

GrowSave Annual Report: 2019-2020

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Introduction

Background

Formed in 2006 as a collaboration between Farm Energy Centre and HDC as they were then known, the GrowSave programme has been in existence for 14 years. During that time, Farm Energy Centre has become NFU Energy, a wholly owned subsidiary of the National Farmers' Union, and HDC is now The Agriculture and Horticulture Development Board (AHDB). While names have changed, the programme's primary reason for being remains: to help reduce energy consumption within agriculture.

This past GrowSave year (September 2019 to August 2020) was the first under the new five-year contract. In some aspects, it is a continuation of what has been done in the past, but in other ways, the programme has evolved. In-line with AHDB's overarching view of agriculture, GrowSave has expanded to include not just Horticulture – which was previously the sole sector – but also Cereals & Oilseeds, Dairy, Pork and Potatoes.

The GrowSave programme has always been focused on knowledge dissemination, with particular regard to energy and efficiency measures. Traditionally, the latest industry findings have been delivered in a range of formats to the people on the ground, i.e. those whose businesses stand to benefit from keeping abreast of developments. For obvious reasons, namely the COVID-19 pandemic, this past year has been severely disrupted; the format and timeline for delivery of contracted activities have had to be rethought, but their quality and relevance have been maintained. Furthermore, there has been much consideration of how best to engage the industry in the absence of traditional face-to-face meetings and workshops.

This report provides a breakdown, by sector, of the activities and deliverables that were contracted and that have been delivered.

Delivery overview

As the first year of the refreshed contract and thus incorporating 4 other sectors this year has been quite different to others in formation and delivery. The first quarter (Sep – Dec inclusive) was spent establishing committees, managing contracts and establishing relationships with relevant key personnel involved in the project. The second quarter was spent establishing the key materials to be delivered followed by the upset of Covid 19 in 3rd quarter, which didn't affect progress so much as disrupt/distract delivery, including requiring the postponement of planned training courses in horticulture. As such delivery of remotely processed materials was truncated into the latter half of the contract year. There are some un-delivered items (especially in Cereals) that we intend delivered in year 2, however the majority of work which was unaffected by Covid-19 was delivered to contract.

Steering Committees

The GrowSave programme has always been led by a steering committee, which represents the various stakeholders. The complementary and diverse mix of people includes project managers (AHDB), the delivery team (NFU Energy) and industry representatives (e.g. growers, business owners). Through quarterly meetings, held remotely and in person, the steering committee helps ensure the programme focuses on topics that are relevant and timely.

Each sector has its own steering committee, which is typically selected through internal discussion between AHDB and NFU Energy. The committee members are named in Table

Table 1: Steering Committees

Sector	Member	Organisation	Role
All	Nathalie Key	AHDB	Project oversight
	Jon Swain	NFU Energy	Content delivery
Horticulture	Wayne Brough	AHDB Horticulture	Sector Oversight
	Scott Raffle	AHDB	Sector Oversight
	Sandy Booth	New Forest Fruit	Industry representative
	James Broekhuizen	Anchor Nurseries	Industry representative
	Richard Fox	Neame Lea	Industry representative
	Andrew Fuller	Neame Lea	Industry representative
	Richard Harnden	Berry Gardens	Industry representative
	Roly Holt	R&L Holt	Industry representative
	Matthew Simon	Glinwell PLC	Industry representative
	Neil Stevenson	Double H Nurseries	Industry representative
Cereals & Oilseeds	Harry Henderson	AHDB Cereals and Oilseeds	Sector oversight
Dairy	David Ball	AHDB Dairy	Sector Oversight
	Joe Towers	Lune Valley Dairy	Industry representative
	Ian Ohnstad	The Dairy Group	Industry representative
	Ian Harvey		Industry representative
Pork	Ben Williams	AHDB Pork	Sector oversight
	Zanita Markham	AHDB Pork	Sector oversight
Potatoes	Adrian Cunnington	AHDB Potatoes	Sector oversight

Steering Committee Meetings

The steering committees, where already established, aim to meet every quarter. The dates and locations of these meetings are summarised in Table . Meeting minutes are included in the appendix.

Table 2: Summary of Steering Committee Meetings

Sector	Date	Location	Minutes
Horticulture	22/11/2019	Stoneleigh Park	See Appendix 1.1
	12/02/2020	Via Skype	See Appendix 1.2
	22/04/2020	Via Teams	See Appendix 1.3
	28/07/2020	Via Teams	See Appendix 1.4
Dairy	22/11/2019	Stoneleigh Park	See Appendix 2.1
	05/02/2020	Stoneleigh Park	See Appendix 2.2
	19/05/2020	Via Teams	See Appendix 2.3
	07/08/2020	Via Teams	See Appendix 2.4
	06/02/2020	Via Teams	See Appendix 3.1

Pork	31/03/2020	Via Teams	See Appendix 3.2
	14/05/2020	Via Teams	See Appendix 3.3
Potatoes	08/07/2020	Via Teams	See Appendix 4.4

Management Teams

This year due to the increase in sectors involved within the GrowSave Project, a management team was brought together. Members of the team are names in Table 3 below:

Table 3: Management Team

Member	Organisation	Role
Zanita Markham	AHDB Pork	Sector manager
Ben Williams	AHDB Pork	Sector manager
Wayne Brough	AHDB Horticulture	Sector manager
David Ball	AHDB Dairy	Sector manager
Scott Raffle	AHDB Horticulture	Sector manager
Harry Henderson	AHDB Cereals and Oilseed	Sector manager
Adrian Cunnington	AHDB Potatoes	Sector manager

Throughout the year we had bimonthly meetings in person at the start and then once we were working from home we meet via Microsoft Teams. Below are the dates of the meetings we had.

Table 4: Management Team

Date	Location	Minutes
25/11/2019	Stoneleigh Park	See Appendix 5.1
13/01/2020	Stoneleigh Park	See Appendix 5.2
12/03/2020	Stoneleigh Park	See Appendix 5.3
14/05/2020	Via Teams	See Appendix 5.4
15/07/2020	Via Teams	See Appendix 5.5

Sector Engagement

Engagement of the various sectors is dependent on several factors, including budget, target audience and the type of information to be shared. Information typically falls into two categories:

1. Technical reference material, delivered as
 - Technical update
 - Technical article
 - Workshop/Seminar
2. News
 - Sector publication
 - Sector conference

Horticulture

The horticulture sector was, for a long time, the sole beneficiary of GrowSave content, and this was limited mostly to Protected Edibles (PE) and Protected Ornamentals (PO). During 2018-19, Soft Fruit

(SF) was also included, and these three branches of horticulture now form the basis of the content delivered (see Table).

Deliverables in the horticulture sector are therefore have therefore matured with the type and format of the content well defined, the topics are a result of the outcomes of industry engagement through steering groups, individual representation or commercial awareness.

Table 5: Horticulture Deliverables

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

All editions of GrowSave News, as well as articles for AHDB's *The Grower* magazine and three technical updates were delivered to contract. However, due to the ongoing pandemic, training workshops and the planned study tour were not possible and have been 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.

Also delivered were an article for All things Dairy and a technical factsheet.

Table 7: Dairy Deliverables

Contracted Activity	Content	Delivered
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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.

Also delivered were Pig World articles and a presentation at a Slurry Cooling Webinar.

Table 8: Pork Deliverables

	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 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.

A Steering committee is being formed for year 2 and some deliverables are still being completed.

Table 9: Potatoes Deliverables

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

This sector is furthest behind in contracted delivery, a similar technology review (as per pork and dairy) is in production to cover the topic of grain drying and we intend to complete these actions over the coming weeks.

Table 6: Cereals & Oilseeds Deliverables

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	Ongoing work

The Impact of GrowSave

Financial Benefit

Quantifying the impact of GrowSave is never easy, given that the primary output of the programme is knowledge. It is incumbent on the industry to take the information provided and to apply it to business processes. There is no strategy to benchmark energy consumption and measure subsequent energy savings of those engaged by GrowSave.

Horticulture

GrowSave's biggest impact is believed to be within horticulture. Using the latest available areas for DEFRA-stated crop types in protected horticulture (see Figure 1) and applying typical energy consumptions for electricity (Figure 2) and heat (Figure 3) to these areas, industry energy usage is estimated at 4,163 GWh/annum. Using the average gas price and electricity tariff, this costs £110M/annum.

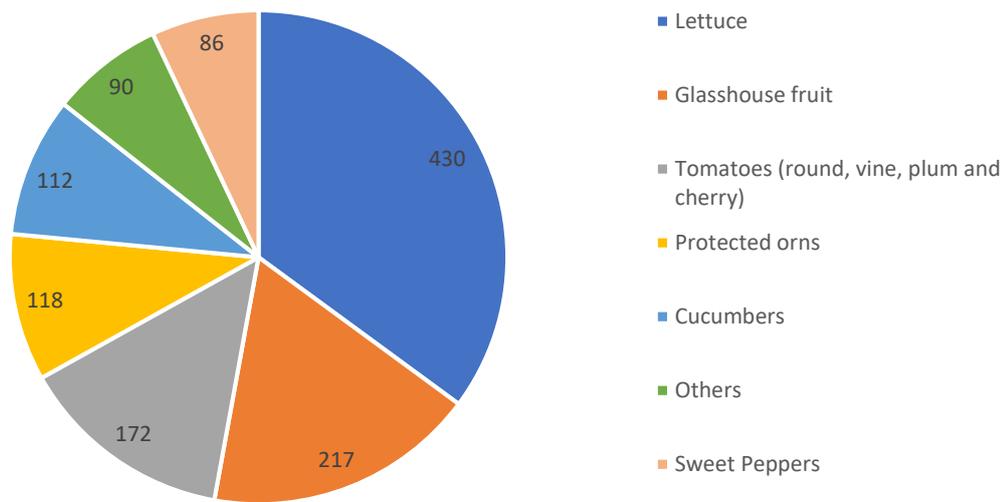


Figure 1: Areas (Ha) utilised for protected growing by crop type

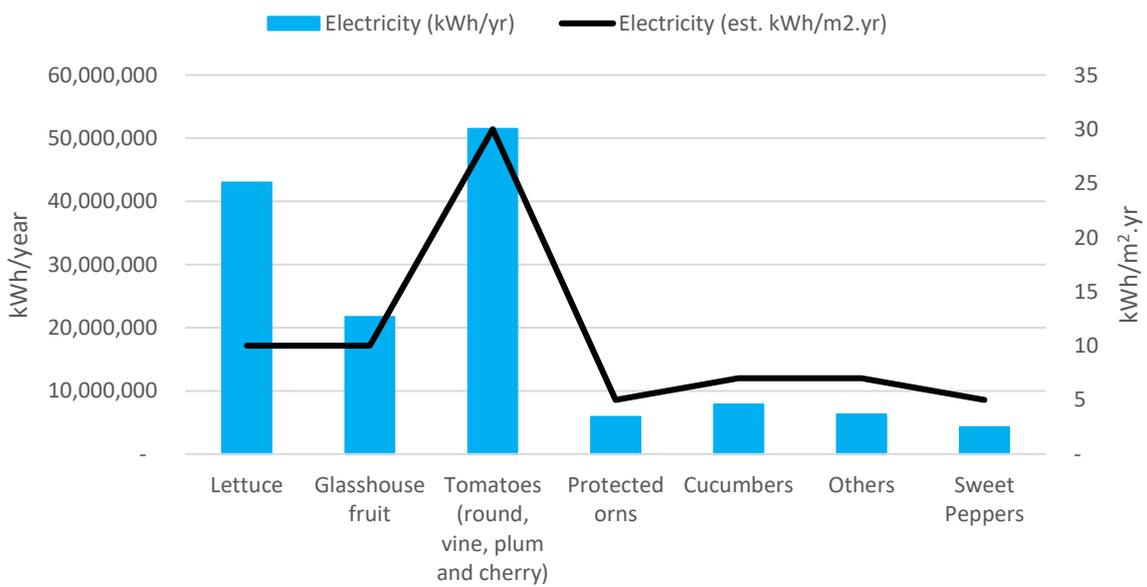


Figure 2: Estimated annual electricity consumption by crop type

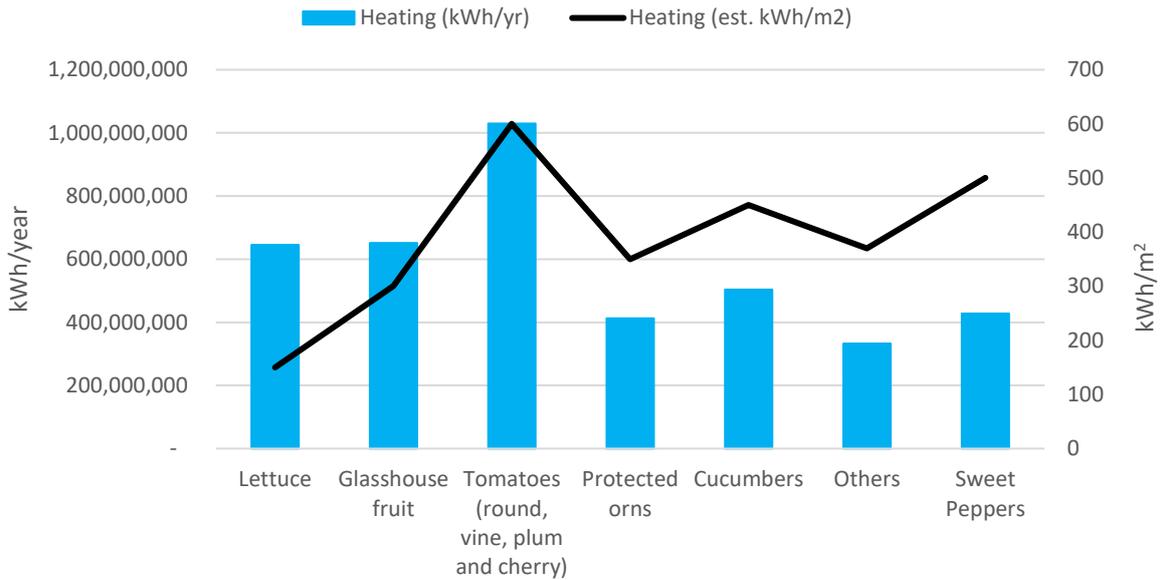


Figure 3: Estimated annual heat consumption by crop type

As GrowSave is more applicable to the higher energy users, and not all growers are aware of or use the services provided, we estimate the programme’s influence to be on 25% of this energy consumption. A modest 5% saving on electrical demand and a 15% saving for the heat use will reduce the sectors’ energy consumption by 152 GWh, with a consequent energy cost reduction of £3.74M.

Pork

The following energy section is reproduced from the technology review and is applicable here:

The use, and therefore cost, of electricity dominates energy consumption in the Pork Sector, this is for lighting, cooling, often for heating and other ancillary uses.

We have interrogated the Climate Change Agreement data available for pork production. This scheme gathers energy consumption data versus the tonnes of pig meat produced. The data shows that there are 115 sites registered in the scheme (these will be the highest energy users and those most likely not to have a high proportion of renewable energy). The data presented equates to a 500 sow unit.

The data shows that:

# sites	Average electricity consumption	Proportion of renewable electricity	Average heat consumption	Proportion of renewable heat
115	334,000 kWh	40,000 kWh	90,000 kWh	14,547 kWh
Specific energy consumptions	278 kWh/tonne	33.4 kWh/tonne (12%)	75 kWh/tonne	12 kWh/tonne (16%)

Using the values of average energy consumptions above, producers will have an energy bill around £52,000 per annum made up predominantly of £45,000 of electricity cost with the remaining being heating fuels.

Whilst the cost of electricity is underpinned by the cost of generation, largely from gas, it is also highly dominated by the additional charges levied to provide revenue to support renewables generation and taxation. This means that of the current 10-16 p/kWh cost for imported electricity, often more than half of this cost is fixed by such charges (non-commodity costs).

The commodity proportion of electricity costs has generally been linked to the primary fuel, gas, used to generate it. When gas increases in cost, so do electricity prices and vice versa. We are seemingly transitioning to a generation mix where renewable energy provision plays a much more significant part. This is especially true of large-scale wind and solar and we have seen increasing incidences during early mornings and weekends where spot market price for electricity is close to zero cost and sometimes even negative. Natural decarbonisation of pork production will occur as the electricity grid decarbonises. However, to decarbonise the heat use will require a much larger shift to lower emissions heating and heating fuels such as heat pumps and bio-based alternatives.

Volatility in energy prices is both a concern and an opportunity. Whilst most producers purchase their energy in a fixed price manner, those with larger supplies (100 kW demand or greater) can play the market and purchase more flexibly. This allows producers to benefit from reducing prices more immediately and employ a consumption and purchasing strategy to reduce costs, without necessarily altering their primary consumption requirements. The employment of battery technologies in times to come may provide additional opportunity for this. A further section discusses battery storage in more detail.

Review outcome

Discussion and provision of materials around strategies to reduce energy cost (especially electricity) will benefit the Pork Sector, in much the same way as they will benefit other sectors in AHDB. With the market in a continuous state of flux, regular updates on the market dynamics will help producers to make purchasing decisions.

Decarbonisation plays an increasingly important part of producers' decision making and therefore, awareness of decarbonising influences and strategies are as important as those for cost.

Dairy

The following energy section is reproduced from the technology review and is applicable here:

Perhaps unsurprisingly, all the farmers spoken to had either invested in some form of renewable energy generation over the last few years or had considered it. A 2017 survey of NFU members showed that up to 40% of members had invested in some form of renewable energy with a 15% growth in uptake between 2014 and 2017 alone (Renewables Growth, n.d.). The uptake will have slowed down since 2017 because of the conclusion of the Feed-in Tariff (FiT) and reduction in Renewable Heat Incentive (RHI) rates. This shows that whilst there is significant installation deployment, there are more than 50% of holdings which are yet to benefit. Some of these technologies are well established by now, others less so. However, the improvements in equipment efficiency, reductions in cost and changing market dynamics make them worthy of discussion and for future work. One main barrier to adoption is the availability of sufficient supply capacity. District Network Operator approval must be sought for generation, even when the intention is to use all generated power onsite, for safety reasons and as there may be occasions when it is exported to the grid.

Before renewable technologies are discussed, we have included a section on energy prices for context and information.

In considering the content of this report it is helpful to bound the comments with the consumption of a 'typical' farm. Unlike other sectors, there is little firm data publicly available to substantiate the electricity requirements in the Dairy Sector. So, the information presented in the table below is a result of NFU Energy consultancy for several years.

Farm	kWh/cow.yr	kWh/1000 litres milk	annual cost for 500 cows	annual cost for 2.5M litres
high	687.42	98.20	£ 49,838	£ 35,598
average	405.20	54.17	£ 29,377	£ 19,635
low	264.26	41.71	£ 19,159	£ 15,121

The use, and therefore cost, of electricity dominates energy consumption in the Dairy Sector, this is for milk cooling, water heating, vacuum pumping, lighting and other ancillary uses. Traditionally the Dairy Sector benefits from time of day tariff structures, especially the 7 hour cheaper night rate called Economy 7 or E7. This structure provides approximately a 25-35% reduction over day rate electricity for the period midnight to 7 am GMT. Whilst the cost of electricity is underpinned by the cost of generation, largely from gas, it is also highly dominated by the additional charges levied to provide revenue to support renewables generation and taxation. This means that of the current 10 p/kWh night rate and 16 p/kWh day rate costs for imported electricity, often more than half of these costs are fixed by such charges.

Review outcome

Discussion and provision of materials around strategies to reduce energy cost will benefit the Dairy Sector, in much the same way as they will benefit other sectors in AHDB. With the market in a continuous state of flux, regular updates on the market dynamics will help producers to make purchasing decisions.

Reaching the audience

In addition to direct engagement of the industry through GrowSave's own workshops and sector events, the programme reaches a wider audience through its numerous publications and web content.

Website

During this GrowSave year, the website content was transferred to the AHDB website. Therefore, analytics for 2019-20 are split; the dedicated (old) GrowSave website was live until January 2020.

The website currently is more applicable to Horticulture than the other sectors, although this is being addressed by the AHDB team.

Between 01 August 2019 and 31 January 2020, the website received 4,346 visits and 7,466 page views. Of these visits, 93% (3,697) were from new visitors, with 972 coming direct, 2,631 via Google and the rest either from other sites or through social media.

The top five most visited webpages are shown in Figure 4. These account for 38% of all page views.

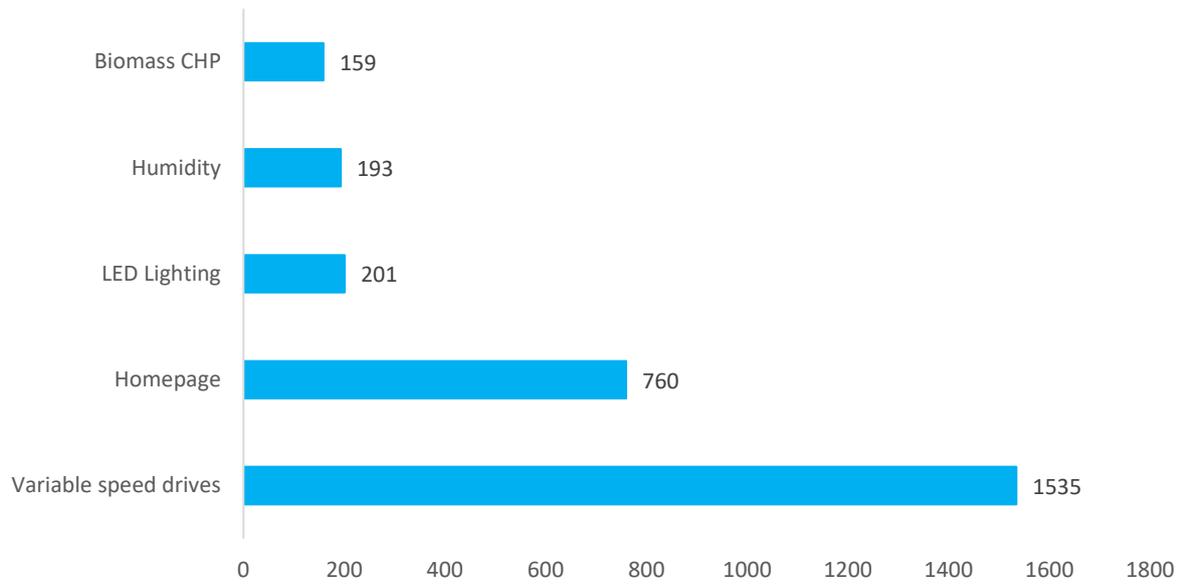


Figure 4: Top five most visited webpages on the old GrowSave website

Other

The GrowSave team publishes regular blogs once a month on the AHDB website and, from time to time, these are featured on other websites.

Appendix

Steering Group Meeting minutes

Horticulture:

Appendix 1.1

22 November 2019	
Item	Notes
Introduction to new Steering Group	<p>OC – Head of Technical Delivery for NFU Energy. EH – Technical Support for the GrowSave programme. JB – Logistics, admin and point of contact for the GrowSave programme SB – New Forest Fruits RF – Neame Lea NS – Double H nurseries SR – AHDB, Soft Fruit WB – AHDB, Protected Ornamentals NK – AHDB, Protected Edibles – AHDB GrowSave project manager</p>
Update on the last five years of GrowSave	<p>EH: GrowSave has been around for 13 years and was originally created to help horticulture businesses save energy and reduce environmental impact. Through workshops, publications and articles GrowSave has...</p> <ul style="list-style-type: none"> • Allowed many to realize the long-term financial benefits of Government incentives; • Reduced the amount paid out by the horticulture industry in the form of Climate Change Levy; • Spent time investigating best practices in other countries; • Expanded into Soft Fruit in 2018. <p>GrowSave is now expanding into Dairy, Pork, Cereals & Potatoes.</p>
Goal of the next five years of GrowSave	<p>EH:</p> <ul style="list-style-type: none"> • Overarching theme across all sectors for the whole five years of helping reach the AHDB and NFU goals of Zero Carbon farming by 2040 <p>NS:</p> <ul style="list-style-type: none"> • Future planning – a look into what is or could be worth investing in over the next 5 to 10 years and beyond • Not just share the quick wins • Energy costs and efficiency as well as carbon reduction
Programme themes for this year and future years	<p>Ideas from Richard Harnden</p> <ul style="list-style-type: none"> • Heating – uses of water extraction – what is the best system to invest in, biomass or Ground Source Heat Pumps? • Lighting – What should we use? Ratio of lights – UVC for disease, LED for extended growing periods • CO₂ – Generation and usage; relative costs of different systems • Air Movement – Ideas and uses

	<p>Air Movement</p> <ul style="list-style-type: none"> • WB - Showed the Air Movement videos to BPOA, videos are still scene setting and would like to discuss future more in-depth videos (funding?) <p>Irrigation water</p> <ul style="list-style-type: none"> • Impact of water temperature on plant, efficiency • Control of substrate • Measure plant microenvironment • Look at Dutch research <p>Battery Storage</p> <ul style="list-style-type: none"> • Balancing electricity production and demand • OC – Historically only viable for grid services • Collate what is currently out there now • State of the nation • What might be on its way? New technologies <p>Provision of energy</p> <ul style="list-style-type: none"> • RF – Expanding businesses limited by DNO capacity • Consumption could double but infrastructure would not cope! • Off-grid solutions? What technologies available to supplement? <p>Future of biomass?</p> <ul style="list-style-type: none"> • Electrification/de-carbonisation • Heat pumps are a key technology • Explanation on how things might pan out over the next 10/15 years. <p>CO₂ from Biomass</p> <ul style="list-style-type: none"> • Solutions for production and uses • Emerging technologies – more carbon neutral/holistic approach • Down-scaling of current projects for mass market
<p>Theme for 2019 – 2020</p>	<p>Air Movement</p> <ul style="list-style-type: none"> • Practical measurement – temperature • Fan position testing • Impact of irrigation • Linking fans to sensors • Using fans when venting and using screens • Different crops need different solutions • Practical demos • Neame Lea could be a good demo site as different fan heights in two different zones • Work with Bedding & Pot Plant Centre to get practical representation out to industry <p>Humidity Control</p> <ul style="list-style-type: none"> • Re-run of the popular training courses from last year <p>Understanding where LEDs are at</p>

	<ul style="list-style-type: none"> • Although not relevant for Soft Fruit, value by sectors? <p>Insulation</p> <ul style="list-style-type: none"> • Heat retention in 2-layer polythene (double glazing) kept apart by air pump • New-build option – light transmission penalty? <p>Repackaging existing content for Soft Fruit (to be discussed with SR)</p>
Annual deliverables for Horti Sector	<p>EH:</p> <p>The GrowSave contract requires the project to deliver the following elements each year to the Horticulture Sector, which is by far the biggest part of the project:</p> <ul style="list-style-type: none"> • 3 editions of GrowSave News and regular AHDB Grower articles • 3 Technical Updates • 2 sector association conferences • 2 training courses • Other work as agreed with the Steering Group to meet thematic requirements and within the budgetary constraints of the programme • 1 blog a month
Future meeting dates	<ul style="list-style-type: none"> • 12 February via Skype • 22 April – in person if possible • Mid-July – Date TBD

Appendix 1.2

12 February 2020	
Item	Notes
Situation to date (JS)	<p>We are mid way through year one of the contract. Need to keep soft fruit in mind plus work around PE and PO. Since the January start, we have been concentrating on the contract managements plans and milestones and work focusing on Air Movement and CO2 Sources Study Tour and have completed one issue of GrowSave News.</p> <p>Pre-meeting reading on the Study Tour and Air Movement has been sent round. WB highlighted that this should have been circulated at least one week beforehand. JS apologised as these should have been sent with the agenda.</p>
Progress on Air Movement Project	<p>Plan for the content of the tests:</p> <ul style="list-style-type: none"> • What can we measure at plant and canopy level? • Testing to look at different scenarios • Dates (TBC) – 28 February and 03 March, Baginton Nursery, Coventry <p>Comments from the Steering Group:</p>

	<p>WB: At what heights will temperature be measured? Four heights proposed: 0.1, 1.0, 2.0, 3.0 metres May be worth taking crop temperatures. Are we just investigating one fan type or several? Planning to use horizontal fan setup at the site firstly, measuring what they have now – will look at different fans at a later point. Work will evolve as the project develops. Impact of glasshouse type – one-off or will be looking at different glasshouse constructions?</p> <p>PM: Glasshouse design – looking to the wider variability. What other areas do we need to look at to add value? Costs – now there are time costs only, as we have the equipment from other projects. Future costs will need to be looked at.</p> <p>NS: Would like to see a clear statement of purpose of the trial – use of heat to control humidity – will be covered in the evolution of the trial. Need to look at using a humidity sensor in the trial. How will the temperature be a proxy for air movement? During the trial suggest measuring the outside weather conditions – wind etc. Gather this info from the climate control computer on site.</p> <p>NK: How are we sharing interim results – milestones etc. Articles/Tech Updates. Future training and outputs? Once we have enough information, we will do a Tech Update.</p> <p>RF: Fan positioning for the trial - where will they be located? Fans in position at the site; the rig will be mobile so it can measure different heights as per the plan. Ebb and flood irrigation – impact on temperature and humidity – include in future work.</p> <p>RH: Relating the trial to what happens in practice, moving things for the sake of moving things. Is it logical? Can it be done with better design? In practice once vents are more than 40% open the fans are turned off.</p>
Next Steps	Ed and Mike to look at comments and work into the content of the days
Progress on CO₂ Sources Study Tour	<p>Last CO₂ Sources event was held five years ago in Canada. Technology has moved on, hence the proposal for another tour. Outline produced of where to go and what to see – Pork sector are interested but this is mostly a horticulture themed study tour. The whole tour is for three days but there may be the opportunity to come and go for specific parts of the tour.</p> <p>Comments from the Steering Group:</p>

	<p>WB: Day 1 is a very long day – logistics could be challenging. Might be better to take the boat to Holland.</p> <p>PM: Looks interesting but again logistics an issue.</p> <p>NS: All good content and relevant. Interested in the AD setup.</p> <p>NK: Logistics will need thinking about, try to prioritise and perhaps split it up into this year and next year.</p> <p>RF: More interest in the Biomass boilers. 8 MW boiler most interesting.</p> <p>RH: Priority is for biomass; does it need to be 8 MW or bigger? Site 1 and 4 more interesting.</p>
Next Steps	The overall interest is there. Jon to speak to the sites to see what is possible and to look at the logistics further based on the comments made.
Any Other Business	Lighting Technical Update – Wayne and Jon to discuss content
Next meeting dates	<ul style="list-style-type: none"> • 22 April – in person if possible • Mid-July - Date TBC

Appendix 1.3

22 April 2020	
Item	Notes
How does COVID-19 restricted movements affect GrowSave delivery? (JS/NK)	<p>JS</p> <ul style="list-style-type: none"> • Not a massive slowdown in delivery of GrowSave due to the majority being desk based and via email. • However, we have had restrictions on the Air Movement testing and • Same for the CO₂ Sources Study Tour. Originally planned for the Autumn but will be a challenge if international restrictions and social distancing are still in place. • Playing by ear to see how restrictions are lessened over the coming months. <p>NK</p> <ul style="list-style-type: none"> • Clearly trial work is not going to be able to go ahead. AHDB are traffic lighting their projects that were due to go ahead this year. • Happy to continue with GrowSave as a lot of the work is desk based and able to continue remotely. • There is possibility for extensions for things such as the Study Tour. • We could do training webinars or podcasts instead. <p>JS</p> <ul style="list-style-type: none"> • Positives – accelerate some actions we have talked about for some time, such as short courses on humidity control/ climate control,

	<p>which get side lined for courses in person. Update on CO₂ could also be an option.</p> <ul style="list-style-type: none"> • We are continuing to produce GrowSave News and articles. • Upcoming is an article on how COVID-19 has affected energy prices. • NK - GrowSave News will be printed and electronic. • Sector Associations – we are playing by ear with hope to being at TGA, CGA and BPOA.
<p>Update on Air Movement Project (EH/MB)</p>	<p>MB</p> <ul style="list-style-type: none"> • Spent two days at Baginton Nurseries with rig of anemometers to measure air speeds in different planes at four different heights with horizontal axis fans. • We have a lot of data to turn into outputs • On the lookout for further test venues when the time is right to do so. • We have approached RH about testing vertical axis fans at his Sandylands site. • Other suggestions for test sites: New Forest Fruit, WD Smith and Neame Lea <p>JS</p> <ul style="list-style-type: none"> • Glasshouse does not have to be empty. We would like to also test with crops in the glasshouse. <p>EH</p> <ul style="list-style-type: none"> • Currently analysing the data and hope to present findings to group soon. • Initial analysis suggests that unless you are right in front of a fan there is not a lot of air movement seen. • Air dispersion predominantly in front of the fan; not much to the side or below. • If fans are 3m up and crop is at ground level, as is the case at Baginton Nursery, there is minimal air movement around the crop. • Looking at ways of 'visualising' these numbers. <p>WB</p> <ul style="list-style-type: none"> • It might be useful to find a way to extrapolate air movement patterns from the data or a series of spot measurements within the greenhouse to get a basic understanding of where the air movement is around the fan. <p>SB</p> <ul style="list-style-type: none"> • Uses 30 MHz wireless sensors out in the fields; suggest speaking to them regarding doing some trials inside. They log airspeed continuously. SB would be able to help with this. <p>JS</p> <ul style="list-style-type: none"> • We would like to gather more data. • Would like to know whether everything we have heard from greenhouse designers to fan suppliers is borne out in real world.

	<ul style="list-style-type: none"> ACTION: EH, MB, SB and WB to discuss further outside of this meeting. <p>RH</p> <ul style="list-style-type: none"> Still happy to volunteer Sandylands as a test site. Crop will be finished late August/early September and will be planting mid-September. Under gutter fans and vertical fans.
Lighting Calculator	<p>JS</p> <ul style="list-style-type: none"> Our current calculators are 6-7 years old so need updating There has been some scope done already, but WB has sent a link to some work that has already been done elsewhere. We will look at this before going any further and report back to the group.
Update on CO₂ Sources Study Tour (EH)	<p>JS</p> <ul style="list-style-type: none"> We can do this as several alternate days so that people can pick and choose which days they come to. There are some interesting things going on in Holland in terms of a very large heat pump/geothermal biomass facility that is being built. It has a CO₂ scrubbing system on it that Vyncke are very keen to have included in the Study Tour. CO₂ from fresh air scrubber in Geneva. UK sites including taking CO₂ from an AD plant. <p>EH</p> <ul style="list-style-type: none"> List of potential sites drawn up, but none contacted yet. Four interesting UK sites – not all in horticulture. <ul style="list-style-type: none"> Nestle – renewable/sustainable ethos Drax power station: capturing CO₂ from flue gases <p>ACTION: EH to determine next steps and draft an outline study tour programme</p>
AOB (All)	<p>AF – A little preoccupied with everything going on but interested in the Air Movement project.</p> <p>JBr – More info on Air Movement</p> <p>MS – Air Movement is high on our agenda.</p> <p>NK – Helpful info about fuel supply, especially the energy prices.</p> <p>NS – Holistic vision of energy outlook and electrification of heat. Overview of where we are heading with this.</p> <p>RH – Very interested in the current energy market. Turning off biomass and using gas boilers again.</p> <p>SB – Interested in the CO₂ study tour and the air movement work. Also looking at heating irrigation water and the root zone.</p> <p>WB – Worth making videos to stay in touch with industry such as an air movement to keep GrowSave in people’s minds. We could also do podcasts.</p>
Next meeting dates (JBe)	<p>Suggested date of next meeting – Wednesday 15 July. Please let me know if this works for you.</p>

28 July 2020	
Item	Notes
NFU Energy Update – progress so far	<ul style="list-style-type: none"> • Completed 3 editions of GrowSave News – Final one with ADHB to be published in the autumn. • Grower articles completed to contract. • Tech updates - one has been completed, Heat network edition is drafted and will be sent to AHDB soon. Which leaves alternative fuel uses tech update and will be completed by the end of August. • Sector conferences – TGA, CGA, BPOA were completed • Training courses – not achieved due to COVID-19 and alternatives are in discussion. • Air movement – Outcomes were presented to AHDB and it was decided that there was nothing yet worth publishing. A new site has had to be found for further air movement work and we have been in touch with Graeme Edwards to use his nursery. Mike Bond is organising to visit soon. • CO₂ study tour prep is well underway for Spring 2021. Which may need to be pushed back if needed.
Lighting calculator	<p>Summary</p> <ul style="list-style-type: none"> • Calculators have been identified • Horticulture Luminaire Calculator – Lighting Research Centre (LRC) • Commercial Hortinergy • MB & EH went through each calculator and the meeting pack contained GrowSave write up on what these will do for people, what's available and how they work. • EH contacted LRC and they are more than happy for GrowSave to signpost to it and write a user guide. <p>Outcome of SG discussion</p> <ul style="list-style-type: none"> • Both are comprehensive and not much point GrowSave reinventing them. • Good functionality and a preloaded database of units. • We would be better off signpost to them. • The two calculators are very different products – LRC's Luminaire Calculator is very much lighting – LED vs HPS. Hortinergy tool looks more at a whole project and everything in a glasshouse: screens, location, lighting, crop, temperature etc. but not designed specifically for direct comparison of lighting scenarios. (More details in evaluation.) • Hortinergy is more commercial than LRC's Luminaire Calculator • A substitute for a project consultant and highlights savings available on new and existing glasshouses.

	<ul style="list-style-type: none"> • Aimed at consultant/crop advisor and not necessarily the grower. • More suited to use at the outset of the project. <p>The General feeling from the group was that these wouldn't be hugely useful as they are more applicable to new build sites or new crop. But it would be worth signposting with clear messaging that it's more useful for new builds. GrowSave could play a role here and upload the relevant UK product specs or we could do a guide on how growers can do that.</p> <p>It's important that the calculators are kept up to date, else they can quickly become obsolete. And if we signpost to these, we will need to make sure that this is something that will happen to these calculators.</p> <p>We will go forward and create a limited program of awareness for these calculators and signpost them appropriately.</p>
<p>Plans for year 2</p>	<p>Carryover from 19/20 year - CO₂</p> <ul style="list-style-type: none"> • Alternative sources of CO₂ is still a popular choice for a theme. • Study Tour – will look at CO₂ from an AD plant, CO₂ stripping from Drax power station, Vyncke boiler which is taking CO₂ out of biomass and CO₂ from fresh air in Zurich. <p>Energy Market</p> <ul style="list-style-type: none"> • This has been up and down all over the place in the last 5 months which created new schemes such as ODFM, which encouraged generators to turn off. • There are also several schemes which encourage generators to turn on such as the Capacity Market. • Prices have had periods of sustained negativity. • When the wind blows it seems that carbon emissions in the UK drop down to 40-50 grams of CO₂ per kilowatt-hour. <p>GrowSave will ensure changes in the energy market alongside the outcomes of the many consultations on renewable energy, net zero tasks and re-organising the grid are presented through literature and webinar touchpoints through the coming 2nd year.</p> <p>Electrification of heat outlook</p> <p>Where are we going with heat? If we are decarbonising the grid to the extent we seem to be, then we could decarbonise the heat network which is something the government are very keen on doing. Using heat pumps and ensuring reuse of low temperature heat sources to upscale for useful temperatures inside a greenhouse coupled with the decarbonising of electricity (and soaking up electricity when there is too much around) is likely to be a major part of our strategy in horticulture</p> <p>Education of where electrification of heat is going is important.</p>

	<p>Considerations -</p> <ul style="list-style-type: none"> • How are we going to get hold of CO₂? • We have had periods of some of the lowest gas prices for a while recently. Natural gas is cheaper than running a biomass boiler and it provides CO₂, which contradicts the electrification of heat. • Many of the large heat pump projects we have been involved in have been for soft fruit growers - users of heat where they didn't need to before. <p>CO₂ and electrification of heat will complement each other as themes for year 2.</p> <p>Carbon Footprinting/circular economy</p> <p>Carbon footprinting is gaining growers' and retailers' attention. Is it time to revisit the Circular Economy idea?</p> <p>This will need to fit with the AHDB environment team's interest and aspirations and we should consult with them on the overlap.</p> <p>Other points:</p> <ul style="list-style-type: none"> • There is interest from tree fruit growers so there may well be interest from soft fruit growers too. • Sequestration is a real challenge that the NFU Net Zero working group are looking into now. • Calculators aren't working to fit how agriculture work currently. However, arguing over accuracy may mean missing the opportunity and time to do something to reduce footprints <p>We can tell people what is out there currently, what's appropriate for UK Horticulture and demonstrations on how they work through the GrowSave program.</p> <p>Outcome was that this would be a theme worth developing during year 2 without necessarily producing anything and it can be a stronger theme in year 3 depending on how things progress.</p>
<p>Alternative deliverables for year 1 (webinars/training videos)</p>	<p>As a replacement of content for this year's study tour.</p> <p>Different ideas have been discussed such as training videos and webinars. We think there is value going over content such as basic climate control and humidity control, as these events are regularly oversubscribed.</p> <p>We will look at creating an online series of training courses for the basic training concepts.</p>
<p>Next meeting dates</p>	<p>Next meeting will be mid to end of October 2020. JB to schedule.</p>

Dairy

Appendix 2.1

22 November 2019	
Item	Notes
Introduction to new Steering Group	<p>OC – Head of Technical Delivery for NFU Energy. EH – Technical Support for the GrowSave programme. JB – Logistics, admin and point of contact for the GrowSave programme IH – Dairy farmer in Cornwall/Devon with approx. 340 stock, 180 of those milking. DB – AHDB Dairy Board representative based in Gloucestershire.</p>
Update on the last five years of GrowSave	<p>EH: GrowSave has been around for 13 years and was originally created to help horticulture businesses save energy and reduce environmental impact. Through workshops, publications and articles GrowSave has...</p> <ul style="list-style-type: none"> • Allowed many to realize the long-term financial benefits of Government incentives; • Reduced the amount paid out by the horticulture industry in the form of Climate Change Levy; • Spent time investigating best practices in other countries; • Expanded into Soft Fruit in 2018. <p>The programme is now expanding into Dairy, Pork, Cereals & Potatoes.</p>
Goal of the next five years of GrowSave	<p>DB:</p> <ul style="list-style-type: none"> • Increase focus on Net Zero – carbon footprint, total environmental impact (zero harm), water/ use of nitrogen. <p>EH:</p> <ul style="list-style-type: none"> • Overarching theme across all sectors for the whole five years of helping reach the AHDB and NFU goals of Zero Carbon farming by 2040.
Programme themes for this year and future years	<p>IH:</p> <ul style="list-style-type: none"> • Monitoring efficiency (critical for cost saving) • Variable Vacuum Pump or heat recovery • Wind/Solar: are these a missed opportunity? Anything else worth investing in? • Low energy lighting for the winter • An update on how things are now and what could happen in the future in terms of energy market/ emerging renewable technology • Battery technology <p>DB:</p> <ul style="list-style-type: none"> • Energy efficiency – cooling milk, heating water, heat recovery – updated or reshared

	<ul style="list-style-type: none"> • Sources of energy – air source heat pumps • Emerging renewable energy technologies • Slurry – heat recovery, reduces ammonia, better end product • Water infrastructure on farms – advice on: Grazing management, pipe size, water pressure, water pumping, size of trough, drinking rates – calculator of water system on grazing dairy herd.
Annual deliverables for Dairy Sector	<p>EH: The GrowSave contract requires the project to deliver the following elements each year to the Dairy Sector.</p> <ul style="list-style-type: none"> • Case studies/key facts documents • Updating of two factsheets and/or calculators • Dissemination to the wider audience
Future meeting dates	<ul style="list-style-type: none"> • Meet at Dairy Tech on the 05 February over a hot drink or lunch • Meet at NFU Energy on 19 May (Day before a Dairy Board meeting) • Meet at NFU Energy on 29 July (Day before a Dairy Board meeting)

Appendix 2.2

05 February 2020	
Item	Notes
Achieving “Net Zero” carbon reductions	<p>Renewables – Energy efficiency (e.g. heat recovery) DairyTech CIEL seminar addressed research programmes. Other seminars discussed fermentation, embedded carbon in feed.</p> <p>Exactly what is the NFU’s Net Zero goal? Where are we starting, how do we count carbon? (e.g. GWP* scheme gives methane a lower factor than other schemes e.g. GWP100 – it has 28x GWP of CO₂ over a certain period, e.g. 100 years, but behaves differently in the atmosphere – converts to carbon after ~10years) 25% of Climate Change is methane, and 25% of methane is ruminants. Static inventory – replaced at the rate it degrades. Is this relevant to GrowSave?</p> <p>JT: food additives have reduced our methane by 30% – seaweed trials in Australia reduced by 90%. Feed solutions or additives coming to market with methane reduction or feed efficiency benefits. Alltech’s carbon footprint said energy forms just 2%.</p> <p>IO: what is GS remit – economics of being carbon-efficient? Need to be clear on definitions, work on evidence basis, not opinions DB: also there’s water, specifications for install, esp. grazing IO: start low, communicate easy wins EH: reminder of deliverables; should we investigate GWP* vs. GWP100? As UK herd numbers fall, we can’t claim “global cooling” while huge debt to repay IO: we need to be clearer on our measured deliverable DB: energy efficiency only a small part of carbon emissions reduction – fertiliser, diet, storage EH: we’re not constrained by the past – opportunity to widen the remit</p>

	JT: carbon sequestration currently 5-15% on well-managed grasslands, only marginal improvement possible, unlike other parts of the world Tell a farmer of energy savings, there is a £ benefit. Tell them about carbon savings, no £s
Heat recovery from milk / slurry	Recovery of heat from slurry into hot water, where demand exists What is best equipment for the purpose? – various exhibitors at Dairy Tech IO: don't assume that all farmers already use electricity to cool milk DB: many using ice banks to cool to 5-6°C – no heat recovery Factsheet/case study should show beginners how to cool, and existing cooling sites how to recover heat to a useful load Review of information already available – see FEC library...
Lighting for increased milk yield	DB: a factsheet could point to energy savings but also improved yield. A farmer adding lighting for the first time will be improving yield at the expense of additional energy. 16h/8h day/night cycle controls melatonin: also gives benefits to non-lactating cows
Industry innovations	Vacuum pumps, e.g. 7.5kW x 2 x 10h/day x 40% saving is easily quantifiable Technology now claiming COP=6 (formerly COP=4); also recovering heat at 80°C not 50°C IO: salespeople's claims need independent verification!
Any other business	DB: not just limited to electricity but also red diesel IO: numbers useful – benchmarking tools? – could obtain electricity usage data from specialist dairy farms – 12-month readings and herd size/yield
Future meeting dates	19 May and 29 July, end of day at NFU Energy or Skype (Dairy Board meetings next day)

Appendix 2.3

19 May 2020		
Item	Notes	Action required by
Tech Review	The outline of the tech review included the sections from the pork review that was relevant to dairy and additions of headings and outlines that are more dairy specific. This now needs to be completed to a point where the Steering group can review it and provide feedback. Arrange a meeting with IO and IH as they weren't able to join the meeting to get feedback.	MB
What is the purpose of the technology review?	Should it be either: <ul style="list-style-type: none"> A levy payer facing document to be read as a review of emerging technologies for the levy payer to pick out what they want. Or	

	<ul style="list-style-type: none"> • A report to AHDB as a menu of emerging technologies that warrant further investigation. <p>DB view was that it would be a report of technologies for AHDB and Steering Group that can be used as a way of decided which would be best to investigate further as technical resources for Levy Payers. Which JS has agreed is the correct way to go providing IO and IH agree.</p> <p>No need to go into a great amount of detail on technologies in the review. This would just link to more in depth content once it has been produced.</p>	JS/MB
Questions to discuss	<p>The following questions were gone through and DB and JT helped answer.</p> <ul style="list-style-type: none"> • Most Dairy Farm energy requirements have been in the three areas of milk cooling, water heating and vacuum pumping. How much has this technology moved on and what are the current challenges? • The management of slurry presents both an opportunity for energy production and a challenge for keeping ammonia emissions low. Do (or should) either slurry cooling or nitrogen fixing have a place within the Dairy Sector? • Is lighting for increased milk yield still of general interest, and how does this fit with the larger/more often housed production systems? • Reduced labour often leads to greater energy consumption (rotary parlours, robotic milking, automated systems). Is this a trade off worth making and how do we ensure this does not compromise NetZero ambition? • Are there any notable industry innovations worth investigating within the boundaries of GrowSave remit? • DB did mention water management suggestions. 	
Approach to completing Year 1 work.	<p>Still to do is:</p> <ul style="list-style-type: none"> • Technical review • Technical article • Fact Sheet <p>As tech review isn't done it would be good to focus the article and fact sheet around energy efficiency around cooling milk, heating water, plate coolers and ice banks. If a levy payer is looking to put in a new system what do they need to do.</p>	JS/MB
Future meetings	Discussion with IO and IH next week. (Comm:25.05.20)	MB

	Then meet with DB to discuss milestone review end of next week. (Comm:25.05.20)	JS/DB
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Appendix 2.4

07 August 2020	
Item	Notes
Update on progress so far	<ul style="list-style-type: none"> Technology Review which needs to be finalised following Steering Groups input. A milk cooling factsheet that is in the final stages of completion. Article for magazine All Things Dairy has been completed. <p>On track for the end of this contract year. Slightly too early to discuss year 2 topics seeing as these will be decided from thoughts created by the Technical Review.</p>
Technology review	<p>SG comments</p> <ul style="list-style-type: none"> Dairy Sector understand energy efficiency and power saving, energy profiling. However, some have a lack of knowledge in very basic concepts such as what is the economic benefit for having a heat exchanger/plate cooler. The tech review is very focused on the highly switched on levy payer. However, there are those who are not ready for this information and more basic concepts shouldn't be ignored. We need to have a programme that will provide information for both types of Levy Payers. <p>Topic suggestions:</p> <p>What's going on in the energy Market What is the impact for renewable energy –</p> <ul style="list-style-type: none"> Low scale - supporting your business high scale – supporting the grid <p>Efficiency technologies and techniques. Pick two or three of the others such as</p> <ul style="list-style-type: none"> milk cooling water heating vacuum milk pumping Slurry pumping <p>Low carbon and GH reduction actions What is the best CF tool, what can people use, how do dairy farmers reduce their carbon footprint – links to themes in Horticulture</p> <p>Heat pumps</p>

	<p>Do dairy farms have a suitable use for the heat produced. Allow Pork Sector to do the work on Heat Pumps and we can apply their findings to the Dairy Sector if relevant.</p> <p>Lighting Lots of companies offering good lighting packages available but there a few less reliable ones. It would be useful to share the correct messages to help people. We would need to identify the correct lighting people to do so.</p>
<p>Ways of getting and sharing information</p>	<p>Any comms created by GrowSave will be shared through the website, articles, emails, blogs, webinars and we will pick which ones are the most appropriate for the Dairy Sector.</p> <p>Webinars have been very successful so it's worth a try to get the information out to levy payers.</p> <p>Use the milk buyers/supply chain to get the messages out. Providing technical staff and appropriate resources would help.</p> <p>Technical factsheet could be used to present information to the milk buyers which they can share with the relevant people. We could also produce a webinar to support the technical factsheet and see how well attended it is. Involve AHDB comms staff to get the message and invites out about the webinar.</p> <p>Strategic farms initiative might be worth looking at as we could encourage them to look at energy usage and use them to get the work out about the messages we want to share. We could benchmark energy usage on these farms to help us with our information and content. This could work well with new project that is about to roll out regarding Carbon Footprint on the strategic farms.</p> <p>Data from strategic farms is not shared currently but we could approach them to share the data.</p>
<p>Outcomes</p>	<p>Members of the steering group will take the next two weeks to read through the technical review and provide feedback. Mike to collate the opinions from the group and share with Jon.</p> <p>So that we can then confirm the year 2 topics and provide AHDB with a proposal and costings by early September.</p> <p>Look at energy benchmarking to run alongside the topics we are doing. Conversation needed with Jon Foot</p> <p>NFU Energy to circulate documents with the Steering Group once they are finalised.</p>
<p>Next meeting</p>	<p>To be scheduled on the 08 October at 8.30 – 9.30.</p>

06 February 2020	
Item	Notes
Potential steering group members	Start contacting the list of potential steering group members provided by ZM. MB to feed back progress to ZM.
Slurry cooling	<p>Joe Dewhurst, a producer, has planning permission with slurry cooling as a condition. Is it already a common practice, are we behind? Maybe it was best option commercially.</p> <p>Klimadan may be market-saturated in Denmark. Maybe upper limit of grants reached.</p> <p>EA requires slurry lagoon and store covering by 2021 to reduce ammonia. Financial drivers: Enhanced Capital Allowance tax relief, or reduced CCL, available? Also, RHI (>45kW for non domestic)</p> <p>We should concentrate our efforts now on slurry cooling, but also continue a broader look at other subjects. So, our contact work should focus on slurry cooling.</p> <p>Matti Wilkin (potential steering group member) is currently installing a Klimadan system – ZM and MD to visit.</p> <p>Burrow Plant (Damien Shields) have slurry separation system, produces clean water and fertiliser pellets – but very energy-intensive. Dairy Development Centre, Llandeilo is doing further research; David Ball (AHDB Dairy) has visited, worth contacting him</p> <p>Any cross-sector relevance? Pig and cow slurries are not similar – cow is wetter and chemical content varies too.</p>
Heat Recovery	<p>Pigs are a big thermal mass, could recover heat in pig shed exhaust, to preheat air intake in winter, heat pads in summer.</p> <p>Use ground as inter-seasonal thermal storage?</p>
Vacuum Pumps	Used for pits. Variable Speed Drives applicable? Worth looking at (50-80% saving)
Lighting	<p>More like Poultry than Dairy for this topic.</p> <p>LED is the future... AHDB has an in-house expert. There is a 3-part guide on AHDB website.</p> <p>A key aspect of welfare code is broad spectrum lighting, as close to daylight as possible; do lux levels have an impact on productivity and fertility?</p> <p>Most research to date done abroad. Spectral and Lux Level benefits need proper research, large-scale trial. Again, beware of cross-sector assumptions</p>
Comms	<p>Provide updates to MD and ZM, not just as milestone, so that progress and information discovery can be shared throughout the year</p> <p>These could ask farmers for feedback</p> <p>Write encouraging article – 350 words by mid-March for April production</p> <p>Another larger article due in September – 1200 words – examples and case studies</p> <p>Regular shorter updates for social media and website etc. – 100 – 200 words.</p> <p>BW to find out if possibility of presenting at Pig and Poultry – Member of staff on the AHDB stand?</p>

	Possibility of a podcast with a pig producer / JS and Klimadan. Old website is still live until the end of February by which point new pages should be on AHDB's website.
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Appendix 3.2

31 March 2020	
Item	Notes
Technology review	<ul style="list-style-type: none"> • Add additional technologies – GSHP, Heat exchange systems, Energy Efficiency, micro-digesters, Solar PV, GHG accounting. • What is GHG calculation and carbon footprint description? • Carry out surveys on the different technologies mentions to see what people feel are worth considering.
Steering group members	<ul style="list-style-type: none"> • JS has asked for a few more people to contact. ZM to provide • MB to call everyone again to find out if they would be suitable and interested in being part of the steering group. • MB to also discuss the technology review with those on the call list in order to refine it.
Marketing	<ul style="list-style-type: none"> • How to present the information other than just a printed fact sheet • Through a webpage on the website which is downloadable • Through articles in Pig World? Any other magazines worth using? • Use social media and NPA forum surveys to discover general thoughts on which technologies are worth looking in to. • Is Pig World the only magazine or could we use others?
AOB	<ul style="list-style-type: none"> • FAQ for slurry cooling • JS to tidy technology matrix and send to Steering Group
Next meeting	Tuesday 28 April

Appendix 3.3

14 May 2020		
Item	Notes	Action required by
Technology review	Solar – report needs to explain continuing potential; batteries – the sheer cost; interplay between green technologies; signpost further info Needs more research; literature review; not just the SG interviews. E.g. lighting already covered by AHDB	MB and JS

<p>Further developments</p>	<p>The document reads as a series of opinions etc. and now needs to be changed to more of a story that has led these people to know this information</p> <p>Decision needs to be made if this should not go further than the steering group and we use it to define the work we are going to do through GrowSave in the Pork sector for the next 4/5 years. Or should it be tidied up for levy payers use.</p> <p>Next steps would be to use these as a baseline documents for any additional steering group members.</p> <p>NFU Energy to go through and change anything factually incorrect and add any missing technologies</p> <p>References to the BAT need to be included in terms of key quotes sentences/ laws from the BAT.</p> <p>NFU Energy to determine a time frame regarding the given feedback and make as much progress as possible before the next meeting.</p>	<p>MB</p> <p>ZM/ BW</p> <p>MB/ JS</p> <p>MB/JS</p> <p>MB/JS</p>
<p>Dairy progression</p>	<p>The dairy draft Tech review for Dairy was received by DB earlier in the week. To be used as a menu of topics that can be developed into a fact sheet etc. during the GrowSave project.</p> <p>In terms of menu type approach. The level of detail we have gone into so far is correct but it needs to be more relative to the Dairy Sector.</p> <ul style="list-style-type: none"> • 	<p>MB/JS</p>
<p>Outcomes</p>	<p>NFU Energy to go away and go through pork and dairy reviews with the given feedback by ZM, BW and DB.</p> <p>The Dairy tech review needs to be more related to dairy before steering group meeting on the 19 May. When we will go through the tech review and get feedback from industry representatives on these technologies.</p> <p>Then before the Pork meeting on the 21 May, NFU Energy will action as much of the feedback as possible.</p>	<p>MB/JS</p> <p>MB/JS</p> <p>MB/JS</p>

Potatoes

Appendix 4.1

08 July 2020		
Item	Notes	Action
Work to date	Technical update on optimising crop storage without CIPC is completed. <ul style="list-style-type: none"> • Information is current as possible currently. We may have to do an update if things change. • A photo may have slipped to the wrong place in word document. Check that this is ok. 	JB
Technical article	Store sealing top tips – Due at the end of July <ul style="list-style-type: none"> • People are using spray foam to seal the store and reduce escape of CIPC. • Not enough details yet if CIPC leakage is going to be an issue but AC feels its not going to be as big a problem as first thought. • Industry players worth talking to would be: • Dutch – Omnivent and Talsna • UK – Welvent • AC not sure if any of above has anything new to share. • So worth looking at other industries. • Look at Cold storage (chilled and frozen) • Also, worth looking into product called Ribfill – used in control atmosphere storage. • Do an outline first to check we are along the right lines with AC 	EH
Technical update	Air leakage and control – Due at the 13 August <ul style="list-style-type: none"> • Be a slightly simplified update of the R439 report. • Areas of air leakage are still around doors, louvers, holes in walls, joins in panels • Some are moving away from vane louvers to a single bigger ventilated door to get a better seal. 	EH
Webinar content	Draft webinar/ you tube content. <ul style="list-style-type: none"> • TIPS are not on AHDB website currently. • Original content in TIPS is worth looking at to update into suitable webinar content. 	JS
Themes for year 2	AC suggested flushing of stores as a potential theme for next year.	

	<ul style="list-style-type: none"> • Measurement and sensing for conditions you want to flush against • Positioning and operation of fans • Scrubber technology • Air movement • Extraction of CO₂ <p>JS suggested that Swiss company Climeworks could be used as an example:</p> <ul style="list-style-type: none"> • They strip CO₂ from air which could be adapted for potatoes store • AHDB is currently doing a trial on the impact of CO₂ but nothing like this and nothing on a commercial scale. <p>Draft a programme for Year 2 work by mid-August</p>	EH, JS
Events	<p>Update milestones with the following events:</p> <ul style="list-style-type: none"> • AHDB Conference – Dec (not sure if its running) • There will possible be grower meetings in early 2021 but to be confirmed. • 27 May 2021 is scheduled for the Sprout Suppressant conference • November 2021 – Potatoes UK – Harrogate 	JB
Steering Group	<p>Time to start thinking about a Steering Committee for Potatoes. Suggestions were:</p> <ul style="list-style-type: none"> • Julian Perone • Mark Means • Supply chains – i.e. Fresh Market • James Daw • Greenvale/seed companies in Scotland <p>Invites to go out after next week's meeting so that we have a group together ready for year 2.</p>	AC

Management meeting minutes:

Appendix 5.1

25 November 2019 – minutes from Nathalie Key

Steering group management (NFU energy)
- first meetings
Following on from the 2 steering group meeting last Friday (22 November), NFU will collate the notes and ideas into a working document to agree work going forward.
Summaries from Oli:
<u>Potatoes</u> – Oli met with Adrian at British Potatoes 2019 on 20 November

Possible areas of focus

- CIPC
- Air tightness of potato stores, air tightness testing, refrigeration savings (possible cross-sector relevance)
- Follow on from R439
- Air flow

Dairy – first steering group meeting 22 November 2019

Possible areas of focus

- Good energy practice
- Slurry source heat pumps
- Water
- Battery technology/energy storage (cross-sector relevance)

Horticulture – first steering group meeting 22 November 2019

Possible areas of focus

- Battery storage/energy storage
- Where sites get their energy from (increasing difficulties with getting grid connection)
- CO₂ from biomass - developments in technology
- Net Zero, reducing carbon footprint
- Likely thematic focus this year – air movement and CO₂

Other activity

- GrowSave News due to be delivered for 9th December

- Wrap-up article for previous project iteration has been written and submitted for next Grower magazine.

Pigs

- NFU energy have provided content for an article in Pig World.
- Zanita suggested mid-January for first Pork Steering Group meeting – NFU energy to arrange
- Zanita will arrange a meeting with NFU energy in advance of this to align activity plan against milestones

Cereals

- Suggested it may be more appropriate to wait on the formation of a steering group until NFU energy have conducted initial review on energy situation within the sector

- filled positions and spaces

Potatoes – require further steering group members suggestions (x 3/4) from Adrian.

Dairy – 3 steering group members, Oli to follow up and confirm them.

Horticulture – would be useful to have an addition PE member (TGA tech?), Nathalie to follow-up.

Pork – Zanita is contacting potential members.

Cereals and Oilseeds – Harry has suggested Mark Chandler, but may be more appropriate to follow-up later in the year at a less busy time and once NFU energy have started review.

Management of steering group should be led by NFU energy with input from respective AHDB sector leads.

Claims for reimbursement for T&S expenses by steering group members should be covered by each sector for the respective members.

Publications timeline and management (all)

- delivery of content

Each sector responsible for liaising with respective comms teams for expected project output as per milestones. Milestones for each sector have been circulated to AHDB sector leads by Nathalie.

Sector work updates (NFU energy)

See above – item 1.

3.1 Horticulture

3.2 Potatoes

3.3 Cereals and Oilseeds

3.4 Pork

3.5 Dairy

Plan for the website (AHDB)

Nathalie in discussions with comms and digital about best way to bring GrowSave web content in house – timeline TBC
Current website (growsave.co.uk) will be live until end January 2020
Jon suggested a holding comment in a GrowSave blog to update industry on how to find information in the meantime – Nathalie will follow up with more concrete dates.
AOB (all)
Nathalie to circulate link to archived GrowSave News and technical updates from previous project iterations.
Jenny Beynon to circulate high resolution GrowSave logo.

Appendix 5.2

13 January 2020	
Item	Notes
Update from NFU Energy	<ul style="list-style-type: none"> • Delivered articles for Winter edition of GrowSave News • Large committee engagement such as TGA, Mushrooms, CGA, BPOA • Air movement concept note sent to Wayne and Nathalie – Discussion around borrowing sensors from Adrian for this project. • Findings and benefits from the air movement work will be fed into edibles next year 2020/2021. • Individual meetings with Pork and Potatoes sectors to discuss plans for steering groups held (very) recently to complete this requirement for all sectors • Zanita (Pork) has already provided suggested names for potential members who Mike will contact. • We are ready to start deliverables
Topic and content suggestions	<p>Here is a brief outline of topics agreed on for each sector:</p> <p>Potatoes:</p> <ul style="list-style-type: none"> • CIPC - Energy impacts of CIPC and reduction measures in a Tech update. • Refrigeration - New /different refrigerants, refrigeration design/ distribution which is transferable to Cereals/Horti/Dairy. <p>Pork:</p> <ul style="list-style-type: none"> • Technological review - Discuss state of the industry and what the main industry figures are doing – what is their view of the upcoming changes and how might these impact the industry.

	<ul style="list-style-type: none"> • Discussion on fluid dynamics and water system planning <p>Dairy:</p> <ul style="list-style-type: none"> • Technological review - Discuss state of the industry and what the main industry figures are doing – what is their view of the upcoming changes and how might these impact the industry. <p>Cereals:</p> <ul style="list-style-type: none"> • Review of currently available calculators • Batteries and power management – How can energy consumption be managed to improve costs and sustainability, including application of renewables and batteries. This is transferable across all sectors. <p>Horticulture</p> <ul style="list-style-type: none"> • PO/PE – Air movement • PE – CO2 sources – possible study tour to investigate new/improved non fossil fuel sources of CO2 – open this up to AHDB sectors too? • SF – Combined with above, air movement and CO2 sources.
Next steps	<ul style="list-style-type: none"> • Jenny and Nathalie to find suitable dates for study tour • Jenny, Nathalie and Lauren to discuss a plan for marketing the study tour. • Training courses – potential of holding 2/3 training days throughout the next GrowSave year to fit in with each Horti sector. • GrowSave team to attend sector shows such as Dairy Tech, pig and poultry and cereals • AHDB is hoping to have the new GrowSave site live by mid February • The current site www.growsave.co.uk will not be available after the end of January. Jenny and Nathalie discussing a holding page to redirect from old site while the new site is finalised. • Discussion was made to have someone from AHDB comms to attend the next meeting for a discussion on how best to get the GrowSave content shared with the relevant sectors. • Perhaps a potential of having a specific GrowSave comms person at AHDB.

Appendix 5.3

12 March 2020	
Item	Notes

<p>Work completed review</p>	<p>Horti –</p> <ul style="list-style-type: none"> • Ed and Mike have completed two days on site for the Air Movement trials • Results so far have been reported on in the most recent Grower article • Study Tour- Suggestion would be to split the tour in two. One in Holland and Switzerland. Jon has had a meeting with Vyncke and first stop would be in Holland where there is a new site with 150 hectares of glass with Geo-thermal, heat pumps... Then on to Geneva to see the CO₂ scrubber. Then the UK Tour would be to see the heat pumps using sewage works and the Drax CO₂ scrubber. Wait to organise events after June to avoid the Coronavirus outbreak. Look to going to Europe sites October time. <p>Pork –</p> <ul style="list-style-type: none"> • Started to call around steering group members • Written results for these calls up into the recent article for Pig World magazine • Participants were very helpful <p>Dairy and Potatoes –</p> <ul style="list-style-type: none"> • Started technical review for Dairy Sector • Writing technical article for Potatoes.
<p>Work yet to do</p>	<p>Horti –</p> <ul style="list-style-type: none"> ○ 1 more edition of GrowSave News ○ 3 Technical Updates ○ 1 more article for the Autumn edition of The Grower. ○ Study Tour ○ 2 more Steering Group meetings <p>Pork –</p> <ul style="list-style-type: none"> ○ Continue technological review ○ Event attendance of the Pig and Poultry Show ○ Confirm Steering group members ○ 2 more Steering group meetings <p>Dairy</p> <ul style="list-style-type: none"> ○ Begin the technological review ○ Write a technical article ○ 2 more steering group meetings <p>Potatoes</p> <ul style="list-style-type: none"> ○ Technical article (Store sealing) ○ Technical updates/Factsheets ○ Potatoes in Practice ○ Steering group meeting <p>Cereals –</p> <ul style="list-style-type: none"> ○ Organise Steering group

	<ul style="list-style-type: none"> ○ Technical update ○ Supporting technical article for AHDB magazine ○ Attend Cereals event
Budget	<ul style="list-style-type: none"> ○ Implications of announcement: <ul style="list-style-type: none"> ○ The government is raising the Climate Change Levy on gas in 2022-23 and 2023-24 (whilst freezing the rate on electricity) and reopening and extending the Climate Change Agreement scheme by two years. ○ The Budget accelerates the greening of the gas grid by announcing a new support scheme for biomethane, funded by a Green Gas Levy. ○ The government will support the installation of heat pumps and biomass boilers by introducing a Low Carbon Heat Support Scheme. ○ It will introduce a new allocation of flexible tariff guarantees to the Non-Domestic RHI in Great Britain in March 2021.
Coronavirus effect	<ul style="list-style-type: none"> ○ No decisions yet from AHDB
Suggestions and Actions from meeting	<ul style="list-style-type: none"> ○ Write a technical update with results from Air Movement trials ○ Also come up with different ways of sharing the results from trials – to be added into the project plan by JB, MB and Ed Hardy ○ Use results from Air Movement trials to create a training course for year 2 ○ MB to breakdown conversations from Steering Group conversations for ZM. ○ Pig and Poultry – ZM to remind Ben about a speaking opportunity at P&P and if Jon can attend event on the AHDB stand? ○ JB to send ZM the number and location of the NFU stand that a member of staff will be on throughout the event. ○ JS to write an update from the Budget announcement yesterday. JB to share with sector teams and work with them to get the messages out via, blogs, emails and social media. ○ JB to sort the redirect from growsave.co.uk to the new AHDB landing pages. ○ JB and ZM to organise a Pig Sector meeting in two weeks time. ○ ZM to find out about Coronavirus effect on contractors. ○ NK to check if GrowSave update is required during the TGA conference call at the start of April. ○ JS and NK to discuss the effects of having the Study Tour in Year 2.
Next meeting dates	<ul style="list-style-type: none"> ○ 14 May ○ 15 July

Appendix 5.4

14 May 2020		
Item	Notes	Action required by
Management of work packages	<p>Set up individual meetings with sector leaders monthly to discuss project milestone progress, clear objectives for Steering Group formation. Like Pork. Copy NK in.</p> <p>Dairy Steering Group meetings have happened every quarter as have Horti.</p> <p>Potatoes – Have met with Adrian occasionally but not as often as probably should.</p> <p>Cereals – we have had no reply to communications with Harry.</p> <p>Dairy, Potatoes and Cereals need catch up meetings the most.</p>	JB/MB/JS
Year one mid term review	<p>Dairy has not had any contact since the last Steering Group meeting. But Jon did send a draft of the tech review based on Pork one. This needs to be more related to Dairy to be used as a start</p> <p>Had thought of Pork and Dairy as a pair in term of contract delivery. However, understanding is that they do need to remain separate</p> <p>That said NFU Energy has used what was learnt from the Pork Tech review and adapting it to Dairy. Now picking up Dairy specifics</p> <p>Need to keep outputs as sector specific as possible but there will be a cross over references between Pork and Dairy.</p> <p>The two tech reviews will need to be realigned to ensure they match where they should and should not.</p> <p>Need to agree with DB on the 19 May meeting that the right technologies are included. Then agree a delivery date.</p> <p>Should only be 3 to 4 weeks away from where the Pork review is now.</p> <p>Discuss realistic dates after we have gone through our comments (in following meeting). It might mean slight milestone alterations.</p> <p>Horti</p>	<p>MB/JS</p> <p>MB/JS</p> <p>BW/ZM/BD</p> <p>MB/JS</p> <p>JS/ZM</p>

<p>Travel restrictions, what that means for milestones</p>	<p>Work that hasn't been completed yet has only been put on hold due to COVID-19 situation.</p> <p>Especially with regards to Air Movement and Study Tour, thoughts and ideas are certainly on hold until we can travel nationwide and abroad.</p> <p>With recent lessening of lockdown restrictions, we may be able to get out on site to do more testing in greenhouses now.</p> <p>A study tour overseas looks unlikely this calendar or maybe even financial year. It might be wise to switch that milestone into next year and consider online training and webinars instead for this year. What the content for these is to be decided.</p> <p>NFU Energy would prefer plan to fill program with some deliverables this year. Rather than moving milestones to next year and increasing the workload for year 2.</p> <p>Webinars would be an option along with instructional You Tube 3 minutes videos.</p> <p>It needs to be decided what the equivalent video delivery would be in exchange for a 20-minute presentation.</p> <p>Then a series of video clips can be planned and ensure that they all follow a similar format and branding.</p> <p>Net Zero tech update should be completed by the end of Q3</p> <p>Air Movement tech update is just waiting to see if its worth producing something once Ed Hardy has done his data review.</p> <p>3rd Tech update is due in June and topic is TBD.</p> <p>One last edition of GrowSave News</p>	<p>JS/NK</p> <p>JS</p> <p>JS/NK</p> <p>JS/MB</p> <p>JS/JB/MB</p>
<p>Additional actions from meeting</p>	<p>Follow up with potatoes and cereals</p> <p>Follow up with possible changes in delivery or swapping of milestones.</p> <p>Review of all milestones and perhaps starting again. As the Dairy, Pork, Cereals and Potato sectors are all new and it was bit of a shot in the dark at the start.</p>	<p>MB/JS</p> <p>NK</p> <p>All</p>
<p>Next meeting dates</p>	<ul style="list-style-type: none"> • 15 July 	

Appendix 5.5

16 July 2020		
Item	Notes	Action required by
Progress report - General	<ul style="list-style-type: none"> We have since caught up with Harry and Adrian and made progress with the work in these sectors. We are still in discussion with Nathalie about changing the milestones. We have reviewed and updated all milestones with all sectors. 	
Pork	<ul style="list-style-type: none"> Webinar and podcast left to do this year. Webinar to be about slurry cooling. Podcast about GrowSave activity and the tech review One action left - to determine what the 2nd year activity will be. There is unlikely to be a dedicated Steering Committee for this work now as this will form part of the Pig Industry Environmental Steering group's remit We need to set up a meeting with Jon Foot to discuss how we take the tech review forward and where he sees the environmental side progressing. Send final report to ZM and BW. 	JS, MB
Dairy progress report	<ul style="list-style-type: none"> We have delivered the 'All Things Dairy' article. Just waiting for one final change to the Milk Cooling factsheet in reply to comments from DB and this should be completed in the next few days for us to send the document back to DB. Dairy review: recent conversation with the Dairy Development Centre which MB is now entering into the review. Nearly finished with this. Then we need discussion on where the next year develops (which also needs input from Jon Foot). Dairy Development Centre has given us an invite to visit which is worth doing. 	JB

Potatoes progress report	<ul style="list-style-type: none"> • Outline for the article and tech update has been sent to AC. • We are to create a steering group and will need to be contacting relevant people over the coming months • Year two work will be about store flushing around CO₂ and how that might be done in a controlled manner. Linked with Horti. 	JS, AC
Cereals progress report	<ul style="list-style-type: none"> • Completing literature review and looking to get progress out to HH in the next couple of weeks. • Furthest behind with this sector. 	JS
Horti progress report	<ul style="list-style-type: none"> • Most written content is completed. • Conference work has been completed – BPOA and TGA. • Training courses been hit the most by COVID-19 and we have suggested alternatives. • Air movement trials are also on hold. We are looking for an alternative venue to Baginton Nurseries. (WB has subsequently suggested Graeme Edwards at Woodlark Nurseries as an alternative). • Climate and humidity control are good subjects to use as remote learning/ training webinars. • WB suggested that these are available all the time for new staff members. Are these something worth reviewing as informal CPD training? • Suggested themes for next year is CO₂ – Study Tour is making progress for next year with venues willing to host. This tour may well be applicable cross sector. • TGA will be virtual this year. Jon has agreed to present • BPOA is scheduled as the 20 January but how this takes place is uncertain. JS to keep the day free. • The Soft Fruit conference will also be virtual and sometime in November. Agenda confirmed in August and to include a GrowSave section. • LED Calculator – webinar training workshop. Update to be sent to WB. • Commercially available calculator to be sent to WB and NK. 	 JS/NK WB/JS NK/JS NK/JS WB/JS SR/JS MB JS
Next meetings	<ul style="list-style-type: none"> • Follow up meeting for end of year 1 for each sector • Management meetings to become every 6 months meeting. • NK to be included in all sector meetings. 	 NK NK

	<ul style="list-style-type: none">• Next meeting would be in mid-March.	JS NK
Final report	<ul style="list-style-type: none">• To be released at the end of September.	