COSTS

Methods to measure emissions need to be better understood by growers across the sector as they devise plans to reduce their emissions, including application of the GHG Protocol[14] to the rural sector.

A company's greenhouse gas emissions are classified into three scopes[15]. Scope 1 and 2 are mandatory, while Scope 3 is voluntary and the hardest to monitor. However, companies succeeding in reporting all three scopes will gain a sustainable competitive advantage.

Traditionally, glasshouse growers have used gas or oil to heat greenhouses. Despite the impact of the 1970s oil crisis, in the 1980's about 90% of growers still heated glasshouses with oil[16], but products such as Channel Island tomatoes or Sussex chrysanthemums were becoming unviable due to Dutch imports powered by cheap gas. At present, for crops produced in conventional glasshouses with a gas boiler, energy costs can be as high as 30% of total variable costs.

In the protected edibles and ornamentals sectors, energy accounts for a high proportion of business variable costs, depending on their fuel, technology used and impact of renewable incentives. The Renewable Heat Incentive (RHI)[17] for on-site bioenergy production (now closed for applications) provides payments over a 20-year period to eligible renewable heat generators (and producers of biomethane).

[14] The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard, Revised Edition, World Business Council for Sustainable Development and World Resources Institute, March 2004

[15] Scope 1 – Direct Emissions from activities of an organisation or under its control, including fuel combustion on site inc. gas boilers, fleet vehicles and air-conditioning leaks. Scope 2 – Indirect Emissions from electricity purchased and used by the organisation. Emissions created during external production of energy eventually used by the organisation. Scope 3 – All other Indirect Emissions from activities of an organisation, from sources it does not own or control including those associated with travel, procurement, waste and water.

[16] Glasshouse Industry (Heating Costs), House of Commons Debate 23 May 1980, Hansard, vol 985 cc903-1

[17] Non-domestic Renewable Heat Incentive

Figure 7: Biomass boiler with feed system

Energy companies such as Eon[18] have commented that the first step for a glasshouse grower is to understand where their energy is being used by carrying out an energy audit and then acting on the data to assess energy use efficiencies and ways to reduce waste energy.

Circa 19% of farm GHG emissions are from heating buildings, including horticulture. Investment in improving heating, ventilation and cooling systems will help, also capturing waste heat. Automation of boilers and lighting systems to cut energy use will also reduce emissions.

Given recent energy price hikes rapid cost savings are needed, including on site electricity generation. Solar panel installations should last in excess of 25 years, and the initial cost can be offset within the first 12-18 years – depending upon future mains electricity prices. Wind and hydro are options and increasingly batteries will be used to store and make use of excess power.

Low carbon energy technologies funded by the RHI included: biomass, heat pumps (ground source, water source, air source), deep geothermal, solar thermal collectors, biomethane, or biogas in combined heat and power (CHP) systems. In 2018, the Office for National Statistics found the largest source of renewable energy consumed in the UK is from biomass - around 7.2 million tonnes of wood pellets, or more than 10% of total UK renewables consumption.

Decarbonising heating and cooling by installing heat pumps, which are more energy efficient than gas or other fossil fuel heating, is an option. They qualified for payments under the RHI prior to its closure in 2021. Existing biomass installations will receive the RHI for the 20-year period under this scheme.

Supported by the RHI, biomass boilers have become more commonplace in nurseries. Wood chip fuel is cheaper than fossil fuel, though fluctuating sourcing of supply and prices can be issues. An example of a business having addressed its Scope 1, 2 and 3 emissions is Herefordshire-based berry and cherry grower, Haygrove. They used 13,986,832 kWh of energy in 2020 compared to 15,247,174 kWh in the previous year, a reduction of 8.3%. The group started to measure Scope 3 carbon emissions in 2020 and has offset Scope 1 and 2 emissions and airfreight of South African fruit by buying carbon credits from gold and Verified Carbon Standard (VCS) projects.

[18] The race to Net Zero: Is your business ready?, Business Green and Eon

Haygrove has bought carbon credits in 2020 and for the next four years but plans to achieve zero-emissions using in-house developed carbon offset projects that will take time to develop. For instance, work is underway to deliver a containerised polythene recycling solution for tunnel customers.

There are several carbon calculators available to help growers calculate their emissions and highlight areas for improvement. A standard, transparent and easy to use system could help growers to reduce emissions and benchmark against others in the sector.

3.1. Further reading

- What is the Difference Between Scope 1, 2, and 3 Emissions?, Compare Your Footprint, 2 November 2018
- "Adopting biomass heating will allow your business big savings and a healthy income", Hortidaily, 3 June 2021
- An introduction to biomass heating for horticulture, AHDB
- The basics of thermal storage for horticulture, AHDB knowledge library
- Nature-based sinks for CO_2 and sources of carbon feedstocks, Oxford Smith School of enterprise and the Environment, May 2021

4. RESOURCE EFFICIENCY AND REDUCED FOSSIL FUEL USE

In recent years, techniques such as regenerative farming, minimum and strip tillage, minimising soil disturbance, maintaining cover crops to retain moisture and widening multi-species crop rotations have been revived and are being followed by hundreds of UK farmers.

ELM funding will help support farmers, encouraging them to adopt environmentally sustainable farming practices and pay for large-scale land transformational projects such as restoring peatland. Peat is the biggest store of carbon in the UK as well as creating 18.5 million tonnes of GHG emissions per year.

Livestock is being reintroduced on cropping farms, as mixed farming makes a comeback, for grazing of cover crops and addition of organic matter. In the recent past, mixed farming was seen as “muddled thinking” but is now back in favour and offers a regenerative impact on soils.

Avoiding use of the plough or power harrow and not requiring fields to look like a billiard table is the future, but improved yields are needed in a competitive marketplace. Farming is in a difficult transition period and growers need to be part of the climate change solution and this includes novel cultivation and harvesting systems.

Figure 8: Gantry system in agriculture

With a more circular use of resources, businesses need to look at their waste products and reduce or re-use them. Plastic is also an issue in horticulture, with packaging the worst culprit. Recyclable packaging for fruit and vegetables is being looked at by more growers including Berry Gardens (see case study).

Berry Gardens CEO Nick Allen commented "We need to look at the integrated supply chain and carbon footprint of the whole rather than individual areas. For example, we focus on having as efficient a transport network as we can, particularly with increased fuel costs." As a business they are working hard to reduce environmental impacts at every level. One area they have made lots of progress on is plastic reduction including use of recyclable films.

Other examples of improved resource efficiency include Dyson Farms, which believes it was the first large-scale commercial farm in Britain to be carbon neutral and has sequestered 300 tonnes more carbon than it released in a year. Advances in tilling technology, drainage and irrigation, and a reduction in use of fertilisers and pesticides, have all contributed to the transition.

Their 11,300-ha farm, in Lincolnshire has two-thirds of turnover from farming, 28% from anaerobic digestion (AD) plants, and the rest from its property portfolio. A generator at the AD plant puts the entire estate effectively off-grid. An AD plant supplies 2 MW of electricity to the farm and the grid. Self-generation of electricity through solar panels and wind turbines are projects underway at growers such as West Sussex-based fresh produce grower Barfoots (see case study). Switching to sea freight with modified atmosphere systems produces 75 times fewer greenhouse gases than air freight.

Barfoots' move towards carbon neutrality began in 2010 with anaerobic digestion. It is a net exporter to the grid. 50,000 tonnes per annum of digestate fertiliser is helping to minimise artificial fertiliser use, which produces 73% of its UK farming emissions. MD Julian Marks commented "Growers, retailers and Government need to work together to get to a point where consumers can make informed choices. We need to create a formal system that gives consumers real insight that they can easily understand."

Figure 9: Digestate fertiliser from anaerobic digestion (fibre portion).

The global market for voluntary offsetting has been growing exponentially for more than a decade. Just 8.8 million tonnes of CO_{2e} were covered in 2006 but, by 2017, the figure stood at 62.7 million tonnes[19]. But the publication of the IPCC's landmark report on global warming in 2018 (The science behind the target for net-zero by 2050) accelerated this trend.

By 2019, NGOs and businesses offering carbon credits were reporting a ten-fold increase in interest from businesses. Some commentators are critical of unregulated carbon offsetting and Barfoots is among growers that have decided to act locally to directly reduce emissions.

Using waste food processing materials to manufacture non-plastic packaging is a successful project at tomato grower APS and this will need to become more widespread. Labelling to help consumers choose climate-friendly products could be helped by retailers and growers creating a system that gives consumers real insight into how products are produced.

For smaller businesses, R&D investment is an issue. Hence, a central agency to research best practice would be desirable. However, the AHDB will no longer perform this role after 2022.

[19] Carbon offsetting: How are businesses avoiding greenwashing on the road to net-zero?, edie, 10 November 2020

5. SYSTEMS CHANGE - INVESTMENT IN TECHNOLOGY, DISSEMINATION AND TRAINING

Commercial glasshouse production of fresh produce requires on-going investment to meet consumer and retailer pressure for more healthy homegrown food. This includes robotics and automation to combat labour shortages post-Brexit and for investment in greener and more efficient systems to cut costs and emissions. There are many examples of UK growers that are investing in decarbonisation and doing so without subsidy.

A standardised measurement system to assess the carbon footprint of the supply chain and support efforts to reduce emissions is required by growers. Without a universally accepted tool, Berry Gardens' Nick Allen has said, "With so many different methodologies, we're in-danger of creating confusion by having too many standards to meet."

5.1. Grower decarbonisation initiatives

According to Angus Davidson, CEO of Haygrove, carbon reduction and environmental protection can be achieved through a combination of government incentives, offsetting and getting nature priced for carbon assimilation (see case study).

He also believes all businesses should be measured using the 'triple bottom line' concept[20], working with Government support for trusted auditing bodies like LEAF to enable land to be priced for its carbon assimilation value. Also, produce that is airfreighted via passenger flights can be important for the social bottom line for the producers from less developed countries.

The UK glasshouse industry has embarked on the road to net zero but is at fairly early stages of the journey. Hi-tech greenhouses offer controlled environment growing conditions that can grow more produce, with fewer inputs and less environmental damage.

[20] Triple bottom line is a business concept that posits firms should commit to measuring their social and environmental impact, in addition to financial performance, rather than solely focusing on generating profit, or the standard "bottom line."

Most multiple retailers have ambitions to source only zero emissions fruit and vegetables from British farms in the next five years. A more supportive and consistent approach from the retail sector could help the transition. National regulators plus local government agencies and planning authorities should also be more supportive of businesses investing in decarbonisation.

The planning and regulatory system needs to be modulated to help facilitate projects such as Oasthouse Ventures, which has built two of the UK's largest greenhouses near Norwich and Bury St. Edmunds. The business has had to change plans on one of its sites after proposals for a heat pump system that will use heat from the local sewage works was turned down by planners (see case study).

The project was based on a low-carbon production concept, providing commercial facilities for the supply of fresh produce, using heat from renewable sources. Heat pumps can use a closed loop system to offtake waste heat from nearby sources, in this case a site owned by Anglian Water. The heat pumps were to have been powered by a new combined heat and power plant, which will also produce carbon dioxide that can be used to assist plant growth.

Andy Allen of Oasthouse warns that if the regulators do not work harder to accommodate new technologies, then investors like him could look outside the UK to develop future projects.

Kent-based Bardsley (see case study) is looking at more mixed farming methods such as introduction of grazing animals to cropland to improve nutrient cycling and to increase the rate of return for organic matter to the soils, along with improving soil fungal and bacterial communities. They would like to see payments for carbon farming and incentives to lock carbon into trees and soils.

They are investing in technologies that provide early warnings on increased disease pressure or early symptoms of disease before they manifest in severe outbreaks. They also expect more focus on and investment in electrification and autonomous vehicles and robotics.

In future, Bardsley plans to recover heat and waste from its packing and storage facilities, exploring the potential to use waste apples and organic matter from farms for its own anaerobic digestion plant.

Improving vegetative diversity through the introduction of cover crops and 'pollinator zones' in the headlands and fallow areas improves habitat and can create wildlife corridors for increased numbers of pollinators leading to better pollination and increased yields.

Reductions in, and more targeted applications of disease control chemicals will reduce tractor passes and reduce fossil fuel emissions. Reduction of fossil-based fertiliser applications (and other synthetic chemicals) reduces their emissions from transport and the manufacturing of chemicals. Regenerative practices that increase soil carbon holding capacity can be combined with incentives for habitat creation, rewarding growers for how they grow along with what they grow.

Perennial horticulture can be used as a mechanism to convert atmospheric carbon into carbon forms that can be stored in the soil. Regen enables better soil health that supports more organic matter in soils increasing carbon storage. The industry needs to pay growers for carbon farming and provide more financial incentive to lock carbon into trees and soils.

5.2. Investment and funding support

The choice of production and energy systems in the next five years will be fundamental to efforts to decarbonise production and Scope 3 emissions for the growers in the produce sector.

Using wind, solar and waste CO_2 cuts fossil fuel use, reducing carbon footprints by up to 75%. In Holland, sustainability financing is becoming more established. Compliance with sustainability criteria is a pre-requisite for accessing agri-bank Rabobank financing. The UK needs to develop comparable funding packages for the agri-food sector.

Koppert Biological Systems supplies pollinators and integrated pest management systems to growers. In 2018, Koppert and Rabobank agreed a set of key performance indicators for which the company received a discount on loan interest, on condition that the targets were met. In 2018, this approach to loan syndication was new but now sustainability financing is common practice and Koppert has a second sustainability financing arrangement. Koppert aims to be zero waste, energy neutral and fossil fuel free, reducing CO_2 emissions by 50% by 2030.

Figure 10: Vertical growing

According to the Centre for International Environmental Law, bio-packaging (e.g. made from seaweed) can reduce CO_2 emissions by 1.9 tons (1.72 tonnes) for every tonne of plastic replaced[21].

The carbon costs of manufacturing and transport can be reduced by more local production, including vertical farming. Vertical farms can also increase output per hectare, cutting water and pesticide use. This can facilitate more urban production, including on rooftops.

[21] Net zero emissions in agriculture, Knowledge Transfer Network (UKRI), 16 November 2020

Technology supplier InFarm has received £3 million in UKRI funding for developing its vertical farming system that produce high value crops with 95% less water, 75% less fertiliser, and zero pesticide use compared to conventional agriculture. Their farms are cloud-connected so can be remotely controlled to manage temperature and climatic conditions.

James Hutton Institute working with Intelligent Growth Solutions has developed a vertical system, where energy consumption can be drastically reduced using LED lighting to mimic the sun.

Some 16.55 million sq. ft. (1.54 million m^3) of indoor farms are now in operation across the globe. However, the Artemis report[22] suggests this figure will increase to 22 million sq. ft. (2.04 million m^3) by 2022. The inclusion of AI and robotics can help deliver 365-day production and also protects crops against pest invasions, and ensures they are well insulated against weather.

Hence, in novel and existing systems, improving efficiency by using big data, precision farming, hyperspectral imaging and artificial intelligence can help farmers and growers to optimise land management and use water, fertilisers, chemicals and fuel more efficiently by generating maps that show nutrient deficiencies, disease infections and pest and weed infestations.

5.3. Consumer and supply chain pressure

Increased pressure on growers to meet sustainability targets from consumers and retailers plus actions of investors (setting sustainability targets) in the businesses that process and manufacture their products, is adding to the drive for a more responsible approach to production of high value crops.

The Courtauld Commitment is leading industry-wide collaborative action towards a 50% absolute reduction in emissions associated with UK food and drink consumption by 2030. Its focus on measuring carbon along the entire food chain and acting on the data is driven by environmental body WRAP (Waste Resources Action Programme). It has brought together over 80 businesses, trade bodies, NGOs and other organisations to set the new GHG targets.

[22] Artemis, Publisher of State of Indoor Farming Report, Launches First Annual Global Ag Report Survey, available at https://www.prweb.com/releases/artemis_publisher_of_state_of_indoor_farming_report_launches_first_annual_global_ag_report_survey/prweb16518911.htm and https://artemisag.com/state-of-indoor-farming-2020/

The commitment now aligns with the wider global target on food waste reduction under the UN's Sustainable Development Goals and to reflect this the agreement has been rebranded 'Courtauld Commitment 2030'. Its primary aspirations and aims are:

Figure 11: Wasted food

1. A 50% absolute reduction in GHG emissions associated with food and drink consumed in the UK by 2030, against a 2015 baseline.
    - A 50% per capita reduction in food waste by 2030 vs the UK 2007 baseline,
    - To achieve sustainable water management (quality and quantity) in the top 20 most important product and ingredient sourcing areas in the UK and overseas – covering 50% of product ingredients deemed 'at risk' from water insecurity.

2. Extending the Courtauld food waste prevention target to 2030, and aligning it with the global target to halve food waste, will mean that:
    - UK food waste should be 800,000 tonnes lower in 2030 compared to 2025, saving food worth £2.4 billion a year by 2030 and the equivalent of 1.9 billion meals,
    - Between 2025 and 2030, the extended food waste target will result in 2,600,000 tonnes (2.6 million tonnes) of food waste being avoided over the five-year period; saving £8 billion of food from being wasted, and the equivalent of 6.2 billion meals.

In line with the Climate Change Committee's (CCC) 6th carbon budget report, roughly 10% of agricultural land in England will need to transition to woodland, restored peat, other semi-natural habitats and energy crops by 2035, as part of the broader UK road to net zero.

The industry can improve soil health by moving away from monoculture, increasing diversity and improving above and below ground habitat. The introduction of grazing animals to cropland improves nutrient cycling and increases the rate of return of organic matter to the soils while improving diversity of the biome within the soils, including fungal and bacterial communities.

In future, ELM support will fund English farmers, growers and land managers to invest in maintaining hedgerows, low-till farming and maintaining new woodlands, plus agroforestry. About 30% of the ELM budget will be focused on the Sustainable Farming Incentive (SFI).

Agroforestry has potential for mitigating emissions[23] providing an opportunity to combine tree planting with horticulture. The British Independent Fruit Growers Association has asked DEFRA to support fruit or nut trees planting to help with upfront costs and the lag time before such new planting is profitable.

[23] Tree cover accounts for 13% of total land use in the UK - storing around 3781 million tonnes, circa eight times the UK's annual emissions. The recommendation from the CCC is to increase this to 17-19%.

6. FUTURE ACTIONS AND STAKEHOLDER EXPECTATIONS

Horticulture can be at the forefront of efforts of the UK land-based industries to reduce their emissions but the sector's diversity (from field crops to urban production) makes it harder to provide a sector-wide template for action.

However, with the sector having been much less reliant on public support under the CAP, it has a reputation for innovation, and this should ensure that it is at the forefront of efforts by farmers and growers to curb their emissions.

To achieve this goal, there needs to be a clear and well-funded sector roadmap that not only considers the role of growers in the wider agri-food system but also focuses on the more energy intensive systems that have been very reliant on fossil fuels. Reducing fossil fuel use must be a priority for all sectors but in particular for protected systems.

While individual practices can be looked at in isolation, there can be advantages with the combination of farming systems, such as integrating field crops with pasture-fed livestock production and agroforestry within the field horticulture sector.

For farmers and growers to contribute to meeting tougher emission targets, measures should be applied across all systems. If done well, on-farm ecological improvements can deliver multiple benefits by mitigating GHG emissions, adapting horticultural systems to the changing climate and increasing productivity. This will involve a range of stakeholders working in collaboration.

However, a note of caution needs to be introduced. British Growers Association CEO Jack Ward has commented that minimum tillage (to reduce soil disturbance and carbon emissions) works for cereals but does not work with existing systems for crops like carrots, onions or vining peas.

He said "We have to look very carefully about what is needed and balance productivity with carbon reduction. We need to be mindful of adopting measures where we do things reducing total production and end up importing the balance."

Increasing local production of higher value fruit, vegetables and herbs, should be a priority as the nation transitions to a more plant-based diet. The sector can expect greater pressure on the industry to replace fossil fuel use with bioenergy and more low emissions systems. Hence, the horticultural industry must develop a low carbon vision that includes increased local production using novel systems like vertical farming and low energy glasshouses alongside carbon sensitive farming.

7. HORTICULTURE CASE STUDIES

7.1. CASE STUDY 1: Oasthouse Ventures

Oasthouse has developed two of the UK's largest glasshouses (in Norwich and Bury St. Edmunds) and they have a 'low carbon farming' concept: with commercial scale facilities using renewable heat. Around 29 hectares of greenhouse space is used for tomatoes, cucumbers and peppers. The units are large enough to contribute to around 12% of the UK's tomato crop. At least 360 permanent jobs have been created.

Their high-tech greenhouses offer controlled environment growing conditions. In doing so, they can grow far more produce, with far fewer inputs, without polluting the environment.

They have plans to install heat pumps to provide heating via a closed loop system to offtake waste heat from nearby Anglian Water treatment facility. The heat pumps are to be powered by a new combined heat and power plant, which will also produce carbon dioxide that can be used for plant growth.

This project would have produced 40% of Welsh tomato demand – but their application was turned down by planners in 2020. However, Andy Allen of Oasthouse hopes it can be revived and has warned that if the Government does not do more to accommodate new technologies in the sector, investors like Oasthouse Ventures will look overseas to develop future projects.

"We are passionate about are low carbon solutions to anything and everything. And horticulture is energy-intensive, and we are determined to look at alternative ways to the best in class at the moment, which is gas CHP. … Our heat pump system which utilises heat from sewage works is one way, but we're working at others, including the utilisation of existing resources, whether they be a waste product or something along those lines, or renewable energy that we can use in horticulture in the UK.

"We think horticulture is a fantastic growth industry. We recognise the benefits and our two projects, which are funded by £120 million of UK pension fund money, invested into the two UK greenhouses, one of which is the largest single block in the UK at 13 ha. They're really high-tech best-in-class projects bringing the best of Dutch innovation to the UK and our intention is to do similar projects here."

7.2. CASE STUDY 2: Berry Gardens

Berry Gardens aim to be industry leading when it comes to carbon neutrality. The recent development of their new packhouse was the first step of that process. They have also recently achieved ISO 14001. Here, 25% of the energy is derived from solar panels and the rest is brought from renewable sources.

CEO Nick Allen comments, "Carbon neutrality and reducing our impact on the environment are a priority across all areas of the business. … It is an area we are calling Responsible Business Conduct" This is an OECD phrase which captures every action, with a view to mitigating the impact on society and the environment in which a business operates, including areas such as employment practices, labour practices, and environmental standards, alongside financial standards.

"When it comes to our growers, we're also working with them to understand the carbon footprint of the supply chain and establish a long-term strategy towards reducing carbon. However, this remains a challenge without a clear universal tool to do this. With so many different methodologies, we're in-danger of creating confusion with too many standards to meet. That said, it feels like our growers are making significant progress in this area. Some growers are making huge investments into solar panels and other environmental practices."

Berry Gardens are looking at integrated supply chains and carbon footprint of the whole system. This includes having as efficient a transport network as possible. They are looking to reduce environmental impact at every level and have made progress on plastic packaging reduction including recyclable films.

7.3. CASE STUDY 3: Barfoots of Botley

West Sussex-based grower Barfoots' efforts towards carbon neutrality began in 2010 with anaerobic digestion to make it a net exporter to the grid. A by-product is 50,000 tonnes of digestate fertiliser, helping to minimise artificial fertiliser use, which produces 73% of its UK farming greenhouse gases. It's not a zero-cost option but is the biggest change farmers can make to go net zero.

Barfoots MD, Julian Marks commented that air freighting is no longer a 'badge of honour' for freshness. Sea freight using modified atmosphere systems is 75 times less productive of greenhouse gases than air freight. Importing by sea freight, from the right place at the right time can have a lower carbon footprint than Barfoots' locally grown produce, grown three miles from its packhouse in West Sussex.

Twenty-five years ago they labelled produce 'airfreighted for freshness'. But airfreight generates up to 75 times more GHGs than sea freight and is less acceptable to a large number of consumers. Positive action without 'offshoring' or offsetting carbon is seen as the best option. Labelling to help consumers choose climate-friendly products could be helped by retailers, growers and Government creating a means of giving consumers real insight into how products are produced.

Julian Marks comments "Growers, retailers and Government need to work together to get to a point where consumers can make informed choices. We need to create a formal system that gives consumers real insight that they can easily understand."

The farming operations have a 2025 zero target. Barfoots is using the Cool Farm Tool and evaluated Trinity Agtech's Sandy in 2021 to monitor carbon - but says no ideal system has been developed. The company is using 'rebranded 18th century techniques' such as regenerative farming, using low and strip tillage, minimising soil disturbance, maintaining cover crops to retain moisture and widening multi-species crop rotations.

Livestock is being reintroduced as mixed farming makes a comeback to allow grazing of cover crops and addition of organic matter. Post WW2, mixed farming meant 'muddled thinking', but it is now back and will have a 'regenerative effect'.

Stopping using the plough or power harrow and not insisting everything looks like a billiard table is the future, but improved yields to meet a 'brutally competitive' marketplace is also important. Farming is in a difficult transition period post-Brexit. More growers want (and need) to be part of the solution.

7.4. CASE STUDY 4: BerryWorld

BerryWorld and its long-standing grower network are proactively working on several initiatives. Their growers are all certified according to the highest food safety, environmental and labour standards including Global Gap, Nurture, Sedex, BRC and LEAF, renewed every year through third-party audits. The company is proud to be working with growers growing in harmony with nature and leading the way towards a more sustainable future for the UK soft fruit sector, with a focus on three key areas:

- Emissions and resources
- Biodiversity and wildlife
- Water sustainability

BerryWorld UK is working towards achieving net zero emissions by 2040 and, within its own operations have already achieved a 20% reduction since 2016. The company has set a framework for measuring carbon and has shared this with its UK grower base to encourage a standardised approach.

Their growers are increasing their use of green energy and are self-sufficient at certain times of the year. The Taskers, one of BerryWorld's growers, are powered 100% by green energy generated through on-site wind turbines, solar power and a biomass boiler. Dearnsdale Fruit has a 100 kWe solar system on the packhouse and transfers heat from cold store units to heat shower water for personnel.

Other sites cover 20-25% of their annual energy needs with green sources and currently, 80% of their growers are zero waste to landfill, whilst remaining growers are on track to achieve this by 2022. BerryWorld growers are making significant strides to protect and encourage biodiversity and wildlife:

- Dearnsdale Fruit have planted 4 ha of wildflower mix in their farm, whilst working closely with consultants for advice on best practice in flora and fauna conservation.
- Starkey's sowed 1.6 ha of their farm astride a public footpath with wildflowers this spring. Cornflowers, poppies, borage etc. flower in the 'bee and butterfly' seed mixture area.
- The Summer Berry Company has a strong commitment to biodiversity, with tree and hedge planting and incorporating wildflowers in fruit fields to encourage insect and bee populations.

BerryWorld are sponsoring three PhD students researching bee sustainability. The objective is to assess behaviour and health of bees in soft fruit crops, whilst finding solutions to support bees all year round.

Figure 12: Wildflower planting for pollinators

The majority of BerryWorld growers are able to capture and store rainfall whilst using efficient irrigation systems, and rainwater from tunnels is reused for irrigation. Additionally, computerised-monitoring systems for irrigation can ensure fruit are only irrigated when required, minimising water usage.

“We are pleased to be working with growers who are committed to growing a sustainable BerryWorld and are continuously looking at ways to minimise impact on the environment. Their determination to continue to improve is what has positioned them as industry leaders today”, says Paul Cole, managing director at BerryWorld UK.

7.5. CASE STUDY 5: Bardsley England

Bardsley, one of the UK's biggest apple growers, is working on supply chain innovation, developing low carbon products and processes, focusing on data-led decisions, along with developing robotics and automation within agriculture and switching to regenerative growing practices[24].

Supply chain innovation and development of low carbon products and processes: Bardsley, with their incubated technology division, Bx Tech, have been investing heavily in their supply chain, focusing on data led decisions, along with developing robotics and automation.

Soil and water management, including pollution prevention and carbon capture: Bardsley have been switching to regenerative growing practices, focused on improving soil health by building up stores of organic matter. Planting different varieties of cover crops between tree rows is improving biodiversity above and below ground. High biomass cover crops are returned to the soil along with tree prunings. This improves soil carbon storage and water holding capacity, reducing run off and nutrient leaching.

[24] ENGIE to help UK fruit producer become 'carbon-negative', Future Net Zero, 7 September 2020

Yield improvement, reducing fossil derived inputs and resource use innovation: Moving away from chemical fertiliser and switching to regen practices may cause initial yield reduction, but the expectation is that improved soil health will translate to better crop health, leading to crops that are more able to naturally fight fungal and pathogenic diseases, decreasing losses and improving yields.

Switching to electric tractors helps to reduce emissions. The company is entering a partnership with US-based Monarch tractors to accelerate adoption of this technology by piloting electric and autonomous tractors. Investment in systems that provide early warning of disease pressure or early symptoms will help get to grips with disease pressure before it is able to manifest in severe outbreaks.

As an industry, there is a need for greater focus on and investment in innovation, electrification and autonomous vehicles and robotics to replace manual and mechanised orchard operations.

Further initiatives being explored by Bardsley include:

- Exploration of autonomous harvesters: FFRobotics and Dogtooth
- A joint partnership with Antobot looking at autonomous robots for yield estimates and scouting (Innovate UK funded project via Agri-EPI Centre)
- Exploration for drone use for yield estimation with Outfield Outfield Technologies – Orchard Management Platform
- Use of drones for estimation of above ground carbon storage with Treeconomy – joint project via the Deloitte Gravity Challenge
- Working with MTC and Boston Dynamics to explore potential for SPOT (a robot dog) for agricultural use including orchard mapping and automated weeding.

7.6. Haygrove - Interview Based Case Study

> It is our generation's job, right now, to give an example to a new era. Horticultural businesses should logically be right in the vanguard of change."

Haygrove, a leading international producer of soft fruit and berries, had a turnover of £106.8 million in 2020. This case study is based on a recent interview of Eccentric Chairman, Angus Davison by Mathew Appleby.

"**Net Zero** is clearly absolutely critical, more than any other activity … having any higher priority seems farcical given what's coming at us so fast. But practically, realistically how do we do it?

Haygrove's journey is based upon a fundamental belief that action required is not complex. There's a solution staring at us. We should change the metrics by which we measure and target business, and define success, to a triple bottom line of planet, people and profit.

What am I saying? That business is the main institution by which we organise ourselves the world over. So just change the way we measure and target it, and reward its managers based upon a more holistic set of criteria that aligns to the needs of people and planet. Which evidently isn't just profit, and profit-related-pay. Pay the world's managers for the result the world wants.

Easy said but change requires leadership. By whom? Tiktok? Celebrities? Government? Business must lead and in particular private business which can take decisions today and enact them tomorrow. Horticulturalists, working in the front trenches of climate change understand the implications intuitively. We get it, and are mostly private businesses. Our industry should be a leading one.

Tunnels going up

And hey, private businesses make up 99% of all business and 2/3 of employment. We could do this. Industry by industry.

So … having decided the 'Why', what has Haygrove practically done?

Like many companies, we have been reducing waste, adding biodiversity, replacing carbon creating

energy sources, and in our case have used carbon offsetting to achieve 'carbon neutral' since December 2019. This is measured as Scopes 1 and 2 - and Scope 3, specifically to include air freight, fertiliser and chemicals.

Haygrove has also invested in trying to help **social issues**. One example led to us winning a World Business and Development award for a fair-trade fruit and vegetable business in Gambia. We support many smaller activities in the UK such as our own Haygrove community gardens charity, and in South Africa where the business community is ironically more advanced than here in these ways. We must do more.

So in a 'Galapogian' way, we visualised, then defined our own extra two bottom lines of environmental and social performance, and slowly developed monthly board reporting. I was recommended John Elkington's triple bottom line theory[25,26] and then discovered B Corp[27] - they are way more developed. Now the world of ESG[28] based finance is moving fast. This isn't a choice, we must do it.

Being critical, our attempt to measure environmental and social performance has been messy and taken many years. We couldn't find a **carbon counting software** tool specialised enough for horticulture, so designed our own, called '**Hortiplanet**'. For a monthly carbon report by team and division, one must input waste, fertiliser and other criteria. It produces a simple use-friendly environmental bottom line 'dashboard'. We are now sharing it, as a non-profit enterprise, with other growers here and abroad.

A word on offsets. I have to say, initially I was sceptical of them as a cop-out, then you realise that you can only put up the number of solar panels that the local transformer allows and can't do any more; you put biomass boilers into all glasshouses, you do the obvious things and dammit there's still a big number.

I've come round to thinking it's extremely positive to put a value on carbon and raise offset demand, because it stimulates exactly what we want to happen – investment in positive carbon activities. So I've been converted to an offset fan, where they are well-certified, and their purchase follows minimisation first. We are now researching starting our own certified in-house offset programme which will likely be land regeneration in the Eastern Cape, to which we will invite others to join.

Waste is a bit of a conundrum. We are responsible for selling a lot of plastic around the world. Some countries don't have recycling industries. So, we're working to resolve a containerised recycling process for our customers without in-country options - a 'must do'!

[25] A Simple Explanation of the Triple Bottom Line | University of Wisconsin
[26] Triple bottom line is a business concept that posits firms should commit to measuring their social and environmental impact, in addition to financial performance, rather than solely focusing on generating profit, or standard "bottom line."
[27] B Lab is a non-profit network transforming the global economy to benefit people, communities and the planet
[28] ESG Investing and Analysis (cfainstitute.org)

Angus and farm supervisor in South Africa

Likewise **air freight** - we fly 2,000 tonnes of fresh berries from South Africa which would rightly make us 'the devil incarnate' - if it weren't for the produce being carried on tourist planes (flying anyway) and 100% offset. How do you account for the life-giving importance of employment to 2,500 people in South Africa and all their dependents, in a post-Covid 44% unemployed reality, and the desperate and dangerous human challenges of that? Imagine!

Berries are backed by South Africa's government, because the crop is so impactful on employment. I am very proud of what Haygrove does there and how we do it. On a Triple Bottom Line (financial, social and environmental performance), South Africa has more potential for a higher triple return on investment (ROI) than the UK.

Biodiversity and water need global accounting too. For decades we actively 'beautified' uncropped land where we farm, which is a recognisable 'Haygrove footprint' often commented upon by visitors.

Our propagation department takes seeds off the hills in Hermanus, South Africa, and has multiplied hundreds of thousands of fynbos plants for almost two decades.

Water is everything! We sell expensive water given that it is 90% of a berry. Thankfully our tunnels are very effective gatherers of today's sudden downpours, if the farm is linked to a reservoir. More and more growers in dry places are installing gutters to capture every drop. Think of Australia - it's obvious.

A more holistic approach has to be the way forward, a base requirement before more 'growth'. American Indians got there far before us. "How can you buy the land, the sea and the air?" Businesses, and in our case farming enterprises, need revolution to push this new era forward - fast, with a clear focus on reducing greenhouse gas emissions, to not 'boil' our grandchildren or perhaps even our children. It's not a choice. It requires relatively simple decisions followed by step-by-step improvement with some painful cash investment. What's the ROI?"