

GrowSave Final Report: 2019-24

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Introduction

Formed in 2006, the GrowSave programme has been in existence for 18 years, but the primary purpose of the programme has remained largely the same throughout that period: to help reduce energy consumption and improve energy efficiency within agriculture and horticulture. The GrowSave programme has always been focused on knowledge dissemination, with regard to energy and efficiency measures. During this current project phase (2019-2024), the GrowSave programme has widened its scope to include work on the Cereals & Oilseeds, Potatoes, Dairy and Pork Sectors, but the focus remained with the Protected Horticulture sector.

The hugely volatile and unprecedented changes in the energy market throughout the entirety of this project phase have been an ongoing feature which has influenced its direction. As ever, energy management remains a key challenge for growers across UK commercial agriculture and horticulture, but particularly within the protected sector. Through the five-year period of this project phase, we have also had a global pandemic with Covid-19, an energy crisis, and AHDB Horticulture wound down which altered the way aspects of the project were managed.

However, despite these additional challenges, energy costs continue to be one of the primary concerns for growers growing protected crops, highlighting the importance of the provision of support in this area and the activity of the GrowSave project. The GrowSave team delivered valuable content on topics across energy to the industry through a range of means, including technical updates, news, workshops, online training courses, study tours and videos.

This report provides an overview of the project activity between 2023-2024, the fifth and final year of the current AHDB-funded programme (2019-2024), and a summary of the activities and deliverables that were contracted over the five years of this contract.

In the 2023-24 GrowSave year we delivered our contracted core delivery. In the eighteenth year of the programme since it was established, the protected horticulture sector was the focus of the programme, with no other sectors involved for this period.

Steering Committee 2019-2024

The GrowSave programme continues to be advised by a steering committee, which represents the various stakeholders. The complementary and diverse mix of people includes project management (AHDB), the technical content delivery (NFU Energy), and industry representation (e.g. growers and business owners), as shown in Table 1 for horticulture delivery. Steering groups in different formations were established for other sectors during the years the GrowSave programme was delivered for them. The steering committees help ensure the programme focuses on topics that are both timely and relevant to the sector.

Regular meetings were held throughout the project. After the first year of the project, mainly due to the Covid-19 pandemic, meetings were moved to Teams, which provided a reliable means of getting good attendance on a bi-monthly basis, by reducing the burden on growers to participate. Meeting minutes are available upon request.

Table 1: Steering Committee for Horticulture

| Sector | Member | Organisation | Role |
|--------------------------|-------------------|-----------------------------|--------------------------|
| Management | Debbie Wilson | AHDB | Project oversight |
| | Nathalie Key | NFU Energy | Content delivery manager |
| | Eirinn Rusbridge | NFU Energy | Technical lead |
| Industry steering | Sandy Booth | New Forest Fruit | Industry representative |
| | James Broekhuizen | Anchor Nurseries | Industry representative |
| | Andrew Fuller | Neame Lea | Industry representative |
| | Richard Harnden | Berry Gardens | Industry representative |
| | Roly Holt | R&L Holt | Industry representative |
| | Phil Morley | Tomato Growers' Association | Industry representative |
| | Matthew Simon | Glinwell PLC | Industry representative |
| | Neil Stevenson | Double H Nurseries | Industry representative |

Management Teams

The management team (see Table 2) oversaw the running of the programme from an overarching and holistic viewpoint, ensuring themes are relevant and aligned to AHDB's goals and the industry. Nathalie Key has been the project manager from the NFU Energy side since April 2023, alongside Eirinn Rusbridge as the Technical Lead since August 2023. Eirinn has had key oversight on the project prior to this, with responsibility for writing most of the technical content in recent years, but he has since taken on the lead role from Jon Swain, who led this project phase from 2019. Debbie Rosa has had AHDB Horticulture project oversight from April 2023.

Other management teams were called on from AHDB to have oversight of the work delivered for the Dairy, Pork, Cereals and Oilseeds, and Potatoes sectors in the first two years of this project phase.

Table 2: Management Team

| Member | Organisation | Role |
|------------------|-------------------|-------------------------------------|
| Nathalie Key | NFU Energy | Content delivery manager |
| Eirinn Rusbridge | NFU Energy | Content delivery and technical lead |
| Debbie Wilson | AHDB Horticulture | Project oversight |

Summary of project delivery 2019-2023

The GrowSave project contracted content is delivered in multiple ways to appeal to a broad audience and improve engagement with energy topics. Information typically falls into two categories:

1. Technical reference material, delivered as technical updates, articles and workshops.
2. News delivered as blogs, energy market updates, sector publications and conferences.

A brief summary of the information and events that were delivered between 2019-2023 follows.

September 2019 – August 2020

This was the first year of the new project contract, and, with the inclusion of other sectors (Cereals & Oilseeds, Potatoes, Dairy and Pork) in GrowSave delivery for the first time, the first quarter was spent establishing committees, managing contracts and establishing relationships with relevant key personnel involved in the project. With some limited interruption to delivery due to the Covid-19 pandemic, the project was otherwise delivered as planned.

Horticulture

Focusing the horticulture side of the project on Protected Edibles, Protected Ornamentals and Soft Fruit sectors (following the implementation of SF into the programme for the first time in 2018), delivery was as follows:

Table 3: Horticulture 2019-2020 content delivery

| Contracted Activity | Content | Delivered | |
|----------------------------------|---------------------|---|---------------------|
| AHDB's The Grower Article | Spring 2020 | The Impact of GrowSave | |
| | Summer 2020 | Air Movement research | 11/02/2020 |
| | Autumn 2020 | Climate Change Levy | |
| GrowSave News | Winter 2019 | SECR; CO ₂ from Biomass; Future Plans for GrowSave; Events | 26/01/2020 |
| | Summer 2020 | Net Zero; What's Next for Renewables; Fuel Summary; Energy Market Update | 31/05/2020 |
| | Autumn 2020 | Effect of COVID19 on Energy Prices; Green Recovery; Low Carbon Farming Case Study | 31/07/2020 |
| Technical Update | 1 | Net Zero Greenhouse | 28/05/2020 |
| | 2 | Heat networks Part 1 | 31/07/2020 |
| | 3 | Heat networks Part 2 | 31/07/2020 |
| Events | Training workshop 1 | | Deferred to 2020-21 |
| | Training workshop 2 | | Deferred to 2020-21 |
| | CGA | Conference presentation | 09/10/2019 |
| | BPOA | Conference presentation | 22/11/2019 |
| Other | Video | Air Movement (no. / length / topic) | 12/10/2019 |
| | Study Tour | CO ₂ – UK & overseas | Deferred to 2020-21 |

Dairy

In starting the current contract with the inclusion of the Dairy sector it was agreed that a 'state of the nation' report was required to look at the issues affecting the use of energy within the dairy farming sector, the current and future challenges and the impact of upcoming new technologies. This was delivered in the form of a Technology Review which also serves to define further pertinent GrowSave activity.

Table 4: Dairy 2019-2020 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|----------------------|---|------------|
| Events | Dairy Tech | Event attendance | 05/02/2020 |
| Publications | Technological Review | A round up of the current marketplace and issues affecting the sector in terms of energy and efficiency | 06/08/2020 |
| | All Things Dairy | Summary of Technological Review | 30/06/2020 |
| | Technical Update | Milk Cooling factsheet | 13/08/2020 |

Pork

As per Dairy, in starting the current contract with the inclusion of the Pork sector it was agreed that a ‘state of the nation’ report was required to look at the issues affecting the use of energy within the pork sector, the current and future challenges and the impact of upcoming new technologies. This was delivered in the form of a Technology Review which also serves to define further pertinent GrowSave activity.

Table 5: Pork 2019-2020 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|------------------------|---|-------------------|
| Publications | Technological Review | A round up of the current marketplace and issues affecting the sector in terms of energy and efficiency | 23/06/2020 |
| | Pig World December 19 | Growsave now inclusive of AHDB Pork | 11/2019 |
| | Pig World April 20 | Technology review update | 18/03/2020 |
| Events | Pig & Poultry | Event attendance | Replaced as below |
| | Slurry cooling webinar | Online content delivery via webinar | 11/08/2020 |

Potatoes

Having a background in Potatoes Sector materials and research delivery meant that it was less needed to produce a technology review as per the previous two sectors, in addition a steering group was not formed initially, with Adrian Cunningham from SBCSR taking the lead in defining work. The work agreed was to support the change in legislation with respect to CIPC with positive energy benefits and impacts.

Table 6: Potatoes 2019-2020 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|-----------------------|--|------------------|
| Events | British Potato | Event attendance | 20/11/2019 |
| | Agronomist Conference | Presentation | |
| | Potatoes in Practice | | 13/08/2020 |
| Publications | Technical Article | Tips for Creating a Well-sealed and Energy Efficient Store | 08/08/2020 |
| | Technical Update | Optimising Crop Storage without CIPC | Not yet outlined |
| | Technical Update | Air Leakage & Control | In production |

Cereals & Oilseeds

A similar technology review was planned for Cereals & Oilseeds, with delivery delayed to the early stages of the following contract year:

Table 7: C&O 2019-2020 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|----------------------|---|------------|
| Events | Cereals | Online attendance | 10/06/2020 |
| | Grain Outlook | Technical article | incomplete |
| Publications | Technological Review | A round up of the current marketplace and issues affecting the sector in terms of energy and efficiency | 31/05/2021 |

September 2020 – August 2021

During the 2020-21 GrowSave year the effects of the Covid-19 pandemic were felt strongly, with options for in-person training events, workshops and study tours completely stalled. However, despite these challenges, the GrowSave programme was adapted and delivered, and the team developed online [training courses](#), videos and participated in webinars.

The biggest setback of the year was the news of AHDB’s winding down of activities in the Horticulture and Potatoes sectors in response to the members’ ballot and subsequent decision by Defra. This has had a marked impact on the activity in this contract year, both through the uncertainty caused and the lost appetite for continued work shown by some sectors.

Horticulture

With the continued involvement of Protected Edibles (PE), Protected Ornamentals (PO) and Soft Fruit (SF), the GrowSave content was structured through engagement with industry, the steering committee, individual representatives and commercial awareness. A summary of the content delivered in 2020-21 is shown below.

Table 8: Horticulture 2020-2021 content delivery

| Contracted Activity | | Content | Delivered |
|-------------------------|--|---|------------|
| GrowSave News | | Changes to RHI, Energy Efficiency & Energy Market News | April 2021 |
| | | Future heating, Geothermal, Circular Economy & Heat Pumps in Horticulture | June 2021 |
| Technical Update | 1 | Energy Market | March 2021 |
| | 2 | Electrification of Heat | May 2021 |
| | 3 | Air Movement | In review |
| Events | TGA Conference | | 24/09/2020 |
| | CGA Conference | | Postponed |
| | Soft Fruit Technical Conference | | 18/11/2020 |
| | Net Zero Webinar | Carbon Footprinting | 28/01/2021 |
| | BPOA Technical Meeting | | 23/02/2021 |
| Other | Online Training Portal (Thinkific) | 1. Basic Humidity Control 2. Horticulture Luminaire Calculator | 30/06/2021 |

Dairy

The programme of work continued with the Dairy Sector from the previous year, including producing online content for the sector, as well as a webinar, and is summarised below.

Table 9: Dairy 2020-2021 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|---------------------|--|------------|
| Events | Rhual Dairy Webinar | Reducing dairy electricity costs | 17/03/2021 |
| Publications | Webpages | Renewable energy opportunities for dairy farmers. Introduction to electricity use & management on dairy farms. Energy efficient use of equipment on dairy farms. | 05/07/2021 |
| | | Energy efficient milk cooling. Energy efficient refrigeration. Energy efficient water heating on dairy farms | |
| | Dairy Lighting | Technical content | 18/08/2021 |

Pork

Following the conclusion of work carried out in 2019-20, the Pork sector did not commit to any GrowSave work, meaning there were no contracted activities in this year.

Potatoes

The winding up of AHDB Potatoes operations meant the proposed steering committee was not formed and further work has not been scheduled. It was agreed to finish the work already committed for this year, summarised below.

Table 10: Potatoes 2020-2021 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|------------------------------|---|------------|
| Events | AHDB Conference | | Cancelled |
| | Storage Technical Discussion | | 25/01/2021 |
| | Webinar | Net zero energy strategy for potato storage | 01/06/2021 |
| Publications | Technical Article | Air Leakage & Control | |
| | ROI Calculator | Update of financial calculator for potato store operating costs | 26/08/2021 |

Cereals and Oilseeds

Year 1 work (2019-2020) was restarted this year and the technology review on grain storage and drying, was completed.

Table 11: C&O 2020-2021 content delivery

| Contracted Activity | | Content | Delivered |
|---------------------|----------------------|--|------------|
| Publications | Technological Review | A round up of the current marketplace and issues affecting the sector in terms of energy and efficiency for grain storage and drying | 31/05/2021 |

September 2021 – August 2022

In the 2021-22 GrowSave year core activity was delivered. The wind down of AHDB’s activity for potatoes and horticulture and the review of the other sectors meant that Horticulture was the only sector to participate in the programme for the whole period, and Dairy had a 3 month participation to finish off work from the previous year. The bigger effect on growers however was the hugely volatile and unprecedented changes in the energy market, especially with regard to energy costs, culminating in government intervention to shore up energy exposure for UK business, which was announced towards the end of summer 2022. This highlighted the importance of the activity of the GrowSave team in delivering valuable content to the industry.

One of the major projects undertaken by the GrowSave team in the third year was the rebuild (under NFU Energy control) of www.growsave.co.uk. This was contracted additionally to the main programme but fell under the auspices of the same management and team to deliver.

Horticulture content delivery

To deliver content to growers in a more effective manner, opportunities were taken to provide updates to, and to meet with, grower groups, including British Herbs, British Protected Ornamentals

Association (BPOA), Tomato Growers’ Association (TGA), Cucumber Growers’ Association (CGA) and others.

The Steering Group decided that this year should tackle the two key themes facing protected cropping – heating and CO₂. The content delivery reflects this.

Table 12: Horticulture 2021-2022 content delivery

| | | Content | Delivered |
|---|--|---|--------------|
| ‘Extra’ Industry representation | British Herbs | Energy Update | March 2022 |
| | TGA Tech Committee | Energy Update | March 2022 |
| | Growsave SG | Energy Market update from our trading team | June 2022 |
| Technical Updates and articles | 1 | Vertical Farming | May 2022 |
| | 2 | Low GWP and High Temp heat pumps | May 2022 |
| | 3 | Energy Market updates and Innovate projects update | March 2022 |
| Events | CGA Conference | Moving towards Net Zero - presentation | October 2021 |
| | Grower workshop | The Future of heat and CO ₂ for Protected horticulture | October 2021 |
| | BPOA Technical Meeting (online) | Energy session | January 2022 |
| | Online Training Portal (Thinkific) | Air Movement | August 2022 |
| | Study Tour | Alternative CO ₂ sources | March 2022 |
| Other – link with Innovate project | Study tour – Visits to the Netherlands and Switzerland looking at alternative heat sources | | March 2022 |
| | Industry exhibition GreenTech , Netherlands | | April 2022 |
| | Industry Exhibition Fruit Logistica, Berlin | | June 2022 |

Study tour

In March 2021 a study tour was organised looking at alternative sources of CO₂ in Horticulture. A small contingent of growers and industry reps were in attendance to:

- Site visit to Springvale Farm Anaerobic Digestion (AD) plant to hear about direct capture of CO₂ from biogas
- Presentation from Future Biogas on their plans to widely capture CO₂ and sequester it
- Presentation from an American company – Direct Air Capture, about how to capture CO₂ from fresh air
- Visit to Drax power station to hear about their plans for Amine scrubbing from the biomass flue gas to recover the CO₂.

In addition, two key industry exhibitions were attended:

- Greentech at the Amsterdam RAI in March 2022
- Fruit Logistica in April 2022 in Berlin.

All the events and visits conducted have been directly related to the theme for this year and the information obtained used in the preparation of materials, discussions with growers and presentation at events, throughout the second year and into the third GrowSave year (22-23).

Online Training

Following on from the creation of the online training platform in the 2020-2021 contract year GrowSave added modules on basic air movement.

September 2022 – August 2023

In the 2022-23 GrowSave year, core delivery was met. In the seventeenth of the programme and the fourth within the current five-year contract, delivery for Horticulture was the focus of the programme and no other sectors were involved in the programme for this period. Hugely volatile and unprecedented changes in the energy market continued on from the previous year and remained a key challenge for growers across UK commercial horticulture, but particularly within the protected sector. Energy costs were one of the primary concerns for protected crop growers, highlighting the importance of provision of support in this area.

Horticulture content delivery

As part of the AHDB Horticulture wind down, The Grower magazine initially reduced the number of issues delivered, before halting production completely, thus removing this as an option for an outlet for contracted GrowSave News and any additional delivery of articles in that magazine. The built-in flexibility of the GrowSave programme allowed the team to replace this delivery with different content via growsave.co.uk:

- Blogs – short pieces in response to key news in energy relevant to the sector
- Topic articles – 600-800 word articles highlighting key topic areas of interest (these can be explored further via in-depth technical articles if agreed)
- Energy Market Updates – monthly news.

In addition to contracted delivery, we also made the most of opportunities to write articles for newsletters and speak at other meetings and events to share energy information with the industry and improve the awareness of and access to GrowSave resources. This has included including British Herbs, British Protected Ornamentals Association (BPOA), Tomato Growers' Association (TGA), the Cucumber Growers' Association (CGA) etc, and articles in The Greenhouse Grower.

Table 13: Horticulture 2022-2023 content delivery

| | Forum/topic | Content | Date |
|--|---|--|---------------------|
| Additional industry interaction | TGA Tech Committee | Energy Update | March 2023 |
| | CGA Tech Committee | Energy Update | March 2023 |
| | British Herbs | GrowSave update and links in grower newsletter | August 2023 |
| | NFU Horticulture magazine | GrowSave overview and key highlights article | August 2023 |
| Technical Updates | Five alternative sources of CO ₂ Series in three parts | 1. Biomass | June 2023 |
| | | 2. Chemical | June 2023 |
| | | 3. Direct capture | August 2023 |
| Topic articles | 1 | Agrivoltaics | January 2023 |
| | 2 | Climate Change Levy Scheme | May 2023 |
| | 3 | Energy Bill Discount Scheme | May 2023 |
| | 4 | Floating Solar | July 2023 |
| | 5 | Glasshouse Heat Recovery | August 2023 |
| | 6 | Energy Efficiency in Glasshouses – summary of workshop events | August 2023 |
| Blogs | 1 | Air movement in Greenhouses – online course | November 2022 |
| | 2 | Conference season round-up | December 2022 |
| | 3 | Anaerobic digestion: what can it do for you? | April 2023 |
| | 4 | Have your say on the Green Gas Support Scheme | May 2023 |
| | 5 | Six reasons you should join the CCL scheme | August 2023 |
| Energy Market Updates | 12 monthly updates | | Throughout the year |
| Events | TGA Conference | Energy outlook for the future | September 2022 |
| | CGA Conference | Supplementing CO ₂ – the options | October 2022 |
| | Soft fruit growers event | Energy outlook | November 2022 |
| | Poinsettia growers event | Energy outlook | November 2022 |
| | British Herbs Association event | Energy outlook | March 2023 |
| | Grower Workshop | Energy Efficiency in Glasshouses + tour Clockhouse Farm water source heat pump | April 2023 |
| | Grower Workshop | Energy Efficiency in Glasshouses + tour of Dyson Farming AD plant and glasshouse | July 2023 |
| Other | Industry awareness | Greentech exhibition – Netherlands (CO ₂ direct capture) | June 2023 |

Events

As well as attending multiple industry events and conferences across the protected cropping sector, highlighting key energy updates and outlook for the industry as outlined above, we also delivered two interactive grower workshops on the 4th April and 11th July 2023 respectively. The workshops covered the same topics but took place in a Southern and Northern location to improve access to growers in different parts of the country, combined with local site visits. They covered the following topics:

- Basics of Energy Efficiency – delivered by Eirinn Rusbridge (NFU Energy)
- Glasshouse heating systems and improving their energy efficiency – Dan & Matt Blood (Ebtech)
- Ways to improve glasshouse energy efficiency – David Summerfield (Bridge Greenhouses)
- How and why to conduct an energy audit – Eirinn Rusbridge

Online training

The online training platform, created in 2021, contains modules on humidity control, air movement and lighting calculators. These have not been further developed in 2022-2023 contract year.

<https://ahdbgrowsavetraining.thinkific.com/collections>.

Project content delivery 2023-2024

The delivery of work for the 2023-24 project year was proportional to contracted delivery. As ever, the delivery plan has built in flexibility to respond to changes in the market and topics that arise which need to be addressed. Most content was delivered online via the GrowSave website.

The aim is to keep the website fresh and updated with news-type content, sharing 2 new pieces of content per month – an energy market update combined with a blog or topic article.

In addition to contracted delivery, we also made the most of opportunities to write articles for newsletters and speak at other meetings and events to share energy information with the industry and improve the awareness of, and access to GrowSave resources. This has included the British Ornamentals Association (BOA), British Tomato Growers' Association (TGA), the Cucumber and Pepper Growers' Association (CPGA) etc and articles in The Greenhouse Grower.

Table 14: Horticulture 2023-2024 content delivery

| | Number | Content | Date delivered |
|--|--|---|---------------------|
| Technical Updates | 1 | Carbon footprinting – scope 3 focus | December 2023 |
| | 2 | Agrivoltaics in depth | June 2024 |
| | 3 | Alternative materials in glasshouses | August 2024 |
| Topic articles | 1 | Conducting an energy audit | September 2023 |
| | 2 | Screens update | November 2023 |
| | 3 | Small wind turbines on horticultural sites | January 2024 |
| | 4 | Study tour round up | April 2024 |
| | 5 | Dehumidification update | May 2024 |
| | 6 | Carbon calculator assessment for horticulture | August 2024 |
| Blogs | 1 | Post-RHI renewable heat opportunities | October 2023 |
| | 2 | Netherlands study tour promotion | December 2023 |
| | 3 | Horticulture & IETF | December 2023 |
| | 4 | EV charging on horticultural sites | January 2024 |
| | 5 | Non-commodity costs levied on electricity moving on to gas - how that would affect spark spread | February 2024 |
| | 6 | Aqueous CO2 distribution | April 2024 |
| | 7 | District eating project update / colocation for PE | August 2024 |
| Energy Market Updates | | 12 monthly updates | Throughout the year |
| Events | BTGA Conference | Energy and CO ₂ outlook | September 2023 |
| | CPGA Conference | Energy and CO ₂ outlook | October 2023 |
| | Horticulture Trades Association energy event | Managing energy efficiency in glasshouses | December 2023 |
| | BPOA conference | Managing energy efficiency in greenhouses: the challenges and opportunities in heating and renewables | January 2024 |
| | Study Tour | Energy innovation in the Netherlands | March 2024 |
| Additional Industry interaction | BTGA Tech Committee | Energy Update | March 2024 |
| | CPGA Tech Committee | Energy Update | March 2024 |
| | BTGA Tech Committee | Energy Update | June 2024 |

| | Number | Content | Date delivered |
|--------------|---------------------------------------|------------------------------------|----------------|
| | Commercial Greenhouse grower magazine | Greenhouse heating | June 2024 |
| | Commercial Greenhouse grower magazine | Heat pumps | July 2024 |
| Other | Industry awareness | Greentech exhibition – Netherlands | June 2024 |

Event round-up

As well as attending multiple industry events and conferences across the protected cropping sector, highlighting key energy updates and outlook for the industry as outlined above, we also delivered a Study Tour to the Netherlands in March 2024. We had 17 growers in attendance from across the Protected Cropping Sector alongside 3 industry colleagues in the Greenhouse industry. The focus of the tour was all things energy – efficiency, sustainability, new technology and innovation. We visited the following sites:

1. Mol Freesia in North Holland: A Solar Thermal Glasshouse
 - 1.5ha field-mounted solar panels (7.8MW) to manage heat requirements of 4ha crop via heat pump
 - Use under and overground tanks for day-to-day storage, but also have boreholes
 - Made possible by government grant. 3m Euro on panels, ~1m Euro energy centre
 - Next Generation Growing/Plant Empowerment practices, LED lighting throughout, water capture and recycling
 - Still have a CHP (gas contract), runs for export, all generated heat apparently destroyed.
 - Interested in wind turbine but planning an issue. May increase solar PV area for business expansion.

2. DES B.V.: Biomass boiler with CO₂ scrubber
 - 3 growers, 23ha crop (tomatoes and aubergines), shared ~8MW biomass boiler for heating baseload, with CO₂ capture -2.2 tons per hour (Natural gas used for peaking)
 - 50t/day fuel, 55-60% target moisture levels.
 - Heat produced shared between glasshouses and CO₂ scrubber
 - Total cost 9m Euro to install whole system
 - Viable model for large production area, but technology not scalable currently.

3. Signify: GrowWise lighting Centre
 - Trialling and demonstrating optimal LED lighting recipes (intensity and spectrum) for indoor crops to grow “better plants faster, more reliably and sustainably”
 - Specialise in recipes to align to grower priorities –i.e. growth speed/taste/yield etc
 - Signify equivalent LEDs are 2x as efficient as old 600W HPS grow lights
 - Light recipe fine-tuning to integrate with electricity spend to curtail lights during expensive hours

4. Botany: carry out greenhouse trials for themselves, different companies and growers
 - 30-week tomato trial – “energy-efficient year-round production with 40% less heat input” –dimmable energy-efficient LEDs, active dehumidification, double screens, adapted nutrient management. Tailoring cultivation for utmost efficiency with “acceptably reduced yield”.
 - Cucumber trial with similar goal –as low as possible energy input. Double and side screens, variable spectrum LEDs, liquid CO₂ + active ventilation unit with heat recovery for dehumidification

5. Certhon, Svensson & Van Dijk on improving air movement and dehumidification
 - All advocate for Next Generation Growing model (“plant empowerment”, focus on plant microclimate, active climate but uniform, vent above closed screens, insulation, etc). Widely adopted in Netherlands (previous topic in GrowSave).
 - Ways to tackle humidity without venting out all the heat and CO₂
 - Van Dijk developed different gable end units for heat recovery/ dehumidification/ recirculation
 - Svensson ClimaFlow system –brings air from above screen without gapping and combine vertical air movement to improve homogeneity.

6. Bleiswijk, Wageningen – trial greenhouse site
 - Grower levy for research funding, government match funded 50/50
 - Many different trials on aspects across greenhouse production – alternative materials (ETFE) and structures, “fossil-free” glasshouse (renewables), energy efficient models with different screening regimes/glass coatings/etc, assessing direct carbon capture viability, picking robotics.

Study tour feedback

We collated a Survey Monkey questionnaire for delegates to assess the study tour, looking at the quality of the visits and organisation. We received 5 responses:

- Each visit was reviewed as “good/very good”
- Organisation was reviewed as 9.8/10
- Recommend to a colleague: 10/10
- The highlights of the tour that were outlined included:
 - high-tech sites
 - understanding how crops change with alternative lighting strategies
 - understanding low-energy growing strategies.
- Elements not worth visiting: none.
- Future tour topic suggestions:
 - trial outcomes from this tour/follow-up,
 - AI and technology in energy and robotics
 - light spectrum trials for ornamentals
 - deep and shallow geothermal energy solutions
- Key takeaways for growers

- *“I’m keeping an eye on carbon capture technology in association with Biomass Boilers. Once it is possible to scale down for smaller biomass boilers this could potentially be a viable option for my site.”*
- *“I am definitely going to look further into lighting recipes and how they work for ornamental crops both in terms of energy saving and crop quality/health.”*
- *“With the sector (and country) moving towards the electrification of heat we need to look and more options for alternative sources for CO₂. I will be interested to hear more about the direct capture testing at Bleiswijk, as well as the progress of carbon capture from biomass. Also, it is going to be even more key to find ways of holding CO₂ in the glasshouse more effectively so models of growing with low venting and dehumidification technologies that we saw are going to be really key.”*

GrowSave website and engagement 2019-2024

GrowSave website overview 2019-2024

The GrowSave website moved twice during the 2019-2024 project period. From January 2020, the GrowSave website was taken back in-house by AHDB during their website refurbishment. This led to some alterations in our delivery approval process, and a gap in our website analytics during this period.

During the 2021-2022 contract year, the decision was made to transfer ownership of the GrowSave website back to NFU Energy due to the wind-down of AHDB Horticulture – www.growsave.co.uk. We have ensured the archive of technical resources and information from previous years of the project have been included and have kept the website fresh and live with new content and information (see Figure 1).

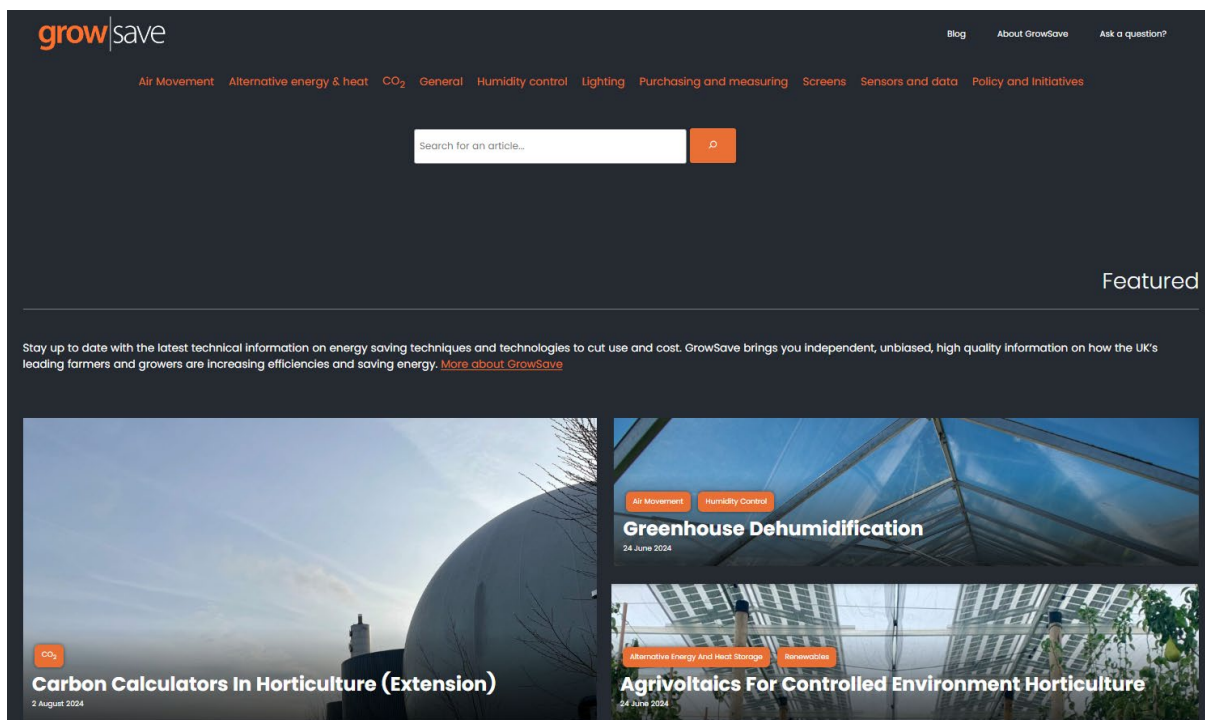


Figure 1. The new GrowSave website format

The website is divided into thematic sections to cover the key areas into which articles and information produced by the GrowSave project fall. This allows us to better display, order and tag content to improve the user experience and accessibility. The current themes covered are:

- Air Movement
- Alternative energy and heat
- CO₂
- Humidity Control
- Lighting
- Energy purchasing and measurement
- Screens
- Sensors and data
- Policy and Initiatives

In addition, there is a General section for the content that does not naturally have a home within this content structure.

Content includes webpage-based textual information, pictures, diagrams and videos to enhance the grower experience. Maintaining content in a web format enhances the searchability of the content via search engines and allows flexibility for updates and edits as appropriate.

Following the end of the AHDB-funded contract on August 2024, we have agreed with AHDB to continue hosting archived and recent AHDB-funded content. We will also ensure any AHDB-funded material remains freely accessible, and acknowledgement is given to AHDB regarding any content they have funded, images provided or information that is repurposed.

Website analytics 2023-2024

The following website statistics were available to determine the activity on the site, accessed on 2 September 2024.

In the last 12 months, the website has had:

- 4100 website sessions of which 1800 active users, and 2300 new visitors.
- Of the users on the website the majority (1,849) came to the website organically (via search engines), followed by via direct links (1,596), then via referral (417 - linked from another site)
- The event count (interactions with the website – clicking on links, watching a video etc) was 19,576.
- They spent an average of 2 minutes 14 seconds on the site (for reference, Google Analytics states that an Average Engagement Time on a website across the board is 52 seconds).

Top 5 users broken down by country:

1. United Kingdom – 1891
2. United States - 592
3. Netherlands - 232
4. China – 125
5. France - 78

The most visited pages included:

- *Spark spread – what is it and what does it mean?*
- *Effective use of screens for energy efficiency*
- *Introduction to air circulation fans in greenhouses*
- *Alternative energy and heat storage*
- *Agrivoltaics*
- *Energy Efficiency in Glasshouses.*

Since last year (period between 30 August 2022 and 30 August 2023) the number of website sessions has increased by almost 1500, but the number of active (repeated visits, engaged) users has dropped from 1900 to 1800, with the number of new entries the site increasing by almost 30%. It is good that we are gaining new interactions with the website, with the level of organic entries to the website indicating an improvement in SEO and accessibility of the site via search engines. However, the direct entries to the website have dropped so we need to assess how we promote the project from this viewpoint going forward and retain more engaged users. Although the active users have decreased, the time spent on the website has increased by almost a minute. Given the Average Engagement Time on websites (according to Google) is 52 seconds this is quite considerable. We still need to examine how to retain engaged users on the website, so they better interact with and use the material we are sharing.

Engagement 2019-2025

Throughout the 5-year project period we have continued to interact effectively with the AHDB team and the Steering Group on a bi-monthly to ensure our delivery remains relevant to the industry. The steering group provide useful feedback and direct comments following their interaction with the delivered material which is invaluable to guide the direction of the project and ensure applicability to the industry.

We are in contact with relevant growers' associations on an ongoing basis to attend their technical meetings and events, contribute to industry newsletters and magazines where relevant, and informally seek feedback.

Additionally, when possible, we have shared articles and signposting within the NFU magazines and sector newsletters to promote articles further and ensured the presence of GrowSave representatives at key industry events and conferences such as the Festival of Fresh, and Greentech in the Netherlands.

We have faced some promotional challenges with the loss of communications and marketing support from AHDB Horticulture following the wind-down. In the 2023-2024 contract year, with the support of the NFU Energy marketing team, we have reinvigorated GrowSave communications and promotion. Not only are the regular outputs of GrowSave shared on key channels, including a dedicated LinkedIn page which is gaining followers, but each month we highlight a topic theme to re-highlight key information and articles from the GrowSave project archive which are still up-to-date to ensure we are highlighting existing quality content. We are also examining different options to widen the scope and reach of how we communicate the output of GrowSave in the future, including possible bi-monthly emails and improved signposting on other websites, such as the NFU.

The Impact of GrowSave

As the primary goal and output of the GrowSave project is the sharing of knowledge, quantifying the impact of GrowSave is not straightforward. The onus is on those engaging with the information to consider what is most relevant and useful to them and apply it to their businesses. Although we can monitor interaction with the website through analytics and through events in the form of engagement and feedback, there is currently no strategy to benchmark energy consumption and measure subsequent energy savings of those engaged by GrowSave.

Within this year of GrowSave delivery, NFUE have had a lot of growers calling in interested in the IETF. Although NFUE had its own publications on the topic, GrowSave also responded quickly to the news to put out a blog detailing the scheme. Additionally, the feasibility of renewable/alternative energy sources is a very common talking point.

Although the extremes of the 2022 energy market have thankfully not been repeated, volatility remains high, primarily driven by sentiment. Average cost of gas across the GrowSave year was around 82p/therm, with a range in monthly average between 64-105p/therm. In contrast, in the previous GrowSave year gas averaged at 129p/therm with a range between 72-275p/therm (37% reduction in average, 79% reduction in range). Likewise, electricity prices have dropped to £71/MWh, range between £54-95/MWh: 46% reduction in average, 80% reduction in range.

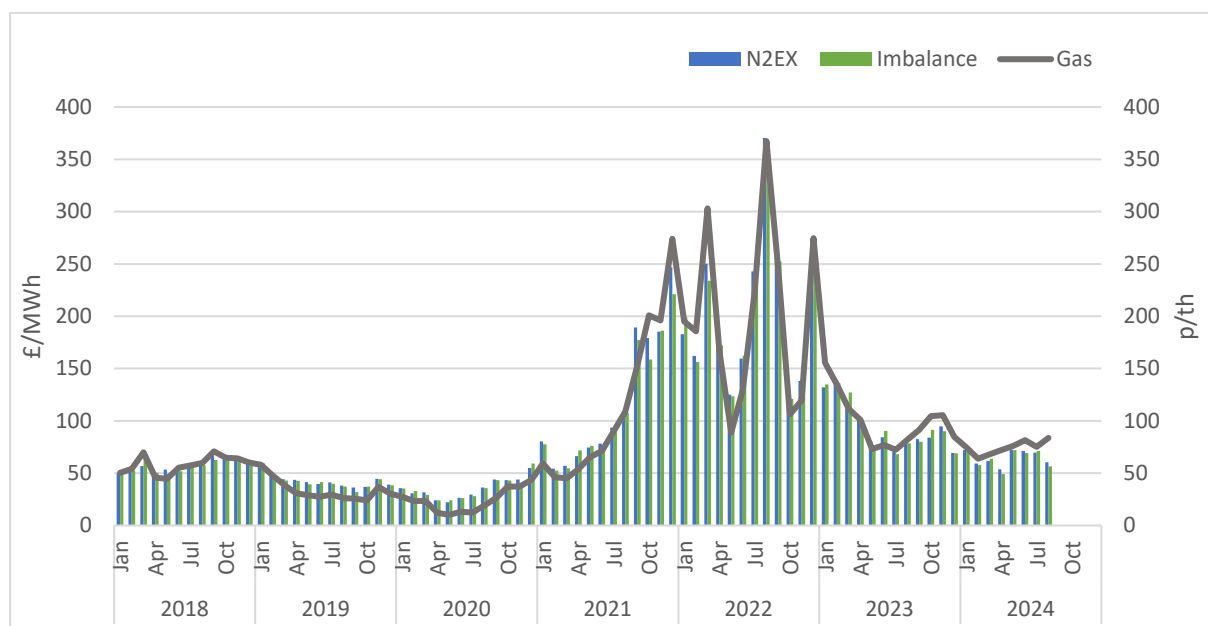


Figure 2: Gas prices over the period of the GrowSave Project 2019-2024

Although this has benefitted sites which rely on gas boilers and/or import electricity from the grid, those who self-generate power, particularly those who operate gas CHPs, have suffered as the spark spread has gotten smaller.

That being said, reducing energy consumption and dependence on fossil fuels remains the best way to mitigate the impact of energy market changes. Improving the efficiency of a site and adopting low energy/renewable technologies can help businesses to ensure their long-term viability. GrowSave

remains well-placed to help the agriculture industry achieve this, firstly by keeping abreast of developments and secondly through its programme of knowledge dissemination.

Please see Appendix 1 for further detail on the energy activity between 2023 and 2024.

Appendices

Appendix 1: Year to date Energy Review – 2023-2024

Looking back at the year in numbers so far, we have seen strong electrical generation from renewables. Wind is performing at a similar level to the previous year, at 54 TWh generated, constituting about 29% of total electricity production in the UK. However, the usual rival to wind has not provided the same competition for top spot. Gas fired power generation has been significantly lower (around 33%) than it was at this stage in 2023. Should the weather remain relatively mild, and consumer habits continue, it is likely to end 2024 significantly behind the majority contributor Wind. This is a real win for power importers.

Gas was the main power contributor in 2022 and 2023, but it would be a big story if Wind was to be the number 1 generator in 2024. With less reliance on non-renewables being an obvious political success, it should also be a factor to keeping energy prices down, particularly if the trend continues and new renewable projects come online. However, this less good news for power exporters, particularly those with CHP generation who will likely see the value of their power sold slowly diminish the more renewable installations come online. This reduced gas has been somewhat replaced by increases in biomass production, strong nuclear production and imports, but also demand has also been down by approximately 16.5 TWh. Reasons for this reduction could include average temperatures higher than 2023 or improving consumer habits.

Gas Storage during Q1 was generally up on the previous year however throughout Q2 and Q3 was largely on par with 2023 levels. August saw a ramp up in injections which continued until the second stage of the Annual Norwegian maintenance. The April/May maintenance largely concluded to schedule and thus caused very few price tremors seen the year prior when maintenance frequently overran. Liquid Natural Gas (LNG) continued to be a factor in helping balance prices. During 2024 the Freeport LNG facility has undergone significant maintenance. With reduced send out during Winter 2023 it has ramped up production through the summer and the markets faith in its resiliency has been good for pricing.

War continued to be waged in Ukraine throughout 2024, with Russia extensively targeting Ukrainian energy infrastructure. This has crippled Ukraine's own energy generation capability, relying heavily on imports from its neighbouring nations. A development in late summer saw Ukrainian forces lead an incursion into Russia Kursk region, most notably capturing the key Sudzha metering station, the last entry point into Europe for Russia's natural gas. This rocked the markets as although the Russian contracts expire toward the end of 2024, this gas being unavailable was not factored into pricing in Summer products. Gas however has flowed uninterrupted through the pipeline as it is in both Russia and Ukraine's interests for the continuation of this gas.

While the gas and power fundamentals have been strong so far in 2024, sentiment has had a significant impact in pricing and has largely been responsible for price increases. A tit-for-tat exchange of missile and drone strikes between Israel and Iran in March saw prices spike, bucking a trend of reduced pricing. This was followed by a further escalation in the region with the deaths of the Iranian President and Foreign Minister in a helicopter crash. This and subsequent attacks by Hezbollah on Israel represented instability in the Middle East which the market did not respond well to.

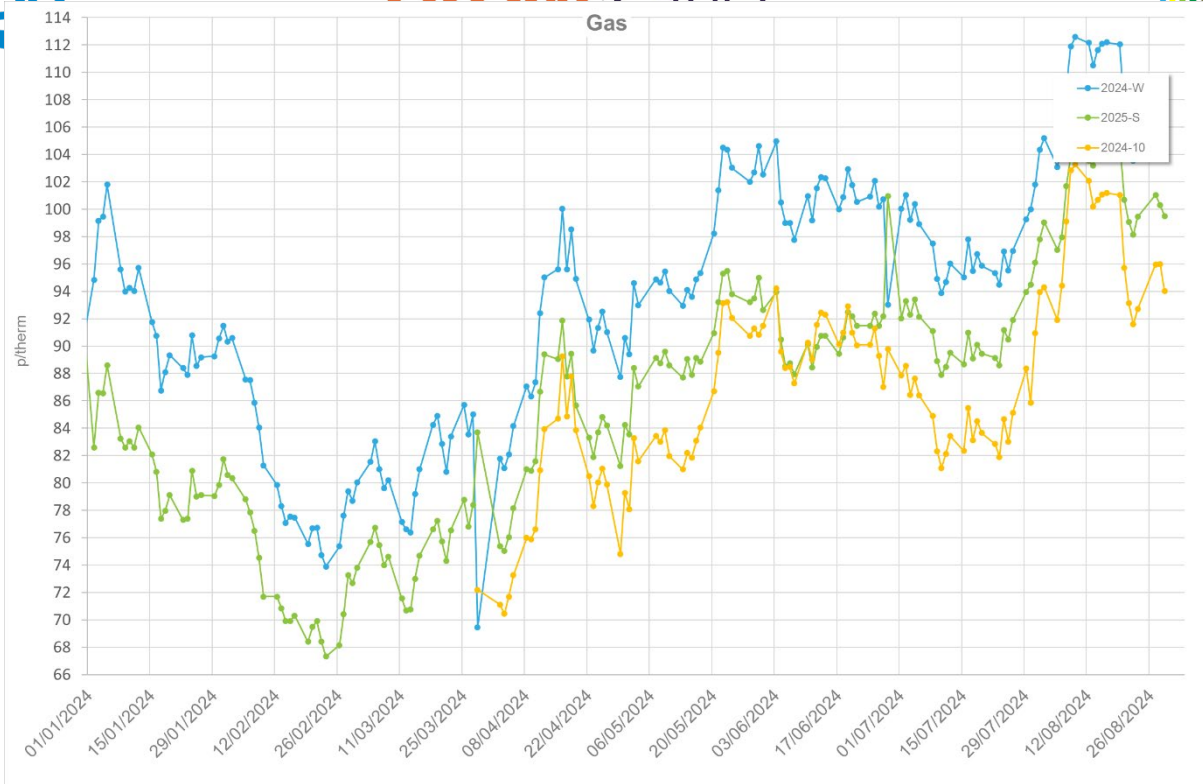


Figure 3: Gas - import prices (2024-Winter; 2025-Summer; 2024 – September)



Figure 4: Electricity - import prices (2024-Winter; 2025-Summer; 2024 – September)