A BRITISH FREE RANGE EGG PRODUCERS ASSOCIATION SUSTAINABILITY FUND REPORT

CASE STUDIES EXPLORING PROGRESS TOWARDS NET ZERO WITHIN BFREPA

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British Free Range Egg Producers Association
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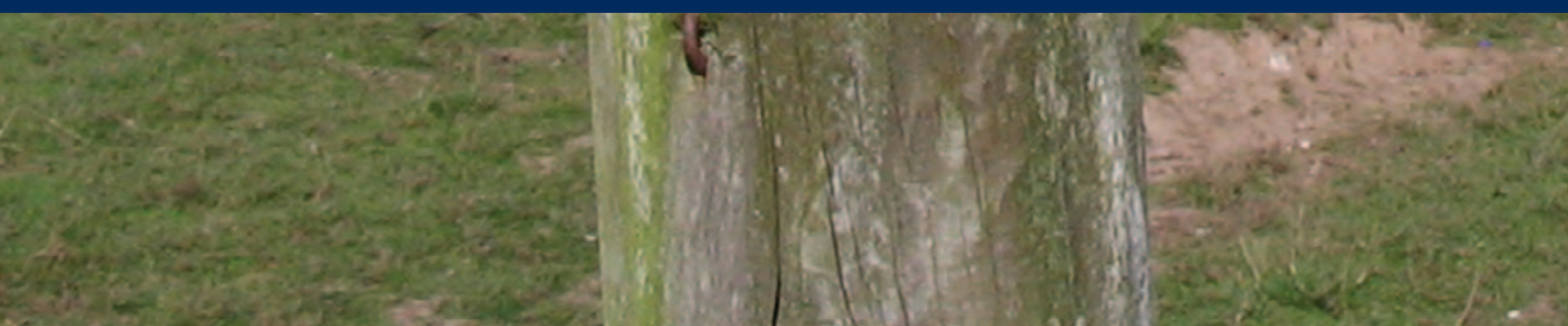
1. INTRODUCTION



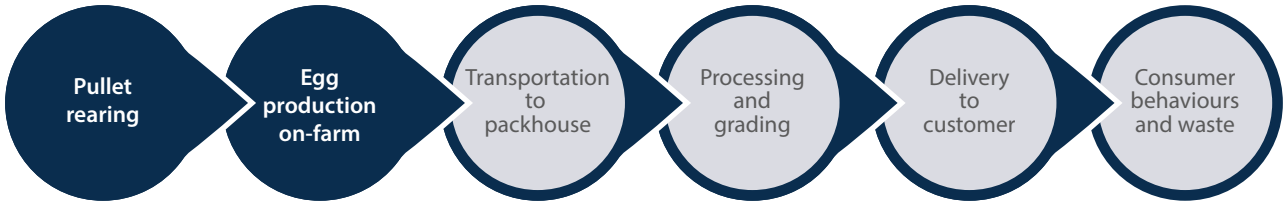
OVERVIEW

The impact of our food systems on the environment – to land, water and air – continues to be a source of considerable and growing interest to policymakers, industry and consumers. Work undertaken between BFREPA, the industry and Promar documented in the 2021[1] report that understanding about the role and contribution of UK free range egg production is limited concerning sustainability and net zero objectives.

This phase 2 report aims to build on the initial report and concentrates on the work and actions of three projects led by BFREPA members who are actively implementing sustainability practices which contribute to the multiple objectives laid out in the phase 1 report. This collaborative project between BFREPA and Promar, and key players within the free-range egg sector has sought to investigate the opportunities for net zero and environmental sustainability within the UK's free range egg production.

The scope of the emissions and environmental sustainability assessment of free-range egg production is important to define. For the purposes of this project, the scope is defined as farm gate impacts only as demonstrated in Figure 1.1 below. Impacts and emissions post farm gate from transportation, grading and packaging at packhouses, retails sales and consumer behaviours and food waste are not part of this study.

Figure 1.1: Project scope within the supply chain



To demonstrate environmental sustainability within the free range egg production industry, defined targets and units of measurement are needed to provide a framework, linking to Sustainable Development Goals where appropriate. The phase 1 report identified six key themes to consider which could begin to set standards for environmental sustainability within the sector:

1) Greenhouse gas emissions

2) Energy efficiency and renewable energy

3) Water quality

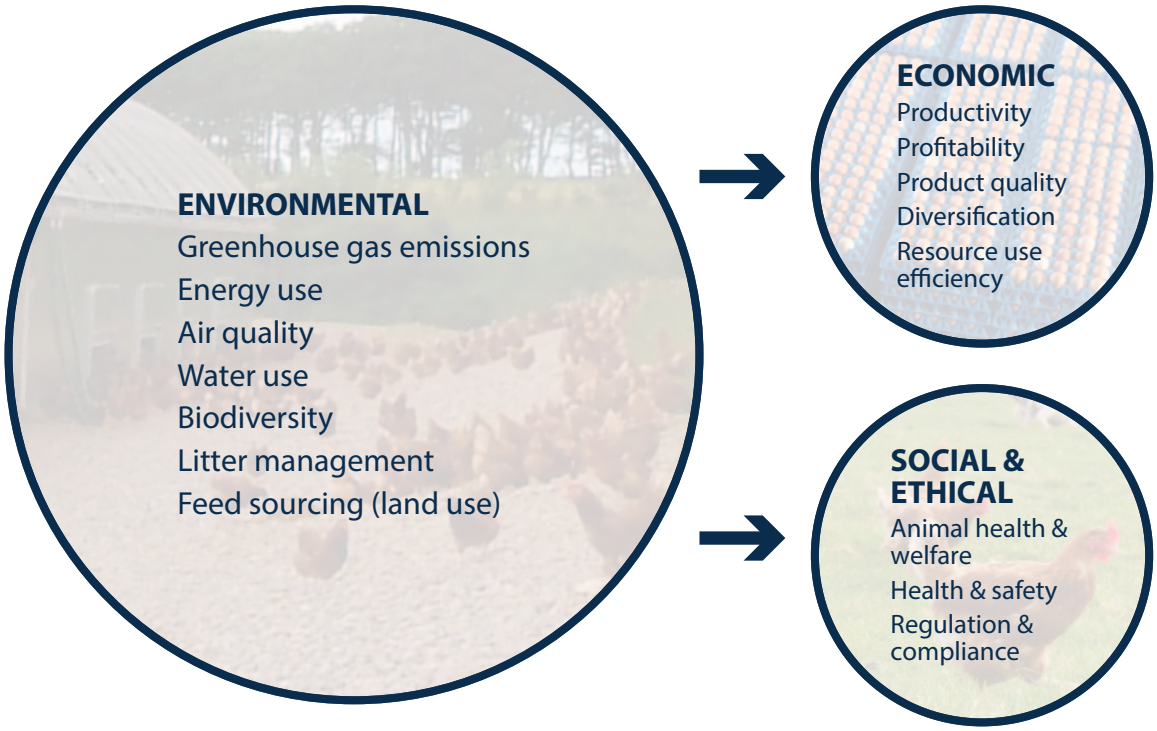
4) Ammonia and air quality

5) Litter and manure management

6) Feed sourcing

Figure 1.2 provides a wider illustration of how the three pillars of sustainability have been categorised for the whole project.

Figure 1.2: Focus on environmental sustainability themes



The second phase of project has delved further into three key themes of environmental sustainability and these are:

- Land use, deforestation and feed sourcing
- Ammonia, air quality and creating resources for sequestering carbon on the range
- Water security, biodiversity and holistic management of available resources

REPORT STRUCTURE

This report covers the following aspects:

- Section 2 provides the detail on the case study approach and the case study analysis and findings
- Section 3 provides a summary of the key themes and actions identified from the phase 2 project
- Section 4 provides a summary of supporting evidence and references

2. NET ZERO CASE STUDIES

2.1 CASE STUDY APPROACH

Following completion of the phase 1 report, BFREPA and Promar reviewed the findings and identified a series of priority net zero topics which could be included as case studies.

The topics identified were:

A Focus on feed:
reducing protein and alternative sources of protein

B Focus on manure:
maximising poultry litter

C Focus on ammonia:
tree planting for ammonia mitigation

D Focus on water:
catchment management and water quality improvement

Working with BFREPA and its members, topics A, C and D were prioritised for inclusion as case studies and engagement commenced to identify suitable farms to be included within this second phase of work. The most challenging topic was to identify suitable case farms for alternative sources of protein.

Figure 2.1: Case study selection

Promar would like to extend warm appreciation and thanks to Tesco Stores, Anglia Free Range, Humphrey Feed & Pullets, For Farmers, Eggbase (and the BFREPA membership) in significant support to identify a project for inclusion. The industry is rapidly developing its approach to soya use and exploring alternative protein sources but the embryonic nature of this work as well as non-disclosure agreements prohibited many case farms from being engaged and/or included.

Following the sourcing of case farms and projects, engagement with each participant commenced to obtain data, insight, and collect qualitative feedback for inclusion in the case reports (see Section 2).

Data was collected during on-farm meetings with each farm, either online and/or in person at the farm. Anecdotal evidence of wider environmental sustainability practices associated with ammonia, water use, biodiversity and litter management and feed was captured in a survey conducted on farm with producers.

2.2 CASE STUDY 1: ACHIEVING NET ZERO THROUGH ALTERNATIVE PROTEINS: WHERE ARE WE NOW?

There is growing interest and importance placed on increasing the availability of alternative protein sources in the UK poultry sector. Soya has traditionally been the main protein source in poultry feeds, with an almost ubiquitous presence, due its availability, consistency and characteristics of high digestibility, high-protein, and a good amino acid profile. The many environmental concerns linked with the production of soya and its import, alongside its fluctuating cost, mean that the industry is actively investigating alternative protein sources that can serve as full or partial replacements.

THE IMPORTANCE OF ADDRESSING FEED EMISSIONS

Since the UK government legislated a net zero target, many commitments have been made across the agricultural industry to decarbonise and transition to a low carbon future. Information on the sources and magnitudes of greenhouse gas emissions from livestock food production is therefore of considerable and growing interest to policymakers, industry and consumers.

As identified in an earlier phase of BFREPA's investigation into opportunities for net zero within the UK's free-range egg production sector, feed emissions account for 87% of a farm's carbon footprint from egg production. The proportion of these emissions which can be attributed to protein sources, and more specifically soybean meal, is highly variable due to the range in feed emission factors associated with country of origin. These feed emission factors are linked closely to land use change, production methods and transportation, which themselves sit alongside a profile of other environmental sustainability concerns. Biodiversity loss, overuse of synthetic fertilisers and soil degradation are just some of the environmental issues associated with soya production in some parts of the world and are often seen most acutely so in the Amazon region.

With over 11% of the 2.7 million tonnes of soyabean meal imported to the UK associated with egg production[2]. The sheer quantity imported highlights the significant contribution of soya to some of the major environmental challenges faced by industry.

THE CURRENT LANDSCAPE OF ALTERNATIVE PROTEINS

There is a growing market for alternative protein sources, some of which have the potential to be produced with less water, land and energy and therefore cut the dependency on soya meal in the future[3]. The cost and protein quality of these alternatives are important considerations, given most are not like-for-like substitutions. The replacement of soybean meal must be approached carefully in order to compare how far alternatives are transported, the need for additional processing and other factors.

Some of the more established alternative proteins include oilseed meals, pulses, brewer's grains and lucerne. Wheat distillers' grains from the bioethanol industry are also good potential material if available and of consistent quality. There are some promising alternative protein sources on within the future of the feed industry, single-cell proteins such as algae. Martin Humphrey of Humphrey Feed & Pullets outlines the challenges associated with this protein source, 'Despite the high theoretical potential of algae, its suitability as a protein for commercial, large-scale production is still being tested in its early stage and there is therefore uncertainty regarding its commercial viability'. Processed animal proteins and insect proteins also have good potential to become a significant part of the poultry ration, however regulation currently blocks their commercial use in the UK, whilst the viability in cost is currently a huge challenge, with some feed companies quoted figures of £4,000 - £9,000 per tonne for inclusion in diets. An FAO report indicates that insect protein has the essential nutrients to replace between 25% and 100% of soyabean meal in poultry feed[4] however, current feed information makes this unlikely at present and this would require balance with other feed ingredients.

MODELLING THE CARBON FOOTPRINT OF A NIL-SOYA RATION

By modelling the carbon footprint of a nil-soya ration, we can begin to understand and quantify the dynamics of alternative protein source emissions. Whilst there are a significant number of assumptions and caveats within the model, this feasibility study helps provide the foundations for what could be a live trial flock which applies these, or similar diets.

Promar International worked in collaboration with Anglia Free Range Eggs to model the carbon footprint nil-soya versions of ration specifications for four flocks (named A – D) that have recently come to the end of their flock cycle. The actual ration fed to each flock over its whole cycle was compared with a 'like-for-like' nil-soya ration, formulated by Premier Nutrition. Diet specifications were maintained so that performance characteristics of the diets would maintain equivalent feed intake and egg output as best as possible.

The carbon footprint of each flock was then calculated for each ration from the point of lay, using the EggBase Carbon Footprinting Tool[5] to compare total annual emissions per kilogramme of egg.

CHALLENGES OF MODELLING A NIL-SOYA RATION

This modelling formed part of a feasibility study which was intended to give an indication of the emission impact of replacing soya in the ration as a precursor to a potential live trial flock. Several important assumptions were made within the calculations that are likely to differ significantly within a live flock. These caveats and assumptions included that the diet change would have no impact on feed intake, egg production, egg size, mortality, and hen behaviour.

RATION COMPOSITION

Nil-soya rations were established that utilized field beans, wheat distillers dried grains and a cooked rape/bean blend. Early diets were characterised by higher levels of sunflower seed meal, which decreased in proportion in later diets. Amino acids formed an important part of the nil-soya ration with increased levels of valine, isoleucine and tryptophan balancing essential amino acids and giving lower crude protein levels in the early diets. Exclusions from the nil-soya rations included wheat feed and barley. An overview of the rations used, and the source of soya is available in Table 2.1.

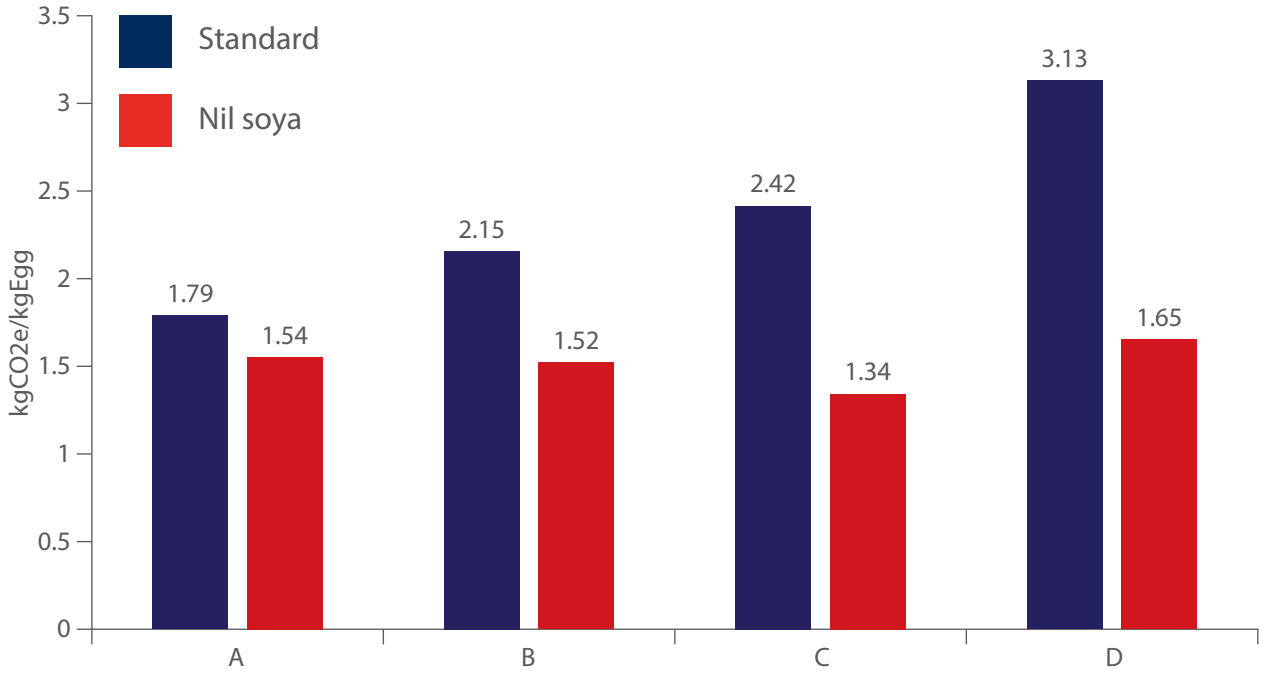
Table 2.1: Actual ration formulation and soya sourcing for each flock (A-D)

A: Ultra, Start & Early Lay A mix of Argentinian and US soya	**B: Start & Early Lay** Mixed soya sources
C: Ultra, Start, Early & Peak Lay Mostly Brazilian soya	**D: Ultra & Start Lay** No soya country-of-origin information available (assumption made)

EMISSIONS OF A NIL-SOYA DIET

The total carbon footprint across the four flocks decreased by an average of 34% when substituting the standard ration for a nil-soya ration, from 2.37 kgCO2e/kg egg to 1.51 kgCO2e/kg egg (Figure 2.2). In comparison to the emission results from BFREPA's phase 1 report, this represents a reduction from 3.23 kgCO2e/kg egg. There was significant variation in total emissions between the flocks, with the reduction in footprint from the ration substitution ranging from 14 – 47%.

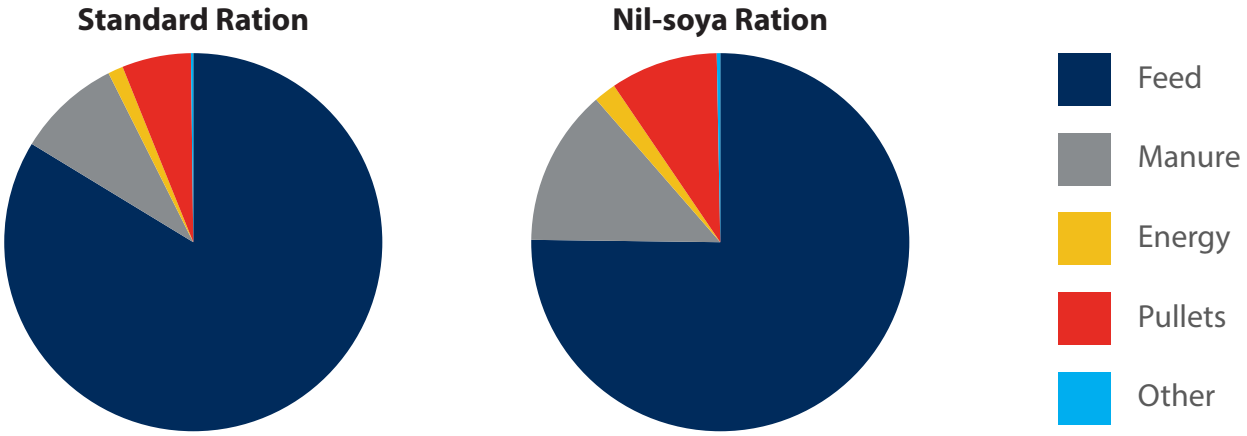
Figure 2.2: Total annual CO2e emissions (kg CO2e/yr) for each flock with a standard and nil soya ration



The variation between the specific feed footprint of the standard ration of each flock was evident, even before modelling the nil-soya ration. The feed emissions of Flock D were 2.72 kgCO2e/kg egg from a total of 3.13 kgCO2e/kg egg, which was 47% higher than the lowest feed emissions from Flock A, at 1.44 kgCO2e/kg egg.

Running the feed emission comparison against the standard ration of these flocks highlighted how the composition of the ration, and more particularly the soya country-of-origin, is a key driver of emissions. This is evident when comparing Flock A and Flock C, which were fed very similar ration types over the course of the flock cycle but differing soya sources (Table 2.1). The soya in Flock A's ration was sourced from a mix of US and Argentinian, which on balance has a relatively low feed emission factor. The feed emissions of Flock A were 31% lower than Flock C, in which the ration was comprised of soya of mainly Brazilian origin.

Figure 2.3: Proportion of total emissions associated with each farm category for standard and nil-soya rations



Ration	Feed	Manure	Energy	Pullets	Other
Standard	83.7%	8.9%	1.3%	5.9%	0.2%
Nil-soya	75.2%	13.4%	1.9%	9.2%	0.3%

As well as total emissions decreasing, the proportion of emission sources on the farm shift when applying a nil-soya, with feed contributing to 8.5 percentage points less, at an average of 75.2% of total emissions.

The modelling reflects a conservative reduction in emissions compared to some existing estimates of feed formulation modelling using IPCC emissions data which indicate a potential 60% reduction in emissions footprint for poultry diets[6].

The attention to detail given by contributing feed companies ensured modelling of a ration that could in theory replicate the performance of a soya-based ration. Development in the studies behind emissions factors and knowledge of the balance of proteins in layer rations could be responsible for this difference in emissions.

The sourcing of soya clearly provides an opportunity to target reductions in feed emissions. This highlights the importance placed on those involved throughout the supply chain, from farmers to feed companies and retailers, to demonstrate the soy country-of-origin through relevant certification schemes. One such source would be European soya, such as Danube soya, which embodies sustainability, non-GMO and European origin. It has an associated carbon footprint that is 10 times lower than soya sourced from Brazil[7], an attractive prospect to producers. Despite European soya coverage growing progressively from its current coverage of 4.3 million hectares, to an expected 6 million hectares, its use is rarely beyond the European continent, where it is in high demand, and therefore its potential as a major contributor to the world's soya

production sits in the shadow of countries such as Brazil, Argentina, and the USA. The challenge remains for feed costs in production to stay viable against a market that reacts to increased demand in responsible soya sourcing schemes with an increased premium.

Eliminating soya from the diet, as represented by the nil-soya ration, brings a significant reduction to emissions from feed, at least in a modelling exercise. Whether these results would be consistent with those from a live flock could be contested. Therefore, the next step would be to apply these alternative protein rations to a live trial.

Harry Irwin, Director at Anglia Free Range Eggs, suggests 'A trial of these model diets would be beneficial, but we would encourage that initially this is post 40 weeks to reduce any potential risk to overall flock performance, egg size performance and welfare'.

KEY CHALLENGES WITH INTEGRATING ALTERNATIVE PROTEINS INTO THE LAYER RATION

The ration modelling establishes the potential of emission reductions when including alternative protein sources in the layer diet, particularly when avoiding Brazilian soya. The challenge for the industry is to work towards a point where this is a viable option for all producers. The complexities of achieving this within the landscape of the current supply chain are evident to all.

Although the impact on emissions of excluding soya from feed rations are clearly significant within this modelling exercise, there are many caveats to this outcome and a shift to alternative protein sources comes with several trade-offs of its own. The first of which being increased dietary costs. Numerous feed companies referenced that it could be expected for nil-soya rations to reach £10-15/tonne more in early diets, at £35-45/tonne, before tapering in later feed rations.

The availability of alternative protein sources is one of the major limiting factors to moving away from soya. Patrick Garland of Premier Nutrition highlights some of the key issues linked to availability, "Alternative proteins need to be available year-round in consistent quantities and of consistent quality to facilitate soya free diet formulation and there needs to be adequate material handling at feed manufacturing sites". At present the demand for alternative protein sources is heavily challenged by market availability, for instance field beans were in limited supply at the beginning of 2022 and cost will increase with decreasing availability. Although peas did not feature in the modelled ration formulations, they would be a good material to include, however, their availability in the market is

poor since low acreage is grown in the UK. There is a clear requirement for the UK to collectively increase the area of production for these home-grown protein sources.

Volatility in global markets bring further uncertainty to consistent availability of feed sources. Increasing the proportion of sunflower seed meal in rations across the UK would depend on further importations of material from the EU and Ukraine. This is not a given, particularly due to the impact of the war in Ukraine at the time of the exercise, which threatens the long-term availability of oilseed alternatives. In terms of supplementary amino acids, the fluctuating global supplies and cost of lysine since the inception of this modelling exercise again illustrate some of the problems with taking formulation exercises in isolation to make long-term predictions and demonstrate the vulnerability in achieving consistent nil soya diets.

The storage capacity of feed mills also poses a challenge to new ration formulations. Limited raw material storage capacity at most feed mills would preclude the introduction of additional raw materials, dropping existing perhaps marginal materials in volume terms to release storage capacity would incur costs on other rations that would need to be recovered. The handling of processed animal proteins (PAP) within the supply chain is also a concern to existing production lines, given that there are not currently species-specific production lines. Dedicated species PAP handling, including rendering and transport, would need to be established to ensure retention food safety and biosecurity, with specific consideration of issues relating to the BSE disaster[8].

Rapemeal and peas represent the closest formulation specifics to soya, and when complimented by an increased proportion of amino acids, are the closest to offering a direct soya replacement. The practicality of introducing rapemeal and peas as dominant protein sources should be carefully considered given the potential indirect issues that could be caused with animal welfare and egg quality. For instance, rapemeal is fibrous so it could cause wet litter or fish taint in the eggs of heritage breeds. The availability of rapemeal is also becoming increasingly limited as the area of the crop continues to decline.

The impact of dietary change on wider-sustainability issues should also be carefully considered. Social sustainability concerns include that some sources of imported rapemeal from eastern Europe have issues regarding modern slavery[9].

Humphrey Feed & Pullets emphasised the importance of egg specifications as a driver of diet formulation. When the preference of consumers leans towards a larger egg, higher protein, and therefore soya, is required to meet this size. A concerted effort to address this could lower protein content considerably within diet specifications. Consumer preference may also play a part in acceptance of some alternative protein sources too. With processed animal proteins yet to be on the radar of most consumers, given the current regulations, it is unknown whether this will be accepted as a source of protein for egg production.

COMMUNICATION IS KEY TO MOVING ALONG THE PATHWAY

The acute challenges of bringing together individuals and organisations from across the supply chain to discuss and address some of these issues have become apparent during this project. It is evident there is significant resource being fed into this area, reflected by the investment and R&D currently taking place. As a result, several non-disclosure agreements are in place, particularly with feed companies, hamper the ability to have fully open and collaborative discussions throughout the supply chain. For the industry to move forwards and find solutions that consider the demands of all stakeholders, from the farmer to the consumer, these communications need to begin to open.

Perspectives from the retail supply chain – John Kirkpatrick (Agricultural Manager – Poultry, Eggs and Feed, Tesco Supermarkets Plc)

Long term sustainability of the egg sector is something we are all focussed upon. The expectations from government, consumer and NGO's will require our whole supply chain to think about how they measure and monitor to deliver decarbonisation within the supply chain.

The way in which farmers achieve that needs to be built on credible and accurate data using proven carbon monitoring tools. The contribution of the ration to the egg producers greenhouse gas emission profile is significant, and this is an area we at TESCO have been working with our long term strategic poultry and egg partners on.

At TESCO we are working collaboratively to identify options and alternatives, some of which has been reflected on in this case study. It is inspiring to see our farmers determination to be 'part of the solution' however there needs to be more collaborative work within the industry to bring forwards options which will accelerate our collective objective to achieve zero deforestation targets by 2025.

All aspects of the supply chain will need to be considered in adopting new, alternative feeds, and to see the progress within this example is fantastic. That said, given the inflationary challenges we are seeing currently we must carefully balance the trade-offs whilst not losing focus on the primary objective of healthy, sustainable, and affordable product.

FIVE STEPS FOR FARMERS TO REDUCE THE IMPACT OF FEED

1 **Target soya reduction** – explore options to reduce the protein % of your feed, starting with manageable soya reduction. Nil-soya diets are still early in their research in relation to live flock effectiveness. Eliminating soya completely could cause production issues such as hen behaviour, despite the ration nutrients being 'like-for-like'

2 **Prioritise country of origin of soya** – US soya is produced more sustainably than Brazilian soya, and therefore has lower associated emissions

3 **Reduce feed wastage** – establish efficient feeding systems and ensure access to clean water etc

4 **Consider flock lifecycle stages for protein reductions** - think of good key stage diets to step down protein as the age of the bird increases

5 **Discuss alternative protein sources** with your feed supplier

To support producers with planning and scoping alternative options, figure 2.4 has been produced based on the latest, publically available information, which will drive farm planning and considerations around the inclusions of soya within layer diets.

Figure 2.4: Roadmap towards understanding how and when free range egg producers will need to tackle soya within lay diets

2019

- UK retailers announced zero deforestation soya plans with Tesco, Waitrose, M&S, The Co-op, and Asda cited by WWF as leading the commitment

2022

- Increased scrutiny of livestock supply chains continues with 'soy credits' no longer deemed enough to meet consumer responsibility expectations.
- Farmers need to be working with feed companies and associated bodies to demonstrate the source of soy origin to meet compliance from UK retail

2022-25

- Commitments expected from UK processors which will start to phase out soya are beginning to be proposed.
- Farmers need to work with feed advisors to scope potential for alternative protein sources.
- Trials of cropping to provide alternative protein are being considered which include sunflower, rapeseed, sprouting vetch need to be more widely reviewed and communicated by the industry
- Producers, processors and supply chains will need to develop and implement robust, transparent decarbonisation plans which will include a focus on soya and palm.

2025-28

- UK retailers committed to achieving and only sourcing from verified zero deforestation regions – farmers will need to demonstrate their feed strategies and sourcing policies
- EU approved PAP for animal feed in autumn 2021 but it is expected to be more widely incorporated into animal feed by mid 2020's. No firm decisions made have been agreed on insect protein.
- The UK Government has not formalised its position on regulation change concerning insect protein/PAP.

2030

- Potential availability and access for farmers in the UK to access / use insect protein and 'new' options such as algae.
- Challenges for policy and the supply chain to work together to address are feed safety legislation (insects) and scale production in the UK.

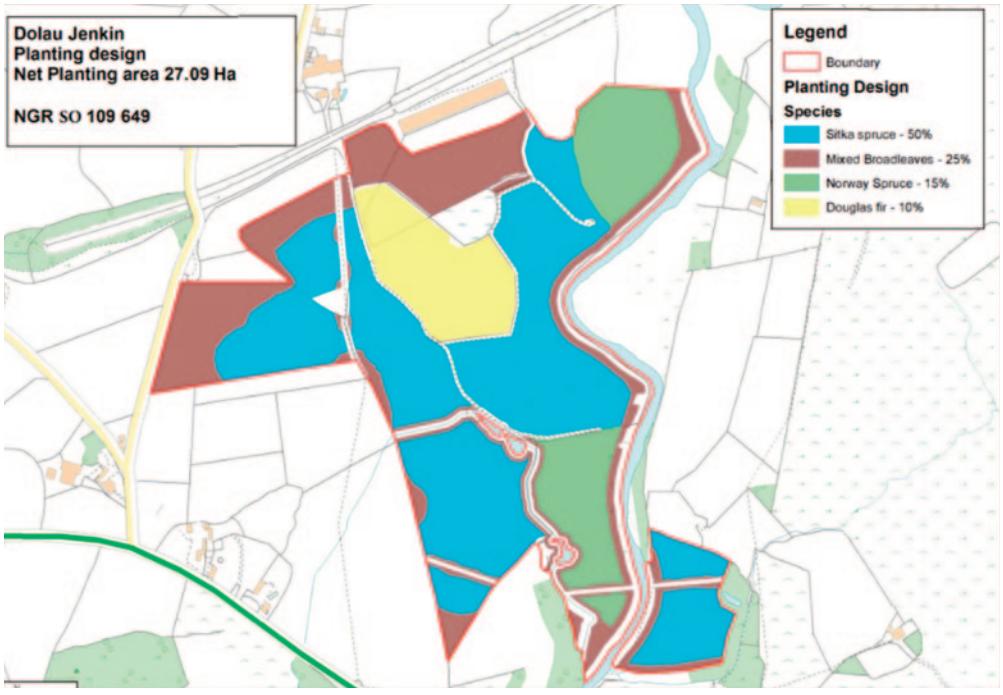
2.3 CASE STUDY 2: REDUCING IMPACT OF AMMONIA THROUGH WOODLAND MANAGEMENT

TREES ON RANGES - SUSTAINABILITY OUTCOMES FOR CARBON AND AMMONIA

Meadowside Free Range Eggs producers Martin and Nikki Lawrence run a 64,000 bird unit in Llandrindod Well, Powys, Wales. In 2019, Martin and Nikki converted 27 hectares of grazing land and planted over 66,000 trees across the site.

The tree planting included species such as Sitka spruce (*Picea sitchensis*), Norway spruce (*Picea abies*), Douglas fir (*Pseudotsuga menziesii*), and mixed broadleaves including Oak (*Quercus spp.*), Ash (*Fraxinus spp.*), and Birches (*Betula spp.*).

Funding from the Wales Government's Glastir Woodland Creation Grants was secured to help cover the financial costs of the tree planting.



Source: Woodland Carbon Code – Land Carbon Registry

Trees on free range poultry units provide multiple sustainability outcomes. They:

- Provide shade, shelter and foraging habitat encouraging hens to use the range
- Draw down carbon from the atmosphere and store it for long periods of time helping to offset greenhouse gas emissions
- Provide a buffer to capture and mitigate ammonia emissions from poultry sheds
- Provide visual screening around housing units
- Help to regulate the flow of water across sloped fields
- Protect the river corridor and creating riparian habitat
- Provide groundcover to protect the soil from erosion

TREES FOR CARBON SEQUESTRATION

The woodland area at Meadowside Free Range Eggs has been validated and registered by the Woodland Carbon Code[10]. The 100-year project is estimated to sequester 6,351 tonnes of carbon dioxide equivalent (CO2e) units over the project lifetime. The rate of carbon sequestration will be verified again at year 5, in 2024, and may result in the generation of carbon credits for this farm to use to offset residual greenhouse gas emissions from the layer unit.

The average price companies are paying to offset their own emissions is between £7 - £20 per tonne of carbon dioxide equivalent carbon credits. This has the potential to offer the farm an additional income stream if the carbon credits were sold in the voluntary market. The carbon drawn down from the atmosphere is also helping the farm to offset its own greenhouse gas emissions associated with egg production.

Martin Lawrence

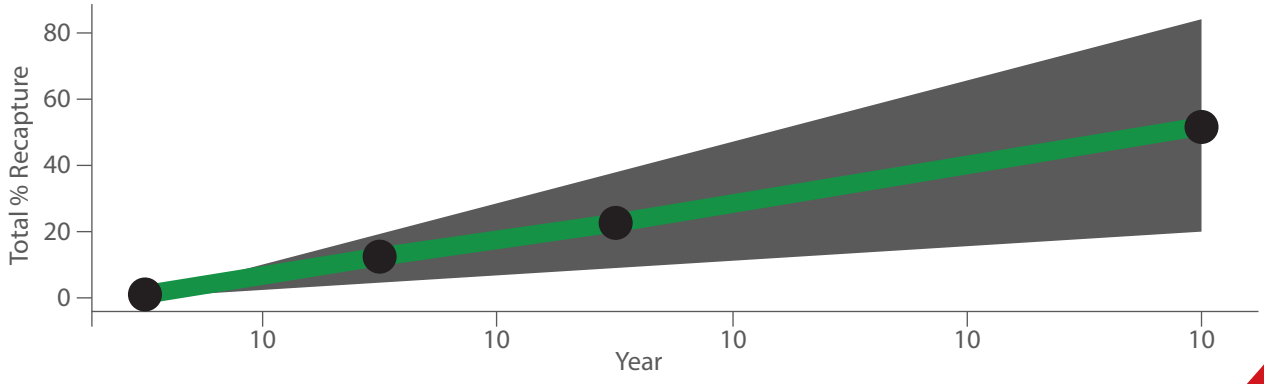
"Planting trees worked out more profitable for our business that letting out the grassland to other farmers. It has also meant no other farmers coming onto the land which has helped our biosecurity."

TREES FOR AMMONIA MITIGATION

Planting trees for ammonia mitigation should be used as a complimentary measure for reducing on-farm emissions of ammonia to the atmosphere. This is because it takes time for the young trees to mature to the point where the canopy closes, and the maximum ammonia capture is reached.

The Centre for Ecology and Hydrology (CEH), and Forest Research Agency (FR) have developed a calculator[11] and guidance for producers so they can maximize the benefits of planting tree shelterbelts for ammonia recapture. The calculator models the potential ammonia recapture based on farm location, soil type, tree species planted and planting density.

Modelling using data from Meadowside Free Range Eggs showed up to 52% of ammonia emissions from the poultry unit can be captured by the tree planting when the trees are 50 years of age. After 15 years, 12.5% of ammonia is captured, and 23% is captured at 25 years.

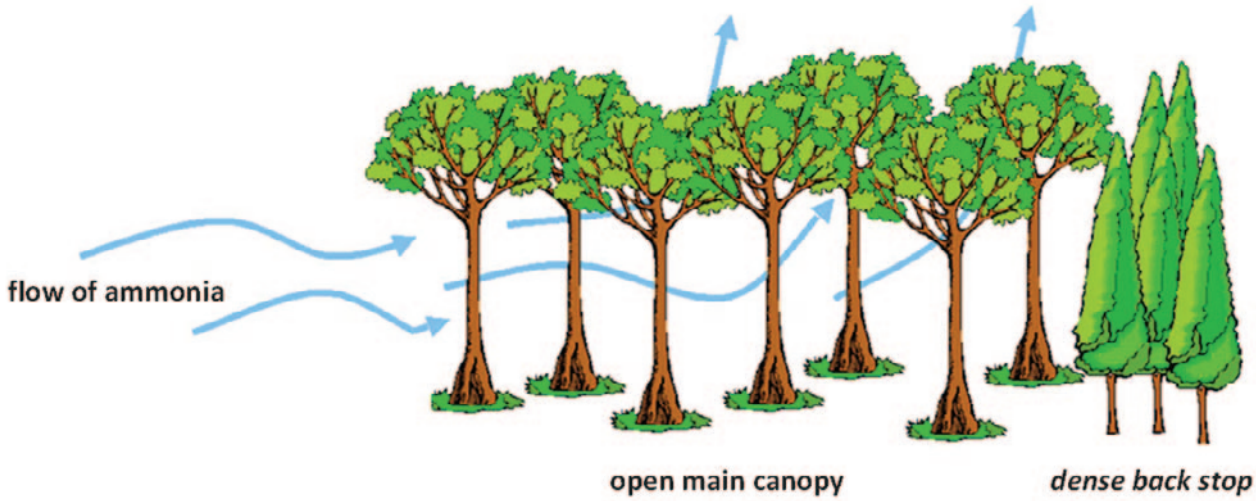


Year	Tree height (m)	% ammonia recapture
5	1.5	1
15	9	12.5
25	18	23
50	37	52

Source: CEH Ammonia Reduction Calculator

The following planting design principles should be followed to maximise ammonia capture:

- The woodland planting should be downwind of poultry housing and between 20 – 100m in depth and extend the full width of the building(s).
- An open understorey is necessary with 2 – 4m spacings between trees to facilitate hen ranging.
- A thick backstop of barrier planting of trees (spaced 2m or less) to further prevent ammonia dispersal to nearby sensitive habitats.



Source: CEH Ammonia Reduction Calculator

FIVE STEPS FOR FARMERS TO REDUCE AMMONIA AND INCORPORATE TREES ON THE RANGE

1 **Use an ammonia calculator** to maximise the benefits of planting tree shelterbelts for ammonia recapture i.e. the Centre for Ecology and Hydrology's ammonia calculator

2 **Plan integration of trees within and surrounding your range**, assessing the long-term suitability of this planting

3 **Consider additional benefits of tree planting for your enterprise** this includes carbon storage and sequestration, an enhanced habitat for hens and other species, improved soil and water quality

4 **Explore scrubber installation opportunities** to help support removal of ammonia emissions with effective design

5 **Ensure good ventilation** in order to reduce ammonia and litter moisture levels

2.4 CASE STUDY 3: UTILISING WATER RESOURCE TO ENHANCE ON-FARM SUSTAINABILITY

UTILISING WATER RESOURCES TO ENHANCE ON-FARM SUSTAINABILITY

Llyr Jones runs a 32,000-bird unit at Derwydd, his 648-hectare mixed farm in Corwen, North Wales. With almost 404 ha of those being mountain and moorland (including 20 ha of peat bog), Llyr has consistently found innovative ways to farm with the landscape and utilise the water resources available to best manage this.

The centrepiece of his water-based strategy has been the installation of a hydroelectric plant. This harnesses the power produced by a tributary as it makes its way to the River Alwen in the valley bottom. The unit was installed in 2012 and on average generates 90,000 kWh per year, enough electricity to power 30 homes. Alongside 24kW of solar panels and a 60kW ground source heat pump, this enables the farm to benefit from a high proportion of home-produced renewable energy.

There are plans to invest further in solar panels to support energy usage at a recently completed layer shed, where 16,000 birds were introduced in November 2021. Only a small proportion of the farm's annual electricity is bought in, and any surplus electricity generated is sold back to the grid through the 'feed-in-tariff'. Llyr has invested in an electric utility vehicle to navigate the farm, which also capitalises on this renewable energy source by charging on excess electricity produced throughout the nighttime.

Protection of existing woodland corridors that flank the tributary has been facilitated by Glastir Woodland Creation funding, the Welsh Government's sustainable land management scheme. Between 2014 and 2019 four miles of stock fencing were erected to ensure a buffer zone for sheep and beef on both sides of the two-mile streamside corridor. This has not only allowed wildlife to thrive but has also improved efficiencies in stock management. Further benefits have included reduced soil erosion on the riverbanks, as well as greater opportunities for carbon sequestration.

Conserving and rehabilitating the 20ha of peatland at Derwydd is a key focus for the farm. Sustainable management of the peat bog takes the form of minimal intervention with Llyr careful to ensure the area remains wet and that any trees are removed that may drain the bog. The peatland provides high rates of carbon storage and sequestration (0.64 tonnes C/ha/yr), whilst providing habitat for rare insects and plants, and reducing flood risk by slowing the flow of water from the uplands.

"Farmers can grow food and help the environment simultaneously, but we cannot do it without support".

Photo: The River Alwen

Enhancement and restoration of the natural environment has also been undertaken; tree planting, again financed with Glastir funding, has been a key feature. With 2,500 mixed broadleaf trees planted in 2018 on a bank adjacent to the River Alwen, woodland corridors have been extended across the site, supporting flood mitigation and assisting in the defence of diffuse water pollution.

3,500 trees have also been planted around the perimeter of the existing range. Alongside existing mature trees, these provide a host of environmental benefits and plans are in place to replicate the perimeter planting around the second range linked to the erection of a new shed.

(l-r) Tree planting around the existing range. The new shed can be seen to the right of the existing shed.

The pursuit of simple solutions to improve efficiencies, has also led Llyr to ensure that his new shed incorporates a range of features that minimise environmental impact whilst supporting a sustainable business plan. For example, the shed has been built taller than the older, first layer house to capture residual heat from the hens, which is then vented down onto the muck conveyors, drying out the manure. Alongside reducing ammonia emissions, odour and fly problems, this process will reduce the physical volume of the manure, resulting in 50 less trailer loads of muck each year, representing a significant saving of labour and machinery costs.

Llyr Jones - Derwydd

"People think it's hard to go green, but it's not. A few simple changes can make all the difference."

FIVE STEPS FOR FARMERS TO IMPROVE LOCAL WATER QUALITY

1 **Use soil, nutrient and water management plans** to identify water pollution risks and effectively plan for the efficient application of manures and fertilisers

2 **Ensure safe storage and use of inputs**, including plant protection products, synthetic fertilisers, manures, slurry and feed to avoid water pollution from the farmyard and fields

3 **Utilise cover crops**, where applicable, to retain nitrogen in soils and reduce soil erosion

4 **Create grass buffer strips** alongside watercourses to minimise the risk of soil and product run-off

5 **Explore establishment of reedbed drainage systems** downslope from the range

3. SUMMARY

3.1 LESSONS FROM THE CASE FARMS

The case study analysis has identified a series of lessons learnt which are worthwhile to share and communicate within the report. These areas are offered to free-range egg producers and/or supply chain partners as recommendations and reflection points dependent on the stage each business is at on their net zero journey.

EVIDENCE BASED ACTION

Each of the case study farms and the work of Anglia Free Range Eggs has used a tool or system to identify its emission inventory and prioritise its focus areas. It is vital any farm starts to use a tool e.g., Eggbase for layer farms. This tool is specifically designed for accurately calculating the emissions performance on layer farms. The phase 1 project reviewed a selection of the freely available tools and identified this tool as the 'best available' for this sector. More information can be found in the phase 1 report. Farmers should use the evidence, insight, data and validated information which the business has used to prioritise actions. Each case has focused its 'lens' on a slightly different aspect of sustainability and net zero but the actions will lead to achieving the outcome. The phase 1 report made clear the recommendation for all free-range egg producers to use Eggbase, and this action has been reinforced through the case studies.

INTEGRATING SUSTAINABILITY

If a producer or supply chain organisation hasn't considered where sustainability fits into the strategy and business plan, now is the time for doing so. This plan needs to recognise the big issues such as feed impacts and where those opportunities to trial alternatives exist. Retailers and brands will be expecting farmers to identify the relevant those actions over a relevant time horizon (0-12 months) to 5 years ahead. The plan needs to align with the metrics highlighted in section 1 of this report (and in the Phase 1 document) to enable change.

KEEP IT SIMPLE

There is no 'one size fits call'. Energy, feed and fuel are all at unprecedented levels and global instability in agriculture supply chains means simple actions such as capturing rainwater, incorporating solar panels or trialling min or zero till (if relevant) can be small changes that have the most significant impact!

EMBRACE WEAKNESSES, RISKS AND FAILING

Failing or things not quite going to plan is not a weakness, this is a strength! Each case found imperfect results to begin with and had to adapt their strategy to accommodate the issue they were seeking to tackle. The changing face of UK agriculture support requires resilience planning, and it is fair to say 'not changing' is not an option! It's how you evolve and adapt from what didn't work which will support the development of your sustainability plan.

REACHING OUT

Communication and engagement are critical, to not only demonstrate action and progress within the local community but to identify the solutions and timelines which need planning against very complex issues. The protein and alternative feeds case highlight the complexity as well as the trade-offs which have to be balanced. Cost, brand expectation, NGO pressure to name but a few mean the free-range egg system has to 'challenge the status quo'. With inflation, energy, fuel and feed costs at all time highs alongside global geo-political situations which threaten food security, now is a key moment for producers to demonstrate how they are planning to tackle in the short, medium and long-term, key sustainability issues on farm.

KNOW THE VALUE OF YOUR ACTIONS

Investment in afforestation, woodland planting, particularly where this might support ammonia mitigation creates potential to build carbon stores. Understanding and quantifying this baseline first is essential and it is as important to 'own' this as much as using Eggbase to quantify greenhouse gas emissions. Building soil carbon and managing the environmental assets is going to be vital as UK farm support systems change from 2025[12]. WWF[13 14] and the Green Alliance[15] have identified a need to evolve the policy landscape to support the transition, but it is important free-range egg producers do not under value the farm 'environment' bank and don't be prepared to give/sell these assets to others who are seeking to 'offset' their own emissions.

COLLABORATIVE ACTION

All the case studies highlight the need for utilising a broad church of trusted and expert advisors to enable a future-fit plan. Part of this will include action led by BFREPA and it is proposed that a further phase 3 involving a 'live' trial with several partners to evaluate the opportunity to phase out soya.

3.2 HOW TO SUPPORT YOUR FARM TO TRANSITION TO NET ZERO

To help producers to plan for the transition, the following decision path has been devised to help BFREPA members to capture the evidence, to build the plan and then begin to implement the actions.

Figure 3.1: Transitioning stages for BFREPA members

4. APPENDIX

APPENDIX 1 – REFERENCES

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