Investing in the future of poultry feed – A Soil Association guide for supermarkets

In April 2022, the Soil Association launched "Stop Poison Poultry", a campaign highlighting the harms caused by highly hazardous pesticides applied to soya crops in Latin America – crops which are used to feed intensively reared chickens in the UK. The campaign launched a petition calling on leading UK supermarkets to take action to mitigate these impacts, working down the supply chain to phase out the most harmful pesticides, beginning with the poultry supply chain. As part of a time-bound plan to address the issue, we are asking supermarkets to **work with your poultry supplier to develop an action plan to reduce the soya content of chicken feed from 20% to 10% by 2030, with UK/EU-grown legumes and beans used instead.**

Please see the 'Stop Poison Poultry' report for further recommendations.

Developing a market for UK peas and beans

Moving away from reliance on soya feed towards more home-grown proteins is both feasible and beneficial to UK agriculture and supply chains. Feed prices are rising globally, alongside fertiliser and fossil fuel-based inputs and feed supplies are at risk. Soya has historically been priced very cheaply as well as being high in protein and pre-processed, making it a good value product to meet the requirements of intensive livestock farming. The food industry now needs to increase its resilience to the impacts of climate change and other shocks such as the crisis in Ukraine. Supermarkets and other industry stakeholders have made commitments to net zero and a change in feed sourcing will enable greater self-sufficiency, sustainability and a transition to agroecology[1].

In order for a reliable market in UK-grown peas and beans to develop, supermarkets need to support research and production of alternative feeds in agricultural systems across the UK. The Soil Association's Innovative Farmers programme provides a mechanism through which such support could be given. The programme supports farmer led research, with over 100 groups of farmers forming field lab groups to work on the challenges which they face and test new ideas on their own farms. Innovative Farmers is celebrating its 10th anniversary year in 2022.

[1] https://www.soilassociation.org/causes-campaigns/a-ten-year-transition-to-agroecology/what-is-agroecology/?msclkid=df76b699b67211ecbf44ecbaccd441d9

We need retailer support to increase UK production of feed proteins, increasing the sustainability of the industry across several factors, including the environmental and monetary costs of importing large volumes of soya from across the globe. Investing in home-grown feed makes good environmental sense, reducing carbon emissions and overseas land-use, and would support a UK market for peas and beans, helping UK farmers at a time when they are facing rising costs and lower margins.

We nevertheless understand the challenge in swapping to alternative feed and that it needs to be phased in over time. We would welcome a further conversation with the supermarkets to identify ways of working together to realise this aspirational but realistic challenge.

This briefing provides guidance on alternative feeds being tested and developed to replace soya in livestock feed. All have been used historically and have the potential to be used again in the future in a market-based economy supporting UK farming and a transition to net zero and agroecology.

Finding alternative protein sources that can be produced locally and more sustainably is an essential way of reducing the environmental impact of feeding chicken. This can be done by substituting soya with alternative protein feeds such as pulses (peas and beans).

When looking at alternatives to soya, it is important to ensure the birds' amino acid requirements are being met and, in particular, methionine and that any alternatives don't possess anti-nutritional factors. Slower growing birds that meet the requirements of the Better Chicken Commitment can better take advantage of feed such as peas and beans which have relatively a lower protein content than soya. Using slower growing birds therefore helps reduce any risk factors associated with lower protein feed as well as significantly contributing to improved bird welfare. An ideal feed choice would be the one with the highest protein but lowest anti-nutritional factors. It should be noted that the soya fed to chickens and other livestock is an already processed product. Processing is required to address the anti-nutritional factors also found in soya.

Analysis of alternative feeds

Table 1 compares the nutrient profile of these alternative feeds with soya[2].

	Soybean meal	**Peas**	**Faba Beans**	**Sweet Lupins**	**Sunflower**	**DDGS Barley**
Dry matter (%)	88	86.5-90	86.6-90	90.2-91	89.8	91.3
Crude protein (%)	47.8	23	24.1-29	31-33.8	37.7	28.2
Crude fibre (%)	3	5.5-6	8.4-9.1	15.4-16.1	22.8	13.8
Ash (%)	6	3.3-3.5	2.7-3.9	2.7-3.5	7.7	
Starch (%)	5.51	46-51.3	38-44.7	4.7-10		
ADF (%)	5.2-6.7	7-8.2	9.9-10.7	19.7-	26.6	23.8
NDF (%)	7.4-12.2	14.2-	12.8-5.9	23.5-	38.7	60.1
Poultry ME kcal/kg	2425	2600	2675	2485		
Lysine (g/16g N)	6.57	7.26	6.29	4.75		
Methionine (g/16g N)	1.4	1.05		0.68		
Methionine (% of CP)	0.7	1	0.8		2.3	2.5

Peas

Peas have a relatively high protein content (usually about 22–24%, ranging between 16 and 32%). Their amino acid profile is well balanced in lysine (similar to soya). They are deficient in tryptophan and sulphur-containing amino acids (notably methionine).

Faba (Broad) Beans

Beans are rich in protein (25–33%) and starch (40–48%) and a valuable source of protein and energy for livestock. They have a moderate content of fibre (crude fibre 7–11%). The amino acid profile of beans has a high lysine concentration in the protein (5.4–6.8%) and a relative deficiency in sulphur amino acids (0.6–1.0% methionine). Nutrient composition varies with variety, environment, growing conditions and year of harvest.

[2] Sources: Paul A. Iji, Mehdi Toghyani, Emmanuel U. Ahiwe and Apeh A. Omede (2017) Alternative sources of protein for poultry nutrition, University of New England, Australia; Nalle, C. L., 2009. Nutritional evaluation of grain legumes for poultry. PhD Thesis, Massey University, Palmerston North, New Zealand; Canadian Feed Peas Industry Guide, Dave Hickling, Ph.D. Third Edition, 2003; Nutritional Value of Soybean Meal, Teresa Banaszkiewicz, (2011) DOI: 10.5772/23306; Feedstuffs Ingredient Analysis Table (2016 edition).

Sweet Lupins

Sweet lupins are rich in protein (35%) and low in anti-nutritional alkaloids. Their amino acid profile is lower in lysine and relatively deficient in methionine compared with peas and beans.

Sunflower meal

Sunflower meals can be made from whole or decorticated seeds and can be extracted mechanically and/or using solvents. The quality of sunflower meal depends on the plant characteristics (seed composition, hulls/kernel ratio, dehulling process, growth and storage conditions) and on the processing (dehulling, mechanical and/or solvent extraction). The protein content of sunflower products ranges from 23% for some non-dehulled, mechanically extracted meals, to more than 40% for highly decorticated, solvent-extracted meals. However, usual ranges for protein are 29–33% for non-dehulled meals and 35–39% for dehulled and partially dehulled meals.

Dried Distillers' Grains with Solubles (DDGS)

DDGS are the major by-products derived from grain during the industrial fermentation and distillation of starch-rich grains for various alcoholic and non-alcoholic drinks, and ethanol production. They are rich in protein, fat, minerals and vitamins. Their nutrient composition is a function of the starting grain and the specific methods used to make ethanol and other products.

Distillers' grains and solubles have very low concentrations of starch because most of the starch in the starting grains is converted to ethanol. The concentrations of protein, fibre, fat and minerals are increased, depending on the concentration of starch in the grain. The bioavailability of phosphorus in DDGS and brewers' products is fairly high at around 60%, but the digestibility of lysine in these by-products is lower than in the starting grain.

Other possible options requiring further investigation include algae and insects. Insect meal has the potential to replace soya but should be part of a circular feed system, incorporating welfare and human health considerations. It requires the support of UK legislation to be developed at scale[3].

[3] https://www.wwf.org.uk/sites/default/files/2021-06/The_future_of_feed_July_2021.pdf

Considerations when integrating these alternative feeds into the ration

Protein and energy content

When considering the nutrient profile of these alternative proteins compared with soya, the high protein content of soybean meal is evident. However, the starch (energy content) of peas and beans is highly significant. In a less nutrient dense (or concentrated) diet the value of each ingredient in contributing both protein and energy is more significant.

Acid Detergent Fibre (ADF) value

ADF accounts for the least digestible plant components, including cellulose and lignin and forages with low ADF concentrations are usually higher in energy. Soya, peas and beans all have low ADF values.

Anti-nutritional factors (ANF)

Pulse crops and other legumes contain several ANFs: protease inhibitors, tannins, alkaloids, lectins, phytic acid, saponins and oligosaccharides. In human diets many of these ANFs are not a concern because cooking deactivates them, but they can be a problem in animal feeds where ingredients are typically not heat processed to the same extent. For peas, the levels of these ANFs are quite low and generally no special precautions are required before using them in animal feed.

Although identifying the risks of the ANF when considering feed ingredients is important, there are multiple ways of overcoming these issues and improving and balancing the nutrient value of different ingredients through processing (see Table 2). However, the cost and environmental impact of processing needs to be evaluated when considering the overall "value" of a feed ingredient. Dehulling is particularly important in increasing the protein availability and reducing the ANF of beans and lupins.

Table 2: Suitable processing methods to reduce anti-nutritional factors (ANFs) in alternative proteins[4].

	ANF present	Suitable processing method
Beans	Protease inhibitors, tannin, lectins, glycosides (vicine and convicine), Oligosaccharides	Dehulling, solvent extraction, germination
Peas	Tannins, Oligosaccharides	Heat treatment, use of dietary enzymes
Sweet Lupin	Alkaloids	Choice of variety, dehulling use of dietary enzyme supplement, fine grinding also aids digestibility
Sunflower meal	High in crude fibre, low in lysine, NSP, chlorogenic acid	Dehulling, mechanical and/or solvent extraction
DDGS	High crude fibre	

Further resources

The Soil Association's Farming and Land Use team has a high level of knowledge and experience in all areas required to help businesses develop supply chains which respond positively to the climate and nature crises and to support farmers to transition to more agroecological farming systems.

Our FABulous Farmers programme is actively looking for partners who share our ambition. One of its key elements is the development of business models to underpin practice change: https://www.soilassociation.org/farmers-growers/supporting-you/the-future-of-organic/fabulous-farmers/

Our Innovative Farmers programme supports farmer led research, with over 100 groups of farmers forming field lab groups to work on the challenges which they face and test new ideas on their own farms. The programme is celebrating its 10th birthday in 2022: https://www.innovativefarmers.org/

Please contact producer.support@soilassociation.org for further information and help.

[4] Sources: Iji et al (2017); Nalle (2009).