NFU

Proud of Poultry

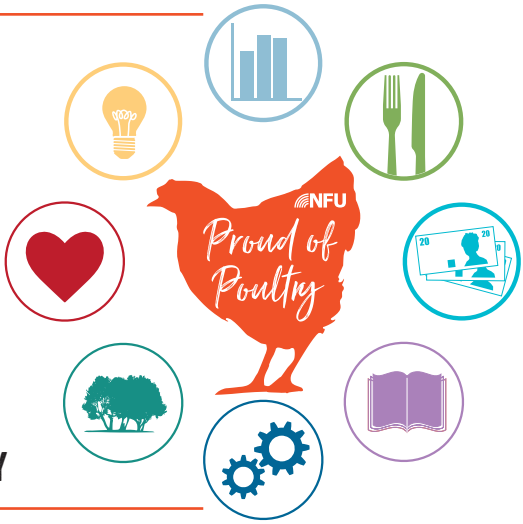
ENVIRONMENT

OVERVIEW

Proud of Poultry has been produced by the NFU to showcase the many positive initiatives the poultry industry has to offer. The aim of this working document is to demonstrate and educate a variety of audiences including farmers, schools, universities, government and the media on how efficient, innovative and dynamic our sector is.

THE PUBLICATION WILL BE SPLIT INTO EIGHT SEPARATE SECTIONS:

- DEMAND
- FOOD SAFETY
- ECONOMIC
- TRAINING
- EFFICIENCY
- ENVIRONMENT
- WELFARE
- INNOVATION AND TECHNOLOGY



Stemming from the original document, a series of additional features for a variety of key pillars within the poultry industry will be created, including: infographics, case studies, social media content, posters and leaflets, as well as briefings and articles.

ENVIRONMENT

The poultry industry is important not just because of the food it provides to our nation, but the range of measures producers take to preserve and enhance the environment they operate in. The British poultry industry are proud of their environmental credentials.

PERMITTING

With the integration of world-leading EU standards, British poultry is at the forefront of environmental, welfare and technological standards, and as part of EU law poultry farmers with more than 40,000 birds must hold a valid permit with the relevant authority concerning pollution prevention and control legislation.

Production permits are part of EU legislation governing the 'Intensive Rearing of Pigs and Poultry'. Under this directive, producers undertake a range of measures including nutritional management, covering feed preparation (milling, mixing and storage), rearing (housing), collection and storage of manure, processing of manure, manure land spreading and storage of dead animals, to reduce the impact their enterprise elicits upon both the local and wider environments.

In conjunction with this legislation, poultry producers must comply with 'Best Available Technique' (BAT) legislation and develop individual environmental policies taking into account systems to minimise the production and accumulation of waste, fly control and reduce the impact of the community with respect to noise, odour and traffic.

TREES

Trees play an important and practical role in mitigating the environmental impacts of poultry production on the environment and provide a valuable contribution to local environments and communities. Poultry farmers actively undertake tree planting under a variety of different scenarios, including: site buffers, stewardship options and incorporation into range areas.

Trees have the ability to clean the air by capturing carbon dioxide, a greenhouse gas, by storing the carbon in the wood and releasing oxygen back into the air. Trees can also act as vegetative filters and creating tree belts within poultry production sites can help to intercept ammonia emissions and particulates, improving the quality of air, water and overall ventilation. Tree belts as narrow

as 10m have been shown to reduce ammonia in emissions by around 53% and dust by 56%, and studies for wider belts suggest ammonia capture of up to 67%.

In addition to the ability of leaves to capture various gases, decomposition of deciduous leaf shed can provide additional organic matter which improves soil sustainability and structure. Water infiltration in tree belts is many times greater than the surrounding land and additional organic matter and the action of tree roots can yield an increase in soil organisms such as worms. By increasing the infiltration rates of the soil and the roughness of the land, trees can help to protect soil and crops against the impact of intense rainfall as well as act as a barrier against the wind, buffering land against strong gusts that threaten to blow away valuable top soil.

Roots can also help to reduce the impacts of flooding, effective in absorbing nutrients, and aid in the filtering of nutrients in runoff and groundwater and reduce the potential for water course contamination. As a result of root absorption and reduction in overland flow, more than 80% of nitrogen and phosphorus can be prevented from entering adjacent water courses.

Trees around poultry units and other farm buildings can also improve energy efficiency by providing shade in summer and acting as windbreaks during the winter. Strategically placed trees provide protection during late autumn, winter and early spring by reducing wind speed by more than 50% as a 'wind-shadow' of approximately 200 feet is developed on the downwind side of an established windbreak. Research suggests that properly established windbreaks offer an energy efficient, natural system yielding between 10-40% reductions in heating costs and reducing cooling costs by 20%. In turn, reductions in energy requirements subsequently yield reductions in greenhouse gas emissions.

Furthermore, eventually, trees thinned from shelter belts can also contribute towards wood fuel.

Properly undertaken tree planting around hen housing can encourage the ranging of hens which promotes natural behaviours that are good for their welfare. Tree cover can also help reduce nutrient load, parasitic contamination and poaching in the area close to the house by drawing the birds away from the building. Planting native tree species on poultry farms also has great benefits to local wildlife and can form part of wider farm planting for biodiversity. Providing a woodland edge type habitat can improve connectivity or buffer to other habitats. By planting trees, the valuable contribution poultry farmers proactively make to their local environment and communities is also recognised within some production standards, for example

under RSPCA Freedom Food standards for laying hens, producers ensure a minimum of 5% of natural range cover, which can incorporate trees. The minimum range area of tree planting rises to 20% to satisfy the Woodland Trust's' Woodland Standard'.

THE WOODLAND TRUST

Organisations such as the Woodland Trust work with farmers and landowners to protect, restore and create woodland areas.

Grants are available to farmers and landowners looking to plant trees for woodland or diversify into agroforestry. For woodland planting, farmers purchasing over 500 trees to plant on land over 1.25ha can receive 60% funding towards costs when planting the trees themselves or 50% towards costs when using a contractor. For agro-forestry incorporation, farmers planting over 250 trees are eligible for full funding.

Support is offered to farmers and landowners throughout the two tree planting schemes, to help conduct a site report and assessment, design the planting layout, select the most appropriate species mix and give advice on how trees can work for the farming business.

CASE STUDY:

Tree planting

The Lakes Free Range Egg Company

Helen and David Brass, farmers and Woodland Trust ambassadors, have been producing free range eggs for nearly 30 years at their family farm in Penrith. Having started tree planting trial schemes in 1997 they have come to appreciate the commercial and welfare benefits that trees deliver.

The Lakes Free Range Egg Company approach involves 'range enrichment' (tree planted pasture) supported by bio-diversity action plans and the company ensures that all of their contract producers follow the same approach.

The Lakes Free Range Egg Company has planted 60,000 trees, including native wild cherry, ash, oak and holly, which have created over 50 hectares of woodland. The company is now one of the largest free range egg packing businesses in the UK and is a major supplier to national supermarkets. At least 20 per cent of the ranging areas on all farms supplying The Lakes Free Range Egg Company are now tree-planted. Across the free range egg producing farmer base this now amounts to over 240,000 trees.

David said: *"There have been no disadvantages to planting trees. For us, it's all an upside. We get better production, reduced mortality, better egg quality, less seconds, reduced incidences of disease and it makes you feel nice too. The cost of planting is recuperated ten times over in the first couple of years. As well as financial benefits, trees improve the overall quality of my farmland, increase wildlife habitats and provide wood fuel for the biomass boiler that heats our farm. Trees are not just nice to have, they are business assets that lead to increased production and income."*

RENEWABLES

Renewable energy sources for on-site generation and use, or for export, can support profitable farming, underpinning traditional agricultural production with additional returns that make businesses more resilient whilst reducing greenhouse gas emissions and lowering farming's carbon footprint. The story of renewables is a positive message throughout the agricultural sector with the NFU Farmer Confidence Survey of 756 members, taken between October and November 2017 indicating agricultural diversification into renewable energy shows no signs of slowing down, with results from a fourth consecutive year showing an increased utilisation of a range of technologies. Within this impressive figure, an astonishing 72% of poultry producers are using renewables, increasing their production and using green energy in order to manage energy costs and enhance productivity.

Renewables can meet on-site energy needs for lighting, heating, feeders and ventilation, as well as exported power. Within the poultry sector, solar PV remains the most popular technology, followed by installations of biomass boilers and then wind turbines and anaerobic digester (AD) plants. The valuable contribution farmers make by embracing renewable energies has been supported through a variety of government initiatives including, the renewable heat incentive and feed-in tariffs.

SOLAR PV

As the most popular form of renewable energy generation amongst poultry farmers, rooftop and ground mounted solar panels harness solar energy to generate electricity to pursue greater self-sufficiency by meeting on-farm energy needs or allowing grid export to provide power to local communities.

Both solar PV options bring environmental benefits as well as simultaneously meeting food and energy needs; roof top solar PV efficiently utilises existing business assets and ground mounted solar PV can be combined with continued agricultural land use for small livestock such as chickens or geese.

New guidance compiled by the NFU and published by the BRE National Solar Centre illustrates how ground mounted solar PV can be combined with continued agricultural land use for small livestock species such as chickens or geese, supporting biodiversity and yielding both economic and ecological benefits. Once installed, 95% of a field is still accessible to vegetation growth and agricultural use. As a result, ground mounted PV can significantly boost local biodiversity, delivering benefits to wildlife and potentially even boosting pollination of surrounding crops.

A recent study by ecological consultants Clarkson & Woods and Wychwood Biodiversity found that when compared with control plots:

- Overall, solar farms had greater botanical diversity
- Overall, solar farms had greater invertebrate abundance
- Overall, solar farms had a greater diversity of birds

The research suggests that solar farms may be of particular benefit for birds of conservation concern, in particular skylarks use solar farms within their territories.

CASE STUDY:

Renewables

Nigel and Patrick Joice

NAME:
Nigel and Patrick Joice

REGION:
East Anglia

SIZE:
560 hectares and 800,000 broilers

TECHNOLOGY:
450kW solar PV and 2MW of biomass including CHP

INVESTMENT:
Approximately £3million

The ground mounted solar photovoltaic arrays were installed for on-site electricity needs on unused land close to the poultry sheds. They were installed to provide energy independence for a large broiler enterprise and complement a poultry litter biomass heating plant. Together with another 150kW of solar panels on the roof of farm buildings, the panels are designed to meet 90% of daytime electricity needs on an annual basis. They also insulate the business from volatile energy costs.

BIOMASS BOILERS

Biomass boilers are the second most popular renewable technology adopted to help poultry producers achieve greater self-sufficiency by meeting on-farm heating needs.

By burning renewable resources such as wood pellets, woodchip, straw, miscanthus, willow, and even poultry litter, biomass boilers enable a low carbon process as the amount of carbon dioxide emitted during the burning process is equivalent to the amount absorbed during the growth of the trees. The heat emitted from this process is then used to ensure chicken welfare and maintain environmental conditions within poultry sheds.

Modern biomass boilers are extremely efficient and sophisticated, offering levels of efficiency comparable to the best fossil fuel boilers whilst minimising levels of atmospheric emissions and pollutants. In conjunction with efficiently designed and constructed poultry housing, overall energy requirements and subsequent emissions can be reduced.

Low carbon technologies such as biomass boilers means less carbon dioxide and water vapour is expelled into both the external environment and within poultry housing. Internally, this then yields improvements in animal health and productivity as avoiding water vapour results in lower humidity and litter moisture; reducing the incidence of associated ailments such as hockburn, pododermatitis and breast blisters. Lower litter moisture content also results in lower ammonia production. Lower ammonia emissions coupled with lower carbon dioxide levels, contributes to a more stable internal poultry shed environment, reducing ventilation requirements and subsequent energy demands. Impacts upon the external environment regarding air quality and local surface and ground waters, are also reduced.

Amongst other available resources, non-food perennial biomass crops such as trees, short rotation willow and miscanthus are often grown on land less suited to food crops and can contribute to the reduction of carbon dioxide. Studies by Rothamsted Research show that dedicated biomass crops which remain in the ground for long periods require low agro-chemical inputs bringing multiple environmental benefits including:

- providing varied habitats for native species
- increasing biodiversity
- improving soil sustainability and structure
- increasing soil organic matter content

- increasing number of soil organisms
- increasing soil infiltration rate
- protecting soil against the impacts of wind and intense rainfall
- increasing nutrient absorption, reducing run-off and potential water-course contamination

Furthermore, many of the biomass resources harvested in the industry are sustainably grown and managed by farmers who grow biomass crops in order to produce fuel. Many of these resources are also produced locally, providing support to local economies and more jobs for local people.

The ash produced by most biomass boilers is also considered to be a compostable component and source of soil nutrients.

POULTRY LITTER

Using poultry litter for biomass became a legal possibility when EU rules were changed in February 2014, reclassifying litter as an animal by-product, rather than a waste product. Utilising poultry litter as a biomass resource possesses many of the same benefits as discussed within the biomass boiler section above. Using poultry litter for biomass boilers also embraces circular economy principles and illustrates another innovative low carbon option utilised by UK poultry producers.

ANAEROBIC DIGESTION (AD)

Anaerobic digestion systems help poultry producers meet on-farm electricity requirements, through the production of biogas and heat. The heating element of AD systems works in a similar way and brings similar welfare benefits to those associated with biomass boiler heating systems. The scale of many AD plants often promotes export of electricity back to the grid, supporting and powering local communities.

In addition to some of the many positive benefits discussed regarding biomass boilers, AD systems allow the utilisation of alternative fuel types such as waste food and readily available energy crops.

In addition to heat, another product of the electricity production process is the creation of digestate, a nutrient rich material resulting from the digestion of biodegradable feedstock. Digestate can subsequently be applied to farmland in either a liquid or solid state as an organic fertiliser, reducing the demand for energy intensive or non-renewable inorganic fertilisers.

Both soil and liquid fractions of digestate bring benefits to soil health and quality. Solid fractions of digestate are rich in organic matter and phosphatic elements, whilst liquid fractions containing ammonical nitrogen and little organic matter can be used like liquid manure

to replace nitrogenous fertilisers and are also more easily used by plants. The treatment of digestate within the AD process also yields a reduction in odours and disease-causing agents.

HEAT PUMPS

Heat pumps are another example of low carbon renewable energies, upgrading low grade energy from air, ground or water source collectors into more usable heat via a refrigeration cycle. The harnessing of existing heat source energy makes use of a totally renewable, free and readily available, yet otherwise unexploited resource. Again, heat pumps possess many of the same welfare and subsequent environmental outcomes as those sought by biomass boilers through the reduction of carbon dioxide or water vapour emissions from the poultry shed.

WIND TURBINES

As another popular form of renewable energy generation amongst poultry farmers, wind turbines are a clean energy source which harnesses the power of wind to generate electricity, allowing producers to pursue greater self-sufficiency by meeting on-farm energy needs or allowing grid exportation to support and power local communities.

Not only is wind power cost effective, it also only occupies a small proportion of land, enabling existing wildlife habitats and biodiversity to be maintained with minimal disruption and current farming practices to continue.

The efficient use of energy plays a large part in many other environmental and economic benefits the poultry industry provides.

AMMONIA

Ammonia (NH_3) is a gas formed from nitrogen and hydrogen. Agriculture is a major source of ammonia emissions to the atmosphere, mainly through the rapid hydrolysis of urea excreted by livestock. Many measures are being undertaken by farmers worldwide to reduce ammonia emissions from agricultural production and as a result agricultural emissions have been falling in recent decades. Through innovation and the application of best practice techniques, UK poultry farmers are making good progress in this field as the sector continues to progress to meet the demanding 2030 targets outlined in legislation.

Poultry housing and husbandry also plays an important role in reducing ammonia emissions. Ventilation, indirect heating

from biomass energy and nipple drinkers all help to prevent increases in, or actively reduce the litter moisture content which in turn results in lower litter ammonia production.

Nutritional management also plays an important role in reducing ammonia emissions from litter. UK poultry farmers provide carefully formulated and tailored nutritional feeds to their birds, matching the flocks' requirements by improving the digestibility of nutrients and by balancing the concentration of the different essential components in order to improve the efficiency of the birds protein synthesis and reduce the amounts of nutrients excreted. To complement this technique, phase feeding is also employed: using different diets during different stages of production to match the birds changing requirements, thus decreasing the wasted nutrient excretion in the manure.

Solid manure is mostly produced in poultry houses and may be temporarily stored in the same building until its removal after the production cycle. Laying hens produce droppings with a typical moisture content of 80–85 % and broilers around 60%. The initial moisture content is likely to be mainly influenced by nutrition, whilst the drying rate is affected by the external climate, indoor environment, ventilation and the manure handling system. By minimising manure handling and the moisture content in the manure through nutrition and housing conditions farmers can also reduce ammonia emissions.

The storage of poultry manure once it has left the poultry house is also an important aspect of reducing ammonia, as well as controlling odour and nutrient run-off. Solid manure is often stored on a solid, impermeable floor which prevents leakage to soil and groundwater. Equipping the storage with drains and connecting these with a pit allows collection of the liquid fraction and of any run-off caused by rainfall. It is also common practice for farmers to have storage facilities for solid manure, to hold sufficient capacity until further treatment or application is carried out.

To reduce odour, the location of the storage on the farm is also often taken into account, taking advantage of natural barriers such as trees or height differences. Also, walls (wood, bricks or concrete) can be erected to surround storage heaps.

Some systems enable manure to be dried to lower moisture content in order to reduce ammonia emissions. Dried poultry droppings are stored in a covered area in enclosed sheds; condensation can be avoided by proper ventilation as to prevent re-moistening of the droppings and subsequent odour or ammonia emissions.

Temporary field stacks are located sufficient distances: 10 metres from watercourses and 50 metres from springs, wells, boreholes or other sources intended for human consumption. Stacking the muck heap in a way that minimises the surface area can help to reduce ammonia emissions; the covering of manure heaps can also reduce run-off, release of ammonia, and odour production.

Poultry litter provides a useful, natural and sustainable source of organic nitrogen phosphorus and potassium, which are released into the ground more slowly and also contribute to improved soil structure over time. In turn, as soil organic matter increases, as does the soils ability to hold water and nutrients, reducing water and nutrient losses and increasing productivity.

The land spreading of poultry manure and litter is a commonly applied technique, and UK poultry farmers employ techniques to reduce ammonia and odour emissions, as well as the loss of nutrients due to leaching and run-off.

In accordance with UK regulation such as Nitrate Vulnerable Zone (NVZ) and the Farming Rules for Water (introduced in England in April 2018) UK farmers adhere to nutrient application plans, which outline suitable areas of land, alongside excluded areas where manure should not be spread at any time or spreading rates should be limited where there is a considerable risk of run-off, such as (very) steep slopes and surroundings sensitive to smell. Weather conditions and the crop growing season are also taken into account when planning the application, avoiding periods that are too dry, windy, cold or wet. Farmers also adhere to buffer zones which avoid contamination of watercourses or the farmyard, as well as minimum distances (50-100m) to springs, wells or boreholes.

Application techniques of poultry manure include rear discharge spreaders, dual purpose spreaders, and rota spreaders. Incorporation following spreading is a vital factor in reducing ammonia emissions, which is affected by a variety of factors including dry matter content, the prevailing weather conditions, soil type and the crop conditions. Incorporation of manure into easily cultivated arable land within 12 hours achieves emission reductions of up to 90% and within 24 hours yields reduction of between 60-79%. Reducing the losses of ammonia through rapid incorporation not only reduces the emissions to air and groundwater, but at the same time increases the amount of nitrogen available for grass and crop uptake.

Dirty water reserves associated with poultry production, for example wash out water, can also be recycled and spread onto land. Using low emission spreading techniques such as a band spreader trailing hose or trailing shoe or placing the dirty water beneath the soil surface using an injector.

PACKAGING

The majority of egg cartons used in the UK are made from reformed recycled paper or cardboard pulp which is heat pressed to produce a 100% recyclable egg carton which is accepted by most municipal waste-collection agencies. There is also a variety of other options for these versatile cartons post-use, including re-using, upcycling and composting.

Other types of material used to produce egg cartons include PET plastic. The process of production behind PET plastic minimises materials used, energy consumed and waste generated. The plastic egg carton is 100% recyclable and is made entirely from 100% recycled materials e.g. recycled soft drink bottles, and can be recycled by most municipal waste-collection agencies. PET can also be remanufactured to produce polyester fibre, which is used in carpets, insulating fleece for clothing and containers.

A slightly less common type of egg carton material is polystyrene foam, which can contain around 40% recycled material and can subsequently be recycled itself. Recycled polystyrene can be used for many products, such as packaging peanuts, CD jewel boxes, office supplies, video cassette casings and other packaging uses. As more products are packaged in polystyrene foam, there is a subsequent increase in the number of local authorities accepting this packaging in their recycling programs.

CASE STUDY:

Packing centre

The Lakes Free Range Egg Company

From their base in the Lake District, Helen and David Brass run their family owned business, established in 1997, producing and packing free range and organic eggs.

After years in a smaller egg packing facility 'The Lakes' designed and built a new state of the art egg packing facility that is leading edge in technology and minimises their carbon footprint. It is the first UK egg packing plant to be carbon neutral. Having achieved Carbon Trust scope 1/2 carbon neutrality in 2016.

The packing centre has fully automatic light switches and leading edge robotic automation with technology allowing for production growth without increasing the energy requirement. Initiatives include utilising car robots to pack eggs and the use of laser technology which avoids the need for labels.

Making use of the weather, 'The Lakes' packing centre harnesses recycled rainwater, cutting water usage by 50%. Solar panels in fields provide shelter for hens whilst creating solar energy to power the packing centre, along with energy from a ground source heat pump and a 200kW biomass boiler that runs a district heating system in the neighbouring village.

Environmental credentials

- Harvested rainwater reduces water consumption by 50%
- New technology will cut label use saving 10 tonnes of paper per year
- Biomass boiler recycles waste wood and tree thinnings from ranges
- Packing centre generates 120% of its own energy and achieved 100% efficient in 2014
- Export renewable energy to national grid/district heating system
- New equipment means greater output on same energy
- 50% reduction in water usage
- No waste taken to landfill achieved in 2012
- Energy neutral achieved in 2015
- Reduce net CO^2 to nil in 2016
- Installation of a district heating system, using excess energy to heat homes in a local village

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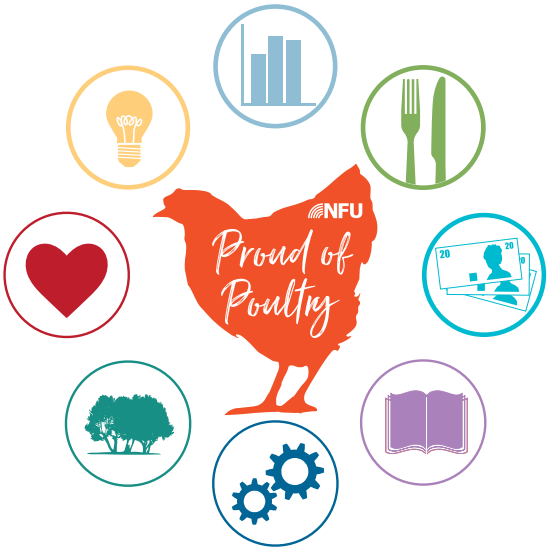

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